

Transport Gateways and Trade Corridors.
Portes du transport et corridors de commerce.

Canadian Transportation Research Forum
Proceedings of the 31st Annual Conference
Winnipeg, Manitoba
May 26 - 29, 1996

VOLUME 1

Le Groupe de Recherches sur les Transports au Canada
Actes de la 31ième Conférence Annuelle
Winnipeg, Manitoba
26 au 29 mai, 1996

CANADIAN TRANSPORTATION RESEARCH FORUM
LE GROUPE DE RECHERCHES SUR LES TRANSPORTS AU CANADA

PROCEEDINGS
of the 31st Annual Conference

ACTES
de la 31ème Conférence annuelle

TRANSPORT GATEWAYS AND TRADE CORRIDORS
PORTES DU TRANSPORT ET CORRIDORS DE COMMERCE

Winnipeg, Manitoba
May 26-29/26 au 29 mai
1996

Edited and compiled
by
Barry E. Prentice, Ph.D.
Vice-President, Programs

Proceedings Printed by

University of Saskatchewan
Printing Services

The Canadian Transportation Research Forum assumes no responsibility for the content of the papers published in these Proceedings or for any errors or omissions in the printing of this volume. These papers are published by the CTRF as a means of disseminating transportation research and to encourage discussion on a broad range of issues during the CTRF Annual Conference.

President's Message

Welcome to CTRF's 31st Annual Conference. Once again our conference organizers have prepared a dynamic conference to address the issues facing transportation in Canada. These proceedings allow the conference participant to "attend" every session at the conference either in person or by review of the proceedings. They represent the current work in progress of our membership and as such are an extremely valuable research aid for all of us.

This year's conference on Transport Gateways and Trade Corridors has been organized by Dr. Barry Prentice of the Transport Institute, University of Manitoba with the support of the Winnipeg Transportation Club, the Manitoba Institute of Agrology, and the Winnipeg Chapter of the Chartered Institute of Transport. Our thanks go to Barry and his team for all the work that is necessary to make the Forum an outstanding success. I am looking forward to a dynamic, exciting and instructive forum and the opportunity to meet you once again.

Le message du président

Bienvenue à la 31ième conférence annuelle du GRTC. Encore une fois les personnes responsables de voir à l'organisation de la conférence nous ont préparé une conférence dynamique portant sur les sujets de l'heure dans les transports au Canada. Avec les textes des présentations regroupés et publiés dans les Actes de la conférence, les participants à la conférence peuvent assister en personne à des séances et consulter les Actes pour les autres séances. Ces Actes constituent un recueil contenant le fruit des travaux actuels de nos membres et, comme tel, représentent un outil des plus valables dans nos propres travaux.

La conférence cette année, qui a pour thème "Les portes du transport et les corridors de commerce", a été organisée par Barry Prentice de l'Institut des transports de l'Université du Manitoba. Il a bénéficié de l'appui du "Winnipeg Transportation Club", du "Manitoba Institute of Agrology ", et du chapitre de Winnipeg du "Chartered Institute of Transport". Nos remerciements vont à Barry et à son équipe pour tous les efforts qu'ils ont fournis afin de mettre sur pied une conférence que l'on peut déjà qualifier de succès. J'envisage une conférence dynamique, excitante et instructive et j'espère vous y voir.

Doug Duncan

CONFERENCE SPONSORS
COMMANDITAIRES DE LA CONFÉRENCE

(as of March 31, 1996/au 31 mars 1996)

Manitoba Department of Highways and Transportation

Transport Canada/Transports Canada

Industry Canada/Industrie Canada

National Transportation Agency/Office national des transport

Statistics Canada/Statistique Canada

CN North America/CN Amérique du Nord

CP Rail System/Réseau CP Rail

Bison Transport

Sprint Canada Inc.

Air Canada

Canadian Wheat Board

Arnold Brothers Transport Ltd.

Stentor

KPMG Management Consulting

VEMAX Management Inc.

Winnipeg Transportation Club

Canadian Institute for Traffic and Transportation

Canadian Freightways Limited

Al & Reed's Lite Frozen Dessert

Manitoba Tourism

Prince Rupert Port Corporation

Actran Consultants

DONORS TO CTRF SCHOLARSHIP PROGRAM
PARRAINS AU PROGRAMME DE BOURSES DU GRTC

Algoma Central Corporation

Bombardier Inc.

Canadian Transportation Education Foundation (CTEF)

Canada Ports Corporation/Ports Canada

Canadian Maritime Agencies Limited

Canadian National Railways

Canadian Pacific Charitable Foundation

Greyhound Lines of Canada Ltd.

Marine Atlantic/Marine Atlantique

Northern Transportation Company Limited (NTCL)

Reimer Express

Trimac

Plus many individual donors

1995 STUDENT PAPER COMPETITION DONORS
PARRAINS DU CONCOURS DES ÉTUDIANTS EN 1995

Air Canada

Canadian Trucking Association/Association Canadienne du camionnage

CANADIAN TRANSPORTATION RESEARCH FORUM
LE GROUPE DE RECHERCHES SUR LES TRANSPORTS AU CANADA

EXECUTIVE - EXECUTIF
1995/1996

President
Douglas B. Duncan
CN North America

Executive Vice President
George A. Clark
Actran Consultants

Secretary
Gail R. Sparks
VEMAX Management Inc.

Vice President Finance and Treasurer
Jan M. Bowland
KPMG Management Consulting

Vice President External
David Dodds
Statistics Canada

Vice President Meetings
Tami Reynolds
Canadian Wheat Board

Vice President Programs
Dr. Barry E. Prentice
University of Manitoba

Vice President Awards
Ron Rice
McGill University

Immediate Past President
Roger Roy
National Transportation Agency

Vice President Organization and Development
Don Good
Fiander-Good Associates Ltd.

Councillors
David M. Cape
Ryerson Polytechnic University

David H. Bradley
Ontario Trucking Association

Wade Elliott
Halifax-Dartmouth Port Development Comm

Elena Fanucchi
Air Canada Centre

Eric Hildebrand
University of New Brunswick

Rachid Raffa
Quebec Ministry of Transport

Bill Raney
Ministry of Transportation Ontario

Jacques Roy
Dept. des Sciences Admin.
UQUAM

Ted Rudback
Transport Canada

Janet M. Weiss
CP Rail System

CTRF is ...
a broadly based network of transportation professionals with an interest in research and commentary on public policy issues. Membership is open to anyone interested in any aspect of transportation.

CTRF's objectives are ...

- to encourage transportation research in those disciplines which address themselves to the economic, managerial, technical, political, and social aspects of transportation.
- to provide a common meeting ground to exchange ideas and research results.
- to provide a forum for presenting and discussing transportation issues.
- to bring together persons involved with Canada's transportation systems.

CTRF's program consists of ...

- a national conference with research papers, panel discussions, and invited speakers held annually in a different Canadian location.
- published proceedings of the national conference.
- a one-day semi-annual conference on a topic of national interest.
- regional seminars promoted and co-sponsored with other organizations.
- an annual CTRF student paper competition.
- the CTRF Scholarship Fund.
- a newsletter published five times a year.

Le GRTC est ...
un groupe de professionnels(les) en transport intéressés(ées) à la recherche et aux questions de politiques publiques. Etre membre du GRTC convient à quiconque s'intéresse aux transports.

Les objectifs du GRTC sont ...

- d'encourager la recherche dans les domaines suivants liés aux transports: économie, gestion, technologie, politique et aspect social.
- de fournir un lieu de rencontre pour échanger idées et résultats de recherche.
- de créer un forum pour présenter et discuter de questions de transport.
- de réunir les personnes intéressées au système canadien de transport.

Au programme du GRTC ...

- une conférence nationale annuelle avec site variable au Canada, qui consiste en une présentation de textes, tables rondes, conférenciers invités.
- la publication des textes présentés à la conférence nationale.
- une conférence semi-annuelle d'une journée sur un sujet d'intérêt national.
- la promotion et le parrainage de colloques régionaux avec d'autres organismes.
- un concours annuel de textes d'étudiants(es).
- un fonds permettant de décerner des bourses.
- un bulletin de nouvelles publié cinq fois l'an.

Volume I

Volume I

Opening and Plenary Session/Séance plénièré d'ouverture

Session/Séance 1: *Gateway Ports: Competing for International Commerce*

Session/Séance 2: *Performance and Structure of the Canadian Trucking Industry*

- *Rethinking Strategy for Global Competitveness: The Logistics Focus.* Dr. Vedanand, University of Manitoba 1
- *Best Practices in the North American Trucking Industry,* Jan Bowland and Don McKnight, KPMG Management Consulting 11
- *Trucking in a Borderless Market: A Profile of the Canadian Trucking Industry, 1988 to 1994,* Fred Barzyk , Transportation Division, Statistics Canada 24

Session/Séance 3: *Logistics Demand Modelling and Assessment of Economic Impact*

- *Macroeconomic Impact and Benefit/Cost Analysis of Transportation and Mining Developments in the Northwest Territories,* Russell D. Neudorf and Dr. Masood U. Hassan, Department of Transportation, Government of the Northwest Territories 42
- *Perspectives d'évolution de la demande de transport de merchandises au Québec,* Yvon Bigras, Université du Québec à Trois-Rivières, Serge Le Brun, Institut Maritime du Québec, and Jacques Roy, Université du Québec à Montréal 56
- *Impact of Transportation Costs Variations on the Relative Market Shares for Different Transportation Modes: A Network Model - the Case of Dry Bulk Transport on the Benelux/Germany to Spain Corridor,* Bart Jourquin, Laurent Demilie and Michel Beuthe, Facultés Universitaires Catholiques de Mons 71

Session/Séance 4: *Economic Development of Gateway Grain Ports*

- *Gateway North Marketing Agency - Defining the Start Up,* Don Taylor, SRP Management Consulting Associates Ltd 80
- *The Relative Competitive Position of the Port of Prince Rupert,* Eugene Ludwick, Prince Rupert Port Corporation 96
- *The Influence of the Sepetiba Port Complex on Brazilian Competitiveness in the International Grain Market,* Lieut. Col. Luis A. Silveira Lopes and Paulo C. Barroso Magalhães, IME - Instituto Militar de Engenharia 107

Session/Séance 5: *Panel: Trends in Transport/Logistics Education*

- *Trends in Logistics Professional Development: Skills vs. Concept: - Case Study: The Logistics Institute,* Victor S. Deyglio, Canadian Professional Logistics Institute and David Cape, Ryerson Polytechnic University 120
- *Integrating the Case Method in Transportation and Logistics Education,* Louis A. Le Blanc and Conway T. Rucks, University of Arkansas at Little Rock 134

Session/Séance 6: *The Historical Development of Gateways and Corridor Routes*

- *The Trade Corridor that is the Rhine-Main-Danube Waterway,* Barry Largent Brown, University of Exeter 144
- *Gateway to the Triangle: Railway Development in Western Canada,* John Hall, Transportation Planner 154
- *Winnipeg: Gateway to the Mid-Continent Corridor,* Barry E. Prentice, Transport Institute, University of Manitoba 171

Session/Séance 7: *Issues in Rail Transportation*

- *Implications jurdiques du projet de loi fédéral C-101, loi sur les transports au Canada,* Louis Doyle, Ministère des Transports du Québec 187
- *Demand Model Development to Assess High Speed Passenger Train Markets on Windsor to Quebec City Corridor - An Update,* Dr. Deepak Ekbote and Dr. Richard Laferriere, Research and Analysis, CP Rail System 195
- *VIA Rail's Strategic Plan for Success,* Gerry Kolaitis, VIA Rail Canada Inc. 200

Session/Séance 8: *Aviation - Competition for International Traffic Corridors*

- *The Canadian Aviation Charter Market: Opening New Transport Gateways or Niche Market Pricing?,* Gordon G. Baldwin, Statistics Canada 212
- *The 1995 Canada-U.S. Air Services Agreement: A Preliminary Analysis,* Michael W. Pustay, Texas A&M University 222
- *Cost Competitiveness of Airline: An International Comparison,* Tae Oum and Chunyan Yu, University of British Columbia (abstract only) 237

Session/Séance 9: *EDI/Information Technology: Evolution and Revolution*

- *New Customs EDI System Set to Change International Clearance Procedures,* Barry Frain, Expert Customs Brokers . . 240
- *Strategic Alliances Enabled by Electronic Commerce - An Overview of the Process,* Alison Lough Sunstrum, Consultant, Alternative Solutions., and F.H. (Joe) Howard, Transportation Consultant 252
- *Information Technology and Transformation in the Grain Industry: The Impact of Logistical and Market Intelligence on Industrial Structure,* Dr. Greg Mason, Prairie Research Associates Inc. 266

Session/Séance 10: *Coastal Gateways and Trade Corridors*

- *Un dervice maritime roulier sur le Saint-Laurent,* Réjean Leclerc, Ministère des Transports du Québec 280
- *Coastal Gateways: Costs and Subsidies on British Columbia Coastal Ferry Routes,* W.G. Waters II, James Evans and Joan Caravan, The University of British Columbia 293
- *Analyse et intégration des statistiques sur le transport multimodal des marchandises,* Louis Pierre, Statistics Canada . . 310

Session/Séance 11: *Farm to Market Grain Assembly and Shipment*

- *Estimating the Value of Rail Car Accessibility for Grain Shipments: A GIS Approach,* Eric L. Jessup, John L. Ellis and Ken L. Casavant, Washington State University 325
- *Farm to Market Grain Movement,* Arthur Friesen and Jerry Fruin, University of Minnesota 339
- *"Not with a Bang but a Whimper" – The Birth, Life and Death of the Crow Rates: Lessons for Policy Makers in an Uncertain World,* Paul Earl, Western Wheat Growers 351

Session/Séance 12: *Competition and Opportunities of Airport Gateways*

- *The Deregulation of Airports and the Opportunities of Gateway Development,* Fredrick Petrie, Aviation Associates 369
- *Canada's Airports, Their Role as Cargo Gateways,* Andrea Mathieson, Statistics Canada 379
- *Airport Privatisation in Canada and Australia: Experiments in Structures of Ownership and Control,* John Street and David Smith, BTCE Australia and University of British Columbia . . . 393

Session/Séance 13: *Economics and Environmental Impacts of Transportation*

- *User Pay Transportation: Full Costs and Pricing Policy Implications,* Neal A. Irwin, Lee Sims and Joseph Jones, IBI GROUP 407
- *The Control of Carbon Dioxide Emissions from Freight Transportation: A Case Studies Approach,* David Hackston, Richard Lake and Louis-Paul Tardiff, Research and Traffic Group 422
- *From Isolation to Integration: Organizational Alternatives to Airport Environmental Planning,* Anthony Perl, University of Calgary 434

Session/Séance 14: *Panel : The East/West Movement of Grain*

- *Grain Handling and Transportation: Capacity, Rates and Tariffs,* Dr. John Heads and Dr. Arthur G. Wilson, Transport Institute, University of Manitoba 443
- *Thunder Bay - Grain Gateway to the East?* Dr. Arthur G. Wilson and Dr. John Heads, Transport Institute, University of Manitoba 459
- *Rail Rationalization and the Grain Industry in Southern Ontario* Dave Hackston, Research and Traffic Group 470

Session/Séance 15: *Infrastructure Investments and Corresponding Economic Impacts*

- *Highway Infrastructure Capital and Productivity Growth: Evidence from Canadian Goods-Producing Sectors,* Bilkis R. Khanam, Transport Canada 479
- *The Role of Transport in determining the Demand for Industrial Land,* Larry F. Loreth, City of Winnipeg 492
- *Highways Costs and Revenues in Québec: Evidence and Analysis,* Michel Boucher, Université du Québec 507

Session/Séance 16: *Sea Ports: Competition and Re-structuring under Privatization*

- *Analyse comparative des ports de Montréal et de Baltimore,* Yannick Unvoas, Université du Québec à Rimouski and Brian Slack, Université Concordia 523
- *Restructuring Canadian Ports: Prospects and Problems,* Michael C. Ircha, University of New Brunswick 539

Volume II

Session/Séance 17: *Grain Logistics from a Continental Perspective*

- *The Logistics of North American Wheat Exports,* Raquel Christie and Gary Warkentine, Agriculture Canada (abstract only) 553
- *Grain Transportation in a Continental Perspective,* Javier Caceres, Consultant and Darrell Richards, Transport Concepts . 555
- *A Short-Run Analysis of Inland U.S. Barge Rates for Grain,* James W. Dunn and Gregory L. Harnish, Pennsylvania State University 566

Session/Séance 18: *Transportation Research Methods and Results*

- *The Use of Hand-Held Computers in Roadside Surveys,* Greg Little and Doug Smith, Ministry of Transportation, Ontario . . . 583
- *A Conjoint Analysis of Air Carrier Loyalty,* Edward Bruning, Barry E. Prentice and Patty-Jo Bellamy, University of Manitoba 599

Session/Séance 19: *Legal Issues in Cargo Handling: Safety, Pollution and Claims*

- *Apportioning the Risks in Intermodal Transport: Impacts of Proposed Revisions to the U.S. Carriage of Goods by Sea Act,* Hugh M. Kindred, Dalhousie University 613
- *Chemical Transportation Risk Management,* John Cowan, KPMG Management Consulting 625
- *Establishing Insurance Requirements for an Evolving Shortline Railway Industry: The Ontario Experience,* Mike Ronson and Ann Misetich, Ministry of Transportation, Ontario 638

Session/Séance 20: *Panel: Grain Transportation Challenges for the 21st Century*

- Tami Reynolds, Organizer

Session/Séance 21: *Trucking in the NAFTA Environment*

- *NAFTA and Truck Configurations: A Framework for Assessments,* Amiy Varma and Nabil Suleiman, North Dakota State University 647
- *Identifying Needed Transportation Investment, by Corridor, to Support NAFTA Trade Flows in Washington State,* Ken A. Eriksen and Ken Casavant, Washington State University 662

- *NAFTA Trade Corridors - The "Unlevel Playing Field" for International Carriers,* R. Ian Kingham, P.Eng., GMK Transportation Planning and Engineering Ltd. 677

Session/Séance 22: *Public Policy and Economic Performance*

- *In Defence of a Transportation "Systems" Approach To Transportation Policy Development,* Derek Lett, Ontario Ministry of Transportation 690
- *Public Transportation in the Face of Deteriorating Economic Conditions and Colonial-Dependent Spatial Policies in Cameroon,* Ambe Njoh, Ph.D., University of South Florida . . . 704
- *Performance Indicators of the Transport Sector,* Jean-Pierre Roy, Transport Canada 719

Session/Séance 23: *Panel: Regional Railroads and Short-line Rail Issues*

- *An Overview of the Short Line and Regional Railroad Industry in the United States,* Andrew Jennings, Mercer Management Consulting, Inc. 734
- *Characteristics of U.S. Grain Short-Line Railroads: Implications for the Prairie Provinces,* Denver Tolliver, John Bitzan, Trent Byberg, Upper Great Plains Transportation Institute, North Dakota State University 749

Session/Séance 24: *Trucking Safety and Driver Education*

- *Truck Safety - Perception and Reality,* Greg Little, Ministry of Transportation, Ontario 762
- *Canada's Trucking Industry Moves Toward a Nationally Certified Program of Driver Training,* Lloyd L. Ash, Trimac Consulting Services 776
- *Controlling Highway Safety – Commercial Driver Qualifications,* Michèle Delaquis and Fred P. Nix 792

Session/Séance 25: *Empirical Analysis and Forecasting Traffic Demand/Movements*

- *Estimating O-D Travel from Link Traffic Counts: Can We Really Get There From Here?,* Bob Leore, Transport Canada . . 806
- *Aggregate Air Passenger Forecasting - Winnipeg International Airport Activity Forecasts,* Darryl Howery, Ellen Taylor and Drina Culo, Applications Management Consulting Ltd. 820

Session/Séance 26: *Urban Transportation: Attracting Ridership*

- *Commercial Ventures at Park+Ride Termini,* David M. Cape, Ryerson Polytechnic University and Lancaster University 831
- *Application of Diesel Rail Car Technology,* Darrell Richards, Transport Concepts 841
- *Urban Transit Ridership in Canada: Nowhere to Go But UP!,* Mebs S. Kanji, University of Calgary 854

Session/Séance 27: *Equipment Challenges in the Truck Management*

- *Assessing Non-Conforming Vehicles for Net Transport and Safety Benefit,* John Woodrooffe, Roaduser Research International, and Douglas Johnson, John Palmer and David Smith, New Brunswick Transportation and Communications .. 869
- *Bridge Cost Allocation Issues,* Edward Fekpe, Battelle Memorial Institute 883
- *Performance-Based Truck Weight and Dimension Regulations.* Fred P. Nix, John R. Billing, and Michèle Delaquis 893

CTRF Student Paper Winners for Publication

David A. Saucy, The Role of Transportation in Canada - ASEAN Trade: Is it a Barrier to Trade? MBA Program, Dalhousie University. A.M. Stevens Award, First Prize, Masters, 1994.

Edward S.K. Fekpe, Ph.D., P.Eng., Uncertainties in Truck Regulatory Policy and Highway Infrastructure Management, Department of Engineering, University of Manitoba. Jim Davey Award, First Prize, Ph.D., 1994.

Hamidreza Soleymani, Sensitivity Analysis for AASHTO Flexible Pavement Design, Engineering Department, University of Saskatchewan. Second Prize, Ph.D., 1994.

Susan S. Dableh, Evaluation of Traffic Sign Retroreflectivity, Department of Civil Engineering, University of New Brunswick. First Prize, Undergraduate; and CSL Groyp Gold Medal (CIT), 1994.

Sharlene Wiseman, Instersection Analysis: Boulevard Decarie "Est" and Rue Jean-Talon Ouest, Department of Civil Engineering & Applied Mechanics, McGill University. Third Prize, Undergraduate, 1994.

Hélène Dufourd, Application de la Méthode de Recherche avec Tabous au Tracé d'une Linge de Métro, Département de Mathématiques et de Génie Industriel École Polytechnique de Montréal. A.M. Stevens Award, First Prize, Masters, 1995.

Darren M. Scott, The Journey to Work and Urban Spatial Structure: A Case Study of the Greater Toronto Area, 1986 to 1991, Department of Geography, McMaster University. Second Prize, Masters 1995.

El Bachir Belhadji, Using State Dependent Utility Functions in the Context of Road Safety: Theory and Evidence. Department of Economics, University of Montréal. Jim Davey Award, First Prize, Ph.D., 1995.

Curtis F. Berthelot, Numerical Load Impact Analysis of Typical Saskatchewan Roads, Department of Civil Engineering, University of Saskatchewan. Second Prize, Ph.D., and Canadian Trucking Association Award, Best Trucking Paper, 1995.

Rethinking Strategy for Global Competitiveness: The Logistics Focus

Dr. Vedanand
University of Manitoba

Introduction

It has been suggested that strategy as a field of study has fallen on hard times in the 1990s. Already there is a frantic search for a new paradigm in various fields of study, This concern has been very much highlighted by management scholars in the context of the need for the emergence of brand new organization theory in the 1990s as well as a new paradigm revolution (Williamson, 1994;; Lincoln,1985). Although this expectation has not materialized as yet; serious efforts are being made to search for a new paradigm in the fields of corporate strategy, business policy and strategic management. The optimism about the usefulness of strategic planners and planning of the 1960s and 1970s has already waned; and serious disillusionment has set in not only in the minds of the consultants, practitioners but also among academics and theorists. Indeed, a serious debate has already begun where the whole existing edifice of strategy literature is being questioned. In fact, the "Rise and Fall of Strategic Planning" (Mintzberg, 1995) and the "Bankruptcy of Strategic Management" (Hurst,, 1986) make a fascinating reading.

This paper will present a synthesis and reconceptualization of strategy concept. in the context of environmental constraints and the current agenda of downsizing and restructuring of organizations and its possible impact on the transportation sector. It also highlights the need for strategic thinking and building of core competencies for meeting the challenges in the context of chaotic and nonlinear discontinuities in the field. Finally, it will draw upon the experiences of Japanese companies and look at the relevance of certain evolutionary perspectives of strategic management in the field of logistics and transportation management in today's competitive world..

The Strategy Paradigm

It might be worthwhile to take a quick look at the dominant ethos of strategic planning in the management literature. It needs hardly any emphasis that for almost six to seven decades managerial mindset has been influenced by the spirit of scientific management. Beginning with Taylor (1868-1920), that line of managerial thinking has had the most significant influence on the western, and particularly the north American management. Things began to change in the 1930s and 1940s when the importance of human relations came to be realized, particularly after the Hawthorn experiments. The 1950s started the beginning of the golden period of strategic planning. From late 1950s and early 1960s the dominant paradigm of strategic planning came to be firmly established. Many individuals and practitioners made their contribution during this period..

However, serious questioning of the dominant paradigm began after many North American industries started losing their market shares in the sectors where they were once the dominant players. This was the time when the Japanese firms began to make inroads in the saturated markets of some selected industries of Europe and North America. And, in a rather short time, they firmly established themselves in industrial sectors like, automobiles, motorcycles, television, VCRs etc. These developments forced some authors to question the validity of the dominant strategy paradigm and call for a paradigm shift in our thinking in regard to the whole issue of strategy planning and implementation. (Pascale, 1982; Mintzberg, 1990, 1995). An interesting debate ensued between the main proponents of the original strategy paradigm and its critics. (See the exchange between Ansoff (1990) and Mintzberg (1991)

Now it might be germane to ask where do we stand as regards the adequacy of this paradigm; and how relevant is it to explain and analyze the organizational realities of modern times? Do we have consensus that the existing paradigm has helped and is helping us in the systemic advancement of knowledge? According to Kuhn (1970), a paradigm is "a constellation of concepts, values, perceptions and practices shared by a community which forms a particular vision of reality ..." Thus, a paradigm refers to the shared values and beliefs of the scientific community regarding the nature of reality at a given time. A paradigm is defined as a theoretical construct or model which can be used to explain phenomena and may be used to systematically advance knowledge. In many other fields, scholars have begun to take a serious look at the usefulness and adequacy of the existing paradigms. In trying to analyze the underlying epistemological assumptions and conceptual foundations of their discipline, they are exploring the "intellectual status and prospects" for the future growth of the respective fields of enquiry. They are re-examining the fundamental assumptions and taking a hard look at the nature and scope of their enquiry. If the basic assumptions and theoretical constructs and models are "false, or misguided" then obviously, there would be serious implications for future of the discipline itself. It is in this vein that a clarion call was made for a new research agenda and a paradigm shift in the field of organization studies (Daft and Lewin, 1993: i):

> ..as we contemplate the cataclysmic changes occurring in the environment of organizations, and as we observe the organizational revolution sweeping one industry after another, it is altogether clear that the management of organizations is undergoing a paradigm shift. Mainstream research on organizations does not appear to be a parallel paradigm shift. We are concerned that organization theory is in danger of becoming isolated and irrelevant to leading the emergence of new paradigms.

Further they bemoan the lack of new constructs and models for providing guidance to managers. The current theories and models do not seem to reflect the need and urgency for establishing a new paradigm. We are faced with a number of new forms of organizations characterized by such labels as virtual corporation, modular organization, learning organization or network organization etc.

> Managers in many organizations are at the frontier of finding new ways to use both the human resources and technology in the creation of new organizational forms. Characteristics of these new organizations seem to include flatter hierarchies, decentralized decision making, greater capacity for tolerance of ambiguity, permeable internal and external boundaries, empowerment of employees, capacity for renewal, self-organizing units, and self-integrating coordination mechanisms. Leadership in these new organizations seems to reflect a shift from maintaining rational control to leadership without control, at least in the traditional sense.

It is in this context that we might now ask, why do we need a new paradigm? And if we do need it, what should be its underlying assumptions, nature and scope? Zald (1993:514) has argued for a reconceptualization of organizational studies as " a humanistic as well as a scientific area of study." Perhaps it would make sense to reevaluate the epistemological and ontological basis of research in the field of organizational studies. As for the field of strategic management, the search for a new paradigm has gone for a long time and "there simply has been no agreement on a paradigm for the field of strategic management." Further, in the same vein, it has been suggested that this area is interdisciplinary in nature--an area which deals more with implementation and application; and therefore, perhaps the need for a single, unifying paradigm is either not desirable nor feasible. (Schendel, 1994:2)

The Legacy of Scientific Management

The dominant paradigm of strategic management has its roots in the traditional model of management. In the past seven decades, we have moved ahead from the machine age, dominated by the mass production technology, to modern information age. But it seems that little change has taken place in the managerial mindset. Indeed, the legacy of Taylor's "scientific management" is , by and large, still with us. It has been suggested that the "practice of management for the information age" has not been yet reinvented. (Prahalad, 1996). The traditional model drew its inspiration from the military metaphor popularized in the machine model of bureaucracy by Max Weber (1947) The rational model which formed the basis of the bureaucratic organization provided the unique setting for the emergence of strategy out of structure. In fact, much of the earlier writings on the subject were influenced by the "command and control" model of Weber. As pioneers of the traditional school, they provided the intellectual background which formed the basis of the traditional mindset. Later, the logical sequence of development in the 1950s and 1960s, finally culminated in the more formal writings of people who began to develop a more formal and rational construct for the management discipline. Simon (1947) became the leader of this new thrust. He sought to bring much-needed legitimacy to the discipline by bringing in academic rigor and sophistication through his individual and joint contributions. Around this time, developments at the Harvard Business School began to shape the new discipline of Business Policy and Strategic Management. Chandler (1962) followed with a major contribution to the strategy field. Andrews (1971), Igor Ansoff (1965) and Steiner (1969) became some of the other major proponents of the strategic planning/management field. Much of the contribution to the field during this period has been dubbed as an

attempt to give an aura of legitimacy to the field and they tried to make the "soft" science look like a "hard" one. (Pascale, 1990). During all this period, it seems the pursuit of reductionistic, quantitative and deductive metaphors continued to be used by scholars. But in all probability, they still represented the old mindset and were representing the values, beliefs and convictions of the old paradigm.

The implicit assumptions of the old paradigm were heavily biased in favor of rational analysis and sequential planning. Most of the emphasis was placed on operations. Taylor, the father of scientific management, had a passion for finding the one best way for doing things. His philosophy of scientific management dominated the managerial mindset almost for the next 50 years. Some of these assumptions have been rightly identified and can be summarized under the following headings:

1. Rational planning and analysis of operations (inputs were thought to be interchangeable)
2. Profit maximization as the ultimate measure of performance;
3. Constant focus on bottom-line
4. Predominance of hierarchy and structure in the organization;
5. Quick fix approach to problems;
6. Strong directive and control-oriented leadership at the top defined the corporate culture.

Most of these assumptions are now in disrepute and have been challenged. Some of the younger scholars and some more perceptive ones began to take upon the challenge and raised the voice of dissent. The old paradigm was no longer representing the organizational reality. Things were constantly changing and have changed drastically. Yet there seemed to be no realization of this change. As mentioned earlier, the 1970s and 1980s were the real eye-openers, when the superiority of some western firms and their technologies were challenged by newcomers to the field, particularly by the Japanese. It was during this period that Toyota, Honda, Canon, Sony, Panasonic/JVC, Fujitsu, Hitachi and various others emerged on the scene as major challengers. Honda's success story in the north American and European markets offers some important and interesting lessons for students of strategy.

The competitive challenge of today's global economy is forcing a rethinking of the basic parameters of strategy concepts. No wonder that the MIT's Commission on Industrial Productivity recommended that "U.S. executives need to fundamentally rethink how they manage..." (quoted in Pascale, 1990:92). Equally disturbing is the fact that much of the literature and theoretical constructs and models of this field are being seriously questioned by strategy scholars themselves. It is being increasingly recognized that (Prahalad and Hamel, 1994: 6)

> ...the concepts and tools of analysis that formed the backbone of the strategy literature, during its period of growth (1965-85), may need a basic reevaluation in order to pave the way for new ideas.

Understanding the Strategy Dynamics

The reality of today's global economy has forced us to reexamine the traditional strategy paradigm and the legacy of the old mindset. Also, the ever-increasing struggle for competitive space among the firms at various levels, is forcing us to seek a better understanding of the strategy dynamics. The theorists, consultants and the practitioners have presented the many faces of strategy. Its focus has changed from seeking a natural fit with the external environment of the firm to its stretch and leverage that the firm can maximize to gain competitive advantage. Following Leavitt (1960), the marketing guru at Harvard, one of the typical questions raised in the 1960s became: "What business are you in?" The main thrust of this question was to enable the companies to define their industry orientation not in terms of the product-service being offered but rather in the context of "underlying generic need" of their customers. Thus, the railways were to see themselves engaged in the transportation business, not in the business of carrying passengers and cargo etc. This line of reasoning still dominates in our text books and business schools. Although, the challenge of "marketing myopia became a great motivator to a whole generation of managers, the concept had its own limitations. It was not easy to broaden the vision of managers and the firms could not transform themselves overnight without any change in their distinct competencies. (Mintzberg, 1994) Now compare this with the response of the Japanese CEO of a large business house. When he was asked what business they were in, he sank back in the luxurious sofa of his office in the Tokyo head office. He took a deep sigh, fumbled for words and said: Muzukashi desu (It's very difficult)". Goaded further by the questioner, he finally said, "We are in the business of surviving."

Chaos and Nonlinear Dynamics

Most of our managerial strategies are based on the implicit assumption that the managers will face a stable environment. Indeed, the mechanistic view of the organization presupposes a stable state and we expect the managers to manage certainty. Discontinuous and revolutionary changes are aberrations; and are not supposed to happen in the ordinary work situations. However, it is now being increasingly realized that the rational and the mechanistic view of organizations is out of joints with the contemporary world of reality. Instead, organizations are viewed as nonlinear dynamic systems, facing the constant interplay of the forces of stability and instability, which often push them to chaotic situations. The emerging science of complexity and chaos provides a new paradigm "where two apparently irreconcilable visions of management--rational and quasi-mechanistic on one hand, unexpected and disorderly on the other hand--can be reconciled" (Thietart and Forgues, 1995:20). The relevance of nonlinear dynamics to strategy formation is reflected in the work of some authors who stress the importance of dynamic interactions and emphasize the role of structured and unstructured decisions in organizations. (Mintzberg and Waters, 1985)

Business Ecosystems

The concept of business ecosystems has been advanced to explain the challenges of innovation and survival for businesses. The analogy is drawn from

the natural environment and the field of biology. Instead of following the Darwinian logic of gradual evolution and natural selection, it has been shown that discontinuous changes are possible and do take place in the realm of nature.(Gould,, 1982) Following this analogy, we can visualize the firms operating in their respective business ecosystems, where they have to constantly interact with all kinds of internal and external forces. Often, the visionary industry leaders create new competitive spaces for themselves by innovation and offering new products and services. In the area of information technology we can see this happening in a number of areas: computers, telecommunications, discount retailing and many other areas. The ecology of competition has to be understood in the context of firm's willingness and capacity for self-renewal. Most ecosystems pass through four distinct phases: birth, expansion, leadership (and vision of future) and self-renewal. (More, 1993) A good relevant example is provided by the experiences of Apple vs Tandy, Wal-Mart vs K-Mart or Microsoft vs Intel. The leaders in these cases created and then succeeded in dominating their business ecosystems. (More, 1993) However, life is not easy in the ecosystems because of the constant struggle for survival and leadership. Often, the external environment and changes in the government's regulatory policies can bring about revolutionary and discontinuous changes that threaten the survival of firms and organizations. (Most of the transport industry is a case in point here.) In the business ecosystem, firms which do not have visionary leadership or which lack competencies and capability for survival will ultimately disappear. When firms are threatened with such dire consequences, they will need a renewed focus on their strategic intent, stretch and/or leverage.

It has been suggested that most analysts of strategy focus on the "what" of competitiveness not on the "why". Obviously this would force us to do some rethinking about the competitiveness of firms. One is tempted to ask: "Why do some companies continually create new forms of competitive advantage, while others watch and follow? Why do some companies redefine the industries in which they compete, while others take the industry structures as given?" (Hamel and Prahalad (1993) Perhaps, the answer might lie in the institutional and the cultural environment of the companies within which they operate---nation's factor endowments, the socio-cultural setting, government policies, macroeconomic factors and the level of competition within the business ecosystem. There could also be a kind of corporate genetic factor about the firm's capacity to take advantage of opportunities in a given competitive situation. Japan did not have a robotics industry. The technology was borrowed from the U.S. But after MITI suggested that robots could be the solution to increase their productivity in a number of industrial sectors, almost 200 firms jumped in to seize the opportunity. Today Japan is the largest user of robots in the whole industrialized world. Similarly, when solid state technology became available, most U.S. firms, including the firm that held the patent, did not think of using it in the Television and electronics field. Japanese firms almost immediately jumped at the opportunity and switched from using picture tubes to solid state in their TV sets. Hitachi came out with a new TV set, and offered a 20-year warranty. Today, the Japanese are the world leaders in television industry; and the TV industry has almost disappeared from the US economy. However, there are some interesting anomalies. Why has Japan's computer industry not been able to become the front-runner as they did in the case of automobiles, and TVs and VCRs? The Japanese experience in this context has some important

lessons to offer. Let us briefly review some important and meaningful experiences of some Japanese companies.

The Japanese Perspective on Strategy

The Japanese perspective on strategy formulation and implementation appears to be quite different from the western view of the relevant issues in this context. Honda's experience in making inroads in the US motorcycle and automobile industry is an interesting case in point. The marketing strategy of Japanese corporations has been likened to a typical samurai warrior's tactics of offense and defence. Are their some specific postulates or theoretical underpinnings in the formulation and implementation of strategy by the Japanese? It has been suggested that the Japanese have done a superb job of applying text-book principles of marketing in implementing their strategy. A few things need to be emphasized here. First, the Japanese have been always distrustful of a codified single grand strategy. In their view, strategy should not be "fixed and frozen." It is evolutionary and keeps evolving all the time. Instead of being rigid, cast in concrete, their strategy is protean in nature, always evolving and ready to adapt to new challenges. Indeed, to be driven by a single-minded strategy is considered a weakness. They are experts in using the inflexibility of their competitors to their best advantage. When they initially began to challenge the market share of Harley-Davidson in the 1960s, here is what the managers at Harley-Davidson thought of the small motorcycle market (as quoted in Kotler et. al., 1985):

> We believe that motorcycles are sports vehicles, not transportation vehicles...It is generally for leisure time use. The light weight motorcycle is only supplemental.....We have seen what happens to these small sizes...

In fact, it was the introduction of these small motorcycles that started the phenomenal success of Honda in the US market. A report commissioned by the British Government (BCG Report) to present an analysis of the decline of their motorcycle industry consequent upon the Japanese competitive challenge has become an interesting case study. The case analysts speculated about the superb Honda strategy, which was based on cost efficiency and aggressive pricing and advertising. The fact of the matter was that they did not have any predetermined and codified strategy to begin with. Instead, there was a lot of organizational learning involved and Honda's strategy evolved through serendipity and on-going experience and learning in the US market. In fact, they were advised not to enter the saturated market of motorcycles in the US. And the Ministry of Finance, allowed them only $110,000 in cash for launching their product in the US market. It is not possible to go in greater details of this case here. However, the details of this case as given by Pascale (1984) make an interesting reading. In short, most Japanese companies look for a void and create a market niche for their product. Usually, once they identify a market opportunity, they follow a low-end entry strategy with sophisticated market segmentation and aggressive pricing. Once, they make the entry, they follow a customer-oriented strategy whereby they offer high quality product and service with proper positioning and product-stretching. In achieving their objectives they are helped by efficient dealership networks, a sense of commitment, mutual trust and cooperation.

Restructuring and Logistics Management

What is the significance of logistics in the context of strategy for competing in the global economy? If a company wants to achieve industry leadership and create its destiny for the future; then it has to be aware that reenigineering and delayering alone will not ensure its future destiny. It has been suggested that logistics management may very well be the last frontier for firms which want to ensure their future destiny in the global economy. Most often, the focus is on cost efficiency and effectiveness in the area of manufacturing. Unfortunately, the product envelope includes service as its very important element. Despite this, the logistics are not efficiently managed. And this provides a real opportunity. Japanese retail industry provides some very good examples of this phenomenon. Logistics becomes the basis of service differentiation. Bottlers of Coca-Cola products in Japan offer many extra services to the retailers. The drivers of the delivery trucks perform many more services and functions than what is being done by drivers elsewhere. With the help of modern information technology, the large (and even small) firms can make logistics an important element in their strategy.

In a study of a large telecommunications company, it was found that roughly 10% of its total costs ($900 million) belonged to the logistics function. As a result, they identified logistically distinct business (LDB) segments, which needed to be looked after in a more imaginative and effective way. It was suggested that tailoring the logistics to the needs of the customers could be the most important element in the overall corporate strategy. (Fuller et al ,1993) It has been recommended that firms should be able to anticipate customer needs and be focused so that they can get appropriate leverage from logistics. (Shapiro, 1984)

Let us speculate about what the current fever of restructuring, reengineering and delayering means to some of the important players like CN and CP rail or the leading airlines of Canada in the transportation industry. Most of the policies of downsizing target correcting the mistakes of the past. However, all attempts at restructuring and reengineering do not enable the firms to become industry leaders. In a survey conducted in 1980, quality was viewed as the most important source of competitive advantage in the year 2000 by 80% of US managers. In the case of Japanese managers, " their primary goal was to create new products and businesses." (Hamel and Prahalad, 1994) The attempt to create a lean (and mean) organization, usually follows what has been labeled as "denominator management" which is the financial expert's short cut to increase asset productivity. Some examples may elaborate this point. Both General Motors and Xerox were world leaders in their industry sector. But during the 1970s and 1980s these companies lost a substantial part of their market shares to Japanese competitors. Despite all the restructuring and improvement of productivity, none of these companies have been able to recapture their lost market shares. The Japanese automobile companies have continued to be a challenge despite the high appreciation of yen. Industry specialists agree that it may not be possible for GM to regain the lost glory and its previous market share. Although Xerox has succeeded in stopping it market share erosion, it has not been able to regain its full market share. Canon still remains a leader in the small paper copier and is one of the largest copier manufacturer in the world. What can we say about the future of big transport industry players of

yesterday? Will they be able to regain their lost glory and recapture their lost market shares? Is some one doing something about their future destiny? We do see that railways have become an important player in the transportation business in Europe. They are still the most important carrier outside of the western world. The important issue here is regarding the ability and capacity of the firms to compete for the future. They must also have a vision to create a new destiny for themselves in the emerging realities of a highly competitive global economy. It must be understood clearly that the game of competitive revitalization requires a capacity to go beyond the accountant's game of denominator management. This would require a different conceptualization of strategy. In fact it may be necessary that the leadership of the organization should think about its organization not in terms of its past, but what it should become in the future.

Conclusion

What we are seeing today is a cataclysmic change in the very nature of competition. We see the blurring of the boundaries. It is no longer clear what constitutes a particular industry. The boundaries now overlap. Are computers a replacement for the old typewriter? Or are they a new product that is going to replace the TV, the telephone, radio, the fax and the copier? How could a small Taiwanese firm (Acer), a late entrant in the saturated market, become a major global player in the industry? And what does it mean to be a leader in an industry? Many Japanese companies hold 50% to 85% of global market shares of important core products. Core competencies and core product market share may be a better measure of a firm's capability to create new products and markets. It may be wise, therefore, to do some rethinking about one's corporate strategy if one wants to survive in the future.

=========

Bibliography & References

Andrews, K.R. The Concept of Corporate Strategy, Homewood, Il.: Irwin, 1971.

Ansoff, H.I. Corporate Strategy, New York: McGraw-Hill, 1965

---------- "The Emerging Paradigm of Strategic Behavior," *Strategic Management Journal*, V.VIII, 1987:501-515.

---------- "Critique of Henry Mintzberg's 'The Design School: Reconsidering the Basic Premises of Strategic Management', *Strategic Management Journal*, V.12, 1991:449-461.

Chandler, A.D., Jr. Strategy and Structure, Cambridge, MA: MIT Press, 1962.

Daft, R.L and A.Y. Lewin, Where are the Theories for the "New" Organizational Forms", *Organization Science*, V. 4(4), November, 1993.

Fuller , J.B. et al, "Tailored Logistics: The Next Advantage," *Harvard Business Review*, May-June, 1993: 87-98.

Hamel, G and C.K. Prahalad, "Strategy as Stretch and Leverage," *Harvard Business Review*, March-April, 1993: 75-84.

_____, "Thinking Differently," Business Quarterly, Summer, 1995:23-35.

----------,"Competing in the New Economy: Managing out of Bounds," *Strataegic Management Journal*, V. 17, 1996:237-242.

----------, Competing for the Future, Boston,MA: Harvard Business School Press, 1994.

Hurst, D.K., "Why Strategic management is Bankrupt," *Organizational Dynamics*, V. 15, Autumn, 1986:4-27.

Kotler, P. et al. The New Competition, Engelwood Cliffs,NJ: Prentice-Hall, 1985.

Kuhn, T.S. The STructure of Scientific Revolution, Chicago, University of Chicago Press, 1970.

Leavitt, T., "Marketing Myopia," Harvard Business Review, 1960.

Lincoln, Y.S. ed., Organization Theory and Inquiry, London/New Delhi: Sage,1985.

Mintzberg, H., "The Design School: Reconsidering the Basic Premises of Strategic Management," *Strategic Management Journal*, V. 11, 1990:171-95.

---------- The Rise and Fall of Strategic Planning, New York: The Free Press, 1994.

----------, Mintzberg, H. and Waters, J.A., "Tracking Strategy in an Entrepreneurial Firm," Academy of Management Journal, , V. 25(3), 1982:465-499.

More, J.F., "A New Ecology of Competition," Harvard Business Review, May-June, 1993:75-86.

Pascale, R.T., Managing on the Edge, Simon and Schuster, New York: 1990.

----------, "The Real Story Behind Honda's Success," *California Management Review*, V. 26(3), 1984:47-72.

Schendel, D., "Strategy: Search for New Paradigms", *Strategic Management Journal*, V.15:1-4, 1994.

Simon, H.A., Administrative Behavior, New York: Free Press, 1947.

Steiner, G.A. Top Management Planning, New York: Macmillan, 1969

---------- Strategic Planning, New York<: Free Press, 1979.

BEST PRACTICES IN THE NORTH AMERICAN TRUCKING INDUSTRY

by

Jan Bowland
&
Don McKnight

KPMG Management Consulting

This paper summarizes the results of our survey of best practices in the North American trucking industry. KPMG assessed trends and practices in the truckload (TL) and less-than-truckload (LTL) sectors in Canada and the U.S. Our analysis included trends in financial performance, major expense items, financial policies, information technology, operating practices and markets.

A. Approach and methodology

KPMG surveyed TL and LTL carriers with best practices or those considered leaders in certain aspects of their operations in the United States and Canada.[1] The survey, carried out during the first half of 1995, focussed on trends between 1991 and 1994 and forecasts for 1995 and 1996.

We collected information through detailed interviews with designated company representatives. We sent interview guides and financial information requests in advance of the interview to allow for the necessary preparation and to reduce the time required to conduct the actual interview. It is difficult to collect accurate and consistent information in the trucking industry, particularly in Canada. Many companies are privately held, financial statements are closely guarded and there is no uniform methodology for accounting practices. Financial information was easier to collect for U.S. carriers due to the information available from the American Trucking Association (ATA) for Class I and Class II motor carriers regulated by the Interstate Commerce Commission. During the interviews with U.S. carriers, we confirmed the ATA data and explored some areas of expense information. In Canada, the motor carriers prepared the necessary data. Through persistence and our industry contacts, we were successful in obtaining the detailed data necessary to conduct our best practices review.

The following table presents the average profile of those carriers surveyed.

---

[1] *Our researach included financial and/or operating data from 11 of Canada's and 16 of the U.S.'s best trucking companies.*

Average carrier profile

	Canadian TL	U.S. TL	Canadian LTL	U.S. LTL
Operating revenues ($ 000's)	77,689	177,534*	73,202	1,625,467[1]
% TL	93.8%	96.7%	29.6%	7.5%
% LTL	6.2%	3.3%	70.4%	92.5%
Fleet size:				
Number of tractors	549	2,263	203	6,091
Number of trailers	1,528	5,107	824	21,846
Number of employees	640	2,398	752	14,767
% unionized	28.0%	0%	22.8%	0%
Number of owner/operators	212	299	121	0

* *Converted to Canadian currency using an exchange rate of $ 1 US = $ 1.2898 CDN (1993 average).*

B. Financial performance of Canadian carriers was superior to U.S. carriers

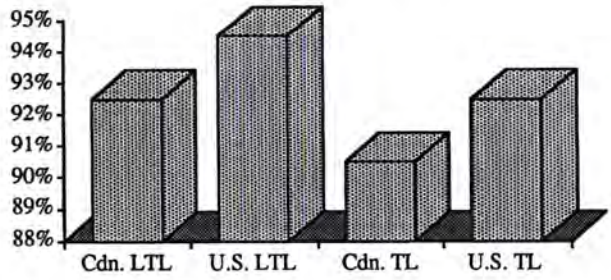
The financial performance of the Canadian TL and LTL carriers surveyed in terms of operating ratio (revenue/expenses excluding taxes and interest expenses) and return on equity was superior to the performance of the U.S. carriers. When the net profit margins were compared, U.S. LTL carriers outperformed their Canadian counterparts. Canadian LTL carriers outperformed U.S. TL carriers. Canadian carriers had a much higher (about three times) total debt to equity ratio than U.S. carriers. TL carriers are more highly leveraged than LTL carriers on both sides of the border. Revenue per mile was higher for U.S. LTL carriers than Canadian LTL carriers. Canadian TL carriers were on par with U.S. TL carriers.

Trends in key financial ratios for the year 1993 and for the period 1991–93 were as follows.

1. Operating ratio

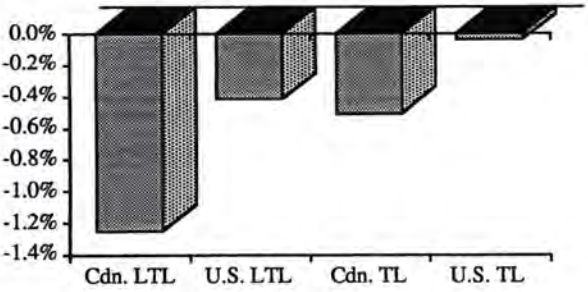
The Canadian carriers had a lower operating ratio than their U.S. counterparts. TL carriers outperformed LTL carriers in their respective countries. In terms of the percentage change in operating ratio from 1991 to 1993, the financial performance of motor carriers improved slightly. Canadian TL and LTL carriers outperformed their respective U.S. counterparts over this time frame.

Operating ratios—1993



* *Operating ratio = expenses - including interest and taxes/gross operating revenues*

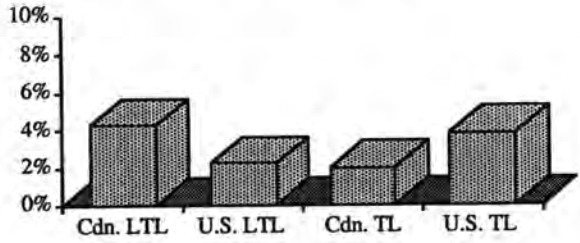
Operating ratio trends—1991–1993



2. Net profit margin

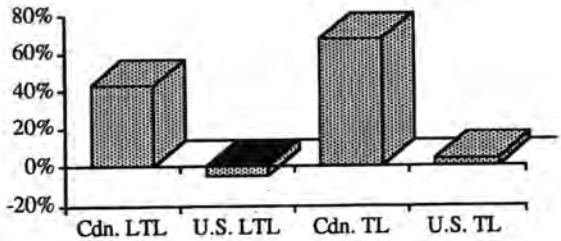
U.S. TL carriers had a higher net profit margin in 1993 than their Canadian counterparts whereas Canadian LTL carriers had better financial results than U.S. LTL carriers. Over a three-year period, Canadian carriers made significantly greater improvement in net profit margin than their U.S. TL and LTL counterparts.

Net profit margins*—1993



* *Net income (including taxes and interest)/gross operating revenues.*

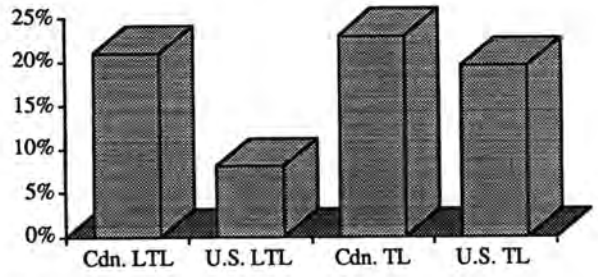
Net profit margin trends 1991–1993



3. Return on equity

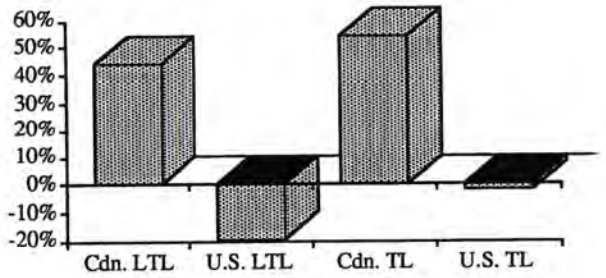
Canadian TL and LTL carriers experienced higher return on equity in 1993 than the U.S. carriers. Canadian carriers experienced significant improvement in return on equity, over the 1991–1993 time period. The situation for U.S. carriers deteriorated over the same time period. In 1991, U.S. TL carriers had a higher return on equity than their Canadian counterparts but this situation was reversed by 1993.

Return on equity*—1993



* *Net income/equity.*

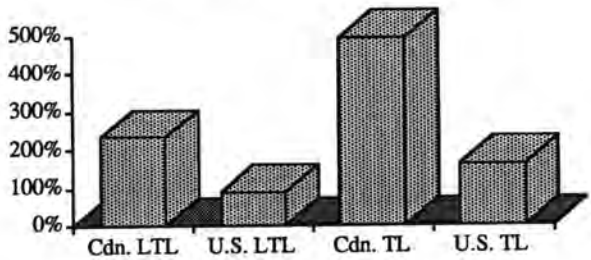
Return on equity trends 1991–1993



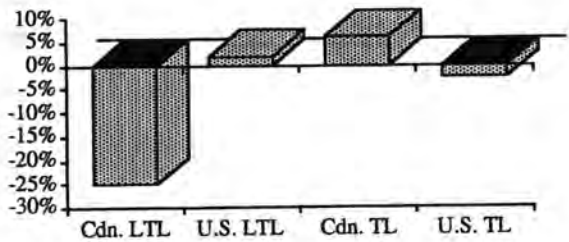
4. Total liabilities to equity

Canadian carriers had a much higher total debt to equity ratio than U.S. carriers in 1993. TL carriers are more highly leveraged than LTL carriers on both sides of the border. Over the three-year period of 1991 to 1993, the debt load of U.S. LTL carriers increased while the debt load of U.S. TL carriers decreased. In Canada, the complete reverse happened. The debt load of TL carriers increased and the debt load of LTL carriers decreased over the 1991–1993 time period.

Total debt to equity—1993



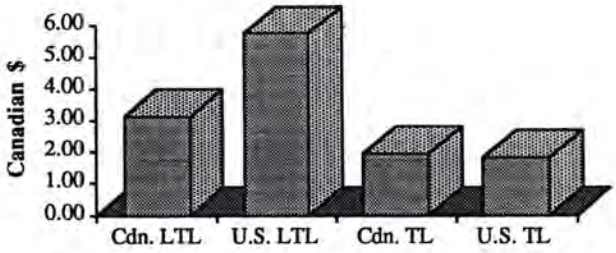
Total debt to equity trends 1991–1993



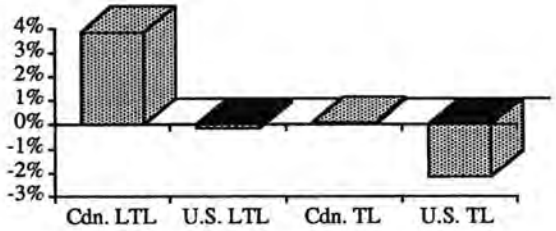
5. Revenue per mile

U.S. carriers generate more revenue per mile than Canadian carriers, particularly U.S. LTL carriers (once the ratio is converted to Canadian currency). While revenue per operating mile figures for U.S. TL carriers are practically equal to their Canadian counterparts, U.S. LTL carriers generate significantly more revenue per operating mile than do Canadian LTL carriers. Canadian LTL and TL carriers improved their performance over the 1991–1993 time period whereas U.S. carriers have experienced a slight decline in performance.

Revenue per mile—1993



Revenue per mile trends 1991–1993



At the time of interview, carriers had experienced an improvement in financial performance in 1994 over 1993. However, in 1995, carriers were experiencing a softening of demand and were predicting a deterioration in financial performance compared to 1994. With hindsight now, this did occur.

C. Trends in major expense items

Our study examined major expense items as a percent of operating revenues for 1993 and over the three-year period based on data for the U.S. and Canadian carriers selected to represent best practices in the industry. We considered salaries and benefits, materials and supplies and other expenses.

1. Salaries and benefits

The salaries and benefits ratio results for the year 1993 for each of the carrier segments are as follows: Canadian TL—29.4%; U.S. TL—34.6%; Canadian LTL—43.4%; and U.S. LTL—63.8%.

It is interesting to note the wide spread in the results between TL and LTL carriers in general and the higher percentage of salaries and benefits paid by U.S. carriers to their employers versus their Canadian counterparts. The main reasons are as follows.

- The LTL carriers, particularly in the U.S. make much less use of owner-operators than the TL carriers.
- The U.S. LTL carriers tend to have a greater percentage of unionized workers.
- U.S. carriers incur more expenses for social benefits due to differences in the administration of the health regimes between Canada and the United States.

2. Materials and supplies

The results for 1993 are as follows: Canadian TL—12.9%; U.S. TL—18.1%; Canadian LTL—11.8%; U.S. LTL—7.7%.

The results here are more mixed and less varied. U.S. TL results are higher than the Canadian TL results due in part to less reliance on owner-operators (owner-operator expenses represented 27.5% of operating revenues for Canadian TL carriers in 1993 versus 11.8% for U.S. TL carriers). Canadian LTL results are higher than the U.S. LTL results possibly due to economies of scale of the much larger LTL carriers.

3. Miscellaneous expenses

The 1993 results for some miscellaneous expense items as a percentage of operating revenues are as follows.

	Cdn. TL	U.S. TL	Cdn. LTL	U.S. LTL
Owner/operators	27.5%	11.8%	10.4%	0.2%
Equipment rentals	5.1%	8.8%	1.1%	1.7%
Purchased transportation	4.0%	1.6%	3.9%	3.4%
Outside maintenance	1.2%	0.7%	2.1%	0.9%
Equipment depreciation	3.9%	5.9%	6.7%	2.6%

The most significant differences concern the following.

- The greater use of owner-operators by the Canadian TL and LTL segments versus their U.S. counterparts, particularly the Canadian TL segment. Over the period of 1991–93, there was a slight downward

trend in the use of owner/operators in Canada versus a slight increase in the U.S.

- The higher percentage of equipment rentals in the case of the U.S. TL carriers.
- The greater use of outside maintenance by Canadian carriers.

D. Key financial policies

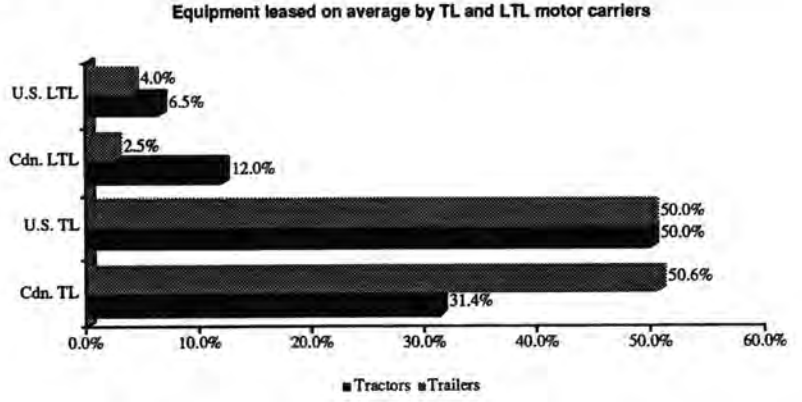
Our review of key financial policies covered a range of issues including depreciation rates, lease versus buy and insurance.

The economic lives in years assigned for revenue equipment for the TL and LTL motor carriers in Canada and the United States were found to be on average as follows.

	Cdn. TL	U.S. TL	Cdn. LTL	U.S. LTL
Tractors	6.8	3.8	5.4	7.0
Trailers	9.0	5.7	8.5	12.5

U.S. TL carriers write-off equipment faster than their Canadian counterparts whereas the reverse is true for LTL carriers. The LTL comparison is probably affected by the vast difference in size between the Canadian and U.S carriers who participated in the survey. The much larger U.S. LTL carriers tend to place older line-haul equipment into more local services to extend the useful life of the equipment.

The percent of equipment leased on average by the TL and LTL motor carriers in each country was found to be as follows.



In general, TL carriers in both countries lease a much greater percentage of their equipment than LTL carriers. Generally, the decision whether to lease or buy is based on financial considerations. TL carriers who turn over their equipment faster may explain the tendency for TL carriers to turn more towards leasing to finance their capital acquisitions.

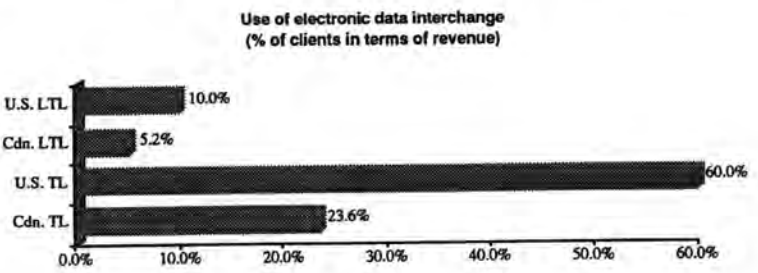
We asked carriers what methods they employ to minimize insurance costs while at the same time ensuring adequate insurance coverage. The key element of comparison was the deductible amount carried for accidents.

U.S. carriers had much higher deductible amounts than their Canadian counterparts. The larger the carrier, generally the larger the deductible. For example, the large U.S. LTL carriers had accident deductibles ranging from $2 million (U.S.) to $4 million (U.S.). The smaller U.S. TL carriers carried deductibles of $500,000 (U.S.).

In Canada, the deductibles are much lower. Size of carrier was also a key factor in the amount of deductible carried. Small carriers carried deductibles as low as $5,000. Medium sized carriers with revenues in the $50 to $100 million, carried deductibles in the $25,000 to $100,000 range. Larger Canadian carriers had even greater deductibles approaching (but not exceeding) the smaller U.S. carriers.

E. Technology based information systems are increasing

Technology based information systems are playing an increasing role in the management and operations of motor carriers. As a per cent of revenue, expenditures in this area are between 1.3% to 2.7% and will continue to grow. Satellite tracking is used primarily by TL carriers. All the U.S. TL carriers interviewed had 100% of their tractors equipped for satellite tracking . The ratio was closer to 50% in Canada. LTL carriers on both sides of the border do not use satellite tracking (line-haul operations for LTL carriers are on fixed schedules between terminals). The use of bar coding and document imaging technologies are generally on the rise for many of the carriers interviewed. Electronic data interchange (EDI) is also gaining acceptance although the extent of use varies between the segments. In terms of per cent of carrier revenue, the use of EDI between carriers and their clients was much more extensive in the U.S. EDI is also more widely used by TL carriers than LTL carriers on both sides of the border.



F. Operating practices and productivity improvement

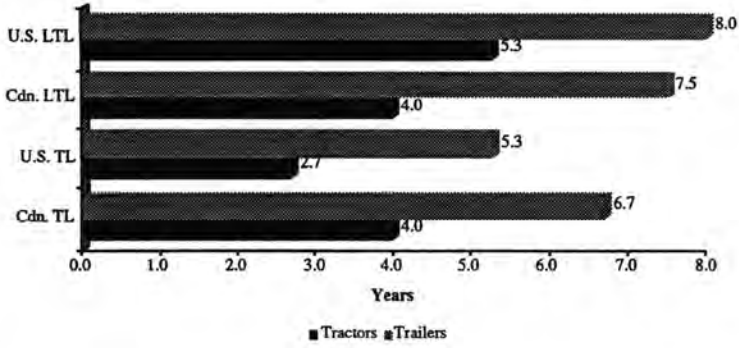
The review of operating practices revealed some interesting findings.

The Canadian TL carriers interviewed have a higher tractor utilization (142,800 miles/year) than U.S. TL carriers (117,000 miles/year) probably due in part to the greater expanse of territory covered by the Canadian TL carriers (the U.S. carriers interviewed were regional carriers). The reverse situation was found for LTL carriers probably due to the much larger size of the LTL carriers interviewed versus their Canadian counterparts (114,500 miles/year for Canadian LTL carries versus 147,300 miles/year for U.S. LTL carriers).

1. Age of fleet

In general, the U.S. TL fleets are younger than their Canadian TL counterparts. Secondly, the TL fleets are younger than the LTL fleets on both sides of the border. The smaller Canadian LTL carriers tend to turnover equipment faster than the large U.S. LTL carriers (who tend to rotate older equipment into P&D services) resulting in a younger fleet which more closely resembles the age of Canadian TL carrier fleets.

Age of fleet—Canadian and U.S. TL and LTL carriers



2. Productivity improvements

Canadian and U.S. motor carriers used a variety of measures to improve their productivity.

- More fuel efficient and better quality tractors. Newer tractors with electronic engines governed to their specifications produce significant savings in fuel consumption.

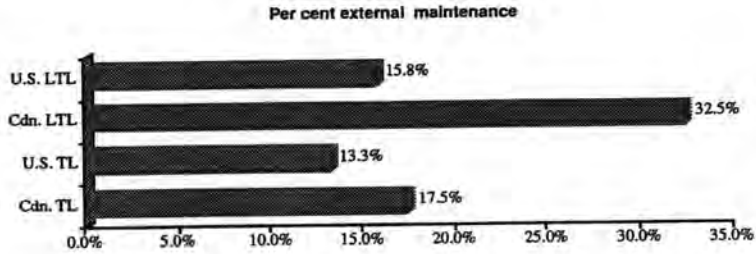
- Rationalization of the network. LTL carriers are rationalizing their networks, consolidating operations and equipment assignment from fewer terminals.

- Greater use of rail intermodal. Carriers serving longer distance corridors that offer intermodal services at sufficient service levels believe that use of intermodal improves productivity and reduces line-haul costs. Driver shortages have also led to greater use of rail intermodal.

- Compensation systems for drivers. Some carries have found that a change in the method of payment (e.g., variable rate compensation) improved productivity. Greater sensitivity to particular driver needs has also been a positive factor.

3. External use of extended maintenance

Canadian LTL carriers make much greater use of external maintenance.



G. Future market trends

As shown in our analysis of best practices in the North American trucking industry, many carriers made significant improvement over the period of 1991–1993. Many carriers struggled through the recession, maintained or increased revenue rates, improved productivity and invested in technology. These carriers represent what we consider to be some of the best carriers in North America and are the ones that are generally leading the industry in performance and innovation. Common themes on future market trends include the following.

- Shipper-carrier alliances and the use of the core carrier concept will continue to grow.

- The use of third party logistics is also on the rise but not all carriers were satisfied having to deal more and more with third party logistics companies rather than directly with the shipper.

- Changing trade patterns (i.e., more North-South traffic) have been felt more by Canadian carriers than U.S. carriers. North-South trade is expected to remain heavy in the future.

- Rail intermodal will continue to grow although the U.S. regional carriers (which is a fast growing segment) do not foresee an increased use of rail intermodal due to the high levels of service that they must provide.

Trucking in a Borderless Market
A Profile of the Canadian Trucking Industry, 1988 to 1994[1]

Fred Barzyk
Transportation Division, Statistics Canada

The Canadian For-hire trucking industry has experienced important changes to its operating environment beginning with deregulation in 1987 and followed closely by the signing of the Canada-US Free Trade Agreement (FTA) and the North American Free Trade Agreement (NAFTA). This paper investigates the size, structure and activity of Canada's For-hire trucking industry in the context of these regulatory and economic changes. Under the FTA and NAFTA, the removal of tariffs resulted in an increased volume of commodity movements and a reorientation of traffic north and south. Trucking activity has reflected these emerging trade patterns while the size and structure of the industry has adapted to a more competitive environment. To quantify these changes, data from the Motor Carriers of Freight and the For-hire Trucking Origin and Destination survey programs are analyzed for the period 1988 to 1994. Other collaborative sources of data are also examined, such as Canada's exports and imports. The paper concludes with a discussion of the implications of these events on Canadian For-hire trucking carriers.

Introduction

Issues affecting the transportation industry impact on the day to day concerns of Canadians. Changes in policy affecting transportation and trade have had altered the landscape for the primary mode of commodity transport, trucking. Economic factors typically affecting the demand for trucking services are - the production of goods for domestic and foreign consumption, as measured by Gross Domestic Product (GDP) and exports and imports, interest rates and the value of the Canadian dollar. The supply of truck transport in turn is affected by the price of inputs, namely labour (drivers and helpers) and capital (straight trucks, road tractors and semi and full trailers). These variables are key determinants of the day to day activity of the industry.

Over the last decade, deregulation and the advent of trade liberalization in North America have impacted significantly on the trucking industry. Deregulation was initiated under the *Motor Vehicle Transport Act* (MVTA) introduced in 1987, which lowered the barriers to entry for incumbent firms. The Canada - US Free Trade Agreement (FTA), signed in 1989, signified the beginning of a new era of free trade bewteen these two countries. This trading arrangement was expanded in 1992 to include Mexico under the *North American Free Trade Agreement* (NAFTA). Isolating

[1] The author would like to thank the following people for their invaluable help in the completion of this paper. Larry McKeown, Gilles Paré, Jim Cain and Willa Rea of the Transportation Division at Statistics Canada and a special thank you to Kathie Davidson and Wendy Christoff for their contribution.

the effects of these events on how Canadian trucking firms do business is a daunting task because they are intertwined with the variables mentioned above. The intent of these policy changes, however, was clear. In the case of deregulation, the goal was to make the trucking industry more efficient and self-reliant by opening this sector to more direct competition, which has lead to an industry that is more productive and less reliant on government regulation. The impetus behind the free trade agreements between Canada, the United States and Mexico was to remove the tariff wall between these countries and establish one of the largest free trade zones in the world.

The main purpose of this paper is to examine the changes that have come about in the trucking industry in the context of the FTA and NAFTA. However, the impact of deregulation needs to be addressed as well, for under the *Motor Vehicle Transport Act* (MVTA) the domestic environment of trucking has been transformed to such an extent that it has had far reaching consequences for the industry's performance on the international scene.

The paper is organized into four sections. The first section introduces the data used for the analysis while the second provides a brief synopsis of the role of trucking in the Canadian economy. The third section contains a summary of the changes that have come about, at least partly, due to deregulation. The fourth section examines changes in trucking activity under the FTA and NAFTA.

I. Data

For the most part, this analysis looks at annual data concerning the trucking industry for the years 1988 to 1994. These data have several sources. Data concerning the financial and operating statistics for Canada based carriers comes from the Annual Motor Carrier Freight survey (AMCF) for those carriers earning $1 million or more.[2] Commodity shipment data is obtained through the For-Hire Trucking Commodity Origin-Destination survey (TOD) which covers Canada based carriers with $1 million or more in intercity revenues. Both of these surveys are administered by the Transportation Division of Statistics Canada. Other series concerning the Canadian economy and international trade are provided by Statistics Canada as well.[3] Information about license applications, bankruptcies and truck tranport rates were taken from the National Transportation Agency of Canada's Annual Review.[4]

II. The Role of Trucking in the Canadian Economy

The year 1989 marked the beginning of a downturn in the Canadian economy. Growth in the Gross Domestic Product, or GDP, peaked in 1988 at 4.5% (see figure 1), followed by a year of lower growth and two years of decline.[5] The economy began to recover in 1992, with a slight increase in GDP (+0.6%), tempered by a decline in the US economy, which shrank by 2.5%. For both countries, 1993 and 1994 proved to be much stronger years for growth. Throughout this entire period, the trucking industry's

[2] At the time of this paper, AMCF data for the years 1988 to 1993 were available.
[3] The System of National Accounts and Business and Trade Statistics branches of Statistics Canda.
[4] Years 1990 to 1993.
[5] In 1986 dollars.

contribution to GDP has remained stable, representing approximately 1.3% of the total output of the Canadian economy. Activity in this sector mirrors closely that of the economy in general, a fact which emphasizes the role of this mode as a primary facilitator of goods market transactions (see figure 2).

Foreign trade is a significant contributor to Canada's overall economic performance, responsible for nearly one third of economic output. From a low of 28% in 1989, this portion of the economy rebounded to represent 38% of GDP in 1994. The growth in exports fueled an otherwise lackluster performance of the Canadian economy (see figure 3), outpacing contributions of government, consumers and business investment. Just as important for the trucking industry is the fact that from 1990 to 1994, imports also grew, by an average of 6% annually.[6] This growth has been credited to the strength of the US economy and the liberalization of trade between that country and Canada. Trade with the US accounts for approximately three quarters of Canada's total exports and two thirds of total imports.

In trading with the US, trucking is the predominant transport mode, accounting for close to 60% of the dollar value of goods exported to the US and over 70% of imported goods from that country.[7] Over this period, the top five commodities shipped to the US by truck were; road and motor vehicles, paper and paperboard, wood fabricated materials, iron, steel and alloys and non-ferrous metals while shipments into Canada consisted of road and motor vehicles, chemicals and related products, general and unclassified freight, iron, steel and alloys and vegetables and vegetable preparations.

Two key variables affecting the economy and therefore the trucking industry are the value of the Canadian dollar and the rate of interest (see figure 4).[8] From 1988 to 1991, the dollar remained strong, reaching a high of 87 cents US in 1991, after which it declined at an annual rate of 6%. The dollar's impact on the trucking sector comes about in two ways, directly, by lowering the cost of trucking to US manufacturers who export into Canada, and indirectly, by increasing the demand for Canadian exports to the US and the need for transporting these goods.

The interest rate reached a high of 14% in 1990, after which it dropped below the double digit level to 9%. The rate of interest is important to the trucking industry because it is central to regulating the domestic demand for goods, leading to changes in production and subsequent demand for the transportation of goods within Canada. The interest rate also affects the value of the Canadian dollar and in turn, Canada's trading activity. From a financial standpoint, changes in the rate of interest alter the cost of borrowing, directly affecting decisions concerning investment and financial management for trucking firms.

---

[6] These changes are based on the *CANSIM* series *D14442 to D14473,* from matrix *# 6840 - G.D.P. Expenditure Based (1986 Prices), Annual.*

[7] Data concerning trade by mode is published by the International Trade Division of Statistics Canada in publications *#65-203 Imports Merchandise Trade* and *#65-202 Exports Merchandise Trade.* As such, goods shipped by truck includes all carriers, regardless of their domicile and level of revenue.

[8] The value of the Canadian dollar as measured in US dollars. The rate of interest represents the prime lending rate that chartered banks offer to their business clientele.

III. Deregulation

Prior to examining the impact of trade liberalization on trucking, this section looks at the changes that occurred in the industry after the introduction of deregulation. The main intention of the MVTA was to increase the level of competition by allowing easier entry into the industry. The perceived benefits of such a policy are increased productivity and lower rates to shippers. In actual fact, the competition that arose out of the legislation was on two levels, domestic and international. On the domestic level, Canadian trucking firms were forced to compete to a greater extent amongst themselves for domestic and transborder market shares, while US carriers also posed a significant threat, penetrating the transborder market (STC 1994).

In theory, the more efficient and productive carriers could offer services at lower prices, while maintaining a sufficient level of return. In reality, measuring the effects of deregulation is a difficult because the impact of regulatory changes are mixed with economic conditions associated with the business cycle (Woudsma 1995). In spite of this, there were several noticeable effects since the advent of deregulation.

Lower rates and better delivery.

Strong rate competition was commonplace throughout this period. Prior to the recession, lower rates were offered by existing firms to stave off competition from new entrants. Once the downturn had begun, carriers were forced by shippers to keep rates low in an effort to retain market share. This persisted until 1993, when shippers finally began to report small changes in their unit freight costs for trucking services. Carriers able to increase their rates did so on the basis of superior quality and proven reliability (NTA 1993).

Industry and Carrier Size

In order to be competitive, carriers shed unproductive assets and targeted more lucrative niches in the transportation market. From 1989 to 1991, the industry size shrank, as evidenced by a decline in the number of firms, the number of employees, the amount of equipment operated and operating revenues (see Table 1). Significant growth in these components was not realized until 1993, when economic output began to grow at a greater pace. Entry into the trucking industry, as reflected by applications for extra-provincial licenses, was in decline from 1989 to 1993, while the number of bankruptcies peaked in 1991 at 763, followed by two years of decline (see figure 5).

The average size of carrier decreased from 1989 to 1993, based on several factors (see figure 6). First, the value of total assets per carrier, after rising sharply in 1990, diminished for the remainder of the period. Second, the amount of equipment operated per carrier fell from 102 pieces in 1990 to 91 pieces in 1993, a decline of 11%. Third, the number of employees per carrier fell from 55 to 46, while operating revenues went from $6.2 million to $5.8 million, a decrease of 6.5%. One further indication of a shrinking carrier size is the fact that of the largest 100 trucking companies in 1988, as ranked by fleet size, thirty-seven were no longer in that size category in 1993. Furthermore, in 1993 the top 40 carriers by size used 26% less vehicles than the top 40 carriers did in 1988 (NTA 1993).

Productivity

Through improved asset management, carriers were able to generate more output from their employees and equipment. For successful carriers, productivity gains allowed them to lower prices and still remain viable. The two major inputs into this industry are labour and capital, where labour is defined as the total number of employees in the industry and capital typically consists of straight trucks, road tractors, trailers (semi and full trailers) and other equipment used in the activity of truck transport. Comparing the output of the industry, as measured by real GDP, to the number of employees and total equipment operated provides basic indicators of productivity. Table 2 presents estimates of output (in constant dollars) per employee and per equipment. As the data shows, during this period output per employee and per equipment both followed the business cycle, peaking in 1990 and then dropping off sharply in the following year. The subsequent two years of growth in these measures result from a continuing lower reliance on equipment and employees.

The various rates of return all indicate that for most of this period, profitability was low. From 1989 to 1992, industry profits suffered alongside the Canadian economy. In 1991, the industry made deep cuts to their transportation costs, particularly those concerning owner operators, in an attempt to improve financial performance. These cuts were sufficient to improve the bottom line for that year. Once absorbed though, the profitability of the industry did not recover until 1993 (STC 1994).

Financial Performance

To put into context the financial performance of the industry, several key ratios measuring profitability, liquidity and the degree of leverage within the industry are examined.[9] The values of these ratios are presented in Table 3.

The short term liquidity of the industry improved for most of this period, with the exception of 1993. For that year, a 20% increase in accounts payable emphasized a switch to more short term financing to meet cash flow needs. The amount of debt relative to equity rose during this period and long term debt was on the rise as well, though it did decline in 1993 in favour of current liabilities. The ability to cover interest charges from profits improved after 1990, due to lower interest rates on financing charges and improved profit levels, particularly in 1993. Interest expense, as a percentage of total expenses, declined from 2% in 1990 to 1% in 1993.

The financial performance of the industry displayed two noticeable characteristics during this period, the first of which was an increased reliance on debt, relative to equity, as a source of financing. Two likely reasons for this are a) in times of poor performance, the retained earnings of the firm decline due to decreased profits, lowering their equity, and b) a decline in the rate of interest, beginning in 1991, made debt financing easier to obtain, relative to equity. Second, profitability was low for the

[9] These ratios are defined in the appendix. Unfortunately, interest payments are not available as a separate expense item for the years 1988 and 1989 in the AMCF survey, so indicators requiring separate figures for interest paid (operating profit rate of return, return on long-term capital and interest coverage) are not available for these years.

majority of the period, due to a combination of increased competition and a downturn in the Canadian economy. In an attempt to cope with these changes, carriers made more use of two options they had available in managing their business - increasing the amount of equipment leased and their reliance on owner operators.

Leasing

As figure 7 shows, the proportion of leased equipment versus owned rose and two factors have led to this switch. First, the price of each component of equipment rose steadily from 1990 (see figure 8), translating into increased investment costs. Second, leasing provided a much greater degree of flexibility in fleet management, allowing carriers to adjust their equipment inventory more quickly to suit current demand and keep operating costs in line. Leasing also reduces the risk associated with investing in capital by lowering the cash outlay that would otherwise be required when purchasing equipment.

Owner Operators

For the carrier, the hiring of owner operators represents another source of flexibility in managing assets to meet demand. By using owner operators, carriers can sometimes bridge the gap between an over-demand for and under-supply of transport services, without the necessary investment in labour and capital. In an industry where service is the key to obtaining and maintaining customer loyalty, using owner operators to meet demand when resources are stretched is a good option to have available.

Throughout this period, the use of owner operators fluctuated with the economy. As figure 9 illustrates, payments to owner operators, as a percentage of total operating expenses, peaked in 1989 at 25.6% decreasing slightly the following year and then dropping dramatically in 1991. In 1993, with the recovery under way, payments to owner operators reached a pre-recessionary level of 25.2%.

All of the above factors point to a better-managed and more productive trucking industry. Due to a combination of deregulation and a downturn in the Canadian economy in the early 90's, carriers were forced to become leaner and more efficient, resulting in two important benefits. First, rates for trucking services declined noticeably while service increased and second, carriers were in a better position to compete with US trucking firms for transborder routes. With these facts in mind, the focus of the paper now turns to the international activity of Canadian based carriers against the backdrop of the FTA and NAFTA.

IV. The FTA, NAFTA and Canada-Based Trucking Industry.

The market for trucking firms can be broken down into two segments, domestic or primarily east/west traffic, and transborder or north/south traffic (shipments to and from the US). The domestic market has been and still is the larger of the two, representing over 80% of total shipment activity throughout this period, although the transborder portion has increased steadily since 1991, while domestic traffic did not increase until 1994 (see figure 10). From 1991 to 1994, north and southbound

shipments both rose by an average of 8% per year while domestic shipments, after three years of decline, did not recover until 1994. Changes in the share of revenues from these markets reflect these patterns. The portion of revenues generated from transborder shipments rose steadily from 24% of total revenues in 1990 to 34% in 1994 (see Table 4).[10]

Canada-based trucking firms were successful in their attempts to expand their share of the transborder market. From 1989 to 1993, the number of applications submitted by Canadian based carriers seeking inter-state licenses averaged 850 per year, a significant increase from approximately 200 applications in 1986 (NTA 1993). The success of Canada-based carriers was partly due to the fact that, with the economic expansion in the US during most of this period, US trucking companies were too pre-occupied with domestic markets to compete for more of a share in the transborder market (NTA 1993). Over this same period, US based trucking firms averaged 1,522 applications per year to operate in Canada, fluctuating from year to year with no real trend emerging.

One the impacts of the FTA and NAFTA on Canadian trucking has been a shift towards transborder shipments relative to domestic traffic. In order to examine this phenomenon more closely, changes in transborder and domestic activity were observed using commodity data from the For-hire Trucking Origin Destination survey for the years 1988 to 1994 (see Table 5). Estimates of the share of shipments, revenues and tonnes accounted for by transborder versus domestic activity were calculated for commodities at the two digit level in each year. The percentage changes from year to year were then calculated and compared. Table 5 provides the average change in the transborder share over the period 1990 to 1994, alongside the change for 1989, the year the FTA was signed.

The results, at this higher level of detail, strongly correspond with the aggregate data. On average, the share of shipments accounted for by transborder movements increased for the years 1990 to 1994 for all but two commodities, 23 - crude wood materials and 58 - road motor vehicles. Revenues and tonnes exhibited the same pattern, supporting the conclusion that a reorientation of trucking activity from east/west to north/south has occurred under the FTA and NAFTA.

The removal of tariffs, along with a declining Canadian dollar, combined to lower the price of exports to the US, resulting in a higher demand for Canadian goods during this period. The increased demand for Canadian exports translated into more business for the trucking industry, explaining the growth in southbound activity. In the northbound direction, a lower dollar allowed Canadian truckers to be more cost competitive with their US counterparts, who were also more focussed on their domestic business, thus leading to an increased share of the transborder market. The domestic market for transportation was still the main source of activity for Canadian carriers, but there is no doubt that the transborder market has been growing in prominence.

[10] These movements correspond with those obtained through the AMCF, where from 1988 to 1990, the percentage of total revenues earned from transborder operations was on the decline, reaching 12 % in 1990. After that, revenues from transborder shipments recovered to reach 23% of total revenues in 1993.

Conclusion

Since 1987, Canadian trucking firms have faced two important changes, each having left its own mark on the industry. Deregulation, introduced a level of competition unequaled in the past that forced carriers to be more receptive and responsive to changes in the Canadian and US economies. Those carriers who were able to adapt survived. Free trade legislation, under the FTA and NAFTA, opened up opportunities for Canadian firms abroad, but it also intensified the level of competition by bringing in other players, namely US trucking firms. The fact that these policy changes have occurred within the span of less than a decade implies that Canadian carriers did not have the benefit of time on their side in learning to adjust to a global market. As trade regulations under the NAFTA are phased in over the next several years, their impact will be more pronounced and Canada-based carriers will have to continue to adapt in order to survive in a market where borders have vanished.

Figure 1 - Percentage Change in GDP - Canada and the US[11]

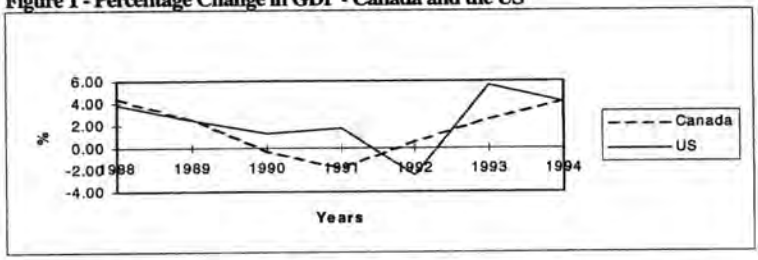


Figure 2 - GDP of the Trucking Industry vs. Rest of the Canadian Economy[12]

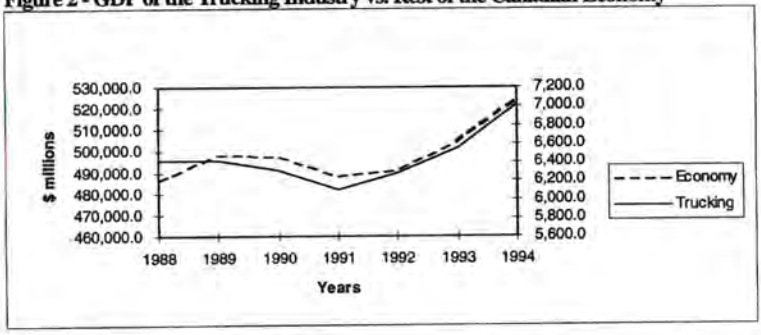
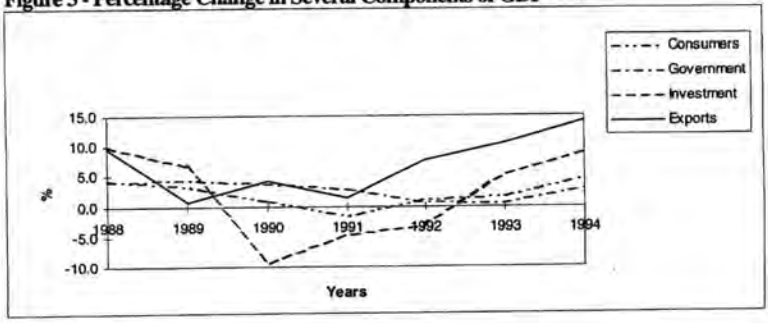


Figure 3 - Percentage Change in Several Components of GDP[13]



[11] Source: *CANSIM series #D14442 and #D369377.*
[12] Source: *Statistics Canada, Cat No. 15-001, June 1995.*
[13] Source: *Statistics Canada, Cat No. 13-001, 1996.*

Figure 4 - Interest and Exchange Rates[14]

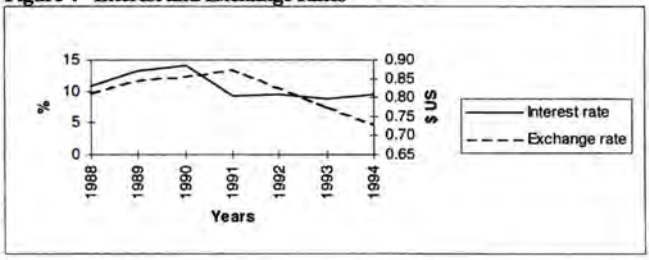


Figure 5 - Entry and Exit of Canadian Carriers[15]

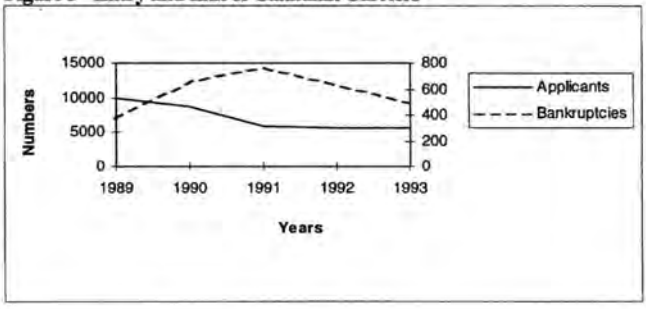
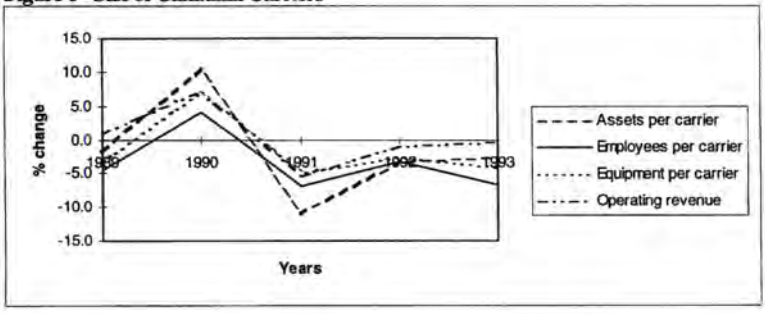


Figure 6 - Size of Canadian Carriers[16]



[14] Source: *Bank of Canada Review, Spring 1995.*
[15] Source: *Annual Review of the National Transportation Agency of Canada.*
[16] Source: *Annual Motor Carrier of Freight Survey*

Figure 7 - Percentage of Equipment Leased[17]

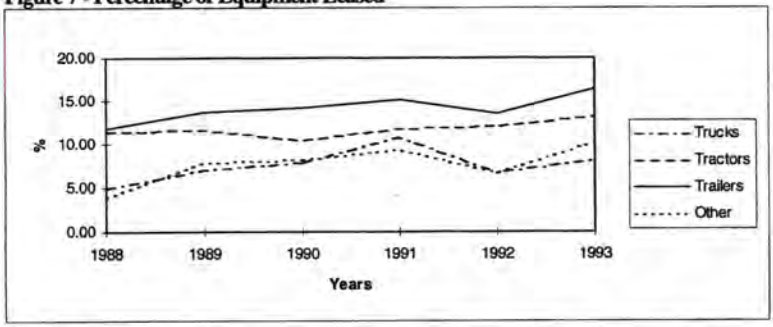


Figure 8 - Price Indexes for Equipment, 1986=100[18]

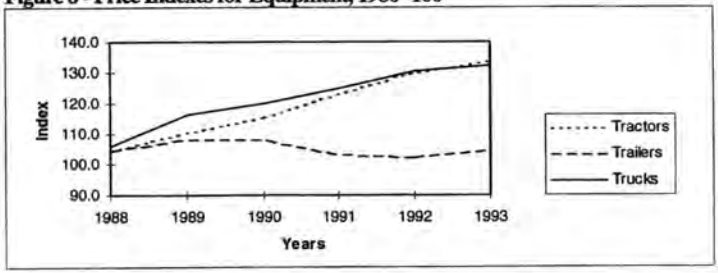


Figure 9 - Payments to Owner Operators as a % of Operating Expenses[19]



[17] Source: *Annual Motor Carrier of Freight Survey*
[18] Source: *Statitsics Canada, Cat No. 62-011.*
[19] Source: *Annual Motor Carrier of Freight Survey*

Figure 10 - Percentage Change in Shipments[20]

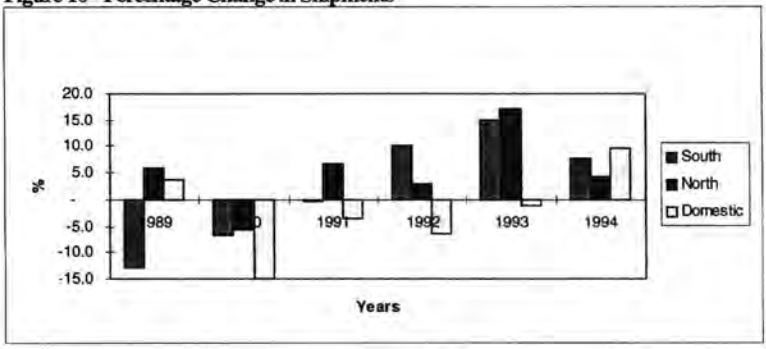


Table 1 - Industry Statistics on Canadian Carriers

Variable		1988	1989	1990	1991	1992	1993
Number of carriers		1,412	1,514	1,350	1,427	1,460	1,580
Operating revenues	$000,000	8,140	8,805	8,423	8,434	8,545	9,221
Number of employees		77,518	79,413	73,716	72,617	71,909	72,728
Total equipment		139,747	144,707	138,333	138,919	138,518	143,878

Source: *Annual Motor Carrier of Freight Survey*

Table 2 - Output of Truck Transport Sector In Relation to Employees and Equipment (in 1986 dollars)

Year	GDP -Trucking / Employee	GDP - Trucking / Equipment
	$	$
1988	82,799	159,797
1989	80,871	154,595
1990	85,584	168,918
1991	84,027	159,042
1992	87,319	164,277
1993	90,090	166,669

Source: *Annual Motor Carrier of Freight Survey and Statistics Canada, Cat No. 15-001, June 1995.*

[20] Source: *For-hire Trucking Commodity Origin/Destination Survey*

Table 3 - Financial Indicators

Indicator		1988	1989	1990	1991	1992	1993
Net Income Margin	%	1.99	1.50	0.10	0.92	0.66	1.55
Return on Assets	%	3.79	2.91	0.20	1.84	1.35	3.22
Operating Profit Rate of Return	%	na	na	2.97	3.30	2.81	3.54
Return on Long Term Capital	%	na	na	8.76	10.18	8.95	11.95
Return on Equity	%	12.57	9.69	0.64	6.26	4.63	11.07
Current ratio		0.95	0.96	0.98	1.02	1.04	0.99
Long term debt ratio	%	50.9	51.8	52.7	54.4	54.5	52.7
Debt to equity ratio		2.32	2.33	2.29	2.41	2.43	2.44
Interest Coverage		na	na	1.44	1.71	1.66	2.69

na - not available
Source: *Annual Motor Carrier of Freight Survey*

Table 4 - Breakdown of Operating Revenues by Market

	1988	1989	1990	1991	1992	1993	1994
Transborder revenue share	25.4	24.2	24.2	25.8	27.7	31.0	33.6
Domestic	74.6	75.8	75.8	74.2	72.3	69.0	66.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: *For-hire Trucking Commodity Origin/Destination Survey*

Table 5 - Change in Annual Share of Transborder Activity, by Commodity

		Revenues		Shipments		Tonnes	
		% for	Avg % 1990 to	% for	Avg % 1990 to	% for	Avg % 1990 to
No.	Standard Commodity Classification	1989	1994	1989	1994	1989	1994
0	Live Animals	-8.1	19.0	-9.5	23.7	11.0	20.8
1	Meat and Meat Preparations	-25.6	14.2	-19.2	12.7	-33.2	12.0
3	Fish	13.0	-2.4	34.5	6.7	37.1	-1.0
4	Other Marine Products	-41.7	6.3	1.9	19.7	-48.9	19.3
5	Dairy Products, Eggs and Honey	-24.4	29.0	-35.1	38.4	-19.2	54.6
6	Cereal Grains (inc. Seed, Flour, Meal and Cereal Prep.)	2.4	16.3	1.9	18.7	-4.7	19.5
7	Fruits and Fruit Preparations	11.5	2.1	10.7	7.3	30.8	-2.2
9	Vegetables and Vegetable Preparations	-12.4	5.7	-11.2	8.6	10.8	-0.5
10	Sugar and Sugar Preparations	-30.8	16.2	-43.8	21.5	-31.1	19.2
11	Cocoa, Coffee, Tea and Spices	-7.9	8.1	-25.0	8.0	-1.5	1.0
14	Other Foods, Food Materials and Food Preparations	19.4	10.5	15.7	14.3	27.5	12.2
15	Fodder and Feed (except Unmilled Cereals)	-3.5	13.3	-24.0	19.2	-35.2	29.7
17	Beverages	-9.0	6.0	-13.2	6.6	-2.3	6.1
18	Tobacco	24.4	32.8	78.0	23.0	40.3	62.7
20	Crude Animal Products, Inedible (except Fibres)	-8.6	19.0	12.2	19.7	-16.4	37.8
21	Crude Veg. Prod., Inedible (exc. Tob., Fibres and Wood)	-10.0	9.0	-17.5	25.0	4.8	19.3
23	Crude Wood Materials	-12.7	-3.8	8.0	-4.4	33.2	-9.5
24	Textile and Related Fibres (including Waste)	-37.6	30.3	-23.0	37.3	-54.6	37.7
25	Metal Ores, Metal in Ores, Concentrates and Scrap	20.1	4.6	-14.0	26.1	13.1	24.6
26	Coal, Crude Petroleum and Related Crude Products	-51.1	33.6	-53.7	3.7	-46.5	4.0
27	Crude Non-metallic Minerals (except Coal and Petroleum)	-21.1	18.8	-21.2	27.1	-26.8	32.0
29	Other Waste and Scrap Materials	10.3	14.5	1.0	13.7	-9.0	13.9
30	Leather	77.8	13.4	51.9	23.0	204.3	1.7
31	Furs, Dressed	57.8	115.3	226.5	183.3	23.3	243.4
32	Rubber and Plastic Fabricated Materials	-14.1	13.8	0.1	18.3	6.6	3.4
33	Wood Fabricated Materials	-7.5	7.9	-5.8	8.5	-9.9	6.0
34	Pulp	-10.7	4.7	-0.9	6.1	6.1	6.4
35	Paper and Paperboard	-0.6	4.6	-4.2	10.5	5.3	0.5

Table 5 - continued

36	Textile Fabricated Materials	22.9	25.9	27.9	32.8	30.1	29.8
37	Textile Fabricated Materials	-9.8	9.8	1.0	15.5	-16.5	3.1
38	Textile Fabricated Materials	-10.7	17.3	24.4	12.5	-49.2	92.4
39	Oils, Fats, Waxes, Extracts and Der., Animal and Veg.	-21.0	10.2	-12.4	16.6	4.1	15.2
40	Chemicals and Related Products	20.7	6.6	9.2	9.5	9.6	3.9
41	Chemicals and Related Products	10.1	7.1	10.3	8.1	6.5	4.8
42	Chemicals and Related Products	-2.5	12.4	-7.1	15.0	-4.9	7.7
43	Petroleum and Coal Products	-31.9	14.0	-22.1	15.5	-14.5	9.9
44	Iron, Steel and Alloys	-0.1	6.5	-1.5	9.2	5.8	5.5
45	Non-ferrous Metals	-15.1	4.8	-8.7	9.8	-18.1	10.9
46	Metal Fabricated Basic Products	-13.0	10.1	-3.8	12.2	-16.7	9.4
47	Non-metallic Mineral Basic Products	-19.7	10.2	-21.3	14.7	-28.5	17.9
49	Miscellaneous Fabricated Materials	-27.2	19.6	-15.7	14.2	-56.3	21.6
50	Machinery Not Elsewhere Specified Classified by Function	-7.1	11.2	-4.5	14.9	-5.9	9.9
51	Conveying, Elevating and Material Handling Equipment	-26.8	8.2	-26.7	17.0	-25.4	8.4
52	Special Industry Machinery	-3.3	13.2	2.4	19.6	-28.2	34.8
54	Agricultural Machinery and Equipment (except Tractors)	7.5	10.3	-7.5	17.9	-0.2	14.3
55	Tractors	41.2	12.4	0.5	17.1	90.6	14.1
57	Railway Rolling Stock	108.6	1.1	51.1	7.1	84.3	4.4
58	Road Motor Vehicles	-8.5	-0.1	-9.1	-0.6	-9.6	0.8
59	Ships and Boats	-8.9	26.2	0.6	25.9	22.0	40.3
60	Aircraft	16.5	13.4	0.4	15.6	-14.0	31.0
61	Miscellaneous Vehicles (include Parts and Accessories)	62.8	39.1	108.3	102.6	395.4	82.2
62	Rubber Tires and Tubes	2.3	8.9	34.4	7.5	32.4	1.9
63	Communication and Related Equipment	14.8	12.8	-5.9	21.2	12.8	7.4
65	Heating, Air Conditioning and Refrigeration Equipment	-1.4	18.6	-0.7	14.0	-19.8	16.1
66	Cooking Equipment for Food	87.0	13.0	35.7	20.6	79.5	10.3
67	Plumbing Eqp. and Fittings (exc. Valves,Pipes, Fittings)	-33.7	35.1	-21.4	25.3	-62.5	35.2
68	Electric Lighting, Distribution and Control Equipment	-21.3	19.5	0.5	21.3	-21.7	29.0
69	Other Electric Equipment and Appliances	4.8	13.1	-13.3	17.5	34.5	10.4
70	Measure, Control, Lab., Medical and Optical Inst. & Acc.	11.6	14.0	-3.1	13.9	12.6	36.3

Table 5 - concluded

72	Safety and Sanitation Equip., Alarm and Signal Systems	-16.7	24.6	-15.1	32.3	-22.1	43.1
73	Service Industry Equipment (include Vending Machines)	15.3	6.5	-48.2	19.9	57.2	22.1
74	Furniture and Fixtures	11.1	22.7	19.9	29.1	11.6	19.0
75	Hand Tools and Cutlery (except Table and Kitchen)	-18.5	15.2	12.4	12.9	-16.1	14.8
76	Other Equipment	16.7	14.7	63.7	16.1	0.1	19.7
77	Office Machines and Equipment	-74.7	27.8	-28.5	13.1	-81.5	53.0
78	Apparel and Accessories	-4.1	30.8	-14.9	28.9	36.8	23.3
79	Footwear	28.9	26.4	5.9	31.3	-17.3	33.0
80	Toiletries, Cleaning Prep. and Chemical Specialities	32.6	11.2	-3.7	4.9	32.0	11.0
81	Jewellery and Silverware (except Watches and Clocks)	116.3	7.1	6.9	45.2	42.9	26.7
82	Watches and Clocks	-78.7	75.3	-62.4	103.5	-65.3	126.7
83	Other Rec.Equip.,Toys,Games, Sporting and Athletic Goods	29.4	17.7	36.8	21.7	21.9	24.5
84	House Furnishings	91.2	20.3	66.8	46.0	124.4	21.0
85	Kitchen Utensils, Cutlery and Tableware (exc.Silverware)	86.4	11.0	36.3	21.2	36.9	12.4
86	Other Household and Personal Equipment (used)	-2.2	0.5	17.2	10.8	-8.7	35.7
87	Medicinal and Pharmaceutical Products	62.4	43.9	-25.9	17.1	59.0	30.2
88	Medical Supplies, Opthalmic Goods and Orthopaedic App.	-2.0	16.1	-35.8	29.9	-24.7	22.1
89	Printed Matter	5.3	7.4	2.2	6.5	-2.2	11.9
90	Stationers' and Office Supplies and Artists' Materials	-5.7	22.4	4.8	29.1	18.6	29.2
91	Photographic Goods	-16.0	7.1	-4.2	16.7	-1.4	5.8
92	Musical Instruments	214.6	37.2	203.7	17.4	839.8	75.6
93	Firearms, Weapons and Ammunition	-45.3	41.0	-44.3	18.4	-19.8	67.1
94	Miscellaneous End-products	5.2	20.3	9.1	26.3	-20.9	22.6
95	Containers and Closures	-15.4	9.0	-32.7	13.6	-24.2	4.5
96	Remaining End-products Classified by Material	21.6	3.4	3.6	16.3	35.0	3.9
99	General or Unclassified Freight	27.5	12.1	47.2	16.1	112.4	24.8

Source: *For-hire Trucking Commodity Origin/Destination Survey*

Appendix 1 - Financial Ratios

There is a wide variety of ratios and indicators relating to financial performance. Generally, they are concerned with three areas of financial activity.

1.) *Profitability*, can be measured at many levels, thereby giving several rates of return. The following is a selection chosen for analysis in this study.

i.) Net Income Margin

$$\frac{\text{net income after taxes}}{\text{total revenues}} \times 100$$

ii.) Return on Assets

$$\frac{\text{net income after taxes}}{\text{total assets}} \times 100$$

iii.) Operating Profit Rate of Return

$$\frac{\text{net income before interest and taxes}}{\text{total assets}} \times 100$$

iv.) Return on Long Term Capital,

$$\frac{\text{net income before interest and taxes}}{\text{long term liabilities plus owner's equity}} \times 100$$

v.) Return on Equity

$$\frac{\text{profits after taxes and before dividends}}{\text{owner's equity}} \times 100$$

The *net income margin* , expressed as a percentage, relates profits to revenues after deductions are made for interest and taxes. The *return on assets* relates the performance of the firm with the total investment in assets. Because this calculation uses profits after taxes and interest, it is less meaningful a measure of profitability when there is a significant amount of interest paid to creditors. To get a clearer picture of how well a firm can generate profits from its assets under such circumstances, the *operating profit rate of return* should be used, since this relationship is independent of how the firm is financed. Together, the *return on long term capital* and *return on equity* provide rates of return for creditors seeking to lend funds and investors wishing to purchase equity.

2.) *Liquidity* ratios measure a firm's ability to meet its short term obligations with its most liquid assets. Cash, accounts receivable, marketable securities and other solvent assets can be sold interim to meet short term debt or credit needs. A common measure of liquidity is the *current ratio,*

$$\frac{\text{current assets}}{\text{current liabilities}}$$

where the greater the ratio, the greater the liquidity.

3.) *Leverage.* The level of debt a firm incurs impacts on its operations. A high degree of leverage (financing the business through borrowing versus equity capital) will increase the level of risk associated with the firm. It also results in higher interests costs, which reduce the net profits of the firm. A common method of comparing the two sources of financing is the *long term debt ratio*,

$$\frac{\text{long term debt}}{\text{total liabilities plus owner's equity}}.$$

Another important indicator of leverage is the *debt to equity ratio*,

$$\frac{\text{total liabilities}}{\text{owner's equity}}$$

Coverage is term which refers to the ability of a firm to meet its debt obligations. The greater the firm's ability to 'cover' its debt payments its through cash flow, the lower the risk of defaulting on these debt payments. The *interest coverage ratio* measures the degree of risk associated with the firm's leverage position,

$$\frac{\text{net income before interest and taxes}}{\text{interest payments}}$$

where a value of less than one means the firm cannot meet its current debt obligations through its operations and may default on its loans. The coverage and long term debt to equity ratios are strong complements.

References

MSSC , Ministry of Supply and Services Canada (1996) *Annual Review of the National Transportation Agency of Canada 1990-1993*, Ottawa.

Statistics Canada (1996) *Trucking in Canada, 1988-1993*, Ministry of Supply and Services Canada, Ottawa.

Statistics Canada (1996) *Gross Domestic Product by Industry, 1995*, Ministry of Supply and Services Canada, Ottawa.

Statistics Canada (1996) *National Income and Expenditure Accounts, 1995*, Ministry of Supply and Services Canada, Ottawa.

Statistics Canada (1996) *Imports, Merchandise Trade, Vol 1, 1988-1994*, Ministry of Supply and Services Canada, Ottawa.

Statistics Canada (1996) *Exports, Merchandise Trade,Vol 1, 1988-1994*, Ministry of Supply and Services Canada, Ottawa.

Woudsma, C.G. (1995) "North American Surface Freight Transportation: Policy Evolution and Evaluation" in *Transport Planning and Policy Issues: Geographical Perspectives*, J. Andrey ed., CAG Public Issues Committee Publication no 3, University of Waterloo, p. 25-58.

Macroeconomic Impact and Benefit/Cost Analysis of Transportation and Mining Developments in the Northwest Territories

Russell D. Neudorf
Senior Transportation Planner
Department of Transportation, Government of the Northwest Territories

Masood U. Hassan
Director of Transportation Planning
Department of Transportation, Government of the Northwest Territories

ABSTRACT

This paper summarizes the results of two studies undertaken to quantify the macroeconomic impact and the benefits and costs associated with transportation and mineral development scenarios in the Northwest Territories.

Each development scenario involves investment in a transportation corridor extending north from Yellowknife towards the Arctic Coast, and the staged development of various mineral deposits. The region north of Yellowknife, known as the Slave Geologic Province, is a storehouse for numerous gold, base metal and diamond reserves and is recognized as the premier new mineral region in Canada. At the present time land-based transportation infrastructure consists of a privately constructed winter road extending from Yellowknife to the Lupin gold mine, approximately two-thirds of the distance to the Arctic Coast.

In terms of the macroeconomic impact, the development scenarios analyzed would have a significant, positive impact on the economy. This impact would be significant not only in the Northwest Territories but also in southern Canada, since most of the goods and services consumed in the Northwest Territories are produced in other parts of Canada. The analysis indicates that approximately one-third of the GDP impacts and three-quarters of the employment impacts would occur outside of the Northwest Territories, mainly in the provinces of Ontario, Alberta, Quebec and British Columbia.

The benefit-cost analysis indicated a positive Net Present Value for each of the development scenarios. For the most optimistic scenario, the benefits exceeded the costs by $3 billion over the 20 year study period. The benefits are dominated by the value of the mineral output resulting from new mineral developments.

Mining holds the best prospects for economic development in the North. Transportation infrastructure is essential for the development of mineral deposits. While a causal

relationship between transportation infrastructure and mining activities was not assumed, the two studies reported here have demonstrated that providing transportation infrastructure for the development of mines produces significant macroeconomic impacts and that the benefits would exceed the costs. This information would be useful in discussions about funding transportation infrastructure projects in support of mineral developments.

INTRODUCTION

An investment in transportation infrastructure can have a number of positive impacts on the economy. The investment can create direct employment, both during and after construction, and can increase productivity. An investment in new transportation infrastructure can also be a catalyst for the development of new resources, within areas that were previously not accessible.

Transportation infrastructure is particularly important for the growth of economies that are dependent on natural resources.

The Northwest Territories holds considerable potential for mineral resource developments. However, many known deposits are currently undeveloped due to the lack of adequate transportation infrastructure. Individual resource developments simply cannot afford the expenditure required to develop the required infrastructure.



Figure 1: The Slave Geologic Province

The region with the greatest potential for mineral developments in the Northwest Territories is known as the Slave Geologic Province[1]. This geologic region, illustrated in Figure 1, extends from Yellowknife to the Arctic Coast, a distance of 600 kilometres, in a band approximately 300 kilometres wide. There are five active mines in this region. Canada's first diamond mine, currently under environmental review, may soon join this list. Many other significant gold, base metal and diamond deposits have been identified and there is considerable potential for new mineral deposits to be discovered. The region has been favourably compared to the Abitibi region of Quebec[2], in which over 100 mines have been developed since 1906.

As illustrated in Figure 2, all-weather roads access the southern reaches of the Slave Geologic Province. A privately constructed winter road extends two-thirds of the way from Yellowknife to the Arctic Coast. This road, constructed by Echo Bay Mines, is used to resupply the Lupin gold mine. The winter road will also be used by BHP Diamonds Inc. to resupply their proposed diamond mine.

The provision of improved land-based transportation into the Slave Geologic Province would provide the necessary impetus to encourage new mineral developments by securing a less costly, more reliable means of access for both exploration, development and operational activities, and for the transportation of base metal concentrates to market. Alternatively, mineral developments themselves may require a certain level of transportation infrastructure for operations.

To determine the potential economic impact of transportation and mineral developments in the Slave Geologic Province, the Northwest Territories Department of Transportation commissioned The Conference Board of Canada to undertake a study to quantify the macroeconomic impacts of transportation and mineral development scenarios in the Slave Geologic Province[3]. Quantifying the macroeconomic impact of regional development projects provides useful information in determining the impact of the development. However, to rank this project with others which may be competing for funding the benefits and costs should also be considered. A second study was therefore commissioned to conduct a benefit/cost analysis for the same transportation and mineral development scenarios[4]. This paper presents a summary of the two studies.

DEVELOPMENT SCENARIOS

Four transportation and mineral development scenarios were created for analysis. These scenarios each included the development of transportation infrastructure in the Slave Geologic Province and the staged development of mineral deposits. The scenarios were developed through a collaborative effort of Northwest Territories government departments. A 20 year time frame was used.

Each of the development scenarios, summarized in Table 1, is comprised of a transportation component and a mineral development component. The assumption in the development of the scenarios was that the type and level of transportation infrastructure

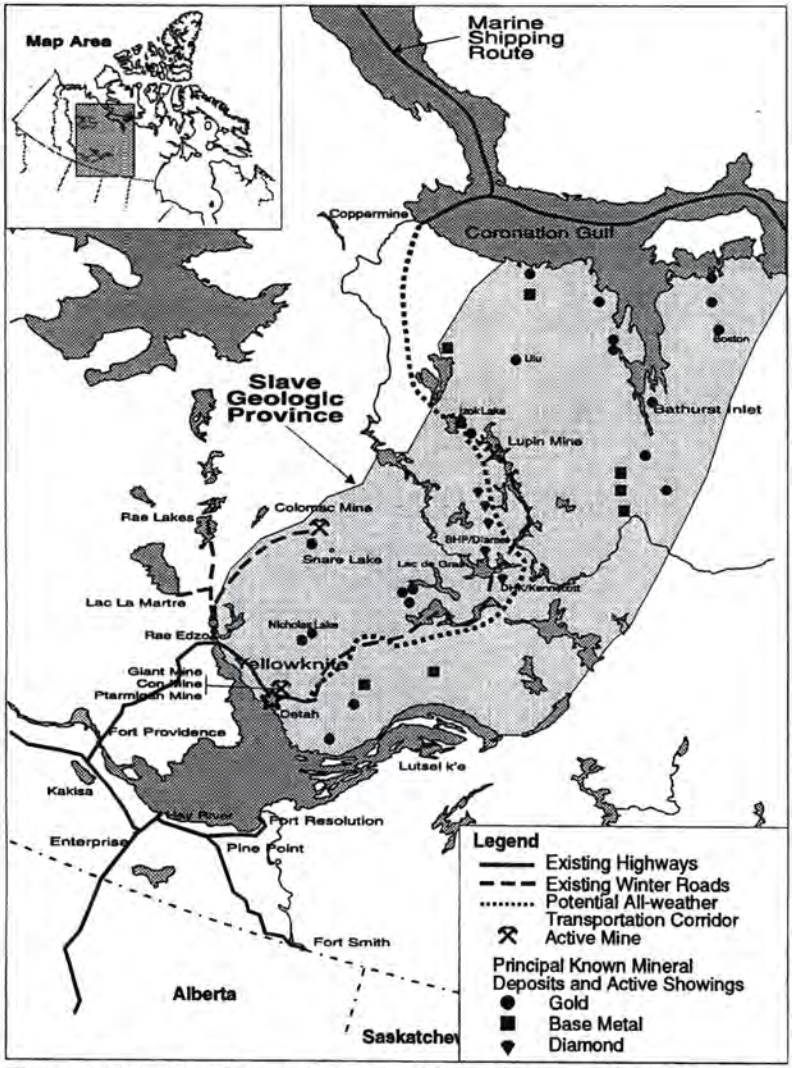


Figure 2: Potential Transportation Corridor and Known Mineral Showings in the Slave Geologic Province

and the number and type of mineral developments are inter-dependent. That is, it was assumed that improved transportation infrastructure would prompt the development of certain mineral deposits, or that a given number of mineral developments would require a certain standard transportation infrastructure.

It is noted that the scenarios were developed to bound the range of potential future activities and not necessarily to forecast actual future events.

Transportation Infrastructure

Each development scenario included an investment in transportation infrastructure. The investment ranged from simply opening and maintaining the current winter road corridor in Scenario 1, to the construction of an all-weather corridor from Yellowknife to a new deep-water port on the Arctic Coast in Scenario 4. Scenario 2 and 3 fall between these two bounds. It is noted that the deep-water port would be used to bring resupply materials into mines located in the northerly portion of the Slave Geologic Province, and to ship base metal concentrates to smelters in Europe and the Pacific Rim.

Table 1: Summary of Development Scenarios

Scenario	Transportation Infrastructure Infrastructure	Mine Developments
Scenario 1	Winter Road Yellowknife to Lupin Mine	One Diamond Mine One Gold Mine
Scenario 2	Winter Road Yellowknife to Izok Lake All-weather road Izok Lake to the Arctic Coast Deep water Port on the Arctic Coast	One Diamond Mine One Gold Mine One Base Metal Mine Extension to Lupin Mine
Scenario 3	All-weather road Yellowknife to Lac de Gras Winter Road Lac de Gras to Izok Lake All-weather road Izok Lake to the Arctic Coast Deep water Port on the Arctic Coast	Two Diamond Mines Three Gold Mines One Base Metal Mine Extension to Lupin Mine
Scenario 4	All-weather road Yellowknife to the Arctic Coast Deep water Port on the Arctic Coast	Three Diamond Mines Four Gold Mines Three Base Metal Mines Extension to Lupin Mine

Note: For the benefit-cost analysis, additional costs quantified include municipal infrastructure and training programs. Additional benefits quantified include transportation safety improvements, transportation efficiency improvements, reduced resupply costs for remote communities and tourism benefits.

Mineral Developments

Mineral developments are a very important aspect of each of the development scenarios. Investment in new transportation infrastructure is assumed to make the development of certain mineral deposits economically viable. New transportation infrastructure is also assumed to increase mineral exploration activities, thus increasing the likelihood for the discovery and development of other deposits.

For Scenario 1, which assumes no new transportation infrastructure, mineral developments include the development of one new diamond mine and one new gold mine over the 20 year study period. For Scenario 4, which assumes an all-weather transportation corridor to a port on the Arctic Coast, mineral developments include the development of three new diamond mines, four new gold mines and three new base metal mines. Scenario 4 is the most optimistic scenario.

ECONOMIC IMPACT ANALYSIS

Methodology[5]

The economic impact analysis quantified the direct, indirect and induced effects of the development scenarios on the economy. Direct impacts result from expenditures made on goods and services that are directly consumed by the project. Indirect impacts occur as a result of expenditures made by firms and government agencies that are directly involved in the project. Induced impacts result from the spending of household income earned by labour involved in the provision of goods and services for the direct and indirect inputs to the project.

Gross Domestic Product (GDP) and employment were quantified to determine the economic impacts of the development scenarios on the economy. GDP and employment were quantified for each Province and Territory[6].

Two tools were used to quantify the economic impacts. Input-Output models were used to determine the direct and indirect economic impacts and the induced impacts for the Northwest Territories. Macroeconomic models were used to determine the induced economic impacts for all provinces.

The first step in estimating the economic impacts of the development scenarios involved estimating the value of output for the various components of the scenarios. For transportation components this involved determining the initial capital investment required and the annual operation and maintenance costs. Mineral developments required an estimate of the initial capital investment in the mine and an estimate of the value of mineral output. As noted previously, a 20 year time period was used for the evaluation.

Once the total expenditures were determined, the Northwest Territories Bureau of

Statistics Input-Output Model for the Northwest Territories and Statistics Canada Inter-Provincial Input-Output model for the rest of Canada were used to translate the initial expenditures into the final demand for goods and services for the affected industries. Tracing of the initial expenditures into the final demand for goods and services defined the direct impacts of the individual projects. The models were also used to estimate the indirect impacts associated with each scenario.

The Northwest Territories Bureau of Statistics Input-Output Model is a "closed" model, and therefore was able to trace the spending of labour income derived from the direct and indirect impacts and thus quantify the induced impacts on the Northwest Territories. Since Statistics Canada Input-Output Model was "open", The Conference Board of Canada's Provincial Medium-Term Forecasting Model was used to determine the induced impacts for the rest of Canada.

Results of the Economic Impact Analysis

GDP and employment were quantified to determine the economic impact of the development scenarios. GDP impacts are expressed in constant 1993 dollars. Employment is expressed in terms of person-year equivalents. All impacts presented are the incremental impacts associated with the development scenarios over the 20 year study period. Both GDP and employment were quantified for all provinces and territories, since economic activity in the Northwest Territories has a significant impact on other parts of Canada.

A summary of the economic impacts associated with each development scenario is provided in Table 2. General conclusions are summarized below.

- The impact of the developments scenarios on GDP and employment are significant.
- GDP impacts range from a minimum of $14.7 billion with Scenario 1 to $50.6 billion with Scenario 4 over the 20 year study period.
- Employment impacts range from 110,000 person-years for Scenario 1 to 395,000 person years for Scenario 4 over the 20 year study period.
- The increase in GDP and employment impacts from Scenario 1 to Scenario 4 is directly related to the increased transportation and mineral activity assumed in the Scenarios.
- The distribution of GDP impacts across Canada for Scenario 4 is illustrated in Figure 3. The largest GDP impacts occur in the Northwest Territories, capturing 63 percent of the total. However, since the Northwest Territories imports many goods and services, 37 percent of the GDP impacts occur outside of the Northwest Territories. The largest portion of these impacts occurs in the provinces of Ontario, Alberta, Quebec and British Columbia.

Table 2: Total Economic Impacts By Province

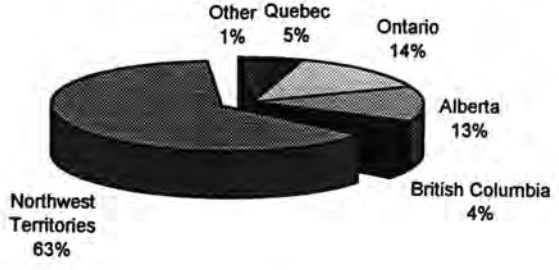
Total Gross Domestic Product Impacts (millions of 1993 dollars)

	QUE	ONT	ALTA	BC	Other	Sub-Total	NWT	National Total
SCENARIO 1								
Gross Domestic Product	759	2,039	1,675	561	192	5,227	9,500	14,727
Share of National Total (%	*5.2*	*13.8*	*11.4*	*3.8*	*1.3*	*35.5*	*64.5*	***100.0***
SCENARIO 2								
Gross Domestic Product	999	2,822	2,595	790	280	7,487	13,136	20,623
Share of National Total (%	*4.8*	*13.7*	*12.6*	*3.8*	*1.4*	*36.3*	*63.7*	***100.0***
SCENARIO 3								
Gross Domestic Product	1,852	5,411	4,591	1,438	505	13,797	23,655	37,452
Share of National Total (%	*4.9*	*14.4*	*12.3*	*3.8*	*1.3*	*36.8*	*63.2*	***100.0***
SCENARIO 4								
Gross Domestic Product	2,429	7,049	6,448	1,973	687	18,586	32,062	50,649
Share of National Total (%	*4.8*	*13.9*	*12.7*	*3.9*	*1.4*	*36.7*	*63.3*	***100.0***

Total Employment Impacts (person-year equivalents)

	QUE	ONT	ALTA	BC	Other	Sub-Total	NWT	National Total
SCENARIO 1								
Employment	15,719	35,192	19,846	9,354	3,540	83,651	26,646	110,297
Share of National Total (%	*14.3*	*31.9*	*18.0*	*8.5*	*3.2*	*75.8*	*24.2*	***100.0***
SCENARIO 2								
Employment	20,437	48,440	31,770	13,116	5,104	118,867	41,700	160,566
Share of National Total (%	*12.7*	*30.2*	*19.8*	*8.2*	*3.2*	*74.0*	*26.0*	***100.0***
SCENARIO 3								
Employment	37,785	91,219	55,432	23,788	9,199	217,424	73,924	291,348
Share of National Total (%	*13.0*	*31.3*	*19.0*	*8.2*	*3.2*	*74.6*	*25.4*	***100.0***
SCENARIO 4								
Employment	49,377	118,956	78,734	32,632	12,494	292,194	103,071	395,265
Share of National Total (%	*12.5*	*30.1*	*19.9*	*8.3*	*3.2*	*73.9*	*26.1*	***100.0***

Figure 3: Distribution of Total GDP Impacts in Scenario 4

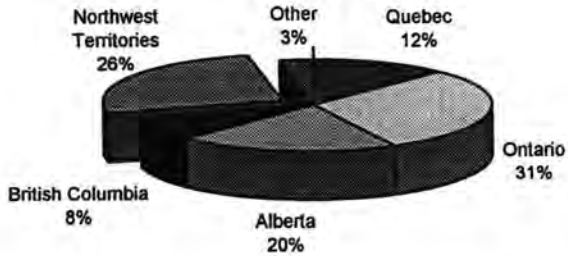


- For Scenario 4, GDP impacts are $1.6 billion per year. This is 74 percent of the actual GDP in the Northwest Territories in 1993. For Scenario 4, national GDP is $2.5 billion per year or 0.4 percent of Canada's actual GDP in 1993.

- The distribution of employment impacts across Canada for Scenario 4 is illustrated in Figure 4. Unlike GDP, the majority of employment impacts occur outside of the Northwest Territories. For Scenario 4, the Northwest Territories accounts for 26 percent of the employment. Substantial employment impacts would occur in Ontario, Alberta, Quebec and British Columbia.

- For Scenario 4, the employment impacts in the Northwest Territories represents approximately 25 percent of actual 1993 employment. For Canada, the person-year estimate represents 0.2 percent of Canada's actual employment in 1993. Of the employment impacts for Scenario 4, direct employment is 179,942 person-years or 45 percent of the total.

Figure 4: Distribution of Total Employment Impacts in Scenario 4



BENEFIT-COST ANALYSIS

The benefit-cost analysis followed guidelines outlined by the Treasury Board[7] and Transport Canada[8], but differed from Transport Canada's prescribed format in one important aspect. The purpose of this analysis was to quantify the economic impact associated with the construction of new transportation infrastructure. Transport Canada's guidelines focus specifically on replacement or upgrading projects, as would be the case for most transportation projects in Canada. However, there are still many areas of the North in which there is no transportation infrastructure. This study examined the effects of introducing new transportation infrastructure into a region previously accessible only by winter road. Since the assumption stated previously was that transportation and mineral developments are inter-dependent, it was appropriate to include the economic impacts of mineral developments in this benefit-cost analysis. In fact, the principal benefit arising from the corridor construction is the development of natural resources

that would otherwise be uneconomic to develop or whose development will be hastened as a result of the investment.

Benefit-cost analysis requires the consideration of a realistic base case. All results are then expressed as incremental to the base case. Since it was determined to be unrealistic to assume no new mineral developments over the next 20 years without transportation infrastructure improvements, Scenario 1 was chosen as the base case. All results reported are incremental to this scenario.

All costs and benefits are considered from a societal perspective. The study did not consider who would receive the benefits or incur the costs. Results are reported in constant 1993 dollar values.

Scenarios used in the benefit-cost analysis are similar to the economic impact analysis in terms of the transportation infrastructure and mineral development components. To be comprehensive in the analysis several additional benefits and costs were quantified. These additional benefits and costs are summarized below.

Costs

Costs quantified in the analysis include:

- transportation corridor construction and operation and maintenance,
- deep water port construction and operation and maintenance,
- mineral resource development including mine site preparation and operation and maintenance, excluding exploration costs (all costs were varied as a function of winter or all-weather road access),
- municipal infrastructure (operation and maintenance costs for existing facilities and construction and operation and maintenance for new facilities), and
- labour force training programs.

Costs not quantified in the analysis relate to environmental considerations. These include items such as disruption of caribou migration, destruction of habitat and point source pollution. Quantification of these costs was beyond the financial ability of the project.

The capital (purchased inputs) and labour components for each cost were determined. These components were treated separately due the differences in the methodology to calculate them. The general approach for both components, however, was to use their opportunity cost, or the dollar value of the next best alternative use. For this analysis, a shadow wage was applied to the labour component to account for unemployed resources in the labour market while the capital costs were estimated as the actual money cost, excluding taxes and subsidies.

Benefits

Benefits quantified in the analysis include:

- the value of minerals extracted,
- transportation safety improvements,
- transportation efficiency improvements,
- reduced resupply costs for remote northern communities, and
- incremental tourism expenditures.

The principal benefit considered in this study was the value of minerals extracted. These benefits were included in the analysis since it was assumed that transportation infrastructure and mineral developments are inter-dependent.

In terms of the other benefits, transportation safety improvements were assumed to result from the replacement of the existing winter road with an all-weather road. Transportation efficiency benefits were the result of improvements to the existing transportation infrastructure, namely reductions in vehicle operating costs from winter road to all-weather roads and reduced resupply costs for northern communities resulting from the construction of a deep-water port on the Arctic coast. Tourism expenditures were assumed to result from the construction of an all-weather corridor to the Arctic Coast.

Economic multiplier benefits associated with each of the scenarios were not included in the analysis and a discount rate of ten percent was used in keeping with Treasury Board Guidelines.

Benefit-Cost Analysis Results

Results of the benefit-cost analysis are presented in Table 3. It is noted that for the benefit-cost analysis, Scenario 1 is assumed to be the base case. The results noted in Table 3 are all incremental to the base case. General conclusions are noted below.

- All scenarios have a positive benefit-cost ratio

- Scenario 4 has the largest net present value at over $3 billion. This means that the benefits associated with this scenario would exceed that costs by over $3 billion dollars.

- The increase in the benefit/cost results from Scenario 2 to Scenario 4 is directly related to the increased transportation and mineral activity assumed in the Scenarios.

- For all scenarios, benefits and costs are dominated by the mineral activity accounting for 99 percent of the benefits and 85 percent of the costs for Scenario 2, with the percentages increasing for Scenarios 3 and 4.

Table 3: Summary of Benefit-Cost Results

Benefit-Cost Criteria	Scenario 2	Scenario 3	Scenario 4
Net Present Value (1993 $ million)	$356.4	$2,167.4	$3,076.9
Internal Rate of Return (Percent)	19.5%	30.8%	29.3%
Benefit-Cost Ratio	1.3	1.55	1.52

- The unquantified environmental costs would result in a reduction in the net present value for each scenario. The unquantified economic multiplier benefits, the result of indirect economic activity and from labour income, would result in an increase in the net present value if they were included in the analysis.

- Sensitivity analysis of key input parameters was conducted. Results are sensitive to changes in the discount rate and the output from mining activities. Results are much less sensitive to changes in the transportation infrastructure costs.

SUMMARY AND CONCLUSIONS

This report has summarized the results of two studies undertaken to quantify the macroeconomic impact and the benefits and costs associated with transportation and mineral development scenarios in the Northwest Territories.

In creating the development scenarios an inter-dependence between the provision of transportation infrastructure and the level of mineral activity was assumed. That is, it was assumed that improved transportation infrastructure would prompt the development of certain mineral deposits, or that a given number of mineral developments would require a certain standard of transportation infrastructure.

In terms of the macroeconomic impact, the development scenarios analyzed would have a significant, positive impact on the economy. This impact would be significant not only in the Northwest Territories but also in southern Canada, since most of the goods and services consumed in the Northwest Territories are produced in other parts of Canada. The analysis indicates that approximately one-third of the GDP impacts and three-quarters of the employment impacts would occur outside of the Northwest Territories, mainly in the provinces of Ontario, Alberta, Quebec and British Columbia.

The benefit-cost analysis differed from the format prescribed by Transport Canada for transportation projects in one important aspect. The purpose of this analysis was to

quantify the economic impact associated with the construction of new transportation infrastructure. Transport Canada's guidelines focus specifically on replacement or upgrading projects, as would be the case for most transportation projects in Canada. However, there are still many areas of the North in which there is no transportation infrastructure. This study examined the effects of introducing new transportation infrastructure into a region previously accessible only by winter road. Since the study assumed an inter-dependence between transportation and mineral developments, it was appropriate to include the economic impacts of mineral developments in this benefit-cost analysis. In fact, the principal benefit arising from the corridor construction is the development of natural resources that would otherwise be uneconomic to develop or whose development will be hastened as a result of the investment.

The benefit-cost analysis indicated a positive Net Present Value for each of the development scenarios. For the most optimistic scenario, the benefits exceeded the costs by $3 billion over the 20 year study period. The benefits are dominated by the value of the mineral output that is assumed to result from the improved transportation infrastructure.

Mining holds the best prospects for economic development in the North. Transportation infrastructure is essential for the development of mineral deposits. While a causal relationship between transportation infrastructure and mining activities was not assumed, the two studies reported here have demonstrated that providing transportation infrastructure for the development of mines produces significant macroeconomic impacts and that the benefits would exceed the costs. This information would be useful in discussions about funding transportation infrastructure projects in support of mineral developments.

ACKNOWLEDGEMENTS

The analysis was undertaken by The Conference Board of Canada. Considerable input was provided by the Department of Transportation and the Bureau of Statistics of the Government of the Northwest Territories. Other Government of the Northwest Territories departments that contributed to these studies included the Department of Energy Mines and Petroleum Resources, Department of Finance, and the Department of Economic Development and Tourism.

ENDNOTES

1. Northwest Territories Energy, Mines and Petroleum Resources, NWT Mineral Sector Report, 1994.

2. G. Riverin and I. Morrison, Metall Mining Corporation, Gold and Base Metal Potential of the Slave Province versus Abitibi. Summary of a presentation at the 1994 Geoscience Forum, 1994.

3. The Conference Board of Canada, Slave Province Transportation Corridor Economic Impacts and Taxation Revenue, 1994 (Unpublished report).

4. The Conference Board of Canada, Slave Province Transportation Corridor Benefit-Cost Analysis. 1995 (Unpublished report).

5. Additional information on the models used are provided in the project report noted in endnote number 3.

6. The induced economic impacts were not quantified for the Yukon due to model constraints. These impacts are not considered to be significant.

7. Treasury Board Secretariat, Benefit-Cost Analysis Guide. Minister of Supply and Services Canada, 1982.

8. Transport Canada, Guide to Benefit-Cost Analysis in Transport Canada. Transport Canada (TP 11875 E), 1994.

Perspectives d'évolution de la demande de transport de marchandises au Québec

Yvon Bigras, Université du Québec à Trois-Rivières
Serge Le Brun, Institut Maritime du Québec
Jacques Roy, Université du Québec à Montréal

1. Introduction

La plupart des études et des données dans le secteur du transport privilégient une approche et des découpages de l'industrie sur la base de l'offre. On aborde presque toujours le transport en fonction de ses modes (routier, ferroviaire, maritime, aérien) ou des marchés géographiques desservis (local, intraprovincial, interprovincial, international). Avec le développement du transport intermodal, la distinction sur la base des modes a de moins en moins de signification. On tend même vers ce que Colin (1987) a appelé l'amodalité, un concept qui fait référence à la capacité du gestionnaire de la chaîne logistique de s'affranchir des modes de transport.

On peut également souligner que les changements dans les pratiques logistiques viennent d'abord des demandeurs de ces services et non des offreurs. On commence par de nouvelles manières d'organiser le flux de marchandises à l'intérieur de l'usine. Une fois ceci réalisé, on se préoccupe de rationaliser la logistique externe, ce qui se traduit par une demande de nouveaux services de transport. L'industrie du transport répond à ce glissement en modifiant graduellement ses stratégies, sa structure, son organisation et sa gestion pour satisfaire la demande de nouveaux services.

Or, les caractéristiques de la demande de transport de marchandises au Québec et au Canda sont en profonde mutation. Un certain nombre de facteurs agissant à l'échelle mondiale, continentale, nationale ou même régionale contribuent à en changer le visage: ils affectent la quantité et le type de marchandises transportées, leurs origines et destinations, ainsi que les exigences au niveau du service. C'est dans cette optique que le ministère des Transports du Québec nous a donné le mandat d'étudier la demande de transport. Cet article présente certaines conclusions de cette étude réalisée au cours de la dernière année

(Bigras, 1995). Les deux principaux objectifs poursuivis par cette recherche étaient les suivants:

- Faire une première analyse des facteurs-clés d'ordre économique, social, politique ou technologique qui influencent ou sont susceptibles d'influencer la demande de transport de marchandises au Québec au cours des dix prochaines années;
- Faire une première analyse qualitative des effets prévisibles de ces facteurs sur les caractéristiques de la demande future de transport des marchandises pour le Québec pris dans son ensemble et pour les régions du Québec.

2. Méthodologie

Dans cette étude, il a d'abord fallu définir ce que l'on entend par demande de transport. Comme on ne peut la représenter par une mesure unique telle la tonne-kilomètre, la demande de transport a été définie comme un vecteur de caractéristiques qui permet de tenir compte du marché du produit transporté, de la dimension service et de la dimension prix. Les treize éléments qui suivent ont été considérés:

Dimension marché: le produit

1. Volume total (poids)
2. Tonnes-kilomètres
3. Nombre d'expéditions
4. Poids moyen des expéditions

Dimension marché: aspect spatial

5. Distance moyenne des expéditions
6. Couverture géographique

Dimension service

7. Temps de transit
8. Fréquence des ramassages et livraisons
9. Fiabilité
10. Qualité/conditionnement
11. Flexibilité
12. Gamme de services demandées

Dimension prix

13. Prix

Nous avons ensuite identifié les facteurs structurels clés de nature économique et managériale les plus susceptibles d'influencer la demande de transport des marchandises au Québec et dans ses régions au cours des dix prochaines années. Ce travail a été fait à partir d'une revue exhaustive de la documentation et de rencontres et discussions avec des experts dans l'industrie. Les questions suivantes ont été retenues:

Facteurs économiques

1. L'évolution de la structure industrielle du Québec et de ses régions.
2. La globalisation des marchés et la continentalisation de l'économie nord-américaine.
3. L'évolution de la consommation au Québec et dans ses régions.

Facteurs managériaux

4. Le juste-à-temps et la production en flux tendus.
5. L'impact des nouvelles technologies de l'information.
6. Les changements dans la distribution physique.
7. Les alliances stratégiques et le partenariat.
8. L'impact de l'implantation de normes de qualité (ISO et autres).

Une analyse spécifique de chacun de ces facteurs clés a par la suite été effectuée afin d'en tirer des conclusions quant à leur impact prévisible sur la demande de transport.

Comme la demande de transport de marchandises n'est pas uniforme, il est souhaitable de la regrouper en un certain nombre de segments de marché. Cela est d'autant plus nécessaire que les facteurs expliquant la demande peuvent varier ou agir différemment sur ces différents segments du marché. Les critères qui permettront de segmenter la demande doivent assurer la plus grande homogénéité possible de chaque segment de marché, sans multiplier indûment le nombre de catégories.

Au départ, il faut revenir à la constatation fondamentale que la demande de transport est une demande dérivée de la demande pour les biens. Ces biens sont acheminés, à partir des matières premières et jusqu'aux consommateurs, le long d'une chaîne logistique. C'est sur la base du rôle joué par le transport dans cette chaîne logistique que nous avons segmenté la demande de transport. Ce découpage selon la «fonction» jouée par le transport colle bien à la réalité des facteurs de changement qui affectent présentement la demande de transport de marchandises. Il s'inspire du cadre de référence des entreprises qui achètent des services de transport.

On a ainsi identifié cinq segments à cette demande de transport:

1) les approvisionnement en intrants;
2) les livraisons aux grossistes;
3) les livraisons aux détaillants;
4) les livraisons aux ménages;
5) les importations et les exportations.

Dans un premier temps nous procéderons à une description des effets les plus importants de ces huit facteurs sur ces cinq segments de marché. Par la suite,

une synthèse est réalisée pour l'ensemble du Québec et elle est présentée sous la forme d'une grille (tableau 1). Pour chacun des huit facteurs étudiés et pour les treize caractéristiques des prestations de services demandées, une évaluation qualitative sera faite de l'impact du facteur.

3. Approvisionnements en intrants du secteur manufacturier

Des cinq segments des marchés, c'est peut être celui où la révolution logistique est la plus avancée. La performance logistique, mesurée par exemple par la baisse des stocks, est beaucoup plus avancée dans ce secteur que dans celui de la distribution. L'implantation du juste-à-temps est beaucoup plus rapide au niveau de l'approvisionnement des usines de fabrication qu'au niveau du commerce de détail. Dans ce dernier cas, on note certes la présence de certaines firmes très innovatrices, dont les grandes surfaces telles Wall-Mart et autres. Mais, en moyenne, les méthodes d'approvisionnement des entreprises manufacturières ont connu depuis cinq ans une révolution beaucoup plus importante. Une partie des stocks des manufacturiers ont par ailleurs été transférée en aval vers les détaillants et les grossistes (White, 1995).

Le secteur manufacturier a par ailleurs été beaucoup plus touché, jusqu'à présent, par la mondialisation de l'économie que les autres secteurs d'activité. Les entreprises se sont constituées en réseaux de donneurs d'ordres et de fournisseurs de plus en plus intégrés. Une entreprise comme Alcan a diminué le nombre de ses fournisseurs de 1 500 à moins de 300 au cours des cinq dernières années. Et il s'agit là d'un exemple parmi d'autres. Les fournisseurs des grands donneurs d'ordre dans le secteur manufacturier ont dû s'ajuster à des procédés de production où les flux sont de plus en plus tendus et où les exigences en termes de qualité et de normalisation augmentent d'année en année.

Ces exigences de la compétitivité mondiale continueront au cours des dix prochaines années à maintenir la pression quant à l'amélioration des procédés de fabrication. Certains secteurs qui ont été relativement protégés de la concurrence internationale connaîtront de leur côté une évolution rapide à mesure que les protections tarifaires ou autres disparaîtront. C'est le cas, par exemple, du secteur des aliments et boissons, dont les approvisionnements seront envisagés de plus en plus dans une perspective mondiale pour s'ajuster aux nouvelles réalités du commerce international.

Pour le transport, les exigences en termes de service continueront d'être haussées. Déjà les transporteurs ont commencé à répondre à ces demandes, mais celles-ci deviendront de plus en plus complexes et porteront sur des prestations

de services à valeur ajoutée. Le partenariat entre expéditeurs et fournisseurs de services logistiques se répand, et les transporteurs devront trouver le moyen d'éviter une trop grande dépendance envers quelques gros clients. On exigera de plus en plus de petites livraisons selon une fréquence accrue. Cette façon de faire se propagera davantage lorsque l'intégration plus complète des systèmes d'information permettra de retarder au maximum la fabrication du produit jusqu'au moment même où il est commandé par le consommateur.

La croissance de ce secteur de marché sera par ailleurs très différenciée en fonction du succès des entreprises à conquérir des parts du marché mondial. Dans un climat général de faible croissance des revenus intérieurs, les secteurs manufacturiers fortement portés vers l'exportation verront leur importance relative augmenter de façon accélérée au cours des dix prochaines années. A l'inverse, les secteurs fortement portés vers la demande intérieure auront une croissance très modeste.

4. Livraisons aux grossistes

Il s'agit du segment de marché qui connaîtra probablement la croissance la plus faible au cours des prochaines années. La tendance dominante dans ce secteur consiste à diminuer le rôle des grossistes dans la chaîne logistique. Les manufacturiers sont de plus en plus appelés à livrer directement aux détaillants quand ce n'est pas directement aux ménages. Les magasins-entrepôts sont l'exemple type de commerce de détail qui fait disparaître le grossiste.

Ces réaménagements n'impliquent pas nécessairement que les stocks baissent dans ce secteur. En fait, la tendance au Canada montre plutôt le contraire, à l'opposé du secteur manufacturier. Mais les stocks se retrouvent de plus en plus dans les magasins-entrepôts plutôt que dans des entrepôts régionaux. A cela il faudrait également ajouter les stocks que les ménages gardent eux-mêmes lorsqu'ils achètent des produits à la caisse ou dans de plus gros formats. Ce dernier aspect n'est jamais considéré lorsqu'on évalue la performance des nouveaux systèmes de distribution.

Il faut cependant souligner qu'il n'y a pas de modèle unique de fonctionnement sur ce segment de marché. Les stratégies assez différentes de Provigo et Métro-Richelieu au Québec illustrent bien les différences possibles entre des entreprises qui sont pourtant dans le même secteur.

Pour le transport, ce segment est donc d'abord marqué par une décroissance en terme relatif et probablement même en termes absolus. Mais il y aura quand même un volume d'affaires intéressant pour les transporteurs qui désireront

offrir des prestations de services élargies en partenariat avec des grossistes et distributeurs. Face à la mondialisation de l'économie et à un approvisionnement de plus en plus diversifié, les distributeurs pourraient avoir intérêt à se concentrer sur les fonctions commerciales et laisser les fonctions logistique et transport à des spécialistes.

5. Livraisons aux détaillants

Comme on vient de le souligner dans la section précédente, cette portion de la chaîne logistique se fera de plus en plus directement à partir du fabricant. Le pouvoir dans le canal de distribution s'est par ailleurs déplacé du fabricant au détaillant dans certains créneaux du commerce de détail, tels l'alimentation, la quincaillerie, les matériaux de construction, les meubles et ameublements. Cette tendance se retrouve dans plusieurs pays (Europe, États-Unis, Japon). Dans d'autres secteurs, tels les appareils électroniques et l'automobile, le type de relation n'a pas vraiment changé.

De façon générale, le pouvoir accru des détaillants ne les a cependant pas amené à baisser leur stock, si on se fie aux indicateurs que nous possédons. On a en effet souligné que les stocks se sont déplacés des manufacturiers aux détaillants. Il s'agit là d'un paradoxe qui n'est pas vraiment expliqué. En fait on peut dire que le secteur manufacturier a d'abord fait ses gains en gérant mieux ses approvisionnements en matières premières et ses produits en-cours. Les manufacturiers ont aussi faits des gains en aval, en transférant certains stocks vers les détaillants et les consommateurs.

On peut donc en conclure que les ajustements dans cette partie du canal de distribution sont encore en grande partie à venir. On retrouve dans le secteur du commerce de détail quelques entreprises qui exercent un certain leadership en matière de logistique, mais le secteur demeure encore relativement inefficace, si on le compare au secteur manufacturier. Évidemment, la nécessité de vendre les produits au consommateur limitera toujours les gains qu'il est possible de faire dans cette partie de la chaîne logistique.

De nombreux ajustements se feront au cours des dix prochaines années au Québec. De nombreux magasins fermeront, de même que de petits centres d'achats régionaux. La mondialisation touchera ce secteur autrefois protégé et de grandes entreprises multinationales de vente au détail prendront de l'expansion. Par contre, cette expansion de grandes entreprises multinationales se fera de plus en plus par le biais de petites boutiques spécialisées qui pourront alors compter sur le support de ces grands réseaux.

Le fort niveau des stocks dans ce secteur, malgré les rationalisations en cours, s'explique par des phénomènes comme la gamme beaucoup plus grande des produits qui découle de la segmentation des marchés. Par ailleurs, l'évolution des consommateurs, qui deviendront de plus en plus exigeants mais de moins en moins riches dans le contexte québécois et canadien, se poursuivra. Le commerce de détail devra trouver d'autres façons de desservir cette clientèle et il devra augmenter sa performance logistique s'il veut leur offrir des produits à des prix abordables. Il se verra en particulier concurrencé de plus en plus fortement par la vente directe aux consommateurs, le téléachat et les formules du genre.

En termes de transport, on assistera là aussi à une hausse substantielle de la demande pour des prestations de services logistiques élargies. Par ailleurs la croissance de la consommation sera très différente entre les régions. La performance et la réussite d'entreprises locales sur les marchés d'exportation sera la seule garantie d'une croissance du revenu régional et des activités de commerce de détail.

6. Livraisons aux ménages

Ce segment de marché a connu depuis une vingtaine d'années une évolution qui a amené les consommateurs à faire eux-mêmes le transport de certains produits de consommation. Les grands magasins à rayons, les épiceries ont quasiment complètement abandonné leur service de livraisons à domicile. Dans le domaine du meuble et de l'ameublement, on a vu l'apparition de produits démontables que les consommateurs pouvaient facilement apporter avec eux. Plus récemment on a vu apparaître des pratiques de livraison qui court-circuitaient le canal de distribution habituel et les intermédiaires qui s'y trouvaient. Certains meubles (les matelas, par exemple) sont pris directement chez le fabricant et livrés au consommateur. Ces pratiques ne peuvent évidemment pas s'appliquer à tous les produits et elles demeureront relativement exceptionnelles.

Il y a cependant une pratique qui pourrait bouleverser ce marché, c'est le téléachat. Aux États-Unis, le téléachat représente déjà un marché de 3 milliards de dollars (Paché, 1995). La croissance de ce segment du commerce de détail est deux fois plus rapide que celui de l'ensemble du commerce de détail et elle ne devrait pas faiblir au cours des prochaines années. Pour les commerçants, il s'agit d'un système de commercialisation beaucoup moins onéreux que la vente par magasin puisqu'il n'est plus nécessaire d'entretenir une série de magasins avec des frais de loyer et de main-d'oeuvre beaucoup plus élevés, sans compter l'éparpillement des stocks dans tous ces points de vente. Pour le consommateur, il y a un gain en temps important puisqu'il n'est plus obligé de se rendre dans

un magasin, ce qui est de plus en plus perçu comme un désagrément pour les consommateurs. L'autoroute électronique facilitera encore plus ce type de commerce en permettant le magasinage virtuel, i.e. où il est possible d'essayer chez soi un vêtement virtuel, par exemple.

Malgré l'emballement de certains pour cette nouvelle formule, elle présente certaines faiblesses qui vont limiter son expansion. Les consommateurs sont très sensibles au service après-vente et les entreprises qui se sont lancées dans cette formule tentent par tous les moyens de garantir aux consommateurs un niveau de service avant et après vente aussi bon et même meilleur que dans les magasins traditionnels. Les aspects transport et logistique de ce type de formule sont en fait au coeur des efforts que devront consentir ces entreprises si elles veulent en assurer le succès. La dispersion des points de livraison, à l'opposé de la tendance récente vers les magasins entrepôts et les «power centres», complique singulièrement le problème logistique. Si, en plus, il faut considérer la présence d'une personne au domicile pour recevoir le produit, le problème devient encore plus difficile. Il est certain que les entreprises engagées dans ce type d'activités ont tout intérêt à utiliser les moyens mis à leur disposition par des prestataires de services spécialisés, d'abord pour la livraison finale à la clientèle, mais également pour la réception des produits des divers fournisseurs et la gestion des stocks. Les entreprises de messageries ont déjà envahi ce segment de marché, en s'appuyant en particulier sur leurs systèmes informatiques.

Il est donc certain que le téléachat va prendre de l'importance, ce qui l'est beaucoup moins, c'est la part qu'il va accaparer. En termes de transport, une partie de ce commerce pourra être assurée par le système des postes et des messageries, mais également par de nouveaux spécialistes de ce type de livraisons. L'utilisation de technologies de l'information avancées pourra constituer une barrière à l'entrée qui protégera les entreprises déjà présentes sur le marché des petites expéditions.

7. Importations et exportations

La mondialisation de l'économie est un phénomène qui n'est certainement pas arrivé à sa pleine maturation. La progression du commerce mondial a été importante depuis une quarantaine d'années, mais elle n'est pas finie pour autant. Il ne faut pas exclure certains reculs, certaines crises causées par des perturbations financières, par exemple, un accroissement plus grand du commerce à l'intérieur des grands blocs commerciaux, mais la tendance inexorable est un approfondissement des liens économiques entre les pays. Un groupe d'experts ayant été consulté sur les tendances logistiques qui affecteront

le Canada dans les prochaines années, était unanime à cet égard (Lynch, Imalda et Bookbinder, 1994).

Cette croissance du commerce mondial ne sera évidemment pas répartie uniformément sur le globe. Les pays asiatiques en profiteront le plus, alors que l'Amérique du Nord et le Québec en particulier seront plutôt à la queue du peloton. La structure du commerce mondial va donc changer mais pour le Québec, malgré une croissance plus rapide des marchés asiatiques et d'Amérique latine, le marché dominant demeurera l'Amérique du Nord. A l'intérieur même du Québec, les secteurs les plus performants sur les marchés étrangers seront ceux qui se démarqueront le plus en termes de croissance de leur chiffre d'affaires et de dynamisme.

La croissance des importations et exportations se fera sur tous les segments de marché, que ce soit au niveau des approvisionnements du secteur manufacturier que de celui de la distribution de biens de consommation aux ménages. La consommation sera d'ailleurs de plus en plus intégrée au niveau mondial, les mêmes produits étant maintenant recherchés par tous les consommateurs du monde qui ont des revenus suffisants. Cette convergence des préférences amènera donc une hausse importante des flux de marchandises. Au niveau manufacturier, le recours aux meilleurs fournisseurs dans le monde («global sourcing») continuera d'influencer positivement la demande de transport. Ce mouvement est cependant en partie ralenti par l'implantation de systèmes de production en juste-à-temps qui poussent à s'approvisionner chez des sous-traitants localisés plus près.

Mais au delà de la croissance du transport international, la nature des services qui seront demandés dépend d'abord et avant tout des stratégies logistiques qui seront adoptées. Bowersox et Taylor (1994) distinguent deux grandes stratégies possibles: la stratégie de spéculation et la stratégie de «postponement».

La première stratégie est la stratégie classique qui consiste à anticiper la demande des consommateurs. Dans le contexte international, cela veut dire approvisionner les usines en matières premières ou les marchés de consommation à l'avance, ce qui occasionne la formation de stocks, selon les prévisions de la demande qui ont été faites. En termes de transport, on demande des services à faibles coûts pour des lots relativement importants et qui demeurent assez peu sensibles à des gains en temps. Cette faible sensibilité au temps vient de la présence d'entrepôts situés à l'étranger et qui peuvent servir de tampons en cas d'imprévus dans la chaîne de transport. Les interactions entre prestataires de services logistiques et clients sont alors minimes.

La deuxième stratégie consiste à ne pas anticiper la demande mais à produire uniquement en fonction des commandes qui ont déjà été passées. Il est évidemment plus facile d'introduire cette stratégie dans un contexte national ou les barrières en termes de distances et de communication sont minimisées. Mais cette stratégie pourra de plus en plus s'étendre au niveau du commerce international, dans la mesure où les services de transport et de communication le permettront.

Il y aura donc une demande de plus en plus grande pour des services porte-à-porte à l'échelle mondiale et encore plus à l'échelle des grands blocs commerciaux comme l'Amérique du Nord. On demandera de plus en plus des services de transport qui sont appuyés par des services logistiques connexes tels l'entreposage, la gestion des inventaires, le traitement des commandes, le courtage douanier et même certaines opérations finales de conditionnement du produit. Ces exigences pour des services de plus en plus complexes à l'échelle planétaire forceront les transporteurs à développer des réseaux de compétence avec des transporteurs dans les autres pays. De plus, le fonctionnement efficace de tels systèmes suppose une collaboration étroite entre les manufacturiers et autres expéditeurs et les prestataires de services logistiques.

8. Synthèse de l'impact sur les caractéristiques de la demande

Le tableau 1 fait une synthèse de l'impact des facteurs clés étudiés sur les caractéristiques des prestations de services demandées. Les impacts sont qualifiés de «très important», d'«important» ou d'«importance moindre». Il y a plusieurs des facteurs étudiés qui peuvent évidemment interagir entre eux. Pour chacun des huit facteurs on essaie donc d'isoler les effets qui découlent directement de l'action de ce facteur, «toutes choses étant égales par ailleurs».

Structure industrielle: la «dépondéralisation» de l'économie a certes pour effet de diminuer le volume total transporté, les tonnes-kilomètres et le poids moyen des expéditions. En transportant des produits qui ont en moyenne une plus grande valeur, certaines variables de la dimension service prennent de l'importance: la fiabilité, la qualité du conditionnement, le temps de transit. La dimension service prenant de l'importance, le prix moyen du transport subira des pressions à la hausse.

Globalisation de l'économie: ce facteur aura un effet déterminant sur la demande de transport. Le volume de marchandises transportées augmentera, mais les tonnes-km encore plus. La distance moyenne et la couverture géographique augmenteront, pendant que le poids moyen des expéditions diminuera à cause de la plus grande dispersion des sources d'approvisionnement

et des marchés. Cette dernière conclusion pourrait être renversée par une meilleure gestion des expéditions. Au niveau de toutes les variables de la dimension service, la globalisation a pour conséquence d'en augmenter l'importance. Le prix du transport devrait également subir des pressions à la hausse dans la mesure où on demandera des prestations de service de qualité accrue.

Évolution de la consommation: les consommateurs demandent des produits de plus en plus sophistiqués qui sont par définition moins pondéreux, ce qui affecte l'importance de plusieurs variables de la dimension marché. A cela il faut ajouter le ralentissement de la croissance de la population, son vieillissement et la stagnation des revenus. Tous ces facteurs affaiblissent encore plus la demande de transport mesurée en termes de volume transporté. Comme les modèles de consommation ont tendance à se standardiser à l'échelle planétaire, la distance moyenne du transport augmente, tout comme la couverture géographique. Par ailleurs, comme le consommateur est de plus en plus exigeant, le transport doit être de plus en plus fiable et le conditionnement du produit de qualité supérieure. Les retours de marchandises doivent être minimisés. Ce sont en fait tous les aspects de la dimension service qui prennent de l'importance.

Le juste-à-temps: cette pratique a d'abord pour conséquence d'augmenter le nombre d'expéditions et d'en baisser la taille moyenne. Elle pourrait amener une baisse de la distance moyenne des expéditions parce qu'elle peut inciter les sous-traitants à se localiser plus près de leur principal donneur d'ordre. Au niveau des services, les exigences sont plus fortes, en particulier en ce qui concerne la fréquence, la fiabilité et le conditionnement. Ces exigences accrues devraient amener des pressions plus grandes sur le prix du transport.

Nouvelles technologies de l'information: ce facteur favorisera la demande pour une gamme de services élargie, services qui devront en particulier être plus flexibles, plus fréquents et donc mieux adaptés aux besoins des clients. Ce facteur favorisera également la demande pour des expéditions plus nombreuses et d'un poids moyen moindre.

Systèmes de distribution: ce facteur aura un effet important sur la distance moyenne des expéditions qui sera allongée par la disparition de certains centres de distribution régionaux et par l'augmentation de la part de marché détenue par les magasins grandes surfaces. L'effet en termes de volume total transporté devrait être neutre, alors que l'impact sur les tonnes-km devrait aller dans le sens d'une diminution dans la mesure où on fera plus de livraisons directes. Le nombre d'expéditions pourrait également baisser dans la mesure ou on augmente le groupage destinataire. Ces conclusions sont quand même incertaines dans la mesure où elles dépendent de la façon de regrouper les expéditions à partir des

centres de distribution qui auront une vocation géographique plus large ou à partir des usines des fabricants. Il est par contre certain que les nouvelles chaînes de distribution impliqueront une hausse de l'importance de tous les éléments de la dimension service. Elles devraient également générer une demande pour une gamme de services élargie. Par exemple, le développement de systèmes de distribution rejoignant le consommateur chez lui demande une flexibilité accrue des services de transport, compte tenu de la dispersion des ménages et des contraintes horaires pouvant s'imposer.

Alliances stratégiques: l'impact majeur ici se trouve au niveau de la gamme de services demandés par l'expéditeur. Le développement de partenariat entre transporteurs et expéditeurs devrait se traduire par une impartition beaucoup plus large d'activités vers le transporteur. Ce dernier devra devenir un véritable prestataire de services logistiques. Le partenariat devrait également se traduire par des exigences accrues pour plusieurs des aspects du service, tels le temps de transit, la fiabilité et la flexibilité. Afin de baisser les coûts logistiques des partenaires logistiques, on devrait par ailleurs avoir une tendance à l'augmentation du poids moyen des expéditions.

Normes de qualité: par définition, ce facteur aura pour effet de générer une demande pour des services de qualité supérieure. La fiabilité du service, la flexibilité et la qualité du conditionnement des produits transportés seront au coeur de toutes démarches de contrôle de la qualité. Quant au poids moyen des expéditions, ce facteur pourrait l'amener à baisser.

9. Conclusion

En conclusion, dégageons les conséquences probables sur l'offre de transport des tendances identifiées au niveau de la demande. D'abord, au niveau de la répartition modale, il ressort clairement que les changements dans la demande favorisent le transport routier et dans une moindre mesure le transport aérien. On pense ici à la baisse de la taille des expéditions, à l'augmentation du nombre d'expéditions et à toutes les variables de services (temps de transit, fréquence, fiabilité, flexibilité). Cela ne veut pas dire que le chemin de fer ne pourra pas contrer cette tendance en développant des services intermodaux. Mais, c'est uniquement dans la mesure où l'offre de services ferroviaires saura s'ajuster à la nouvelle demande de transport qu'elle pourra conserver ou augmenter sa part de marché. Sans ajustements importants au niveau de l'offre, les pressions au niveau de la demande continueront de favoriser le transport routier. Ces ajustements au niveau de l'offre devront tenir compte à la fois de la qualité des prestations de transport et des coûts d'utilisation des différents modes. Il y a cependant un changement qui favorise le transport ferroviaire, c'est

l'augmentation de la distance moyenne des expéditions qui découle, entre autres, de la globalisation de l'économie. Cette tendance stimulera également la demande pour des connexions intermodales.

En général, les pressions sur les infrastructures de transport seront assez modérées, dans la mesure où la croissance de la demande de transport sera plutôt faible au cours de la prochaine décennie. En effet, la faiblesse de l'activité économique intérieure au Québec et le phénomène de «dépondéralisation» de l'économie viendront diminuer l'impact de facteurs tels la globalisation de l'économie ou l'implantation du juste-à-temps. Il y aura par ailleurs au cours de cette période, des ajustements importants dans la répartition de l'activité économique. La capacité des secteurs industriels et des régions d'augmenter leurs exportations sera cruciale dans la détermination de leur niveau de croissance. Les infrastructures et les équipements de transport pourraient donc se retrouver en situation de surcapacité dans les régions qui déclineront, alors qu'il y aura des goulots d'étranglement sur les axes de transport des produits exportés ou importés, notamment avec les États-Unis. La situation du réseau routier de Montréal pourra également poser des problèmes dans la mesure où les infrastructures actuelles de transport comportent déjà certaines lacunes et dans la mesure où Montréal est très souvent une voie de passage pour les produits destinés ou en provenance de l'extérieur du Québec, étant donné sa localisation géographique et la présence d'infrastructures intermodales majeures.

Finalement les nouvelles exigences en termes de qualité du service et la demande pour des services logistiques complets et intégrés, poseront un défi important à l'industrie du transport. Ces exigences se poseront d'ailleurs dans un contexte mondial, ce qui implique des exigences en termes de services que les transporteurs ne sont pas tous prêts à remplir. On assistera probablement à une polarisation des transporteurs en deux groupes: ceux qui savent et peuvent offrir des services logistiques élargis et ceux qui se contentent de faire de la traction. Ces derniers seront dans une position de plus en plus précaire, à cause des prix très bas qui seront consentis pour ce genre de service. Les premiers, dans la mesure où ils peuvent offrir des services à forte valeur ajoutée, pourront connaître une meilleure croissance et une meilleure profitabilité. La nécessité d'offrir ces services élargis forcera également le recours à des ententes de plus en plus fréquentes et détaillées, à la fois entre transporteurs et entre transporteurs et expéditeurs. Les transporteurs devront donc développer les compétences, les stratégies et les pratiques leur permettant de gérer ces interfaces de plus en plus complexes avec des partenaires.

Bibliographie

Bigras, Y. (1995), *La demande de transport de marchandises au Québec et dans ses régions: caractéristiques et perspectives*, Rapport remis au ministère des Transports du Québec.

Bowersox, D.J. et J.C. Taylor (1994), «Would trade to become more intra-regional», *2001 A Transportation Odyssey*, Revue officielle de la 22ième Conférence biennale du ICHCA, Toronto, pp. 2-6.

Colin, J. (1987), «Du conteneur à la logistique: vers la dissolution des modes de transport?», *Revue culture et technique*, no 19.

Lynch, M.E., S.J. Imada et J.H. Bookbinder (1994), «The future of logistics in Canada: a delphi-based forecast», *Logistics and Transportation Review*, vol. 30, no 1, pp. 95-112.

Paché, G. (1995), «La logistique, un frein au développement du télé-achat en France?», *Actes des 1ères rencontres internationales de la recherche en logistique*, Marseille (France), pp. 335-352.

White, K. (1995), «Transportation and Logistics in Canada; an Economic and Statistical Overview», *Actes de la 30ième Conférence annuelle du GRTC*, Aylmer (Québec), pp. 325-339.

Tableau 1. Relations entre les facteurs et les caractéristiques des prestations de services de transport demandées

	Dimension marché					
Facteurs	Volume total	Tonnes-km	Expéditions	Poids moyen	Distance moyenne	Couverture géographique
Structure industrielle	-	-		-		
Globalisation de l'économie	+	++	+	-	++	++
Évolution de la consommation	-	-	-	-	+	+
JàT			++	-	-	
Technologies de l'information			+	-		
Système de distribution		-	-	+	+	
Alliances stratégiques				+		
Normes de qualité				-		

	Dimension service						Prix
Facteurs	Temps transit	Fréquence	Fiabilité	Condition-nement	Flexibi-lité	Gamme de services	Prix
Structure industrielle	+		+	+			+
Globalisation de l'économie	+	+	+	+	+	+	+
Évolution de la consomation	+	+	+	+	++		+
JàT	+	++	++	++	+	+	+
Technologies de l'information		+	+		++	++	-
Système de distribution	+	+	+	+	+	+	
Alliances stratégiques	+		++		+	++	
Normes de qualité			++	+	+		+

++ Très important + Important - Importance moindre

IMPACT OF TRANSPORTATION COSTS VARIATIONS ON THE RELATIVE MARKET SHARES FOR DIFFERENT TRANSPORTATION MODES : A NETWORK MODEL

THE CASE OF DRY BULK TRANSPORT ON THE BENELUX /GERMANY TO SPAIN CORRIDOR

by Bart JOURQUIN , Laurent DEMILIE and Michel BEUTHE[1]

1. Introduction

For historical reasons, the width of the rail tracks in Spain and Portugal is smaller that in the other European countries. This particular situation makes it very difficult to send and receive freight convoys from these countries, through the French border. As passengers can relatively easily accept to transit to another train, things are different for freight transport as transhipping costs are very important. At the time being, some special and recent techniques are improving the transhipping operations efficiently, but they are not yet widely spread and they are still not adapted to all the categories of goods.

That is probably the reason why short-sea shipping is so intensively used on the Benelux/Germany to Spain corridor. In fact, only two transportation modes are used for dry bulk on this particular route i.e. short-sea shipping and trucking. As the relative market share for road transport is only more or less 5% of the total market, it may be important to measure its sensitivity to its own cost variations.

The objective of this paper is to estimate this sensitivity by the implementation of a particular network model. Our analysis takes into account the different inland transportation modes (railways, inland waterways and roads) as well as short-sea shipping. Railways and inland waterways are included in the study as they can be used for combined transport in the Benelux/Germany or Spain/Portugal areas.

This paper will start with a short exposé of a systematic Geographic Information System (G.I.S.) designed for freight transportation over long distances. Its name is NODUS and it has been recently developed for the trans-European network in the Mons Facultés (Jourquin, 1995b). This G.I.S. includes a

[1] Group « Transport & Mobility », Facultés Universitaires Catholiques de Mons (F.U.Ca.M.), Belgium

detailed analytical structure that allows an easy set-up of all its parameters. It is also one of the very few G.I.S. focusing on transportation of goods.

Based on a full decomposition of all the transport operations over a multi-modal geographic network, i.e. loading, moving, unloading, transhipping and transiting, it creates an expanded « Virtual Network » which gives a mono-modal version of a complex multi-modal network. Different virtual links correspond to moving goods by different modes and by transportation means of different sizes or characteristics; some others correspond to the possibilities of transferring the goods from one mode or mean to another. Hence, the alternatives of combined transports can be taken into account. Specific generalised cost functions, in terms of distance, time and costs, can be attached to each virtual link. Then, given a transportation task, it is for instance possible to minimise its total cost by the choice of the best combination of mode, mean and route.

This model of analysis, with its associated software, constitutes a powerful tool for evaluating the impacts of transportation new infrastructures and policies. Actually, that was the motivation behind its development, and it has already been used for evaluating some public investments and estimating the cost of the State controlled organisation of the inland waterways transports in Belgium (Beuthe and Jourquin, 1994a and 1994b).

After a description of the « virtual network », a second section will discuss the cost functions associated to each specific link, and the method of total cost minimisation which is applied. The third section will present the methodology that is used to obtain the above described market shares analysis.

2. The Virtual Network

Transportation of goods on a real network may be realised with various means on the same infrastructure. For instance, the same large canal can be used by small and large boats. Transportation involves also many different operations which do not appear in a normal geographic representation of the network, i.e. loading, moving, unloading, transhipping and transiting. In particular, the operations of transferring goods from one mean or mode to another are not represented in a real network. However, in order to properly analyse a transportation problem with all its alternative solutions and operating dimensions, it is necessary to identify and separate each transport operation. This can be achieved by creating a network, a virtual network, linking in a systematic way all the possible successive operations in the geographic space.

In the context of freight transportation models, the idea of virtual links was initiated by Harker (1987), who extended its General Spatial Price Equilibrium Model (GSPEM) with additional links corresponding to different levels of services. It was further developed by Crainic *et al.* (1990) for defining a multi-modal network with links connecting the various modes. Jourquin's recent contribution (1995b) is to propose an automatic generation of all the virtual links on the basis of a well structured notation of the virtual nodes and links. This method allows to deal rather easily with very large networks like the trans-European one and facilitates greatly any ensuing sensitivity analyses. It uses a particular structured notation that provides a convenient matching of each specific link with the appropriate weight or cost functions.

This automatic generation starts with the tabulation of the real network G=(X, U) which enumerates the links U_j of the graph of the real network, their associated end-nodes X_i and X_k , and the modes *t* and means *m* which can be used on the links. Then, virtual links are created automatically for each possible mode and mean on each real link; they are defined by their two virtual end-nodes X_i^{jtm} and X_k^{jtm}.

The next step is to create the virtual links corresponding to transhipping operations. That can be done by a systematic comparison of the virtual nodes which could so be linked. Transhipping operations are possible between all virtual nodes pertaining to a same real node, like a transhipping between a ship and a truck. However, no transhipping should be possible between these nodes when they relate to the same real link *j*, since that would be like a transhipping between two means of the same mode before turning back on the same real link. Besides these transhipping virtual links, it may be convenient to include transiting virtual links for the simple passage from one virtual node to another without changing the mode or the mean of transportation. These links will connect virtual nodes with same *i*, *t* and *m* but different *j*.

The last step deals with the operations of loading and unloading at the real nodes. This problem is handled by the creation of virtual nodes X_i^{000} for each real node X_i. It is then possible to create a set of virtual links corresponding to these operations between X_i^{000} and every virtual nodes X_i^{jtm}.

In some cases, this method of automatic and exhaustive generation of virtual nodes and links may create virtual links corresponding to operations which cannot be proceeded at some nodes, like the handling of containers in some places without adequate equipment. This problem can be handled by defining a list of exclusions for each real node, which is checked during the process of creating the virtual links and nodes.

Because of possible differences between loading and unloading costs for instance, the so generated virtual network must be oriented, so that separate arrows are created between the two end-nodes for each virtual link.

Now, it can be seen how this notation allows for matching easily the virtual links defined by a particular operation to the corresponding cost functions. Actually, the two end-nodes defining a link provide the necessary information:

- When two virtual end-nodes relate to different real nodes *i* and *k*, the virtual link corresponds to a moving operation between *i* and *k*, to which must be attached the relevant cost function for mode *t* and mean *m*.
- When the nodes refer to different real links *j* and *l*, but to the same mode *t* and mean *m*, it is a simple transit operation, to which must be attached the relevant cost, if any.
- When the nodes refer to different real links and different modes *t* and *t'* and/or to different means *m* and *m'*, it must be a transhipping operation, for which there is a special set of cost functions.
- When one of the nodes is X_i^{000}, it must be a loading or unloading operation, for which there are some other particular functions.

3. Cost functions

As the main objective of a freight network analysis is often to minimise the total generalised cost of transportation, this section will present the general framework of such an approach[2]. This total cost is computed as the sum of the minimum total costs to achieve the transportation tasks between origins O and destinations D, with mode *t*, mean *j* on the path *i*. These subtotal minimum costs may be obtained, for some O-D pairs with a particular combination of different modes and means of transport θ. So, the total cost $TC = \sum_{OD} \sum_{\theta} TC_{tji}$.

These subtotal minimum costs are calculated for each transportation task, i.e. each element of the O-D matrix. We consider that, to achieve a particular task between O and D, a certain number of transportation units are needed. Each transportation unit of mode *t* and mean *j* can carry a quantity *q*. So, the total quantity that is to be transported between O and D, via the path *i* will be carried by *N* transportation units. We can thus write: $Q_{OD} \Rightarrow Q_{tji} = N_{tji} * q_{tj}$.

[2] Other kinds of objective functions can obviously also be used in NODUS

As we developed cost functions for the different modes/means, we can calculate the cost to move a unit q_{mj} along the path *i*. The total minimum cost for a transportation task can thus easily be computed as $TC_{ij} = N_{ij} * C_i(q_{ij})$.

Once the cost functions relative to the different types of virtual links are written, the assignment procedure has to minimise the following expression for a given quantity to transport on each O-D pair:

$$TC = \text{Min} \sum_{\text{Origin–Destination}} \sum_{\text{Mode/Mean}} \left[\sum_{\text{Unloading}} \text{costs} + \sum_{\text{Loading}} \text{costs} + \sum_{\text{Moving}} \text{costs} + \sum_{\text{Transhipment}} \text{costs} + \sum_{\text{Simple Transit}} \text{costs} \right]$$

For the particular application that is presented in this paper, complete cost functions sets were developed for electric and diesel powered trains, 40t trucks, 300t, 1.350t and 4.500t barges and general cargo ships. A complete discussion of these costs can be found in Jourquin (1995b).

4. Methodology

If we refer to the classical four steps model (Generation, Distribution, Modal-Split and Assignment), the EUROSTAT[3] statistics that were used correspond to the output of the « generation » step, in the sense that they give precise information on the total quantity of goods that circulates between two countries of the European Community. But this information does not provide any information on the precise points of origin and destination. In order to solve this problem, we have created a set of additional nodes (centroïds) in the following way: We first assigned each real node of the network to the closest node where loading/unloading operations are possible, and computed their average distance from that node. Then, for each of these sub-group of nodes, we created an additional node, called centroïd, as a unique regional point of origin or destination. The distance from a centroïd to its corresponding loading/unloading real node is taken to be the computed average. Over that distance, transports are supposed to be made by truck. In the present case, there were 158 potential loading/unloading real nodes, so that we generated in this way, 158 centroïds.

Obviously, the centroïds are not evenly distributed over the network, but they are more numerous in industrialised areas where the density of the network

[3] EUROSTAT publishes all the statistics available from the European Community.

is greater. Thus, we assigned the total flows of goods among all the centroïds by repeated random drawings for small bundles of goods. By this Monte-Carlo procedure, we obtained a detailed O-D which is probably very similar to the real one.

Given the above generated O-D matrix and all the cost functions for the various operations, it is now possible to minimise the total cost of the transportation task by choosing the cheapest combinations of modes, means and routes, including the best alternative of combined transport. This cost minimisation is made on the basis of an all-or-nothing procedure for each O-D pair, in order that all the traffic on this route is assigned to the same combination of transportation mode and mean on a particular itinerary. This procedure supposes that there is no capacity constraint, an hypothesis which can be justified for the present type of analysis, based on a large network and for transport flows which are spread over a rather long period of time.

To analyse the impact on the relative market shares, an iterative procedure is implemented that modifies, at each step, the relative operation costs of a particular transportation mode, e.g. road transport, from 50% to 150% of the actual cost. As we used steps of 10%, 11 iterations were needed, that means 11 assignments of the O-D matrix on the network. At the end of each iteration, the relative market shares for the different transportation modes were computed. These figures were easy to obtain since we just have to observe the results of the assignment procedure: As the railways on the French-Spanish border were not introduced into the model, an itinerary that crosses this particular border is assumed to be a road transport. In all the other cases, short-sea shipping is used. Anyway, as specified earlier, the railways are nearly not used on the studied route for dry-bulk transport.

Just a remark here on the quality of our cost functions: Without any further calibration, the modal-split we obtained with the actual costs is remarkably close to the real one.

5. Results and Conclusions

At this stage it is possible to compute the effects on the modal split of variations of costs. In the present paper, we choose to vary the relative price of road transports. The next table presents the market shares for short-sea shipping and road transport, following successive increases and decreases of the road transport relative operating costs.

	Relative Market Shares	
Relative Operation Costs Road/Ship	Road	Short-Sea Shipping
0.5	7,8	92,2
0.7	3,3	96,7
0.8	3	97
0.9	2,2	97,8
1	2,2	97,8
1.1	1,9	98,1
1.2	1,8	98,2
1.3	1,7	98,3
1.5	1,3	98,7

Impacts of a variation in road transport costs

On the basis of these results, we can compute the road transport direct demand elasticity, as well as the short-sea shipping crossed demand elasticity. The road direct elasticity (-1.536) indicates that the market share of road transport is (proportionally) sensitive to a variation of its own costs. The very small cross elasticity (0.032) of short-sea shipping shows how little effect the same costs variations have on the market share of short-sea shipping. This is not to say that different results could not be obtained for other categories of goods like the manufactured ones, since their value should be higher. In that case it is likely that the modal choice would be more sensitive to variations of costs, because of the higher opportunity cost.

6. Concluding comments

In this paper, we analysed the impact of road transport relative costs on the market shares for dry-bulk transport. Obviously, we could have chosen to apply such a sensitivity analysis to any of the costs functions parameters. Hence this network model provides a powerful tool of analysis which can be applied to a large number of specific transportation problems[4]. Provided that the appropriate costs information be available, transports of other goods could also be analysed. For example, it would be particularly interesting to investigate in this way the impacts of new harbour facilities like « ro-ro » and « lo-lo » terminals. We are planning to pursue such further researches in the near future, but the main constraint, as always, is the dearth of relevant data.

[4]A few other applications are presented in Beuthe and Jourquin (1994a and 1994b) and in Jourquin (1994, 1995a and 1995b).

7. Bibliography

- Beuthe M. and B.Jourquin (1994a), *L'influence du tour de rôle sur les coûts de la navigation intérieure*, Revue d'Economie Régionale et Urbaine n° 3, 417-427.
- Beuthe M. and B. Jourquin (1994b), *Incidences d'une modification du réseau hydraulique belge sur les transports par voies navigables*, PIANC Bulletin n° 83.
- Blumenfeld D.E, Burns L.D., Diltz J.D. et Daganzo C.F., (1985), *Analysis Tradeoffs between Transportation, Inventory and Production Costs on Freight Networks*, Transportation Research, 19 B, 361-80.
- De Saint Martin. A-S, (1989), *La rentabilité du Canal du Centre*, dissertation, FUCAM.
- Deming W.E.,(1978), *On a rational relationship for certain costs of handling motor freight over the platform*, Transportation Journal, 17, 5-11.
- Direction des Transports Terrestres du Ministère de l'Equipement, des Transports et de l'Espace, (1991), *Conditions d'exploitation et prix de revient dans le transport routier de marchandises à longue distance*, France.
- Eurostat, (1991), *7.C. Transport Annual Statistic 1991*, European Community, Luxembourg
- Gathon H-J., (1991), *The performance of the european railway: management and autonomy*, thesis, University of Liège.
- Hague Consulting Group, (1992), *De Reistijdwaardering in het Goederen vervoer*, rapport 142-2.
- Hall R.W., (1985), *Determining Vehicles Dispatch Frequency when Shipping Frequency differ among Suppliers*, Transportation Research, 19 B, 421-31.
- Jourquin B. (1995a), *Market Share Estimation for Different Transportation Modes: A Network Model, The Case of Freight Transport in Europe*, Proceedings of the International Conference on Industrial Engineering and Production Management, Marrakech, 177-186.
- Jourquin B. (1995b), *Un outil d'analyse économique des transports de marchandises sur des réseaux multi-modaux et multi-produits: Le réseau virtuel, concepts, méthodes et applications*, PH.D. Thesis, Facultés Universitaires Catholiques de Mons.
- Jourquin B. (1995c), *Estimation de fonctions de demande pour les différents modes de transport par un modèle de réseau. Une approche multi-modale et multi-produits*, PIANC-PCDC third seminar proceedings, november 13-18, GOA, India, 801-813.

- Packer. J.J.L., Consultant and Project Manager, (1991), *Shipping cost: shortsea bulk.*
- Peeters and Alii, (1995), *Analysis of the competitive position of the shortsea shipping*, Delft University Press, Delft.

GATEWAY NORTH MARKETING AGENCY - DEFINING THE START UP

The Gateway North Marketing Agency (GNMA) will focus on alleviating the uncertainty that surrounds the future of the Port of Churchill. This follows the growing deregulation of Transport Canada's functions at the Port, and the pending privatization of CN Rail (CNNA). The mission of the GNMA will be to develop and execute an overall 5-year marketing plan for Churchill's transportation systems. The huge savings (conservatively calculated at $12.00 per tonne on 2 million tonnes per year, or $24 million per year) available to the Saskatchewan farmers would make the efforts of the GNMA successful by most detractors' standards.

BARRIERS AND RISKS

The current environment of deregulation has caused great concern among the people of Canada. With the elimination of the Crow Rate and the imminent privatization of CNNA, Churchill's foundation may be crumbling. The Canadian Wheat Board (CWB), the farmer's chief selling agent, supports Churchill only with an opportunistic marketing plan. It subjects Ports Canada, the Coast Guard, and other infrastructure providers to the whims of its "latest deal." The GNMA will need to press for the support and active participation of the CWB. CNNA have been very supportive in information, but have not provided any financial assistance.

Transport Canada has moved to terminate the operation of Ports Canada, leaving open to speculation who will take over the Port and elevator. Without the investment in infrastructure improvements outlined in the Churchill Task Force Report, the future of Churchill is uncertain. Furthermore, the risk of the Government of Canada closing the port operations at Churchill is very high.

The Government of Saskatchewan is seeking Cabinet approval to financially support GNMA. Final support will be a sign to Ottawa that the Saskatchewan farmers are interested in the Port.

Farmers are under the impression that grain represents CNNA's most profitable commodity in long haul business. Western farmers' grain freight bills could easily become a more obvious cost in a falling commodity market, causing farmer's to become discontent with the railroads. Furthermore, there is no support or interest in the GNMA from the major grain companies because of infrastructure problems at Churchill. There is also a lack of interest by the major farm organizations and their broadly based memberships.

Farmers believe the huge concrete elevators now rising on the Prairies will lead to increased competition and lower freight and handling prices. However, the major regional price setters seem to be the least efficient and highest cost service providers. The efficient elevators may choose to put higher profits into their own pockets if they can successfully shift the competitive forces to other factors such as contracting arrangements and farmer crop financing contracts. If the farmers became more aware of the cost difference, they would demand lower cost shipping, thereby diminishing the profits of the shippers.

The dream of gaining ground in the value-added processing of farm commodities on the prairies is not likely to be sustainable. The CWB's 50 year history of developing bread and pasta products for free at Canadian International Grains Institute (CIGI) for customer countries has never been value-added. The very basic CWB corporate strategy of being an opportunistic commodity marketer runs counter to the province's strategy and those promoted by Agriculture Canada and the Prairie Farm Rehabilitation Administration (PFRA). The CWB's policy favours commodity export and GNMA must develop Churchill as its lowest cost marketing point for those districts closer to Churchill than Vancouver.

A final obstacle to face is the increasing threat of Rankin Inlet. Rankin Inlet is making a determined effort to replace Churchill as the re-supply point for fuel for the eastern NWT area, and has prepared development plans to build an ocean port to replace Churchill for fuel re-supply. It is also making a determined effort to build its own health services centre in competition with Churchill. Lastly, Rankin Inlet has begun to replace Churchill as the centre for air services to the north.

Churchill

It was not until King Charles II granted sole rights of "trade in lands watered by rivers running into Hudson Bay" in 1670, that permanent fur trading posts appeared on the shores of Hudson Bay. The trading posts were needed to ensure the continued arrival of furs and their dispatch to London. So on June 10, 1717, three men from the Hudson Bay Company, James Knight, Henry Kelsey, and Richard Morton, traveled north from York Factory. It was these men who built the first trading posts, and stores, which served Churchill in the years to follow. As the fur trade intensified, so did the competition between inland posts, causing the merge of the Hudson Bay Company with the North West Company, in 1822.

An application was made by the Hudson Bay Railway and Steamship Company which would permit the building of a rail line from Southern Manitoba to Port Nelson, in 1877. Many of the companies trying to construct railway lines from southern points to Nelson or Churchill formed the basis of the present day CNNA.

By 1908, estimates for a start on the Bay Line had passed parliament, and rail lines already reached The Pas. However, it was not until September 10, 1929, that the Hudson Bay Railway from The Pas to Churchill was open for service.

The first commercial export cargo of wheat moved out of Churchill on September 10, 1931, for London, England. This steamship carried about 250,000 bushels of wheat provided by Pool elevators, and the voyage was put together by James Richardson and Sons, Ltd.

In 1938, Ottawa contemplated the closure of the Port for the following year. After strong protests, 20 ships were promised to the Port for 1939. However, World War II interfered with this, and Churchill was closed for ordinary commercial use from the rest of 1938 until 1946. The Port was reopened in August of 1946, when 3 million bushels of grain were shipped to England. The future of Churchill has remained uncertain since 1944.

MARKET OPPORTUNITY:

Projected Traffic Volumes 1995 - 2000 (000's)						
	Current	95/ 96	96/ 97	97/ 98	98/ 99	99/ 2000
CWB Grain	291	350	375	400	425	450
Specialty crops & canola	-	80	200	400	650	800
NTCL	35	35	35	35	35	35
Arctic Bridge	-	-	-	142	173	205
TOTAL	326	465	610	977	1283	1490

Grain Train Leads:

The projected traffic volumes presented are believed to be attainable if the CWB and other shippers use the Port. The elevator needs tonnage in the 400,000 tonne range to break-even under current operating cost budgets. The rail line volume needs are more difficult to understand because of the VIA contract with CNNA, the dollars of investment in maintenance that CNNA would allocate to the different services, and the inability of CNNA to leverage it's assets with greater volumes, and to lower its costs of delivering services.

The strategy of getting into a major competition as the low cost delivery port alternative to the Thunder Bay/Seaway organization is important. This strategy will serve to focus the Port on the goal of coordinated cost reduction in order to gain market shares.

The actions of the CWB, in being an active participant in the Gateway North Task Force, with agreement to the reports market projections was an excellent start to ensuring they were onside with the market opportunity. The CWB actions in early 1995, of not loading the Churchill elevator with a product in June (140,000 tonnes of a product), indicated that the CWB was not committed to the current program. That is, to a minimum loading of 291,000 tonnes of a product for the 1994/95 year. The CWB believes it must be an opportunistic marketer in terms of the Canadian ports, and as such will not participate in any individual port's sales planning programs. Hence, CWB remains a primary contributor to continuing logistics problems in grain shipping and planning programs.

Notwithstanding the problems associated with getting the cooperation of the CWB, the Port's marketing plan must be based on a formal goal driven marketing programs aimed at delivery of the low cost grain delivery point for eastern world markets. This strategy is driven by the development of a vision of Churchill being a low cost model of farmer-based cleaning, grading, and loading of grain into producer cars, with the shipment of grain to the Churchill elevator. The chart below outlines this low cost vision of reaching a potential goal of $41.12 per tonne of delivered farm grain to the ship in Churchill:

- $2.00 road costs
- $4.55 average farm trucking cost
- $0.81 mobile elevation
- $1.30 CGC inspection costs (on the farm)
- $1.31 on farm cleaning (or Churchill terminal cleaning)
- $25.87 Saskatoon - Churchill rail cost
- $3.62 Churchill terminal handling - direct hit
- $1.66 marketing cost (CWB or private company)

Obviously, the low cost vision will not be supported by everyone. Some will challenge the vision as too futuristic. However, both UGG and SWP currently have truck mounted elevator units operating on an experimental basis. This low cost dream of the future must be sold today, since this strategy supports the ability of the farmer to control costs, and the more extensive branch line strategy in arranging the logistical components to unit-train runs.

NWT Re-supply:

The 35,000 tonnes of re-supply could be threatened by the Government of Canada support for the NWT plan for a deep water port installation in Rankin Inlet. Without a capital investment of more than $5 million at Rankin Inlet, the volumes of NWT re-supply at the Port of Churchill are solid.

New Opportunities:

Specialty crops are very feasible. The sales plan projections are easily attainable, if farmers and producer car operators can get unit trains running from the new CWB Churchill districts. Once the pea trade is working well, other commodities, could be added to the product mix.

Manitoba Trading Corporation (Arctic Bridge):

The Government of Manitoba remains committed to the future development of the Manitoba Trading Company, which would arrange two-way barter deals between Russia and Manitoba. The volumes reported in the Task Force Report are achievable if the Port can invest in the required changes necessary to handle the incoming cargo. Obviously, with the current changes taking place in Ports Canada, the investment needed may be a hard sell.

Mining, Ore Shipping Possibilities:

Inco has been reported to be seeking possible nickel concentrates in Russia. The Newfoundland Voisey Bay discovery may influence future opportunities for Inco Manitoba to process some portion of Newfoundland ore. In addition, Cuban ore is being shipped by CNNA from Halifax to Fort Saskatchewan. The opportunity to handle these shipments depends on an aggressive partnership of Ports Canada, CNNA, and an ocean shipping operator. No volumes are included for this activity.

MARKET BARRIERS

CWB

CWB has a corporate strategy of being an opportunistic commodity marketer. The CWB policy favours commodity export. Churchill must be developed as a lower cost marketing point than Vancouver for districts closer to Churchill. In the Gateway North marketing presentation, Mr. Adrian Measner stated, "The least-cost route from the country elevator to our customers' port facility will determine the port of preference from a CWB prospective." He goes on to say that the majority of CWB's sales are concluded on a FOB basis, with the customer determining which port will be used. It is imperative that in order to remove the barrier of not being able to influence the deal, the GNMA is strategically placed within the CWB to ensure all eastern world customers get a sales pitch on using a Churchill carrier.

In the same presentation, Mr. Measner presented a map of the CNNA lines that the CWB believed to be the most logical and economic to serve Churchill's needs. The 1995/96 restricted catchment area for Churchill is so small, it does not include

even 5% of his presentation area map to the study group. Who changed CWB thinking between December 1994 and April 1995? The small CWB Churchill catchment area is the single largest barrier to gaining any grain products to travel the now isolated CWB train runs.

If the CWB were consistent in their policies, then it follows that Churchill's loading should be consistent with this principle of loading the low cost port to capacity. Following this reasoning, Churchill CWB product placement should surpass break even volumes by at least three times, reflecting Churchill's Port capacity of 1.5 to 2.0 million tonnes.

A Churchill rate schedule should be provided to farmers. The use of the Montreal pooling point will be a major issue at the CWB hearings, and is the most significant barrier to getting greater returns to producers from the geographic advantages of the Port to the wider catchment area.

Making the 1600 buffalo car fleets available for producer car loading on a sustained year after year basis would be very beneficial. On daily train runs of 165 cars from within the catchment area, today's problems of random loading of the elevator and the uncertainty of operating the system on CWB ad hoc planning basis could be alleviated.

The offering of a FOB Churchill price for wheat and durum would expand the volumes, and expand the product offering to include the grocery boat theory. Adrian Measner referred to this in his report as a barrier, "It would not be practical to load a vessel such as this at Churchill given the wide area from which the wheat would have to be drawn." This was said without realizing that the total growing area of western Canada is closer to Churchill than Montreal. To outsiders looking practically at the logistics, the lack of a "can do" attitude at the CWB in relation to utilizing Churchill to its maximum is the biggest barrier of all!

The need for a CIF Rotterdam price from Churchill is necessary to expanding product mix. The CWB should remove this barrier at once!

Transport Canada

The current environment of deregulation (Crow rate benefit ending) with its uncertainty, coupled with the CNNA privatization program, is a major barrier to getting a solid commitment to future infrastructure investment for the Bay line.

The uncertainty surrounding future plans for Ports Canada involves these issues:

- The announced closing of Ports Canada, with only limited financial support for Churchill, and no mechanisms available for future planning of Churchill, or criteria for classifying Churchill as a National Port, or regional or local port, or just a whale watch fisheries port;
- Will the Ministry of Fisheries and Ocean, who will soon take over responsibility for the Coast Guard, wish to make changes at the Port of Churchill?
- Future cost recovery for coast guard service for Churchill;
- Future sale of the port elevator or negotiation of a long term lease;
- Lack of recognition of some sales representatives to coordinate, plan, and sell the use of the Port of Churchill to specialty crop shippers is a major barrier;
- There exists no agent to work with the major buyers in Europe (ie. To work with export dealers);
- There are no concrete plans for investment in infrastructure improvements as outlined in the GNMA report.

It is uncertain whether the Government of Canada or Manitoba maintains ownership of the 1600 buffalo grain rail car fleets. If these cars are turned into cash by the treasury board, they may not be available for Churchill's use in the future. Similarly, if the aluminum hopper cars are successful, how will the 2300 units be transferred by the Government of Canada to priority service for Churchill? A committee of senior officials of the grain industry is currently examining the issue of disposition/allocation of the government-owned grain car fleet. The issue of transferring the cars to CNNA and CP, or to financial leasing corporations will be addressed extensively over the next few months.

The Saskatchewan Car Corporation has done an excellent job of managing the 1000 cars in its fleet over the past years. The location in Melville is very practical from an operating logistics viewpoint. The transfer of the Buffalo car fleet and the 2300 aluminum car fleet to the Saskatchewan Car Corporation via some method agreeable to all players, would put the cars into the hands of a fleet manager in the heart of the growing region responsive to all customers' needs.

There exists a need for a low cost alternative mechanism to be the delivery agency for rail cars to the industry. A logistical computer dispatch center for organizing the grain trains in conjunction with the elevator, the ship chartering customers of CWB and pea marketers could be attached to the rail car corporation in Melville.

Farmers Market Choices:

With farmers wishing to be more proactive in marketing their crops, the following list of barriers exist:

- GNMA is crippled by exposure of farmers using the US route over Canada;
- Should grain shipping freight become a huge farm cost in a falling commodity market creating negative farm reaction toward the railways?
- Today farmers believe they can ship grain to an US destination at a cheaper price by truck. Burlington Northern is arranging shipments to Portland for Canadian farmers. However, North Dakota farmers report that the same BN railroad is charging $350.00 per car finder's fee to US producers'. These same US producers are choosing trucking wheat to Duluth (300-450 miles) over the BN monopoly service to Portland. Heavy discounted service to Canadian farmers could close the US border to Canadian grain;
- Farm marketing groups cannot arrange grain runs effectively because they are impeded by the lack of interchange service between CNNA and CP; and
- There is a lack of interest by the major farm organizations and their broadly based memberships in actively supporting Churchill as the low cost port.

CNNA

The rush to privatize CNNA takes Churchill along a potentially bumpy road, in terms of the required future investments needed to solidify the GNMA business plan. The recorded level of past capital expenditures, is not enough to solve the railbed instability problems during the summer thaw. Capital expenditures as a percentage of revenues has averaged between 2.2% and 4.9%. A strong shipping program by the CWB would triple revenues and reduce the unit cost, allowing a more sustained investment program.

Year	Car Loads	Revenue	Capital	%
89	6,720	$13,522	$671,000	4.9
90	9,471	$18,073	$425,000	2.3
92	5,420	$11,013	$370,000	3.4
93	5,033	$10,138	$229,000	2.3

Other possible CNNA challenges to giving strong support for the Bay Line include:

- Public policies supporting roads over rail, hence the Government of Canada has not seen fit to invest the necessary capital in the Churchill line;
- Research the retrofit of a roof hatch to more easily fill the Buffalo cars. If the aluminum cars do not work, investigate the possibility of altering the steel cars to a lower centre of gravity and/or equip the cars with shock absorbers. Investigate the 15 - 23 km/hr. problems reported with all grain hopper cars;
- There is no cash flow from the line to make the necessary capital investments. Some long term capital investment will be required to upgrade portions of the line in order to handle the higher capacity;

- Train runs and elevator points that are still capable of filling buffalo cars should be inventoried and circulated in the industry;
- Freight rates for non-board grains should be worked out for customers, and service for specialty crops should be looked at, including the start-up of container service for customers within the specified catchment area;
- VIA Rails' services along the Bay Line, should be reviewed to determine the cost allocation to each level of service the line infrastructure attracts. This allocation could be used as a basis for discussion of the level of public budgetary support for the line infrastructure programs, dividing commercial from non-commercial public costs;
- The allocation of union labour to the line, priced at National Contract levels, reflects the higher cost of labour and the lack of flexibility in organizing service outside national labour rules. Local labour market pricing would lead to lower costing and wider service levels. Gaining flexibility on the Bay line may be a huge barrier to introducing needed customer service improvements;
- Overhead costing, at CNNA's current level, is a burden for a regional rail service line to carry. The market prospectus for CNNA addresses the operating efficiency gap that exists when compared to more efficient US competitors. The relatively higher costs on the Churchill line due to train weight that is less than average, and other issues all add to the problem.

Grain Dealers and Inland Elevators

Historically, farmers have not had competitive access to the grain handling system. Churchill, as the orphan of the old system, has the opportunity to write a new chapter in the Canadian agricultural transportation system. Opportunities include:

- Coordination with CWB on trains to Churchill to include specialty crops from the CWB catchment area;
- Attempt to get a smaller grain dealer who is growing rapidly to take over the port elevator operations at Churchill;
- Attempt to get the 18 inland elevators in Saskatchewan interested in Churchill. Contractual operating arrangements between the farm investors of the elevator and the major grain companies, may preclude the opportunity to make shipping arrangements with Churchill;
- Aggressively attract producer car groups in the catchment area, to actively service Churchill;
- The major grain companies, because of perceived or real infrastructure problems at Churchill, are not at all interested in shipping through the port;
- Intense new competition from the Seaway and Prince Rupert's terminal operators and interest groups, who are at a serious long-term freight price disadvantage to Churchill and Vancouver due to distances from tidewater port.

NWT

Rankin Inlet is making a determined effort to replace Churchill as the re-supply point for fuel for the eastern NWT's area and has filed development plans to build an ocean port to replace Churchill for fuel re-supply. It is important to also realize that Rankin Inlet is making a determined effort to build its own health services center for the NWT in competition with Churchill. Finally, Rankin Inlet has replaced Churchill as the center for air services to the north.

STRATEGIC FRAMEWORK

The agency will need to undertake a more formal business planning exercise once the staff and the Directors are appointed. The following is a strategic framework from which the fledgling organization can get started.

Principles necessary for success in 2000

A customer driven sales demand product management. Grain moves to port to order from the farmer network, thereby maximizing operating flexibility and port facility turnover, while contributing significantly to lowering fixed overhead costs to world benchmark levels.

A single management structure focused on managing the JIT supply system to ensure contract delivery of the sold grain to Churchill from both the farm storage position and the rail line (country elevator or inland terminal). The startup position of Churchill will enable the management group to start with a futuristic world's best computer logic system which can be green fielded and installed without significant detraction because of entrenched old systems.

Reliability of "ON TRACK ON TIME' commercial business agreements will be carefully and accurately monitored and reported to each partner on an ongoing basis using effective and simple to understand performance measures. All rewards and payments when practical will be tied to these performance measures and carefully managed and enforced.

Establishment of a "Boutique grain trade," with the intended higher margins and customer service requirements, will require serious marketing efforts. Also efforts to secure 100 % of CIDA's African relief business along with the Mennonite Foundation on an annual contract basis.

Control over 2300 aluminum grain hopper cars and box cars is required to manage the system. Churchill must become Saskatchewan Farmers Port

The Saskatchewan market is the key to Churchill's shipping future. The reasons are very simple, Saskatchewan farmer's cost to move grain is more than $1.3 *billion* annually. These farmers produce 55% of Canada's grain export, equal to 22.5 million tonnes. Saskatchewan farmers export 80% of their wheat crop, with 38% currently going to Eastern world markets via the Seaway and 25% to Vancouver.

Today, farmers pay approximately $61.65 per tonne to deliver, inspect, clean and ship their grain. These per tonne costs are as follows:

$0.55	road costs	$4.98	average farm trucking cost
$9.86	fixed elevator costs	$33.13	Saskatoon - Churchill cost
$3.00	Port terminal cleaning	$7.17	Port terminal handling
$1.66	marketing cost	$1.30	CGC inspection costs

How can a Saskatchewan farmer reduce his or her cost? What is in the cost from your farm to on-board the ship? This list approximates the different choices a farmer has in how he gets the crop to market. The more he/she handles at the farm or on a direct basis, the less cash flow is needed to contract out various functions. Choices to be made include:

- grading, may be completed on the farm, at the elevator or terminal;
- cleaning, may be completed on the farm, at the inland elevator or terminal;
- storage, may be completed on the farm, at the elevator, or at the terminal;
- loading, may be completed at the rail line, at the elevator, or at the terminal;
- transport, using farm truck, railroad, lake freighter, or ocean ships.

The farmer lowest cost option could be to grade, weigh, clean on the farm, transport to rail, load on the rail, and ship to a "Quick hit" port, which transfers the grain to the ship.

The Specialty Crop Procurement Plan

The plan is built on possible sourcing in the Saskatchewan procurement plan area. Shippers could be prime users of the Churchill system.

Crop District	Lentil 1994 (acres)	# Cos. Cleaning Lentils	Dry Pea 1994 (acres)	# Cos. Cleaning Dry Peas
1b	12,900	3	26,300	3
2b	140,000	14	54,300	9
5a	56,300	11	96,100	13
5b	4,100	2	56,200	7
6a	92,400	5	67,800	4
6b	135,800	15	86,800	13
8a	10,100	9	104,700	19
8b	43,400	3	164,800	8
9a	20,700	5	141,700	13
Total	515,700	67	798,700	89

Grain Dealers Plan Does Not Include Churchill

The farmer could also buy all the necessary services from a service provider such as SWP (Saskatchewan Wheat Pool). The SWP vision of the future includes a much rationalized system from today, including closing 363 elevators, to slim down from 423 to 60 inland elevators. This "Rapid Grain Flow" vision of the future, includes tandem tractor trailer hauling, a major adjustment from rail to road leading to the closure of 363 towns, and the elimination and abandonment of miles of track in favor of mainline rail, with major community impact along the way.

Churchill Becomes World Class Model

Churchill is Western Canada's world class model for major change for the future. The model incorporates the following basic values:

- each component must add value;
- each component must have enough competition to reflect market prices;
- administration and logistics system reflects least cost market driven;
- all players are integrated into a master planning system on equal basis.

Australia, Argentina and England all feature grain systems which average 350 miles or less to tidewater port by rail. In Australia each grain producing state has

its own railroad, where trains cycle every 30 hours, with each car carrying an average 57 tonnes. Churchill could be Saskatchewan's own Port. See the overheads, "Destination Marketing," "Past Markets Served by Churchill," and "Shipments - Primary Elevators" in the appendix for more information.

Thunder Bay Port Churchill's Main Competitor

Thunder Bay and the Seaway service the Eastern half of the world, inclusive of east coast South America, Europe, Africa, Russia, and involves similar rail distances to direct loading at the port of Thunder Bay from Manitoba market points such as Brandon. The CWB uses the Montreal seaway designation for 4,066,534 tonnes of wheat, 1,700,000 tonnes of durum vs. 220,000 tonnes of wheat from Churchill (3.8%). The active shipping season is 36 weeks, with Lake freighters using iron ore back hauls to reduced costs of shipping grain to the Quebec ocean transfer elevators.

All of Canada's major grain exporter/handlers operate elevators out of Thunder Bay. These firms have made heavy capital investments over the past 5-10 years to ensure economical world class cost advantage. Elevator capacity is in excess of 600,000 tonnes/wk and includes storage and cleaning equipment for a wide range of crops.

There exists a sustained drive by the Great Lakes Union of Ports Employees to keep the St. Lawrence and Great Lakes ports competitive, and open to ocean going ships. Major change in labour negotiations at Seaway locations have addressed the traditional confrontational attitudes of workers and has lead to new thrusts to ensure productivity gains, and to help maintain the jobs of 600 workers.

The St. Lawrence ports natural ability to take in larger ships, which can accommodate a wide range of products secured in segregated storage compartments, allows the servicing of grocery ships. Ocean rate negotiations are handled almost exclusively by the exporting companies on behalf of the customer, hence it is easy for them to control the quotations and chartering in favor of their established investments in the Seaway. Ocean cargo insurance is also handled almost exclusively by the exporting companies on behalf of the customer.

Assumptions about the Grain Train and Port Plan:

1. July 1, of each year is designated as day one, of each shipping season.
2. The actual ship loading season is based on 22 weeks, July 1 to Dec. 2.
3. The elevator loading season ranges from May 1 through to December 15, at which time the elevator would close for the season. No receipts are required

after Oct. 22, in 1996 and 1997, until the next season. Elevator loading will be handled by the Aluminum Hopper Cars, with 14 trains needed to fill the elevator.

4. The plan would call for the elevator to be empty at shipping season end, with the exception of the need for balancing stocks left from the train runs. The numbers used on the train loadings are as follows:

Trains		# of Cars	Car Tonnage	Total Tonnage	Trains/wk Total
BBT's	165	58	9,570	3	28,000
AHT's	130	80	10,400	1 or 2	10 or 20,000

BBT - Buffalo Box Car Train AHT - Aluminum Hopper Car

In order to make the number easily understood, they were rounded off.

The Port Plan

The responsibility of getting Churchill up to a level of 840,000 tonnes in 1996 is equally divided between the farm/producer operators and the CWB. The 1996 plan is about 24 ships carrying 35,000 tonnes. The CWB has responsibility to have 12 ships sold to Eastern world markets. Four of the twelve ships would be Durum, representing early and late season shipments for the CWB.

The Rotterdam Program has responsibility for 12 ships. The GNMA CWB market representative has responsibility to work with the CWB and the Saskatchewan GNMA Rotterdam Peas representative in determining the train runs. The BBT's are envisioned as primarily a producer car trains with at least 60% peas. The AHT's are used to balance the loading on the BBT's, because they can stop at all Manitoba and Saskatchewan elevators, and can't be refused loading by industry shippers trying to force products to Montreal in order to utilize their Thunder Bay facilities.

The shipping plan was made to the year 2000, primarily to focus all GNMA partners on the possibilities of expanding grain shipping. When the CWB is finally forced by its membership to enjoy the least cost benefit's of the Port of Churchill in 2000, the number of ships rises to 72 carrying 2,520,000 tonnes of product. The season extends from CANADA DAY to DECEMBER. The port is a tremendous success story, saving the farmers of Manitoba, and particularly Saskatchewan millions of dollars.

Churchill Shipping Plan Overview (volume is in tonnes)

Client		1996	1997	1998	1999	2000
CWB	Ships	12	16	20	20	34
	Volume	420	560	700	700	1,190
Peas -	Ships	12	16	26	36	38
Rotterdam	Volume	420	560	910	1,260	1,330
Total	Ships	24	32	46	56	72
	Volume	840	1,120	1,610	1,960	2,520

Assumptions:
- all planning statistics based on 1 ship = 35,000 tonnes cargo
- CWB includes both durum and wheat (no barley)
- no pulse crops are included other than peas

CRITICAL SUCCESS FACTORS

The following items must occur in order for the GNMA to be successful.

1. A long term, viable, profitable "On Track on Time" rail service capable of sourcing and handling two way heavy freight trade via the Port of Churchill while servicing VIA Rail or its successors needs.
2. A long term, viable, profitable "On Track on Time" Port of Churchill harbour operation capable of servicing the transport industry - Rail, Ship, Tour ships, Bulk Commodity shippers and supporting suppliers.
3. A long term, viable, profitable port elevator operator capable of servicing the CWB, PEAS, other grains, alfalfa, and special pulse crops industries.
4. A Government of Canada cabinet with the will to invest in the future of Churchill, with no strings attached to needed infrastructure improvements. The Government of Canada should immediately allow Churchill, along with the Governments of Manitoba, Saskatchewan and NWT, to proceed with a program to establish a Port Authority for Churchill. Acknowledgement of the Use it or lose it principle in securing Arctic sovereignty is paramount in securing the Eastern Arctic region from foreign land claims by other nations. Transport Canada should fund the transition program as well as the study.
5. A strong supporting GNMA Board of Directors and a General Manager capable of articulating the vision of Churchill to governments, the public, both domestic and foreign customers' asset owners and individual operators.
6. A new attitude of infrastructure investment in the future of Churchill is just as critical as the "On Track on Time," just do it customer service focuses. The "low cost" operating model is also critical in selling Churchill's major assets.

7. A native employment training program would help alleviate the constant importation of labour to handle in-season jobs. This strategy would help stabilize a fluctuating population in Churchill, and add to long term community stability.
8. Cooperation of all local tourism partners involved in the recreation activities toward leveraging the budgets of Tourism Manitoba and Tourism Canada in expanding an already solid unique business opportunity.
9. The cooperation and partnership of the new Nuntavit region is needed to solidify the available service to the northern region in resupply. An approach to Rankin Inlet identifying strong customer service to the community is needed.
10. Develop a close working relationship with Akjuit in ensuring all efforts are made to please their prospective US customers, thereby ensuring future growth in satellite launching business.
11. Develop a close working relationship with the group that gains responsibility for the grain rail cars from Transport Canada. Help develop a plan for the rail car fleet that would improve the logistics in moving grain on a weekly schedule from country to port.

THE RELATIVE COMPETITIVE POSITION OF THE PORT OF PRINCE RUPERT

by Eugene Ludwick, M.A., F.C.I.T. [1]

ABSTRACT: This paper examines Prince Rupert's position as a transport gateway for a variety of commodities. To many observers the sole rationale for the Port's existence is to serve the grain trade in some small way complementing the roles of larger grain ports. Abolition of the Crow benefit and other changes to the Western Grain Transportation Act have resulted in price signals leading to the perception that even this role is in serious doubt.

First, we will see that Prince Rupert is a thriving port whose success has been built upon several corner stone commodities and not just grain. Second, while there is no doubt that abolition of the "CN adjustment" has resulted in higher rail rates to Prince Rupert from prairie points, any decline in the use of the port as a grain export outlet should be reversed once Prince Rupert's advantages over other ports are better understood by serious exporters. What is meant by this latter term is the recognition of the real and time value of money taken into account by shippers who understand that their competitiveness in the global market hinges on total costs from inland points to the import terminals of final customers.

The paper concludes with an overview of some of the exciting developments which are certain to ensure Prince Rupert's expanding role as a key player in getting western Canadian goods - including grain - to world markets.

BACKGROUND

The Port of Prince Rupert, located near the mouth of the Skeena River on the northern British Columbia coast, is the second largest deep sea port on the west coast of Canada. Since its modest but colourful origins as a port and railway terminal city earlier in the century, Prince Rupert has made some impressive strides. Notable milestones include designation of Prince Rupert as a "national harbour" in 1972, opening of coal and grain facilities on Ridley Island in 1984-85 and major expansion of Fairview Terminal in 1990. The improvements to the Port's infrastructure continue every year in order to respond to ever-growing interest in Prince Rupert as a major export outlet for western Canadian bulk commodities.

[1] Eugene Ludwick is Manager, Marketing for the Prince Rupert Port Corporation

Figure 1 **Major Canadian Ports**

1994 Revenue - $ Millions

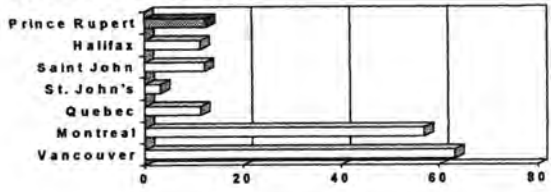
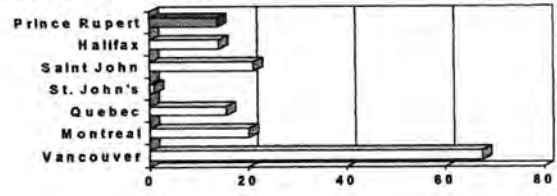


Figure 2 **Major Canadian Ports**

1994 Tonnage - Millions



Competitive advantages offered by the Port include:

- direct, congestion-free and ice-free access to ocean lanes;
- shorter distances to Asian-Pacific ports (approximately 420 nautical miles or 1.5 days sailing time closer than Vancouver);
- deepest natural harbour in North America easily accommodating vessels of up to 250,000 deadweight tonnes with no need for dredging;
- state-of-the-art equipment and service facilities that minimize turnaround time; and
- exceptional transportation support to central Canadian and mid-western U.S. markets.

A major highway and first class rail system built on bedrock and gentle grades provide direct access to western Canada. The Port and Canadian National Railways work together to promote the excellent rail and sea link available to customers.

The following terminal facilities are available at Prince Rupert:

- **Fairview Terminal** - Facilities include three berths for handling and export of forest products, agricultural products, ore concentrates and general cargoes utilizing bulk, break bulk and Ro-Ro operations. Fairview Terminal features a consolidation area of 21.5 hectares, covered storage of 4,583 square metres and 3,000 metres of rail trackage. Some 616,000 tonnes were handled in 1995, up over 22% from a half million tonnes in 1994.

- **Ridley Terminals Inc. (RTI)** - The coal facility on Ridley Island is a world leader in the efficient and reliable movement of coal from unit trains onto ships. RTI regularly handles over 6 million tonnes annually and has the capacity to handle well in excess of 13 million tonnes. RTI's tandem rotary car dumper can tip 65 cars (6,000 tonnes) per hour. The two quadrant slewing shiploaders each can load vessels at the rate of 4,500 tonnes per hour.

- **Prince Rupert Grain (PRG)** - This facility, situated on the west side of Ridley Island, is Canada's largest and one of the world's most technologically advanced cleaning grain elevators. The terminal has an annual export capability of in excess of 6 million tonnes, the highest of any grain cleaning elevator in Canada. Its high performance allows grain to be cleaned as fast as it is unloaded from rail cars. Typical vessel loading average 50,000 tonnes. In 1994, a record 5.5 million tonnes were handled while in 1995, unfavourable crop, weather and other conditions reduced output to 4.3 million tonnes.

- **Ocean Dock** - This facility is used for off-loading fish and by government or specialized research vessels.

- **Westview Terminal** - This property is ready for development. The site is approximately 10 acres and has a 310 metre wooden pile dock structure which is presently under consideration by several customers. Plans for redevelopment by potential tenants are being developed and it is anticipated that commercial activity will result within the next year.

- **South Kaien/Ridley Islands** - These properties, approximately 1100 acres, have been identified as potential sites for proposed petrochemical and other major industrial developments, such as a liquid bulk terminal development.

- **Watson Island** - Situated in Porpoise Harbour, this privately owned terminal is used for log storage and as a pulp loading facility by Skeena Cellulose Inc. In the normal course of events, Skeena Cellulose Inc. ships over 300,000 tonnes of woodpulp per year.

- **Lightering Dock** - This facility is available for the transfer of passengers from larger cruise vessels. It is also under license agreement with a number of fish chartering operators and water taxi services to facilitate loading and off-loading of passengers.

The following tonnages (selected commodities) moved through the Port over the last five years (millions of tonnes):

TABLE 1: PRINCE RUPERT COMMODITY TONNAGES

	1991	1992	1993	1994	1995
All Cargoes	13.3	12.7	11.7	13.8	11.2
Coal	6.4	6.2	5.5	6.7	5.7
Prince Rupert Grain	5.1	5.3	4.5	5.5	4.3
Forestry Products	0.8	0.7	0.7	0.6	0.6

Figure 3

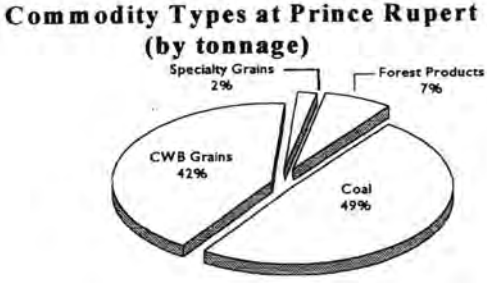


Figure 4

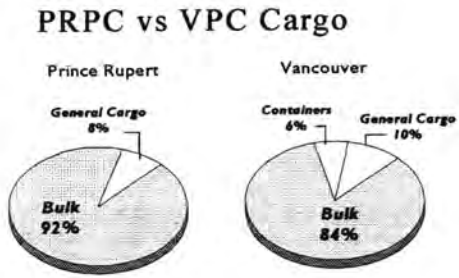
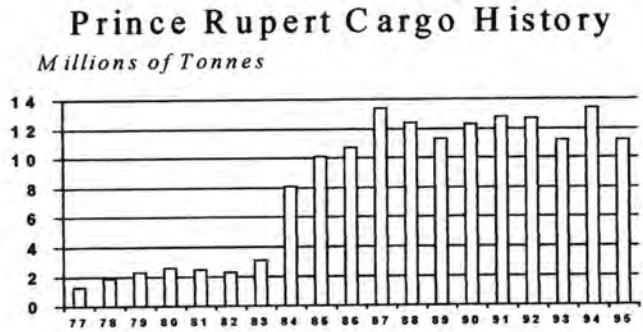


Figure 5



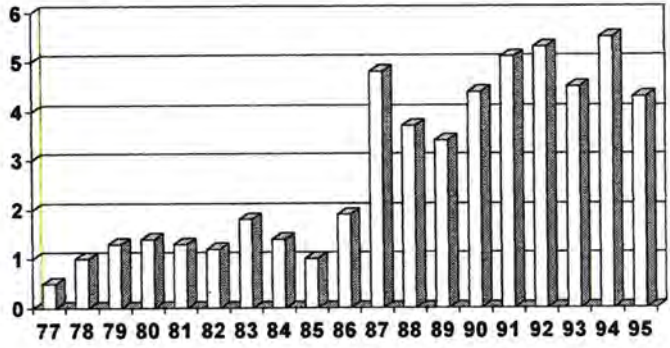
GRAIN EXPORTS

As demonstrated in Figure 5, tonnage took off dramatically in 1984, with the completion of the new coal and grain handling facilities on Ridley Island. Figure 6 shows the history of grain movement through the port.

Figure 6

Prince Rupert Grain Handling History

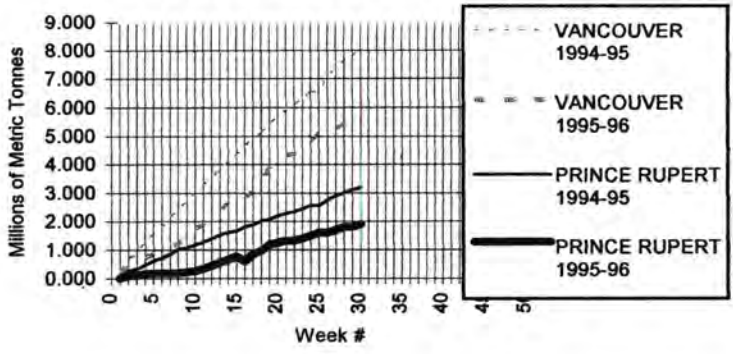
Millions of Tonnes



Elimination of subsidies and the reform of the Western Grain Transportation Act are widely regarded as placing the Port at a competitive disadvantage for grain shipments. Ending the rate parity between west coast ports resulted in an average premium of $4.50 per tonne initially. Though the differential has been reduced to $2.25 per tonne on average, owing to volume-related incentive rates negotiated between CN and the Canadian Wheat Board, Prince Rupert is now regarded as merely a residual export outlet by the grain handling and transportation industry.

There is no doubt that grain volumes are down. In the first 30 weeks of the 1995-96 crop year, 1.9 million tonnes of grain were shipped through Prince Rupert compared to 3.2 million tonnes the previous year, a decline of 40%. Figure 7, however, shows that a significant decline in grain throughput has also been experienced in Vancouver.

FIGURE 7 - CUMULATIVE WEEKLY VESSEL SHIPMENTS[2]



Bob Butler, President of the Terminal Operators Association, points out that, "A severe winter is adding to a bleak year for B.C. grain ports. Ocean storms and prairie snows have been slowing grain transportation both coming and going. The weather follows a bad start to the grain year; last summer, a lack of export product due to poor crops forced layoffs of staff... terminal operators are anticipating a renewed shortage of grain during the June-July end of the crop year." [3]

Thus, other effects this crop year are confounding the obviousness of the conclusion that the freight differential is harming Prince Rupert, at least in the case of grain moving through Prince Rupert Grain Ltd. (PRG). The effects of the rate differential (i.e. the full $4.50) on Continental Grain's speciality agricultural products facility at Fairview Terminal, however, have been much more clear and painful; volumes are down by half as buyers and carriers who call on Prince Rupert as an add-on to Vancouver resist the extra rail freight cost.

[2] Source: Western Grain Transportation Office, "Weekly Grain Report"

[3] Business in Vancouver, Interview: "Another Blow for Grain Ports", January 16 - 22, 1996

While all is not lost for Continental - other opportunities are being pursued - the advantages of using the Port of Prince Rupert for grain export are to be achieved by using the high throughput facilities at PRG for direct shipments to Asia. In addition to the advantages mentioned earlier, key characteristics of PRG including:

- highest loading rate in tonnes per hour on the west coast
- lowest labour costs per tonne shipped
- greatest volume shipped among all west coast elevators
- most grain shipped per terminal employee
- shortest vessel loading rate per tonne on the west coast

For those who believe that western Canada's export challenge is to get goods to the coast, there is no doubt that the freight rate differential is inhibiting. However, for those who realize that the real challenge is to land goods at the customer's door at the most competitive price, the freight rate differential is offset by other effects estimated as follows:

	$ per tonne
• Average extra rail cost Prince Rupert over Vancouver	($2.25)
• Savings from faster rail car turnaround time	.61
• Berth utilization advantages	.60
• Vessel voyage savings[4]	3.72
TOTAL PRINCE RUPERT ADVANTAGES PER TONNE	$2.68

Prince Rupert's attractiveness is further enhanced when one considers its inexpensive potential for expansion. It has been estimated that 4 million tonnes of additional capacity could be built for a cost of $40 million. In December, 1995, investors announced that they were considering developing new grain terminal capacity at Roberts Bank to handle about 4 million tonnes of grain per year. The capital cost of the facility was estimated at $175 million. By March, 1996, more detailed engineering revealed that the capital costs were more likely to exceed $250 million, about 43% more than originally thought. Table 2 shows the annual financing challenge to be faced by investors at Roberts Bank compared to a capacity expansion at Prince Rupert.[5]

[4] Shorter sailing time and less demurrage

TABLE 2: FINANCIAL IMPLICATIONS OF WEST COAST GRAIN CAPACITY EXPANSION

ALTERNATIVE	TOTAL COST ($ Millions)	ANNUAL MORTGAGE ($ Millions)	FINANCING COST PER TONNE ($)
• Prince Rupert initial estimate	$40	$4.7	$1.18
• Prince Rupert with 43% overrun	56	6.6	1.72
• Roberts Bank initial estimate	175	20.6	5.15
• Roberts Bank with 43% overrun	250	29.4	7.35

While a new facility at Roberts Bank would place a very high financial burden on its investors, expanding Prince Rupert's capacity more than pays for itself out of the savings generated by the Port's inherent advantages.

Notwithstanding the poor performance of the grain handling and transportation system this year, typical west coast performance in the last several years has been about 17.4 million tonnes with record exports of 20 million tonnes in 1991-92. The Canadian Wheat Board [6] and other sources project exports of 20.8 million tonnes by 1999-2000 and 22 to 23 million tonnes by 2005. One must question whether these volumes warrant expenditures of $250 million for the foreseeable future. An investment of $40 or $56 million in Prince Rupert holds more logical appeal.

OTHER ISSUES

The Port of Prince Rupert is entering an era of both daunting challenges and exceptional opportunities. Several issues besides grain rates could or will continue to mitigate the progress of development at the Port of Prince Rupert.

- Pending expiration of coal contracts in 1998 and 1999 which if not renewed, could have significant adverse financial implications for the Port.

- The Port Corporation's "isolation" relative to the marine and shipping business community and proximity to the Port of Vancouver which overshadows Prince Rupert on the west coast contribute to the perception that Prince Rupert is a secondary, residual port.

[6] Canadian Wheat Board CWB Grain Trade Forecast to 2004-05, released February 28, 1996, Winnipeg

- The strictures of two separate regulatory regimes for B.C. Rail (British Columbia Railway Act) and CN Rail (National Transportation Act) discourages the interchange of traffic which would travel shorter distances if routed to Prince Rupert.

OUTLOOK

Despite the challenges, all of which are being addressed through the Prince Rupert Port Corporation's strategic plan, the Port Corporation considers the future to be quite bright. Factors or issues which generate this optimism include:

- Continued and growing pressures of transportation network congestion, urban encroachment and environmental concerns/restrictions at other major B.C. ports.

- Continued growth of the Alaskan cruise market and related congestion at existing Alaskan ports of call.

- Ridley Island offers the best tide water industrial property on the west coast.

- Recently completed Transit Shed #3 and rail access will enable higher pulp and forest product traffic volumes to be handled over Fairview Terminal as market conditions improve.

- Increasing world demand and regional extraction of gas, other bulk liquids and petrochemicals have opened up opportunities for production and/or export terminal developments in northwest B.C.

- The Port's proximity to marketable mineral deposits and the potential for new mining developments in northeastern B.C. and Alberta.

Given these circumstances, the Prince Rupert Port Corporation is aggressively pursuing numerous business development opportunities including:

1. **Increasing pulp traffic over Fairview Terminal.** The Port's new pulp shed was completed and a new five year shipping contract was signed with its existing and premier pulp shipper in 1994. Spot shipments from a second shipper started in 1995. Discussions are underway with a number of other potential pulp producers in the Port's hinterland.

2. **Attraction of cruise passenger vessels to Prince Rupert**. This opportunity is created by the continued growth in the Alaska cruise market which remains the industry's fastest growing segment, showing continued strength and profitability for cruise operators. Traffic projections, confirmed by strong order files by various vessel builders around the world who have secured business from the major cruise lines, indicate that the strong Alaska market and increasing levels of congestion in the southeast Alaskan ports will continue into the foreseeable future.

3. **Attraction of liquid and dry bulk products to Ridley Island from the expanding energy resource industries.** This opportunity is created by the abundance of undeveloped land on Ridley Island as well as the availability of under-utilized infrastructure at Ridley Terminals. There are several development opportunities under detailed investigation at present, including:

    - Hot Briquetted Iron Mill;
    - Propane/Butane Liquid Petroleum Gas (LPG) Export Terminal;
    - Multiple Oxygenate Plant (MOP) for reformulated fuels (MTBE/ETBE);
    - Liquid Natural Gas (LNG) Export Facility; and
    - Sulphur Export Terminal.

4. **Attraction of Concentrate Handling Facility**. This opportunity is created by increased mining exploration and development in the Port's catchment area and efforts of the Port and its terminal operator to refurbish existing storage facilities previously provided for Noranda's Bell Mine.

5. **Refurbishment of Westview Dock.** This opportunity in the short term involves converting the wharf for the multi-purpose use of seafood unloading companies.

The Prince Rupert Port Corporation is sparing no effort to ensure the future success of the Port. We encourage other stakeholders to make sound capital investment decisions and to recognize the value of this vital component of western Canada's export economy.

THE INFLUENCE OF THE SEPETIBA PORT COMPLEX ON BRAZILIAN COMPETITIVENESS IN THE INTERNATIONAL GRAIN MARKET

by Silveira L. A. Luíz
Magalhães B. Paulo

ABSTRACT

The assurance of food supply has challenged man since the beginning of time. Trigueirinho[1] lists 12 countries in the world with the perspective of an agricultural area below 0.07 hectares/person by 2025, a limit which does not provide autonomy in food supply. This information was provided by *Newsweek*, in an article that raises the issue of who would feed those countries.

Brazil certainly offers part of the answer to that, since it combines soil, climate, water, and solar energy enough for agricultural surpluses of respectable proportions. This productive potential, however, is not paired by a transport infrastructure capable of ensuring competitive prices for the product placed in Brazilian ports. On the contrary, continental transportation costs are among the highest in the world in that sector, at an average of US$ 40.00/t [2] for the specific example of the soybean from Central Brazil. Arrival of the crop to the ports is synonymous to long waiting lines for trucks, trains, and ships, generating atypical port expenses which hinder greater advancement in Brazilian grain production.

Implementation of an export processing zone in Sepetiba presents itself as an option capable of minimizing the problem, provided that it be integrated with the railway networks with access to Central Brazil. Pluriannual government goals prioritize the complex and establish important investments in infrastructure renovation in the entire country over the next four years.

Under this perspective, this study intends to disclose the results of a preliminary evaluation of the impacts of this new port complex on Brazilian competitiveness in the international grain market, especially for the soybean complex, due to its striking performance in the country's export agenda.

1. INTRODUCTION:

Brazil has approximately 500 million hectares adequate for farming [3], while the current agricultural border does not reach one third of that area. The United States, for example, a country with strong agricultural resources, already uses approximately 94 percent of its 400 million hectares fit for agriculture; this is the reality of most developed countries. Without computing the traditional farming areas in the South and Southeast regions of Brazil, nor the Northern region, occupied by the Amazon forest, Brazilian Cerrados (Brazilian savannas) occupy a continuous area of 207 million hectares. Of this total, 136 million hectares (2/3 of the area) may be incorporated in the productive process on sustainable grounds, preserving 71 million hectares for biodiversity maintenance.

A basic plan for the use of the soil for various cultures and farm animals associated to the use of technologies previously adapted to regional conditions, is expected to produce **354 million** tons a year of food supply, which is enough to feed a total of 875 million people, against a population estimated at 177 million Brazilians by the year 2000. By adding to that context the traditional farming areas in the South and Southeast of Brazil, which still produce 70 percent of the domestic food supply, Brazilian Cerrados are capable of producing an export surplus that will project the region as one of the main food producers in the world.

2. HARVEST ESTIMATE FOR BRAZIL:

By analyzing trends based on studies on the Competitiveness of Brazilian Industry [4], soy crops in Brazil have been estimated up to the year 2000. The meal consumption rate in the world is expected to drop from the current 3 percent/year to 2.04 percent/year, by the end of the decade. After that, the significant difference between estimates by various authors has led to the option of the even more conservative value of 2.5 percent/year, by 2015. Even in considering projection errors for such a long-term estimate (20 years), see figure 1, the studies of economical feasibility in the transportation area frequently cover projection limits of this nature, and the considered values are apparently the most appropriate.

Reference [5] presents data from "Oil World", a German publication specialized in this type of study, which estimated the Brazilian soy harvest in the year 2000 at 28,500,000t. That figure is relatively close to the one obtained previously. To confront the results, an analysis of temporal series applied to historical data of the last 25 harvests was also used. The best results were obtained with the use of "Double exponential smoothing with linear trend", with estimates in the order of 30,100,000 tons by the year 2000 and a R^2 factor of 78.5 percent. Overall, there

was a general convergence of results among the various methods, with a difference below 10 percent among the trend analyses and temporal series analyses, even at the end of the period, in 2015.

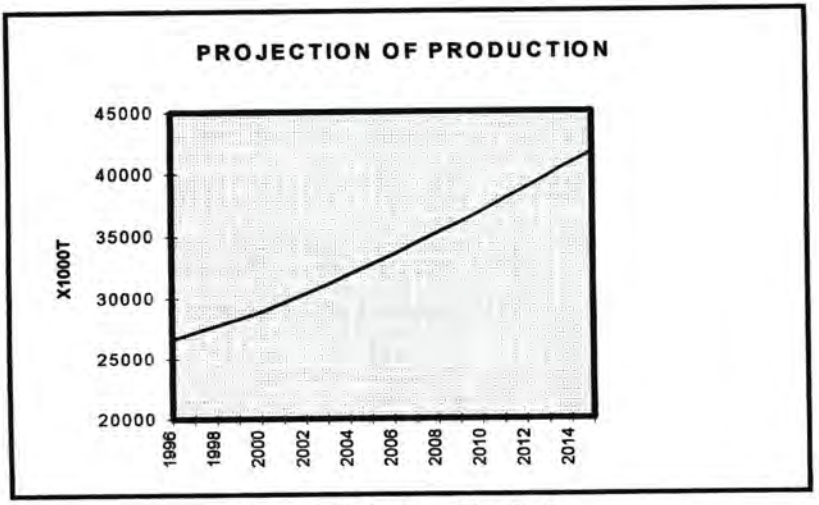


Figure 1- Projection of Production

3. COMPETITIVENESS INDICATORS

The Agribusiness competitiveness analysis for the soybean sector relies on a large set of indicators, in virtue of the high level of international organization of that complex. In this study, the criteria of competitiveness evaluation according to export performance and the criteria of productive efficiency comparison according to costs have been applied.

In terms of its export performance, Brazil is the first in the world in soy meal supply, in spite of the hindrances depicted. According to projections by Sparks Companies[6], the country will have a participation in the market in the order of 38 percent of all soy meal exported in year 2000, against 27 percent by Argentina and 10 percent by the USA. Argentina is prominent in soy oil exports, with estimates that the country will reach 42 percent of that market in the same period, against 9 percent by the USA and 19 percent by Brazil. The Americans will remain in the lead in soy grain exports, with an expected participation of 58 percent of the international market in the year 2000, against 16 percent by Brazil and 12 percent by Argentina.

In terms of the competitiveness evaluation criteria by comparison of final production costs, the following table, extracted from reference [1], has been selected for considering recent performance data for the sector.

The comparison between the potential net revenue in the United States, Argentina, and Brazil clearly shows the Brazilian handicap in terms of competitiveness in product export. Argentina has the benefit of a lower tax load, while the US are literally exempt from taxing. The latter have yet an adequate transportation infrastructure which emphasizes the port, waterway, and railway networks, as well as a privileged geographic location in terms of the North Sea importing countries. Argentina's most important areas for soybean culture are located at 30km from the sea, or 250km at the farthest point [7]. In Brazil, on the other hand, the dislodgment of the productive mass to the Cerrados has implied transportation distances of up to 1,200km between important areas in Mato Grosso and the ports. This distance is normally traveled on poorly preserved highways, which are responsible for the transportation of 74 percent of the production. The freight value in the table above does not consider future dislodgment to the Cerrados, with a freight value growth to US$ 40.00/t, if the current conditions are maintained.

DESCRIPTION	BRAZIL	USA	ARGENTINA
1. ROTTERDAM C&F	250	250	250
2. SEA FREIGHT	-23	-18	-26
3. FOB QUOTATION	227	232	224
4. FREIGHT TO THE PORT	32	15	17
5. PORT EXPENSES	9	3	3
6. EXPORT TAXES	30	0	8
7. NET REVENUE	156	214	196
8. REVENUE/FOB (%)	69	92	88

TABLE 1

Very possibly stimulated by this adverse reality, Brazilian soybean cultures have reached, in the first half of the present decade, productivity levels comparable to the competition, obtaining 2,242kg/ha in 1995 [8]. In the major production states of the Cerrados (MT and MS), an average productivity of 2,500kg/ha has been reached, while technologically advanced cultures in the same region have reached 4,000kg/ha [3]. It seems that the soybean complex in Brazil is beyond the issue of technology use. The country has entered a stage in which production management and costs reduction, via increased production, are the key to profits. When analyzing transportation and financial costs, a producer that harvests the

national average (2,242kg/ha) will realize that he only managed to balance budgets and expenses. Those that produced the average of the Cerrados (2,500kg/ha), for example, obtained profits. Therefore, the producer's future will depend on the good use of technology, soil treatment and preservation, and on sensible administration of resources. More than ever, costs reduction seems vital to the competitiveness of the sector in an international market which will continue to adjust prices in future years.

4. COSTS ASSOCIATED TO PORT INEFFICIENCY

With the methodology proposed by Novaes[9], the "CUST-OPER" program, described under reference [10], was developed. It calculates daily operational costs (at sea and at port), specific for grain cargo ships transporting soybean and meal. Expenses with wages and social charges with ship crews, food, on-board material, fuel, lubricants, minor repairs, periodic docking, pluriannual docking, hull insurance, capital amortization for ship acquisition, and administrative expenses have been included. Those are costs simulations valid for studies of this nature, where absolute values are less relevant than the relative proportion when compared to distinct scenarios.

Considering grain cargo ships with 45,000 DWT and a 16-knot speed, operating between the Southeast coast of Brazil and the European ports of the North Sea in "Voyage Charter" system (representative hypotheses), the program established daily costs at sea and at port. With this information, the total operational cost per trip may be expressed as follows:

(1) Ct = [Cm (d/24V)] + (CpTp) where:

Ct	=	operational cost per trip	Cm	=	daily cost at sea
d	=	distance (miles)	Cp	=	daily cost at port
V	=	speed (knots)	Tp	=	total time spent at original and final ports

For an average known transport distance which includes expenses such as ship repositioning after cargo delivery, and using the data produced by the cust_oper program, we have:

(2) Ct = 374849.80 + 14608.78 (Tp)

With fixed ship size and route conditions, the first part of the equation remains the same as well, while operational costs show a linear growth, according to the number of days spent at port. We may also estimate an acceptable stay time at the ports, with the following equation:

(3) Tp = Te + Tat + [Q/(λ.N.h)] where:

Te = Waiting time offshore, before docking (days)

Tat = Docking and sailing time, consumed in preparing for docking and leaving for sea

Q = Amount of cargo moved (t)

λ = Effective equipment productivity (t/hold/hour)

N = Average number of holds operating

h = Workday (hours)

Considering properly equipped, modern ports, the acceptable productivity and waiting time value in maritime practice may be applied to expression (3), yielding a total time of 5.6 days at port. To face unforeseen problems of several orders, an increment of 20 percent is assumed in that period, producing an interval of 6 to 7 days, which may still be considered normal for the ship of average size considered.

In order to better illustrate the poor conditions of the national port system, Mac Dowell [11] presents a series of surveys made in one of the most representative grain ports in the country. Almost 56 percent of the time spent by ships in this port refer to unused time and of the total hours paid to employees, between August and September of 1989, 43 percent refer to hours of effective work. These are various losses that, when added to inefficiencies in access, storage, operational design, and equipment, have led to an excessively extended total period of permanence in Brazilian ports. Between May and June of 1992, for example, the main grain port in the country (Paranaguá) recorded as much as 15 to 20 days of permanence of grain cargo ships in the port, according to references [12]. With the expression (2) and a total of 7 days of permanence in the ports of origin and destination, an operational cost is calculated that is 20 percent smaller in relation to that obtained for a total period of the order of 15 days. And this is certainly not overlooked in the composition of freights in routes going through Brazil. Even if the freight market behaves in a complex manner, with frequently unpredictable records, it is reasonable to admit that freights will grow (or decrease) in time, at the same ratio as the operational costs. None of the parties involved, whether shipbuilders or contractors, would stay at a disadvantage for long, and the correlative supervision would finally balance, in a fashion, the equations of freight variation and cost variation.

Brazil will produce in the year 2000, about 18 million metric tons of soybean and meal for export. Besides the 3.0 million tons that could be drained by a more efficient port, like Tubarão, at least 15 million tons will be submitted to the current unreliable conditions. However, if there were a comprehensive restructuring of the national port sector, which would guarantee total time in ports by the acceptable standard (7 days), freights could theoretically reach an average of US$ 18.40/t, already equivalent to the American competitors (US$ 18/t) and 29 percent lower than the Argentine (US$ 26/t). These are preliminary

calculations, based on the available data, which signal to a reasonable growth of the country's competitiveness in the global grain market. After all, this US$ 4.60/t reduction with relation to the original freight (US$ 23/t), applied to a 15 million ton volume, represents a benefit of the order of US$ 69 million each year.

Another important factor to be considered is the effect of the scale economy noticed in the maritime transportation when using larger sized vessels [9]. From a strictly economic point-of-view, the shipbuilder would tend to put the largest possible ship on the route, to reduce the operational costs per ton. However, port service characteristics once again play their part in this scene, since the cost of vessel permanence in the port also increases in relation to size. Therefore, this increase in size should take place only up to the point where the marginal gain (due to the DWT increase) becomes compromised by an increase in equal proportion of the cost of the ship's permanence on port. To determine this point of equilibrium, it is necessary to equalize the absolute values of the derivatives of the functions of unit cost per ton in relation to size and the unit cost of port permanence, also in relation to size. Adopting as a first approximation the equations suggested under reference [9], and calibrating the model with the shipping data under survey, an ideal size for grain cargo ships of 55,000 DWT is reached. Above that, port costs would already be enough to annul any advantage obtained with the increase in size. On the other hand, if we consider a future scenario, where time reaches normal levels of the order of seven days, an optimum size of the order of 110,000 DWT is reached. This represents a reduction in expenses (and freight) of about 40 percent, according to an approximation using abacuses also published under reference [9], for grain cargo ships. However, many grain importing ports still have draft restrictions for the docking of vessels with a gross size above 80,000 DWT, and therefore that will be the value considered. The reduction in expenses in this case is calculated at 33 percent and has a clear relation with productivity. In a strictly economical assessment, a port with modern operational characteristics, such as Sepetiba, should preferably specialize in vessels of that size. In this case, it is worth remembering that the expected reduction regarding the current freight (US$ 23/t) is of US$ 7.59/t, a value that is even more representative than the others.

If we are to include in all this a reduction in port tariffs from the current US$ 9/t to US$ 3/t, according to competitive standards, there will be a global unit reduction of US$ 18.19/t, attributed exclusively to the modernization of the national port system. Brazilian agribusiness will record a real gain in the F.O.B. price of that same order and will incorporate an extraordinary resource of US$ 272.85 million per year. This is the price of the national port inefficiency for the Soybean Complex, without considering a possibly greater volume of resources if the loss of revenue, due to the current system's incapacity, is calculated. And it is essentially because it places itself as part of the solution that the implementation of the Sepetiba complex acquires a larger scope.

5. THE PORT'S ADVANTAGES AND ITS LIMITATIONS:

The greatest problem faced by port agencies throughout the world has been precisely how to transform conventional ports with outdated designs into modern terminals, with sophisticated operational characteristics. From this perspective, an important advantage of Sepetiba, located 50 nautical miles west of the city of

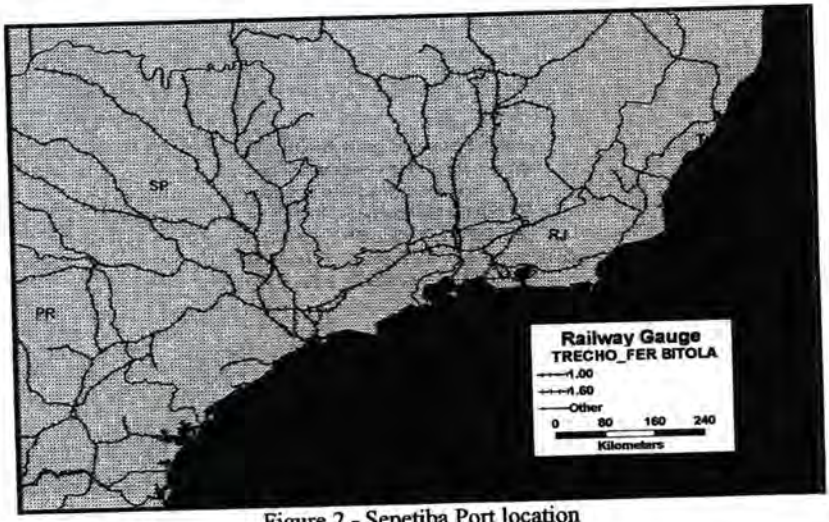


Figure 2 - Sepetiba Port location

Rio de Janeiro, is the existence of neighboring areas still free from any direct urban interference. Therefore, there is enough space for a design adequate to the highest standards of port engineering. If this condition cannot be guaranteed, that is, without back areas of preservation, assured by the law for the use of soil, and without equipment, layout, and modern operation methods, its privileged location in the Rio de Janeiro-Santos highway axis, its potential railway accesses, or the satisfactory depth of its waters, among other highly publicized advantages, are of little use. The justified excitement with regard to a bulky undertaking that can set a landmark in the modernization of the Brazilian ports, should not disguise situational inefficiencies capable of compromising future results. One clear example is the restricted access of the port to the railway network that crosses the greater part of the productive areas of the Brazilian Cerrados. A broad survey of the macro-logistic chain in this "hinterland" is therefore necessary. Figure 2 show the Sepetiba port location

6. THE FRONTIERS OF THE SEPETIBA HINTERLAND (Preliminary)

In the survey of the Sepetiba port Hinterland, only ports capable of competing for the draining of the Cerrados production are of interest; that is: Paranaguá, São Francisco do Sul, Santos, Sepetiba, and Tubarão, according to figure 3. At a first approximation, the Geographic Information System used considers that each of these ports has the capacity to absorb the entire exportation flow from the Cerrados for soybean and meal in the project's forecast. This represents 67 percent of the Brazilian exportable volume, which in turn corresponds to 62 percent of the national production. The remaining 33 percent would be referent to the exportable production from the South states, not considered in this survey. Under this hypothesis, the GIS produced a map of the of the natural attractiveness of the ports for soybean and meal, from a strictly geographic point-of-view.

For the situation originally forecast, see figure 3, the results were:

- São Francisco would attract **0%** of the export total	(-)
- Paranaguá would attract **39%** of the export total	(6,753,383)
- Santos would attract **40%** of the export total	(6,926,546)
- Sepetiba would attract **12%** of the export total	(2,077,964)
- Tubarão would attract **9%** of the export total	(1,558,473)

Under strictly geographical circumstances, we notice that the mass center of the important production zones of the Cerrados and the state of São Paulo is closer to the Santos and Paranaguá ports.

If we consider, besides the geographical distance of the ports with regard to the production centroids, a limited port capacity of the level of 1 million tons in São Francisco, 4 million in Paranaguá, 2.5 million in Santos, 3 million in Tubarão (under construction), and limitless capacity in Sepetiba (to be projected), the result is as follows:

- São Francisco would attract **6%** of the export total	(1,038,982)
- Paranaguá would attract **23%** of the export total	(3,982,764)
- Santos would attract **14%** of the export total	(2,424,292)
- Sepetiba would attract **47%** of the export total	(8,138,692)
- Tubarão would attract **10%** of the export total	(1,731,636)



FIG 3 - Geographic attractiveness

Rio Grande is considered to have the capacity to move 4.5 million tons/year, while Paranaguá and São Francisco correspond to a total of 8 million and 2 million tons, respectively. However, the total capacity of the Rio Grande port and half the capacity of the other two will be committed to the draining of the soybean and meal harvest from the South.

The last hypothesis surveyed with the GIS considers, besides the forecast capacity restrictions, the influence of port and maritime costs valid for each link in the analysis. Under these circumstances, which are very close to current reality, the outcome was:

- São Francisco would attract **10%** of the export total	(1,731,636)
- Paranaguá would attract **23%** of the export total	(4,000,000)
- Santos would attract **12%** of the export total	(2,038,982)
- Sepetiba would attract **37%** of the export total	**(6,389,820)**
- Tubarão would attract **18%** of the export total	(3,000,000)

This would be the preliminary diagnostic of the attractability of Sepetiba for soy grain and meal. Alternative draining through the South by the Paraguay waterway [11] or through the North by the Araguaia or Tocantins waterway or the North/South railway were taken into consideration. These are routes demanding construction work and resources of greater bulk and that will be assessed later.

7. THE IMPACTS OF THE NEW PORT IN DIFFERENT SCENARIOS

When considering a preliminary scenario without the intended implementation of Sepetiba and where the current port structure is maintained, the situation reaches alarming patterns. The ports operating soybean and meal in Brazil have a joint capacity of the order of 18.5 million tons and are already operating in a system of total saturation. Taking into consideration the construction work to duplicate the current capacity at Tubarão from 1.5 to 3.0 million tons, the maximum capacity ceiling is of the order of 20 million, a volume the country will be reaching by 2005. Therefore, until then, Brazilian agribusiness would bear the costs of the current port inefficiency and, from then on, would no longer be able to satisfy the demands projected. An adequate alternative would be the inclusion of a new port with sophisticated design, since expansions are usually expensive and frequently serve only as palliatives. The costs for this scenario have already been set out above.

In a second scenario, there is the Sepetiba Complex with the capacity to receive **6 million** tons yearly of soybean and meal, connected to Central Brazil by a Central-Southeast railway corridor, including, as well, a portion of the Ferronorte production to be concluded in its southern section. The capacity of the system will increase to 26.0 million tons, a figure reached only at the project's forecast end, therefore enabling the programmed exports. The introduction of a new port in the Southeastern system is, consequently, more than an issue of cost reduction, but assumes the shape of an absolute priority. In this second scenario, Sepetiba would attract the greater part of the exportable production from the Cerrados, since the access links to this port have in its favor a lower cost for the ship x port set and the advantage of replacing trucks for soybean trains. Continental transportation would benefit from the reduction of the current average cost of US$ 40.00/t, for the Cerrados, to US$ 25.00/t, according to the simulation developed. It is therefore possible to project a reduction of the order of US$ 33.19/t, when considering the benefits of a modern port structure (-18.19/t) and of a continental railway transportation (-15/t). The volume exported will vary yearly, but by 2010 (center of the interval range), 6 million tons would be flowing through Sepetiba. This amounts to an average gain of the order of US$ 200 million yearly for the Soybean Complex.

In the third and last scenario, the Sepetiba port would be under the same conditions as those described above, but disconnected from the Central Brazil railway network, as it is today. The links ending in Sepetiba continue with the advantage of a reduced impedance referent to the Ship x Port system, but a remarkable migration occurs of the cargoes towards Tubarão. In this scenario, Sepetiba would haul about 2 million tons, against 6 million to Tubarão, which must prepare for a volume of that order, in a future scenario in which Sepetiba cannot count on a direct railway link with the Cerrados.

8. CONCLUSIONS:

When considering the historical adjusting trend of soybean production by region in the country, the establishment of an intermediate port alternative between Tubarão and Santos is more than a question of optimizing the existent logistic chain. It is actually an issue of allowing the projected flow rate. In this aspect, it is important to predict a capacity and facilities compatible with the directives to be set out in a later, more detailed study.

In describing the outlines of a new macro-logistic chain to be structured in the short term, it is possible to become aware of clear signs of volumes that seem to justify investments in an effective connection between the Southeast and the Central-East railway networks. Without it, the attractive force of Paranaguá, Santos, and Tubarão (400 km farther) is expanded, against a joint capacity already in its saturation limit. It is also important to stress the importance of the study of new port outlets for the North of the country, with the intensive use of railways and waterways and important gains in scale economy.

Considering an average yearly volume of 6 million tons of soybean and soy meal to Sepetiba, as of the middle of the next decade, annual benefits of the order of US$ 200 million, for the simulated conditions, are calculated. We must stress the fact that differentials of this size could mean the placement or not of a product in the consumer market, directly affecting the production structure and competitiveness of the growing grain crop originating from Central Brazil.

Finally, a specific examination of table 1 allows us to register the importance of a broad, agile, and well-directed tax reform in the country, despite the fact that this was not a subject of the study. What can be perceived is a high tax load that reduces external competitiveness of the Brazilian soybean complex products.

ACKNOWLEDGMENTS

Support of this paper was provided by Castro, Ana Célia(CPDA); Trigueirinho, Fábio(ABIOVE); Mac Dowell, Fernando(IME) and academic staff of the transportation engineering master program of the Military Institution of Engineering(IME). We are grateful to them.

Bibliographical References:

[1] Trigueirinho Fábio - Abiove, A Multimodalidade Como Fator de Competitividade: Visão da Agroindústria, Outubro de 1995.

[2] Abag - Associação Brasileira de Agribusiness, Segurança Alimentar: Uma Abordagem de Agribusiness, Edição Abag, 1993

[3] Macedo Jamil (EMBRAPA - Empresa Brasileira de Pesquisa Agropecuária), Os Cerrados Brasileiros: Alternativas para Produção de Alimentos no Limiar do Século XXI, in Revista de Política Agrícola, Maio

[4] Castro C. Ana, Estudo da Competitividade da Indústria Brasileira, CPDA, 1994 de 1995

[5] Furlan L. Fernando, O Setor de Óleos Vegetais, Abiove, 1990

[6] Sparks Companies Inc., The Future Structure of the Global Oilseeds Industry, March 1992

[7] Ciani Ruben et alii, Estudio de Competitividad Agropecuaria y Agroindustrial, de Argentina, Octubre de 1993

[8] Furtado Rogério, Perspectivas Agrícolas: Mudança de Rumos, in Revista Globo Rural, Outubro de 1995

[9] Novaes Galvão A., Economia e Tecnologia de Transportes Marítimos, USP, 1975

[10]Magalhães B. Paulo e Keller R. Rômulo, Conceitos e Procedimentos Aplicáveis ao Transporte de Carga Geral por Cabotagem, IME/1996

[11]Mac Dowell C. L. Fernando, Análise Sistêmica do Setor Portuário Nacional, Julho de 1995

[12]Barroso Sérgio, Global Perspective of Economic, Political, and Other Factors Affecting Demand and Supply of Protein Meals, Abiove - Brazilian Vegetable Oil Industry Association, 1995

TRENDS IN LOGISTICS PROFESSIONAL DEVELOPMENT: SKILLS vs. CONCEPT - CASE STUDY: THE LOGISTICS INSTITUTE

Victor S. Deyglio, Canadian Professional Logistics Institute and
David M. Cape, P.Log., Ryerson Polytechnic University

This paper provides a conceptual framework for discussion, and is not intended to be a detailed analysis of the issues at hand.

The Logistics Challenge: The real challenge today is not supply chain management, but Logistics strategic leadership. To meet this challenge, the Logistics community in Canada founded the Canadian Professional Logistics Institute as a not-for-profit corporation under Part 2 of the Canada Corporations Act, originally November 01, 1989 and with Supplementary Letters Patent February 28, 1992.

Strategic leadership builds on competence, motivation, and the commitment to life-long learning. In meeting this challenge, the Logistics Institute co-ordinates activities and efforts among industry, government and education stakeholders in order to

* establish a Logistics profession
* develop comprehensive training in Logistics
* define Logistics career opportunities for a global economy
* sustain Logistics human resource development in Canada.

The unique value the Logistics Institute brings to the Canadian Labour Market and the Logistics community, both in Canada and worldwide, is professional certification in Logistics: professional status involving the *P.Log.* designation earned through certification training and built on competence achieved through experience., and maintained through continuous re-certification. All activities initiated and undertaken by the Logistics Institute aim to support and sustain this primary objective.

The key issues are:

a. the human resource, management and competitive issues facing the Logistics labour market, and how professional development attempts to deal with these issues;
b. the Professional Mandate, and how it differs from the mandate of traditional educational institutions and their programs;

c. the Logistics Professional Development Process, as designed, developed and delivered by the Logistics Institute, and how it meets the professional mandate.

Logistics: Competitive, Labour Market and Management Issues

Competitive Forces of Change: Change is a "way of life" for all businesses, and there will be no end to change. It is a popular notion that we can, and even must, "manage change", but in truth, we can no more "manage" change than adequately theorize about chaos.

Nonetheless, we can learn something about change, identify the forces of change, and prepare ourselves to meet change head on. We, as individuals and enterprises, are the real focus of "managing change"; for, in the end, while we can neither completely manage nor eliminate change itself, we can manage ourselves and our responses to change.

There are a number of forces changing how business is done today. Among these forces, we can list: restructuring markets, demanding customers, changing technologies, trading blocs, global competitors, environmental concerns, evolving human resource needs, dwindling natural resources, and demanding shareholders.

Balances must be struck: between customer value and shareholder value; between sustainable development and the environment; between corporate/employer requirements and labour/employee needs; between local, regional and global markets. As we compete in world markets, so the world competes in our backyard. Whatever our particular circumstances, we should be prepared to re-think our traditional paradigms and revolutionize our attitudes. Success today does not guarantee success tomorrow.

Logistics leaders are -- or should be -- concerned with all these forces of change, but two stand out in particular: demanding customers and evolving human resource needs.

The Customer Challenge: There are many ways to define a "customer", but the widest description identifies the customer as "anyone in the business chain who can positively or negatively affect the successful outcome of an enterprise".

There are external customers, identified both as consumers or end-users; and as commercial or industrial clients of products or services. Even the government can, in some instances, be considered an "external customer" as

per this definition: for example, Canada Customs would be a client seeking appropriate customs information and duties, without which they could seize the goods, and negatively affect successful delivery.

There are internal customers, identified as corporate divisions, departments, work units, and even fellow employees -- all of whom can have positive or negative impacts on the work at hand simply by providing or withholding information. The greatest competition that exists in North American business today is often inter-departmental.

Each customer wants something different. But generally, all customers want quality products/services, fair [not necessarily cheap] prices, pre and post sales service, and instant access to goods and services. All customers have well-ness and environmental concerns. In addition, commercial/industrial customers want suppliers and sometimes even consumers to manage/handle/store inventory. "Inventory en route" into and through the supply chain is often more important than "inventory on hand", whether in a JIT delivery system or an ECR consumer goods supply system.

Given these overall demands from customers, one should nonetheless take a critical look at the "customer service ethos" considered essential to leading edge Logistics. Such a stance is not meant to criticize such management techniques as "ABC customer analysis" or the application of "Pareto's Law [80-20 rule]" to the development of customer service policies and directions. While all customers may be equally demanding, it is only common sense and good business to choose which customers merit the greatest amount of effort and energy. But more fundamentally than analytical tools and management tactics, we need an attitude check here: customers should not be "served"; a "master-servant" relationship is unacceptable under the best circumstances, because it defines success in terms of power and control. The "leveraging paradigm" [what can I get out of you] needs to be rethought, and replaced, by the "partnering paradigm" [how do we win together]. And this paradigm is applicable equally to all our customers, whether external or internal, whether government or labour.

Partnerships are built on trust, shared responsibility and communication. Partnerships begin with, and revolve around, people. Who are the people we can depend on to ensure success in a constantly changing global business environment?

Restructuring the Corporation: Before we can answer the "people question", we should look briefly at the corporate and business contexts in which people are expected to work. In the 1990's organizations must become high

performing enterprises: customer focused, obsessed with quality and service, cost competitive, effective at working in cross-functional teams, driven to do things faster, geared to continuous improvement, able to learn continuously, and superior in a few core areas of competence.

The challenge is to shift from a command structure to a dynamic process model where:

* pyramid structures give way to participative processes [triangle (top-down) replaced by circle (face to face)];
* passive/command communication is replaced by active/ listening communication;
* functional/departmental silos become cross-function teams.

The new organization has a flat structure with minimal hierarchy and is run by self-managed process teams made up of functional specialists [Logistics is one such process team]. Managers must become team leaders; employees are now team players. The measures of effectiveness are value: cost, quality, time, and service. Compensation and reward are associated with knowledge and team success, not with corporate position.

Surprisingly, this new organizational approach is not so new: the federal public service and many provincial bureaucracies have been implementing self-managed process teams since the 1970's in a service, non-competition context. Only in the 1990's has the private sector begun to consider the competitive advantages of redefining and redesigning the workplace along process lines.

But the "dream" can also be a "nightmare". The reason for this is not in the vision, but in the implications of the vision. We must recognize that the process model has an impact on the total organization, including people in the workplace, the workplace culture, and business systems. Indeed, we often limit our focus to streamlining business systems as key to success, while ignoring the people and culture components. After all, it is easy to retool systems, but more difficult to reshape culture and attitudes, and nearly impossible to deal with people.

The flattened organization will have fewer people, but each person will have increased responsibilities/control. There will be less direction from the top, and more front line customer oriented management. The new workplace culture will demand a higher level of mutual trust and a greater flow of communication. Whatever else we do as a business enterprise, effective human resource management is the real essence of success today.

Human Resource Management: There are four keys to effective HR management:

> *Leadership*: the ability to influence and motivate people to achieve goals; the skill to establish and pursue a vision; the willingness to accept responsibility; the commitment to treat people with respect; the commitment to learn continuously.
>
> *Valuing individual differences:* the ability to understand how individual behaviour affects group functioning and how work teams can use individual strengths to make the group succeed.
>
> *Working together:* the skill to manage the process of moving from a "collection of individuals" to a "high performing team".
>
> *Performance management*: the ability to establish clear goals for the organization, department, team and individual; the skill in balancing individual differences and team activities to achieve maximum benefit and performance gain; the ability to make change happen, adopt new habits, and be flexible.

In the new workplace we expect people to take risks, learn from experience [even mistakes], look outward [customers, competitors, suppliers], pay attention to results and not just procedures, have a strategic view and improve continuously.

These are "heavy expectations". How do we lead people to meet these expectations? Some key attitudes to cultivate are:

* starting with the belief that being different does not equate to being less;
* never assuming you ever reach full agreement on key issues;
* allowing time to confirm consensus;
* recognizing silence does not necessarily mean acceptance;
* never assuming your message is clearly understood;
* never assuming that normal for you is normal for everyone.

Leaders know that "smarts" are not always at the top [in the board room], and that employees do not leave their brains at home when they come to work.

Developing leaders is harder than developing managers. Leaders must innovate, not just administer; they must develop and improve, not just maintain; they must rely on people, not on systems; count on trust, not on control; do the right things, not just do things right.

Logistics – Strategy for Competitive Advantage in a Global Economy:
Where does Logistics fit in the new world order? Some say that logistics is the "new science" of competitive advantage. But the "new science" is really a relatively old military support system that has recently received some front page press in the wake of the Persian Gulf war. The Gulf war was emphatically a "logistics war" waged with leading-edge enabling technologies. The military elite from that war are now being hired as senior logistics executives in the private sector. To quote the New York Times business section from November 3, 1993:

The clearest signal that logistics has moved onto centre stage [in the private sector] came last month when the retail division of Sears, Roebuck & Company hired Lieutenant General William G. Pagonis, who managed the tangled military supply chain during the Persian Gulf war, as senior vice president in charge of logistics.
This fact was reconfirmed in the Globe and Mail's Report on Business, January 8, 1996, in an article identifying the top 10 "emerging trends to keep an eye on this year". It is significant to note that Logistics is listed as the first of these top 10, although one can wonder if this is the result of "column-inch" editing rather than meaningful ordering.

For the purposes of today's discussion, logistics can be understood in three ways: as a business process, as a competitive strategy and as a profession.

Logistics is the *business process* concerned with the effective and efficient movement of materials and information from source to consumption. The logistics process team is made up of functional specialists in purchasing, production planning/demand forecasting, inventory management, materials handling, warehousing, transportation, distribution, order processing, and customer service.

Logistics *partners* include both users of logistics services and providers of logistics services. Users are the traditional shippers, and include manufacturers, retailers, wholesalers, distributors. Providers are the traditional carriers, and include transport carriers [all modes], public warehousing operators, freight forwarders, customs brokers, as well as cargo insurance underwriters and international bankers. In a deregulated transportation environment, it is often difficult to distinguish between "shippers"/users and "carriers"/providers.

The logistics *process* involves the comprehensive management of the total supply chain by both internal and external suppliers, working in partnership for the purpose of achieving functional integration [streamlining] and

efficiency [co-ordination] in support of customers. The logistics business/work ethic is: getting the right product to the right destination in the right condition at the right time and for the right price.

But logistics is more than an "integrating/co-ordinating" business process; logistics is more than supply chain management; logistics is more than a bridge or pipeline between supplier and customer. Logistics is a *competitive strategy* that positions a company in the marketplace, and consequently is necessary to meet and control customer demand.

As such, logistics is a determining factor in product design and market development: how we move, store, package and deliver a product should determine how it is designed and made, as well as to whom, when or even whether it is delivered. In this sense, logistics does more than integrate business functions; it integrates products and customers.

The macro significance of the strategic importance of logistics cannot be underestimated:

> Think of supply chain management as nothing less than the re-engineering of the entire economy -- one convoluted chain at a time. Once you start re-conceptualizing you company as a collection of business processes, it becomes dauntingly clear that those processes extend beyond the portals of any one building, the boundaries of any one corporation, and the borders of any one country.
>
> As the economy changes, as competition becomes more global, it's no longer company vs. company, but supply chain vs. supply chain.
>
> Fortune, November 28, 1994.

The real logistics challenge is not supply chain management, but logistics strategic leadership. How can we develop logistics managers who can lead? We need to create a new *logistics professionalism* in a global business environment.

The Professional Mandate

A profession is an occupation which is recognized and acknowledged by society to be distinct from a trade by its uniqueness of skills, its requirements of learning, and its significance to the affairs of others, and which an individual professes to be skilled in.

Professionals are individuals, not corporate bodies. Certification is public acknowledgement that individuals using the professional designation are competent in skills related to the profession, and therefore are entitled to practice this profession. Certification distinguishes a professional from an employee and a profession from a job.

Admission into a profession requires expertise, and not just knowledge. Expertise differs from knowledge in that it combines practical knowledge with individual ability. Expertise can be taught and learned, but is perfected in application.

The process towards professional certification is more accurately identified as professional development than simply education. Professional development includes both formal education [strategic values], training [technical acumen], and work experience [applied skills]. Professional development bridges the gap between formal education and work experience by requiring both in the process towards professional certification.

Earning a degree or diploma is the end of a process. Earning professional status is the beginning of life work in applying knowledge to experience with increasing skill, precision, and certainty. A professional is a practitioner and not just a graduate.

For a profession, formal education is not an end in itself, as with educational institutions. Nor is formal education a practical means to a functional end, as with business interests. Rather, for a profession, formal education, integrally linked to practical experience, is the guarantee of competence and the standard of trust, consistency, quality and expertise.

Professional competence begins with the professional development process, but grows throughout an individual's professional life. Retaining professional status entails on-going professional development as essential to maintaining professional competence.

A professional is first and foremost committed to the profession as the guardian of competence, and subsequently as a career opportunity. A professional equates achievement to the certification of competence, and not just to corporate status or compensation levels.

Building on a reference to alternate corporate organizational paradigms first introduced by Peter Drucker in 1968, we can envision the *Logistics Professional* as being like a symphony conductor, who leads and co-ordinates specialists, to perform together [teams], by motivating their contributions, and

balancing their achievements, guided by a creative vision [knows the score], and enabled by personal professional competence, to the satisfaction of the customer [audience].

Concomitantly, the skills required of logistics professionals can be identified as four-fold:

* **logistics skills:** specifically identified as integrating and partnering skills, and not simply functional skills;
* **business skills:** focused on process, quality, and continuous improvement;
* **management skills:** involving leadership, empowerment, and team building;
* **professional skills:** concerned with business and professional ethics, as well as with the risks and liabilities of the responsible leader.

Logistics Professionals have a responsibility to themselves to develop these skills, and have an equally weighty responsibility to the public to certify their competence in them. It is irresponsible to be called a "logistics professional" without being able to substantiate logistics competence in concrete and real ways.

The Logistics Professional Development Process

To realize this vision of a logistics profession in Canada, the Canadian Professional Logistics Institute was established as a private sector initiative jointly funded by HRD Canada and industry. The Logistics Institute is responsible for testing, assessing and certifying the competence of "P.Log." professionals, and for accrediting and providing, where necessary, the professional development needed to earn such certification.

As part of the Certification Policy ratified by the Institute's Board in August 1993, and with input from participants in a workshop on Integrated Logistics Management held in December, 1993, the Institute developed a formal Professional Development Framework for Certification in January 1994. The Framework embraces the following principles:

* The scope of certification is professional, not simply educational. Emphasis is on training, skills development, and professional development, not only on access to information or concept development.

* Skills development involves the ability to apply and implement, and not just to know. What one can do in a competitive business environment is the "value added" to what one knows as a result of the education process.

The *P.Log.* is a professional statement of competence in Logistics and a personal statement of commitment to Logistics as a career. Earning the *P.Log.* involves two steps: Assessment and Certification. Retaining the *P.Log.* involves recertification.

An independent **Assessment** evaluates an individual's career to date by analyzing prior education and experience in Logistics related fields. The Logistics Career Diagnostic that results from assessment identifies strengths and opportunities for career development. In light of this Diagnostic, the Institute recommends training options to "fill the gaps" and identifies requirements for *P.Log.* certification.

Certification enables individuals to earn the *P.Log.* by

* undertaking a minimum of one or maximum of four certification modules, depending on assessment outcome;
* completing a minimum of five years experience in Logistics fields in Canada, two required for assessment;
* paying appropriate fees for assessment, training, and certification.

Since 1994, the Institute designed, developed and delivered four Certification Modules:

> ***Integrated Logistics: Supply Chain Management.*** Introduction to total system concept of integrated logistics, the articulation of its parts, and its relevance to successful business in a globally competitive marketplace.
>
> ***Integrated Logistics: Customer-focused Diagnostics.*** A practical consideration of professional diagnostic tools, technologies and strategies that help ensure optimal logistical and business performance.
>
> ***Logistics Professionalism: Leadership Strategies.*** An opportunity for the Logistics professional to develop the leadership and strategic planning and implementation skills needed to be a member of the corporate executive/ management team, through insights into and applications of current, leading-edge business strategies.

Logistics Professionalism: Professional Ethics. An opportunity to examine and reflect on the ethical issues, and the risks and liabilities faced by Logistics professionalism.

Modules are open to certification candidates and the general public, and may be taken in any order. To be considered for certification, candidates must be assessed, but assessment can be done either prior to or after completing modules. Prior assessment is not a requisite for registering in modules.

What distinguishes the Institute's certification process is an emphasis on skills development, rather than access to information or concept development. Each module involves a "self study component" and "interactive sessions".

While the overall content of each module is the same in outline for both components, the interactive sessions entail more than just small group exercises illustrating or applying concepts introduced through the self study process. Minimal time is spent in sessions reviewing self study content, while maximum time is devoted to applied learning. Session "teachers" do not teach; they facilitate interaction, and participants learn by doing and from each other.

Self study is the "concept development component" of each module, and entails selected readings from Logistics and management literature. Exercises are part of this process, but are intended only to assist candidates in focusing awareness, distilling information and relating theory to personal business experience. Exercises are not used to gauge or test concept acquisition.

Interactive sessions are the focal point of each module, and have as their primary objective the development of interconnectivity skills among professionals. To ensure participation, sessions are restricted to a maximum of 35 and entail the use of simulations [games], diagnostic tools, cases and team projects. Simulations and diagnostics tools are the quintessential skills development processes in each module: simulations facilitate group interaction; diagnostic tools probe personal values and identify personal and business skills [see chart for details].

The P.Log. Designation: BUILDING COMPETENCE

MODULE	SELF STUDY COMPONENT	INTERACTIV E SESSIONS	CASES SIMULATIONS
SUPPLY CHAIN MANAGEMENT	6 weeks: Lambert & Stock, *Strategic Logistics Management* [third]	1 weekend 3 days	**Cases:** Benetton Ferle [Canadianized]
CUSTOMER FOCUSED DIAGNOSTICS	4 weeks: selected readings from HBR, Sloan-MIT, California Management, Business Quarterly, A.T.Kearney, Western Business School	2 weekends 3 days each 3 weeks apart	**Diagnostics:** Cause-Effect, Pareto, Flow Chart, Benchmarking, Mapping, Activity Based Costing **Cases:** Laura Ashley, Bentwood, TECHNO, Wal-Mart, Chembright **Simulations:** Logistics World [CPLI owned]
LEADERSHIP STRATEGIES	4 weeks: selected readings from HBR, Sloan-MIT, California Management, Business Quarterly, A.T.Kearney, Western Business School	2 weekends 3 days each 3 weeks apart	**Simulations:** "Tower", BPR "Styrofoam Cup" "Leadout" **Diagnostics:** "Leadership" "Team Diagnosis" "Resilience" "Change" "Assimilation" **Cases:** Maltby [CPLI]
PROFESSIONAL ETHICS	4 weeks: W.D.Hitt, *Ethics and Leadership* [Battelle Memorial Institute]	1 weekend 3 days	**Diagnostics:** Situational Perceptions Observations Test [SPOT] **Simulations:** Grey Matters [Martin Marietta] **Cases:** various dilemmas

In 1995, the Institute began to enhance its certification process through the design and development of technology-based management training simulations. At this time, three modules use simulations in their delivery: Diagnostics: Logistics World; Leadership: BPR and other simulations; Ethics: Grey Matters.

The Institute plans to develop several CD-Rom based simulations: Logistics/ Inventory, Leadership and Maltby [case study]. Each CD-Rom will be interactive, challenging players to demonstrate their Logistics and decision-making skills against industry norms. These simulations are integral to certification in that they bring "competency testing" to the process.

Recertification is a policy developed by the Logistics Institute to give substance to the conviction that professional competence begins with the professional development process, but grows throughout an individual's professional life. Retaining the *P.Log.* designation involves meeting two requirements:

* annual renewal of professional membership in the Logistics Institute;
* maintaining competence through continuing professional development.

Continuing professional development entails meeting increasing levels of training requirements over a three year cycle after earning the *P.Log.*

The Logistics Institute is not an educational institution, but does provide training services as part of its certification process to members, industry and the general public. As such, the Logistics Institute is registered with Revenue Canada as an "educational institution for personal income tax purposes". All costs associated with training, including assessment fees, the price of each module, and the educational costs for all conferences and workshops, are tax deductible.

Conclusion

> Our traditional organizations are designed to provide for the first three levels of Maslow's hierarchy of human needs: food, shelter and belonging. Since these are now widely available to members of industrial society, our organizations do not provide significantly unique opportunities to command the loyalty and commitment of our people. The ferment in management will continue until organizations begin to address the higher order needs: self-respect and self-actualization.
>
> William O'Brien, President and CEO
> Hanover Insurance

[quoted in P.Senge, The Fifth Discipline]

The *P.Log.* professional designation is a unique opportunity towards "self actualization" not simply because it is a symbol of competence, but more importantly because the process to earn to designation builds competence. Cases re-enforce experience-based awareness and knowledge; diagnostics raise self-awareness and enhance skills; simulations facilitate interconnectivity among professionals. In the end, the *P.Log.* builds community, and that is the primary value added to Logistics in Canada and worldwide.

INTEGRATING THE CASE METHOD IN TRANSPORTATION AND LOGISTICS EDUCATION

Louis A. Le Blanc* and Conway T. Rucks*

This paper describes what is involved in learning through using the case method, with particular emphasis on transportation education. The case method calls for discussion of real life situations that have been faced by transportation managers or executives. Cases approximate the kinds of situations that students would encounter in a managerial role. These situations have been prepared by casewriters, who have sought as good reporters to present the information available to the manager or executive concerned.

Educational Purpose of a Case

Cases assist managers sharpen their analytical skills, since they must produce quantitative and qualitative evidence to support recommendations and decisions. In case discussions, participants are hopefully challenged by instructors and fellow participants to defend their arguments and analyses. The desired effect on the participants is a sharpening of problem-solving and an increased ability to think and reason rigorously.

Case studies span a wide range of organizations and situations, providing an exposure far greater than a participant is likely to experience in their day-to-day routine. Cases permit building knowledge across various management subjects by dealing selectively and intensively with problems in each field. The participant comes to recognize that the problems he or she faces as a manager are not unique to one organization and may develop a more professional sense of management.

Cases and the related case discussions in class, provide the focal point around which the participant's expertise, experience observations, and rules of thumb are brought to bear on managerial problems. What each participant brings to identifying the central problems in a case, analyzing them, and proposing solutions are as important as the content of the case itself. The lessons of experience are tested as the participant presents and defends his or her analysis

* L'Université d'Arkansas à Petit-Rocher

against those of others having different experiences and attitudes gained by working in other positions. It is here where common problems, inter-dependencies, differences of attitudes and organizational needs, and the impact of decisions in one sector of an organization upon other sectors emerge and force the participants to face and deal with them.

Perhaps the most important benefit of using cases is that they help managers learn how to ask the right questions. A greater part of the tasks of a top manager is to ask useful questions. Answers are relatively easy to find, but asking good questions is a more critical skill. In suggesting discussion questions for each case, the faculty is not preempting the participant's task of identifying the problems in a case. The instructor must still ask what really are the problems which a manager has to resolve. In real-life situations, too often facts and figures are manipulated without the problems having been specifically defined.

A final benefit that the faculty seeks to achieve by using cases is that the case method of learning renews the sense of fund and excitement that comes with being a manager. Participants should come to sense, once again, that being a manager is a great challenge - intellectually, politically, and socially.

How To Prepare A Case

The use of the case method requires that the participant first read carefully and to think about each case (approximately two hours of study for each case). No single way works best for everyone. Some general ideas are listed below, and they can be adapted to the method which works best for an individual.

> Read the first few paragraphs, then go through the case almost as fast as one can turn the pages. While doing this, one should ask themselves "What broadly is the case about and what types of information is being given to analyze?"
>
> Read the case again, but this time very carefully, underlining key facts as one proceeds. The participant should then ask: "What are the basic problems this manager has to resolve?" The participant should try hard to put him/herself in the position of the manager in the case, developing a sense of involvement in the manager's problems.
>
> The participant should note the key problems on scratch paper, then proceed through the case again and sorting out the relevant considerations for each problem area.

> The participant would then develop a set of recommendations supported by their analysis of the case data.

Until now, the best results would come if a participant would have worked by himself or herself. However, if they have time before class, it is useful to engage in informal discussions with some of the other participants about the case situations. This can be done at social hours, meals or at any occasion before class. In fact, some people like to form discussion groups to conduct such conversations. The purpose of these discussions is not to develop a consensus or a "group" position; it is to help each participant refine, adjust, and amplify his or her own thinking.

What Happens In Class

In class, the instructor usually will let participants discuss whatever aspects of the case they wish. However, it is the faculty member's role to prod students to fully explore the avenues of investigation down which they have started and to lead them into consideration of areas that they may have missed. A healthy debate and discussion should ensue. Sometime, the instructor will tell business "war stories" from other settings that relate to the situation under discussion, and he or she will encourage participants to do likewise. Finally, the instructor will summarize the discussion and draw out the useful lessons and observations which are inherent in the case problem and which emerge from the case discussion.

A typical request at the end of a case discussion is "What is the answer?" It should be emphasized that the case method of learning does not provide the answer. Rather, several viable "answers" will be developed and supported by various participants within the total group.

Business is not an exact science. There is no single, demonstrably correct answer to a business problem. For the student or business person, it cannot be a matter of peeking in the back of a book to see if he or she has arrived at the right solution. In every business situation, there is always a reasonable possibility that the best answer has not yet been found - even by teachers.

The instructor may suggest the pros and cons of various alternative actions or tell what actually happened in a particular situation. However, what actually happened or what any one person thought ought to be done is of no great significance; what is significant is that one know what they would do in a specific situation.

Learning results from rigorous discussion and controversy. Each member of the class, including the instructor, assumes a responsibility for preparing the case and for contributing ideas to the case discussion. The rewards for these responsibilities are a series of highly exciting, practically oriented educational experiences which bring out a wide range of topics and viewpoints.

Getting Started Teaching Transportation With Cases

Most instructors of transportation and related subjects did not experience the case method while in school. The only exceptions to this would be those who attended one of a few schools that feature the case method, such as the Harvard Business School or the Western Business School at the University of Western Ontario (Canada). Although courses may have included a few cases, it is only a few schools, or a few faculty at non-case oriented schools, that emphasize the case method of teaching and learning. Consequently for most instructors, they did not experience the case method as a student and usually need some guidance and direction from an experienced case instructor.

In addition to needing a mentor, the beginning case teacher (possibly a seasoned faculty member without case experience) needs a plan to integrate the case method in his or her arsenal of teaching techniques, information about case teaching materials, and how to begin the process of integrating case teaching into existing courses or developing an entire course based on case learning.

Personal Experience With A Case Mentor

As a graduate student, case learning was not a feature of the graduate programs which we attended. Although case materials were widely available for these economics and business disciplines, case learning was not even a small part of the pedagogy of these graduate programs. As we began to teach more frequently in graduate programs (i.e., MBA), there seemed to be alternatives to the standard lecture format for these graduate classes. A colleague that we had known for several years began to serve as our unofficial mentor in this attempt to integrate cases in our courses. The mentor, a veteran faculty member and case teacher and writer at the Western Business School, would visit informally with us about our case teaching experiences, usually before and after each semester over a two year period. We did not discuss specific case materials, but only visited about strategies to begin and improve teaching using the case method. In addition to providing solid "technical" advice on case teaching, the mentor gave much psychological support to the effort to develop as a case teachers.

A Case Integration Plan

Most instructors who are not veteran case teachers are best advised to begin slowly by adopting only a few cases for their first course using this pedagogical tool. For a semester class, five cases might be an appropriate starting point. These cases might be inserted as a final exercise for major segments of a course. As the novice case instructor gains experience with this technique, they can infuse more cases along with lecture. Finally, if so desired, a class can be comprised of all cases and no traditional lecture component. This transition would occur over several semesters.

Not every course may lend itself entirely to the case method; but for the graduate level or upper division undergraduate course, there is much opportunity to integrate the case method into existing classes. But no matter what the instructor's objectives may be with regard to adopting the case method, an implementation plan is critical to ensure successful integration of case teaching into transportation or other related management courses.

Table 1. Sample Transportation Cases Related To Information Systems

Title	Mode	Year
American Airlines: The InterAACT Project	Air	1989
Burlington Northern: The ARES Decision	Rail	1990
Canadian Airlines: Reservations about its Future	Air	1993
Frontier Airlines	Air	1983
Singapore Tradenet: A Tale of One City	Multi	1989

Source: *Harvard Business School 1995-96 Catalog of Teaching Materials*

Locating Case Material

Several sources provide a wide assortment of case teaching materials. These materials include cases, teaching notes, videos, and case software. These items are available for a variety of areas such as general management, finance, operations management, information technology, management science, marketing, transportation and logistics. In the categories of transportation and logistics, materials are available by mode (e.g., aviation, trucking, shipping). There are many more listings for case materials in transportation than logistics in the major case material catalogs. But this is not to say that what is listed as a "transportation" case only relates to the management of a conveyance enterprise and is in no way related to the logistics function. There is no substitute for close review of case catalogs and their abstract listings to accurately determine the subject content of case material. See Table 1 for a sample of information technology cases related to transportation organizations.

Sources of Case Materials

The primary case collections are: the European Case Clearing House (ECCH); Harvard Business School (HBS); University of Western Ontario (UWO) (i.e., Western Business School); and the University of Virginia's Darden School (UVA). ECCH includes cases from many universities and organizations in Europe, including: the European Institute of Business Administration (INSEAD) at Fontainebleau, France; the International Management Development Institute (IMD) at Lausanne, Switzerland; London Business School; Cranfield University at Bedford, United Kingdom; Helsinki School of Economics, Finland; McKinsey & Company at Dusseldorf, Germany; and Erasmus University, The Netherlands.

Most of these case collections can be reviewed on the WorldWideWeb (WWW) or through other electronic connections. Paper and electronic (i.e., CD-ROM) catalogs are available for Harvard, Western and Darden case collections. For example, the *Harvard Business School 1995-96 Catalog of Teaching Materials* contains listings on more than 3,000 cases as well as other related course materials. Western publishes several individual catalogs for each functional area such as finance, general management, production/operations management, etc. In most catalogs, transportation is likely a subset of the production/operations management category. However, transportation and logistics are usually listed in the subject index of most catalogs. The 1995-96 Harvard Catalog provides 31 listings on transportation and 26 listings for logistics, with some overlap of listings.

Table 2. Harvard Catalog Subject Listings Related to Transportation

Subject Listings	Number	Sample Cases
Air Freight	14	DHL Worldwide Express Emery Worldwide Federal Express United Parcel Service
Aircraft	14	Airbus vs. Boeing Boeing and McDonnell Douglas Boeing 767: Concept to Production
Airlines	75	American Airlines, Inc.: Revenue Management Battle for the Skies: British Air's Bid for USAir Continental Airlines Scandinavian Airlines System Swissair's Alliances
Logistics	26	Benetton Gillette Co.: Evolution of EDI
Strategy		Sara Lee Knit Products: Quick Response at Hanes Value-Rite Distribution System
Railroads	21	Acid Rain: Burlington Northern, Inc. Massachusetts Bay Transportation
Authority		Texas High-Speed Rail Corp. Union Pacific Railroad: Transition to Client-Server
Trucking	7	CF Motor Freight in 1992 Consolidated Freightways: The On-Board Computer Project

The most expeditious way to search the entire four collections simultaneous is with the Case On-Line Information System (COLIS). This bibliographic database contains over 10,000 items and includes case studies, videos, technical notes, industry notes, case software and course modules. The entire COLIS collection has 171 listings containing the key word "transportation" and 73 listing containing the key word "logistics."

COLIS is a free-text retrieval system which allows searching on any set of characters that appear anywhere in the database. It provides users with the facility to combine search terms with AND or OR, and to repeatedly refine questions asked, allowing precise identification of appropriate cases. On-line help is available, and a simple menu sequence allows the system to be used confidently by individual without extensive computer experience. Any or all of the four collections can be searched at one time.

Not surprisingly, the Harvard case collection (by its sheer size) appears to dominate a COLIS search for transportation listings. See Table 2 for sample transportation case listings by subject. According to the 1994 *Teaching Materials Directory of the Western Business School* (Western Ontario), there were only 18 transportation listings and only two logistics listings. There were no listings for aviation-related subjects, railroading, shipping, nor trucking. Western did offer "Logsim," a computer simulation game for logistics education. As an aside, the Western case entitled "Throw Anna From the Train" (Parts I, II and III) was listed under women's issues.

Summary and Conclusions

Teaching by the case method is one of the most demanding forms of pedagogy for both students and instructors. Effective preparation of a case takes a significant amount of time and thought. Students must not only digest the "facts" of the case, but must also identify the key issues, the information that support their analysis of those issues, and the approach they would take for addressing the issues.

As instructors, we too must read the case thoroughly the gain an understanding of the situation, and must identify the key issues, supporting information, and alternative approaches for addressing the situation. It is only once we have completed these steps that we can actually begin preparing how to teach the *content* of the case. It is only with experience that we learn that the case serves as a backdrop for enabling students to discover the specific concepts and skills that the course is designed to teach.

But even after having prepared the content, we must still prepare for the *process*. How will I set the tone for the class and begin the discussion? What questions can I use to help students fully explore specific issues? Will I use mini-lectures during the class the help emphasize concept area, or will I wait until the end of class to summarize the key points? This level of preparation is not only required for each and every case discussion class, but is also required during the development and on-going management of the course itself.

Mastering the art and skill of effective case teaching is a complex process. Preparation to begin teaching a case method course requires a thorough understanding of the content and frameworks of the course, the students that you will be teaching, and the technical aspects of the classroom environment. The Western Business School offers a week-long workshop on for case teaching and another on case writing and research.

Teaching by the case method is one of the most challenging forms of pedagogy. Students bring high levels of enthusiasm to the discussions, and the case method teacher facilitates learning through discovery. This teaching style is much more demanding than "lecture style" teaching, but it is also tremendously rewarding.

References

Darden Case Bibliography 1995-96: Management Cases and Notes, Twelfth Edition Graduate School of Business Administration, University of Virginia, Spring 1995, Charlottesville, VA.

Dooley, Arch R. and Wickham Skinner, "Casing Casemethod Methods," *Academy of Management Review*, Volume 2, Number 2 (April 1977), pp. 277-289.

Erskine, James A., Michiel R. Leenders and Louis A. Mauffette-Leenders, *Teaching With Cases*, School of Business Administration, The University of Western Ontario, 1981, London, Ontario, Canada.

Harvard Business School 1995-96 Catalog of Teaching Materials, Harvard Business School Publishing, 1995, Boston, MA.

Leenders, Michiel R., and James A. Erskine, *Case Research: The Case Writing Process*, 3rd Edition, School of Business Administration, The University of Western Ontario, 1989, London, Ontario, Canada.

Reynolds, John I., "There's Method In Cases," *Academy of Management Review*, Volume 3, Number 1 (January 1978), pp. 129-133.

Western Business School Teaching Materials Directory 1994, Western Business School, The University of Western Ontario, 1994, London, Ontario, Canada.

The Case On-Line Information System, The European Case Clearing House, 1995, Babson Park, MA.

"The Trade Corridor that is the Rhine-Main-Danube Waterway"

Introduction

On 25 September 1992 a modern canal was opened in Germany between Bamberg, on the River Main and Kelheim, on the River Danube, allowing traffic to pass from the North Sea to the Black Sea. On a charitable view the canal had had a rather long gestation period: the Rhine-Main-Donau (RMD) canal was formally recorded as a corporate objective in 1921 and as long ago as the reign of Charlemagne[1] an attempt (albeit feeble) had been made to drain marshland to promote a canal linking the Main to the Danube.

It is the purpose of this short paper to examine some of the likely advantages for European commerce offered by the completion of the RMD waterway.

Matters historical

First, a little historical geography to set the scene. Whereas Charlemagne's canal attempt failed miserably (in 793 A.D.), a local royal - Ludwig I of Bavaria - made a much better job of canal construction in the nineteenth century. Indeed, with the critical assistance of guest workers from Italy,[2] Ludwig I managed to complete a course between the Main and the Danube in 1846. Both trade and travel expanded[3] and flourished for over 60 years. However, the outbreak of the Great War[4] in 1914 brought this golden period of commerce to an end.

---

1 Charlemagne's travels often took him from the Rhine and Main to the Danube (remember, he ruled a huge empire), hence it is hardly surprising he was keen to link the Main to the Danube by means of a canal. So the "Fossa Carolina", between the river systems of the Main and the Danube, dates from the times of this Franconian Emperor.

2 The use of guest workers, e.g. Turks, in the 1950s and 1960s underpinned the economic miracle in West Germany during the regeneration of this populous European power. So it would appear that guest workers can be "a good thing".

3 Given the Main-Danube waterway marked the route of Kings and Emperors over the ages the nineteenth century canalisation merely reflected the historical importance of this trade route.

4 As appears in later argument the pestilence of warfare has artificially created barriers to trade along the Rhine-Main-Danube waterway over the centuries.

As mentioned already, the RMD Company was established in 1921 and it was mandated to build a self-financing waterway facilitating cargo movements between east and west on ships between 150 and 3,300 (metric) tonnes. Work went well - locks were built and hydro-electric stations constructed - and the rise of National Socialism[5] did not hinder the prestigious RMD canal project. But, of course, the outbreak of the Second World War proved a great shock[6] to the waterway system. The immediate post war period and the decade of the fifties failed to generate sufficient interest for the ambitious modernisation scheme begun by the RMD Company. However, by the mid-sixties enough political will amongst Bavarian men of influence (keen to underline the ecological sublimity of the scheme and likely boost to trade and tourism) was manifest to revive the hopes of the canal building fraternity. Nonetheless, the environmental lobby[7] was far from convinced that a modern canal (system) would pay due regard to ecological niceties. Fearing a transfer of the bulk products and raw materials from the train to the canal barge, railway workers and their union representatives made common cause with the influential Green Party[8] in Germany. In the event, a number of politico-economic compromises were made between the various factions in the 1980s, as can well be imagined. Further "trade-offs" were agreed and in the autumn of 1992 the 71 year old dream of the RMD Company was fulfilled.

1992: the year of the Single European Market

The canal builders of the RMD waterway were very conscious of the need to show their dream was truly part of the European dream, that of an integrated (single) market (place) for the various Member States[9] of the European Community. Unblocking the artery between Bamberg and Kelheim meant that alternative waterway transport, bisecting continental Europe, could

---

5 Notwithstanding the well-justified criticism of National Socialism, just like Mussolini in Italy making the trains run on time in the 1930s, the leaders of this German fascist party did pour great investment into transportation links (witness the burgeoning framework of the autobahn system during the inter-war period).

6 The literature on the economic effects of the Second World War is legion. One of the writer's favourite texts in this regard is David Thomson's *Europe since Napoleon* (2nd edn. 1962, Longmans).

7 Further particulars of the arguments raised by this lobby will be made available, upon request, on 27th May 1996.

8 The Greens currently have a critical role to play in the remaking of Germany and could act as "kingmakers" at the next General Election.

9 In 1992 the Member States comprised the Benelux countries, the "G7" members Italy, Germany, France and the United Kingdom, plus Spain, Portugal, Greece, Denmark and Ireland.

provide a vital instrument of European integration.[10] Against a background of growing fears amongst environmentalists (and their supporters) about increasing road traffic movements involving the carriage of dangerous substances and other hazardous cargo, the RMD waterway gained strong political support.

1992: war in the Balkans

Yet even as a political head of steam was gathering exciting momentum the age old problem of European canal builders erupted: war, this time in the Balkans. The death of Marshall Tito[11] had left ethnic groupings - Serbs, Croats, Muslims etc. - rudderless and precocious enough to seek self-determination by fair means or foul. Warring factions dominated the life of the former Yugoslavia and the country split on racial and ethnic lines. The Danube flowing through a war torn landscape could no longer provide safe passage for pan-European commerce. As a trade corridor to the Black Sea the volatile town of Vukovar[12] proved the lie.

1996: quiet flows the Danube?

At the time of writing this paper (early February) some cause for optimism exists that the bloody Balkan fighting along the banks of the Danube will not recur in the light of the Dayton peace accord (signed last year to end war in the former Yugoslavia) and its credible "enforcement" by IFOR.[13] Yet peace cannot be taken for granted. Apart from the possibility of a recurrence of actual belligerence, the international community has the serious problem of actively pursuing the perpetrators of war crimes during the Yugoslavian hostilities. Bringing war criminals to justice may cast a giant shadow over the Danube lands for some considerable time.[14]

---

10 Commitment to a "United States of Europe" remains a dream. Problems over defence, social issues and a common currency have yet to be solved.

11 Marshall Tito managed the Herculean task of bringing together southern Slav peoples and fostering peaceful coexistence, after the cessation of World War II, for decades. Tito's death was followed by internecine warfare.

12 Firm indication of the success of the Dayton agreements will be the use of Vukovar by transport operators 'without let or hindrance'.

13 IFOR stands for the "implementing force" governed by (NATO) on the ground in the Balkans to ensure the Dayton accord brings forth a credible peace.

14 It is anticipated that when this paper is delivered forum delegates should themselves be in a position to judge whether the relevant War Crimes Tribunal(s) appear(s) credible.

1996: a time for retrenchment?

Given the abovementioned geopolitical factors, it is suggested that expansive plans for pan-European trade from the North Sea to the Black Sea should proceed with the utmost caution. The better view may be to see this year (and perhaps the next) as suitable for a period of retrenchment.[15] By this is meant trading interests could plan for realistic traffic flows utilising the RMD waterway eastwards as far as Vienna (a natural meeting place for traders from the west and the east). A strategic springboard for such a venture might easily be Regensburg, so often bypassed by businessmen and tourists alike in search of the more fashionable Munich (Germany's "secret capital").[16]

Regensburg

It is submitted that this Bavarian stronghold through the centuries (between 1663 and 1806 the regular seat of the Imperial Diet for example) deserves a much better press. The former Roman legionary camp *castra regina* could become a modern day camp (centre) for logistics and distribution management. As the most northerly point of navigation on the Danube downstream to the Black Sea it is hardly surprising Regensburg sparkled like a gemstone for so long. Largely escaping Allied bombing during the Second World War, Regensburg has managed to retain a very special brand of old world charm. It is an administrative centre for eastern Bavaria just now, but with the wonders of advanced telecommunications could easily serve as a trading centre for inland waterway movements taking full advantage of the nearby modernised canal course between Kelheim and Bamberg.[17] Furthermore the Austro-German frontier to the east at Passau provides easy access to the lands of the former Austro-Hungarian Empire.[18]

---

15 "Retrenchment" should not be taken in a negative sense, rather as a prudent businessman would evaluate commercial risks to be taken in a theatre of war and peace.

16 Given a choice of business location for "high-flyers" between Bonn, Berlin and Munich, the latter usually wins.

17 For readers of German, Walther Zeitler's *Durch Bayern nach Europa* Die Rhein-Main-Donau-Wasserstraße, published by Mittelbayerische Druckerei - und Verlags - Gesellschaft mbH Regensburg, 1992 (ISBN 3-927529-87-7) makes fascinating reading, giving a learned and historical perspective to the modern link between Bamberg and Kelheim.

18 Prior to the outbreak of the First World War (in August 1914) Austria-Hungary was a great European power. On the losing side at the end, part of her southern lands were ceded to the newly formed state of Yugoslavia.

Passau

This "city of the three rivers" (owing to its location at the conjunction of the Inn, Ilz and Danube) lies some 100km from Regensburg. Until Austria acceded to membership of the European Union (on 1 January 1995), Passau marked the boundary between the twelve Member States' market and that of the European Free Trade Area (EFTA).[19]

Vienna

Now part of the fifteen Member State European Union,[20] Austria presents a German-speaking trading nation in favour of east-west commercial expansion and sees the continuing development of intermodalism[21] in Vienna (using the Danube, motorway connections and reliable rail freight timetables, used to transport movements with the former East Germany and other old Warsaw Pact[22] countries) as a likely boost to the nation's GDP. Indeed, when peace has once more become a permanent state of affairs - and not a transient one as at present - transportants would be well advised to develop stronger inland waterway connections between Regensburg (via Passau) to Vienna with a view to running lines all the way to the Black Sea.[23]

Maastricht: a treaty too far?

However, as the European Union (EU) has conspicuously failed to develop a meaningful common transport policy,[24] notwithstanding the terms of the

---

19 EFTA is now simply of historical interest. European complications do remain however: witness the vote of Switzerland to stay out (along with Norway) of the European Union.

20 The three new members of the European Union being Austria, Sweden and Finland.

21 It should be emphasised that intermodalism is seen as an essential boost to modern trade and waterway links with rail traffic of especial interest.

22 With the fall of the Berlin Wall the rule of the Soviets over their Eastern and Central European satellite countries (Warsaw Pact countries) effectively came to an end. Artificial barriers to trade between east and west came tumbling down too. So in the late nineties prospects for trade are intriguing.

23 Given the independence of the rich lands of the Ukraine in recent years, the opening-up of the Black Sea presents great economic opportunities to enterprising traders provided the (natural) jealousy of Russia can be assuaged.

24 Perhaps the current Commissioner for Transport in the EU, the former Labour Party leader in the U.K., Neil Kinnock, will have enough "political clout" to persuade his fellow commissioners to make European transport a

Treaty on European Union (TEU) - otherwise known as the Maastricht Treaty[25] - for waterborne transport, much has still to be decided before shipping lines can operate profitably along the Danube.

Whereas some European politicians and media commentators have criticised the Maastricht Treaty as a treaty too far, afraid it would bring about an unwanted federal Europe, a kind of United States of Europe, this writer criticises the TEU for not going far enough: that is to say towards formulating a workable water transport policy (regarding sea transport and inland waterway traffic).

Happily this summer sees the start of a series of intergovernmental conferences[26] in the EU to review the workings of the Maastricht Treaty. During the conference review period interested parties, particularly MEPs (Members of the European Parliament) with constituencies including sections of the Rhine, Main or Danube, have the opportunity to educate colleagues about the potential for European commerce offered by the modernised RMD waterway. This opportunity should not be missed![27]

Kelheim

Of course, one should be wary of predicting what politicians will do. But some matters of great import can be addressed by transportants almost purely in distribution management terms; one such is the likely role of Kelheim[28] as we approach the millennium.

As is well known in these parts, the confluence of the Red River and the Assiniboine River has provided a classic trading point for Winnipeg. Indeed, the Hudson's Bay Company was so jealous of this strategic meeting place that it maintained a fort - Upper Fort Garry - from 1837 to 1870 to secure peaceful trading activities thereat.

Similarly, where the River Altmühl runs into the River Danube at Kelheim (in Bavaria) merchants have traded their wares (and services) for many years.

---

greater priority in collegiate deliberations in Brussels. This remains to be seen.

[25] Maastricht was supposedly designed to encourage further European integration; without proper coordinated transport infrastructure projects in the EU "integration" cannot surely receive approbation from transportants.

[26] These conferences could easily last a year.

[27] The writer is presently preparing a short "briefing paper" for interested politicians; copies should be available in May.

[28] Interestingly, Kelheim was the very first Bavarian residential city.

Glancing at the sketch map enclosed[29] you can see that the settlement of Kelheim overlooks the confluence of these rivers and to the east lies Regensburg. At the southern end of the modernised RMD canal it is most likely barges from the east will be forming queues to pass through Kelheim to the new canal, thence[30] to Bamberg and beyond to major German conurbations, once the recent war in the Balkans is (literally) history. So Kelheim should develop the most advanced logistics and telecommunications systems to facilitate this forecast barge traffic. This is a matter of urgency for transportants in the west; competition from the Pacific Rim is well understood in Canada, perhaps not so well comprehended in central Europe.

Rhine barges: towards a millennium model

Not only do the waterways have to keep on modernising to develop their potential as trade corridors, so too do the canal barges to keep competitive with other (land based) modes of transport. To this end it is submitted that the sea-going Rhine barge be totally modernised[31] so that it is capable of making egress from the shelter of the Dutch coastline and pass up the Thames estuary to the riparian reserves governed by the Port of London Authority.[32] In order to act as a vital instrument of European integration the use of waterway traffic should be extended to the capital of the United Kingdom. (It would be "a good thing" at this time, when steady nerves are needed in London, Paris and Berlin to integrate Member States more closely, for such a physical link to manifest itself).

The Mannheim Convention: in need of revision too

It is very easy to forget - and sometimes quite convenient it has to be admitted - that no matter how brilliant your telecommunications systems appear,[33] how wonderfully your canal barges perform, how well you manage your team of dedicated transport professionals, in short notwithstanding your operational

---

29 See Figure 1.

30 Passing (northwards) through Eastern Bavaria and Franconia along the Main-Donau-Canal (Kanal) itself.

31 Already heavy-duty hovercraft and catamaran craft are capable of providing waterborne traffic with fast and safe passage. The traditional Rhine barge needs a "technological audit" to promote modern commercial operations.

32 The P.L.A. (Port of London Authority), a creature of statute for almost 90 years, is held out as 'Working for the Tidal Thames from Teddington to the Sea' and presently administers, preserves and improves the port of London (still by far the largest UK port in terms of tonnage of cargo coming in and going out).

33 "Surfing the net" for such systems can be most revealing!

prowess, the relevant law(s) of carriage need to be honoured, not just in the spirit, but in the small print.

The rules and regulations emanating from the Mannheim Convention (1868, as amended) pose many traps and dangers for the (cavalier) operator not smiled upon by friendly legal advice[34] on the scope of this far-reaching international regulation.

Whilst this is not the place, nor is there sufficient time, to go into the technicalities of this piece of regulation, the short point is that it is a complex document and the amendments (issued as Protocols) over the last thirty years have not served to make it any more transparent to the non-lawyer.

In the opinion of the writer the Mannheim Convention needs "overhauling", otherwise trade will be impaired by technical barriers in the form of legal complexity. (Laws should be understood and written as plainly as possible to achieve this purpose: the Mannheim Convention fails abysmally on this count).

Dangerous goods: "no worries" on the RMD waterway?

If the RMD waterway is to act as a modern trade corridor it simply must be able to cater for the movement of dangerous substances and other hazardous cargo. The environmental lobbyists in Europe want less dangerous goods on the roads for safety reasons and see both rail and water transport modes offering safe passage (at least in theory); for the increasing demands of business to move dangerous goods to be met water carriers need to make a special "carriage of dangerous goods audit".[35] Like most audits the performance of this exercise would not necessarily be a popular experience amongst the workforce. Nevertheless, it would have to be undertaken to secure the trust of the general public and retain the confidence of shippers wanting economic and safe passage for the hazardous cargo in question.

Trade prospects towards the Millennium

This brief paper has but touched upon some matters of interest for businessmen and women wishing to take advantage of the Rhine-Main-Danube waterway now that the artery has been unblocked by the opening of the modernised canal section between Bamberg and Kelheim. However, it is

---

[34] As a lawyer, the writer wishes to stress the need for transport operators to have one director who has some legal qualifications so as to better instruct specialist shipping law counsel when the need arises.

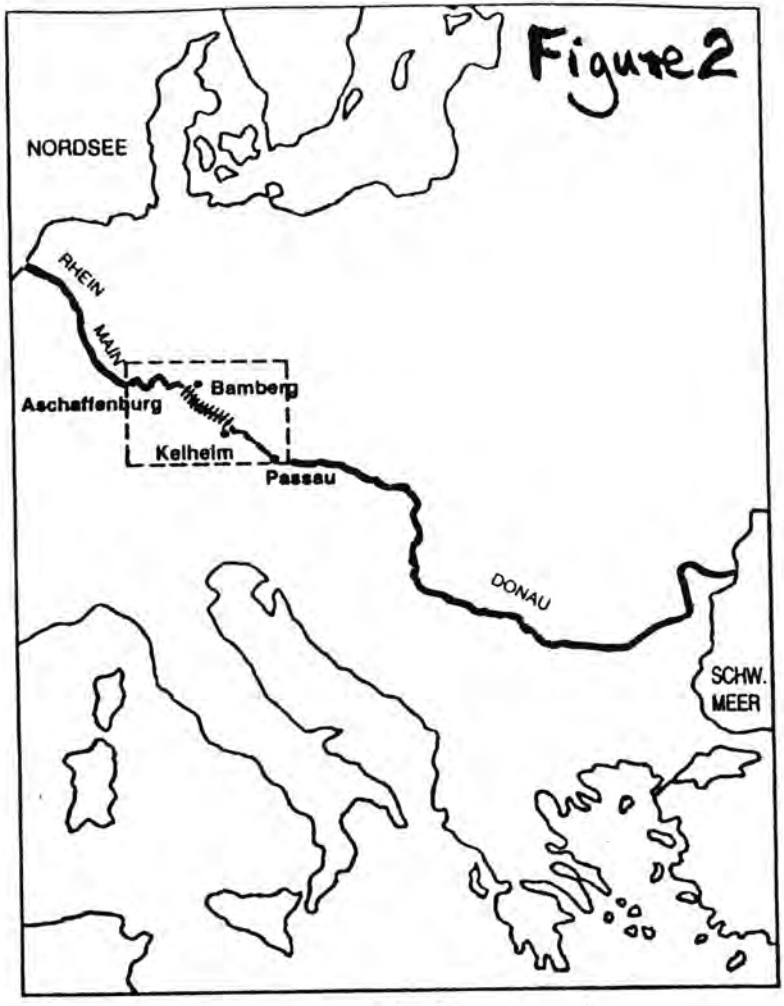
[35] Audits constitute useful management tools and could be profitably used more.

anticipated that upon reflection and given reference to the literature mentioned in the footnotes to this paper there should be sufficient material to stimulate the minds of company directors, whether executive or non-executive, at the next board meeting. Essentially the RMD waterway offers great prospects for trade. Certain obstacles to trade in the short term have been flagged. These are primarily geo-political.[36] Whereas in matters of war and peace one should proceed with caution, it is the firm view of this writer that the chances are good for IFOR to make a success[37] of the Dayton Agreement. Given real peace in the former Yugoslavia, the Danube could live up to its German description as a *Strom* (a current, literally) and serve trade as an ever-rolling force: from Bavaria to Bulgaria, from Bratislava (east of Vienna) to Braila (just above the estuary to the Black Sea) barge traffic could become a dominant feature of the transport geography of the new Europe, a community of nation states drawn ever closer by the dynamics of the modern manufacturer seeking to meet the increasingly sophisticated demands of the consumer of the twenty-first century.

---

[36] For an up to date manual on EU geo-political factors see *The Penguin Companion to European Union* by Timothy Bainbridge (with Anthony Teasdale), Penguin Books, 1995.

[37] The Rome summit in February 1996, instigated by American mediator Richard Holbrooke, appears to have won new guarantees for peace in the Balkans; in Holbrooke's words: "We have avoided a crisis by smoothing out, and perhaps eliminating, some of the bumps in the road we encountered."



European waterway with Canal

GATEWAY TO THE TRIANGLE

JOHN HALL, M.ENG.

EARLY DAYS

Winnipeg, the "Gateway city" owes its very foundation and growth to the railway, particularly the Canadian Pacific, yet it almost didn't make it. Sandford Fleming's original 1871 proposal was for a route north of Winnipeg across the narrows of Lake Winnipeg, but a fortunate change of decision by Sir Charles Tupper re routed the burgeoning transcontinental main line southwards from Selkirk to Portage la Prairie, through the Red River settlement assuring not only Winnipeg's future growth but creating the very conditions for the city's development not only as a geographic gateway to the west but as a true portal for trade development, expansion and immigration.

Plans for transcontinental railways across British North America preceded Canadian Confederation itself. One suggestion by a Mr Henry Fairbains writing in the United Services Journal in 1832 proposed a line from the Bay of Fundy into Quebec, which was expanded in 1845 by Sir Richard Brown who proposed an ocean to ocean railway. Meanwhile Canada's first railway (in what was then Lower Canada) opened in 1836, a portage line on the Richilieu River. Construction spread slowly at first but accelerated in the 1850's and 1860's. The government of the Province of Canada (as the government was then constituted) commissioned reports on the west in 1857 and 1858 under George Gladman, H. Y. Hind and S. J. Dawson, all reported optimistically on the agricultural possibilities of the area. Entry of British Columbia into confederation had led to a promise of better communication with the east in 1871 (originally only a wagon road was proposed). Sandford Fleming's survey of 1872 established a feasible route. An all-Canadian route across the barren Laurentian shield north of the Great Lakes was proposed which would then head from Lakehead at Thunder Bay through Fort Frances, Fort Garry (Winnipeg), Edmonton, the Yellowhead pass and Kamloops to Vancouver.

DEVELOPMENT OF THE "TRIANGLES"

Settlement would eventually develop progressively as a series of "triangles", initially (and almost disastrously) starting with a "triangle" based on a dry, almost arid, final extension of the great American desert, extending from Mexico into the southern portions of the prairies, true rattlesnake territory that only extensive and expensive irrigation projects would finally overcome in the early years of the present century. Palliser's "triangle" was in fact a "wedge" of land, its base lay along the International boundary between 100 W. longitude and the foot of the Rockies, its "Apex" extended north to the 52nd parallel forming a shape somewhat between a triangle and a Pentagon, originally "discovered" and described by Captain

Palliser, explorer and engineer reporting to the British Government in 1863.

Further development would later occur in the central "triangle", based on Winnipeg, Calgary and Edmonton an area of far more fertile soil, encouraging not only CPR expansion from the mid 1890's onwards but two newcomers, the Canadian Northern Railway and the Grand Trunk Pacific, a subsidiary of the long established Grand Trunk Railway. The central "triangle" was described by H. Y. Hind in his 1858 report as a great "rainbow" of territory eminently suitable for agriculture encompassing the Red, Assiniboine and North Saskatchewan river valleys more of a "belt" than a "triangle". It was in fact the central cereal belt. Palliser gave it his approval but added that ranching may be more profitable than wheat because of frost hazards.

A third "triangle", based roughly on Dauphin, Edmonton and Le Pas, Manitoba would develop in the early years of the present century. This area was largely north of the "thermal line", beyond which farmers generally were refused credit, a condition that would dramatically change.

STEEL OF EMPIRE - THE CANADIAN PACIFIC

The building of the Canadian Pacific is well know and often told. The CPR contract allowed for $25 million cash bonus, 25 million acres of land in alternate sections of 40 acres each, 24 miles deep on each side of the railway (land for right of way, stations depots etc was additional and usually, but not always, free). 710 miles of railway already under construction were also included, tax exemptions applied to all construction materials and rolling stock (also exemption from import duty). Further there was to be no control of freight rates nor would any competing line be allowed for a 20 year period. Significantly, there was no guarantee of bonded debt. The CPR would have to borrow on its own credit. The route chosen for strategic reasons lay close to the 49th parallel, Fleming's proposals were ignored, the route lay through Pallisers triangle.

The triangle had been previously avoided by railway surveyors as a result of Captain Palliser's exploration of 1863. However, a botanist on the staff of Fleming's 1872 survey, John Macoun had other ideas, a self made and largely self taught man, his visit coincided with unusually rainy conditions, the wettest decade in more than a century, Palliser had observed it under normal to dry conditions. Macoun's report convinced the CPR to a change of route, Fort Selkirk to the Kicking Horse Pass There was still no known crossing of the rockies - Rogers Pass was yet to be discovered. The die was cast Palliser's triangle would get both a railway and eventually a major irrigation work, with many disappointments in between.

SPIKING DOWN A NATION

Christmas Eve 1879 saw construction commence west of the Red River from Winnipeg, as the "Victoria Branch" 16 miles north to "Victoria Junction" it being the intention that the main line would by-pass Winnipeg, crossing the Red River at Selkirk. An "ice

crossing" (rails and ties laid on ice) sufficed from Winnipeg to "Winnipeg Junction" on the east bank (and also on the Penbima branch which stretched north to Selkirk, south to Emerson and the US Border). The Ice bridge lasted until March 27th 1889, replaced by a temporary bridge later that year.

Construction was rapid, Victoria Junction by June 30th, to mile 45¼ by September 30th (now Portage la Prairie) and to the Manitoba/NWT boundary (mile 97) by December 31st. No sooner built than abandoned! (Manitoba's first abandonment) caused by the Minister of Railways, Sir Charles Tupper's (very popular) decision that the main line must be rerouted through Winnipeg. The 16 mile section between Stonewall (just west of "Victoria Junction" which would never in fact be a junction) to Portage la Prairie (29 miles) was abandoned, when a new line from "Airdrie Junction" (2 miles west of Winnipeg) to Portage la Prairie via Rosser was opened. The Gateway City was no longer condemned to "side line" status. This improvement was initiated in December 1881, the true starting point of Winnipeg's growth. Prairie construction was now under CPR's own control, initially under Major Rosser (until his exposure in the Brandon land scandal) reaching Flat Creek by 31 December 1881. Rosser was replaced by the legendary Cornelius Van Horne and the rest is legendary. The dash across the prairies reached Laggan (now Lake Louise) at the NWT (District of Alberta)/British Columbia boundary at the end of 1883, the last spike driven on 7th November 1885 with full transcontinental service initiated as from June 29th 1886. The period 1886 to World War I would be one of increasing immigration, burgeoning freight traffic and prairie branch line construction.

Canadian Pacific police would be frugal. Innis's View that the "importance of freight with reference to ... the road made necessary a marked increase in passenger traffic, essential to settlement of western Canada but such an increase was subsidiary to the increase in freight". Freight would come first, immigration would certainly be encouraged as a prime source of later freight generation. Settlement was encouraged in every possible way under a joint CP/Government of Canada advertising and development campaign, while to encourage traffic volumes, traffic movements south of Winnipeg to the US were positively discouraged and the monopoly clause rigidly insisted upon.

THE DISMAL YEARS 1885-1896

The CPR was now open. Its first ten years would be a struggle. Construction coast had proven higher than estimated, the government constructed lines in need of rebuilding (a poor gift as it turned out) settlement only just beginning and much mileage through sparse, low to nil traffic generating lands. Most outbound traffic from the west occurred in summer (navigation period) but the cost of keeping open for business in winter were high. A very real situation developed in which summer earnings would be swallowed up by winter operating costs.

Branch line expansion would be initially sparse, the minimum mileage to serve the maximum area (the monopoly clause allowing this policy). Nevertheless expansion would occur, even by separate railway

companies (allowable under the monopoly clause if they merely acted as feeders" to the CPR and were not competition). The first the Manitoba and South Western Colonisation Railway opening on May 26th 1884.

Initially settlement was mainly within the area of Palliser's triangle but only after the opening of the Regina - Prince Albert line in 1891, and from Calgary to Strathcona (Edmonton) in 1892 was the invasion of the Central triangle really begun.

The Manitoba and Saskatchewan railway was leased in perpetuity in 1884 and totalled 151 miles, an additional 222 miles were built by 1885, 255 miles were added in Manitoba (all in the Palliser triangle) by 1893. A line striking out from the Palliser triangle north across the cereal belt to Prince Albert was leased in 1890 (and later lost to the Canadian Northern). Expansion in the District of Alberta saw the Calgary - Edmonton (Strathcona) line (190 miles) open in 1891 and south into the heart of the triangle to West Mcleod (103 miles) in 1892. Overall expansion was relatively slow and nowhere approached that of MacKenzie and Mann a few years later.

THE GOLDEN YEARS 1897-1913

From 1897 CPR entered a rapid period of expansion and growth (as did the entire nation), immigration had not reached expectations up to this point, land sales were stagnant - but under direct government encouragement particularly the policy of Clifford Sifton, Minister for Immigration, immigration started to flow strongly from 1896 and soon turned into a flood. As will be seen later it would be the Canadian Northern that would take the biggest advantage, but the CPR shared in the gain as well.

CPR was now wedded to a triangle bounded by Winnipeg, Edmonton and the international border, composing both Pallisers triangle and the central cereal belt. In return for assistance in the construction of a railway through the Crows Nest Pass, CPR had relinquished its monopoly clause, and had agreed to lower freight rates, partly to revive the then stagnant western economy. Other aid would be granted to CPR for further branch line construction, which now got under way, but at no point would it reach that of Canadian Northern. There was a difference of philosophy between the two railways. CPR looked on itself as Steel of Empire - the All Red Imperial route from Atlantic to Pacific, opening up the prairies was a secondary (but important) issue. The Canadian Northern, however were wedded to opening the prairies first - their transcontinental line would come later.

126 miles in south west Manitoba were open in 1900 together with a north west line from Portage la Prairie to Yorkton, (Sask) in the cereal belt (223 miles plus 53 miles of branches) A South West line took off from Arcola (Man) through to Regina (113 miles) tapping new territory. The cereal belt saw the north west line through to Lanigan (Sask) (125 miles) with 251 miles of branches by 1909 and extended to Wetaskiwin (Alta) on the Calgary Edmonton line by 1910. No less than 674 miles of subsidiary main lines were opened in this period, mainly in Saskatchewan and Alberta, with 477 miles of branch

lines. 221 miles of additional main line north of Lacombe (Alta) completed CPR's main conquest of the cereal belt in 1914. There still remained considerable infilling and in this period 1268 miles were built. By 1914 CPR had dominant control of the entire Palliser triangle (despite Mackenzie and Mann's infiltrations) and were in hot competition in the cereal belt with both the Canadian Northern and Grand Trunk Pacific.

LAND GRANTS

The final policy over land grants was a contentious one between the company and government. The original grant of 25 million across (later reduced by 7 million acres) being adjusted after considerable bickering, the railway finally agreeing to 8,347,000 acres in the railway belt and in Southern Manitoba and the remainder a further 9,000,000 acres to be selected elsewhere. Land selection was also important, the company having "indemnity selection" rights to reject arid, or barren land, in favour of more fertile land elsewhere.

Additional land grants were made to encourage branch line construction, usually at the rate of 6,400 acres/mile, eventually totally 1,568,000 additional acres mainly in the central triangle. There was even bickering over just <u>when</u> the land should be released to the railway - although it was in the interest of government for CPR to make an early selection of land, it was definitely to the railway's benefit to delay selection until after completion of the line (increasing land value significantly). Table I give details of CPR land grants. By using delay tactics, government gave in, releasing branch line grants on the basis of each completed 20 miles section of line, while in Southern Alberta a solid "block grant" of 3 million acres was bequeathed, giving eventual rise to the Bassano dam irrigation project (1904-1912). An appraisal of whether or not the granting of land was correct policy or whether too much land was granted must allow for the fact that the land was worthless without a railway, further that very much larger quantities had been offered earlier (100 million acres in 1878). CPR's 25 million (later reduced) was small compared to what had previously been regarded as necessary.

WESTWARD THE COURSE

In 1870 Canada had a poor claim to the territories west of the Great Lakes, there were only 1565 settlers in what is now Manitoba, less than a thousand in what is now Alberta and Saskatchewan, 10,000 in British Columbia (including a large number of US citizens). By 1890 there were over 250,000 colonists on the prairies, spread over a million square miles, but by 1890 emigration had dwindled to a trickle. All this changed in 1896 with the rise to power of Sir Wilfred Laurier and with him his henchman - Clifford Sifton. A publicity campaign in Europe "free homes for millions" spearheaded a policy to occupy the Canadian west - at public expense if necessary. Population meant more railways - how much more, how to fund it and importantly who to build it were the questions facing Laurier and Sifton. How much more mileage was easily settled - based on Canadian Pacific experience. Settlement did not spread much more than 10 miles from a railway, thus one mile for each twenty square miles of arable land - there was 100,000 square

miles of arable land at a rough guess - 5,000 miles would be needed. How to fund it and who to build it - clearly not the Canadian Pacific, except for mileage within their triangle of power. Who to build and how to fund would be answered in two separate ways by two very different organisations.

The results would be a tripling of the population on the prairies, mainly a result of Clifford Sifton's Campaign (which in 1904 had the first million dollar budget in advertising history). Acres under construction would increase from 1.5 million in 1891 to 22 million in 1915. (Tables II gives a break down of the growth) with a tenfold increase in crops (primarily wheat, oats and barley). Prairie life was destined to grow with the expansion of the rail network, the mail order catalogue would bring any city luxury to the farmers front door, the spreading postal system would ensure communications and help spread the printed word with a postal rate of 1¢/lb on newsprint, irrespective of distance - the west was becoming habitable.

THE CANADIAN NORTHERN SAGA

Successful completion of the CPR had dispelled many uncertainties not to say ignorance of the prairie environment, of railway construction costs and of settlement (at least until the full rigors of Palliser's triangle were realised). Clearly, it seemed, the risks and difficulties had been overestimated, furthermore the CPR was proving to be profitable! Sir Wilfred Laurier and Clifford Sifton had by 1896 set the "ground rules" for further prairie expansion, the CPR monopoly was now broken with the US based Northern Pacific slowly but surely entrenching itself into Southern Manitoba - on ominous sign for Dominionists. Apparently only a system built, owned and operated by the Dominion government, involving both a prairie grid and trunk line extensions to both the Atlantic and Pacific remained as the (very unpalatable) solution.

At the juncture two extrovert legends would appear on the scene, Donald Mann, born in Acton Ontario in 1853, as unknown subcontractor for CPR who helped bring the first locomotive into Winnipeg across the ice of the Red River on Christmas eve, 1879 and William Mackenzie, born 1849, at Kirkfield, Ontario on the Balsam Lake-Lake Simcoe Portage, and onetime shopkeeper, school teacher and railroad tie cutter. Both had met on a CPR sub contract in Kicking Horse Pass in 1884 (where Mann is reputed to have short changed Mackenzie over some mules). After various separate adventures involving South America, Toronto streetcars, various railway projects and even street cars in both Birmingham, England and upper New York State they met up again in 1896, took possession of the Lake Manitoba Railway and Canal Company (then moribund) which had a land grant attached of 6,000 acres/mile for the first 125 miles, without any formal association and in two meeting which seem to have lasted 5 minutes each, subscribed $195,000 cash, let a construction contract to themselves and declared the subscription list full! Within weeks they had floated a bond issue and obtained a Manitoba provincial guarantee on $1 million of bonds at $8,000/mile! By April 1896 construction was underway.

NORTHERN TRIANGLE

Concurrently another line took off into the west from Dauphin towards Gilbert Plains (1st section to Grand view opened 1/6/02). Up to this time farm implement manufacturers, suppliers and banks refused to grant credit to farmers north of a so called "thermal line", which was considered to represent the northern limits of the cereal belt, the "worlds end" of civilisation. This "thermal line" passed south of Dauphin. Thus Mackenzie and Mann were gambling (nothing new to them!) but a gamble of audacious if not outrageous proportions - the soil versus the climate. They did, however have their meed of luck, initially of a transient (but only semi realised) nature, for in the 1890-1910 period (the period of most rapid expansion), the plains enjoyed very unusually bountiful rains and snow falls. They were to get help in a more permanent form later.

BREAKTHROUGH

In 1901 6½ million bushels of grain were shipped on a system built with an outlay of just under $200,000 but with a million dollar guarantee! What was probably the two decisive events in the development of the Canadian Northern took place in 1901. The first was the opening of the line through to Lakehead, the second was the "branch line coup" in southern Manitoba.

EARLY CONSTRUCTION DAYS

Their original endeavor opened for traffic between Gladstone and Dauphin and on to Winnipegosis on 3/1/97 built partly by voluntary labour from "on line" farmers who were "paid" later in seed grain (which meant eventual traffic!), the first seed grain ever brought into the district. Early operation was slap-dash (2 loco's, 2 passenger cars a few flat cars), freight cars were "borrowed" from the CPR Yard without asking! The "train" stopped anywhere and everywhere, and it was profitable! The blood-letting over, the team obtained another defunct charter, the Manitoba and South Eastern planned to run from St. Boniface to Rainy River and Lake of the Woods. Work got underway in 1898, again a shoestring operation on "cut the costs according to the cloth". They also now had an arrow poised right at Thunder Bay the outlet to the Atlantic, free of the CPR. However next thoughts turned to the North West - and another moribund charter, the Winnipeg Great Northern, originally planned to head north into the North West territories towards Hudson Bay. In typical style Mackenzie and Mann re-orientated the proposal north west from a point just north of Dauphin (Sifton Junction, no less!) to Prince Albert (then in the Assiniboine district of the NWT). With the re-orientation went the right to switch the land grant from the scrub and muskeg of the old route to the black soil belt west of the Manitoba boundary. There was a further bonus, in the NWT the land grant under the old charter doubled to 12,800 acres/mile. By 15/12/1900 construction was 23 miles into the NWT and growing!. The Manitoba and Minnesota sections were also opened on 9/12/1902 and by 31/12/02 Lakehead was reached, permitting a evilly disposed Winnipeg newspaper to announced "Its first train left Port Arthur last night and will be here next year". The scene was set for the most rapid expansion of railways Canada would ever know, the biggest investment machine up to the time and for

decades after, the largest bond issues probably ever raised under the circumstances, and, inevitably eventual, receivership that would come within an ace of ruining the nations credit. Up to now grain was delivered by CNOR to the US Northern Pacific. It would now flow eastwards over an all Canadian route. Construction had netted both Dominion and Ontario cash subsidies, and even (unusual step!) a Manitoba government guarantee for the construction bonds of the Ontario section (to a maximum of $20,000/mile). Manitoba valued highly an alternative shipping route to the CPR or US railroads.

A BRANCH LINE COUP

The second decisive event would be the Northern Pacific's Manitoba branch lines coup. The CPR monopoly clause, revoked in 1888 led the Manitoba government to allow the US Northern Pacific Railroad, the so called "Mainstreet of the North West" to construct 313 miles of branch line in the Winnipeg/Emerson/Brandon/Portage la Prairie area (some previously built by the Manitoba government and leased to the "Northern Pacific and Manitoba Co"). Northern Pacific's first bankruptcy modified this situation but by 1896 the NPR sought to regain and consolidate. Now considered to be a perfidious Yankee, CPR tried to acquire the trackage. Manitoba's Roblin administration would have no truck with either of them and on January 14 1901 all were leased to the Canadian Northern for 999 years, who immediately commenced by building or acquiring extra mileage to link with their existing lines (62 miles in 1901, a further 61 miles in 1902). Further the CNOR agreed to a 15% freight rate reduction, to rate control in Manitoba, and to never pool traffic with the CPR.

METEORIC EXPANSION

From 1901 onwards the prairie network would spread like wildfire. Already an embryo main line (soon to be a second transcontinental main line) was in existence from Lakehead (Port Arthur) as far as Grandview (Manitoba) 666 miles, with a further 630 miles of branches, (436 in the central "triangle" cereal belt , and 194 in the northern triangle), for a total of 1276 miles, all for an initial investment of $195,000, with considerable land grants and government guarantees on bonds, to boot, and ALL since 1896. Prairie branch line construction accelerated in a most unbelievable style after 1901 and, in this period, to last 15 years, not a single share of stock would be sold, 10,000 miles of railway would be constructed, contributing more to prairie settlement than any other railway (not excluding the CPR), about a quarter billion Edwardian dollars would be borrowed and both progenitors Mackenzie and Mann would gain knighthoods.

At the end of 1902 they owned or controlled 1285 miles of railway, were purchasing railways in eastern Canada as part of their transcontinental ambitions and acquired potentially useful obsolete charters which had still had provisions for land grants. The system now described a giant "Y" laid up its side. The stem ran westwards from Port Arthur to Winnipeg, the focal point, with two "arms" a longarm into the North West, a short arm into the South West. Mackenzie and Mann fully appreciated the time factor, a few short years to build a network on the prairie, now filling up with settlers, before they could dare to push through a second transcontinental line.

Fully be known to them, a "chicken and egg" situation was being created. No transcontinental could be viable without a prairie network, but a prairie network could not flourish without a transcontinental line of their own. The clock ticked away remorselessly.

Initially all went well, construction was now pushed into areas often ahead of settlers, but settlers came anyway. Between 1897 and 1914 Canadian Northern construction and western settlement proceeded in parallel, at roughly a rate of a thousand miles of line per half million settlers. This was not however, a coordinated process, it simply happened. A detailed log of openings is available separately from the author but during this period 450 miles were built in south and west Manitoba, often in competition with CPR, between 1903 & 1907. Between 1907 & 1916 161 miles were built in the Lake Winnipeg "peninsular" plus a further 121 miles in and around Lake Winnipeg and Lake Manitoba. (14 miles of this trackage, the Victoria Beach subdivision opened on 19 September 1916, was one of the final, faltering thrusts of Mackenzie and Mann).

A GAMBLE PAYS OFF

Mackenzie and Mann had gambled audaciously on the northern triangle, they knew full well of Macoun's delusions in the Palliser triangle and their luck with the weather could break at any time. For 30 years a Dominion government cerealist, Charles D. Saunders (and his father before him) had been experimenting to find a wheat that would mature quickly and so escape damage by early frosts. In 1904 twelve kernels showed promise. Within a very few years these 12 kernels had sired a crop of 700 million bushels, ripening 10-14 days earlier than any other variety - Marquis wheat had rolled the thermal line northwards a full 200 miles.

The main line to the (soon-to-be) provincial capital of Edmonton was well under way in spring of 1905, reaching the by then new provincial capital on 17th December 1905, adding a further 618 miles. Mackenzie and Mann pulled an amazing coup on the CPR, purchasing the Qu'apelle, Long Lake and Saskatchewan railroad, 249 miles of strategic trackage between Regina and Prince Albert, then operated by CPR under lease. The pair approached the company's British stockholders and carried off an coup-de-grace under the very eyes of the CPR. Last moves were made in Manitoba, where little territory was left, a line from Hudson Bay Junction to Le Pas (88 miles) was built largely for its land grant, but would eventually be the jumping off point for the Hudson Bay railway. A further 124 miles of branch lines were built between 1910 and 1914, the last 78 miles in the early months of World War I which would do much to unseat the two knight errant.

Saskatchewan, a province since July 1st 1905 with Regina as capital would see similar expansion. Mackenzie and Mann "invaded" the new province six lines abreast the main line in the centre, two lines to the north, 3 to the south. The network spread, 191 miles were built between 1905 and 1915 north of Swan River, 94 miles west of that community between 1908 and 1915, 155 miles west of the Riding Mountain block in the same period, 74 miles in the cereal belt (Hallboro-

Beulah) in 1911 a direct invasion of the Grand Trunk Western Zone. This construction led to severe protests and went no further.

However protests did not stop the pair from a direct and flagrant invasion of CPR territory, 371 miles being constructed in the Maryfield/Moose Jaw/Avonlea area (1911-1915) in undoubtedly CPR territory. In order to block any invasion of THEIR territory by either CPR or Grand Trunk, a network of 170 miles in the Saskatoon - Kindersley area, (1908-1911) plus a further 194 miles in the Delisle - Elrose area (1911-1915) were intended in the dual rule of "Containment" of the two other railways and of a development nature. North west Saskatchewan obtained a "hodge podge" of branch lines thrust into the bush lands. 268 miles were built between 1907-1915. However further planned "invasions" of CPR territory in western Saskatchewan were thwarted.

The prairies needed coal, rather than the straw and peat of pioneers days. Coal was plentiful along the eastern upthrust of the Rockies and in the Red Deer River valley (focused on Drumheller). By 1910 over 700 miles of railway were planned to serve these deposits and to distribute the black diamonds to Edmonton, Calgary and Saskatoon, 480 miles built in Alberta between 1911 and 1914 served Drumheller, a further 173 miles (4 miles leased from CPR) served the Rocky Mountain House/Brazeau area opening for traffic on the very eve of World War I in 1914. The breakneck pace would slow down in Alberta, with the Edmonton and Slave Lake railway opening to Athabaska landing (74 miles) in 1912, a rail/waterway route to the north was now open, which according to one report Chippewayan, Cree and "half-breed" (SIC) river men heard the whistle and saw the smoke of locomotives for the first time. An initial push was made to the Peace River block in a 44 miles line to Sangudo at the Pembina Crossing (1914). It would later reach Whitecourt and go no further under Canadian National auspices. Two branch lines, to Alliance, 59 Miles (1916) and from Hanna to Stephenville (6 miles) were under construction when bankruptcy struck.

BORROWED MONEY, BORROWED TIME

The financing of the Canadian Northern was remarkable, to say the least, with a heavy dependency on bonded debt, subsidies and guarantees. Until 1914 the shares of the company were issued to the original promoters, ostensibly in return for services rendered. Mackenzie and Mann thus had total control over the empire without having to worry about shareholders and without investing too much of their own money (it is untrue, however to state that they invested no money of their own, as certain researchers have claimed.) As a method of financing it had grave drawbacks, so grave as to finally promote ruin since the railways were overburdened with heavy fixed charges for interest, weakening the railways ability to survive depressions, temporary declines in earnings or other unforeseen circumstances.

Mackenzie and Mann turned borrowing into a fine art. Five million dollars of British investment in Canadian Northern represented about 25% of all British investment in the Dominion. Loans were "packaged"

to suit the market, some for the US tastes, some for Britain or Europe, just like groceries! One method was "loans upon loans" eg the Imperial Rolling Stock Company organised to purchase locomotives and cars, partly by purchase but mainly by lease, was then used to float new loans on the security of the (usually leased) locomotive and cars! This roguery was not too far short of downright dishonesty but was in fact just about legal.

The game started with a Canadian Bank of Commerce (now Canadian Imperial Bank of Commence) loan of $3 million in 1899 on the security of the various guarantees winkled out of government up to that time. Borrowing then spread in pace with construction, indeed, one demanded the other. By 1907 the pair had borrowed $129,944,604.18, accepted liabilities of $13,561,240.77 and had marketed 29 separate and quite bewildering bond and stock issues (mortgage bonds, gold mortgage bonds, land grant bonds, income bonds, prior lien bonds, sinking fund gold bonds etc the list exhausted the stock exchange dictionary!). 35% of these bonds were guaranteed by various governments (Manitoba, Ontario and Dominion) There was even a "omnibus" issue of 4% perpetual consolidated debenture stock, authorised in 1905, it was euphemistically described as for "general funds" The pair were conjuring up money from the very cobblestones of Bay Street, Wall street, Threadneedle Street, Paris, Amsterdam, Brussels & Zurich. In fact anywhere and every where.

1912 saw an ominous tightening of the money markets towards Canada in general and Canadian Northern in particular, only short term loans on the New York Market being available, time was running out. Their enterprises were voracious - they personally invested $37 million of their own to keep the pot boiling. Their transcontinental line was was under construction (as it had to be to beat the time element) before the prairie network could really sustain it. Appeal to the Dominion government in 1914 brought a further guarantee of $45 million but the government now was a shareholder, the pair transferring $33 million of stock to the Dominion in exchange. Mackenzie and Mann now had a powerful shareholder and one of ultimate if not manifest destiny. 1915 and World War I saw completion of their transcontinental line, also a total dependency on New York for funds, War was raging on three continents, immigration ended, the system still incomplete, a massive interest burden, inflation and a half forgotten clause in their subsidy agreement stating that, in time of war, transportation services would be rendered free of charge to government up to 3% of the subsidy received. The final straw. Fixed charges had risen by $2 million annually and there was now an actual operating loss, the first ever, in 1915 of $2,265,283. The writing was clearly on the wall.

OTHER ASSISTANCE

Cash subsidies and land grants played a role also. Land grants had been abolished after 1896 but were still written into older charters, purchases of such charters allowed the railway to claim the land and if necessary under Indemnity selection, choose elsewhere, a

concession as good as "money in the bank". Sir John A. MacDonald had set aside 100 million acres of western land to pay for railway construction under the belief that it would be at no cost to anyone. By 1896 32 million acres had been granted in Western Canada to all railways. As one historian acidly commented "just about the same area that King Richard was willing to give up for a horse at Bosworth Field". Taken in alternate lots, the system allowed for the simultaneous arrival of both railway and settlers. Under old railway charters, Mackenzie and Mann eventually amassed 4,102,951 acres of land which were sold at $1,25 to $7,25 an acre to settlers, later increased to $9.50/acre for prime lands (1917 inflation upped the figure to $19.32/acres) Purchase was over a six year period on unusually lenient terms. The railway had a "no foreclosure policy" (after all it was not their land to begin with and foreclosure meant loss of traffic). By 1909 only 40% or 1,828,251 acres remained unsold, by 1912 half of this remaining land had been sold. There after sales were negligible. Cash grants totalling $218,215,409 were made both provincially and federally (or $20,905/mile) Table III gives a breakdown by province. Only the state of Minnesota was in the blessed position of never giving aid of any description.

APPOINTMENT WITH DESTINY

By 1916 the financial situation was intolerable and Wall Street had a specialist team, Colverdale and Colpitts closely examining CNOR's affairs. On May 15 1916 the prime minister (then Sir Robert Borden) found the cash to keep the trains rolling - $15,000,000 - it bought only 29 days respite! The report published in 1919 declared CNOR basically sound, wisely constructed (except for duplicate mileage) and should be complete as system, but an additional $555 million was needed. An annual profit of $84,615,000 could be expected. The government thought differently and a royal commission recommended government acquisition. On July 14 1917, with World War I raging, the flower of the Empire dying daily in Vimy Ridge, Passchendaele and the mud of the Somme, soaring grain prices and a "Feed Britain" campaign, the news was broken to the pair. Mackenzie, a man of iron, broke down into audible sobs, (Borden remarked only the second time his self control had deserted him). The government had taken over.

In their day the Mackenzie and Mann had been likened to true Imperialists, not too far behind Robert Clive of India or Cecil Rhodes (of "two roads to progress" fame - Railroads and Cecil Rhodes) in Imperial vision and ruthless ambition. By 1917 a different view prevailed. Clifford Sifton, to whom the pair had done so much to help his vision of the west come true, wrote nastily to J. W. Defoe of the Manitoba Free Press "It is not forbidden...to enjoy a good deal of satisfaction that the promoters of this railway are finally eliminated from Canadian Politics". Equal back handed sanctimonious piety was shared by the editor of the "Grain Growers Guide" forgetful of the plethora of branch lines that had made the prairies prosperous "It is doubtful if they are entitled to one red cent - anyone would build a railroad if they had money enough." True, but would "anyone" had taken the gamble that they had?

GRAND TRUNK - DREAM TURNED NIGHTMARE

The Grand Trunk was Canada's first true main line, sensationally floated in 1851 and authorised in 1853 under (as usual) a guaranteed loan, it eventually became the "largest double trunk main line in North America" stretching from Quebec City to Chicago, Illinois with an extensive network in Ontario and Quebec, subsidiary companies in Maine, New Hampshire, Michigan and Illinois. It extended from Lakehead at Chicago, (Lake Michigan) to the St Lawrence and to an ice free Atlantic port (Portland Maine), a British Imperial company, run from Dashwood house, London, England, under the then energising influence of such directors as Sir Edward Watkin a viscount who would build Britain's last main line, the Great Central London extension, an enthusiastic promoter of the Channel tunnel (with dreams of through trains from Manchester, England to Paris and the far east). He dreamed of an eventual westward extension of the Grand Trunk to girdle the world with associated shipping lines. Regrettable management in the 1860's brought near bankruptcy. A recovery and dramatic expansion in the 1870's brought however, little return on shareholders investment.

The Grand Trunk had been the first to be considered by the Canadian Government for the Pacific extension, their refusal to consider any line north of Lake Superior (an all Canadian route) discounted them quite early - and an opportunity was lost. By 1895 the Grand Trunk was ripe for change - until then administered in British fashion, scrupulous but unenterprising. It's City president Rivers Wilson's only previous transportation experiences were with army transport on the Nile and with desert caravans. A new general manager an American, Charles Melville Hays formerly of the Wabash Railroad was brought in, a new expansionist era began. The incoming Liberal government looked on the CPR as an MacDonald/Tory institution, Mackenzie and Mann as westerners "on the make" - a Liberal transcontinental was "needed" - and an all Canada route to boot.

THE DREAM

The scene was set for a third transcontinetal and for disater. Initially intended to run from North Bay, Ontario westward, policial considerations insisted on a commencement at Moncton, New Brunswick avoiding the use of Portland Maine as an Atlantic terminus but also avoiding the necessity of choosing between St John's and Halifax as an alternative. The further decision was taken to split the project into two parts - a federally constructed section the "National Transcontinental" from Moncton to Winnipeg - through barren, if not actually hostile territory, the so called "clay belt" between the Laurentians and Hudson Bay - profitless territory indeed - which the Grand Trunk would lease upon completion; and the "Grand Trunk Pacific" westward from Winnipeg through Saskatoon and Edmonton to a new port, Prince Rupert on the Pacific, nearer to the Orient but the most northerly port on the Pacific seaboard range. This latter section was to be constructed, owned and operated by the Grand Trunk itself.

The Grand Trunk Pacific was authorised in 1903 with a capital of

$45 million (only $25 million was ever issued) guaranteed by the federal government at $13,000/mile on the prairies and three quarters of the actual costs of the mountain section. To gain access to Lakehead, the Grand Trunk Pacific was authorised to build a branch from Sioux Lookout, Ontario (on, significantly, the National Transcontinental section) to Port Arthur, Ontario. A situation to prove to be their undoing.

CONSTRUCTION DAYS

Construction of the National Transcontinental got underway in 1905 to a (government insisted) very high engineering specification, in land fit only for a "pioneer" railway, if any at all. Construction was completed on November 17th 1913, on the eve of World War I and a refusal on the part of the Grand Trunk to take it over. The lease, initially estimated, ($81.5 million annually) had grown partly by government venality and partly by construction "graft" to over three times this amount.

Meantime Grand Trunk undertook construction of the western division - the Grand Trunk Pacific. Built almost "ruler straight" from Winnipeg to Edmonton, almost along the route of Fleming and Grant, the third main line to be built but, as it turned out, the most desirable alignment. Construction got under way on 29th August 1905 (at 6.0AM). Service commenced between Winnipeg and Portage la Prairie on 20th July 1908 and 8 weeks later Watrous was reached (345 mile from Winnipeg), by 13th August 1910 Edmonton was reached, by early 1911 service reached Wolf Creek, Alberta where the prairies officially ended. It was a work of giants, entering Yellowhead Pass at just about the site of Sandford Fleming's original 1872 bench mark (with the unwelcome companionship of the rival Canadian Northern) the GTP struck out along the Skeena River to Prince Rupert the last spike driven on April 7th, 1914. A steamship service "Grand Trunk Pacific Steamships" was inaugurated along the coast, but regrettably no Pacific service - no shipping line was interested.

ATTEMPTS TO EXPAND

Hemmed in by the Canadian Northern to the North (and also to the south) and the CPR to the south, there would be relatively little branch line construction on the prairies. The British Columbia and Manitoba Governments were both conservative and no lovers of the GTP, there would be no provincial grant aided branch lines in either province. Manitoba hardly needed any more anyway - the GTP was in fact saved from even further folly by its enemies.

However a friendlier atmosphere prevailed in Alberta and Saskatchewan. In Saskatchewan, a government bountiful to Mackenzie and Mann, granted similar aid to the GTP and 732 miles were opened between 1911 and 1917. In Alberta (where so much was planned but would have to wait until the 1920's) 260 miles were provincially assisted between 1911 and 1912 (Saskatchewan guaranteed $20,000/mile, Alberta $13,000/mile) In total both provinces guaranteed $13,469,004 (about 2/3 of the actual costs). Much more was planned and indeed authorized - the over ambitious Grand Trunk Pacific Saskatchewan

railway got eligibility for 1300 additional miles (only 14 miles Weyburn - Talmage were ever constructed). Though service opened on August 24th 1914 for freight, and for passengers on September 6th, in the opening months of World War I. The most ambitious enterprise launched in Canada up to that time (perhaps ever! a quarter billion dollars of risk capital, equaling the Panama Canal as the greatest civil engineering project of the time.

NIGHTMARE

It had a bare chance of success but under party politicians, greedy contractors and the arrogance of Hays (and others) it had none. By 1917 the GTP alone had an indebtedness of $225,154,881 (the National Transcontinental was extra - which, having cost three times more than it should, would have been a intolerable burden to lease). The catastrophe had been set previously, Hayes having convinced his London board to accept the onerous National Transcontinental terms under the worried agreement of Rivers Wilson and the unwilling consent of the board, only realising by 1912 he was sending a great company to its ruin. Returning from a periodic meeting in London on the Titanic he remarked that "The White Star, the Cunard and the Hamburg Amerika line are now directing their attention to a struggle for supremacy... the time will soon come when the greatest and most appalling disaster will be the result" only too true - one could also read Grand Trunk, Canadian Northern and CPR - how easy to see the mote in others eyes but not the beam in one's own! Hayes did not survive the disaster, his dreams perished with him. Grand Trunk refused, in 1915, to take over the National Transcontinental, whereupon the Government proceeded to disallow further (much needed) grain shipments over GTP's branch from Sioux lookout to Lakehead (requiring 252 miles of government line to reach it). 1919 saw the Grand Trunk Pacific forced into receivership.

DEATH AND BIRTH OF A GIANT

Unwillingly the government assumed control of the National Transcontinental as from June 15th 1915 under the title of "Canadian Government Railways" The rest has no real place in this paper other than to say that on 10th September 1921 all Grand Trunk stock (over $37 million) was declare worthless, the Grand Trunk was nationalised among claims for the City (London's business exchange) that Canada had behaved just like another banana republic, "Naboth's Vineyard" was even shouted at a visiting Canadian Minister in London - Bob Edwards of the "Calgary Eye Opener" had another view "The Grand Trunk got a shabby deal - they deserved it".

The Canadian Northern and the Intercolonial were already controlled by Government, the rest was inevitable. One October 4th 1922, Canadian National Railways, for five years an operating description became a statutory entity. A dark horse was appointed president, Sir Henry Thornton (formerly of the Pennsylvania and later Long Island Railroads and England's Great Eastern Railway). Simultaneously CPR had a new president in Edward Wentworth Beatty, (as from 11th October 1918, Chairman by 1922) - A new round of fighting had begun!

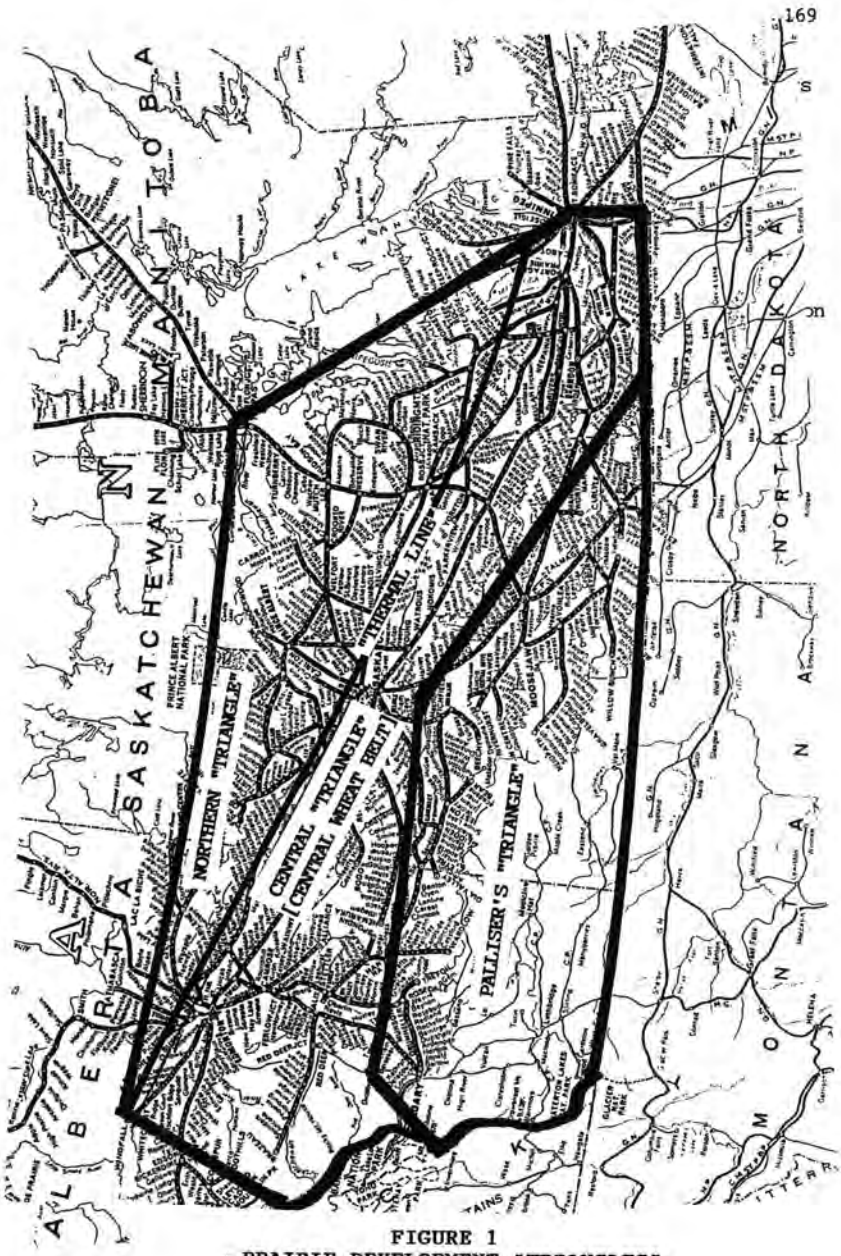


FIGURE 1
PRAIRIE DEVELOPMENT "TRIANGLES"

TABLE I
CPR WESTERN LAND GRANTS

INITIAL GRANT	25,000,000
(less Deduction - debt cancellation)	-6,793,014
Residual grant	18,206,986
Manitoba Branch lines (18/5/89, 4/6/89 and 7/4/91 Agreements)	1,568,000
Southern Alberta (additional lands)	3,000,000
Manitoba & Southwestern Rly	1,349,424
Great North West Central Rly	320,004
Grand Total	24,344,414*

(* excludes eastern canadian and BC land grants).

TABLE II
Number of acres under the five principal grain crops in the Prairie Provinces 1891-1915

	Manitoba	Saskatchewan	Alberta	Total
1891	1.31		.18	1.50
1898	2.16		.43	2.59
1902	3.14			
1904	3.76			
1906				8.04
1908	4.97	3.52	.93	9.42
1909	4.92	5.78	1.40	12.10
1910	4.42	6.75	1.82	13.00
1911	4.94	9.02	3.15	17.10
1912	4.77	10.21	3.38	18.37
1913	4.76	10.20	3.47	18.42
1914	4.45	9.12	3.15	16.73
1915	4.71	12.97	4.33	22.01

TABLE III
TAXPAYER INVESTMENT IN CANADIAN NORTHERN

	Total Grants	Mileage	Aid Per Mile
Federal Government	$110,600,767	10,483	$10,533
	5,663,666	434	$ 2,800
Nova Scotia	380,000 acres	564	691 acres
Quebec	$ 7,859,997	2,337	$ 3,3200
Ontario	2,000,000 acres		855 acres
Manitoba	$25,662,545	1,990	$12,869
	4,102,951 acres		
Saskatchewan	$14,883,750	2,430	$ 6,125
Alberta	$18,950,362	1,726	$19,793
British Columbia	$40,157,523	832	$48,266

* Some acreage transferred to Alberta & Saskatchewan under "indemnity selection"

WINNIPEG: GATEWAY TO THE MID-CONTINENT CORRIDOR

by Barry E. Prentice*

The terms "transportation gateway" and "transportation hub" tend to be used interchangeably. However, Burghardt (1971) hypothesizes that gateway cities are different from other large cities that serve as regional transportation hubs. Typically, a gateway city is located at one end of an economic region where it provides a natural access point for transportation. Unlike a central place that might be envisioned to have a circular tributary area, a gateway city usually has a fan-shaped zone of economic influence. In other words, transportation hubs tend to have many short spokes, while a gateway city typically occupies a strategic position on one, or two, major transportation corridors.

Within the above definitions, the City of Winnipeg -- located at the point where the Canadian Shield meets the fertile Prairies -- clearly falls in the category of gateway cities. This paper examines Winnipeg's development, current status, and future as a transportation gateway. The first section reviews the economic and political forces that shaped Winnipeg's development. The report then turns to recent changes in trade patterns, logistics and other transportation innovations that pose significant opportunities to enhance Winnipeg's gateway functions.

Location, Location, Location

Geographic features dictate how transportation and other services are funnelled to a particular territory. Gateway cities provide the transportation and communications links that ease trade between two productive areas separated by a less productive tract of land and/or water. Consequently, gateway cities can be found in the transition zones or shear points between different geographic regions (Burghardt, 1971). For example, where the marine environment gives way to the land mass of North America, the gateway cities of Vancouver and Montreal provide access to a continental hinterland.

The location of gateway cities that develop in the interior of a continent are more difficult to predict. Their location is often influenced by the presence of mountain ranges, deserts or other large features that separate areas with

---

* Acting Director, Transport Institute, University of Manitoba

differing resource intensities. Winnipeg developed as a gateway city at the point where the Canadian Shield gives way to nearly a thousand miles of fertile prairie land. Lake Winnipeg to the north and the U.S. border to the south hemmed in the possible places where transportation links could cross the Red River. The exact location of Winnipeg, at the junction of the Red and Assiniboine Rivers, was favoured by the easy transportation and communication access that these waterways provided.

Evidence of trading activity at the forks of the Red River can be traced back for hundreds of years. By the time technology evolved from canoes to Red River carts and steam boats, Winnipeg had already established an extensive distribution network. In 1878, a rail link was completed between Winnipeg and the U.S. border. Four years later the Canadian Pacific Railway completed its section of railroad from Thunder Bay to Winnipeg. As the railway encouraged economic development to the west of the Red River, Winnipeg became the obvious place for most goods to be warehoused and distributed.

> Situated near the point where the empty and unproductive Laurentian Shield gave way to the rich prairie farmland, Winnipeg was the logical focus for [railway] branch lines feeding the main line ... Winnipeg's position was analogous to that of a funnel in the collection and consolidation of eastern moving products, and in the distribution of eastern products to the smaller centres of the west. (Schmidt, 1974: p.212)

Trade and transport linkages tend to enhance a gateway city's economic development, and may retard the growth of smaller cities located in its immediate shadow. Cronon (1991) notes that the influence of Chicago has been so great that no important central place has ever developed in Iowa. Until recently, Winnipeg could be said to have had the same impact on the urban centres of Saskatchewan.

Political and Commercial Influences on Gateway Development

The original route surveyed for Canada's first trans-continental railway envisioned crossing the Red River at Selkirk, Manitoba where the banks were more stable and less prone to flooding. However, the pull of population and a proactive business community at Winnipeg supplied the financial incentives to outweigh the engineering concerns, and to bring the eventual river crossing through Winnipeg.[1]

Political barriers can be as important as geographic features in the development of gateway cities. Although Winnipeg served as a logical place to ford the Red

River, Winnipeg's gateway functions could have been subsumed by Minneapolis-St. Paul if it had not been for the international boundary between Canada and the United States. To this day, the dominance of the Minneapolis-St. Paul gateway remains undisputed in the northwestern United States: no city as large as Minneapolis-St. Paul exists to its north or west, until the Pacific coast. If not for the Canadian border, Minneapolis-St. Paul could have taken over much of the distribution role that occurred at Winnipeg.

The growth of Winnipeg as an east-west gateway was reinforced by the newly formed Government of Canada. In 1879, Sir John A. MacDonald initiated his *National Policy* of high customs tariffs that increased the trade barrier posed by the border. The customs tariffs were critical to government financing of the transcontinental railway and to creating a market for its services.

> By means of the tariff, the settlement of the west would provide a national market, and the national market would supply east-west traffic for Canadian trans-continental railways and areas of exploitation for eastern Canadian industry. (Creighton, 1957: p. 346)

Regulation of transportation was another policy lever used by the Canadian Government to secure Winnipeg's place as a gateway city. Schmidt (1974) notes that in 1882, the community of Emerson, Manitoba on the U.S. border unsuccessfully challenged Winnipeg for the gateway role. Besides imposing tariffs that sharply curtailed Canada-U.S. trade, the government disallowed the charter of Emerson's projected railway, the Emerson and North-Western.

The role of transport regulation in favouring or undermining gateway locations continues to this day. A current example is the limits on air routes imposed by the bilateral treaties that funnel international traffic to specific airports in Canada.[2] Cabotage restrictions on trucking also affect traffic patterns, but it is unclear whether they favour or discourage development at Winnipeg's gateway.

The national boundary helped make Winnipeg the gateway to the newly developing territories, but even with high tariffs, the lower transport costs to the south continued to favour U.S. suppliers. Without the trans-continental railway -- and the underlying federal government will to realize this accomplishment -- Canada's claim to the Prairies would soon have been challenged by the United States. Competition for Western Canada's hinterland pitted the merchants of Montreal against the business interests of the New York-Chicago axis. The battle to finance the railway through the Canadian Shield to Winnipeg was staged from Montreal. If the Montreal group had been unsuccessful, competing U.S. suppliers would have soon pushed their rail lines beyond St. Paul to serve

this area. This illustrates the importance of strategic alliances with other commercial centres to the growth and development of gateway cities.[3]

Government policy also dealt the first significant blow to Winnipeg's gateway status, with the regulatory change in freight rates known as the Western Rates Case (1914). In 1901, Manitoba had negotiated a stop-off privilege with the railways on westbound freight. The agreement gave Winnipeg distributors the equivalent of through rates to the rest of the Prairies. This privilege provided Winnipeg with a significant advantage in breakbulk operations that other western cities did not enjoy. In 1914, the Board of Railway Commissioners undertook a major overhaul of the freight rate system in Western Canada. These changes included a rationalization of the class rate system and the elimination of the special rates for Winnipeg (Hackston, 1981).

Technological Change

Technological changes can have a direct effect on the growth and development of gateway cities. During the period of sail power, for example, the important gateway cities were coastal ports which dominated commerce. Many of these cities were located on navigable rivers, or could serve their hinterland through barge canals. Quebec City, Boston and Savannah are examples of early gateway cities that dominated large hinterlands.

Initial settlement of the Canadian Prairies was based on river transport in York boats and canoes that entered through Hudson's Bay. By 1855, the Red River cart became the principal means of transportation, and Winnipeg had emerged as a gateway with a southern orientation through St. Paul, Minnesota. Although romantic, the Red River cart and river barge system of transport were too slow and expensive to support large-scale development of the Winnipeg gateway.

The arrival of the Canadian Pacific Railway shifted the focus of Winnipeg's supply base from the U.S. to Eastern Canada. As rail lines were built to the west and north, Winnipeg's hinterland expanded to include all three Prairie provinces and eastern British Columbia. The railway forged Winnipeg into a true gateway and propelled the city to its peak period of growth from 1895 to 1920.

After the setback resulting from the Western Case Rates in 1914, the completion of the Panama Canal in the same year added a second blow to Winnipeg's gateway. By the 1920s, the competition from water routes to the Port of Vancouver via the canal began to erode the western extent of Winnipeg's hinterland. Correspondingly, it reduced the volume of rail traffic through Winnipeg. The Panama Canal is often identified as the most important

cause of Winnipeg's declining growth during this period, but that overlooks the impact and timing of frontier settlement. By the time the Panama Canal was opened, most of the Prairie land was occupied and immigration numbers had slowed considerably. Competition from the Panama Canal may have diverted traffic, but there is only one opportunity to develop the frontier and by this time it had passed. The dynamic growth of Winnipeg's gateway was arrested further by the economic depression of the 1930s, which affected the entire country.

Following the setbacks resulting from the Panama Canal and the Great Depression, Winnipeg's status as a gateway again took a positive turn in the 1950s -- this time due to the rise of interprovincial trucking. Heads (1990) summarizes this period as follows:

> Winnipeg was the natural place to break bulk and consolidate shipments for other Western Canadian destinations. The markets in Calgary and Edmonton, for example, were not then sufficiently large to absorb full truckload shipments of goods from Eastern Canada. In the technology of the 1950s, truck transport could not compete with rail over longer distances. Moreover, the Manitoba government had negotiated trucking reciprocity agreements with several neighbouring states and provinces to avoid duplication of registration fees charged on trucks. This reinforced the locational advantages of the province." (Heads, 1990, p. 84)

By the 1970s however, a growing Prairie economy -- which engendered increased competition from Calgary and Edmonton -- and a maturing trucking industry tended to erode Winnipeg's gateway status. This occurred because of the decentralizing effect of motor carrier technology. The history of the meat-processing industry at Winnipeg illustrates the point. During the rail era, it made sense to locate the meat-processing industry in Western Canada at a central location where livestock could be readily concentrated. From a logistical perspective, Winnipeg was the ideal location for a major stockyard because it was at the junction of the transcontinental railroads. Loads of live animals could be consolidated for shipment to Eastern Canada, or slaughtered and shipped as frozen meat. The rise of the trucking industry enabled rapid and flexible delivery to be made to processing plants in each region of concentrated livestock production. The resulting decentralization of the meat-packing industry was the first strike against Winnipeg's gateway function for livestock.

The second and third strikes came with the completion of the Trans-Canada Highway and the adaptation of mechanical refrigeration to truck trailers. Initially, the trucks offered competition to the railway only for movements east of Winnipeg, but as the trucks became larger, they could deliver directly to

Ontario from Alberta meat-packing plants. During the 1980s, the railways exited the carriage of live animals, and the meat-packing industry in Manitoba became characterized by derelict buildings.

Changes in transportation technology can have profound effects on competing gateway locations. The centralizing effect of the railway tended to concentrate and reinforce the gateway activity at Winnipeg. As the railways lost freight to the trucking industry, the gateway at Winnipeg was forced to compete with more small centres. Unlike the railways, the trucking industry holds no allegiance to any particular gateway, but views every location as a potential distribution centre.

Shifting Trade Patterns and Capital Markets

Shifting trade patterns can accelerate the relative change in gateway cities. In the case of Canada, the growth of trade with the Asian countries increased the importance of the western gateway cities of Vancouver and, to some extent, Calgary relative to Winnipeg. The dynamic growth of California also benefited Calgary which serves as the Prairie provinces' gateway to the U.S. west coast.

The economic stimulus of the energy sector, and the population growth that it encouraged, refocused the gateways of the Prairies towards Calgary and Edmonton. Distributors can reduce their logistics costs by concentrating inventories in the largest population zones. The expansion of these cities encouraged the relocation of various warehousing and logistics activities from Winnipeg.[4]

Cronon (1991) addresses the provision of capital as another gateway function that reinforces its transportation, communication and distribution advantages. Some of the loss of gateway functions at Winnipeg may be linked to its failure to develop as a strong financial centre. It has been argued that after the formation of the Canadian Wheat Board in 1935, Winnipeg's role in the financing of the grain industry was greatly diminished, and has never recovered. "The creation of the wheat board and the development of the wheat pools eventually drained away much of the great commercial and entrepreneurial drive that was instrumental in the creation of the original grain companies in Winnipeg." (Douglas, 1994). In contrast to Winnipeg, Minneapolis has evolved into a major financial and venture capital centre in the United States.[5]

It is clear that gateway cities can have multiple functions and that there are different kinds of gateways. Some cities are primarily gateways for goods; others for capital and/or information. To the degree that a gateway has more functions, it will be more important. It may also be useful to distinguish

between gateways that are primarily for goods of domestic origin versus international origin. The diversity of transport modes serving a gateway is likely to be another indicator of importance. Winnipeg would rank relatively high in terms of distribution functions, trade and diversity, but lacks a strong financial sector. Moreover, the scale of a gateway city's activities are proportioned to its hinterland. In the case of Winnipeg, its hinterland is large but sparsely populated.

Stages of Development of Gateway Cities

While technological changes can affect the relative growth of gateway cities, history also suggests that time itself is a factor. Like many industries and products, gateway cities are subject to a life-cycle process. The rate of economic growth and the functions performed at the gateway change as a region develops and matures. A conceptual model of the life cycle process is illustrated in Figure 1.

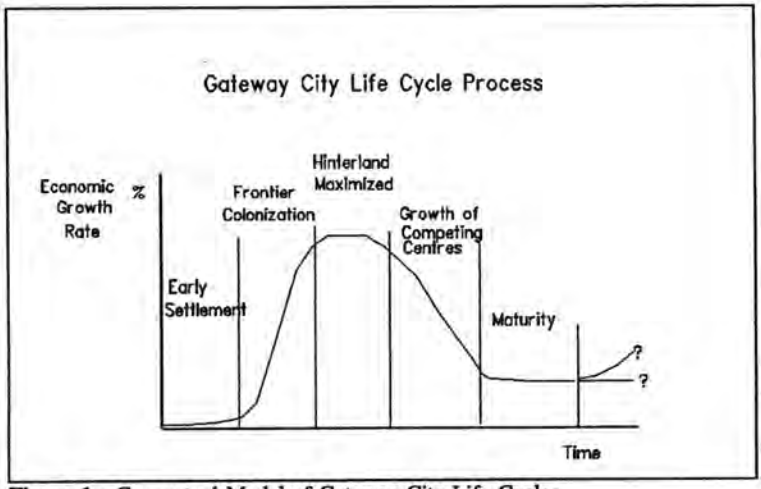


Figure 1: Conceptual Model of Gateway City Life Cycles

The first phase is an early settlement period when the gateway location becomes established as a community. The rate of growth is slow and there are few, if any, distribution functions. The second stage, which is a period of frontier colonization, is generally associated with a technological breakthrough.[6] During this stage, gateway cities are characterized by dynamic, and often speculative, growth. If located along a moving frontier, they grow to become the largest

service centre in the region. The peak growth rate of the gateway city coincides with the maximization of its geographic hinterland.

Regional economic development literature holds that beyond each large city, other satellite cities and towns develop that are subordinate to the main, central place. The dominant cities serve as transportation hubs, where goods are collected from, and disbursed to smaller communities. As the region becomes settled, the transportation hubs grow at the expense of the gateway city which experiences a relative decline.[7] Ultimately, the gateway city reaches maturity, as a large central place with a growth rate similar to the average in the economic region.

The length of a gateway city's life-cycle can vary considerably. Burghardt observed that the process for Cincinnati probably lasted a century and a half. In the case of Winnipeg, the stage of maturity was likely reached within 50 years of the frontier colonization. As the pace of technical change increases, the advantage of any gateway location is likely to be shorter-lived.

The declining phase of the gateway life-cycle may have a negative psychological impact on the business community. Like an aging athlete that pines for his robust youth, the loss of its relative status as the leading commercial centre can affect the outlook of the gateway city's residents. The nineteenth-century citizens of St. Louis berated their leaders' inability to capitalize on the city's natural advantages and their failure to respond to the challenges of Chicago. These feelings of economic malaise and stagnation -- which are not entirely foreign to Winnipeg -- can have real effects as would-be entrepreneurs are encouraged to migrate to more dynamic centres, and investments in public infrastructure are delayed or abandoned. This tendency points to the need for ongoing identification and analysis of transportation and logistic opportunities for mature gateway cities.

Winnipeg's Current Status As A Transportation Gateway

Even as a gateway city's influence is eroded by competition from other cities, it will tend to retain a significant share of its transportation linkages. Indeed, Winnipeg still retains much of the transportation infrastructure and many of the transportation facilities that are associated with a gateway city. The Province of Manitoba has a disproportionate share of the national employment in transportation relative to its population (Heads, 1990). In addition, a gateway city can remain a manufacturing centre for transportation equipment, as Burghardt observes for Cincinnati. This also applies to Winnipeg, where Heads (1993) identifies 7,000 jobs in the transportation equipment manufacturing industries.[8]

Winnipeg continues to serve as an important junction point for traffic moving east-west within Canada and as a border crossing for trade with the United States. An analysis of freight traffic that flows through Winnipeg shows that the volume of rail, truck and air movements through Winnipeg greatly exceed the traffic to and from Manitoba (Prentice, 1995). From this perspective, Winnipeg still functions as an important gateway city. The more interesting feature of the analysis is the southern pull on Winnipeg's gateway and the emergence of a dual gateway role: Winnipeg continues to serve as the gateway to the prairies for Ontario and Quebec, but in addition, it is now Western Canada's most important gateway to the U.S. industrial heartland and Mexico Clayton and Blow, 1995).

A mature gateway city is unlikely to ever recapture the exceptional growth rates of its early stages, but it may be able to achieve a higher-than-average growth rate than its region if a technological breakthrough re-kindles its economy. For example, the advent of new double-stacked container technology has helped Chicago recapture some of its lost transportation activity (GAO, 1992). This technology is also likely to help other rail-oriented gateways, like Winnipeg, as intermodal transport replaces long-haul trucking.

The good news for Winnipeg in this context is that the above example is only one of a series of transportation innovations, changing trade patterns, and logistical developments that can be harnessed to spur Winnipeg's economic development. These developments, along with related opportunities to enhance Winnipeg's gateway function, are outlined in the next section.

NAFTA and the Mid-continent Trade Corridor

The potential for greater north-south trade under NAFTA has stimulated interest in the development of new commercial alliances in the United States and Mexico. Several regions of the U.S. are trying to establish trade corridors that funnel the north-south flows from Canada to Mexico through their jurisdictions. The trade corridor of interest to Winnipeg is being called the Mid-Continent Trade Corridor (MCTC), i.e., the Highway 75 and Interstate 29-35 route to Laredo, Texas and on to Mexico City. Fortunately for Manitoba, the jurisdictions that make up the MCTC identify Winnipeg as the gateway city for their trade with western Canada.

A recent meeting of U.S. and Canadian representatives identified the following advantages of the MCTC relative to other competing corridor routes:

1. The MCTC offers the shortest distance and least travel time between the major population centres of Mexico and Western Canada. The entire

north-south route is served by limited-access, divided highways. In fact, it is easier to travel from Edmonton via Winnipeg to Mexico, than to go straight south through an Alberta border crossing.

2. The MCTC is one of the few corridors where the rail lines virtually parallel the highway route. Kansas City is a potential substitute to Chicago as a major interchange point for double-stacked container trains. Consequently, the MCTC could have a significant advantage over alternative corridors as intermodal containers replace longhaul trucking.

3. The MCTC has access to large airports at eight-hour (or less) driving intervals. This could permit shuttle services of cargo to move along the MCTC for the furtherance of air freight between non-connecting flights. It also permits the MCTC to position itself as a truly "multi-modal" corridor, which makes it more difficult for other corridors to match.

4. The MCTC route runs through the Great Plains which are flat and dry. As a result, it is less subject to weather-related interruption than routes to the west, or east.

5. Being located in the centre of the continent, the MCTC has a larger geographic window for business operations than other corridors.

6. The MCTC accounts for the fourth-largest Canada-U.S. trade flow, and connects with the busiest U.S.-Mexican border crossing at Laredo, Texas.

7. The MCTC connects with all transcontinental east-west routes and serves a hinterland that encompasses approximately one-third of the populated area of North America.

The inherent advantages of the MCTC relative to other trade corridors are substantial. Perhaps more important, is the recognition of the "trade corridor" concept at the political level. Some concrete proposals to take advantage of the MCTC are under study. One group based in Texas has proposed to lay fibre optic cable along the interstate highway to facilitate data flows for customs clearance, tracing, and to minimize vehicle re-inspection.

There are major initiatives in air, rail and trucking that could help enhance Winnipeg as a transportation gateway to the MCTC. Each of these projects can be considered on a stand-alone basis, but there are synergies that would be created if more than one of these activities are realized. The three initiatives presented here are: an international air-cargo facility, rail container ports and an electronic market for freight.

International Air Cargo Centre

Burghardt (1971) predicted that air cargo gateways are likely to develop only at large city airports. At the time he was writing however, air freight was almost exclusively a by-product of passenger transport, i.e. belly space. Since the mid-1980s, the air freight market has been growing faster than the rate of air passenger transport. The demand for air freight has led to the development of dedicated air cargo corporations and airports.[9]

Dedicated air cargo operators must consider weather conditions, cargo flows, operating costs and regulations in choosing gateway locations. Reliability is an extremely important factor in cargo service, as shippers who receive inconsistent or unpredictable service will likely switch carriers. Moreover, an air cargo operator can increase profits, if its aircraft can fly non-stop between locations with the maximum amount of cargo on board.

Winnipeg has the advantage of exceptionally good flying conditions and an airport with twenty-four hour operating status. Some people may find it hard to believe that Winnipeg has a strategic location as an air cargo gateway. The doubts can be explained by "flat earth map" syndrome. On most maps, Winnipeg appears to be a lot farther from Europe than cities like Chicago, or Toronto, but the data in Figure 2 tells a different story. These data show that Winnipeg is closer to Europe than any of these other cities except New York, and that only Los Angeles and Seattle are closer to Asia.

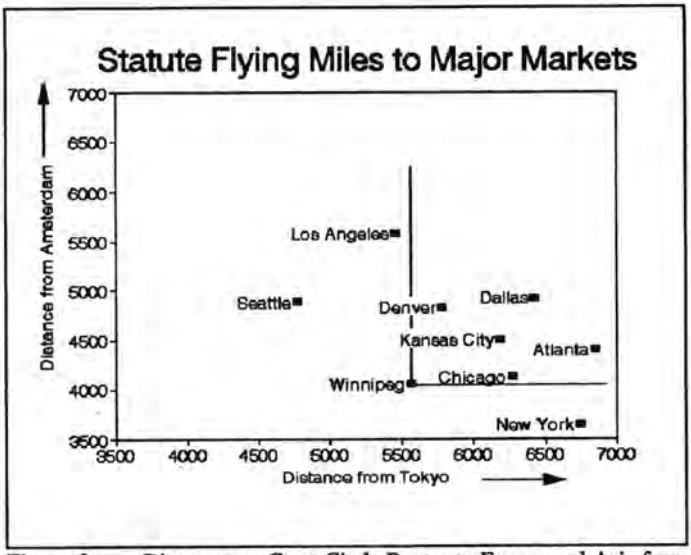


Figure 2: Distances on Great Circle Routes to Europe and Asia from North American Cities

Winnipeg is the first large airport on the Great Circle Routes where the airlines can put down on transpolar flights to North America. The largest air cargo jets (Boeing 747-400) can fly fully loaded, non-stop from Japan, Korea, eastern China, or from anywhere in Europe, to Winnipeg. From Winnipeg, shippers can get access to the low cost highway or rail infrastructure that serves the industrial heartland of North America. Burghardt observes that a location on the fringe of a large fertile area is most favoured for a gateway city. In the case of international air freight, Winnipeg's location for transpolar flights could hardly be more ideal.

In addition to the opportunity to encourage direct air cargo flights from Europe and Asia to Winnipeg, the city could play a role in air freight services to Latin America. At the present time goods from Latin America moving to Europe tend to use the Miami gateway, while goods moving to Asia use the Los Angles gateway. Mexico City has ample belly capacity on passenger flights to Latin America for air cargo routes that would permit a linkage with Winnipeg via the MCTC that could be cost effective and convenient for shippers.

The majority of the infrastructure to make Winnipeg an air cargo gateway is in place. The missing ingredient is a rapid-handling air cargo terminal and the associated road/rail links on the west side of the airport.

Double-stacked Container Facilities

The introduction of double-stacked container technology creates opportunities and threats for Winnipeg. At the present time, the three railways (CN, CP, BN-Santa Fe) handle their intermodal containers in separate yards. None of the yards are specifically designed for the efficient movement of containers or to meet the projected needs of the industry. Hence expansion and/or relocation will eventually be necessary. The BN-Santa Fe Railway, for example, has very limited terminal facilities for handling rail traffic in Winnipeg. At the present time, containers are moved by truck to and from Manitoba to their container facility at Fargo, ND. The construction of a multi-user container port could lower the handling costs for the BN-Santa Fe and encourage their use of Winnipeg as a gateway for north-south trade. This could provide Winnipeg with a strategic advantage for intermodal traffic along the MCTC. It would also cement the commercial relations with the gateway cities in the southern U.S. and Mexico.

Lowering the cost of operating double-stacked container trains through Winnipeg would help attract other businesses as well as promote railway employment in the city. A good part of the expected employment associated with the air cargo initiative is related to the manufacturing/assembly business it inspires. This will require good surface freight connections and low costs.

The presence of a high-speed multi-user intermodal container rail port at Winnipeg could enhance the proposed air cargo facility. Construction of a rail container port on the northwest approaches to the airport would help maintain its 24-hour operating status by preventing urban encroachment. The two operations could share surface infrastructure. Proximity of a rail port would reduce costs and increase service for the distribution of air cargo. The access to the air and rail services would also make an industrial park more attractive to new industry and distribution firms.

Electronic Market for Freight

As we enter an era of electronic highways and telecommunications, the ability of some locations to serve a population better than others is likely to increase in importance. The central time zone is certainly an advantage that has helped Winnipeg attract new "call centres" and retain the head offices of national trucking companies at this location.

The development of an electronic market for freight is a third transportation initiative that could enhance Winnipeg's transportation gateway. The city has all the requirements to establish such a market, including experience with transportation-related information services, a well-established transportation industry, and a long tradition of commodity markets. Interest in the development of a fibre optic data network along the MCTC could provide the means for inexpensively linking the electronic market to transportation centres from Winnipeg to Mexico City.

The benefits of an electronic freight market to Winnipeg's status as a gateway city would be substantial. The Winnipeg Commodity Exchange earns more than half of its revenue from the sale of information that is generated by its activities. An electronic market would create new employment in the service sector through transactions that neither originate nor terminate at Winnipeg. Finally, the electronic freight market would encourage the existing trucking firms/freight forwarders/air carriers/etc. to remain in Winnipeg, and provide a reason for others to seek this location for their headquarters.

The development of an electronic freight market for trucking/intermodal containers could be followed by other related markets. Similar markets for air freight could be centred on the new air cargo centre (Winnport), and as a method for allocating grain hopper cars. The establishment an electronic freight market at Winnipeg could have far-reaching implications. Figuratively speaking, it could be the glue that binds the various transport activities into a true multi-modal transportation centre at the Winnipeg gateway.

Conclusion

History suggests that business institutions often stay where they are started. Winnipeg has a favoured geographic location, and there is no reason why it should be surpassed by others in securing leading-edge air and rail intermodal infrastructure. Winnipeg needs to capitalize on its transportation sector to create the climate of business success and its residents need to believe again in the opportunities of their gateway location. A concentrated effort is needed to finance air cargo, rail, and information developments that can renew its growth and solidify Winnipeg as Western Canada's gateway to the Mid-Continent Trade Corridor.

REFERENCES

Burghardt, A. F. "A Hypothesis About Gateway Cities" *Annals of the Association of American Geographers*. Vol. 61, 1971: 260-285.

Clayton, Alan and Phil Blow. "Western U.S.-Canada Crossborder Case Study" *FHWA Comprehensive Truck Size and Weight Study*. Battelle: repot to Federal Highways Administration, December 1995.

Creighton, Donald. *Dominion of the North: A History of Canada*. (revised edition) Toronto: MacMillan Company, 1957.

Cronon, William. *Nature's Metropolis: Chicago and the Great West*. New York: W.W. Norton & Company, 1991.

Douglas, John. "Wheat Boom sowed declined" *Winnipeg Free Press*. December 27, 1994: C7

General Accounting Office. *Intermodal Freight Transportation: Combined Rail-Truck Service Offers Public Benefits, but Challenges Remain*. United States General Accounting Office, Report No. GAO/RCED-93-16, December 1992.

Grain Matters. "The CWB: What's it worth to you?" January-February, 1996.

Hackston, D.C. "Railway Freight Rates in Western Canada (1880-1980)" Symposium on Rail and Air Transportation and Regulatory and Research Roles of the Canadian Transport Commission, University of Alberta, 1981 (mimeo).

Heads, John. *Manitoba Transportation Action Plan to the Year 2000*. A report to the Transportation Industry Development Advisory Committee, Transport Institute, 1990.

Heads, John. *Transportation Employment in Manitoba to the Year 2000*. Report submitted to the Manitoba Department of Highways and Transportation, September 1993.

Prentice, Barry E. *Retaining Winnipeg As A Transportation Gateway Into the 21st Century*. Report submitted to Manitoba Department of Highways and Transportation, November 1995.

Schmidt, R. "Winnipeg As a Transportation Centre". *Winnipeg 1874-1974: Progress and Process*. Tony J. Kuz (ed.), Winnipeg: Manitoba Department of Industry and Commerce, 1974.

Acknowledgement

The initial study of this subject was supported by a grant from the Manitoba Department of Highways and Transportation. The author wishes to thank Dr. Jim Dunn, Pennsylvania State University for helpful suggestions on an earlier draft, while relieving him of responsibility for any comments contained in this version.

Endnotes

1. This historic success of a "proactive business community" continues to be referenced in modern Winnipeg as an example of the spirit that should be summoned to forge an airfreight gateway in the community.

2. The 1995 "Open Skies" Agreement between Canada and the United States has eliminated the restrictions on transborder flights to Winnipeg. The additional services that have been provided since the Agreement suggest the pent up demand for Winnipeg's gateway that had been frustrated by the bilateral regulations.

3. Cronan (1991) observes that the ascendency of Chicago as competition to the St. Louis Gateway was related to the strength of Chicago's strategic alliance with New York. St. Louis' weaker partners (New Orleans and Baltimore) could not match New York's commercial power.

4. For example, Winnipeg lost Safeway's head office (food distribution) to Calgary, and a significant portion of CN Rail's management positions to Edmonton.

5. Of course Winnipeg's loss may have been the farmers' gain. A recent study suggests that risk management by the CWB could be worth as much as $6.00/tonne to wheat producers (Grain Matters, 1996).

6. Typically, we tend to think of changes in transportation as the important technological breakthrough, but it could also be a new manufacturing technique or innovation in production that opens a previously undeveloped frontier. Cronan (1991) cites the importance of new milling technology that expanded the market for hard spring wheat, as the factor that led to the emergence of the Minneapolis gateway in competition with Chicago.

7. Initially, only the inventories of the fastest moving products are shifted from the gateway to be closer to the customer. Inventories follow the "80/20 rule", in that 80 percent of the sales are supported by 20 percent of the inventories. Consequently, the gateway continues to dominate the distribution trade. As development continues however, the shift of the remaining 80 percent of inventories is disproportional to growth. Hence, the gateway can experience a rapid relative decline.

8. In addition, there are 27.2 thousand full time equivalent jobs in air, rail, trucking and incidental transport services in Manitoba (Heads 1993).

9. Federal Express may the best known example of a dedicated airfreight carrier, while the airport at Huntsville, Alabama is often cited as a specialized air cargo gateway.

IMPLICATIONS JURIDIQUES DU PROJET DE LOI FÉDÉRAL C-101, *LOI SUR LES TRANSPORTS AU CANADA*

Louis Doyle
Analyste en transports
Ministère des Transports du Québec*

I. INTRODUCTION

Le ministre fédéral des Transports, M. Doug Young, a déposé en juin 1995 le projet de loi C-101, *Loi sur les transports au Canada*, qui remplace la *Loi de 1987 sur les transports nationaux* (LNT-87) ainsi que d'autres textes législatifs.

Ce projet de loi vise surtout à établir un nouveau cadre juridique au transport ferroviaire : il aura donc sans aucun doute des incidences énormes et nombreuses sur tous les intervenants, et au premier chef, les expéditeurs.

Dans ce contexte, il nous apparaît utile de préciser, pour toutes les parties intéressées en transport ferroviaire, les implications juridiques et économiques de ce projet de loi.

Avant d'en débuter l'analyse détaillée, il est bon de souligner certaines considérations qui expliquent l'introduction du projet de loi.

En juin 1994, M. Doug Young, dans une allocution prononcée dans le cadre de la Journée nationale des transports, livrée à Thunder Bay, soulignait les nouvelles orientations pour les transports. De plus, il précisait sa vision du transport ferroviaire en ces termes :

> «L'avenir de l'industrie du rail est incertaine. Il est entravé par des problèmes de surréglementation, de mauvaise administration, de surcapacité, de pertes financières, de pratiques archaïques de travail et de réglementation désuète[1].»

---

[1] Allocution du ministre des Transports, Doug Young, au dîner de la Journée nationale des transports, Thunder Bay (Ontario), vendredi 3 juin 1994, p. 2.

En décembre 1994, M. Doug Young récidivait devant l'Assemblée des expéditeurs nationaux réunis à Ottawa. Dans ce discours, il précisait ses intentions quant à ses futures interventions en matière de transport ferroviaire :

> «Nous voulons modifier la *Loi sur les transports nationaux* et la *Loi sur les chemins de fer* pour favoriser le développement de l'industrie du transport sur courtes distances, que ce soit sous compétence fédérale ou provinciale[2].»

De plus, le projet de loi s'inscrit dans le grand plan de renouveau ferroviaire initié par Transports Canada. Cette politique de renouveau vise aussi la commercialisation du Canadien National (CN), recommandation principale du Rapport du groupe de travail Nault. Ainsi, en juin 1995, le gouvernement fédéral adoptait le projet de loi C-89, *Loi sur la commercialisation du CN*.

En somme, le projet de loi C-101, *Loi sur les transports du Canada*, ne constitue qu'un volet, bien que très important, de la nouvelle politique de renouveau ferroviaire du gouvernement fédéral. Rappelons que des audiences publiques du Comité permanent des transports de la Chambre des communes ont eu lieu, en octobre 1995, pour entendre le point de vue des parties intéressées à ce projet de loi. Le projet de loi devrait être adopté au printemps par le Parlement.

II. CONTENU DU PROJET DE LOI

Le projet de loi C-101, comprenant plus de 283 articles, constitue en fait une consolidation de nombreuses lois (la *Loi sur les chemins de fer*, la *Loi sur les chemins de fer de l'État*, la *Loi sur les billets de transport* ainsi que la *Loi de 1987 sur les transports nationaux*).

1. Création d'un nouvel organisme de réglementation ferroviaire

En premier lieu, le projet de loi crée un nouvel organisme, l'Office des transports du Canada, qui remplace l'actuel Office national des transports. Le rôle du nouvel organisme sera plus limité. En effet, certaines compétences de l'Office, dont les fusions et les acquisitions, sont confiées au Bureau canadien de la concurrence. De plus, l'Office détiendra dans l'avenir la faculté de ne considérer la demande d'un expéditeur relative au prix que s'il estime que celui-là subirait autrement un préjudice commercial important.

---

[2] Notes d'allocution du ministre des Transports, Douglas Young, sur la relance du secteur ferroviaire à l'Assemblée des expéditeurs nationaux, Ottawa (Ontario), 14 décembre 1994, p. 5.

2. Maintien des mécanismes de protection pour les expéditeurs

Ce projet de loi reprend les dispositions de la LNT-87 relatives au maintien des mécanismes de protection à l'intention des expéditeurs utilisant le chemin de fer pour assurer un niveau de service adéquat à des prix compétitifs.

3. L'octroi de droits de circulation aux seuls chemins de fer fédéraux

L'article 138 du projet de loi relatif à l'octroi de droits de circulation reprend le libellé de l'article 148 de la LNT-87 sauf que l'Office peut rendre sa décision par arrêté sans audiences publiques. Soulignons que l'octroi de droits de circulation n'est autorisé qu'entre les compagnies de chemin de fer fédérales tel que le prévoit actuellement la LNT-87.

4. Nouveau mécanisme de transfert et de cessation de l'exploitation

Le nouveau mécanisme de transfert et de cessation de l'exploitation est décrit aux articles 140 à 146 du projet de loi. En premier lieu, il est fait l'obligation aux compagnies de chemin de fer d'adopter un plan triennal où est précisé l'avenir de l'ensemble de leurs lignes ferroviaires.

Postérieurement à son plan triennal, la compagnie de chemin de fer concernée n'aura qu'un avis de 60 jours à donner pour préciser l'avenir de toute ligne (vente, cession ou cessation de l'exploitation). S'il y a un acheteur, un délai de quatre mois est autorisé pour conclure la transaction. Dans l'éventualité où aucun acquéreur ne s'est manifesté, les gouvernements fédéral, provincial ou municipaux auront un délai de 30 jours chacun pour décider d'acheter la ligne ou non.

5. Dispositions sur l'arbitrage

Les dispositions sur l'arbitrage contenues dans le projet de loi constituent une reprise des dispositions de la LNT-87. Cependant, il y a des distinctions; le projet de loi ne reprend ni les dispositions sur la médiation ni celles de l'enquête d'intérêt public, pouvoirs actuellement détenus par l'Office national des transports (O.N.T.).

L'article 160 du projet de loi est de droit nouveau. Cette disposition nouvelle permet aux administrations ferroviaires de banlieue (S.T.C.U.M., Go Transit) ainsi qu'à Via Rail de bénéficier de l'arbitrage de l'Office des transports du Canada en matière de tarification ou de fourniture de services.

6. Abrogation de deux dispositions importantes de la *Loi sur les chemins de fer*

Le projet de loi prévoit l'abrogation de la *Loi sur les chemins de fer*. Deux éléments de cette loi revêtent une importance particulière : les dispositions relatives à l'abandon des services de train voyageurs (articles 264 à 270), ainsi que celles concernant la *Loi sur la divulgation de renseignements — Rail Disclosure Act* — (articles 352 à 354).

Rappelons que les articles 264 à 270 concernant le financement de certains services passagers permettent à l'Office (O.N.T.) de réexaminer tous les cinq ans la contribution financière fédérale (soit 64 % des pertes d'exploitation).

Au Québec, le gouvernement fédéral subventionne le service voyageurs (Sept-Iles/Schefferville) de la Compagnie de chemin de fer Q.N.S.& L. Soulignons que sans ces dispositions spécifiques de la *Loi sur les chemins de fer*, la contribution financière fédérale serait à la discrétion totale du ministre fédéral des Transports. La nouvelle approche fédérale est de confier les questions d'intérêt public et de subventions non à un organisme quasi-judiciaire, mais plutôt à une autorité politique en raison de son imputabilité.

En ce qui a trait aux dispositions de la *Loi sur la divulgation de renseignements ferroviaires*, dispositions qui disparaissent dans le projet de loi C-101, il faut remarquer que les articles 351 à 354 de la *Loi sur les chemins de fer* permettent au gouvernement d'une province de demander des renseignements (à titre d'exemple, le coût des frais de services pour le transport de banlieue) au ministre fédéral des Transports qui oblige alors la compagnie de chemin de fer concernée à dévoiler ces informations au gouvernement de la province qui les a demandées.

III. ANALYSE DE CERTAINES DISPOSITIONS DU PROJET DE LOI

1. Nouveau mécanisme de transfert et de cessation de l'exploitation de lignes

Ce processus fort expéditif (avis de 60 jours, 30 jours pour chaque autorité, fédérale, provinciale et municipale) permettra aux sociétés de chemin de fer de se départir, d'une façon très rapide, de leurs lignes ferroviaires sans justification économique ou d'intérêt public.

Ce nouveau mécanisme de transfert et de cessation de l'exploitation n'est guère susceptible de favoriser la création de chemins de fer d'intérêt local (C.F.I.L.). En effet, dans un tel contexte, il nous apparaît difficile, voire impossible, de

trouver un acquéreur potentiel pour exploiter un C.F.I.L. dans des délais aussi courts, soit 60 jours.
Il en est de même pour l'acquisition éventuelle de lignes par les gouvernements provinciaux qui n'auront que 30 jours pour décider de les acheter ou non avec le «privilège» de l'acquérir à la valeur nette de récupération.

À cet égard, nous estimons que la notion de valeur nette de récupération devrait exclure le coût de l'emprise et se limiter à la valeur nette des voies et traverses. L'emprise a été acquise par les compagnies de chemin de fer non comme propriété immobilière mais pour fins de transport. De plus, la valeur nette de récupération devrait prendre en compte les coûts d'établissement de titres clairs de propriété (il s'agit d'une tâche parfois très complexe) ainsi que les coûts associés au «nettoyage» environnemental.

Le nouveau mécanisme issu de ce projet de loi aura donc pour conséquence fondamentale une accélération du démantèlement de voies ferrées en raison de la difficulté de trouver dans des délais aussi courts, des candidats pour l'acquisition des lignes. De plus, ce nouveau mécanisme aura des conséquences néfastes sur le **transport ferroviaire des passagers**, notamment pour la subdivision Montmagny (gare de Lévis) ainsi que la subdivision Alexandria (Montréal-Ottawa).

Le plan triennal proposé par le projet de loi et débutant dès 1996, devrait plutôt entrer en vigueur en 1997 sinon il sera fort difficile de trouver à court terme des candidats potentiels pour l'exploitation de C.F.I.L. De plus, les délais accordés aux autorités (30 jours) pour procéder à l'acquisition ou non sont trop courts et même irréalistes.

2. Aide financière aux C.F.I.L.

Le projet de loi, contrairement à la LNT-87, ne prévoit aucune aide financière fédérale à d'autres moyens de transport. En effet, l'article 175 de la LNT-87 prévoyait une telle aide même si Transports Canada n'a jamais dans les faits octroyé aucun fonds à l'exception d'un cas en Colombie-Britannique.

Rappelons qu'antérieurement à la LNT-87, Transports Canada a déjà contribué pour plus de 2,7 millions de dollars à un projet-pilote permettant la création d'un premier chemin de fer d'intérêt local au Canada, le chemin de fer Central Western, en Alberta, en 1986.

Il nous apparaît fondamental de prévoir dans le projet de loi une disposition spécifique octroyant une aide financière fédérale réelle aux C.F.I.L. pour restaurer les voies ferrées dès l'acquisition, mesure essentielle à l'émergence de telles entités. En effet, il est connu que la réglementation ferroviaire en matière d'abandon contenue dans la LNT-87 a eu pour effet d'inciter les transporteurs ferroviaires principaux à négliger systématiquement l'entretien du réseau

ferroviaire secondaire, de sorte qu'aucun entretien majeur sur la plupart de ces lignes n'aurait été fait depuis 1987.

L'inexistence d'un programme spécifique aux C.F.I.L. pour restaurer les voies ferrées dès leur acquisition se trouve en contradiction avec l'un des objectifs premiers du projet de loi qui est de favoriser la création de ces chemins de fer locaux.

3. Octroi de droits de circulation aux C.F.I.L.

Dans le but de favoriser l'émergence de C.F.I.L., il nous apparaît impérieux de leur prévoir l'octroi de droits de circulation. En effet, l'octroi de droits de circulation leur permettrait de transporter leurs marchandises au moins jusqu'au point de correspondance le plus pratique. Cette approche aurait aussi le mérite d'améliorer la concurrence entre les sociétés ferroviaires.

Nous sommes surpris de constater que l'octroi de droits de circulation aux C.F.I.L. apparaissait dans toutes les ébauches du projet de loi, sauf lors de son dépôt le 20 juin 1995. Il est permis de s'interroger sur les motifs d'une telle omission. En outre, le législateur rate ici une belle occasion pour la mise en place d'un véritable système de transport.

4. Dispositions sur la *Loi de la divulgation des renseignements ferroviaires*

Le projet de loi fait disparaître un élément important de la *Loi sur les chemins de fer*, soit les dispositions 351 à 354 relatives à la divulgation de renseignements ferroviaires. En effet, ces dispositions contenues dans la *Loi sur les chemins de fer* permettent au gouvernement d'une province de demander des renseignements (à titre d'exemple, le coût des services pour le transport de banlieue) au ministre fédéral des Transports qui oblige alors le compagnie de chemin de fer concernée à dévoiler ces informations au requérant. La réintroduction de ces dispositions dans le projet de loi nous apparaît essentielle.

5. Dispositions sur le financement des services ferroviaires passagers

Le projet de loi fait disparaître un autre élément important de la *Loi sur les chemins de fer*, soit les articles 264 à 270. Ces dispositions permettent à l'Office de réexaminer tous les cinq ans la contribution financière fédérale à certains services ferroviaires passagers.

À titre d'exemple, le service voyageurs (Sept-Iles/Schefferville) a fait l'objet d'un réexamen lors d'audiences publiques par l'Office à Sept-Iles. Nous

croyons essentiel d'intégrer dans le projet de loi les dispositions spécifiques sur le financement fédéral de ces services, afin d'offrir aux résidents de ces régions isolées un cadre général traitant de l'accessibilité de ces régions plutôt qu'une approche discrétionnaire.

6. L'exigence d'un préjudice commercial important

L'article 27 du projet de loi prévoit que l'expéditeur doit faire la preuve d'un préjudice commercial important avant que l'Office ne donne suite à la plainte de ce dernier. Nous croyons que dans la mesure où le projet de loi enlève certains recours aux expéditeurs (enquête d'intérêt public et médiation), il serait logique de ne pas ajouter de nouvelles restrictions à leurs recours tel l'article 27 du projet de loi prévoyant l'exigence d'un préjudice commercial important.

Nous estimons que le recours à la médiation devrait être conservé et que, de plus, l'introduction de l'article 27 devrait être repensée en raison de ses effets négatifs sur les possibilités de recours des petits expéditeurs.

IV. CONCLUSION

Pour comprendre les principaux enjeux découlant du projet de loi, il faut présenter les positions des différentes parties intéressées, soit les chemins de fer principaux (CN et CP), les expéditeurs ainsi que les futurs exploitants de C.F.I.L.

1. Les chemins de fer principaux

Les sociétés fédérales de chemin de fer ont formulé au ministre fédéral des Transports quatre demandes précises : un nouveau mécanisme très expéditif de cession et d'abandon de lignes, une plus grande liberté en matière de tarification, la suppression des obligations de transporteur public ainsi que des modifications à la taxation (taxe sur les carburants, règles plus souples d'amortissement).

Les sociétés ont vu leur principale revendication satisfaite dans le projet de loi, soit un nouveau mécanisme très expéditif de transfert et de cessation de l'exploitation. Cependant, elles n'y ont pas obtenu une plus grande liberté en matière de tarification; de plus, les modifications à la taxation seront considérées ultérieurement par le ministre des Finances, M. Paul Martin.

2. Les expéditeurs

Les expéditeurs ont soulevé trois points : le maintien des obligations de transporteur public pour les transporteurs ferroviaires, celui des recours concurrentiels (interconnexion, prix de ligne concurrentiel) ainsi que l'octroi de droits de circulation pour les exploitants de C.F.I.L.

Ils ont obtenu dans le projet de loi leurs premières demandes (maintien des obligations de transporteur public et celui des recours concurrentiels), mais ils n'ont pas obtenu le troisième, soit l'octroi de droits de circulation aux exploitation de C.F.I.L.

3. Les futurs exploitants de C.F.I.L.

L'un des principaux objectifs du ministre fédéral des Transports est de favoriser l'éclosion de C.F.I.L. Or, les dispositions du projet de loi relatives au nouveau mécanisme de transfert et de cessation de l'exploitation ainsi que le refus d'octroyer des droits de circulation aux C.F.I.L. nous apparaissent en contradiction avec l'un des objectifs premiers du projet de loi.

Il est évident que les futurs exploitants de C.F.I.L. sont les parents pauvres de ce projet de loi. En effet, les autres parties intéressées ont vu leurs principales revendications satisfaites : les transporteurs ferroviaires principaux ont obtenu un nouveau mécanisme de transfert et de cessation d'exploitation et les expéditeurs, le maintien des obligations de transporteur public ainsi que celui des recours concurrentiels.

* * *

En conclusion, il nous semble que l'absence d'un groupe de pression formé exclusivement des exploitants actuels et futurs de C.F.I.L. au Canada a nui à l'expression de leurs intérêts. Aussi, l'une des grandes faiblesses du projet de loi réside dans la contradiction entre un de ses objectifs principaux, soit l'émergence de C.F.I.L., et l'absence de telles dispositions allant dans un tel sens.

---

* Le texte ne reflète que les opinions de l'auteur.

Demand Model Developments to Assess High Speed Passenger Train Markets on Windsor to Quebec City Corridor - An Update

Dr. Deepak Ekbote, Director Cost Research & Analysis, Research & Analysis, CP Rail System

Dr. Richard Laferrière, Senior Research Analyst, Research & Analysis, CP Rail System

1. INTRODUCTION

In 1991, CPRS and Air Canada initiated a project, using outside consulting assistance, to develop ridership and revenue forecasts for an HST service and to gain a better understanding of consumer behaviour regarding transportation choices for inter-city travel. The study concluded, among other things, that an HST service would not be financially self-supporting without direct or indirect government assistance. The findings of this study were the subject of an earlier article of similar title published in the 1994 CTRF Proceedings (pp599-609).

In early 1994, CPRS initiated Phase II to enhance the Phase I findings in three areas: (a) to expand the automobile sample, (b) to obtain more data on travellers' habits in the Montréal-Québec City corridor and (c) to conduct more research on the induced demand for an HST service in the Québec City-Windsor corridor.

2. SURVEY METHOD

The survey method retained for both phases is called the Interactive Video Interview System (IVIS). This survey-medium plays a major role in the research since it allows gaining an understanding of consumer behaviour, attitudes and motivations. In addition to actual travel patterns, the IVIS survey gathers consumer mode choice intentions through a set of experiments were respondents are asked to react to a set of hypothetical scenarios.

The IVIS surveys were offered, in both French and English, in London, Toronto, Ottawa, Montreal and Quebec City, from April 27 to May 7, 1994, and allowed to increase the number of surveys for analysis by 33%.

Simple tabulations based directly on traveller surveys reveal key travel patterns in the corridor:

- The current mode choice is a key determinant of responsiveness toward HST as auto travellers appear to be most averse to HST, while air and train travellers are the most willing to switch to HST. Air travellers, with less than 15% finding HST unsuitable, remain receptive to HST while 60% of the auto travellers indicated they would never use HST. Mathematical travel forecasting models confirmed that traffic diversion would arise most likely from air and train.

- HST acceptance varies with trip purpose. Half of those travelling for non-business purpose have indicated they would never choose HST. In comparison, 42% of business travellers are averse to HST. Mathematical travel forecasting models indicate that HST would be primarily a business-oriented travel mode.

- Public mode users have lesser resistance switching to HST than the auto travellers. For example, only 10% of the Toronto-Montreal travellers perceive HST as unsuitable compared to 52% for auto travellers. Different aversions to HST are also found in other markets: 38% of public mode travellers in Montreal-Quebec market compared to 70% of auto travellers; 20% of public mode travellers in Montreal-Ottawa market compared to 65% of auto travellers.

- Affordability, necessity of a car and fixed schedule are the main reasons given by auto travellers for not selecting HST. More than 65% of the auto travellers said they would never switch to HST because they find the cost too high; while 53% said so because they need a car either at the beginning or at the end of their trip; and, 47% of respondents do not want to be limited to fixed schedules.

- A vast majority of travellers are not likely to travel more often even though HST service were available and suited their needs.

Taken together, these findings confirm some conclusions obtained in Phase I: for business travellers, HST would compete primarily against air travel, while for non-business travellers HST would compete directly against auto. The results also confirm the difficulties for HST to attract auto travellers.

3. DEMAND ESTIMATION

The overall approach taken to demand estimation is as used in Phase I. For instance, the forecasting base year is still 2010 and the study considered four different technologies defining the HST concept - 200 kph, 250 kph, 300 kph and 400 kph for each business and non-business.

However, additional survey samples necessitated several adjustments to the demand estimation methodology which, in turn, had an effect on the result analysis, increasing notably their accuracy.

Phase II results confirm the Phase I findings and provides additional information:

- An HST service (300 km/h) from Quebec City to Windsor would attract 5.7 million passengers and generate $516 million in revenue. The business market would provide approximately 42% of the ridership and 65% of the revenues.

- The CPRS studies indicate that the most important source of HST ridership and revenues are business passengers currently travelling by air over medium range distances (e.g. Montreal to Toronto). The air mode could lose one-third of its ridership, mainly from medium-haul business travellers, for a revenue reduction of close to $200 million.

- The diversion of traffic from automobile to HST is most feasible over medium range distance. Approximately 26% of the business automobile passenger traffic in this distance range would divert to HST. However, in this business market the volume of automobile traffic in this distance range represents only 1.4% of the total corridor automobile traffic. In contrast, for trips of less than 300 km, which accounts for 91% of the total automobile volume, only 0.7% of the passengers would divert to HST and the diversion for other distance segments would not be significant.

- The induced demand would be relatively minimal.

- The relative inelasticity in ridership and revenues from increases in train speed suggest that incremental improvements to existing technology would provide greater net benefits than the introduction of HST service.

The reliability of the CPRS ridership and revenue forecasts was confirmed by the various sensitivity analyses conducted during Phase II. A high degree of

confidence is placed on the methodology and the ridership and revenue estimates.

4. COMPARISONS BETWEEN CPRS AND TRI-GOVERNMENT STUDIES

Recently, the Ontario, Quebec and federal governments made public an HST feasibility study. The results of the CPRS Update report and the Tri-Government study for the 300 kph scenario are summarized below:

	CPRS Phase II Study (2010)	Tri-Government Study (2005)
Annual Ridership (Million)		
Business	2.4	2.9
Non-Business	3.3	5.8
Total	5.7	8.7
Induced demand	0.9	2.7
Connect air	0.0	0.5
Annual Revenues ($ Million)	516.0	887.0 (1)

(1) Including induced demand and connect air

The similarities and differences between the two studies are as follows:

- The forecasts of both the business and non-business passenger volume are higher under the Tri-Government study than under the CPRS study. The relative difference is greater for the non-business market than for the business market. The higher ridership and revenue levels in the Tri-Government study could stem from more optimistic demographic trends and the use of a more recent trip table. We have not yet been able to assess the impact of the latter.

- The ridership forecasts in the Tri-Government study reflect, in part, a significantly higher level of passenger diversion from automobiles to HST and a higher level of induced demand for HST service. These conclusions raise concerns given the results of previous studies.

Regardless of those differences, both the Tri-Government and the CPRS studies conclude that the returns are insufficient for the private sector to absorb the full cost of the project.

5. CONCLUSION

The phase II study concluded that the passenger demand for HST was strongest in the business travel market. The demand for HST in the more price sensitive non-business market was significantly weaker. As a consequence, the business travel market would provide the majority of HST revenues. The study also concluded that there would be significant diversion of traffic from air, but the diversion from automobiles, bus and conventional rail service would be small. The Montréal-Ottawa-Toronto corridor offered the best potential in terms of revenue and ridership.

VIA RAIL'S STRATEGIC PLAN FOR SUCCESS

Gerry Kolaitis

Department Director
Corporate Planning and Financial Support
VIA Rail Canada Inc.

May 27, 1996

INTRODUCTION

- VIA is facing serious challenges, as daunting as any in the public or private sectors. In 1992 VIA's total government subsidy was $389 million. By 1999 it will fall to $170 million, a reduction of $219 million per year or 56%.

- In order to meet falling funding levels, triggered by the 1993 federal budget, VIA was faced with a major decision; it could either reduce the train services network by 25% or improve the bottom line.

- The corporation chose to improve the bottom line through productivity gains and revenue growth, while maintaining and enhancing its presence in the market and focusing all efforts and resources on providing excellent value for money and services tailored to each market's and each customer's needs.

- VIA's goal has been to reduce costs while increasing the quality of service and not reducing the current train services network.

- The tool used to focus our efforts and resources is an integrated Strategic Plan which is the blueprint that every employee is following to ensure that the corporation achieves its objectives.

- VIA is already making good progress in meeting the funding challenge. Between 1992 and 1995 total government subsidy fell from $389 million to $295 million respectively, a reduction of $94 million annually.

- On the service side, VIA's performance has remained excellent. In 1995, VIA achieved a customer service satisfaction rating of 95% (expectations met or exceeded) and on time performance came in at a solid 86%.

1.0 PRODUCTIVITY GAINS

- Since 1992, all operations have been made much more efficient, while improving the level of service offered to customers. To do this, every employee at VIA was asked to put the customer first, while examining the manner in which they conducted their business, in order to eliminate anything that did not add value to the customer.

- The results are impressive. Between 1992 and 1995 VIA reduced its annual operating expenses from $487 million to $397 million, a $90 million or an 18% drop. By 1999 operating expenses will decrease to $369 million, $118 million or 24% lower than in 1992, while absorbing significant revenue and ridership growth.

- All aspects of VIA's operations have been thoroughly reviewed and many of the resulting productivity initiatives have already been implemented, although their full benefits have not all been realized. A summary of these initiatives follows:

1.1 Management and administrative streamlining

- Management and administrative staff reductions implemented in 1993 through 1996 resulted in a reduction of approximately 800 positions in total (over 60% of management and administrative staff) and savings of $46 million annually.

1.2 Labour savings

- In 1995, VIA's out-dated collective agreements were modernized as a result of legislation and the ensuing arbitration process, resulting in annual savings of over $31 million. The initiatives include: consolidating all shopcraft unions, changing the method of pay for running trades employees from a mileage to an hourly basis, operating some train services with only one conductor and one engineer, rationalizing customer services staff in the Quebec-Windsor Corridor, reducing the number of employees eligible to receive employment security and freezing wages since 1993.

- A freeze on management pay since 1993 resulted in additional savings of $2 million annually.

1.3 Equipment Maintenance Cost Reduction Initiatives

- Approximately $17 million in annual savings is coming from various initiatives in the equipment maintenance department, including: reducing unplanned repairs by improving the quality of work and technical robustness of systems, introducing modernized equipment, doing more work in-house (rather than contracting out), streamlining maintenance and servicing practices, and reducing utilities and plant maintenance expenses.

1.4 Train Service Improvements

- Train service adjustments implemented in early 1996, including the introduction of modernized equipment on the Churchill and northern Quebec services, and new daylight schedules for the Jasper-Prince Rupert and northern Quebec services, will result in annual savings of $11 million.

1.5 Other

- Various productivity and structural savings implemented mainly in 1994 and 1995, including a more efficient crew calling system, the elimination of temporary positions, reduced numbers

of guard equipment, improved telephone sales office productivity, reduced professional services, better procurement practices, and lower reservation system costs; account for the remainder of savings in operating expenses.

2.0 REVENUE GROWTH

- In addition to cutting costs, VIA's future progress is dependent upon increasing revenues through gains in yield and ridership. If these objectives are not met, market share will diminish, as will the ability to live within established funding levels without taking resources away from essential capital projects.

- One of the major contributers to ridership and revenue growth is the quality of service provided to our customers. VIA knows that much of its future success will come from its ability to meet or exceed customer expectations. On this front, VIA has been working hard and the results have been substantial.

  - In 1995,VIA received a customer satisfaction rating of 95% for its ability to meet or exceed customer expectations

  - In 1995, a training program was launched, entitled "Achieving Excellence in Customer Service", that was developed to enhance front-line employee interactions with customers. VIA supervisors are also receiving training in the skills they need to support front-line employees in their efforts to provide excellent customer service

  - Externally, VIA's progress has not gone unnoticed. National and international recognition was received for our products and VIA has been asked to chair Canadian Quality Month in 1996.

- To date, VIA has been successful in increasing revenues. Despite weak travel market conditions between 1992 and 1995, revenue grew by 12%, although passenger growth remained flat.

- VIA's current Corporate Plan assumes revenue and passenger growth over the next four years of 33% and 18% respectively.

- In order to achieve these revenue and passenger targets the following initiatives will be implemented:

System Wide

- Introduce loyalty programs to increase customer frequency and loyalty
- Position VIA as a leader in the travel industry
- Accelerate joint ticketing agreements and strategic alliances with other travel partners
- Improve and simplify customers' access to information, reservation and ticketing world-wide through continued links with airline reservation systems. For example, test automatic ticketing machines and reservations using the Internet.

Corridor Services

- Increase the focus and effort on marketing to the business traveler
- Launch a customer rewards program.

Western Service

- Expand seat capacity between Jasper and Vancouver during the peak season
- Continue to increase volumes in the off-peak by aggressively marketing a winter touring program jointly with VIA's travel industry partners.

Eastern Service

- Increase the volume and revenue of the Montreal-Halifax service *"The Ocean"* by promoting it as a leisure product and a lower-price version of VIA's Toronto-Vancouver service *"The Canadian"* during peak months.

3.0 THE STRATEGIC PLAN

- VIA Rail's management has developed a comprehensive strategic plan which confirms the corporation's values and defines its mission and vision. The Strategic Plan has focused all employees' attention on a common direction and is playing a major role in meeting VIA's revenue and productivity challenges.

3.1 Values

- Quality - to our customers
- Productivity - to our shareholder
- Responsiveness - to our co-workers.

3.2 Vision

- VIA will be the best passenger transportation company in Canada.

3.3 Mission

- To offer high quality, low cost passenger rail service.

3.4 Goals

- The five goals and corresponding strategies are:

Service

Objective: Customer service better than any other transportation mode in Canada.

Strategies include:

- Adopt a zero tolerance approach to on-time performance
- Improve the delivery of service by VIA people to be consistent and customized to each customer's needs

- Keep adjusting our products and associated services based on what customers want
- Seek out and destroy irritants to customers.

Growth

Objective: Increase VIA's ridership above market growth.

Strategies include:

- Create maximum flexibility and increase speed in pricing action to increase ridership while maintaining profitability
- Develop aggressive and targeted programs designed to increase revenues over and above incremental costs and attract more riders
- Introduce a coordinated sales program initially targeted at the corporate market
- Turn every employee into a salesperson for our organization to promote our services and products
- Using existing resources, focus on increasing frequencies and reducing trip times to be airline competitive in high potential corridor markets.

Finance

Objective: Reduce subsidy through increasing revenues and reducing costs.

Strategies include:

- Find waste and destroy it
- Leverage each square foot of space used by VIA in stations, maintenance centers and offices, and seek to eliminate costs on all other space
- Optimize the size and deployment of the fleet and maximize utilization of the resulting fleet capacity
- Have information systems which are proactive, solutions oriented and closely linked to the current and future needs of users

- Develop and implement a company-wide, managed approach to the reduction of maintenance center costs through the sale of services in our areas of expertise
- Assign development spending to multi-year capital investment programs focused on trip time reduction targets.

People

Objective: Successful employees through enhanced training and effective communication.

Strategies include:

- Develop a plan and appropriate media to communicate the Strategic Plan to ensure awareness and understanding by each employee, department and area of the company
- Become a continuous learning organization
- Implement Performance Enhancement principles which improve the way employees relate to customers and to each other.

Safety

Objective: A safe environment for employees and customers by making continuous progress towards no injuries, accidents or environmental impacts.

Strategies include:

- Have effective corporate safety policies and standards and support VIA safety committees
- Continue to have an Emergency Measures Organization plan which is regularly updated, tested and triggered immediately when required
- Provide enhanced safety information on board trains and on company premises.

4.0 CONCLUSION

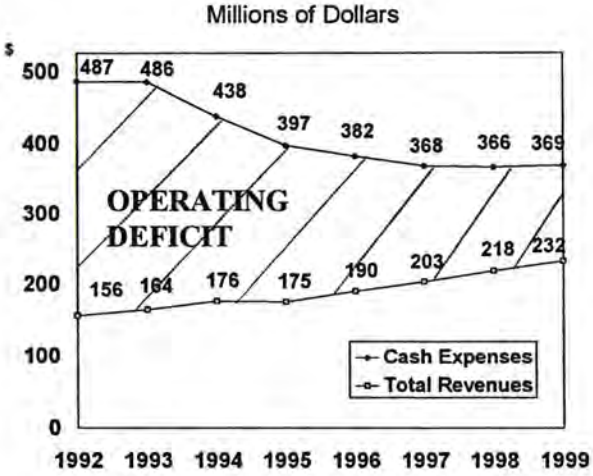
- The results of VIA's productivity and revenue initiatives have been impressive, including :

  - A $109 million reduction in the operating deficit, between 1992 and 1995, from $331 million to $222 million annually. By 1999, it will be $137 million, representing a 59% drop from 1992
  - An improvement in the revenue/cost ratio from 32% in 1992 to 44% in 1995. By 1999 the revenue/cost ratio will almost double from 1992 levels to 63%
  - A reduction in staffing levels from 4,478 in 1992 to 3,178 in 1995, a 29% decrease.

- While VIA was achieving these milestones, new train services were introduced, frequencies were increased and trip times were shortened. Furthermore, national and international recognition was received for the quality and design of our products and services.

- In short, VIA has gone from an operationally-centered organization to one that is customer-focused, providing quality products at low cost to the tax payer. We will continue to be a learning organization, which is responsive to both customer needs and the financial challenge. By continuing with the implementation of the Strategic Plan, VIA's management is confident that its past successes will continue and that it can meet the lower funding targets without train service reductions. It is also confident that VIA will achieve its vision of becoming the best passenger transportation company in Canada.

VIA RAIL CANADA
REVENUE & OPERATING EXPENSES*
1992 TO 1999



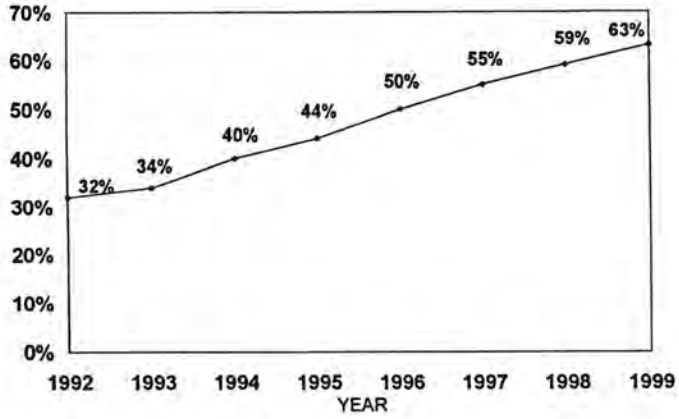
*Excludes restructuring and non cash expenses

VIA RAIL CANADA
TOTAL GOVERNMENT FUNDING*
1992 TO 1999



*Includes restructuring and capital expenditures

VIA RAIL CANADA
REVENUE/COST RATIO*
1992 TO 1999



* Excludes restructuring and non cash expenses

The Canadian Aviation Charter M arket: Opening New Transport Gateways or Niche Market Pricing?

Gordon G. Baldwin, Chief, Aviation Statistics Centre, Statistics Canada

Introduction

In referring to his first overseas air charters in 1962, Max Ward said "We were pioneering...". In examining the Canadian carrier charter market over the past two decades, what has been the pattern? Has the experience been one of market development and pioneering to open new transport gateways, to expand aviation markets, or have the charter carriers been focused on offering a lower priced product for the leisure traveller in already established markets? The paper will examine the Canadian experience in domestic, transborder (Canada-United States) and international charters.

The Different Roles of Charter Activity

There are different reasons why charter activity is used in different markets. There are charter carriers who perform solely or primarily charter service. Examples would include carriers such as Wardair, Nationair, Odyssey, Worldways and Air Transat. They are in the charter market to focus "upon sunspot leisure activities..."[1] [Nationair]. They exist as "a producer of value-added product for primarily an inclusive tour clientele" [2] [Air Transat].

Scheduled carriers also use charter activity to generate income and reduce downtime for aircraft on weekends and during nights. The aircraft are used for scheduled activity during peak hours and additional revenue is generated during the off-peak hours from charter activity. While there are additional costs, only the marginal costs need be covered.[3]

Carriers also use charter activity where bilateral agreements may not allow scheduled service or where the carrier has not been designated as a carrier in the market. This was particularly evident with the Canada-United States charter activity prior to the 1995 bilateral exchange agreement. Canadian Airlines International Ltd. [CAIL] compensated for the very few routes where they were

the Canadian designated scheduled carrier between Canada and the United States by operating charter flights. In 1994, CAIL flew over 250,000 seats on charters in each of the Canada-Florida and Canada-Nevada markets.[4]

Opening New Transport Gateways: Market Development

During a conference in 1988, Max Ward indicated that he felt that Wardair had no choice but to try to enter scheduled services since scheduled carriers moved into the leisure markets developed by the charter carriers.[5] Have charter carriers pioneered and opened and developed new markets, new transport gateways, into which scheduled carriers later moved? Table 1 shows the thirty-seven city-pair markets for international charters which had a passenger volume of 10,000 or greater in 1974; nineteen of the markets [51%] had scheduled carrier direct flight service (although two other markets had close service with Air Jamaica service out of Detroit rather than Windsor). For the remaining 49% of the city-pairs, there was no direct scheduled service linking the two cities but it would have been possible to travel on scheduled services with a transfer at a third city. If the development hypothesis is correct, one would expect to see more scheduled services on these routes over time. This does appear to have been the case. By 1995, scheduled carrier service had been added in nine of the markets (and it was dropped in one of the markets). This meant that the number of large 1974 charter markets with direct scheduled service had increased to 73% in 1995 compared to 51% in 1974. Scheduled services were introduced to fully one half of the markets which had only charter service in 1974. Not only did the number of markets linked with direct scheduled flights increase but the number of carriers involved also increased. The proportion of routes with a choice of carrier for scheduled direct services increased from 37% to 55%.[6]

Flying between city-pairs that are not flown by the scheduled carriers may not always be an attempt at developing markets. It may also be a method of avoiding direct competition with the scheduled carriers. The charter carrier Air Transat acknowledged that "during the summer, Air Transat serves 12 regional airports in the United Kingdom and seven in France, thereby avoiding direct competition with scheduled carriers on their main routes...".[7]

Table 1: Large 1974 Charter Markets and Direct Scheduled Services

Canadian City	Foreign City	1974 Charter Passengers (000's)	1974 Direct Scheduled Service	1995 Direct Scheduled Service
Calgary	London, England	14	AC	AC
Edmonton	London, England	13	AC	AC CP
Edmonton	Honolulu, Hawaii	23		
Montreal	London, England	12	AC	AC BA
Montreal	Paris, France	26	AC AF	AC AF VD
Montreal	Acapulco, Mexico	12		
Montreal	Bridgetown, Barbados	17	AC	AC
Montreal	Freeport, Bahamas	31		AC
Montreal	Montego Bay, Jamaica	11		AC
Montreal	Nassau, Bahamas	26		AC
Montreal	West End, Bahamas	21		
Montreal	Miami, Florida	27	AC DL	AA AC DL US
Montreal	West Palm Beach, Florida	10		
Toronto	Frankfurt, Germany	25	AC LH	AC LH CP*
Toronto	Glasgow, Scotland	53	AC BA	AC
Toronto	London, England	248	AC BA	AC AI BA CP
Toronto	Manchester, England	38		AC
Toronto	Acapulco, Mexico	53	CP	
Toronto	Aruba	26		
Toronto	Bridgetown, Barbados	63	AC BW	AC BW
Toronto	Freeport, Bahamas	33	AC	AC
Toronto	Montego Bay, Jamaica	13	AC JM	AC JM*
Toronto	Nassau, Bahamas	54	AC	AC
Toronto	Port of Spain, Trinidad & Tobago	12	BW	AC BW
Toronto	Saint Lucia	11		AC
Toronto	West End, Bahamas	34		
Toronto	Fort Lauderdale, Florida	15		AC CP
Toronto	Honolulu, Hawaii	20		CP QF* NZ*
Toronto	Las Vegas, Nevada	18		AA AC
Toronto	Miami, Florida	11	AC	AA AC US CP*
Toronto	Tampa/St. Petersburg, Florida	38		AA AC CP
Toronto	San Juan, Puerto Rico	12		
Vancouver	Amsterdam, Netherlands	13	CP	KL
Vancouver	Honolulu, Hawaii	26	CP	AC CP QF* NZ*
Windsor	Montego Bay, Jamaica	11	[JM at DTW][8]	
Windsor	Nassau, Bahamas	19	[JM at DTW]	
Winnipeg	London, England	12	AC	AC

* Indicates a code-share flight arrangement

While Table 1 gives an indication of overall changes in the large charter markets, an examination of three specific markets will highlight some of the aspects of the relationship between charter activity and scheduled activity.

Opening New Transport Gateways: Canada-Cuba

Canada-Cuba city-pairs do not appear in Table 1 which showed the largest charter markets in 1974. This is because although there were 66 charter flights between Canada and Cuba carrying a total of 12,526 passengers[9], these were split between the three markets of Toronto-Havana, Montreal-Havana and Ottawa-Havana. The Canada-Cuba market has been selected for examination since it appears to have witnessed the impact of charter stimulation resulting in scheduled carrier entry on two occasions.

Air Canada carried 99% of the charter passengers between these two countries in 1974. The charter market grew to 50,000 the following year and a bilateral agreement was signed between the two countries which lead to the commencement of scheduled services by both Air Canada and Cubana in 1976. The 1976 charter passenger total hit 53,000 of which Air Canada carried 49%, Nordair 19% and Quebecair 19% and the remainder was carried by Eastern Provincial Airways, Pacific Western Airlines and Transair[10].

With both Air Canada and Cubana operating scheduled flights in the Canada-Cuba market, the market size for charters declined to only 19,000 passengers[11] in 1984. Over the next decade, however, this grew to 221,000 in 1994.[12] This was achieved by expanding the market to include new Cuban cities such as Santiago, Manzanillo, Cayo Largo Del Sur, Ciego de Avila and Cienfuegos in addition to the previously served cities of Havana, Varadero, Holguin and Cameguey. Air Transat was so successful in this market that they obtained the designation of a Canadian scheduled carrier for Montreal and Toronto-Varadero service and commenced scheduled flights in November 1995.

Opening New Transport Gateways: Canada-United Kingdom

As the Canada-Cuba market has shown, opening a new transportation gateway might not only be restricted to starting up service where there was none before. Another example is Canada-United Kingdom. While this is one of the oldest international major scheduled services routes, in operation since the 1940's, Wardair showed that a charter carrier could have a significant impact in such a long established market.

Chart 1: Carrier Market Share, Passengers, Canada-United Kingdom, 1985, Scheduled and Charter Services



Source: Statistics Canada catalogue # 51-207, Air Charter Statistics 1985
ICAO, Traffic By Flight Stage 1985

Wardair "represented 2 per cent of the trans-Atlantic and non-scheduled traffic in 1962" .[13] By 1985, as is shown in Chart 1, Wardair had become a key player in terms of passenger volume between Canada and the United Kingdom. They carried 27% of the passengers in the market to Air Canada's 38% and British Airways' 35%. In May 1985, Wardair was designated as a scheduled carrier for Canada-United Kingdom service and their scheduled service started a year later.[14]

Opening New Transport Gateways: Canada-United States

The transborder charter market appears to have been a way for the Canadian scheduled carriers to get around the restriction of the limited number of routes provided for in the bilateral aeronautical agreements prior to 1995. Canadian carriers did not have route access to much of the fast growing sun belt. In 1994, 91% of Air Canada's 395,000 charter passengers were carried in the Canada-United States market. Canadian Airlines International Ltd had 584,000 Canada-United States charter passengers, 73% of their total charter passengers. With the signing of the new bilateral agreement in February 1995, the services are now being converted to scheduled services. The Air Canada press release announcing the changes for Florida made the following statement:

> ' "Under Open Skies, charters are out and daily scheduled service is in" said Robert Milton, Senior Vice President, Marketing and In-Flight Service. "Independent travellers who just want a good fare on a reliable airline are being liberated from the rigid rules, irregular schedules and cramped seating of charters." '[15]

This conversion from charter to scheduled was not restricted to the two largest Canadian air carriers. Both Canada 3000 and Royal Airlines also started converting their Canada-United States charter services to scheduled services in November 1995.

It was primarily to the sunspot leisure destinations of Florida, Hawaii and Nevada that the charter traffic occurred. Table 2 shows that 89% of the traffic was to these three states in 1994. A large apparent decline in charter traffic to these states can be expected in 1996 but this will actually be due to the conversion of the services to scheduled operations.

Table 2: Canada-United States Charter Passenger Traffic, 1994

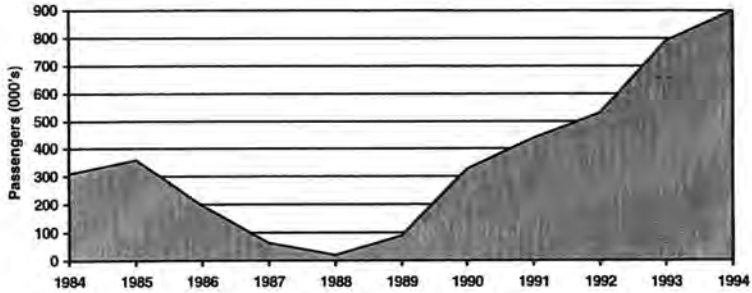
Market	Passengers (000's)	% of Canada-United States Charter Market
Florida	1,088	52
Nevada	592	29
Hawaii	169	8
California	88	4
Other	147	7
Total	2,084	100

Source: Statistics Canada catalogue 51-207, Air Charter Statistics 1994

Domestic Charters

While the focus of this paper has been primarily on international charter activity, domestic charters also exist in Canada. In the international scheduled market, there does appear to have been a relationship between using charter services to establish a market until volumes are such the scheduled services and carrier designation are possible. Since 1988, Canadian air carriers have been free to fly between any city-pairs in Southern Canada (and effectively anywhere in Canada). It was not necessary to establish a presence to obtain designated carrier status and permission to operate scheduled services. Carriers could choose the type of service and the routes where they felt the service was viable. They also have had complete freedom in the setting of domestic fares. The prediction was made in 1988 that "A laissez-faire approach toward restrictive discount fares should diminish the demand for charter flights...".[16] The year of the prediction was the low point in domestic charters in Canada. They have shown strong growth since as is shown in Chart 2.

Chart 2: Domestic Charter Passengers, 1984-1994



Source: Statistics Canada catalogue # 51-207

Where has this great growth in domestic charter activity occurred? The largest domestic charter markets of 1994 are shown in Table 3 which shows the following:

- Of the ten largest city-pairs in terms of passenger volumes, seven are also in the top ten city-pairs for scheduled service traffic.
- Seven of the largest city-pairs in terms of charter volumes in 1994 were also in the top ten for 1978.
- Five of the seven largest charter markets in 1978 were also in the top ten for scheduled services that same year (and were also in the top ten for both charter and scheduled services in 1994).

This close relationship between the big domestic charter markets and the big domestic scheduled markets suggests that rather than opening new markets domestically, the charter carriers are providing extra lift at the lower end of the pricing scale rather than offering alternative destinations.

The results shown in the Table 3 actually just confirm the findings of the Canadian Transport Commission's "A Review of Domestic Low-priced Air Fares--January-August 1978". Two of the conclusions of the study were:

> "The large number of travellers who have taken advantage of domestic low-priced air fares would suggest a need for programs such as CCC's [Charter Class Canada fare], Nighthawks, Couriers and ABC's to facilitate travel by Canadians within their own country."[17], and,

> "The demand for low-priced air travel peaks in the summer period and is concentrated on a relatively small number of city-pairs. The challenge in the domestic marketplace is thus to provide sufficient capacity during the peak period in order to develop the low-priced air travel market, without having unutilized equipment in the off-peak."[18]

It appears that the conclusions from the early experiment in low fares in 1978 are still holding true 16 years later. The domestic charter offerings in Canada are still highly concentrated amongst a small number of city-pairs and concentrated during the summer months. To solve the problem of how to meet this seasonal capacity, the same aircraft are used for flights to the South rather than domestically during the non-summer months.

Table 3: Top Ten Domestic Charter Markets, 1994, Ranking for Scheduled and Charter Passengers in 1978 and 1994

	Charter Rank 1978	Scheduled Rank 1978	Charter Rank 1994	Scheduled Rank 1994	Charter Passengers 1994 (000's)	Scheduled Passengers 1994 (000's)
✈ Toronto-Vancouver	1	4	1	3	272	559
✈ Calgary-Toronto	3	8	2	5	93	328
✈ Halifax-Toronto	7	10	3	8	85	240
Edmonton-Vancouver	..	6	4	9	57	238
Calgary-Vancouver	..	5	5	4	53	352
✈ Edmonton-Toronto	6	9	6	10	54	199
Montreal-Vancouver	4	16	7	11	52	155
✈ Toronto-Winnipeg	2	7	8	7	48	257
St. John's-Toronto	5	26	9	18	47	98
Vancouver-Winnipeg	..	12	10	15	45	121

✈ Indicates that the market was in the top ten for scheduled and charter services in 1978 and 1994

Source: Statistics Canada catalogue 51-207
Statistics Canada catalogue 51-204

Conclusion

An examination of what has happened in the large international charter markets over the period 1974 to 1995 suggests that charter carriers have indeed helped to establish new transport gateways. Of the thirty-seven largest international charter markets from 1974, 51% had scheduled direct services. By 1995 direct scheduled service had been introduced on fully one half of the markets which had only charter service in 1974. Markets such as Canada-Cuba showed that charters were used to establish markets to the point that scheduled services could be introduced and that the process then could repeat with other carriers and city-pairs. The same process of charters expanding a scheduled market was also seen with Canada-United Kingdom. The previously restrictive bilateral agreement governing Canada-United States air travel may have been an added inducement for charter growth which appears now to be switching to scheduled service under the 1995 bilateral agreement.

In the domestic market, with far fewer viable city-pair combinations possible, the charter traffic appears to be concentrated in the already large established scheduled service markets where the charter price is their principle appeal. This was the case in the 1970's and continues to be the situation today.

Note

The views and opinions expressed in this paper are those of the author and do not necessarily reflect those of Statistics Canada. I would like to thank Lisa Di Piétro, Rolf Hakka, Francesca Thibeault, Tricia Trépanier and John Ross for their valuable comments, corrections and criticisms while retaining all responsibility for any remaining errors.

References and Notes

1 "Montreal's Nationair", Wings, Issue #5, 1991.

2 "Air Transat: A 'wait and see' approach", Wings, Issue # 5, 1992, p. 23.

3 Transport Canada, Economic Regulation and Competition in the Domestic Air Carrier Industry, TP2743E, February 1981, p.183.

4 Statistics Canada, catalogue 51-207, Air Charter Statistics, 1994, Table 2. They operated 385,000 seats and carried 325,616 passengers Canada-Florida and the Canada-Nevada market saw 220,989 passengers on flights with 250,782 seats.

5 Author's notes from question period at the Second Annual Canadian Airline Investment Conference, Toronto, September 13, 1988.

6 Where there was code-sharing on the market, this has been included in the count of carrier choice since the services are still being marketed as different carrier flights by the airlines.

7 Transat A.T. inc. Annual Report 1994, p. 11.

8 While there was not direct scheduled service from Windsor to Montego Bay and Nassau, there was direct scheduled service from the nearby Detroit.

9 Statistics Canada, catalogue 51-207, International Air Charter Statistics, Table 6.

10 Statistics Canada, catalogue 51-207, International Air Charter Statistics, Table 3

11 Statistics Canada, catalogue 51-207, Air Charter Statistics

12 Statistics Canada, catalogue 51-207, Air Charter Statistics.

13 Max Ward, The Max Ward Story, p. 186.

14 Max Ward, Ibid, p. 295.

15 Air Canada Press Release, August 14, 1995, "Air Canada to add daily non-stops as part of new Florida Strategy".

16 R.J. Joedicke, "Internationalization of the Airline Industry", Proceedings of The Second Annual Canadian Airline Investment Conference, p. 5.

17 T. Hooper, T. Dew, J. Greig, A Review of Domestic Low-Priced Air Fares-January-August 1978, p. 35, Passenger and Aviation Economics, Research Branch, Canadian Transport Commission.

18 T. Hooper, T. Dew, J. Greig, Ibid, p. 36.

THE 1995 CANADA-U.S. AIR SERVICES AGREEMENT: A PRELIMINARY ANALYSIS

by Michael W. Pustay*

Despite the general openness of and the large magnitude of trade between their two economies, for most of the post-war period the bilateral air service agreement between Canada and the United States was among the most restrictive of all such agreements entered into by the United States. Leaders from both countries recognized the inappropriateness of the agreement and that promotion of transborder air travel should be encouraged. For example, the Shamrock Summit Declaration of 1985 declared that liberalization of transborder airline services was an important goal of both countries. Yet for over a decade Canadian and U.S. negotiators intermittently met and failed to come to a new agreement. In February 1995, however, officials of the two countries announced the signing of a new air services agreement (ASA) that significantly liberalized trade in airline services between the two countries.

This paper explores the evolution of transborder airlines services between Canada and the United States and examines why liberalization was so difficult to achieve. It begins by reviewing the domestic and international airline policies of the two nations. These policies have had a significant impact on the structure of the airline industries of the two countries, which in turn has affected the nature of existing transborder competition among them. The competitive impact of these policies is then used to explain why liberalization of trade in airline services between the two countries was so difficult to achieve. Finally, the initial responses of carriers to the liberalization of trade in airline services is analyzed.

1. DOMESTIC AVIATION POLICIES

The domestic aviation policies of the United States and Canada today share several important similarities. Both countries rely on privately-owned carriers competing in deregulated environments to provide air transportation services. However, the structures of the airline industries in the two countries differ substantially as a result of the disparate sizes of their domestic markets and their divergent past regulatory policies. As we will discuss, differences in past domestic regulatory policies have affected the international airline policies of the two countries, which in turn have shaped the positions that the two nations have taken in negotiating the new transborder air services agreement.

U.S. Domestic Aviation Policies

The U.S. airline industry grew from a handful of barn-storming entrepreneurs in the early 1920s to a dozen or so corporations in the 1930s as a result of federal subsidies to carry airmail on routes between major U.S. cities. However, a series of financial scandals, an airplane crash involving a U.S. senator, and aggressive bidding for airmail contracts--on some routes, carriers

*Professor of Management, Texas A&M University

offered to carry the mail for free--led to calls for reforming the air mail subsidy program.

Reform came in 1938, with the passage of the Civil Aeronautics Act, which initiated regulation of the domestic airline industry. The newly-created Civil Aeronautics Board was given responsibility for controlling entry, exit, and prices in domestic airline markets. Over time, the CAB created three classes of carriers: trunk carriers, which provided service between large U.S. cities using jet aircraft; local services carriers, which provided service between large U.S. cities and smaller communities using large turboprop equipment; and commuter carriers, which were freed from CAB regulation so long as they used aircraft of 19 seats or less. A feature of these carriers unique to the United States is that they were all privately-owned; indeed, the United States is the only major country that has consistently and totally relied on privately-owned carriers to provide airline services in its domestic and international markets.

Over the forty-six years of its existence (1938-1984), the CAB tried to find an appropriate balance between promoting too much and too little competition. When the airlines were doing well financially and the economy was growing, the CAB allowed new entry into existing city-pair markets or authorized new service to previously unserved markets. When the industry's financial performance weakened, the CAB would refuse to hold any new route application hearings. As a result of this process, on most major U.S. domestic routes two or three carriers typically provided service. However, most of their competitive energies were focused on service competition, rather than price competition, as a result of the CAB's pricing regulations.

Another feature of CAB regulation warrants mentioning: it treated the airline industry as a closed club, allowing no new carriers to enter the trunk segment or the local service segment of the industry. More importantly, the CAB strove to ensure that no carrier in these two segments would fail financially. In choosing between competing applicants seeking to provide service on a newly-authorized route, the CAB was forced to make trade-offs among such factors as strengthening weaker carriers, maximizing single-carrier or single-plane service, promoting competition, and spreading awards among carriers so that all would maintain their political allegiance to the CAB's regulatory system. As a result of its balancing act, at the end of the regulatory era some twenty carriers comprised the trunk and local service segments of the industry.

The United States deregulated its domestic airline industry in 1978 with the passage of the Airline Deregulation Act. Subsequently U.S. air carriers have been free to enter and exit domestic markets and to charge whatever prices they wish, subject to safety and fitness standards administered by the U.S. Department of Transportation. The experience has generally been a positive one: new carriers have entered (and left) the industry, inflation-adjusted prices have fallen, and the intensity of competition has increased. As a result of bankruptcies and mergers, the number of major carriers in the industry has shrunk from its pre-deregulation level. Although industry concentration (measured by the four-firm concentration ratio) has risen above its pre-deregulation level, concentration on individual routes has fallen. The number of major players in the U.S. airline industry remains large by Canadian standards: American, United, Delta, Northwest, Continental, TWA, US Air, and Southwest have extensive systems and compete with one another on a

nation-wide basis. All except Southwest operate large, complex hubbing operations and have significant international operations.

Canadian Domestic Aviation Policies

Scheduled airline service on short-haul routes began in Canada in 1919. Transcontinental services were slower to develop. For many years, for example, travelers wishing to fly from Toronto to Vancouver were forced to fly via the United States. To overcome this problem, the Trans Canadian Airlines Act of 1937 called for the establishment of a federally-owned carrier to provide transcontinental service.[1] Trans Canada Airline, which later became Air Canada in 1964, commenced service between Montreal and Vancouver in 1938. Canadian Pacific Airlines (later CP Air and Canadian Airlines), the carrier that would grow to become Trans Canada's chief rival, developed from a series of acquisitions and mergers initiated in 1933 by its corporate parent, Canadian Pacific Railways. After the Second World War, a number of regional carriers also arose to serve local needs, including Quebecair, Nordair, Eastern Provincial Airlines, and Pacific Western Airlines. During the 1960s, these regional airlines were assigned designated territories and given the mission of acting as feeders for the transcontinental services of CP Air and Air Canada. A number of charter carriers also emerged to offer non-scheduled service, particularly between Central Canada and points in Florida.[2]

Federal regulation of domestic air services commenced in Canada with the passage of the Transport Act of 1938. It empowered the Board of Transport Commissioners to issue operating authority to new carriers when justified by the "public convenience and necessity." Governmental policy focused on creating a national network of routes. To cross-subsidize unprofitable services, regulators favored the establishment of route monopolies in profitable markets. Under this and successive legislation, Air Canada enjoyed a protected and favored position in many key markets. On the main transcontinental routes, for example, Air Canada was granted a monopoly position from 1937 to 1959. After CP Air was allowed to provide service on these routes, it labored under capacity restrictions that limited its flight frequencies to well below those offered by Air Canada until 1979. As a result of these policies, Air Canada enjoyed a dominant position in the domestic market.

In 1984 the government of Canada commenced the process of relaxation of its regulation of domestic airline service with the issuance of its *New Canadian Air Policy. Freedom to Move*, which further outlined the government's transport policies, was published in 1985, followed by the passage of the National Transportation Act of 1987, which was enacted at the beginning of the next year. These reforms were driven in part by a re-thinking of appropriate regulatory philosophy and in part by the diversion of traffic to such U.S. airports as Seattle, Buffalo, and Burlington as Canadians voted with their feet, seeking to benefit from cheaper U.S. fares brought on by U.S. deregulation.[3]

The regulatory reforms divided the country into two zones, northern and southern. Existing regulations in the northern, less populated zone remained intact, as the area's thin population (only 5 percent of Canada's total) would not support competition. The southern zone, where it was believed market density was sufficient to support competition, under went significant regulatory relaxation. Most regulatory controls on airline service were

removed in the south, including restrictions on capacity, frequency of service, and equipment type, although controls on exit were retained in some circumstances. Carriers were also granted power to reduce prices as they saw fit, while their ability to raise prices automatically was limited by an inflation index.[4]

Unlike that of the United States, however, the airline industry in Canada remains highly concentrated. In fact, the industry's concentration increased in the late 1980s, with the establishment of Canadian Airlines International (CAI), a new carrier created from the consolidation and merger of the operations of CP Air, Wardair, and four regional airlines--EPA, Quebecair, Nordair, and PWA. Most remaining regional carrier act as feeders either to CAI or Air Canada.[5] Air Canada and CAI are essentially a duopoly, controlling directly or through their affiliates 98 percent of domestic passenger revenues, 97 percent of domestic passengers, and 93 percent of all domestic passenger-kilometers in 1992.[6]

These differences in industry structure affect competition in numerous ways. The number of passengers paying full fares is much higher in Canada (34 percent) than in the United States (8 percent). Per capita usage of air services is much lower in Canada. In 1994, for example, per capita domestic enplanements in Canada were .43, while in the United States the corresponding figure was 1.73. Also, the threat of potential competition is much lower in Canada than it is in the United States as a result of the relative sizes of their markets.

As we will discuss in the next section, the differences in the concentration and structures of the domestic airline industries in the two countries affects transborder competition. The differing structures also affects the bargaining needs and positions of the two countries' negotiators. U.S. negotiators had to juggle the conflicting needs and interests of the eight major U.S. carriers, as well as accommodate the interests of smaller, new entrants such as ValuJet, Kiwi, and Reno Air. Canadian negotiators had to balance the needs of just two carriers. However, these two carriers' interests were by no means homogenous, thereby complicating the development of a bargaining strategy by Canadian negotiators.

2. INTERNATIONAL AVIATION POLICIES

These differences in the structure of the two countries' domestic airline industries and the evolution of their domestic regulatory policies and philosophies have resulted in substantive differences in the evolution of their international aviation policies. These differences in turn have affected the ability of their carriers to exploit the new Canada-U.S. air services agreement.

U.S. International Aviation Policies

Throughout most of the post-war period, U.S. policy has generally favored freer competition in international airline markets. The pro-competitive philosophy of the United States was reinforced in 1978 with the Carter Administration's announcement of its new "Open Skies" policy and the passage of the International Air Transportation Competition Act of 1979. As a result of these two initiatives, in negotiating new bilateral air service agreements, the U.S. Department of Transportation has sought to:

1. Reduce entry barriers to international service by increasing the number of international gateways;
2. Increase price competition among carriers and reduce government control over carrier pricing decisions;
3. Allow multiple designation of carriers;
4. Eliminate restrictions on capacity and frequency;
5. Increase carrier flexibility in providing intermediate and beyond service;
6. Increase flexibility in offering charters; and
7. Eliminate unfair competitive practices that discriminate against U.S. carriers.[7]

These objectives obviously promote the pro-competitive policies of the United States. They also accommodate the unique needs of the United States that result from its geographic size, the number of its potential gateways, and the number of U.S. flag carriers. No other country has as many major carriers as the United States--hence the emphasis on multiple designation. No other country has as many potential gateways as the United States, given its geographic size and the dispersion of its population among major cities. Thus U.S. negotiators seek international agreements that allow them to accommodate these diverse geographic and corporate interests.

Canadian International Aviation Policies

Historically Canada's international aviation policies were strongly influenced by Air Canada's status as a Crown Corporation. Air Canada enjoyed a monopoly on all international routes from 1937 to 1948, when CP Air was designated as the nation's flag carrier in the Pacific. CP Air's domain expanded in 1965, when it became the sole Canadian carrier to serve Latin America, Southern Europe, Australia, New Zealand, and Asia. Air Canada was given monopoly rights to the rest of Europe (including the United Kingdom), the Middle East, and the Caribbean.[8]

A 1987 order by the Minister of Transportation resulted in a realignment of these "spheres of influence" by reallocating international operating authority between CP Air and Air Canada.[9] Rather than grant exclusive rights to serve regions, the two carriers were given exclusive rights to serve individual countries within these regions. In most cases, both carriers served each of the world's regions. The right to serve Spain and Portugal was shifted from CP Air to Air Canada, for example, while traffic rights to Scandinavia and parts of South America were shifted to CP Air from Air Canada. Wardair's entry into the transatlantic market and its subsequent purchase by CAI eroded the boundary lines established in the 1987 order. As a result, both CAI and Air Canada may provide service to London, Frankfurt, and Paris. While Canada has negotiated the right to designate multiple carriers in 39 of the 61 ASAs it has signed, it has exercised this right only in a few cases.[10]

Air Canada also possessed a monopoly on all transborder routes until 1967, when CP Air received its first U.S.-Canada route, between San Francisco and Vancouver, as a result of the 1966 air service agreement between the two nations. Because the 1966 ASA remained in force until 1995 with only minor amendments, CP Air, or its successor, Canadian Airlines, had little opportunity to expand its transborder service during this time span. Accordingly, when the new ASA was signed between Canada and the United

States in February 1995, Canadian Airlines was in a far weaker position to exploit the agreement than Air Canada. It was but a minor player in the transborder market, serving a handful of U.S. west coast cities (San Francisco, Los Angeles, and Honolulu). Air Canada had a far greater physical presence (i.e., gates, check-in terminals, etc.) and brand name recognition in most U.S. cities than Canadian Airlines.

Canada's regulatory philosophy of dividing the world into spheres of influence was designed to suppress intra-flag competition among Canadian carriers in international markets. Presumably this policy was adopted to reduce price competition in these markets and to allow Canadian-flag airlines to focus their competitive energies on foreign carriers. However, this policy had two negative by-products. First, relative to their U.S. competitors, Air Canada and CAI were less able to construct efficient hubbing complexes and route networks to control on-line passengers flows for their domestic and international flights. As a result of domestic deregulation, both U.S. and Canadian carriers were free to serve whatever domestic cities they wished. However, because of the differences in the two countries' populations, U.S. carriers have the choice of more cities to integrate into their hubbing complexes than do Canadian carriers. Canada's sphere of influence policy, which granted Air Canada and CAI Canadian-flag monopolies in international markets, exacerbated the problem. Canada's policy limited the number of international cities that each carrier could serve and integrate into its hub-and-spoke system. In contrast, the open skies treaties signed by the United States expanded the number of international cities that its carriers could serve and incorporate into their hubbing systems. Because of the strong economies of scope that exist in creating hubs, *ceteris paribus*, the route networks of Canadian carriers would thus be less efficient than those of their U.S. counterparts. Second, because they were arbitrarily precluded from competing in certain international markets, each Canadian carrier would have an incentive to link up with a foreign carrier that had such rights. For example, locked out of much of the Asian market by government policy, Air Canada had an incentive to enter into a strategic alliance and code-sharing arrangement with United Air Lines in order to access United's Asian flights. The net result is that instead of competing with Air Canada on Canada-Asia routes, CAI is now competing with the strategic alliance of Air Canada and United. Ironically, by suppressing intra-flag competition, the spheres of influence policy may have actually increased it.

3. AIR SERVICE AGREEMENTS BETWEEN THE UNITED STATES AND CANADA

Until February 1995, the bilateral air services agreement (ASA) between the United States and Canada was among the most restrictive of all ASAs in which the United States was a party. Although it was amended several times, the basic ASA was signed in 1966. It delineated 82 separate point-to-point routes between the two countries. Only 18 of these routes--so-called "double track routes"--were open to competition between carriers of the two nations. Thirty-eight of the routes were reserved for U.S. carriers and the remaining 26 were limited to Canadian airlines.[11] On most of these routes, each nation could designate more than one airline only with the permission of the other government. While capacity was left to the determination of the designated carriers, either government was allowed to reject proposed fares on transborder routes.

Two agreements were signed in 1984 that liberalized transborder air services to a limited extent. The Regional, Local, and Commuter Services Agreement granted automatic approval of route applications for commuter airlines under certain circumstances. Such approval was restricted to routes served by aircraft of 60 or fewer seats between a U.S. city of less than 1 million population or a Canadian city of less than 500,000 persons. In addition, stage lengths could not exceed 400 miles for routes serving Central Canada and 600 miles for other routes. A second 1984 agreement granted automatic approval to transborder routes between Montreal's Mirabel Airport and points in the United States, excluding seven U.S. gateways (Boston, Chicago O'Hare, Los Angeles, Miami, New York JFK, San Francisco, and Seattle). As part of this agreement, the U.S. government designated the San Jose, California airport to receive similar treatment as Montreal Mirabel. Furthermore, these air services operated under a double disapproval pricing regime--that is, carriers were free to establish whatever prices they wished unless both the governments of Canada and the United States disapproved of them.

As part of the Shamrock Summit Declaration in March 1985, both countries agreed to examine the possibility of creating free trade in transborder aviation services. The concept paper issued by the United States favored liberalization of transborder air services along the lines of its "open skies" philosophy: complete freedom of carriers to provide service between any city in Canada and any city in the United States; double disapproval pricing; and liberalized charter regulations. To accommodate Canadian interests, the United States offered to grant Canadian carriers change of gauge rights to allow them to better match capacity and demand in thinner markets.

Canada's concept paper, however, sought to create a common market in airline services. The key difference in the two proposals involved cabotage. (Cabotage occurs when a carrier from country A carries local traffic between two cities in country B.) The unwillingness of U.S. negotiators to grant cabotage rights had led in part to the exclusion of air services from the Canada-U.S. Free Trade Agreement and later the NAFTA. The United States was fearful that if it granted Canadian carriers cabotage rights in the United States, then Asian and European airlines would soon clamor for the same privilege. U.S. negotiators dismissed the Canadian proposal, wary of letting the cabotage genie out of the bottle.[12] Canadian negotiators similarly rejected the U.S. position, believing that the proposal would benefit U.S. carriers to the detriment of Canadian airlines.[13]

Yet both sides were unhappy with the status quo. The 1966 ASA worked to the detriment of consumers in both countries. Almost two-thirds of the 100 largest cities in the United States lacked nonstop service to Canada. As noted, service on many routes was restricted to a single carrier, reducing actual and potential competition below that found in either country's domestic airline market. Moreover, either country was allowed to disapprove a fare, further strengthening the anti-competitive biases of the agreement. Many major city-pair combinations, such as Montreal-Atlanta or Toronto-Washington, did not receive service because of the limited number of routes detailed in the ASA.

The existing arrangement also worked to the particular disadvantage of the Canadian carriers. U.S. carriers had direct access to some 90 percent of Canada's population, while Canadian carriers had equivalent access to only 30 percent of the U.S. population. Because of the limited services authorized by

the old bilateral ASA, much of this traffic was forced to funnel through a handful of U.S. cities. Hubbing systems operated by U.S. carriers at these cities allowed them to control the flow of passengers from non-gateway U.S. cities on to their flights to and from Canadian cities.[14] The competitive value of these hubs was enhanced by the availability of preclearance facilities at Canadian airports. The preclearance facilities allow U.S.-bound travelers to clear U.S. customs in Canada, making it easier for them to utilize the connecting services offered at U.S. hubs. One Canadian study indicated, for example, that only 11 percent of passengers flying a Canadian carrier had a connection in the United States, compared to 55 percent of passengers on transborder flights of U.S. carriers.[15] As a result, U.S. carriers dominated the market for transborder services, as Table 1 shows. By Canadian estimates, U.S. citizens accounted for only 40 percent of the transborder market, yet U.S. carriers routinely carried almost 70 percent of scheduled transborder traffic.

Table 1

U.S.-Canada Scheduled Transborder Passengers (in thousands)

	Total	U.S. Flag	Other Flag	U.S. Market Share
1994	10,655	7,194	3,461	68%
1993	10,810	7,545	3,265	70%
1992	10,260	7,064	3,196	69%
1991	9,871	6,649	3,222	67%

Provisions of the 1995 ASA

The 1966 ASA seemed to displease virtually everyone. Its anti-competitive philosophy ran contrary to the aviation policies of both countries. Carriers believed the agreement harmed their ability to construct efficient North American components of their global route networks. Community interests on both sides of the border believed that the ASA hurt their economic development.

As a result of these pressures, the United States and Canada agreed to a new, much liberalized ASA in February 1995. The new ASA allows each country to designate as many carriers as it wishes to provide transborder services, a clause consistent with the open entry and multiple designation policies of the United States. Neither country may unilaterally limit the capacity offered by any of these carriers. Carriers are free to offer any prices they wish; such prices remain in effect unless both governments disapprove of them. The grounds for disapproval are limited to preventing unreasonable discrimination or exploitation of a dominant position (fares too high) and protecting carriers from competing against low fares resulting from government subsidies or from low fares designed to eliminate competition. The pact gives the Canadian carriers somewhat of a head start, as they are immediately free to fly between any U.S. and any Canadian city of their choice, with no regulatory restrictions on aircraft size, capacity, or frequency of service. They may also combine service to two U.S. points, although they may not carry local traffic between the two points (e.g., Air Canada may fly Toronto-Kansas City-Houston, but it may not carry local passengers between Kansas City and Houston.)

While similar rights will ultimately be granted to U.S. airlines, in the short run their ability to offer service to Vancouver and Montreal (Dorval) is

constrained for two years and for three years at Toronto (Pearson). During the first year of the agreement, the U.S. government may designate six carriers offering two frequencies a day to provide new service to Montreal and Vancouver and two carriers offering two frequencies a day to provide new service to Toronto. At the beginning of year two, the U.S. government may make a second series of similar designations. At the beginning of year three, limits on new U.S.-flag service to Vancouver and Montreal end, and the U.S. government may authorize four carriers to provide two new daily frequencies to Toronto. Under certain circumstances, U.S. carriers may increase the frequency of service to the three cities during this transition period to match that offered by Canadian carriers not operating under such constraints. After the transition period is over--twenty-four months in the case of Vancouver and Montreal and thirty-six months in the case of Toronto--U.S. carriers will be able to offer whatever services they wish to any Canadian city they choose. Carriers from both countries will be allowed to code-share their flights as they see fit.

The desire of Canadian negotiators to temporarily exempt Toronto, Montreal, and Vancouver from the ASA's open entry provisions is understandable given the concentration of transborder traffic at those three airports. Toronto (Pearson), Montreal (Dorval), and Vancouver accounted for 72.4 percent of the commercial transborder aircraft movements between the two countries in 1992. For Canadian carriers, these three airports accounted for 76.9 percent of their transborder flights and 82 percent of their transborder passengers. These three airports, in contrast, account for 31.8 percent of Canadian domestic commercial aircraft movements and 45 percent of domestic passengers.[16] Moreover, the three phase-in airports serve the eleven largest transborder markets in 1993 and 24 out of the 25 largest. Accordingly, the phase-in provides Canadian carriers with some temporary protection at these key airports and focuses new U.S.-flag service to other Canadian cities, who were prime lobbyists for a change in the ASA in the first place.

Breaking the Deadlock

There are several reasons why the negotiating deadlock between the United States and Canada, which lasted nearly thirty years, was finally broken. The previous agreement became increasingly unacceptable to both sides. Both sides agreed that the former ASA was suppressing transborder travel and economic activities between the two nations. For example, between 1980 and 1993, transborder air travel grew only 1.8 percent annually, well below growth rates experienced in country-pairs involving the other leading trading partners of the United States. Another obvious factor is that the 1966 ASA was contrary to the pro-competitive philosophy of U.S. aviation policy. In the past, U.S. negotiators have been willing to promote their ideological agenda even if the benefits received by U.S. carriers were outweighed by the benefits received by foreign flag carriers (e.g., the U.S.-Netherlands ASA). A second factor is that Canadian carriers were not doing very well under the previous agreement, as Table 1 indicated.

In the past, however, Canadian negotiators were very concerned about the ability of Canadian carriers to survive in an open fight with the U.S. carriers in the transborder market. A 1991 policy statement issued by the Ministerial Task Force on International Air Policy, for example, concluded that protecting the interests of Canadian airlines should be given higher priority than

community development and consumer welfare by Canadian negotiators.[17] Thus a second critical element that helped break the deadlock was the agreement of the two major Canadian airlines to liberalizing the ASA. Their change of heart was based in part on the strengthening of their competitiveness and their financial conditions. Both carriers suffered heavy losses in the early 1990s because of recession and the reduction in international traffic that followed the Persian Gulf War. However, since its privatization in 1989, Air Canada has made significant strides in controlling its costs and improving its productivity.[18] Accordingly, Air Canada has subsequently returned to profitability, as has Canadian Airlines.

Both carriers have also benefited from strategic alliances with U.S. carriers. Air Canada purchased a 24 percent ownership stake in Continental Airlines in 1993, and began an extensive program of coordinating its flight schedules and code-sharing with Continental at its Houston and Newark hubs.[19] Air Canada has ample opportunity to expand coordination of its flights with those of Continental at Continental's other hub in Cleveland, given the terms of the new 1995 ASA. Air Canada has also strengthened its ties with Continental's frequent flyer program. After its equity purchase, participants in Continental's frequent flyer program earned mileage for their Air Canada flights. In March 1995 the two carriers also announced that Air Canada mileage could be used to help flyers qualify for "elite" status, which permits travelers to more easily upgrade to first class--an attractive perk for business travelers who fly more often and pay higher prices than the average passenger. Air Canada has also entered into a similar code-sharing and flight coordination program with United Airlines.

The competitive status of Canada's "second" airline has also improved. Canadian Airlines' parent, PWA, ran into substantial financial difficulties in the early 1990s. In 1992, American Airlines and Canadian Airlines announced that they would seek to establish a comprehensive strategic alliance, with American buying a minority interest in the Canadian carrier. A primary benefit of such an alliance to American was the ability to feed its U.S. passengers on to CAI's transpacific routes, allowing it to compete with the transpacific service of its bitter rival, United. Canadian Airlines in turn would benefit by flowing its Canadian passengers over American's U.S. network, thereby raising the attractiveness of Canadian Airlines' flights vis-à-vis those of its bitter rival, Air Canada. Air Canada fought a fierce battle against the proposed arrangement, attempting to derail it by offering to buy Canadian Airlines' Asian, European, and South American routes. Despite this opposition, American Airlines succeeded in purchasing a one-third interest in Canadian Airlines in 1994, although by law its voting rights were limited to 25 percent. Canadian Airlines and American Airlines then entered into an extensive code-sharing agreement and coordinated their flight offerings, helping both boost their competitiveness against their respective chief domestic rivals. As part of this arrangement, Canadian Airlines shifted its computerized reservation system from the Gemini system, which it had shared with Air Canada and which was allied with United's Apollo system, to American's Sabre system.

Increased access to the U.S. market also made strategic sense to both carriers. On the one hand, Canadian Airlines had so little access to the transborder market that any increase in service would be an improvement. Air Canada, on the other hand, had benefited from the protected monopoly offered by the old ASA in several markets. However, the old ASA also gave it little room to

grow. Increased transborder service thus provided Air Canada with increased growth opportunities. Moreover, if Air Canada wishes to be a major player in the globalizing airline industry, it needs to expand its "home" traffic base from that provided by Canada to that provided by North America.

4. INITIAL AIRLINE REACTION TO THE NEW AGREEMENT

The initial reaction by U.S. and Canadian carriers to the new ASA has been as expected, with perhaps one surprise. The U.S. Department of Transportation quickly allocated the limited new entry rights at Canada's Big Three airports using applications already on file. Particularly noticeable was the importance of hubs in the new route allocations.[20] Delta received authority to fly twice daily between its Atlanta hub and Montreal and Toronto; United, twice daily between its San Francisco hub and Vancouver; Continental, once daily between its Houston hub and Toronto and Vancouver, once daily between its Newark hub to Vancouver, and twice daily between Newark and Montreal. Similarly, USAir was allowed to fly twice daily between Pittsburgh and Toronto, while Northwest received twice daily Minneapolis-Montreal and Minneapolis-Vancouver authority. Reflecting the diversity of the U.S. industry--and the Clinton Administration's support of smaller start-up carriers--authority was also granted to ValuJet (Washington Dulles-Montreal), Midwest Express (Milwaukee-Toronto), and Reno Air (Reno-Vancouver).

However, U.S. carriers have not been as aggressive as one might have expected in exploiting opportunities outside of the Big Three airports. Most new service to non-Big Three airports by Continental, American, and United has been in the form of code-share flights offered by their Canadian partners. Continental, for example, now advertises new service to Vancouver, Calgary, Toronto, Quebec City, Ottawa, Montreal, and Halifax, but most of this service is actually performed by Air Canada or commuter carriers affiliated with Air Canada. Delta, which lacks a Canadian partner, has done little to expand its transborder service other than at the Big Three airports.

The new ASA freed Canadian carriers to enter any transborder market they wished. Air Canada immediately announced plans to aggressively exploit opportunities created by the new ASA. By March 1996--a little more than a year after the ASA's approval--Air Canada and its regional airline subsidiaries expect to commence service on 30 new transborder routes, adding a total of 390 new transborder flights per week. Because of Air Canada's existing code-sharing alliances with Continental and United, these new flights will attract new passengers throughout North America.

Examination of the pattern of new services offered by Air Canada suggests that it has adopted several strategies:

1) In choosing Canadian points, exploit the temporary constraints imposed on U.S. carriers at the three phase-in airports by introducing new services there. For example, of Air Canada's first 24 new transborder routes operated by Air Canada, all but four have one of the phase-in airports as their Canadian terminus. Given the already high concentration of its transborder flights at the phase-in airports, Air Canada's behavior suggests that it is trying to convert these airports into fortress hubs impregnable from assault by U.S. carriers after the phase-in period expires.

2) In choosing U.S. points, focus on city-pairs unserved or underserved under the old ASA. For example, the Washington, D.C. area became an

important target for Air Canada. Transborder service to the Washington area was quite limited prior to the signing of the ASA. In May 1995, however, Air Canada introduced thrice daily service between Ottawa and Washington Dulles; in June it added five daily Toronto-Washington National flights and three Montreal-Washington National flights. In October, it commence thrice daily service between Toronto and Washington Dulles. On all of these routes, Air Canada is flying 50-seat Canadair CL-65 jet aircraft.

3) In short-haul business markets, offer frequent service by using small jet aircraft (i.e., 50-seat Canadair CL-65 jet aircraft). By so doing, Air Canada hopes to build brand loyalty and market share before U.S.-flag carriers can legally enter these markets.

4) In vacation-oriented markets, utilize large jet aircraft whose operating costs per passenger are low. Since most of these markets are dominated by Canadian-originating traffic, Air Canada again hopes to build brand loyalty and capture first-mover advantages during the phase-in period.

5) Expand international services to benefit from increased transborder passenger flows. In December 1995, for example, Air Canada announced new service between Canada and Switzerland, Germany, and Hong Kong.

Canadian Airlines has also moved aggressively into the transborder market. For example, prior to the new agreement, CAI averaged less than 3 flights per day between Toronto and the United States. By August 1995, its transborder service from Toronto increased almost ten-fold. A particularly important facet of CAI's transborder strategy is its code-sharing alliance with American Airlines, which allows CAI to provide service to 300 communities in Canada and the United States. Like Air Canada, CAI is leveraging its enhanced North American service by expanding its transocean service. New service is being planned between Canada and Malaysia, Vietnam, and the Philippines.

5. CONCLUSIONS

The signing of the new ASA between the United States and Canada promises to improve the quality of air services between the two nations. It lowers the barriers to trade in transborder airline services to those commensurate with most other sectors of the unified Canadian-U.S. economies. It will benefit consumers, expand the number of communities in both countries with direct air service, and promote the efficiency and productivity of carriers in both countries.

The carriers' initial responses to the liberalization of the Canadian-U.S. ASA can be summarized as follows. First, the carriers' behavior reiterates the importance of the Big Three airports in the transborder market. Most of the new entry has been focused on Toronto, Montreal, and Vancouver. It also suggests that the decision of the Canadian negotiators to seek a phase-in period at Toronto, Montreal, and Vancouver was a wise one. Second, strategic alliances have strongly influenced the entry strategies of the carriers. Most of the new transborder entry by United, American, Continental, and Canadian Airlines is in the form of code-sharing arrangements on partner airlines' flights. Code-sharing is also an important, though not the dominant, component of Air Canada's new strategy for exploiting the new ASA. Conversely, code-sharing is the dominant component of CAI's transborder strategy. Third, utilization of their hubs has played an important initial role in the strategies developed by U.S. carriers to increased their transborder market shares.

BIBLIOGRAPHY

Baldwin, Gordon G. "The 1995 Canada-United States Air Transport Agreement: An Analysis of the Initial United States Response," mimeo, Ottawa, 1995.

Bogosian, Richard W. "Aviation Negotiations and the U.S. Model Agreement," Journal of Air Law and Commerce, Vol. 46 (1981), pp. 1007-1037.

Button, Kenneth. "Liberalising the Canadian Scheduled Aviation Market," Fiscal Studies, Vol. 10 Issue 4 (November 1989), pp. 10-52.

Dempsey, Paul Stephen. Law and Foreign Policy in International Aviation. (Dobbs Ferry, N.Y.: Transnational Publishers, Inc., 1987)

Dresner, Martin, "Hubbing Effects on the Canada-U.S. Transborder Air Market: A Summary," in Louis Le Blanc, editor, Proceedings of the Thirty-fifth Annual Meeting of the Transportation Research Forum (1993), pp. 327-331.

Dresner, Martin, Carolyn Hadrovic, Michael W. Tretheway, "The Canadian-U.S. Air Transport Bilateral: Will it be Freed?", Transportation Practitioners Journal, pp. 393-405.

Gellman Research Associates. A Study of International Code Sharing (Mimeo, Jenkintown, Pa., December 1994).

Gillen, David W., Tae H. Oum, and Michael W. Tretheway. Canadian Airline Deregulation and Privatization (Vancouver: Centre for Transportation Studies, University of British Columbia, 1985).

Gillen, David W., W.T. Stanbury, and Michael W. Tretheway, "Duopoly in Canada's Airline Industry: Consequences and Policy Issues," Canadian Public Policy, Vol. 14, No. 1 (1988).

Hakka, Rolf, "Canada-United States Scheduled Air Services," in Louis Le Blanc, editor, Proceedings of the Thirty-fifth Annual Meeting of the Transportation Research Forum (1993), pp. 324ff.

Lewis, Ira, "United States-Canada Air Services: The Role of Alliances in a Future Bilateral Agreement," Transportation Journal, Spring 1995, pp. 5-12.

Ministerial Task Force on International Air Policy, Volume III, Recommendations: U.S. transborder issues, Transport Canada, June 1991.

Oum, Tae Hoon, W.T. Stanbury, and Michael Tretheway, "Airline Deregulation in Canada and Its Economic Effects," Transportation Journal, Spring 1991, pp. 4ff.

Oum, Tae Hoon, Allison J. Taylor, and Anming Zhang, "Strategic Airline Policy in the Globalizing Airline Networks," Transportation Journal, Spring 1993, pp. 14-30.

Oum, Tae Hoon and Allison J. Taylor, "Emerging Patterns in Intercontinental Air Linkages and Implications for International Route Allocation Policy," Transportation Journal, Vol. 34, No. 4 (Summer 1995), pp. 21-22.

Sampson, Anthony. Empires of the Skies (New York: Random House, 1984).

Taneja, Nawal K. U.S. International Aviation Policy (Lexington, Mass.: Lexington Books, 1980).

U.S. Department of Transportation. Secretary's Task Force on Competition in the U.S. Domestic Airline Industry. Mimeo, February, 1990.

Windle, Robert J. "The World's Airlines: a Cost and Productivity Comparison," Journal of Transport Economics and Policy (January 1991), pp. 31-49.

ENDNOTES

[1] Sampson, pp. 48, 89.

[2] Button, pp. 19-52.

[3] Taneja, p. 2.

[4] Gillen, Tae, Tretheway, p. 74.

[5] Oum, Taylor, and Zhang, pp. 14-30.

[6] Aviation Statistics Centre, *Service Bulletin*, Vol. 25, No. 11 (November 1993), pp. 8-9.

[7] Dempsey, pp. 29-30; Bogosian (1981).

[8] Oum, Stanbury, and Tretheway, pp. 4f.

[9] Minister's Policy Statement No. 248/87, October 5, 1987, as reported in the *International Air Policy Task Force Report*, Vol. 1, p. 148.

[10] Oum and Taylor, pp. 21-22.

[11] Lewis, pp. 5-12.

[12] Button, pp. 18-52.

[13] Dresner, Hadrovic, and Tretheway, pp. 393-405.

[14] Dresner, pp. 327-331.

[15] Hakka, p. 324.

[16] Statistics Canada, *Air Carrier Traffic at Canadian Airports*, April-June 1992, p. 13.

[17] Ministerial Task Force on International Air Policy, Volume III, *Recommendations: U.S. transborder issues*, Transport Canada, June 1991.

[18] Windle, pp. 31-49.

[19] Gellman Research Associates Incorporated, pp. 33-34.

[20] Baldwin, Gordon G. "The 1995 Canada-United States Air Transport Agreement: An Analysis of the Initial United States Response," mimeo, Ottawa, 1995.

Cost Competitiveness of Airlines: an International Comparison

Tae. H. Oum and Chunyan Yu

Faculty of Commerce and Business Administration
The University of British Columbia
Vancouver, B.C. V6T 1Z2
Fax: 604-822-8521

Summary

Significant structural, institutional and regulatory changes have occurred in the airline industry since the mid-1980s. These changes have intensified competition in both domestic and international air transport market. As the market becomes more competitive, the ultimate ability of a carrier to survive and prosper depends greatly on its cost competitiveness. This paper measures and compares the unit cost competitiveness of the world's major airlines, using the yearly panel data of 23 major airlines over the 1986-93 period. We focus our analysis on identifying the potential factors which influence the observed unit cost differentials among airlines, including input prices, productivity, network and other firm-specific variables.

A translog variable cost function is estimated taking into account of the capacity utilization, that is:

$$VC = V(Y, W, Z, t, uK)$$

where VC is the cost of the variable inputs, Y is the aggregate output index, W is a vector of input prices, Z is a vector of airline characteristics, t is time shifter for technological progress, K is capital stock, and 'u' is capacity

utilization rate (in this case, weight load factor). The results from the variable cost function estimation show that (1) airlines with higher concentration on freight service and non-airline businesses are expected to have lower variable costs; (2) government-owned airlines have about 15% higher variable cost, and tend to use more labour- and capital-using technology than privately-owned airlines; (3) technical progress in airline operations has reduced variable costs by about 8% during the 1986-93 period.

Adopting the methodology proposed by Caves and Christensen (1988), the following formula is used to decompose the total unit cost differential between observations (firm and year), *1* and *2*, into the effects of differentials in size, output mix, input prices, stage length, ownership forms, and residual components:

$$
\begin{aligned}
c^1 - c^0 = {} & S[1/2(d_y^1 C_v + d_y^0 C_v) \cdot (Y^1 - Y^0) - (Y^1 - Y^0)] \\
& + S[1/2(d_k^1 C_v + d_k^0 C_v) \cdot (K^1 - K^0)] \qquad \Big\rangle \ \textit{size} \\
& + (1 - S)[(K^1 - K^0) - (Y^1 - Y^0)] \\
& + S[1/2(d_r^1 C_v + d_r^0 C_v) \cdot (R^1 - R^0)] \qquad \textit{output mix} \\
& + S[1/2(d_w^1 C_v + d_w^0 C_v) \cdot (W^1 - W^0)] \qquad \Big\rangle \ \textit{input prices} \\
& + (1 - S)(W_k^1 - W_k^0) \\
& + S[1/2(d_z^1 C_v + d_z^0 C_v) \cdot (Z^1 - Z^0)] \quad \textit{operation attributes} \\
& + S[1/2(d_t^1 C_v + d_t^0 C_v) \cdot (t^1 - t^0) \quad \textit{time effects} \\
& + S[1/2(d_g^1 C_v + d_g^0 C_v) \cdot (g^1 - g^0) \quad \textit{government ownership}
\end{aligned}
$$

where S denotes the average share of variable cost in the total cost for observations 1 and 0; $d_x^i C_v$ denotes the partial derivative of the variable cost for observation i with respect to variable x. For ease of presentation, American Airlines (AA) is used as the benchmark for comparison.

The results of the unit cost decomposition are used to construct a cost competitiveness indicator after removing the effects of network and output

attributes. This indicator allows one to compare the true cost competitiveness of airlines in a given market, especially in an inter-continental market, and shows us what factors are contributing or harming a carrier's cost competitiveness. Our results can be summarized as follows:

(a) Major Asian carriers (except JAL and ANA) enjoy substantial cost competitiveness over American Airlines (AA) mainly due to their lower input prices, but their cost competitiveness relative to AA has decreased over time;

(b) JAL is 65% less cost competitive relative to AA mostly due to its high input prices;

(c) Major European carriers are 5% (BA) - 60% (SAS) less cost competitive relative to AA, mainly because of their high labour and non-labour input prices; lower productive efficiency is also partly responsible, however, European carriers' productive efficiency has improved relative to AA during the 1986-93 period;

(d) In 1993, AA, United and Delta are similar in cost competitiveness, and US Air is 20% less cost competitive while Northwest and Continental enjoy, respectively, 10% and 15% cost competitiveness over AA;

(e) Canadian carriers and the US mega carriers are similar in cost competitiveness; and Canadian Airlines has about 6% unit cost advantage over Air Canada.

Overall, the input prices together have been a more important factor than productive efficiency for determining a carrier's cost competitiveness in the past. However, the importance of input prices is likely to diminish over time as airlines increase their global sourcing of labour, materials, services and other inputs, and as input prices in the developing (and the NICs) continue to increase faster than in the developed countries. Furthermore, as liberation of the airline industry continues, productive efficiency will become progressively more important in determining cost competitiveness in the future.

NEW CUSTOMS EDI SYSTEM TO CHANGE INTERNATIONAL CLEARANCE PROCEDURES

Are your drivers spending a lot of time clearing their truck shipments at the border? Do your shipments clear at inland sufferance warehouses in less than a hour seven days a week twenty four hours a day? Are your crucial air shipments delayed waiting for customs clearance? These delays can be substantially reduced if international carriers, freight forwarders, warehouse operators, and importers or customs brokers participate in Revenue Canada, Customs, Excise, and Taxation's (RCCET) EDI programs.

The latest Customs 2000 initiative is the Accelerated Commercial Release Operations Support System (ACROSS). This program will allow importers or customs brokers to submit and obtain a commercial release electronically at any automated customs port throughout Canada.[i] The program, scheduled for national implementation in March has the potential of changing importers and customs brokers business practices. In turn these changes will have a profound effect on the international carriers' customs clearance procedures. This paper first states why RCCET is introducing the ACROSS program and its potential benefits to all the participants involved in an international customs clearance. The paper then examines international carriers current release procedures and how these will change with the implementation of the new ACROSS program.

Introduction

Revenue Canada, Customs, Excise and Taxation similar to other government departments has been mandated by the Minister Of Finance to continue to cut its costs while improving productivity. Revenue Canada Customs and Excise has been re-engineering its operations since 1990 and has already introduced a series of pre-review, frequent importer and low value shipment programs which have improved and streamlined their operations.

The latest initiative is designed to benefit carriers, importers and RCCET. RCCET will be able to: enhance the role of the Customs Inspector; improve their productivity, and effectiveness; standardize the release process; obtain efficiency gains; reduce the paper handling, storage requirements and position the

department to meet the needs of other government departments. RCCET will be able to reduce the development costs for future enhancements and use the new system as an automated workload management tool.[ii] RCCET intends to use the new system to assist them in targeting high risk commodities, carriers, vendors, and importers and to determine which shipments must conform to other government departmental requirements.[iii] RCCET is also developing enhancements to the system so frequent importers with a good compliance record can obtain a machine release, and other government departments requirements can be incorporated into the system.[iv]

International carriers, freight forwarders, and warehouse operators who work with importers and customs brokers utilizing the new ACROSS system should be able to obtain quicker releases and have more consistent in-transit times. Release times will be reduced since the ACROSS program will not allow customs brokers to submit release packages which do not meet the minimum release requirements. (Currently these packages are rejected and the driver must return to the customs broker to have the packages corrected.) Release times will also be reduced since Customs Inspectors workloads will be subject to a regional queue based on the actual time the goods will be available for release and examination. Machine releases for certain shipments will also reduce release times.

Importers and Customs Brokers will also obtain benefits from the ACROSS program. Importers and customs brokers should be able to reduce their: paper burden; fax and courier costs; release rejections; out port costs; runner costs; and obtain a more timely release of goods.[v] Many of the importers or customs brokers may also utilize the ACROSS program since it may take less time to prepare and send the ACROSS release package than it does to prepare and present an RMD package.[vi]

International carriers, freight forwarders, and warehouse operators play an integral part in the customs clearance equation. Carriers, freight forwarders, and warehouse operators who adapt to the new EDI initiatives will benefit and carriers who do not adapt may find themselves encountering new and additional delays in obtaining their customs clearances. This paper examines current customs clearance procedures and how the procedures may change with the introduction of ACROSS. This paper, although applicable to all modes of international transportation compares the current and upcoming release procedures for highway carriers.

Current Release Procedures at Highway Frontier Ports

International carriers predominately obtain their commercial releases using the RMD, PARS and FIRST release procedures. Statistics quoted in this section are based on 307,350 commercial shipments which were released from January 1 through January 31, 1996 at the various frontier ports across Canada.

RMD Release Procedures

Approximately 54% of commercial shipments are released using the Release on Minimum Documentation (RMD) procedure. To obtain a commercial release using the RMD procedure the operator of the conveyance hand delivers the Customs Delivery Authority and Long Room Copies of A8A cargo control document along with any supporting paperwork to the importer or customs broker. The importer or customs broker reviews the supporting documentation, obtains any necessary permits and / or supporting paperwork, and prepares a paper based release package. The customs broker hands the driver the release package and the driver enters the queue to wait his/her turn for a Customs Inspector to review the release package.[vii] Once the Customs Inspector reviews the release package and updates the Customs computer system the inspector will either: 1) release the shipment, 2) call it up for examination, 3) refer it to another government department, 4) or reject the release package. If the release package is rejected, the driver returns the package to the customs broker for corrections. After the customs broker corrects the release package the driver returns to customs to obtain a release. Once the shipment is released the Customs Inspector will stamp the Customs Delivery Authority Copy of the A8A cargo control document and return it to the driver. Release times are proportional to the length of the queue at both the customs broker's office and at RCCET.

PARS Release Procedures

Approximately 37% of commercial shipments are released using the Pre-Arrival Review System (PARS) release procedure. Most carriers fax their PARS packages to the customs brokers at the port which they intend to cross. The customs broker reviews the supporting documentation, obtains any necessary permits or supporting paperwork and submits a paper based PARS release package to RCCET. A Customs Inspector reviews the release package, updates the customs computer system and either: 1) makes a release recommendation 2) refers the release package to another government department, 3) or rejects the release package. If the package is rejected it is returned to the customs broker for corrections. After correcting the release package the customs broker resubmits it

to RCCET for review.[viii] Once the driver arrives at the port a Customs Inspector wands in the unique PARS cargo control number and either releases the shipment, refers it to another government department, examines it, or advise the driver that the PARS release information is not on file. If the PARS release is not on file the driver must obtain an RMD or take the shipment in bond to a sufferance warehouse. Once the shipment is released the Customs Inspector will stamp one of the bar coded PARS documents and return it to the driver as a proof of clearance.

FIRST Release Procedures

Approximately 6% of commercial releases at the frontier port are released using the Frequent Importers Release System (FIRST) release procedure. Changes to the FIRST procedure have been postponed until September 1996.

Current Release Procedures at Inland Ports

International carriers and freight forwarders predominately obtain their commercial releases using the RMD, INPARS and PARNS release procedures at inland sufferance warehouses / ports. Statistics quoted in this section are based on 171,832 commercial shipments which were released from January 1 through January 31, 1996 at the various inland ports across Canada.

RMD Release Procedures

Approximately 83% of commercial shipments are released using the RMD procedure. To obtain a commercial release the carrier delivers or faxes the Customs Delivery Authority and Long Room Copies of A8A cargo control document along with the supporting paperwork for the shipment to the importer or customs broker. The importer or customs broker reviews the supporting documentation, obtains any necessary permits or supporting paperwork, and prepares a paper based release package. The importer or customs broker then presents the release package to RCCET. The release package enters the RMD queue and waits for a Customs Inspector to review the release package.[ix] A Customs Inspector will review the release package, update the customs computer system, and will either: 1) releases the shipment, 2) call it up for examination, 3) refer it to another government department, 4) or reject the release package. If the package is rejected, it is returned to the customs broker for corrections. After the customs broker corrects the release package it is returned to RCCET for review and release. Once the shipment is released the Customs Inspector will stamp the Customs Delivery Authority Copy of the A8A cargo control document and send

it the sufferance warehouse operator. At some ports the release copy is faxed the appropriate warehouse operator whereas other ports warehouse operators obtain their releases using the Release Notification System (RNS).[x] Release times are proportional to the size of the RMD queue at the customs broker's offices and the RCCET. The hours of service of both the customs brokers and RCCET also affect release times.

INPARS, and PARNS Release Procedures

Approximately 10% of commercial shipments are released using the Inland Pre-Arrival Review System (INPARS) and the PARS Arrival Notification System (PARNS) at the inland ports throughout Canada. Carriers fax or courier their INPARS, and PARNS packages to their own terminals, the warehouse operators, or the importers or customs brokers at the ports where they intend to clear the shipments. The importer or customs broker reviews the supporting documentation, obtains any necessary permits or supporting paperwork, and submits a paper based INPARS or PARNS release package to RCCET. A Customs Inspector reviews the release package, updates the customs computer system, and either: 1) makes a release recommendation, 2) refers the release package to another government department, 3) or rejects the release package. If the package is rejected, the package is returned to the customs broker for corrections. After the customs broker corrects the release package they resubmit it to RCCET.[xi]

Once an INPARS shipment is available for examination the carrier, warehouse operator or customs broker presents the Customs Delivery Authority copy of the A8A cargo control document to RCCET. The customs official wands in the bar coded A8A cargo control document and either releases the shipment or calls it up for examination. Once an INPARS shipment is released the Customs Inspector will stamp the Customs Delivery Authority copy of the A8A cargo control document and return it to the warehouse operator. Since INPARS releases are presented to customs for release or examination these releases are subject to the hours of service of RCCET at the particular inland port.

Once a PARNS shipment is available for examination the warehouse operator sends RCCET a PARNS EDI arrival message advising RCCET that the goods are available for examination or release. RCCET will send a PARNS EDI message to the warehouse operator to advise him/her whether the shipment is released, called up for examination, or that no release information is on file. If there is no release information on file RCCET's computer will maintain the arrival information and the warehouse operator will be advised by a PARNS EDI

message when the goods are released or called up for examination. EDI transmissions between the warehouse operator and RCCET can be performed on a twenty four hour seven day a week basis, ultimately providing warehouse operators with around the clock release capability.[xii]

The ACROSS Program Basics

The ACROSS program is a EDI cargo release program which will allow importers or customs brokers to submit electronic release packages to RCCET for shipments clearing at any automated port in Canada twenty four hours a day seven days a week.[xiii] ACROSS releases are restricted to shipments which do not involve any other government department. Shipments involving import permits obtained from Foreign Affairs and International Trade Canada (FAITC) can be released if the importer or customs broker obtains in import permit utilizing the FAITC EXCAPS program.[xiv] Under the ACROSS program, importers or customs brokers will be able to present electronic releases to customs utilizing their current Customs Automated Data Exchange (CADEX) communication lines or through third party Value Added Networks (VAN) such as TDNI or GE.[xv] A Customs Inspector will review the electronic release information and make one of four decisions: 1) make a release recommendation, 2) release the shipment, 3) call it up for examination or, 4) electronically reject the release package back to the importer or customs broker.[xvi] Once the shipment is released RCCET's computer will send an EDI message to the designated warehouse, and the appropriate carrier using the RNS system. Carriers clearing shipments at frontier ports will still be able to obtain stamped release copies of their cargo control documents. Inland warehouses operators will only be notified about their releases by the customs RNS EDI program. If the warehouse operator does not participate in the RCCET's RNS EDI program, the warehouse operator will need to make arrangements with the ACROSS EDI participant to obtain a copy of the notification of release.

Potential Across Release Procedures at Highway Frontier Ports

ACROSS RMD Release Procedures

To obtain a commercial release the operator of the conveyance will first have to determine if the importer or customs broker has a branch at the port where he/she is crossing. If the customs broker has a branch at the port, the driver would hand deliver the Customs Delivery Authority and Long Room Copies of A8A cargo control document and the supporting paperwork he/she has for the shipment to the customs broker. The importer or customs broker would determine if the

shipment involved another government department and whether it would be faster to submit an ACROSS release package. If it would be faster to submit an ACROSS release package they would return the Customs Delivery Authority Copy of the A8A cargo control document to the driver and advise him / her to proceed to customs to obtain a release. The driver would have a Customs Inspector wand in the bar coded A8A cargo control document number into their system to determine whether to release, refer, or examine the shipment.[xvii]

If the importer or customs broker operating at the port determines that the shipment involves another government department or it would be faster to obtain a release using the paper based RMD the driver would be sent back to customs with the release package and enter the queue to wait his/her turn for a Customs Inspector to review the release package.[xviii] A Customs Inspector will either: 1) releases the shipment, 2) call it up for examination, 3) refer it to another government department, 4) or reject the release package. If the package is rejected, the driver returns the release package to the customs broker for corrections. After the customs broker corrects the release package, the driver returns to the RCCET's queue to obtain a release. Once the shipment is released the Customs Inspector will stamp the Customs Delivery Authority Copy of the A8A cargo control document and return it to the driver.

If the importer or customs broker does not have a branch at the frontier port the importer or customs broker may request the carrier fax all the documentation and the cargo control document to a central location for processing. The importer or customs broker would then review the supporting documentation to determine whether the shipment involved another government department and whether it would be more efficient or cost effective to submit an ACROSS release package. If the importer or customs broker determined it would be beneficial to submit an ACROSS release they would advise the driver to proceed to customs to obtain a release. If the importer or customs broker determined that the shipment involved another government department or it would be more efficient to obtain a paper based RMD release they would direct the driver to see the appropriate customs broker to obtain a RMD release package.[xix]

Across PARS Release Procedures

The release procedures for PARS shipments will be essentially the same as they are today. The exception will be that carriers will have to determine whether they should fax the customs broker at the frontier port where they intend to clear the shipment or a central location where the importer or customs broker will process the shipment. Importers and customs brokers would review the

supporting paperwork to determine if the shipment involved another government department. The importer or customs broker would then either submit an ACROSS release or make arrangements with another customs broker at the port where the driver intended to cross to prepare a paper based PARS release package. Carriers would still present their PARS packages to RCCET upon arrival and obtain a stamped PARS bar coded document as a proof of release. If the PARS package is not on file when the carrier arrives at the port they would revert to the ACROSS RMD release procedures.[xx]

Potential ACROSS Release Procedures at Inland Ports

ACROSS RMD Release Procedures

To obtain a commercial release the carrier will have to determine if the customs broker has a branch at the port where he/she is intending to clear the shipment. If the customs broker has a branch at the port the carrier would fax or deliver the Customs Delivery Authority and Long Room Copies of A8A cargo control document and the supporting paperwork he/she has for the shipment to the customs broker. The customs broker would determine if the shipment involved another government department, and whether it would be faster to submit an ACROSS or a paper based RMD release package.

If the importer or customs broker does not have a branch at the port the importer or customs broker may request the carrier fax them all the documentation and a copy of the cargo control document for central processing. The importer or customs broker would then review the supporting documentation to determine if the shipment involved another government department and whether it would be faster or more cost effective to submit an ACROSS or a paper based release package. If the importer or customs broker determined that it would be beneficial to submit an ACROSS release they would submit the electronic release package from their central location. If the customs broker determined the shipment involved another government department or it would be more efficient to obtain a paper based RMD release they would advise the carrier to forward the cargo control documents and the supporting paperwork to a customs broker operating at the specific port.

ACROSS INPARS, and PARNS Release Procedure

The release procedures for a carrier utilizing the INPARS and PARNS procedures would be the same as previously described in the INPARS and PARNS release procedures section. The only difference would be that the carrier

would have to determine if the customs broker has a branch at the port where he/she is intending to clear the shipment. Please refer to the ACROSS PARS release procedures for the specifics on forwarding the supporting documentation.

Conclusions

RCCET projects that the importers and customs brokers participation rate in the ACROSS program will approach the participation rate of the CADEX EDI system within three years. Approximately 85% of the customs accounting documents for all the commercial transactions are transmitted to RCCET utilizing the CADEX system today. It is the author's opinion that the participation rate may not reach the projected participation rate. The participation rate will depend on: the ability of RCCET to incorporate other government departmental requirements into the system; and on the ability of customs brokers to obtain invoice information on specific shipments via EDI transmissions from vendors, carriers and importers. It is also the author's opinion that the participation rate will increase proportionately to the rate the international carriers and freight forwarders utilize the various PARS / PARNS procedures.

Carriers should note the cargo handling procedures will be essentially the same as their current cargo handling procedures. The notable differences will be in the handling of the supporting paperwork and the obtaining of customs releases if the carrier operates a sufferance warehouse. Warehouse operators will only receive an electronic release notifications from RCCET on shipments released using the ACROSS release program. If the warehouse operator is not obtaining releases through the RCCET's RNS EDI program they will be required to obtain the service from one of the VAN's or to make arrangements with the EDI participant to obtain a copy of the notification of release. If the carrier obtains a RMD or PARS release at the frontier port or uses the INPARS release procedure they will still be able to obtain a stamped release copy from RCCET.

Carriers will have to ensure that their customs paperwork is forwarded to the correct importer or customs broker since the new ACROSS system has the potential of changing the business practices of many importers and customs brokers. The business practices will change because the ACROSS program will allow importers or customs brokers to obtain releases on shipments anywhere in Canada from a single office. Customs brokers may be able to find niche markets and will use this program to reduce or eliminate their subagent and after hours costs by requesting carriers fax the cargo control document and the supporting customs paperwork direct to their office. Cooperation between customs brokers may decrease in situations where one customs broker clears on behalf of another.

The cooperation may decrease because the ACROSS program will allow the broker of record to release the shipment without involving the second customs broker. Carriers may incur additional delays in these situations due to the paperwork being lost or misplaced when the release paperwork is forwarded to the wrong customs broker. Other customs brokers will rationalize their operations by reducing staff, closing offices and requesting carriers fax their paperwork to centralized locations for processing. Importers will also be able to take advantage of this new system by obtaining bonds and releasing and accounting for their own shipments anywhere in Canada thus reducing or eliminating their customs brokerage costs. Carriers that do not adequately monitor the handling of their paperwork will find that the mean time for their shipments to clear will decrease but the variability will increase. Carriers should also monitor the number of shipments which involve third party importers since this paperwork is typically forwarded to the wrong customs broker and this new system may make it more feasible for importers to drop ship.[xxi]

International carriers, freight forwarders, warehouse operators, importers, custom brokers and RCCET will benefit from this program. RCCET will be able to cut its operating costs while improving its productivity. Importers and customs brokers will be able to reduce their costs and carriers will also notice a reduction in clearance times. International carriers, freight forwarders, and warehouse operators who utilize the PARS clearance options also offered by RCCET in conjunction with importers and customs brokers utilizing the ACROSS release procedures will ultimately obtain the maximum benefits from this program.[xxii]

---

[i] There are approximately 92 automated customs ports across Canada. Customs is continually automating additional ports.

[ii] The ACROSS program is designed so that workload can be spread around the various automated ports throughout a region depending on the queue.

[iii] RCCET is developing importer, carrier and other profiles within the scope of this new project. They will be using these profiles to assist them in targeting their enforcement and examinations.

[iv] Machine releases is the process where the computer automatically makes the release decision based on the importers compliance record, the vendors history, and the carriers compliance record. Shipments will not be machined released if they are subject to other governmental departments restrictions or if they are called up for a random examination. Importers will be allowed machine release privileges by application only. Upon receiving an application RCCET will audit an importers records to verify compliance before machine release privileges are allowed.

[v] RCCET goal is to process ACROSS releases in less than one hour. Therefore if the ACROSS release meets all the release requirement shipments should ideally take less than a hour to clear after the importer or customs broker electronically transmits their ACROSS EDI release.

[vi] The amount of time that it takes a customs broker to prepare and submit an ACROSS release depends on variables such as: the number of lines of invoice lines; whether the invoice information was sent to them via an EDI transmission from the vendor or importer; whether the carrier is using a PARS, INPARS or PARNS release procedure; the distance they are from the customs port; and how often they have a runner submit the releases to customs. The overall time to prepare and submit the releases should be reduced since RCCET advises that the mean number of lines of all commercial releases which are accounted for using the CADEX and CUSDEX is equal to 2.5.

[vii] A driver may have more than one release package at a frontier port and should present release packages for all the shipments on the conveyance at one time.

[viii] PARS packages must be submitted to customs a minimum of two hours and a maximum of ten business days in advance of the arrival of the conveyance. If the PARS package is rejected and cannot be resubmitted within the two hour time frame the driver is required to either obtain a RMD or take the shipment in bond to an inland sufferance warehouse.

[ix] Most inland ports have an importer, driver waiting, or rush release program in place to release critical or time sensitive shipments. Other RMD's are processed in a first in first out basis.

[x] The Release Notification System is an EDI program between RCCET and warehouse operators and carriers. Electronic release messages based on A8A cargo control numbers are sent by RCCET through a third part VAN to warehouse operators and / or carriers.

[xi] INPARS packages must be submitted to customs a minimum of two hours and a maximum of ten business days in advance of the arrival of the shipment. If the PARS package is rejected and cannot be resubmitted within the two hour time frame the carrier is required to obtain a RMD. The two hour time constraint may be removed with the introduction of ACROSS since the warehouse operators will only have to transmit the PARNS EDI arrival message once and the PARNS database will maintain that the goods are available for examination and release.

[xii] Release times on INPARS shipments are also dependent on how often a warehouse operator obtains release information from the VAN.

[xiii] ACROSS releases will be subject to the normal operating hours of the particular port although RCCET is setting up the ACROSS system so that the automated ports will have their shipments processed through regional processing centers on a seven day a week twenty four hour a day basis throughout Canada.

Shipments which are called up for exam will only be inspected during regular business hours. PARS and PARNS release procedures will still be subject to a single cargo control number / document.

[xiv] The EXCAPS program is an EDI permit system between FAITC RCCET and FAITC's agents. Importers or Customs brokers obtain import permits by application to FAITC or one of their designated agents. The national introduction of the FAITC EXCAPS program is scheduled to coincide with the ACROSS implementation.

[xv] CADEX lines are not available between 0:00 and 18:00 hours every Sunday.

[xvi] Customs Inspectors put in a release recommendation on PARS, INPARS and PARNS release programs. RCCET is setting up the system so that the automated ports will have their shipments processed through regional processing centers on a seven day a week 24 hour a day basis throughout Canada.

[xvii] Please note the release times will still be subject to the length of the queue at the customs brokers office along with the length of the queue RCCET.

[xviii] A driver may have more than one release package at a frontier port and should present release packages for all the shipments on the conveyance at one time.

[xix] Importers or Customs Brokers may request that the drivers / carriers fax them the paperwork directly instead of using a subagent. These decisions may be based on reducing or eliminating the customs brokers or the importers subagent costs.

[xx] PARS releases will still must be transmitted at least two hours in advance of the conveyances arrival at the frontier port under the ACROSS program.

[xxi] Most carriers forward the paperwork to the consignee's customs broker and have not trained their staff on how to determine if a party other than the consignee is responsible for paying the duties and taxes to the Canadian Government. Shippers and importers in an effort to minimize their logistic costs will continue to drop ship goods directly to their customers. Some shippers in an effort to gain a greater market share become non-resident importers and pay the duties and taxes themselves offering their customers a landed price. In all these cases the shipments are imported by third party importers

[xxii] The Canadian Society of Customs Brokers is also promoting a new Windows based software program called TradeGate. This software is designed to make vendors, carriers, warehouse operators, importers and customs brokers EDI capable.

STRATEGIC ALLIANCES ENABLED BY ELECTRONIC COMMERCE - An Overview of the Process

Alison Lough Sunstrum
Consultant, *Alternative Solutions*, Winnipeg, Mb.
F. H. (Joe) Howard
Transportation Consultant, Vancouver, B.C.

ABSTRACT

The following paper is a discussion of the information technology and processes that enable enhanced or strategic partnerships. The exchange of data by electronically enabled means has been utilized since the conclusion of the second world war. The Canadian business community did not embrace the electronic data interchange concept until the 1980's although isolated segments began test and prototype developments prior to this date. The 1990's have seen an increase in the number of entities establishing trading partner relationships which routinely exchange documents by a variety of electronic means. This paper does not provide an exhaustive study of Electronic Commerce but provides an introduction to the electronic data interchange environment and briefly attempts to forecast the future of EDI.

INTRODUCTION

There is a *fundamental shift in the way business is being conducted. Strategic partnering* is the hot management topic for the 1990s. Corporate visionaries are no longer satisfied with the incremental gains offered by the adherence to total quality management systems. *Reengineering* enabled by increasingly available and reliable technology has become a crusade for several corporate strategic planners. Vendor-managed inventory, efficient consumer response and other technologically enabled initiatives are in full operation in many companies across North America. Technology, and its associate vocabulary, is changing at a rapid pace and will have a profound effect on the small to medium sized Canadian shipper/carrier; particularly those who are not yet electronically exchanging information with their trading partners.

ELECTRONIC COMMERCE

Electronic commerce is the term that is used to describe the standards, practices and technologies which are utilized to conduct business between trading partners. Aspects of electronic commerce include Electronic Data Interchange (EDI),

Electronic funds transfer, (EFT) enhanced fax, bulletin boards and imaging techniques. Electronic commerce is the plateau that our current business society has reached in its departure from a society based on paper document based processes.

ELECTRONIC DATA INTERCHANGE

EDI might be considered the single most important tool to effectively manage a strategic partnership. Electronic data interchange is the exchange of information in standard electronic format between organizations.

The transportation industry has been actively involved in electronic data interchange from the onset. The Transportation Data Coordinating Committee (TDCC) which was formed in 1975 laid the groundwork for the ANSI ASC X12 standards which are used throughout North America. Ocean and rail carriers have been in the forefront of EDI development in the areas of shipment status, bill of lading, and freight invoicing exchanges. The trucking industry at large has been slower to develop its EDI capabilities however there are several small to medium motor carriers with highly advanced and integrated systems.

The American Trucking Associations Management Systems Council's *1995 List of Motor Freight Carriers* list 431 carriers that offer EDI services. This compares to the first edition - February 1988 - 68 carriers, 2nd edition - April 1989 - 151 carriers, 3rd edition - April 1991 - 176 carriers and the 4th edition April 1993 - 296 carriers.[1] An informal survey of the Canadian Trucking Association and certain provincial trucking associations indicate that a list of EDI enabled Canadian carriers is not readily available.

EDI PROCESS

First generation EDI was driven by the automotive and retail industry giants who dictated the terms of their electronic trading partner relationships usually to their sole benefit. Shippers and carriers were forced to comply through the threat of reduced market share. In reaction to these demands many companies undertook EDI-PC standalone developments. Data was received by the shipper/carrier, translated into paper format then re-keyed into application software. The shipper/carrier appeared EDI capable but no benefits from the exchange were captured. EDI-PC standalone developments or 'pseudo-EDI' are quite common amongst small and mid-sized carriers. Several large companies have undertaken 'pseudo-EDI' when faced with the daunting prospect of integrating data to mainframe based computer systems. These 'pseudo EDI' developments may pacify a demanding customer but they will not enable a strategic partnership. For

the purpose of this discussion it should be understood that Electronic Data Interchange enabling strategic partnerships does not refer to EDI-PC standalone developments. EDI enabling strategic partnerships refers to a development which allows for full data processing between organizations, and across multiple organizations, without human intervention.

In theory, the EDI process is relatively simple In the case of a purchase order – the buyer inputs the purchase order information into his application software. Rather than printing the data in paper format, a flat file is created from the company database and is transferred to the EDI translation program. The EDI translation program formats the data into the agreed standard EDI format. The EDI formatted data is transmitted directly to the seller or to a value added network. (VAN). The EDI formatted data will be translated out of the EDI format into the format used by the seller's order entry application software. In addition to translation software both parties will require some type of communication software and possibly may require EDI VAN communications script.

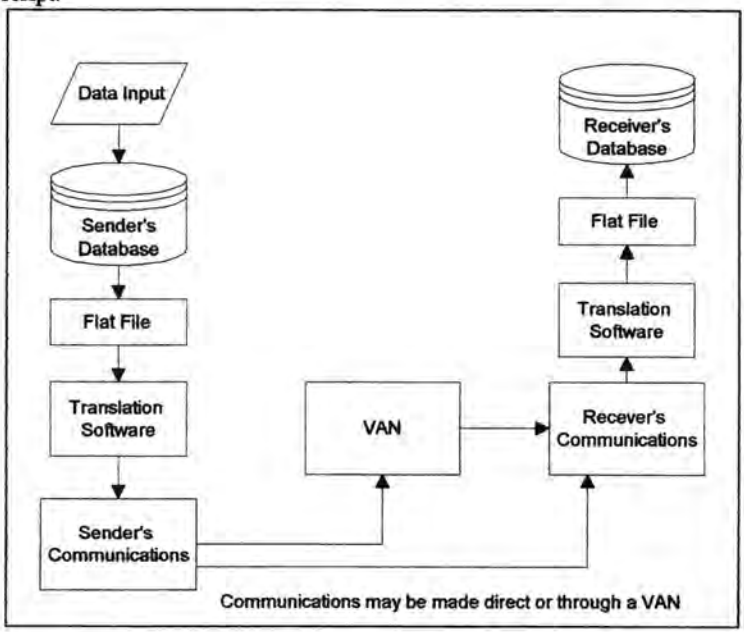


Figure 1 - Simplified EDI process

The technical process of EDI is easily handled by in-house programming staff. Moreover, it is possible for small to medium enterprises without in-house programming capabilities to become fully EDI capable. The Logistics Management Institute in McLean, Virginia produces an annual list of EDI translation software and its capabilities . A review of previously published guides indicates that EDI translation software is rapidly maturing and becoming increasingly user friendly.[2] EDI translation software is available for all sizes and types of operating environments.

The greatest technical challenge faced by a prospective EDI user is integrating the EDI transaction file into application programs. Certain mainframe systems do not allow entry other than by keyboard, and may not allow more than one data entry point. Each time a new electronic trading partner is acquired new standards, different implementation conventions and new communication requirements may influence the mapping of data.

There are several new integration tools on the market which support EDI development. Software developers are including EDI enabled input/output in their application software. Certain developers are also using EDI as a tool to integrate different applications and platforms within corporate entities. SAP, which is becoming the software choice of Fortune 500 companies, is using application messaging (EDI) to migrate from their mainframe based software to their client server-R3 version. Several software companies are also developing tools which will allow independent and diverse applications to message each other. These tools may eventually replace the first generation translation software.

STANDARDS

The technological challenges to EDI may be considerably less daunting than those challenges posed by standards and process limitations. A corporation undertaking international and global EDI is faced with a plethora of standards and implementation conventions. Standards do not define how trading partners will connect or exchange their data. Several industries have developed action groups, working parties or alliances to determine the implementation conventions for their specific interests. In essence, an implementation convention is a standard to implement a standard.

The fundamental premise of EDI is that data will be exchanged in a standard format. The standards currently in use include the rules for the format, content and order of information in transaction sets.

ASC X12

There are approximately 280 transaction sets or business documents defined by ANSI ASC X12 standards. The Data Interchange Standards Association, Inc. (DISA) has been the secretariat of Accredited Standards Committee (ASC) X12 on Electronic Data Interchange since 1987. Standards are constantly evolving. Different releases and subreleases are NOT upward or downward compatible. Transaction sets, segments and data elements must all be used at the same version/release level. [3] During the period November 1987 to December 1995 there were 18 releases of ASC X12 standards.

Within ASC X12 standards there are several transaction sets which may transmit the same fundamental information - or complete a related business process. For example, Transaction Set 810-Invoice, Transaction Set- 811 Consolidated Invoice, Transaction Set 857-Shipment and Billing notice. Different modes have also established separate transaction sets for the invoicing function. The invoicing/billing function is essentially the same process across corporations – A service or product is being exchanged or performed for a given consideration. Standards must evolve to a place where an invoice is an invoice regardless of mode or entity.

A paper document mentality has been maintained by standards developers and EDI users. Within a database sophisticated tables may be maintained which allow cross matching from codes to representative identifying information. The most efficient EDI documents will be those designed to transmit the least amount of information. Several implementation conventions routinely call for transmission of product codes and further identify products by names, weights or sizes. Such distinctions were necessary in paper documents where paper cross reference was time consumptive, and human error was a potential factor. Additionally, data segments such as notes ("NTE") allow for free form information. Such free form fields are not machine processable and human intervention is required to process this information. This information in an electronic environment is redundant.

EDIFACT

EDIFACT is the main body of standards used across Europe. Several different subsets of EDIFACT have evolved. For example, EANCOM - messages from the European retail industry managed by EAN - European Articling number body. There are two message standards used by the Automotive industry - ODETTE based on EDIFact syntax and VDA - an older standard developed for use within mainframe environments

ALIGNMENT OF ASC X12 AND UN/EDIFACT

The migration of ASCX12 to UN/EDIFACT has been under consideration for some time. It was generally thought that migration to UNEDIFACT would occur in 1996. In February 1995, it was determined that prior to terminating all new transaction set development in X12 syntax, input and guidance from the EDI community would be obtained by a survey to be conducted in 1997. An ASC X12 ballot will be conducted in 1998 to determine if new transaction set development should be terminated. Termination of X12 development will not occur earlier than one year following the ballot approving termination.[4] There is a fairly comprehensive document in place defining the migration process however the inclusion of a ballot in the process indicates that actual migration may never take place.

In reality, the majority of the world's EDI transmissions occur within North America using ASC X12 standards.. Migration to one standard is highly practical however it is premature to assume that EDIFACT will be the one surviving standard, in its present form. The users– the business community, will determine the migration through their ballot. It is unlikely that the majority of users will seek to adopt a standard, other than that which they are currently using.

NEW GENERATION OF EDI

A new generation of EDI is now emerging. The first generation of EDI focused on a exchange of business documents between similar trading partners. The exchange of electronic information was based on existing paper document structure. The new generation of EDI will seek multi-enterprise integration with a focus on reengineered business processes. New EDI will seek to expedite trading partner relationships by standardizing business processes not just documents.

The new model of EDI standards development will focus on business analysis and definition of requirements rather than the current concentration on data and how it is arranged into messages based on the paper model. [5] There are several international groups and academic institutions currently working on the new model of EDI.

OPEN-EDI

Open EDI can be described as electronic data interchange among multiple organizations to accomplish an explicit shared business goal according to open-EDI standards. [6]A joint ISO (International Organization for Standardization) and

IEC (International Electrotechnical Commission) sub-committee has been formed to develop the open-edi reference model, to establish a basic semantic repository and to provide EDI support services. The first draft for the open-reference model has been determined, and is currently under international review.

BSR - BASIC SEMANTIC REPOSITORY

The Basic semantic repository is a reference point for the identification and rationalization of the semantics of business data used in computerized and manual business systems. [7] In oversimplified terms, the BSR will attempt to bridge the gap between existing standards and their limitations to the perceived new generation EDI. The main user of the BSR is intended to be the computer software industry however if successful, the BSR will have significant impact on the business community.

The effect of the open reference model and basic semantic repository will be to provide a universally standard definition of business practices. Adherence to this model by software developers will provide users with application software which conforms to standard without application translation to EDI format.

A highly significant component of the BSR, is the ability for developers to create application software without language constraints. The control vocabulary of the BSR is established with corresponding registration numbers. The reference language is English, however each language will have a control vocabulary correlating to the registration numbers.

The BSR is currently under construction and there is substantial development work to be undertaken prior to its acceptance as a "new standard". It is an extremely promising initiative, which in the future may overcome the limitations of first generation EDI.

CURRENT PRACTICES IN ELECTRONIC COMMERCE

EDI AND BARCODES

EDI and barcoding are compatible tools, which when effectively used together eliminate human error in data capture. The two should always be designed as a logical extension of each other. Barcoding will reduce the need for initial manual data input. Barcoding will provide the primary information for an EDI message. New barcoding processes such as portable data files (PDF) can contain up to 2,000 characters of data. This translates to complete bills of lading or shipping

notices in barcode format. A significant amount of data could be entered by a scanner and then transmitted electronically through the use of PDF to EDI.

ECR, VMI, QR, JIT

Several strategies such as efficient consumer response, vendor managed inventories, quick response and just in time manufacturing have more or less the same objective - coordinated partnership initiatives wherein product is never warehoused but is in continuous movement, with the least number of handling steps. Product in continuous movement has significant impact on the way goods are transported. Companies embracing these electronic commerce initiatives will require carriers who will assist them in these initiatives and will assume greater responsibility than the physical movement of goods.

EDI AND THE INTERNET

The Internet may impact the evolution of electronic commerce more than any standard or given initiative. The Internet is the inter-working of existing corporate and government networks using common telecommunications standards.[8] It is not a government agency.

Exchanging EDI messages over the Internet is in its infancy, however several successful pilots are underway. The greatest impact EDI over the Internet may have is reducing the cost of EDI, and re-defining the role of value added networks.(VANS) It is unlikely that EDI over the internet will totally replace VANS. Value added networks provide technical support, security and audit functions which may not be readily available to a novice EDI user with an internet connection.

It is possible to read current publications which state that financial transactions over the Internet will *not* be possible due to lack of security over the Internet. Security remains the primary concern when utilizing the Internet however EDI financial transactions are in pilot, and are proving successful.

A joint pilot project undertaken by BankAmerica Corporation and the Lawrence Livermore National Laboratory (LLNI) commenced all electronic financial EDI over the Internet in August 1995. The goal of the pilot will be to demonstrate how internet EDI can be accomplished providing real data in a timely, reliable and secure manner. LLNI is operated by the University of California, for the Department of Energy and has been studying electronic commerce, computer security and internet related issues for several years.

During the pilot, EDI messages will be exchanged using the Internet standard, Simple Mail Transport Protocol (SMTP). SMTP provides a fast and inexpensive delivery method for EDI messages. The Messages will be secured using two standards - Privacy Enhanced Mail (PEM) and Multipurpose Internet Mail Extension (MIME). PEM ensures the authenticity of messages through digital signatures and security of confidentiality through data encryption. MIME describes how non-printable data (binary) is sent over the internet. With MIME , encrypted digitally signed electronic payment messages secured with PEM can be sent in one electronic mailing. [9] This project is one of the first large trials which may dictate the future of EDI.

Legal and Audit Issues

One of the minor limiting factors to rapid EDI growth has been legal and audit concerns. EDI audit issues are relative to those audit issues for all information technology. The objective of EDI auditability is "the maintenance of adequate audit trails with regard to transaction sets, and the ability to pre-verify and adequately monitor electronic authorization and integrity controls of EDI transactions."[10] DISA has recently published the first Model EDI Audit guide which will set a standard for consistent auditing procedure when implementing EDI.[11]

EDI specific agreements have developed to accommodate the electronic trading partner relationship. There are several issues between trading partners which may arise through the use of EDI. Agreement must be met with regard to the Standards Version/Release to be used. Periodic updates of these standards and time periods for conversion must be agreed to . Agreement must be reached on Transaction sets and implementation conventions to be used. A Model Electronic Data Interchange Trading Partner Agreement and Commentary has been prepared by the Electronic Messaging Services Task Force of the American Bar Association.[12]

Negotiation between trading partners to agree on terms and conditions of exchanges are often arduous and time consuming. Current interchange negotiations are usually determined by the partner wielding the most power. Agreement to conditions imposed by trading partners should not occur before cost-benefit examinations are undertaken.

As EDI processes evolve it is hoped that extensive legal documentation will not be required to conduct interchanges. An agreement over the Internet with a trading partner in the future may conceivably require email address exchange, agreement on encryption and digital signature protocols, email acknowledgment

or non-repudiation process, public key exchange, and agreement on the format of the message. It will be desirous in an internet environment to be quickly able to locate customers, establish trading conventions and commence trade. Electronic commerce must become easier to initiate than paper based commerce.

Canadian Public Sector EDI

In October of 1994, the U.S. government released its report, *Streamlining Procurement Through Electronic Commerce.* [13] This document was in response to the U.S. President's 1993 directive to commence a government wide electronic commerce acquisition system. The Federal Electronic Commerce Acquisition Team's (ECAT) document is comprehensive and wide reaching. As a result of this report, Electronic Commerce Resource Centers (ECRC) have been established in several U.S. cities. The ECRC's target small to medium enterprises and assist them in acquiring the technology to participate in the federal acquisition process. The resulting benefit to the U.S. economy will be an increasingly technologically abled marketplace across all sectors.

The Canadian government does not have a comprehensive national electronic commerce initiative in place although it is anticipated that federal acquisition via electronic data interchange will be a requirement in the foreseeable future. There are several electronic initiatives within the Canadian government of specific interest to the transportation industry.

Revenue Canada

In his position as Revenue Minister, Otto Jelinek launched *Customs 2000 - A Blueprint for the future.* This document determined the infrastructure to electronically accommodate a free trade environment.

An early initiative of this Revenue Canada program was ***CADEX*** - *Customs Automated Exchange.* CADEX allows a direct connection to Canada customs. Importers barcode commercial goods invoices and these are scanned by Customs at the port of entry. Through CADEX the importer is invoiced for this transaction on a periodic basis. CADEX enables users to eliminate brokerage fees and reduces errors in tariff classification.

Revenue Canada's pilot customs program, ***ACROSS*** - *Accelerated Commercial Release Operations Support System* - uses the exchange of electronic information to increase border efficiency. ACROSS enables an importer to transmit purchase order information and carrier cargo control numbers to customs where release decisions are made. Phase I of the program has been in test at four sites in

Southern Ontario -- Pearson International Airport, Fort Erie, Hamilton and Niagara Falls. The pilot has successfully concluded that customs officers may efficiently utilize online data to effect a customs release. ACROSS seeks to eliminate the need for clients to present paper documents to Revenue Canada reducing handling and related costs. Nation wide rollout to automated Customs offices is anticipated to commence March 1, 1996.

Revenue Canada has several other programs under consideration and in pilot, including customs line release system, GST Efile and remittance, and EFT and direct deposits.

EDIPORT Atlantic

EDIPORT Atlantic Inc. is perhaps the most dynamic example of effective strategic partnering in the Canadian transportation industry. EDIPORT Atlantic Inc. was initiated by the stakeholders in the Port of Halifax in 1989 to facilitate across the board paperless import and export of goods.

The partnership venture has included in excess of 25 firms including major shipping lines, trucking firms, railways, freight forwarders, container terminals, sufferance warehouses, Canada customs, Agriculture Canada and the Halifax Port Corporation.

This venture has enabled Port of Halifax to become one of the most electronically efficient ports in North America. The technology designed by Perwill EDI, Inc. and EDIPORT Atlantic, Inc. has been packaged as *TransportLink*, an EDI software product designed for the transportation industry that lets users accept, process and transmit all documents necessary for the movement of freight.[14]

Strategic Alliances

Electronic commerce is primarily the exchange of information between two or several trading partners. Although many early EDI developments were in reaction to compliance letters from demanding suppliers/customers there is a move towards proactive partnering. Effective ECR and VMI programs are completely reliant on successful partnering. No company can undertake these programs in isolation.

While speaking at the Canadian Transportation Research Forum, CTRF in Halifax in October 1995, the General Manager of Overseas Markets - CN Intermodal discussed the alliance CN had undertaken with J.B. Hunt. He briefly

identified the changes in attitude, process and commitment required to undertake such an alliance. He also stated that the lessons learned were exceedingly simple - "that partners must enter as equals and they must benefit equally from the association."[15]

There is no question that there are numerous examples and case studies of Canadian EDI success stories. There is also no question that Canada lags behind its U.S. counterparts in EDI development and usage. There are several reasons for this which are beyond the scope of this discussion. One possible reason which bears comment is the inability for the Canadian transportation industry at large to unite in its adoption of EDI. It is relatively easy to acquire information regarding U.S. EDI enabled truckers. It is not possible to easily acquire this information from the Canadian trucking industry. The EDI Council of Canada has attempted on several occasions to establish EDI User Groups within the trucking industry. These initiatives have not been successful.

The concept of user groups are wide spread in the United States. User groups can be found within industries, within geographical boundaries, and moreover amongst disparate interest groups. U.S. EDI user groups are using the internet to communicate, interactive BBS's to conference, and are holding education meetings on topics of interest to their users. A grass roots revolution is occurring which seeks, to inform, educate and empower its users.

CONCLUSION

The cost benefit of EDI has not been discussed. The benefit of a proactive well designed and implemented strategic electronic commerce program may well be to guarantee corporate survival. If you are conducting business supporting paper based practices take note of the Canadian brokers experience when CADEX emerged on the scene. The Canadian Society of Customs Brokers estimates that the number of Canadian brokers has dwindled to 275 from 500. "Five years ago, Customs Brokers cleared 95 per cent of all Canadian shipments. Today, only about 70 percent of all Canadian shippers are cleared through brokers."[16]

If you are not conducting business electronically, quite simply, you will be. Assess the electronic initiatives undertaken by your customers and competitors. Familiarize yourself with the global electronic commerce community. Determine the processes you can change to efficiently conduct business electronically with your partners. If you are conducting business electronically, review your system. Determine if your EDI platform has the features and functionality to enable you to undertake strategic partnering initiatives.

Electronic commerce is not a technology. It is a group of technological tools and processes. The impetus and responsibility for electronic commerce rests with senior management not merely the information management team. Ensure senior management commitment. Reengineering and electronic commerce are initiatives that must have support from the top down. Electronic Data Interchange and electronic commerce are business issues. The evolution of standards and processes will not be dictated by legislation they will be determined by the user.

REFERENCES

[1] EDI Capable Carriers, Technology in Trucking , Management Systems Council, American Trucking Association, 1995.

[2] EDI, A Guide to EDI Translation Software, Logistics Management Institute, 1994.

[3] Data Interchange Standards Association, Inc., 1995.

[4] ASC X12W/95-137 ASC X12 Plan for Technical Migration to and Administrative Alignment with UN/EDIFACT Data Interchange Standards Association, Inc., 1995.

[5]The Case for Next Generation EDIFACT, K. Steel, The University of Melbourne, 1995.

[6] ISO/IECJoint Technical committee (JTC1/SC30), 1995.

[7] The Users Guide to the BSR, Intelligent Commercial and Research Information Systems (ICARIS Project), K. Steel, University of Melbourne, 1996.

[8]EDI Meets the Internet, IETF-EDI Working Group, Internet-Draft, W. Houser, C. Hage, 1995.

[9] BankAmerica Corporation, 1995

[10] EDI for Managers and Auditors, S. Chan et al, EDI Council of Canada, 1991., p. 69.

[11] The Audit Guide, Legal and Business Controls Work Group of ASCX12, DISA, 1995.

[12] Model Electronic Data Interchange Trading Partner Agreement and Commentary, Electronic Messaging Services Task Force, American Bar Association, 1990

[13] Streamlining Procurement Through Electronic Commerce, Final Report, Federal Electronic Commerce Acquisition Team, 1994

[14] Product Announcement, Transportlink., Phillips Business Information, Inc. 1994.

[15] Strategic Alliances: Integrating Transportation Capabilities, J.R. Powell, CTRF - Halifax, Nova Scotia, 1995.

[16] Michael Chudleigh quoting Carol West president of Canadian Society of Customs Brokers in CMA-the Management Accounting Magazine, June, 1995.

INFORMATION TECHNOLOGY AND TRANSFORMATION IN THE GRAIN INDUSTRY: THE IMPACT OF LOGISTICAL AND MARKET INTELLIGENCE ON INDUSTRIAL STRUCTURE

by Greg Mason[1]

This paper examines the role of information costs in structuring the grain marketing and logistics sector through vertical and horizontal integration. The research is based on work completed for Industry Canada,[2] however the author is solely responsible for the views expressed herein.

1.0 ORIGINS AND CURRENT TRENDS

Dominated since the turn of the century by wheat destined for export, the Canadian grain market is now experiencing major challenges and changes including:

- The rise of alternative suppliers to Canada, foreign subsidy programs, and erosion of traditional high volume consumers;
- Increased demand from market niches and greater segmentation of product;
- Weakening prices for wheat; and,
- Elimination of the Crow Rate and the Grain Transportation Agency.

The rise of alternate grain supplies and the weakening of export markets have eroded the market power enjoyed by Canadian wheat producers in the seventies. Lower prices have encouraged increased diversification; the emergence of canola as an important cash crop is an example of this shift. Economies of scale and scope are consolidating primary production into fewer and larger units with the consequent threat to the family farm.

Many believe these structural shifts in agriculture and recent policy shifts such as the elimination of the Crow Rate are the primary determinants of change in the grain industry. This paper pursues another perspective. Information and information technologies are increasingly important in determining marketing, the institutions,

---

1 Prairie Research Associates Inc. and Department of Economics, University of Manitoba

2 The research assistance of Clinton Skibitzky is gratefully acknowledged. Also, the comments of Dick Dawson, Clay Gilson, Gary Hosea, Stephen Leahey, Bob Lynch, Tam McEwen, and Emilee Pedruchny, were important in framing this paper, but none are responsible for any errors that remain.

and the relative power among grain industry participants. The revolutions sweeping industries as diverse as retailing and broadcasting will also have important impacts in the grain industry. The basic argument of this paper is that changes in information processing will motivate significant vertical integration and realignment transforming institutions and market structure.

2.0 THE ROLE OF INFORMATION TECHNOLOGY IN THE EVOLUTION OF MARKETS AND INDUSTRY

Information -- more specifically its cost -- is a determinant of market structures. Much of the innovation in financial markets, such as derivatives, is little more than new ways to package risk and deal with current ignorance and uncertainty about prices. Measures of risk and uncertainty are merely quantitative indicators about the lack of information. The fact that information gathering and processing is costly means that certain conventions, institutions and organizations emerge to save in these costs. Kenneth Arrow has also defined the "limits of organization" as the boundary where the costs of information gathering and processing within the organization exceed the costs of accessing information outside the group. The private company (firm), institutions such as the Canadian Wheat Board, and regulations such as trade agreements are just three possible responses to costly information. Contracts and insurance are examples of other ways to reduce the costs of poor information.

2.1 Information, Market Costs and the Formation of Firms

Markets are never free. Involved in every market exchange are a variety of *transaction costs* classed into:

- Searching for the best price/quality, suppliers, buyers, etc.;
- Negotiating costs; and,
- Enforcement costs needed to ensure that the promised goods/services are delivered as agreed.

Many forces explain why we organize economic units such as the firm. One of the most persuasive theories relates to how the costs of using a market compels the creation of a firm.[3] The firm defines the feasible limits of coordinating transaction costs within a single entity. From this perspective, a firm is an organization "glued" together by a structure of contracts and conventions. Shares, employment agreements, and internal policies are examples of methods used to coordinate the production and delivery of goods and services.

---

3 Coase, R.H., "The nature of the firm," *Economica,* No. 4 (1937)

In general, the costs of using the market are the costs of obtaining and analysing information. Therefore, according to this perspective, a firm exists to reduce the costs of information transfer. It can contract employees every day or have longer term relationships that reduce the costs to the firm of daily hiring. The process of incorporating new activities within the firm is the result of a conscious decision to minimize the costs of information and avoid using costly market mechanisms.[4]

2.2 Firms and Industries

Here, we speak of industry in two ways. First, an industry can be a collection of firms producing similar goods and services. Therefore, the grain *industry* can be viewed as a collection of farmers, grain marketing companies, transportation and storage activities along with their attendant regulations. Second, we also see an industry as comprising upstream inputs and downstream outputs. From this perspective the grain industry can be seen as a continuum from producer, through grain handler, transporter, marketer, and final consumer.

The term "value chain" illustrates the process whereby a firm captures the *value added* from initial production through to delivery to the final consumer. A firm captures additional value added by moving vertically along the value chain to incorporate additional upstream or down-stream functions. It may also move horizontally to include other lines of activity within its management and organizational structure. The determination of whether to move vertically or horizontally is made at the margin. Each step is weighed in terms of the costs of additional complexity versus net revenues obtained from the additional activities.

The ability to organize and structure information determines management's ability to control the more complex structures. The process of vertical and horizontal integration is usually seen as being controlled by economies of scale and scope. Scale economies refer to the efficiencies which accrue from being larger. Scope

---

[4] A contract is a specific example of an information cost reduction system. The contract reduces uncertainty about future supplies and prices and eliminates the need to constantly collect additional information about market opportunities. Futures contracts allocate supplies for an increasing share of output in agriculture and allow market participants to spread risks from price movements through time.

Insurance compensates for the costs of imperfect foresight (lack of information). The insurance market is actually a process of allocating risk over time. Neither the purchaser nor supplier of insurance can predict catastrophes. The insurer makes predictions based on pooled information and calculates probabilities of the event occurring. The purchaser rarely makes this calculation and exchanges small, regular payments to the insurer for a large compensatory payment from the insurer if a catastrophe occurs. Central to this practice is information (or more correctly its lack). No one knows when an event will occur. Insurance is a service arising to manage the consequences of insufficient information.

economies result from using management and organizational resources to cover a wider range of activity.

A farm which adds a quarter section to production is seeking to exploit scale economies. The fixed capital is spread over additional production and unit costs fall. The limit of expansion is reached by input constraints. At some point additional equipment is needed and unit costs jump.

A farmer who diversifies and includes hogs and livestock in addition to grain is seeking scope economies by spreading management and organizational resources. The ability to manage a diversified operation requires the ability to organize information. Diversification need not be into other crops or livestock. A producer who adds custom trucking for other producers must developed additional logistical skills. At the core of economics of scope, and therefore basic to integrating along the value chain, is the mastery of information.

2.3 How Institutions and Organizations Form to Minimize Costs

A central proposition in economics is that an organization or firm "congeals" to minimize market transaction costs resulting from the production, distribution and marketing of a good or service. As we have argued, these are essentially information costs. Therefore, a flow of information is associated with the exchange of any good or service. New information technologies alter the flow of market data and change the cost structures involved in a market. This creates an incentive for new institutions, firms, regulations and conventions to emerge. It may also alter the economic rationale for existing institutions and firms. Two examples illustrate this process.

> *Example 1 - Retailing.* The instantaneous sharing of bar-code information between retailer and supplier eliminates the need for inventory. Using just-in-time techniques, suppliers can restock retailer shelves with precisely timed deliveries reflecting current sales. The retailer evolves to become a "landlord" and rents shelf space to suppliers on a competitive bid basis. A satellite transfers bar-code data instantaneously from retailer to supplier. New firms emerge to specialize in the installation of these systems and in transferring these data among retailers and manufacturers. Warehousing and wholesaling become less important and may even disappear. The "middleman or jobber" is eliminated.
>
> *Example 2 - Airline Scheduling.* Airlines share scheduling codes allowing one firm to route its passengers to destinations served by other companies. This is one of the traditional functions of a travel agent who had access to all airline codes. This interconnectedness can include companies that are otherwise competitors. As this system emerges, a local airline will be able

to ticket and provide boarding passes for all airlines along a route. Clearly, this eliminates the brokerage function for travel agents.[5]

In these two examples, information technologies, and new views on information sharing have revised market organization. Sometimes a new firm arises to exploit the opportunity such as specialists in transferring bar code information between retailer and supplier. The costs saved in the elimination of inventory exceed the costs of paying the specialist firm and the capital cost of the equipment.

In other cases existing firms vertically integrate to capture the value added. Sharing airline codes shows this vertical integration forward from the production of the service to its marketing. Whether the integration is forward, backward or results in a new firm depends on the cost structures of the firm. It is entirely possible that within an industry different firms may pursue alternative strategies.

Vertical integration occurs when an existing firm expands to include the production of inputs or further finishing and marketing/logistical activities previously done by separate economic entities. Finally, integration can exist along a spectrum from complete inclusion to a system of alliances and semi-formal contractual relationships. The bar code sharing between retailer and manufacturer does not result in the integration of retailer and manufacturer, but increased coordination and the reduction of a middle wholesaling function. Here, vertical alliances create a tighter bond between supplier and retailer; in the process, both types of activity are changed.

Reduced information costs need not produce integration -- the reduced information costs can cause firms to disintegrate. Retailers who connect directly to manufacturers divest themselves of the inventory function. New firms emerge to transfer the bar code information. The value chain need not be engulfed by one of the existing firms. Rather, the industry rearranges into a new pattern of commodity and information flows.

Of course other factors influence the direction and pace of market adjustment. Input costs, economies of scale and scope, and market demand all modify the point at which it makes sense to expand. The purpose of the argument here is to highlight the role of information and then examine the grain industry.

---

5 It is too soon to write off the travel agent. Tailoring a destination package to the needs and requirements of a traveller will remain a main function of the travel agent.

2.4 Information, the Costs of the Market and the Value Chain

An organization grows in response to the incremental value added of new capacity or entirely new activities. If sharing airline codes allows a firm to increase its value added (a measure of economic viability), then we say that it is moving to incorporate more of the value chain within its activity. Incorporating the value chain involves the acquisition of other firms at other points in the input/output chain or simply starting new ventures as part of the parent firm. New firms may also emerge under separate ownership to exploit niche positions in the value chain. Again, changed competitive circumstances may be induced with an integration or disintegration of the value chain.

Information in an industrial setting consists of three main categories:

- Market data (prices and quantities demanded/offered);
- Production services (input testing and sourcing, market research, marketing, human resources, capital planning, inventory control etc.); and,
- Logistical data (outgoing freight, distribution, etc.)

Each of these areas is experiencing rapid technological evolution. Market data is becoming increasingly available on a 24 hour, on-line basis. Increased specialization and growth of niche firms is seen in production services. Finally, logistical data is more widely available. Global positioning systems (GPS) will allow a producer or shipper to know where every kernel of grain is stored, from farm bin, to elevator, to truck in transit, to train and ship. That information will create valued added in the same way that transmitting bar codes has between retailer and shipper.

Imagine a grain farmer fifty years ago transporting the harvest to elevator. The options for the sophisticated then consisted of making a few phone calls to elevators in the area to determine the best price and then transporting. Most farmers just delivered to the same elevator because of distance or habit. Now prices can be checked by satellite and the producer can engage in forward contracts and store the output to maximize the return. Bid and ask prices from various buyers are easily checked on-line and the producer will direct the custom hauler to the chosen buyer.

3.0 INFORMATION, LOGISTICS AND GRAIN HANDLING

Figure 1 shows a view of the grain industry as it enters the nineties. The heavy black lines show actual flows of grain. Institutions that "own" the grain are in bold.[6] The doubled lines show information flows, consisting of:

- Market data (grain prices and quantities demanded/offered/sold);
- Production services (soil testing, planning, advice, research, etc.); and,
- Logistical data (truck/rail car availability, inventory, turn-around, elevator storage capacity, etc.).

The institutions are shown in dashed lines. The Canadian Wheat Board (CWB), Grain Transportation Agency (GTA), and the Canadian Grain Commission (CGC) never take possession of grain but perform vital functions and therefore have a dominant market presence.

The CWB, GTA, and CGC, perform three basic functions:

- Marketing for two principal grains;
- Quality control and market regulation; and,
- Rail car allocation.

With the gradual elimination of the Grain Transportation Act (over the next five years), rail car allocation will evolve to a market driven process.[7] Railroads and trucking companies successfully organize the logistics for the vast array of products emerging from North American industry. There is no reason why this should not work successfully for grain.

---

6 Note that wheat and barley destined for export are not owned by the private grain companies. They are owned by farmers, on whose behalf the CWB acts as a marketing and distribution agent.

7 The federal budget of February 27, 1995 announced that rail cars will be allocated by an industry group consisting of representatives from railways, grain companies, Canadian Wheat Board and producers. Further, the fleet of 13,000 hopper cars will be sold to the highest, most likely the railways.

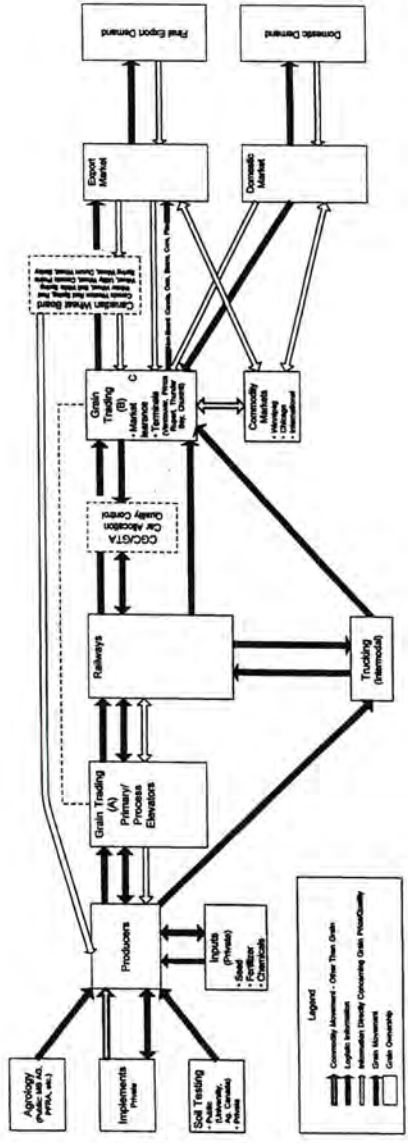


FIGURE 1
Current Market Structure of Grain Industry with Information Flows

These functions support three databases:

- The **Grain Inventory Accounting System (GIAS)** is derived from the CGC's role in grain inspection and rail car allocation. This system provides detail on the disposition of inventories in the large inland and export terminals.

- The **Cars in Transit Inventory (CITI)** database uses information provided to the Canadian Grains Commission by the two railways. This system captures information electronically on grain car position and disposition between primary terminal elevators and Vancouver (with Thunder Bay in process). Future developments will use the transponders presently installed on grain cars and await the grain industry providing readers at the terminal points. GPS is also a possibility.

- The data on **permit holders** provide the CWB with information on all "board" grains delivered to the primary elevator system.

There are important gaps in the information system. First, these databases do not provide any information on what is held in the country (primary) elevator system. This is information closely held by the grain companies. Further, the CITI system only provides rail car location on a 24 hour update basis between the inland terminals and the export point (Vancouver). There is no information on grain movements to unlicensed points such as trucking to the US. Finally, relatively poor information exists about the emerging crop. Statistics Canada does survey producers three times a year (March 31, July 31 and December 31) to obtain inventories, but these are sample surveys and also probably contain non-response and other errors.

One can project technology forward and imagine future developments. Satellite imaging may evolve to support detailed identification of different crops and support yield and quality forecasts for small areas, but this has yet to be refined.[8] Grain companies could, through forward contracts, pay their contractors to supply weekly information on crop progress, or through its input services (soil testing, spraying) collect regular information on the emerging crop.

---

[8] Satellite imaging has been able to provide gross measures of yield for over 20 years. In the mid-seventies, the Russian crop failure was known to the US State Department, but not shared. The gyrations in market price clearly illustrate the value of accurate supply forecasting to support futures pricing.

Global positioning will eventually support accurate identification of rail cars and the disposition of product. This is extremely useful in timing the delivery of the grain to the export point to minimize demurrage.

4.0 PRESSURES FOR CHANGE

Several trends are clearly discernable in Prairie agriculture:

- Diversification;
- Contracting input services by farmers;
- Greater involvement in off-farm work for producers; and,
- Product differentiation and increased consumer driven demands.

Commensurate with fewer, larger farms, and low prices for wheat, producers are diversifying where possible. In certain areas diversification is not feasible due to soil and weather. It is likely that producers who survive in these areas must exploit economies of scale to find the low unit costs needed to make a profit with low wheat prices. These producers will typically search for efficiencies in volume, undertake a variety of market activities (e.g., hedging), and attempt to discover savings through hiring custom operations and entering into complex and long-term relationships with suppliers and grain marketing companies. Those producers who cannot earn sufficient income from farming will seek off-farm income, and Statistics Canada data clearly shows an increase in this trend.

Some changes are already well under way. Under its legislation the Canadian Wheat Board has the authority to determine the quotas for various grains (including non-board grains) a producer may deliver to an elevator. This regulation allowed the CWB to ensure sufficient elevation capacity to meet export obligations. It has not exercised this authority for some time as any attempt to do so would meet with a volatile reaction from producers and the industry.

4.1 Vertical Integration, Vertical Disintegration and Strategic Alliances

Vertical integration means the acquisition and control of upstream (inputs) or downstream (output) activities. Backward integration occurs if a grain marketing company undertakes primary agriculture. Many grain marketing companies have minor farming operations but these are usually for obtaining direct information on growing conditions.

Forward integration occurs if a farmer or group of farmers acquires interest in grain marketing and distribution. This would not include purchasing shares in a grain

company. Individual farmers would not do this, but a consortia of producers might be in a position to engage in grain distribution. The formation of the "Pools" in the 1920's is an excellent example of this process. Today, a producer who also offers custom services or trucking is integrating forward.[9]

4.2 Grain Marketing/Trading Integrates Back

A grain company integrates *backward* to incorporate supply and production as in the model presented above. This is the conventional approach and the most advanced trend. Grain and feed companies are providing an increasing array of services and removing the need for the landowner to "walk the land." In effect the landowner becomes a manager with specialists providing major services and supplies. The primary elevator becomes both a collection point for grain and a delivery point for various inputs. This mitigates the need for chemical and feed suppliers to duplicate inventory structures.

It is unlikely that grain or input supply companies will own farms in the foreseeable future. The capital requirements to obtain large areas of land would make this prohibitive. Rather, a process of contracting input services and managing the producer's harvest, marketing, and distribution will produce much the same result with a lower investment.

4.3 Producers Integrate Forward

Producers can also integrate *forward* to include grain marketing and input supply. For example, some farmers grow seed as well as provide input supplies. Marketing clubs are cooperatives providing current market information and allowing elite producers to take futures positions directly without going through a grain trader. As experience is obtained in using commodity markets, increasing numbers of producers may integrate forward. Some groups of elite producers may be in a position to purchase or lease elevators and deal directly with railways to move their products to market. Others will form cooperatives with similar results.

Trucking and custom operations are areas where forward integration by producers is natural and well advanced. Increasing numbers of producers may offer trucking, especially with the opening of the US border and the growing need to access the continental market. In an example of disintegration, some farmers will specialize only in custom operations and move away from production.

---

[9] Vertical disintegration can also occur as a result of changed information technologies. One of the companies presently offering satellite based information for farmers is a spin-off from a large grain handling company.

4.4 The Evolving Nature of Agriculture

Both processes will occur so that a few (perhaps a hundred or so) integrated producers will emerge on the Prairies. The essential point is that production planning and marketing (two information activities) facilitate vertical integration forward and backward.

We show a simplified structure in Figure 2. The integrated producer may contract from specialist firms the complete range of services, such as soil testing, specialized farm labour, trucking, etc. Alternatively, a single firm might do all functions. The conventional theory of transaction costs will determine how much integration occurs. We can expect to see a range of integrated producers from tightly controlled corporations undertaking all functions to loosen alliances where a landowner contracts with grain companies, chemical and seed suppliers and custom farmers to seed, harvest and transport the crop.

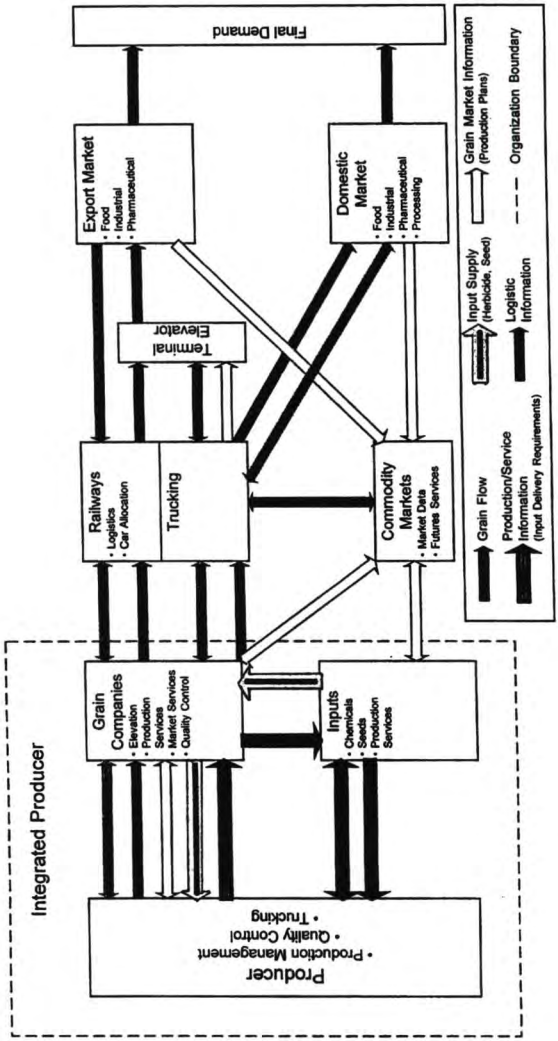


FIGURE 2
Future Configuration of the Grain Industry

Two main forms of producers will emerge over the next decade:

- First, many producers, especially those who run diversified grain/livestock operations will find it advantageous to form longer term contractual relationships with grain marketing companies. These companies will offer a range of integrated services including:

  - marketing and forward price/quantity commitments for accepting outputs;
  - input services such as soil testing, chemical application, seeding, harvesting, etc.;
  - delivery of inputs to the farm and of outputs to the terminal.

  Multi-year contracts for outputs and inputs will become more common. Essentially these producers will evolve toward being land-owner/farm managers and will have increasingly less direct involvement in the daily management of the production. Producers with under 2000 acres may find this arrangement attractive.

- Second, there is an opportunity for coordination to produce large cooperatives of producers who share resources and skills. It is likely that within a cooperative, specialization will evolve as some provide trucking, marketing, and other custom farming services. Cooperatives will still purchase certain services external to the group, and will still deal with grain marketing companies.

5.0 SUMMARY

This paper has considered a number of forces that are operating on the logistics of grain marketing and transportation. The focus has been on how information costs affect the process of vertical integration. Along with the political and business forces shaping the industry, information costs will alter industrial structures. We are likely to see an increasing number of vertically integrated enterprises, where the organization, being a corporation or cooperative will coordinate a broader range of functions. Transportation, grain storage, and marketing are likely to be coordinated by a new breed of integrated "farmer."

UN SERVICE MARITIME ROULIER SUR LE SAINT-LAURENT

par RÉJEAN LECLERC, PH. D.

Le corridor du Saint-Laurent se caractérise par des flux routiers de plus en plus accentués de véhicules lourds aussi bien sur la rive sud que sur la rive nord pour desservir les différents centres urbains des régions, de la Côte Nord, ou de la Gaspésie/Bas Saint-Laurent à partir des pôles centraux que représentent Montréal et Québec.

Compte tenu de la sur-utilisation du réseau routier qui engendre des coûts élevés d'entretien en plus de consommer abondamment de l'énergie, de produire de façon importante des émissions polluantes dans l'environnement et de constituer un facteur négatif sur la sécurité routière, n'y aurait-il pas lieu d'implanter un service maritime roulier sur le Saint-Laurent qui pourrait s'avérer une alternative de transport intermodal intéressante pour les expéditeurs et destinataires de marchandises de même que pour la société en général et une utilisation accrue de la voie fluviale?

Une étude du ministère des Transports du Québec portant sur «Les traverses fluviales et maritimes en aval de l'Ile-aux-Coudres», réalisée en 1981 est particulèrement explicite sur le sujet et concluait à la pertinence d'un service roulier réservé au transport des marchandises sur le Saint-Laurent[1]. L'étude recommandait la mise sur pied d'un service de transport roulier favorisant l'intégration des modes routier et maritime mais aussi ferroviaire.

Les facteurs qui influenceront l'utilisation de ce mode de transport sont l'économie d'énergie, ainsi que la diminution des coûts d'entretien des chaussées de même que celle de l'impact des véhicules lourds impliqués dans les accidents de la circulation[2].

Plus récemment, l'Association des armateurs du Saint-Laurent s'adressait au Govuernement du Québec afin d'effectuer un travail de recherche en ce sens et pour vérifier cette hypothèse[3].

C'est pour mieux évaluer les opportunités et les limites du transport intermodal route-eau que le ministère des Transports du Québec a confié à l'Université du Québec à Rimouski (UQAR) et au Centre de formation et de recherche en transport maritime et intermodal (CFoRT) le mandat de réaliser une Étude de préfaisabilité sur la création d'un service maritime roulier sur le Saint-Laurent. Selon le devis de l'étude, les chercheurs devaient déterminer s'il existe une opportunité de mettre sur pied un service intermodal route-eau qui puisse être

opéré de façon rentable et qui puisse se substituer efficacement aux services entièrement routiers. C'est un résumé de ce travail que nous vous présentons ici.

TABLEAU 1

CIRCULATION ROUTIÈRE LOURDE DANS L'AXE DU SAINT-LAURENT
Nombre de véhicules à 2 et 3 unités, 5, 6 et 7 essieux
pour une période de 12 heures (de 7h00 à 19h00)
d'après observations effectuées en 1992 et 1993

RIVE SUD AUTOROUTE 20 ET ROUTE 132		RIVE NORD AUTOROUTE 40 ET ROUTE 138	
Départ de Montréal vers l'Est	6 284	Départ de Montréal vers l'Est	2 026
Entre Drummondville et Québec	3 092	Entre Trois-Rivières et Québec	1 185
Entre Québec et Rivière-du-Loup	1 644		
Entre Rivière-du-Loup et RImouski	648	Entre Tadoussac et Baie-Comeau	272
Entre Rimouski et Matane	253		
Entre Matane et Ste-Anne-des-Monts	175	Entre Baie-Comeau et Port-Cartier	145
Entre Ste-Anne-des-Monts et Gaspésie	63		

Extrait de CFORT «Étude de préfaisabilité sur la création d'un service maritime roulier sur le Saint-Laurent, Rapport final, Rimouski avril 1995, Tableau 1.1 p. 6

Estimation CFORT/UQAR basée sur une évaluation du ration nuit/jour du trafic de véhicules lourds. Ce ratio suppose que le trafic est réduit de moitié la nuit. Il a été évalué par le ministère des Transports du Québec à partir de quatre sites sur la route 132 et les autoroutes 20 et 40.

Source : Compilation faite par CFORT/UQAR à partir des comptages de camions 1993 effectués par le ministère des Transports; régions : 1. Région du Bas-Saint-Laurent/Gaspésie/Iles-de-la-Madeleine/Région du Saguenay/Lac St-Jean/Côte Nord et Région du Québec; 2. Région de l'Estrie/Mauricie/Bois Francs et

Montérégie; Société de l'assurance automobile du Québec, vice-présidence aux opérations régionales, Service du contrôle routier, Division planification et coordination, mai 1994.

1. LE TRAFIC

On observe un trafic routier plutôt modéré entre Montréal et la Côte-Nord (85 semi-remorques par jour dans les deux directions) et moyennement élevé sur la rive sud (220 semi-remorques par jour sans les Maritimes et 607 semi-remorques incluant les Maritimes). On remarque toutefois que le marché de la Côte-Nord est plus facile à capter que celui de la rive sud. En effet, il est déjà pénalisé par l'absence d'autoroute, par des conditions routières difficiles et par le nécessaire passage de la traverse fluviale Tadoussac-Baie-Sainte-Catherine. On y compte aussi un petit nombre de communautés (environ 30) groupées autour de Baie-Comeau, Port-Cartier et Sept-Iles et accessibles, via la route 138, par l'un ou l'autre des ports retenus dans l'étude (Baie-Comeau et Sept-Iles). Finalement, il s'agit d'une région en plein développement économique où le trafic de semi-remorques est appelé à croître considérablement.

Par ailleurs, le volume plus important sur la rive sud ne doit pas nous faire perdre de vue les difficultés qu'il nous faudra surmonter pour pénétrer ce marché. Tout d'abord, contrairement à la Côte Nord, la région Bas-St-Laurent / Gaspésie compte un grand nombre de communautés (environ 150) éparpillées entre Rivière-du-Loup et Gaspé et rendues accessibles par une ramification de routes principales et secondaires. Cette situation est à l'avantage du transport routier, beaucoup plus flexible que le transport roulier.

De plus, chaque port de la rive sud envisagé dans l'étude ne bénéficie pas du même potentiel de marché. Il se situerait à 87 semi-remorques par jour dans les deux directions pour le port de Matane contre 220 semi-remorques pour Rimouski et 607 semi-remorques (incluant les Maritimes) pour Cacouna. Cette répartition plaide en faveur de Cacouna qui pourrait non seulement desservir le Bas-Saint-Laurent / Gaspésie mais aussi l'important marché des provinces Maritimes. Mais il faudra alors concurrencer l'autoroute 20 qui procure au transport routier la rapidité et la possibilité du train routier. Sans oublier que Montréal/Cacouna représente une distance maritime très courte qui ne permet pas de profiter pleinement des économies du transport maritime. À cet égard, Matane serait le choix privilégié puisqu'il est le plus éloigné de Montréal, mais il est aussi le plus éloigné des marchés du Bas Saint-Laurent et des Maritimes. Par ailleurs, pour desservir l'ensemble de la Gaspésie et du Bas Saint-Laurent (donc en excluant les Maritimes), Rimouski bénéficie d'une position géographique avantageuse. Il est toutefois pénalisé par son faible tirant d'eau et la configuration de ses installations qui limite la taille du navire qu'il peut recevoir.

2. LA LOGISTIQUE DES EXPÉDITIONS

Dans le cadre de cette étude, le CFoRT a effectué une enquête par entrevues de groupes et entrevues personnalisées auprès d'expéditeurs et de transporteurs routiers et maritimes. L'objectif était de tracer un portrait des circuits logistiques empruntés par les expéditions entre le centre du Québec et les régions considérées. L'on voulait aussi établir les contraintes que devra surmonter le service roulier. Trente-et-un répondants de Montréal, de Québec, de la Côte-Nord et du Bas Saint-laurent ont participé à cette enquête.

Cette enquête a révélé les différents segments qui composaient les marchés de la Côte Nord et de l'Est du Québec. Ces segments répondent à des logiques d'expédition qui leur sont propres et qui ne s'accommodent pas toutes aussi bien du service roulier. Dans l'ensemble, les expéditeurs accordent énormément d'importance à la rapidité et à la ponctualité du transport routier : la norme étant 24 heures de livraison pratiquement partout au Québec. La possibilité d'utiliser un service roulier offrant un délai de livraison de 36 heures n'est envisageable qu'en autant qu'il soit accompagné d'une diminution de coût d'au moins 15% et qu'il offre les mêmes fiabilité et ponctualité que le réseau routier.

De leur côté, les transporteurs routiers ne verraient d'attrait dans le service roulier que dans la mesure où il leur offre une économie de coût d'opération suffisamment importante pour mieux concurrencer les voituriers indépendants et les transporteurs américains. Pour les transporteurs maritimes, la courte distance impliquée, le faible volume de trafic, l'importance des frais portuaires et la forte concurrence de la route sont autant de facteurs qui compromettent la rentabilité du service.

Toutefois, les répondants ont conclu que l'élimination des pratiques non-réglementaires chez les transporteurs routiers et l'imposition d'une taxe spéciale couvrant la dégradation des routes auraient probablement pour effet d'augmenter les coûts d'opération du transport routier et d'ainsi rendre le transport roulier plus concurrentiel.

Le transporteur routier utilisant le service recherchera une réduction de ses risques financiers par une diminution du nombre de ses tracteurs et de ses chauffeurs et une baisse du taux de roulement des remorques, dont la durée de vie se sera accrue. Il visera aussi une amélioration de sa compétitivité vis-à-vis des transporteurs indépendants et des transporteurs américains. Pour sa part, le transporteur maritime y verra une novuelle source de profits.

Tous s'entendent aussi pour que le service roulier soit offert sans coût additionnel à la société québécoise en général. Il faut donc exclure les subventions aux opérations. Tout au plus, le gouvernement pourrait procéder à la mise en place d'installations portuaires (Ro-Ro et aires de stationnement) là où elles sont inadéquates.

3. ANALYSE FINANCIÈRE, ÉCONOMIQUE ET DE SENSIBILITÉ

La taille relativement restreinte des marchés, particulièrement sur la Côte Nord et dans la Gaspésie, a amené à considérer, comme scénario de référence, l'utilisation d'un navire d'une capacité de 50 semi-remorques. De plus, les exigences des expéditeurs en termes de rapidité (36 heures) et de régularité de service expliquent pourquoi n'a pas été retenu un trajet en triangle impliquant Montréal et successivement un port de la Côte Nord et de la rive sud. Il a été plutôt privilégié deux services distincts pour chaque rive. La vitesse du scénario de référence est 17 noeuds. La fréquence du service est de 3 voyages par semaine pour les routes reliant Montréal à Cacouna, Rimouski, Matane et Baie-Comeau alors qu'elle est de 2 voyages par semaine entre Montréal et Sept-Iles.

À partir de ces paramètres, ont été établis les coûts du transport roulier et du transport routier. Les coûts du roulier tiennent aussi compte des coûts résiduels que devraient continuer à supporter les transporteurs routiers participant au service.

De cette première analyse, il résulte que seule la route Montréal/Sept-Iles obtenait un coût inférieur au camionnage par semi-remorque soit 1,08 $ contre 1,14 $. Cela ne représente toutefois qu'une économie de 5%, ce qui est encore loin du 15% recherché.

L'analyse a été poursuivie afin de déterminer si la réduction des coûts sociétaux qu'entraînerait le transfert d'une partie du trafic routier vers le roulier pouvait contribuer à rendre ce dernier plus compétitif. Les coûts externes du trafic routier ont été calculés. Puis a été estimée la fraction de ces coûts qui pourraient être éliminés par le transfert vers le roulier.

Le tableau 2 donne la réduction des coûts externes suite à l'introduction du service roulier pour les scénarios de référence. On peut y lire que pour le service Montréal/Baie-Comeau, l'économie annuelle de 350 587 $ provient d'une diminution des accidents de la route. Soulignons qu'il s'agit d'estimations conservatrices puisqu'elles ne tiennent pas compte du coût des infrastructures et de l'usure des ouvrages d'art (ponts, bretelles...) et n'incluent pas l'impact du transport routier sur le tourisme et sur les conditions de vie des résidents. La réduction des coûts externes a fait passer le coût réel du roulier à un niveau 10% inférieur à celui du routier pour la route Montréal/Sept-Iles et 3% inférieur pour la route Montréal/Baie-Comeau. Aucune des autres routes n'obtenait un coût inférieur au routier même en tenant compte des coûts externes. L'objectif du 15% n'était donc toujours pas atteint.

TABLEAU 2

RÉDUCTION ANNUELLE DES COÛTS EXTERNES
SUITE À L'INTRODUCTION
DU SERVICE ROULIER POUR LES SCÉNARIOS DE RÉFÉRENCE
(Navire de 50 semi-remorques)

Scénarios de référence		Réduction des coûts de dégradation de la route $	Réduction du coût des accidents routiers $	Réduction totale annuelle $
Routes	Fréquence du service par semaine			
Montréal/Cacouna	3 voyages	104 000	27 306	131 306
Montréal/Rimouski	3 voyages	169 000	47 412	216 412
Montréal/Matane	3 voyages	202 000	108 040	310 040
Montréal/Baie-Comeau	3 voyages	130 000	220 587	350 587
Montréal/Sept-Iles	2 voyages	150 000	323 023	473 023

Extrait de CFORT «Étude de préfaisabilité sur la création d'un service maritime roulier sur le Saint-Laurent, Rapport synthèse, Rimouski avril 1995, p. 21.

La capacité des navires étudiés pour offrir un service maritime roulier sur le Saint-Laurent varie de 50 à 300 semi-remorques. La vitesse du navire oscille entre 15 et 20 noeuds et le taux d'occupation varie de 80% à 100%. La route desservice et la fréquence des services par semaine sont les suivantes.

NOMBRE DE VOYAGES PAR SEMAINE SELON LES PORTS RETENUS

PORTS	CACOUNA	RIMOUSKI	MATANE	BAIE-COMEAU	SEPT-ILES
Montréal	3 et 4	3 et 4	3 et 4	3 et 4	2 et 3
Sorel	3, 4 et 5	3 et 4	3 et 4	3 et 4	2 et 3

À l'aide de ces paramètres, 1512 scénarios ont été construits portant sur les caractéristiques du marché jusqu'à un maximum de 100% et respectant les délais de livraison (36 heures maximum). 212 scénarios potentiels ont été identifiés. Parmi ces scénarios, nous en retrouvons 80 qui obtiennent un coût au moins 15%

inférieur à celui de la route selon qu'on déduit les coûts externes ou non et indépendamment du taux d'occupation du navire.

Si on ne retient que les scénarios supposant un navire à 80% de capacité nous obtenons les 35 scénarios.

3.1 Marché de la Côte Nord : distance suffisante mais taille réduite du marché

Le service Sorel/Sept-Iles, navire de 100 semi-remorques à 2 voyages par semaine, obtient un coût 20% inférieur à celui du routier. Si on ajoute la réduction pour coûts externes, l'économie est de 25%. Dans le cas du navire de 125 semi-remorques à 17 noeuds, l'économie est de 25% (29% en déduisant les coûts externes).

Par ailleurs, le service vers Sept-Iles requiert une couverture de marché plus faible que celui vers Baie-Comeau. Vers Sept-Iles elle atteint 71% pour le navire de 100 semi-remorques à 80% de sa capacité. C'est-à-dire, qu'il faut 71% du trafic Montréal (Sorel)/Sept-Iles pour alimenter un navire de 100 semi-remorques à 80% de sa capacité (80 semi-remorques). Pour le navire de 125 semi-remorques, la couverture requise est de 89%. Vers Baie-Comeau la couverture nécessaire atteint 100% du marché.

Ajoutons que, parmi les scénarios considérés ici, celui dont la couverture de marché est la plus basse (71%) s'accompagne aussi d'une économie de 20% par rapport au transport routier (25% si on inclut les coûts externes), ce qui contribuera sûrement à obtenir la part de marché requise. Il s'agit de Sorel/Sept-Iles,navire de 100 semi-remorques. Bref, la capacité du roulier de concurrencer efficacement le transport routier est démontrée. Toutefois, la taille limitée du marché constituera un défi important que le service devra surmonter.

3.2 Rive sud : forte concurrence du camionnage et marché abondant

Sur la rive sud, aucun scénario ne présente un coût inférieur à celui du transport routier. Cela ne découle pas tellement d'une mauvaise performance du roulier mais plutôt de la plus grande compétitivité du routier qui bénéficie de l'autoroute 20 jusqu'à Rivière-du-Loup et de conditions routières plus favorables.

Pour profiter d'économies d'échelle, des navires de forte capacité doivent être considérés. Bien que le marché de Cacouna puisse soutenir les grands navires (200 et 300 semi-remorques), la courte distance maritime qu'il implique, des faibles coûts externes, et des coûts du transport routier très bas le rendent non-concurrentiel. Il y a tout de même espoir de solutionner ce problème puisque l'utilisation d'un navire de 200 semi-remorques à une vitesse de 17 noeuds, un taux d'utilisation de 80% et une fréquence de service de 5 voyages par semaine entre Sorel et Cacouna

génère un coût de 1,19 $ par remorque par kilomètre, 1,18$ en déduisant les coûts externes, contre 0,99 $ pour le transport routier. Par ailleurs la consommation de carburant du roulier est de 0,29 litre par remorque par kilomètre par rapport 0,41 litre pour le routier. Finalement, la couverture requise pour alimenter le navire n'est que de 38%, ce qui apparaîtrait réaliste si on pouvait abaisser le coût du roulier.

Sur la rive sud, seuls des scénarios reliant Rimouski réussissent è égaler les coûts du transport routier. C'est notamment le cas du scénario Sorel/Rimouski, 3 voyages par semaine, avec un navire de 300 semi-remorques à un taux d'occupation de 80%, à une vitesse de 15 noeuds. Le coût par remorque par kilomètre est de 1,01 $ (0,98 $ lorsqu'on déduit les coûts externes) contre 1,05 $ pour le routier, et le délai de livraison de 31 heures. La consommation de carburant n'est que de 0,20 litre par remorque par kilomètre contre 0,42 litre pour le routier. Par ailleurs, la limite de profondeur et les configurations du port de Rimouski interdisent l'utilisation d'un navire de cette taille.

Matane obtient une performance supérieure à Cacouna en termes de coût du roulier bien qu'elle soit inférieure à celle de Rimouski. Ainsi, la route Sorel/Matane, 3 voyages par semaine, navire de 100 semi-remorques, à 80% de capacité, à 16 neouds, obtient un coût de 1,05 $ par remorque par kilomètre contre 1,03 $ pour la route. Lorsqu'on tient compte des coûts externes, le scénario génère un coût inférieur à la route soit 1,02 $. Le délai de livraison est de 28,7 heures et la disponibilité du navire de 31,9 heures par semaine. La consommation de carburant est légèrement supérieure è celle de la route, mais 0,44 litre par remorque par kilomètre par rapport à 0,42 litre pour le routier. Il faudrait toutefois s'assurer une couverture de marché de 88% pour alimenter le navire.

Par ailleurs, sans exclure Cacouna et Matane, il apparaît que Rimouski est le mieux positionné pour accueillir un service roulier à court terme lorsqu'on tient compte du coût d'opération, de la taille du marché et de la consommation de carburant. Toutefois, la limite du tirant d'eau qu'on y retrouve constituera une contrainte avec laquelle il faudra composer.

4. ASPECTS TECHNIQUES ET LÉGAUX

Que nous retenions l'achat d'un navire neuf ou existant, il faudra conserver à l'esprit que la vitesse devra être obtenue tant pendant le trajet maritime qu'au moment du chargement et du déchargement.

Il faudra aussi utiliser un navire renforcé pour les glaces et possédant des propulseurs d'étrave et de poupe ainsi qu'un montant massif réduit pour en accroître la manoeuvrabilité. Nous recommandons aussi l'usage d'un navire avec puissance fractionnable pour en accroître la flexibilité.

Installations portuaires

L'analyse des installations portuaires révèle que le port de Montréal est celui dont les caractéristiques se prêtent mieux à l'offre d'un service roulier. Il possède des infrastructures Ro-Ro et des aires d'entreposage appropriées ainsi qu'une profondeur d'eau importante sans être vraiment encombré par les glaces. Outre l'absence d'infrastructures Ro-Ro, le port de Sorel possède des avantages comparables à ceux du port de Montréal.

Sur la Côte Nord,les ports de Baie-Comeau et Sept-Iles possèdent des caractéristiques comparables et ne devraient pas avoir de difficulté à accueillir les navires retenus dans l'étude. Baie-Comeau est toutefois soumis à des conditions de glace plus sévères que Sept-Iles, ce qui pourrait compromettre la régularité du service. Notons que les deux ports possèdent des infrastructures Ro-Ro et une excellente profondeur d'eau. Sept-Iles étant le plus éloigné, ses délais de livraison sont aussi les plus longs. La marge de manoeuvre en cas de retard en est ainsi réduite.

Sur la rive sud, la profondeur d'eau des ports de Cacouna et de Matane est suffisante pour accueillir les différentes tailles de navires retenus dans l'étude. Il en va tout autrement de Rimouski-Est qui ne pourra accueillir les navires entre 75 et 200 semi-remorques qu'à marée haute alors que le navire de 300 semi-remorques ne peut y avoir accès.

Le service roulier devra concurrencer le transport routier tant en termes de coût, de délai que de fiabilité et de régularité. Pour atteindre cet objectif, nous devons nous assurer que le navire passe le moins de temps possible au port en réduisant au maximum le temps de transbordement. Cette obligation a amené à retenir un type de navire permettant le chargement ou le déchargement de quatre remorques à la fois. Cela sous-entend aussi que les ports retenus devront offrir les rampes rendant ce débit possible. Des rampes doubles, superposées, donnant à la fois accès au pont garage et au pont supérieur, seraient requises pour les plus petits navires (50 à 100 semi-remorques).

Aucun des ports retenus dans l'étude ne possède de rampes doubles ou suffisamment larges. Là où on ne retrouve pas de rampes (Rimouski, Cacouna et Sorel), leur mise en place devra tenir compte de ces exigences. Là où on retrouve des rampes (Montréal, Baie-Comeau, Sept-Iles et Matane), il faudra se tenir prêt à adapter ces installations aux exigences du service.

Quoi qu'il en soit, des investissements en frastructures seront probabalement requis même dans les ports possédant des rampes Ro-Ro. Ces investissements seront nécessaires non seulement pour l'installation ou l'adaptation des rampes, mais aussi pour l'aménagement des espaces d'entreposage.

Du côté légal, l'ordonnance sur le transport de passagers et de marchandises par eau, introduite par Québec en 1961, pourrait s'avérer contraignante. Cette

ordonnance stipule qu'une personne ou une compagnie qui désire exploiter un service de transport de marchandises par eau devra acquérir un permis à cet effet. Toutefois, le requérant qui est déjà détenteur d'un permis de transport routier ne pourra se porter demandeur pour l'émission d'une autorisation de cabotage qui couvrirait les mêmes points et les mêmes localités desservis par son permis.

Suite à l'abandon du programme de subventions en transport dans l'Est du pays, le gouvernement fédéral prévoit un fonds de transition de 326 millions de dollars sur cinq ans destiné aux provinces affectées. Pour le Québec, cela représente 78 millions de dollars sur cinq ans[4]. En effet, le fonds pourrait notamment servir à mettre en place des rampes Ro-Ro et des espaces de stationnement pour remorques dans les ports touchés par le service roulier.

5. IMPACTS DU SERVICE ROULIER SUR LES SERVICES RÉGULIERS EXISTANTS DE TRANSPORT MARITIME DE MARCHANDISES SUR LE SAINT-LAURENT

Le service traversier-rail de Cogema a manutentionné 545 597 tonnes de marchandises en 1993, dont 95% était constituée de papier journal et de produits d'aluminium provenant de la Côte Nord à destination des marchés du Canada central et des États-Unis. Le trafic de Matane vers Baie-Comeau ne reprséente que 5% du total manutentionné et est principalement constitué de papier rebut et de propane. Considérant que le service de Cogema est essentiellement utilisé pour le transport d'importantes quantités de marchandises lourdes. Nous ne croyons pas qu'il sera affecté par l'introduction d'un service roulier.

Le service du Relais Nordik dessert les communautés de la Basse Côte-Nord, inaccessibles par la route. Pour la saison avril 1993 - janvier 1994 le chargement à Rimouski atteignait 8 400 tonnes et le déchargement 1 800 tonnes. Ses expéditions vers la Côte Nord étaient essentiellement constituées de biens de consommation. À notre avis, il s'agit probablement du service susceptible d'être le plus affecté par l'introduction du service roulier, particulièrement si ce dernier touche d'abord la Côte Nord.

CONCLUSION

Ailleurs dans le monde, le transport roulier est largement répandu que ce soit entre l'Europe continentale et le Royaume-Uni, entre les pays de la mer Baltique, en Europe du sud, entre la France, l'Espagne et les pays d'Afrique du Nord et l'expérience italienne «Viamare-The Autostrada by the Sea» entre Gênes et Palerme (Sicile)[5].

En Amérique, le transport roulier s'effectue entre les États-Unis, les Caraïbes, l'Amérique centrale, l'Amérique du Sud et Puerto Rico, l'Alaska et Hawaï. Un service Ro-Ro est aussi offert dans le golfe du Mexique entre Houston (Texas) et Teexpan (Mexique).

Enfin, une étude réalisée en 1994 recommandait que soit utilisé le transport roulier dans le transport sur la côte est des États-Unis et dans le Golfe du Mexique comme alternative aux transports routier et ferroviaire[6]. Cette étude suggère l'utilisation de navires sans écoutilles d'une capacité de 80 à 100 semi-remorques ou conteneurs (2 500 à 3 000 tonnes de port en lourd). Les ports priorisés se situeraient entre Boston et Miami mais le service pourrait s'étendre de Halifax à Veracruz (Mexique).

Toujours selon les auteurs de l'étude, les tarifs de ce service varieraient entre 0,60 $ et 0,80 $ par remorque-mille contre 1,10 $ et 1,20 par transport terrestre. Tous ces exemples nous démontrent qu'il est possible de faire du transport roulier une affaire rentable.

Sur la Côte Nord, le service roulier a clairement démontré sa capacité de concurrencer le transport routier. Son potentiel est cependant limité par la taille restreinte du marché. Sur la rive sud, le service roulier bénéficie d'un marché plus abondant mais il fait aussi face à un transport routier beaucoup plus compétitif.

L'économie générée par le transport roulier pour les expéditeurs, la possibilité de réduire les coûts externes provoqués par le transport routier et la nécessité d'offrir une alternative de transport aux régions (particulièrement sur la Côte Nord), devraient nous encourager à poursuivre la réflexion qui mènera à la création d'un service roulier viable et efficace ou à une autre forme de transport combiné dans le corridor du Saint-Laurent, soit le rail/route (Iron Highway ou Écorail) comme alternative au transport exclusivement routier.

BIBLIOGRAPHIE

- Association des armateurs du Saint-Laurent, Levons l'ancre : pour une politique du transport maritime au Québec et au Canada, Québec 1992, 85 pages.
- Desmeules, Daniel et Gaston Poirier, Analyse préliminaire des coûts comparatifs entre un service de transport de semi-remorques par navire Ro-Ro et un service de transport routier et semi-remorques entre Montréal et Baie-Comeau. Ministère des Transports du Québec, Québec, janvier 1982, 51 pages. (Cette étude a aussi fait l'objet d'une publication dans la collection Recherches Transport du ministère des Transports du Québec, n° 12, 1982.
- Developments in handling of ro-ro cargo, ICHCA, London, 1991, 70 p.
- L'Émeraude d'Émeraude-Lines : premier car-ferry à grande vitesse, Revue Commerce, 11 mars 1994.
- L'Europe mise davantage sur le transport intermodal pour se développer. L'Expéditeur, septembre 1993, p. 10.
- Feeder and short sea container shipping : Rgional Market Structures, Modal Competition and Economics, Drewry Shipping Consultants, London, 1993,208 p.
- Grey, Michael, ed. Ro-Ro ships and Shipping, Fairplay Publications Ltd, London, 1985, 174 p.
- Khan, M.A.M., Efficience environnementale du transport maritime, rapport final abrégé. A.K. Socio-technical consultants (Ottawa) Incorporated, 15 septembre 1992, révisé en janvier 1993, 46 p.
- Leclerc, Réjean et AL, Étude des traverses fluviales et maritimes en aval de l'Ile-aux-Coudres, 3 volumes, Ministère des Transports du Québec, Québec, 1981, 1506 pages.
- Major et Martin Inc., Étude de préfaisabilité d'un système de transport de trans-roulage et de barges sur le Saint-Laurent, Offre de service présentée à la Société Inter-Port de Québec, 1989, 15 p., annexes.
- Nadeau, Jean Benoît, Le défi dans le transport des marchandises au Canada: la place respective du camion, du bateau, de l'avion et du train, Revue Commerce, octobre 1991.
- New Options for Ro-Ro, Lloyd's Ship Manager, July 1992, p. 61
- Que coûte chaque mode à la collectivité, Navigation, Ports et industries, 10 mars 1991, p. 111 (Cet article fait référence à deux études allemandes qui tentent de calculer les coûts externes des modes routier, ferroviaire et fluvial dans le transport des marchandises).

NOTES DE FIN DE DOCUMENT

1. Leclerc, Réjean et AL, Étude des traverses fluviales et maritimes en aval de l'Ile-aux-Coudres, ministère des Transports du Québec, Québec, 1981, 3 volumes, Vol. I, 146 pages, Vol. II et III, 1380 pages.

2. Op. cit. Vol. III, page 1234.

3. Association des armateurs du Saint-Laurent, Levons l'ancre, Québec, décembre 1992, p. 82.

4. Nouvelles orientations de Transports Canada et le Budget 1995, ministère des Transports du Canada, février 1995, p. 32.

5. Viamare di Autostrada by the Sea, Lloyd's Ship Manager, August 1992, p. 73 à 75.

6. Réalisée par le professeur Asaf Ashar du National Ports and Waterways Institute of Washington, cette étude est citée dans l'article de George F.M. Telfer, «Researchers sees containers moving via roll-on coaster», Journal of Commerce, Friday, October, 7, 1994.

Coastal Gateways: Costs and Subsidies on British Columbia Coastal Ferry Routes

W.G.Waters II
James Evans
Joan Caravan
The University of British Columbia

Introduction

Ferry service to remote communities is a type of "gateway," a link for the "locationally disadvantaged" to the rest of the provincial transportation and economic system. The British Columbia Ferry Corporation (BCFC) operates numerous services along the B.C. coast, including the high volume services between the Lower Mainland and Vancouver Island. The large volume routes generate revenues at least close to full cost recovery. In contrast, BCFC also operates a number of "minor routes" which link various coastal and island communities to centres with road access to the rest of the Province. These minor routes invariably generate revenues less than costs. Just as with other government services, the ongoing need for subsidies is being questioned. It is likely that BCFC will come under increasing pressure to reduce deficits and move toward higher cost recovery on many of these routes.

Following a brief review of possible rationales for ferry subsidy, and the current practice, the paper reviews the extent of subsidy on 17 minor ferry routes in B.C. A cost model based on BCFC cost experience provides a common basis for costing services on each of the routes and comparing projected cost recovery and subsidy levels on the routes. A final section examines the policy environment and challenges facing the Government and BCFC in meeting the subsidy requirements.

Rationales for Subsidizing Ferry Service

Subsidies for coastal ferry services can reflect a number of rationales. There are circumstances where economic efficiency considerations call for subsidy, such as under increasing returns to scale or externalities. Scale economies or indivisibilities have been a traditional argument why infrastructure may not result in full cost recovery. Because the costs are sunk, the optimal policy is to price low to encourage utilization of such facilities.

However, ferry service is not like the classic textbook example of low marginal cost service such as bridges or roads. Ships are mobile assets which have opportunity costs. The prices paid must cover the opportunity costs. Moreover, although the marginal costs of additional cars or passengers may be essentially zero on any given trip, the costs of operating the vessel for the shift or for the day need to be covered by the cumulative demands served that day. In theory, the prices charged could vary for every trip depending on the demand at any particular hour, but the cumulative revenues for the day would cover the costs of providing the service. That is, unlike the text book illustration of sunk infrastructure, short run marginal cost pricing on ferries would not call for prices close to zero, but rather the average fares would have to be sufficient to cover the full avoidable costs of the service.

Another situation where economic efficiency arguments may call for subsidy is where services generate economic benefits for society generally, i.e., a positive externality. Ferry service enhances economic well-being and stimulates commercial, recreational and tourist activities in the markets served. Some might see this as an argument for subsidy, but the argument is weak. The economic efficiency arguments for subsidy require that these external benefits go unrecognized by ferry users or direct beneficiaries. Otherwise, the market outcome (supply meeting the demand) would be an efficient outcome. Tourism and other development will benefit businesses served by ferries. But this development generally will be diversions of tourist activity from one region to another; the net gain to the B.C. economy is much less than the local impact. Further, just as with transportation services elsewhere, whatever development is stimulated by subsidized ferry operations will result in higher land values. It is unlikely that these benefits go unappreciated by ferry users or nearby land owners, i.e., it is difficult to argue that those who benefit would not notice and be willing to pay for these benefits.

In brief, the economic arguments for ferry subsidies are weak. But there are also various social rationales. These include policies to redistribute income, favour particular regions, certain social groups such as aboriginal peoples. There are also constitutional entitlements, i.e., agreements for subsidy enshrined in law. The most likely rationale is a perceived social obligation to partially offset the locational disadvantage of residents of remote regions. There is a tradition of such policies in Canada and elsewhere, although the rationale and relevance today may be more debatable today than many decades ago. Existing B.C. ferry subsidies probably reflect a mix of considerations, primarily social, but are more accurately described as historical happenstance: for whatever reasons, subsidized ferry services have existed for some time and have come to be regarded as entitlements both by the recipients and perhaps by government and BCFC as well.

A particular interpretation is a "road equivalent" entitlement whereby ferry service is viewed as an extension of the highway system. More specifically, because of a community's proximity to other settlements and the size of the local population, communities would expect to have roads constructed at public expense as a regular part of the highway network, except that water and adjacent terrain make road construction prohibitively expensive. The ferry is viewed as a cost-minimizing obligation to provide the equivalent of highway services. The dilemma here is identifying just what combination of population, distance, costs, etc., society is willing to support given the points were connected by land rather than by water. Certainly there are examples of roads built which serve small traffic volumes, but they tend to be minimal roads, and increasingly, road investment must be justified by calculations of the user benefits of time and operating cost savings. There are limits to what society will spend to provide access from remote locations. A complication for ferry services concerns safety standards. Roads built to small communities can be of minimal standard, whereas ferry service must conform to the rigorous safety standards imposed for all commercial waterborne transport.

Although the "road equivalent" argument has been used as a guideline for ferry subsidies in various locations, this is not a theoretical justification for ferry subsidy. Rather this is a pragmatic rationalization to arrive at a specific figure given that the principle of subsidization has been accepted.

In sum, existing ferry subsidies are a historical happenstance whereby long-standing subsidized services have come to be regarded as entitlements. Because of past commitments by the Government and BCFC, the expectations of users that subsidies will continue is understandable, but these expectations do not necessarily justify indefinite continuation of subsidies. Like many other government services being reexamined in Canada and elsewhere, traditional ferry subsidies clash with the fiscal pressures facing today's governments. The rationales for, and size and structure of ferry subsidies are under scrutiny.

The Costs of Ferry Services

Ferries provide service to passengers and vehicles of various sizes and types including freight. Because vessel capital and operating costs are shared among the traffic types, allocations of costs to specific traffic can be arbitrary. The traffic category most useful in examining capacity and utilization is vehicle traffic, expressed in automobile-equivalent units (AEQ), i.e., trucks and buses are converted to equivalent deck space occupied by automobiles. However, note that the presence of passengers necessitates larger crews, safety equipment and amenities which are not required by vehicles; hence passengers have a disproportionate impact on costs compared to deck space occupied.

BCFC reports annual costs, revenues and losses for the various minor routes. However, the BCFC cost figures record the actual expenses for one particular year, which are not necessarily a guide to the expected costs to be incurred over a long term basis. In addition, the BCFC cost figures include allocations of overhead expenses most of which would be incurred independent of the operation of any one minor route. Third, the route costs reported by BCFC are influenced by the cost characteristics of the specific vessel assigned to the route; routes which have larger vessels than necessary -- or recently acquired and thus more expensive vessels -- will tend to show higher costs and lower cost-recovery. Thus, the first step in analysing cost-recovery across the minor routes was to develop a cost model which would reflect BCFC capital and operating costs, but on a long term basis which would enable a more consistent cost comparison across the routes.

Essentially, the costs of building and operating vessels for various size-classes were averaged to produce a consistent cost for each size vessel. Then, any route using a particular size vessel would be assigned identical costs per hour of operation. Current construction costs for various size vessels were obtained from BCFC. **Figure 1** shows the relative size of different cost categories, expressed as an index of the costs of the largest class vessel (greater than 130 AEQ). Both construction and operating costs are expected to show economies of scale in that costs per unit of capacity decline as ship size increases. However, Figure 1 reveals that the economies of scale are not as pronounced as was expected. The slope of the line showing the rise in costs with ship size is expected to rise less sharply as ship size increases. Instead, the graph tends to rise more sharply. The operating cost of the 100 AEQ vessels appears higher than it should be relative to the costs of other vessels. The largest category, greater than 130 AEQ, also shows costs increasing more rapidly than the increase in capacity. However, both of these vessels are a different design which incur higher costs for passenger space and amenities, and correspondingly higher crew requirements. There is also a change in wage rate structure between a 70 AEQ vessel and a 100 AEQ vessel.

BCFC figures for individual terminal operating costs were used to estimate the annual costs of operating various routes.

Costs and Subsidy Calculations for Ferry Routes

Four sets of cost and implied subsidy figures are presented:

(1) BCFC cost and revenue figures as presented in their annual report;
(2) Minimum cost estimates from the cost model, i.e., operating costs only;
(3) Full cost estimate from the model including capital costs of vessels and terminals valued in current dollars and allocations of overheads; and,

(4) "Modified" cost estimates which use current dollar capital costs but depreciate the valuation to the average age of vessels and terminals.

Revenues are the same for all calculations, i.e., reflecting actual revenues collected in 1993/94 on each of the routes.

Table 1 summarizes the cost-recovery ratios for different calculations (route names are in the Appendix). The cost-recovery ratio in column 2 is the figure reported by BCFC. The minimum cost estimate (operating costs only) from the cost model is in column 3. The full cost ferry service (including depreciation and financing costs based on the current replacement cost of vessels) is in column 4. Column 5 is the "modified" calculation from the cost model: this includes an allowance for ship and terminal capital investment, but uses a depreciated current cost valuation of fleet and terminal investments.

In assessing the current situation facing BCFC, the minimum cost basis for the cost-recovery ratio is the most relevant. It indicates the immediate financing required to cover operating costs excluding any allowance for capital replacement or contributions to overheads. The minimum cost basis shows an overall average cost-recovery ratio of 46.8 percent compared to the average cost-recovery ratio of 33.5 percent reported by BCFC.[1] Note that the latter includes historical-based capital costs and allocation of overheads.

The most relevant comparison between the cost model and BCFC figures would be the "modified" calculations. The overall average cost-recovery ratio is 29 percent in the cost model, which is similar to BCFC's overall average of 33.5 percent. There are differences among routes due to different depreciation and financing charges attributed to the routes by BCFC and the model.

Column 6 in Table 1 shows the ratio of the minimum cost-recovery ratio relative to the full cost ratio. There are some differences across the routes, but on average the difference is about two to one, i.e., the cost-recovery ratio on a full cost basis is about half what is measured in terms of operating costs only. Expressed another way, if fares were increased to bring the current minimum cost-recovery up to 100 percent, this would only be about half the level of revenues needed to sustain operations based on current vessel and terminal costs.

Table 1

BCFC and model predicted cost-recovery ratios					
Route	BCFC Results	Minimum Cost	Full Cost Model	Modified Cost	Minimum Cost/ Full Cost
4	57.8%	83.4%	41.8%	52.7%	2.00
5	17.2%	26.1%	13.2%	17.0%	1.98
6	44.7%	46.1%	23.0%	30.3%	2.00
7	37.7%	70.4%	36.8%	45.1%	1.91
8	40.7%	68.7%	34.3%	43.3%	2.01
9	44.7%	81.7%	38.4%	49.0%	2.13
12	52.5%	50.1%	22.0%	30.8%	2.28
17	49.3%	60.2%	30.3%	39.1%	1.98
18	12.7%	23.0%	10.4%	13.8%	2.22
19	40.2%	55.6%	29.9%	37.3%	1.86
20	20.6%	22.8%	9.5%	13.1%	2.41
21	30.2%	39.7%	18.6%	24.5%	2.13
22	27.5%	32.0%	12.7%	17.9%	2.53
23	39.6%	55.0%	26.9%	34.3%	2.05
24	13.6%	25.1%	8.7%	12.5%	2.89
25	22.5%	36.0%	14.1%	19.3%	2.56
26	17.7%	19.6%	9.5%	12.5%	2.07
Unweighted Avg.	33.5%	46.8%	22.3%	29.0%	2.09

Analysis of Variations in Cost Recovery

The minimum cost recovery ratio (CRR for operating cost only) are used to analyze any patterns in cost-recovery across the routes.

Three factors might influence the level of cost recovery:

(i) annual traffic volume (one might expect lower cost recovery on low volume routes);

(ii) the severity of the peak (cost recovery may be more difficult for routes with a more severe seasonal imbalance); and,

(iii) the utilization of capacity (cost-recovery will be more difficult for routes with low utilization of the vessel).

However, none of these factors explain variations in the level of cost-recovery across the routes.

Figure 2 plots annual traffic volumes in ascending order along with the cost-recovery ratio of the minimum cost basis. There is an upward trend as expected, but there is substantial variation across the routes. Relatively high and

low cost-recovery is achieved on both low and high volume routes.

Figure 3 shows the relationship between the seasonal traffic differentials and cost-recovery. The seasonal variation is measured as the ratio of the two busiest months relative to the two lowest months. The routes are graphed in ascending order of the peak/low-season differential. Contrary to what might be expected, there is no apparent correlation between the problem of the peak and the extent of cost-recovery.

Figure 4 shows the link between average annual vessel utilization and cost-recovery for routes which record vessel utilization. The vessel utilization figures in Figure 4 are the average of peak and low season utilization. They are graphed in ascending order along with their respective cost-recovery ratios. There is an upward trend as expected, but with deviations for a couple of routes.

The effect of vessel utilization requires further discussion. Because vessels are purchased infrequently and traffic volumes are growing, vessels tend to be larger than necessary for current traffic volumes. As utilization increases, revenues will increase with little change in costs, hence cost-recovery will improve. For some routes, we were able to calculate current average vessel utilization over the year. We can then re-scale the cost-recovery ratio (CRR) in order to estimate what it would be on each route when each route reached the same target level of utilization. We chose a target of 60 percent average utilization. This is an arbitrary choice but it is broadly consistent with BCFC's target of 80 percent utilization during the peak season. **Table 2** shows that current fare levels will yield much improved cost-recovery once traffic grows to the target vessel utilization. Two routes (Routes 6 and 7) are projected to more than cover their operating costs. However, an important caveat is that it will be many years before traffic volumes are projected to reach these levels.

Table 2

Adjusted Cost Recovery Ratios (CRR) for Differences in Capacity Utilization (selected routes)			
Route	CRR minimum cost model	Annual capacity utilization	CRR if 60 percent
5	26.1%	32%	48.9%
6	46.1%	24%	115.1%
7	70.4%	34%	124.2%
8	68.7%	44%	93.7%
9	81.7%	57%	86.0%
12	50.1%	42%	71.6%

Analysis of the Ferry Fare Structure

The fare structure refers to the fare differentials among traffic types,

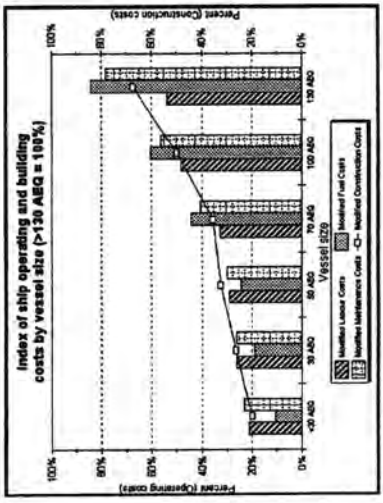


Figure 1

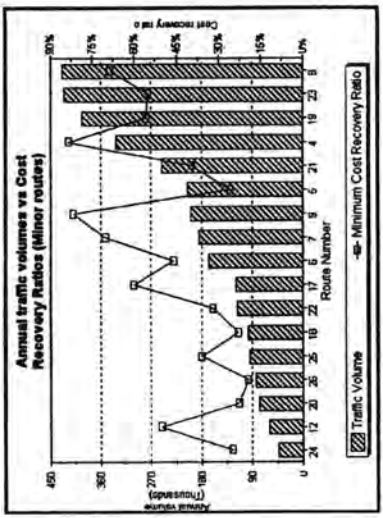


Figure 2

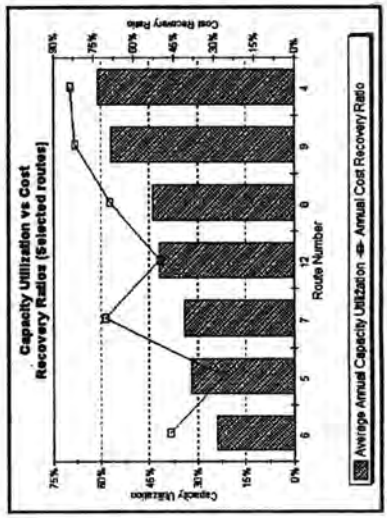


Figure 4

Figure 3

distances travelled, peak/off-peak, etc. We first examine the *consistency* of fares among traffic types. **Figure 5** shows the various fare categories as a percent of the overheight vehicle fare (PVOH). The only apparent anomalies are the relatively high fares on intermediate links of multiple-point routes (identified as 5A and 25A, components of Routes 5 and 25, respectively).

Fare differentials among traffic types. The cost data limit our ability to assess whether or not the fare differentials among traffic types are appropriate. The fares for vehicles seem low relative to those for passengers since it is the carriage of vehicles which determines the size of vessels needed and limits the utilization of that capacity.

Fares and distance. Although other cost and demand factors may be involved, we expect a link between fare levels and distance travelled. **Figure 6** shows only a loose relationship between them. Analysis of ferry operating and cost characteristics can provide a basis for linking fares more closely with distance. **Figure 7** superimposes a hypothetical cost-distance relationship (reflecting time required in port relative to time travelling) on a plot of the (standard passenger car) fares for the minor routes. Because average fare levels are not recovering costs, it may be appropriate to plot the cost-distance line from a higher base (left hand axis) as a basis for adjusting fares to more accurately reflect the distances involved.

Seasonality and fares. The seasonal difference in traffic varies substantially across the routes. **Figure 8** plots the ratio of high/low monthly traffic (bar graphs scaled on the left hand axis) against the peak/off-peak fare differential for under-height vehicles. Notice the size of the traffic differential, as high as a 250 percent increase during the peak season and as low as about 30 percent. In contrast, the peak fare differential is very modest and is almost uniform compared to the major differentials in traffic volumes.[2]

For a few routes, we estimated the proportion of total annual costs which could be assigned to the peak season demands. Serving the peak requires acquiring a vessel larger than necessary to serve the route for the rest of the year. That is, the costs of serving the route are higher than necessary throughout the year in order to have capacity adequate for the summer peaks. We assign this increase in annual costs to the peak season, and calculate the implied surcharge above a "shoulder" fare that would be necessary for peak users to bear the full costs of serving them.

A minimum vessel size was chosen sufficient to handle the shoulder season with 80 percent utilization. This compares with BCFC's target of maintaining capacity to achieve 80 percent utilization during the peak months. The average

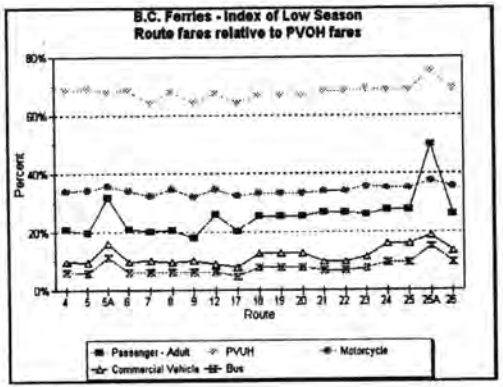


Figure 5

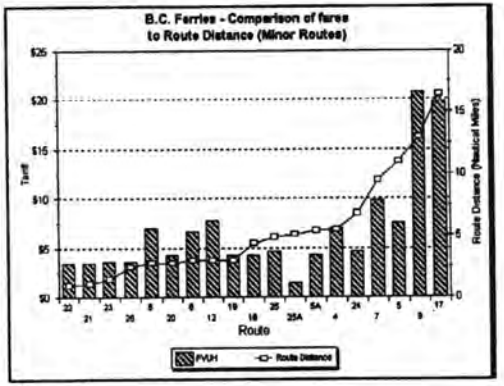


Figure 6

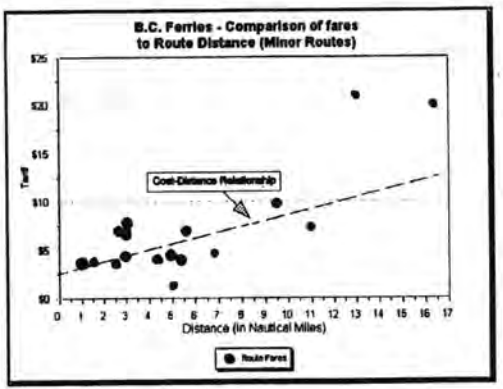


Figure 7

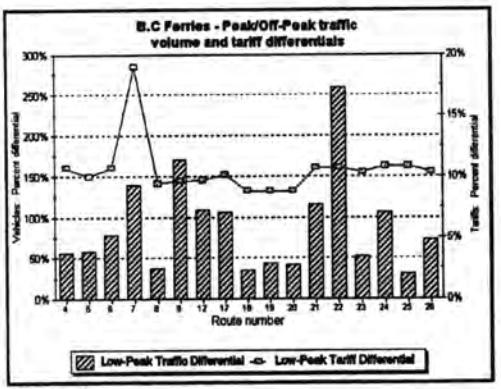


Figure 8

fare necessary to cover the annual costs of the smaller vessel, TC_S, is found by dividing annual costs by annual traffic volume, Q_{annual}. Total costs can be defined as operating costs only or inclusive of the capital costs of the vessel. We calculate both versions, using full replacement costs for the total cost calculation.

We wish to calculate the proportional increase in peak period fares sufficient to cover the full annual incremental cost associated with running the larger vessel needed to serve the summer peak. This peak fare is the average fare calculated above plus the difference in total costs of the large and smaller vessel, (TC_L-TC_S), divided by total peak traffic (i.e., three months), Q_{peak}. This calculation can be written as:

$$\text{Peak Fare} = \frac{TC_S}{Q_{annual}} + \frac{TC_L - TC_S}{Q_{peak}}$$

Dividing the numerator through by TC_S and the denominator through by Q_{annual} yields:

$$\frac{\dfrac{\text{Peak Fare}}{TC_S}}{\dfrac{1}{Q_{annual}}} = \frac{\dfrac{TC_S}{TC_S}}{\dfrac{Q_{annual}}{Q_{annual}}} + \frac{\dfrac{TC_L - TC_S}{TC_S}}{\dfrac{Q_{peak}}{Q_{annual}}}$$

$$\frac{\text{Peak Fare}}{\text{Avg. Fare}} = 1 + \frac{\text{\% increase in vessel costs}}{\text{\% peak to annual traffic}}$$

Thus, the surcharge for the peak fare is found simply by dividing the percentage increase in annual costs by the proportion of annual traffic carried during the peak months. (This does not allow for any loss of traffic due to the higher fares; incorporating a demand elasticity would call for even higher fares.)

The calculations are shown in **Table 3** both for operating costs only as well as on a total cost basis (including vessel capital costs). The required surcharges are shown in the two right-most columns of Table 3. These differentials are much higher than current peak/off-peak differentials, and do not allow for reductions in demand which might accompany such price increases.

The analysis of peak/off-peak traffic differentials relative to the modest seasonal fare differentials reveals a substantial cross-subsidy implicit in BCFC fare policy. At present, low- and shoulder-season travellers are paying a substantial part of the costs of supplying peak users, and peak period fares are well below the incremental annual costs of supplying them.

Table 3

Peak Surcharge Necessary to Cover Annual Incremental Cost of Operating a Larger Vessel Needed for the Peak (selected routes)					
Route and vessel size, peak / off-peak	Increase, Annual Op. Costs	Increase, Total Cost (including capital)	Peak / Annual Traffic	Peak Surcharge, Op Cost Only	Peak Surcharge, Total Cost
Route 7 70 AEQ / 50 AEQ	23.4%	17.8%	34.2%	68.4%	52.0%
Route 8 70 AEQ / 50 AEQ	23.4%	17.7%	27.8%	84.2%	63.6%
Route 21 50 AEQ / 30 AEQ	12.6%	16.7%	34.3%	36.7%	48.6%
Route 23 70 AEQ / 50 AEQ	23.4%	17.6%	29.5%	79.4%	59.7%
Route 24 30 AEQ / <30 AEQ	26.5%	29.3%	32.7%	81.2%	89.7%

This cost calculation is simplistic, but it is believed to be a reasonable approximation of the difference in annual costs imposed by serving the peak season. A more sophisticated analysis could allow for changes in the number of sailings during different times of the year. We also ignore the occasional demand surge during the year (i.e., holiday weekends, spring break, etc.) which would be better served by the larger vessel. Hence, this calculation of peak costs is probably overestimated, but the degree of overestimation is uncertain. Incorporating a demand response would complicate the calculation further: high peak fares would cause some traffic not to move, thus reducing revenues, but also reducing the costs of serving the peak since less capacity would be required.

The Policy Environment and Directions for Change

The foregoing illustrates the magnitude of subsidies on BCFC's minor routes. There is no explicit rationale for the level of subsidy, and certainly no rationale for the differential subsidies across the routes. Nor is there a clear directive from the Government of British Columbia; what guidelines that exist are contradictory or unworkable. To appreciate the policy vacuum which exists, we review the history and suggest directions for ferry subsidy policy for B.C.

Provincial subsidy policy

B.C. Ferries was formed in 1960 by Premier W.A.C.Bennett, who saw ferry services as an important tourist attraction as well as an essential service for B.C. residents. The B.C.Ferry Authority operated essentially as a government department. Apparently there was no explicit subsidy arrangement, the government provided the ships and left the ferry operation to cover operating expenses.

BCFC was formally incorporated in 1976. The Act of incorporation included explicit provision for subsidies by the Province. At about the same time, the Province signed an agreement with the Federal government whereby an annual subsidy to the Province for ferry service would be accepted in lieu of direct Federal involvement and payment for certain coastal services. Provisions of the 1976 Act called for BCFC to finance its operations from fares and borrowings, and to receive an annual subsidy from the Province:

> "The Lieutenant-Governor in Council... may authorize the Minister of Finance to pay to the corporation in its 1977 fiscal year and in each subsequent fiscal year a sum of money, to be known as the Annual Highway Equivalent Subsidy..."

which was calculated as:

> "...the aggregate of the annual cost of maintaining and the annual amortization of the capital cost, of lengths and classes of highways in the Province which, in the opinion of the Lieutenant-Governor in Council, are substantially equivalent to the ferry routes operated by the corporation..."

Orders-in-Council specified the highway-equivalent costs in some detail and linked the total payment to the system route mileage, then 918.96 miles, for an initial payment of $43.5 million to the corporation for the fiscal year 1977-78. In subsequent years, the payment would be adjusted according to changes in the Consumer Price Index for Vancouver and changes in ferry route mileage.

Over the years the basis for provincial payment of subsidies changed. The reference to "...may authorize ... an annual highway equivalent subsidy..." was retained, but without any reference to how it would be calculated. Section 20 of the Act goes on:

> 20. "In addition to any other money authorized to be paid under section 19, the Lieutenant-Governor in Council may, by order, authorize the Minister of Finance to
> (a) purchase unissued shares of the corporation;
> (b) purchase notes, bonds, debentures or other securities of the corporation; and
> (c) advance money to the corporation for its temporary or long term purposes on the terms and conditions as the Lieutenant Governor in Council may determine..."

In brief, the Act is entirely permissive in authorizing the Provincial government to grant subsidies, but there is no direction regarding the amount or purpose of any subsidies.

The Province has paid subsidies, along with the Federal subsidy discussed below. In March 1989, the budget speech agreed to finance BCFC's capital expansion and maintenance program by a subsidy of $51.0 million annually for ten years. However, following the change of government in 1991, this commitment was reduced although an operating subsidy has continued on an annual basis. BCFC prepares an annual budget which forecasts revenues and expenses; this is reviewed by the Treasury Board. The subsidy is used first to cover annual operating loss excluding depreciation, less net financing income and long term debt and capital lease repayments. The subsidy is applied secondly to a capital subsidy account. The amount of subsidy has been on the order of $50 million annually including the Federal subsidy discussed below, but reduced to about $41 million in 1992/93 as the Province cut its grant. The Provincial subsidy declined further, to about $10 million by 1995, for a total of $30 million.

Federal subsidy for B.C. ferry service

British Columbia receives an annual subsidy from the Federal government. The origins for the Federal subsidy are found in British Columbia's terms of union with the Confederation. Canada agreed to provide the Province with "an efficient steamship service between Victoria and the northwestern United States and to adapt these vessels for conveyance of freight and passengers."

This subsidy has since been prescribed in the *Federal-Provincial Subsidy Agreement* of 1977 which transferred authority for the provision of ferry and coastal freight and passenger services in B.C. from the Federal to the Provincial government. The agreement specifies a Federal subsidy to be provided to the Province, via the Minister of Transport, in return for the assurance of "reasonable and adequate service." In addition, the Province is required "to give effective links where required on the coast between communities and principal water and air services." However, the amount of the subsidy is linked to the route mileages of two water links, the Strait of Georgia crossing and the Port Hardy to Prince Rupert link, for a total route mileage of 337 statute miles.

The initial subsidy was set at $8 million for the fiscal year 1977/78. In each subsequent fiscal year, the Federal government subsidy would be:

> "equal to the previous year's subsidy increased or decreased, as the case may be, by the percentage difference between the average Consumer Price Index for the two preceding fiscal years as published by Statistics Canada for Vancouver, British Columbia."

The subsidy has grown with inflation and now is about $20 million per year. Although the Federal subsidy agreement made specific reference to certain

coastal services, it appears that both the Province and Federal government have accepted that the subsidy may be used for ferry support generally and not confined to specific routes.

Current subsidy payments

BCFC both operates ferry services and contracts for freight or passenger service on some even smaller routes than those they operate (the latter are not included in this analysis). The losses are absorbed into the overall operating budget of BCFC, and covered out of the general subsidy received from the Provincial and Federal governments as well as some cross-subsidy from operating revenue surpluses from the high volume "major" routes.

In 1992/93, BCFC received $41 million in subsidy, $19.6 million from the Federal Government with the balance from British Columbia. In addition BCFC raised about $17 million in cross-subsidy from major routes and inadequate provision for capital replacement.

Policy directions

Although at present there are no explicit directives regarding subsidies for BCFC, there are explicit guidelines for ferry pricing. In 1992, a Cabinet Committee on Crown Corporations issued a directive to guide BCFC pricing policies. The guiding principles include:

> "... the relationship between the fare charged to a user and the costs imposed by that user on the system should be the same among all users....
>
> "... The demand of users will fully take into account, through pricing, the costs involved in meeting that demand."
>
> "... revenues ... to be equal to operating costs plus a positive return on capital [where] .... the operating costs should include the capital maintenance required to fully sustain the operability of each existing asset to the end of its economic life.... [and] the rate of return on capital should reflect the value of the social and economic opportunities foregone elsewhere and the financial impact of acquiring the capital....
>
> B.C. Cabinet Committee on Crown Corporations, "Pricing Principles for B.C. Ferry Corporation," (July, 1992).

In brief, the pricing guidelines call for no subsidies, but this contradicts the historical price levels and structures of BCFC. But Cabinet has not showed any inclination to hold BCFC to the pricing directives. In fact it is the opposite.

BCFC is overseen directly by Cabinet, i.e., price and service decisions must be approved by Cabinet, rather than by a regulatory commission at arms length from Government. Cabinet members are reluctant to approve substantial fare increases because of the furor that is likely to result. This appears to be the age-old conflict between politicians' desire to be prominent when capital expenditures are made, but reluctant to be identified with less politically-palatable decisions such as raising prices to pay for the capital expenditures.

The present policy trap needs to be broken. If subsidies are to be paid, the corporation needs to be able to plan for a certain amount, and some directions are needed regarding the subsidies. The present subsidies have arisen with little conscious direction. They reflect a social principle of partially offsetting the burdens faced by the locationally-disadvantaged. This is a social rationale for subsidy, and not an economic one. It is not appropriate for an operating agency to decide social policy. Some directions need to come from Government.

One way to break this policy deadlock may be an institutional change which distances the Minister and Cabinet from pricing, operating and service decisions (perhaps to be overseen by a regulatory board). It might be necessary to maintain Treasury Board and Cabinet approval for major capital expenditures. This can preserve the "ribbon-cutting" opportunities for Ministers but provide some insulation from the less politically-palatable commercial decisions which must be made by the corporation.

While waiting for guidance from Cabinet and/or a changed reporting structure, there are some policy issues which are more straight forward, viz., the corporation needs to take some steps to restructure fares so they better reflect the relative costs of different services provided. At present, fares and implied subsidy levels differ across routes with no obvious pattern to explain them. The fare structure across traffic types is fairly consistent, although passenger fares may be high relative to vehicle fares. Since vehicles are the primary determinant of capacity utilization, these fares should be increased relative to passengers. There is a case for greater correspondence between fares and distances travelled. Most important is the need to recognize the costs of the severe seasonal imbalance (peak loads) on the routes. At present the seasonal price differentials are modest and not necessarily consistent with the differential peak loads which are faced. Current pricing practices involve substantial implicit cross-subsidization whereby off-peak and year-around users cross-subsidize peak travellers who are often temporary visitors. It is difficult to justify this policy either on efficiency or social grounds. A promising strategy is to move to a three season fare policy: off-peak, shoulder and peak, something already followed on their high volume runs. By offering some off-peak discounts, this may make higher peak surcharges more palatable to the year-around users, who otherwise

will actively lobby to resist fare increases. Further steps would be to adopt even more flexible pricing structures which would offer even greater incentives for better "space management" of ferry sailings.

The ferry corporation needs better guidance from the Government. This in turn would benefit from separating pricing and service decisions by the corporation from Cabinet, and leave Government to concentrate on broader issues of policy such as overall levels of subsidy and criteria they should meet. In the mean time, the directions of change for ferry fares are clear: whatever the final level of subsidy to be permitted, the present fare structure should begin to change toward one more consistent with economic and commercial principles.

Endnotes

1. These are unweighted averages, i.e., these are the numerical average of cost-recovery ratios of individual routes, not weighted by the relative size of costs and revenues. The overall or system cost-recovery is 53.3 percent for the minimum cost model compared to the unweighted route average of 46.8 percent shown at the bottom of Table 4-8.

2. The higher peak to off-peak fare for route 7 is because that route has a three season fare structure in contrast to two fares for the rest of the routes.

Appendix: B.C. Ferry "Minor" Routes

Route	Terminals	Region
4	Fulford Harbour & Swartz Bay	S. Gulf Is.
5	Swartz Bay/Otter Bay/Village Bay/Lyall Harbour/Sturdies Bay	S. Gulf Is. - Vancouver Is.
6	Crofton & Vesuvius	S. Gulf Is.
7	Earl's Cove 7 Saltery Bay	Sunshine Coast
8	Snug Cove & Horseshoe Bay (Berth 1)	Bowen Is.
9	Long Harbour/Sturdies Bay/Village Bay/Tsawwassen (Berth 2)	S. Gulf Is. - Mainland
12	Brentwood Bay & Mill Bay	S. Vancouver Is.
17	Little River & Powell River (Westview)	Vancouver Is. - Sunshine Coast
18	Blubber Bay & Powell River (Westview)	Texada Is.
19	Nanaimo Harbour & Descano Harbour	S. Gulf Is.
20	Chemainus/Thetis Island/Kuper	S. Gulf Is.
21	Buckley Bay & Denman Island	N. Gulf Is.
22	Hornby Island & Denman Island	N. Gulf Is.
23	Campbell River & Quadra Island	N. Gulf Is.
24	Whaletown & Heriot Bay	N. Gulf Is.
25	Alert Bay/Sointula/Port McNeill	N. Vancouver Is.
26	Skidegate & Alliford Bay	Queen Charlotte Is.

Analyse et intégration des statistiques sur le transport multimodal des marchandises

Louis Pierre
Division des transports, Statistique Canada

Le transport en transition

Le transport est une industrie de toute première importance au Canada notamment en raison de sa vaste superficie (10 millions de km^2), de la faible densité de sa population (2,9 habitants au km^2), de l'abondance de ses ressources naturelles et de ses échanges commerciaux avec les États-Unis et ses autres partenaires. Il s'est donc développé au cours des décennies un réseau de transport impressionnant et fort complexe. Ce développement a été influencé par de nombreux facteurs tels que les forces concurrentielles du marché, la règlementation, l'offre et la demande de services et la transition d'une économie axée est-ouest vers une économie nord-sud.

Les changements rapides des dernières années dans le monde ont forcé chaque segment de l'industrie du transport à repenser ses activités et ses façons de faire de manière à demeurer compétitif. On cherche à rationaliser les coûts et il faut trouver les moyens les plus efficaces d'acheminer les marchandises tout en respectant la notion de plus en plus répandue du service "juste à temps". On doit examiner des routes alternatives ou même des combinaisons de modes de transport. Chaque secteur du transport cherche à s'approprier la part de marché dans laquelle il excelle. Les différents modes de transport deviennent donc complémentaires et pour répondre aux besoins des expéditeurs, une collaboration entre les différents moyens de transport doit s'installer. De plus, avec l'utilisation accrue des conteneurs pour le transport de marchandises, la collaboration entre les modes de transport devient vitale.

Le transport doit donc être vu comme un système plutôt que comme une multitude de modes de transport indépendants les uns par rapport aux autres. Plus encore, ce système doit être pensé en fonction des besoins des industries productrices de biens et des attentes des industries consommatrices de ces biens. Le tout s'inscrit dans un contexte de globalisation des marchés.

Intégration de l'information

Pour bien comprendre ces systèmes complexes et ses interactions, les décideurs ont de plus en plus besoin d'information pertinente. L'information, elle existe en abondance. Le problème, c'est que les décideurs n'ont pas le temps voulu pour la recueillir, la consulter, en faire le tri, et de se familiariser avec la façon de l'exploiter. Pire encore, les données provenant de plusieurs sources différentes sont souvent incompatibles, voire même contradictoires. Ils ont donc besoin de données intégrées et compatibles.

Exemples de statistiques intermodales

Prenons l'exemple de l'analyste qui fait une recherche bibliographique de façon à trouver des sources de données qui lui donneraient une vue d'ensemble de ce que représente le transport intermodal ou par conteneur dans le monde. Pas facile! Une première source lui apprendrait que l'essor de la conteneurisation a eu lieu à partir des années 80. Ainsi, en 1983, les conteneurs en circulation dans le monde avaient une capacité de 3,8 millions "d'unités équivalentes à vingt pieds" (UEVs)[1]. Dix ans plus tard, les conteneurs avaient une capacité de 7,3 millions de UEVs, presque le double. Voilà pour la capacité. Quelle est la quantité de marchandises qui transite dans ces conteneurs? Selon le "Institute of International Containor Lessors", les mouvements mondiaux de UEVs en 1989, ont été évalués à environ 78.5 millions de UEVs[2]. Combien cela représente-t-il de conteneurs? Le nombre de conteneurs en circulation dans le monde en 1989 était estimé à 4,3 millions et représentait 6 millions de UEVs. Selon une autre source, le nombre de mouvements de conteneurs dans les terminaux maritimes mondiaux ont été de 61 millions de UEVs en 1986 et de 66 millions de UEVs en 1987[3].

Voyons maintenant plus prêt de nous. Le transport intermodal au Canada est estimé entre 20 et 23 millions de tonnes en 1991[4]. Par ailleurs, certaines statistiques américaines pour 1995 estiment le transport intermodal ferroviaire à 4,6 millions de conteneurs et 3,5 millions de remorques[5]. Et on pourrait continuer à trouver des chiffres ici et là. Pour augmenter la frustration de l'analyste, ces chiffres sont souvent assaisonnés d'une multitude de mises en garde du genre "n'inclut pas telles données...." ou "peut comprendre du double comptage....", etc.

Le problème, c'est que toutes ces données sont indépendantes, elles ne sont pas comparables entre elles et elles ne représentent qu'une facette du phénomène qui nous intéresse et non une vue d'ensemble de ce qu'est l'intermodalisme ou la conteneurisation. En fait, l'analyste reste sur son appétit pour ne pas dire que ça crée une certaine frustration. Si celui-ci avait plusieurs

mois (ou plusieurs années) devant lui, il pourrait essayer de faire un ménage parmi toutes ces sources et tenter de consolider toutes ces informations. Mais voilà, en tant qu'analyste ou en tant que décideur, nous n'avons pas de temps à consacrer à comprendre toute cette information disparate. Nous avons besoin de données intégrées, complètes, compatibles et comparables.

C'est la direction adoptée par Statistique Canada que de promouvoir l'analyse et l'intégration de l'information. Dans cet effort corporatif, la division des transports de STC tente de mettre en place les mécanismes nécessaires à l'atteinte de cet objectif. Mais qu'est-ce au juste que l'intégration des données?

Elle consiste à rassembler l'information de plusieurs sources et d'en assurer la compatibilité. Il ne doit pas s'agir uniquement d'un ramassis de données qui n'ont rien à voir les unes avec les autres. L'intégration des données permet à un utilisateur de faire des comparaisons valides et harmonieuses entre les différentes sources sur des sujets connexes. De plus, si elle utilise une même plate-forme, l'utilisateur n'a pas à se familiariser avec un grand nombre de systèmes d'exploitation propres à chaque source. Si le système est plutôt convivial, l'utilisateur n'en sera que plus heureux.

Les sources de données

Pour développer une base de données intégrée, on doit d'abord identifier les sources d'information pertinentes à l'étude ainsi que les variables communes (le plus possible) qui feront le lien entre les différentes sources d'information. Encore faut-il que ces variables soient d'un intérêt. Nous avons répertorié un grand nombre de sources possibles d'information, entre autres:

- Enquêtes sur le transport maritime;
- Enquêtes sur le transport ferroviaire;
- Enquêtes sur le camionnage;
- Enquêtes sur le transport aérien;
- Enquêtes sur le transport par pipelines;
- Enquêtes sur les industries productrices de biens;
- Enquêtes sur le commerce interprovincial et international;
- Enquêtes sur le commerce de gros;
- Etc.

Cet examen nous a également permis d'identifier des lacunes au niveau de la disponibilité de données concernant les statistiques sur l'origine et la destination des marchandises:

- Services de messageries;
- Transport de marchandises par autobus;
- Transport aérien de marchandises;
- Compagnies de camionnage américaines opérant au Canada;
- Plusieurs industries productrices de biens;
- Etc.

Différentes approches

Comme vous l'avez remarqué, notre approche vise à utiliser au maximum le potentiel des sources de données existantes plutôt que de développer de nouvelles enquêtes. Nous croyons que les bases de données existantes sont sous-exploitées et qu'elles recellent une abondance d'information pertinente qu'il suffit de mettre en valeur. Cet exercice nous permettra d'identifier les véritables lacunes parmi les sources disponibles et d'apporter alors les correctifs requis. On pourrait bien sûr opter pour le développement de nouvelles enquêtes pour recueillir l'information spécifique que l'on désire. Cette approche serait coûteuse, augmenterait indûment le fardeau de réponse et constituerait une duplication partielle d'information qui existe déjà sous d'autres formats.

Utiliser l'information déjà disponible dans le contexte statistique canadien implique l'utilisation de données recueillis auprès des transporteurs et validées par les données de l'offre et de la demande et les données du commerce international. Les États-Unis, pour leur part ont pris l'approche de recueillir l'information auprès des expéditeurs. Cette approche américaine a bien sûr ses avantages et ses inconvénients. Elle permet une identification précise des biens transportés et une bonne identification de l'origine et de la destination des marchandises. On sait également si celles-ci sont transportées par conteneur. Les obstacles à l'utilisation d'une telle approche par le Canada sont les suivants: très coûteuse, fardeau de réponse important et importations non couvertes.

Modeler l'information

Dans cet effort d'intégration de données, nous nous sommes donc concentré dans un premier temps sur l'intégration des données de trois moyens de transports importants, soient le transport maritime, ferroviaire et par camion. Dans une deuxième phase, on étendra l'étude aux autres sources. On s'est attardé à établir les fondements d'une base de données à laquelle se greffera ultérieurement d'autres modules. Lorsque les variables ne sont pas compatibles, on pourra créer des variables dérivées. Par exemple, si on a trois sources d'information utilisant des années fiscales différentes, on pourra convertir celles-ci sur une base d'année civile. Autre exemple, les données disponibles en tonnes métriques, en kilogrammes, en livres ou autres mesures de quantité ou de volume devront être converties sur une même base. Quant aux variables

descriptives complexes comme le niveau géographique ou les classifications des biens ou des industries, on fera appel à des classifications standardisées.

La clé: des variables communes

Lorsque les données de plusieurs sources sont regroupées selon des paramètres communs, on facilite le travail de l'analyste. Les tableaux 1 et 2 identifient les variables pertinentes à notre étude selon chacune des sources. On constate d'emblée la difficulté à trouver des variables communes. Celles de la première colonne ne reflètent d'ailleurs que l'intégration d'une partie des données du transport maritime, ferroviaire et par camion. Par exemple, on a déjà une incompatibilité pour faire une analyse complète au niveau sous-provincial. De plus, le seul quantificateur commun est la tonne métrique qui est par ailleurs le résultat de la conversion d'autres unités de mesures. Les recettes par biens sont disponibles pour le transport ferroviaire et par camion, mais pas pour le transport maritime. Au niveau de la conteneurisation, ce sont les données sur le camionnage qui font défaut. Comme on peut le voir, les systèmes de classification des biens ont dû être convertis selon un système développé cette année, la CTBT (Classification type des biens transportés). Quant au concept d'origine et de destination, il faut être prudent dans son interprétation. S'agit-il de l'origine et de la destination finale de l'expédition peu importe le mode de transport ou de l'origine et de la destination du bien sous la responsabilité d'un mode particulier? Par exemple, dans le cas des livraisons effectuées par chemins de fer vers le port de Vancouver pour exportations maritimes, les compagnies ferroviaires déclareront la Colombie-Britannique comme destination finale de la marchandise. Les statistiques sur le transport maritime international montreront le port de Vancouver comme origine. Par contre, pour une livraison d'un conteneur de marchandises du Québec à Terre-Neuve, les sociétés ferroviaires pourraient déclarer Terre-Neuve comme destination finale même si le conteneur a été transféré au bateau à Halifax et livré par camion de St. Johns à Gander, par exemple.

Où cela nous mène-t-il? D'abord à se demander quelles variables sont utiles. On voudrait connaître la proportion des expéditions qui est transportée par conteneurs et peut-être quel type de biens est transporté par conteneur. L'analyste s'intéressera également à l'origine initiale, au corridor utilisé, aux points de transferts ainsi qu'à la destination finale des marchandises lorsque plusieurs modes de transport sont utilisés. Après avoir identifié ces besoins, on étudiera la façon de dériver ces informations en faisant le rapprochement ou le couplage des différentes sources de données. Si c'est impossible, on recommendera de modifier les enquêtes actuelles de façon à faire la collecte de cette information précise. Encore là, on devra évaluer sérieusement si le répondant a la capacité de fournir l'information.

Quelques problèmes et leurs solutions

Transport ferroviaire

Une forte proportion des marchandises transportées par "remorque sur wagon plat" (RSWP=TOFC en anglais) et par "conteneur sur wagon plat" (CSWP=COFC en anglais) n'étaient pas identifiables. À partir de 1994, la majorité des mouvements intermodaux du CN/CP seront identifiables par marchandise. Ces distributions pourront servir à calibrer les données des années précédentes.

Il faudrait aussi revoir la définition de l'indicateur "intermodal" ou préférablement le remplacer par un indicateur de RSWP et de CSWP. Cela permettrait une meilleure comparaison avec les données sur les conteneurs du transport maritime et les données sur les remorques ou les conteneurs du transport par camion.

Finallement, les données du transport des sociétés ferroviaires de classe II seront converties et intégrées à la base de données en éliminant le double comptage avec le CN/CP. Ce processus n'est pas nécessairement évident, mais en posant certaines hypothèses, on devrait pouvoir obtenir d'excellentes estimations. Rappelons qu'en terme de tonnage, ces mouvements représentent le quart des mouvements ferroviaires au Canada. Par contre, il s'agit surtout de marchandises en vrac.

Transport par camion

La grosse lacune de l'enquête sur l'origine et la destination des marchandises par camion est l'absence d'un indicateur intermodal. Idéalement, il faudrait:

- un indicateur intermodal qui indiquerait si la remorque, le conteneur ou le camion a voyagé sur un wagon (piggyback);
- un indicateur qui nous informe si la marchandise était dans un conteneur ou pas;
- un indicateur qui nous informe si la marchandise provient d'importations maritimes ou est destinée aux exportations maritimes.

Transport maritime

On doit intégrer les données sur le nombre de conteneurs et sur les UEVs. Cette information n'est actuellement pas disponibles par marchandises. Elle pourrait l'être à compter de 1996, du moins partiellement. En attendant, on pourrait dériver des ratios de tonnes par UEVs, par marchandises.

Estimations des matrices O/D pour les autres modes de transport

Comme on l'a vu plus tôt ainsi qu'au tableau 2, il y a moyen de faire des estimations des matrices O/D en terme de tonnage à partir de l'information

fragmentaire disponible de certaines sources. Si ces estimations sont moins précises au départ, elles le deviendront au moment de la confrontation et de la réconciliation de toutes les matrices O/D et du processus d'équilibrage dont on discutera plus loin. Les données seront réajustées en conséquence de façon à équilibrer les données du transport, de l'offre, de la demande, des importations et des exportations. Voici la liste des matrices à estimer:

- transport routier pour compte d'autrui de niveau III;
- transport routier pour compte d'autrui ayant des revenus d'exploitation de moins de $25,000;
- transport routier pour compte d'autrui effectué au Canada par des transporteurs américains;
- transport par avion;
- transport par services de messageries;
- transport par autobus;
- transport par pipelines.

Variables souhaitables

Lorsque certaines variables ne sont pas disponibles de certaines sources, il faudra décider de modifier les enquêtes pour les recueillir ou les dériver. En voici quelques exemples:

- UEVs;
- Distance;
- Recettes;
- Corridors.

Classifications des biens

Un obstacle majeur à l'intégration des données provenait du fait que les sources disponibles utilisaient un grand nombre de classifications différentes des biens. Nous avons donc développé une classification type des biens transportés basée sur le Système Harmonisé (S.H.). Le Système Harmonisé est une norme internationale qu'un grand nombre de pays ont adopté, dont le Canada. Statistique Canada a la ferme intention d'utiliser la base du S.H. dans ses enquêtes liées aux marchandises. La CTBT a été développée conjointement avec le gouvernement américain et consiste en une liste structurée de biens transportés. C'est un système hiérarchique à quatre niveaux basé d'abord sur le S.H. Chaque catégorie est conçu pour capturer des données significatives. Chaque niveau d'agrégation couvre l'univers des biens transportés. On a de plus donné au niveau le plus agrégé (à 2 chiffres = 46 catégories) une structure similaire à celle de la classification par industrie d'origine pour faciliter le rapprochement avec les bases de données qui utilisent la Classification type des industries (CTI).

Le développement de cette classification était vital à la poursuite de l'intégration des statistiques sur le transport multimodal. Parallèlement, nous avons développé des tableaux de concordance entre les anciennes classifications modales et le SCTG. Dans le cas des matières premières, la concordance est très satisfaisante. Toutefois, pour les produits finis ou semi-finis, la prudence est de rigueur puisque les systèmes de classification sont parfois complètement incompatibles pour l'instant. L'adoption et la mise en opération de cette nouvelle classification facilitera beaucoup l'intégration des données et augmentera la fiabilité des données grâce à l'utilisation de descriptions uniformes des biens.

Imputations

Il arrive parfois que les répondants des principales enquêtes modales nous rapportent des descriptions trop générales en ce qui concerne les biens transportés comme "nourriture" ou "matériel de construction". Nous utiliserons les systèmes d'imputations généralisés pour en faire la redistribution dans les catégories de biens appropriées.

En ce qui concerne les enquêtes sur les autres modes de transport (services de messageries, autobus, ...) pour lesquelles les données ne sont pas disponibles par marchandise, on pourrait utiliser les distributions de "l'Enquête sur les mouvements des marchandises" des américains ("Commodity Flow Survey"=CFS).

Intégration des données du commerce international

Les données du commerce international concernant la valeur et la composition des marchandises sont très fiables puisqu'elles proviennent de fichiers administratifs qui servent à l'application des règlements sur les importations/exportations et sur l'établissement des tarifs douaniers. Par contre l'emphase est mise sur les flux de marchandises entre le pays de production des biens, le pays de consommation et le lieu de dédouanement. Les statistiques sur le transport mesurent, elles, les flux de marchandises de leur point de chargement à leur point de déchargement. L'intégration des données du transport et celles du commerce international donne donc une plus-value aux données puisqu'elle bénéficie des avantages des deux sources. Comme on peut le voir au tableau 2, les variables des fichiers du commerce international sont très compatibles avec les données du transport et devraient s'intégrer assez facilement à notre base de données intégrée. Par exemple, ils utilisent le S.H. comme système de classification des biens et il existe une variable sur les modes de transport utilisés.

Un autre grand avantage est le fait que les fichiers du commerce international maintiennent deux variables clés à un niveau désagrégé, soient les

valeurs ($) des marchandises et leurs quantités. Cela nous permettra de dériver des valeurs unitaires, qui serviront à leur tour à dériver les valeurs des marchandises des autres sources de données pour lesquelles on n'avait que les quantités, ou vice-versa. Quelle est l'intérêt de connaître les valeurs des biens transportés? D'abord, à faciliter les rapprochements entre les données du transport et les données de l'offre et de la demande qui sont exprimées le plus souvent en terme de valeurs. On élaborera sur ce point dans la section suivante. En plus, elle nous donne une autre perspective quand à l'importance des marchandises transportées au lieu de toujours mettre de l'emphase sur le tonnage qui met surtout en évidence les marchandises en vrac.

Modèle proposé

Jusqu'à présent, nous avons surtout expliqué comment résoudre les problèmes de base de l'intégration des données de différentes sources. Tout cet exercice vise cependant une étape cruciale, soit la modélisation des flux de transport des biens. En effet, dans la première étape, on a suggéré de créer des matrices origine/destination par marchandise pour tous les modes de transport et pour le commerce international ainsi que les matrices origine/destination par marchandise de l'offre et de la demande. Dans la deuxième étape, nous procèderons à la confrontation et à la réconciliation de ces données.

En fait, la procédure s'inspire du Système de comptabilité nationale. On doit d'abord établir les matrices de l'offre et de la demande (origine/destination) pour chaque bien. L'offre totale de chaque province est égale à ses exportations internationales, plus ses expéditions vers les autres provinces et vers les acheteurs de la province. Elle comprend les retraits des stocks des producteurs. Parallèlement, le total de la demande de chaque province est égale à ses importations internationales, plus ses achats des autres provinces et des vendeurs de la province.

La somme pour les provinces et les territoires de leurs importations et exportations internationales, de leur offre totale et de leur demande intérieure donne le total canadien. Ces identités servent à établir les contrôles nationaux et provinciaux et définissent un ensemble de contraintes qui permettent de vérifier par recoupement, la validité et la cohérence de chaque élément d'information. C'est par rapport à ces contraintes et ces contrôles qu'on pourra dériver des données sur le transport multimodal ou unimodal des biens.

Il va de soi qu'au départ, les matrices O/D ne s'équilibreront pas automatiquement puisqu'il peut exister des biais dans les différentes sources que nous utilisons. Lorsque les valeurs des données originales ne satisferont pas aux identités établies, on apportera des ajustements aux éléments dont les données

nous semblent plus faibles et ce, dans un processus itératif. On utilisera une méthode d'équilibrage statistique pour obtenir l'équilibrage final.

Une fois que nous aurons une bonne idée du total de chaque marchandise qui a été transportée au Canada, nous serons en mesure d'évaluer les modes de transport utilisés, les origines réelles et les destinations finales de ces marchandises. Les points de transfert seront validés par rapport aux infrastructures connues ainsi qu'aux données sur l'origine et la destination de chacun des modes de transport. Toute cette information sur une base intégrée et consistente permettra de comprendre les flux des marchandises peu importe si elles ont été transportées de façon unimodale, intermodale ou multimodale.

Utilisation de la base de données

La démonstration qui suit constitue une brève incursion dans une base de données intégrée vraiment préliminaire qui ne vise qu'à démontrer le potentiel d'utilisation et la flexibilité d'un tel outil. Elle est préliminaire parce qu'elle n'intègre actuellement que des données du transport maritime, ferroviaire et par camion. Notre intention est d'intégrer d'autres sources de données comme celles du commerce international, des autres modes de transport et des industries productrices de biens. Il nous reste aussi à résoudre certaines questions de confidentialité et de fiabilité des données contenues dans la base.

Nous allons donc vérifier si la base de données permet de répondre rapidement à des questions spécifiques qu'un utilisateur potentiel est en droit de se demander, ou du moins, lui donner suffisamment de pistes ou d'information pour lui permettre de comprendre un phénomène particulier. Veuillez noter que toutes les données de la démonstration se rapportent à l'année 1992[6].

- Quels sont les principaux mouvements multimodaux du charbon en relation avec nos importations et nos exportations du charbon?
- Comment les données du transport de charbon se compare-t-elle aux données de l'offre et de la demande de charbon et les données du commerce international?

La base de données indique que 91% des 27.2 millions de tonnes de charbon exporté du Canada quitte le pays des ports de la Colombie-Britannique, dont 18.4 millions du port de Vancouver et 6.1 millions de Prince Rupert. Le Canada exporte 15.9 millions de tonnes de charbon au Japon dont 9.3 millions partent de Vancouver et 100% du charbon chargé à Prince Rupert. La Corée du Sud vient au 2^{e} rang avec 4.5 millions de tonnes expédiées exclusivement de Vancouver. De l'autre côté du pays, 2 millions de tonnes sont chargées au port de Sydney dont la moitié est expédiée au Danemark. Les statistiques de CN/CP

confirment que 8.2 millions de tonnes ont été transportés par train de l'Alberta vers la C.-B. et 15.3 millions de la C.-B., pour un total de 23.5 millions de tonnes; 99% de ces mouvements étaient destinés aux exportations maritimes. Ce chiffre se compare aux 24.9 millions de tonnes déclarées pour les ports de la C.-B. La différence s'explique par les données des sociétés ferroviaires de classe II qui seront ultérieurement intégrées à la base de données, ainsi que par la consommation intérieure que l'on retrouve dans les matrices de l'offre et de la demande du secteur du charbon[7].

- En terme de tonnage, quelle sont les marchandises les plus importantes reçues au Canada par les différents modes de transport et quels sont leur taux d'intermodalisme?

Les trois principaux produits reçus au Canada par voie maritime sont le pétrole brut (17 millions de tonnes), le charbon (12.7 millions) et le minerai de fer (5.6 millions). On constate que presque tout le pétrole brut est destiné à l'Est du Canada. Plus particulièrement, 6.8 millions de tonnes sont déchargées dans le port de Saint Jean au N.-B. Selon nos chiffres, ce pétrole n'est pas repris ni par les sociétés ferroviaires, ni par le camionnage, ni par le transport par pipelines. L'équilibre se trouve donc dans les matrices de l'offre et de la demande du pétrole brut qui confirment que tout ce pétrole est destiné au raffineries du N.-B. Ce mouvement est donc unimodal.

Au niveau du transport par camion, ce sont les pièces automobiles qui constituent la principale importation venant des É.-U. avec 1.2 millions de tonnes. Les statistiques du CN/CP liées à ce produit révèlent que seulement 72,000 tonnes des 450,000 tonnes qu'ils transportent sont intermodales avec le camion.

Pour CN/CP, ce sont les CSWP et les RSWP qui constituent les plus importantes marchandises transportées des É.-U. (1.4 millions de tonnes), suivies par les produits du papier avec près de 1 million de tonnes. Environ 57% des CSWP et ses RSWP reçus des É.-U. sont pour exportations maritimes et ce, presqu'exclusivement du port de Montréal et 43% constituent de l'intermodalisme avec le camion. Les points de transfert seront au Québec dans 50% des cas et en Ontario dans 30% des cas.

- Quelle est la marchandise conteneurisée la plus importante que nous exportons par voie maritime? Que nous importons par voie maritime? Qu'arrive-t-il à ces conteneurs avant et après leur arrivée aux ports?

Un million de tonnes de cargaison générale sont exportées du Canada par conteneur, suivi de 1/2 million de tonnes de bois de construction et 1/2 million de tonnes de fruits et légumes frais. Le total des exportations maritimes conteneurisées est de 7.4 millions de tonnes Les importations maritimes conteneurisées représentent quand à elles 5.3 millions de tonnes. Là encore, les cargaisons générales constituent la principale importation avec 1.2 million de tonnes, suivi des produits manufacturés divers, les articles de plastique et le vin. Si on reprend l'exemple du vin, 116,000 tonnes ont été déchargées dans les ports canadiens (Québec, C.-B., et N.-É.). Les statistiques du camionnage pour compte d'autrui montrent que 78,000 tonnes ont été transportées par camion. Il faudrait tenir compte ici de la consommation intérieure et des transporteurs pour compte propre.

C'est le genre de questions auxquelles on peut répondre présentement avec l'intégration des données de trois modes de transport. Lorsque nous aurons terminé l'intégration de toutes les autres sources et que nous aurons développé le modèle, nous serons en mesure de répondre à d'autres questions plus précises telles que:

- Comment et où sont distribuées les automobiles construites en Ontario, aux É.-U. ou reçues dans les ports canadiens?

- Quels sont les principaux points de transferts qui manutentionnent le fret conteneurisé et non-conteneurisé et quels modes de transport sont impliqués? Quels sont les volumes manutentionnés (UEVs, tonnes, nb de conteneurs)?

- Quelle est la quantité de produits manufacturés en Ontario qui est exportée en Europe ou en Asie? Quelle proportion est transportée par conteneur, par quels modes et par quelle route?

- Combien de conteneurs sont transportés par plus d'un mode de transport et dans quel corridor?

- Quelle est l'origine réelle et la destination finale d'un bien semi-fini tel que les produits d'acier laminés plats (iron plates, sheets and strip)? Quels sont les modes de transport impliqués?

- Quelle est le temps moyen et la distance moyenne d'un mouvement intermodal type, par marchandise?

Conclusion

Cette brève incursion dans une base de données intégrée pilote nous a permis de voir les possibilités d'un tel outil mais aussi d'identifier certaines lacunes parmi les sources de données que nous utilisons. Ceci nous permet donc de concentrer nos efforts à résoudre ces faiblesses dans les enquêtes actuelles.

Évidemment, il reste beaucoup à faire pour intégrer les autres sources de données comme celles du commerce international et les données de l'offre et de la demande des industries. Mais maintenant que nous avons développé une classification standardisée des biens, notre tâche sera d'autant plus facile. Quand aux secteurs de transport qui ne sont pas actuellement couverts (ex: services de messageries, autobus,...), dépendamment de la volonté des intervenants et de la disponibilité des ressources, il faudra décider si on doit recueillir l'information ou si on a suffisamment d'information pour faire des estimations raisonnablement fiables.

Références

(1) Containerisation International Yearbook
(2) Touhami Rachid Raffa, Canadian Transportation Research Forum, June 1992
(3) Containerisation International Yearbook 1989
(4) Bill Harbour, Policy and Coordination Group, Transport Canada
(5) American Association of Railways
(6) Base de données intégrée préliminaire, Division des transports, STC
(7) Statistique du charbon et du coke, cat. 45-002, STC

Tableau 1
Intégration des bases de données liées au transport multimodal
Les convergences et les divergences

		Principales enquêtes modales		
	Base de données intégrée	**Transport maritime**	**Transport ferroviaire**	**Transport par camion**
Mesures temporelles:	• Année civile	• Année civile • Mensuelle	• Année civile	• Année civile • Trimestrielle
Niveau géographique:	• Pays • Provinces	• Pays • Provinces • États • Ports canadiens • Ports étrangers • Régions canadiennes	• Pays • Provinces • Régions américaines	• Pays • Provinces • États • Régions métropolitaines de recensement
Concepts:	• Origine • Destination	• Arrivée/Départ • Port de manutention • Chargements/ Déchargements	• Lieu de chargements / déchargements	• Origine • Destination
Quantificateurs :	• Tonnes métriques	• Tonnes métriques • UEV • Nb de conteneurs	• Tonnes métriques • Recettes • Tonnes-km • Nb de wagons	• Kilogrammes • Recettes • Tonnes-km • Kilomètres • Expéditions
Indicateurs:		• Conteneuri-sation	• Intermodal • Interligne • Importations/ exportations maritimes • Porte d'accès	
Classification des biens:	• SCTG	• SCG-marine	• TFC-rail • STCC-rail	• SCC-truck
Autres variables:			• Compagnie de chemin de fer	Variables dérivées: • Recettes/Expéd. • Recettes/Tonnes • Recettes/Tonne-km • Tonnes/Expéd.
Type d'enquête:	• Modèle	• Recensement	• Recensement	• Échantillonnage (transporteurs et expéditions)
Méthode de collecte:	• Réconciliation et intégration	• Sources administratives	• Sources administratives	• Inspection des factures

Tableau 2
Intégration des bases de données liées au transport multimodal
Les convergences et les divergences

Autres, transport				Autres
Aviation	**Services de messageries**	**Autobus**	**Pipelines**	**Commerce international et industries**
• Annuelle • Trimestrielle		• Annuelle	• Annuelle • Mensuelle	• Annuelle • Mensuelle
• Pays • Province • Aéroports canadiens		• Canada • O/D non-disponibles	• Pays • Provinces	• Pays • Provinces
• Origine/Départ / Chargement • Destination/ Arrivée/ Déchargement		• Transport interurbain	• Livraisons • Arrivage • Transfert • Utilisation • Inventaires	• Importations • Exportations • Production • Consommation
• Tonnes métriques • Tonnes-km • Recettes tirées du transport de biens	• Recettes	• Recettes tirées du transport de bagages et de colis	• Mètres cubes • Revenus ?	• Valeurs ($) • Quantités
				• Province de dédouanement
Par marchandises non-disponibles	Par marchandises non-disponibles	• Bagages et colis	• Produits pétroliers et gaz	• Système Harmonisé
• Recettes-marchandises par tonnes-km • Transporteurs				• Classification des industries • *World Trade Base* • Modes de transport

Estimating the Value of Rail Car Accessibility for Grain Shipments: A GIS Approach

Eric L. Jessup, John R. Ellis and Ken L. Casavant*

Introduction

The rural transportation problem is a matter of distance, as opposed to the urban transportation problem of congestion. The production of agricultural and natural resource products typically requires movement from remote, rural locations to manufacturing centers (either domestic or abroad) for processing and distribution. The marketing of grain is one example where the commodity must traverse considerable distance between the geographical locations of production and consumption activities. The cost associated with transporting grain from production locations to final destinations is directly reflected in the producer price, providing the incentive for producers to minimize this cost component.

Grain farmers often have access to several transportation options for grain shipment: truck, rail and barge transport. The availability of different modal choices provides producers with flexible shipping options and a competitive balance between shipping rates of each mode. With unlimited access to each shipping mode and equal service attributes, producers naturally select the mode (or combination of modes) which minimizes the total transportation cost of moving grain to market. The modal selection for grain shipment depends on (among other things) the locational proximity of the producer to elevators (with and without rail loading facilities) and river ports and the handling and storage charges associated with each modal usage. However, there are often external constraints which limit the use of a particular modal choice at certain time periods, creating inefficient movement of grain at higher transportation costs. Rail car shortages is one external constraint which forces grain producers and handlers to utilize more costly truck transport.

The shortage of rail cars for grain shipments is a seasonal problem experienced by producers and grain handlers on an annual basis in Eastern Washington[1]. The problem arises from the seasonality associated with grain production, harvest and transport. Favorable marketing conditions from September through February encourage producers to ship the majority of grain

---

*Transportation Economist, Research Associate and Professor, respectively, in the Department of Agricultural Economics, Washington State University

during these time periods, with considerably less grain movement the remaining six months[2]. Consequently, the quantity of rail cars demanded is considerably larger during this time period.

Rail companies, however, invest in equipment (grain cars) with the anticipation of receiving a favorable return on investment, which is difficult if the rail car is not used throughout the year. Thus, to maintain a consistent return on investment, railroad companies attempt to purchase and allocate grain cars on a monthly basis, supplying a base number of rail cars throughout the year rather than supplying cars to meet peak demand. Unfortunately, the demand for grain cars is not evenly distributed throughout the year.

In addition to increased road damage, excessive energy utilization and safety concerns, rail car shortages have a negative impact on grain shippers through higher transportation cost and decreased service. More expensive truck shipments are utilized to either transport grain to river ports for barge transport or directly to final destinations. Increased time intervals for shipping grain from production areas to final destinations also limits the producers ability to supply domestic and international grain market demands[1].

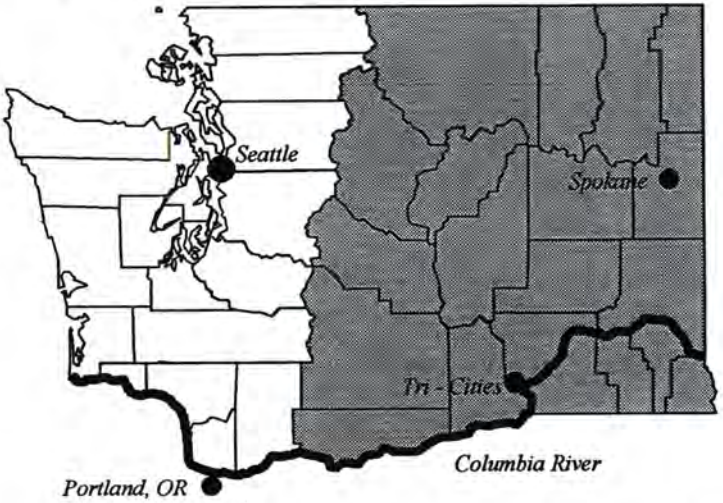
Objective and Approach

This study's purpose is to empirically estimate the value of rail car accessability to producers. Changes in transportation flows for different levels of rail usage in the 20 county grain production region of Eastern Washington (see Figure 1) are also determined. A transportation optimization model, implemented through a Geographical Information System (GIS) incorporating grain movements originating from 695 township centers and passing through over 400 grain elevators en route to final destinations, is descriptively and analytically developed. Impacts on producer's (private) cost of transportation are estimated. Producer's cost is estimated by constraining the volume of grain shipped on rail, thereby generating shadow prices reflecting the marginal value associated with relaxing rail constraints. Description of the data acquisition and modification procedures are first presented, followed by the transportation optimization model description.

Sources of Information

The transportation and marketing system being modeled involves grain movements from production areas in eastern Washington to feedlots and ocean ports for processing, consumption and export. Intermediate destinations, such

Figure 1. Eastern Washington Study Area

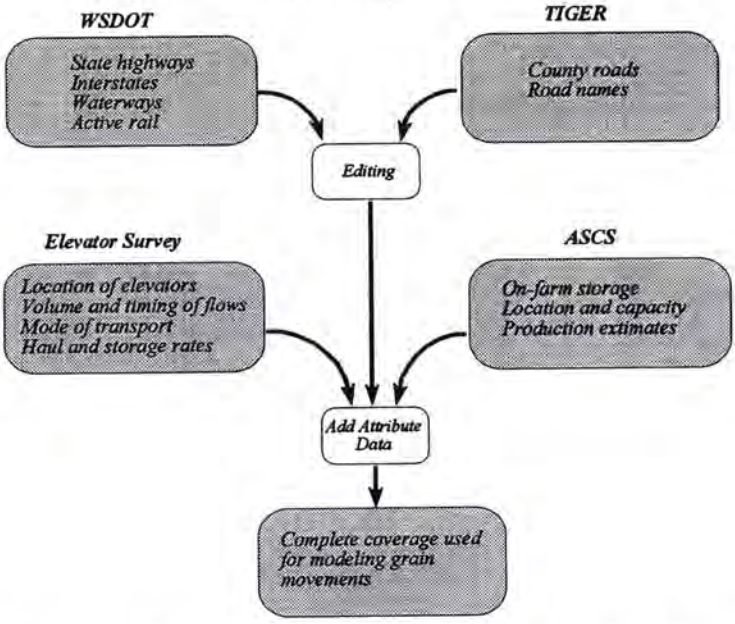


as elevators and river ports, serve as short (and long) term storage facilities, transfer stations and points of consolidation. Hence, information from each component of the system was needed on a common platform to facilitate investigation and analysis. The one common element in each component of the system being modeled is geography. The production areas, elevators, river ports, ocean ports and transportation infrastructure (roads, highways, rail lines, barges) are all connected through geography, creating an ideal environment for a Geographical Information Systems approach.

The GIS coverages were constructed primarily from four sources, as illustrated in Figure 2. The Washington State Department of Transportation (WSDOT) provided GIS coverages for most county, state, U.S., and Interstate highways, in addition to active rail lines and navigable waterways. However, these files weren't entirely complete; missing road names and lower density county roads were added from U.S. Bureau of Census Topologically Integrated Geographic Encoding and Referencing (TIGER) files. WSDOT and TIGER file coverages were merged and edited to remove any coinciding arcs or needless road coverages, resulting in a complete and non-duplicative coverage of the road and highway transportation network.

Additional information relating to the grain production areas and intermediate destinations (elevators and river ports) was obtained from the

Figure 2. Data and Information Sources



Agricultural Soil and Conservation Service (ASCS) and from an elevator survey sent to each of the 400 plus grain elevators in the study area. Detailed data concerning on-farm storage locations and capacities, in addition to acreage and production estimates within each township, were obtained from the ASCS. Elevator locations, capacities, handling and storage rates, and modal usage were acquired from the brief survey sent to all elevators in the study area. Over 90% of the surveyed elevators (96% of volume) returned completed questionnaires, providing valuable information on grain movements from production locations to final destinations and the modes utilized in the process. Transport rates for truck shipments were also obtained from the elevator survey. Rail rates were collected from Burlington Northern and Union Pacific, the two class I railroad companies operating in the region, and barge rates were collected from barge companies operating on the river.

Optimization/Modeling Procedure

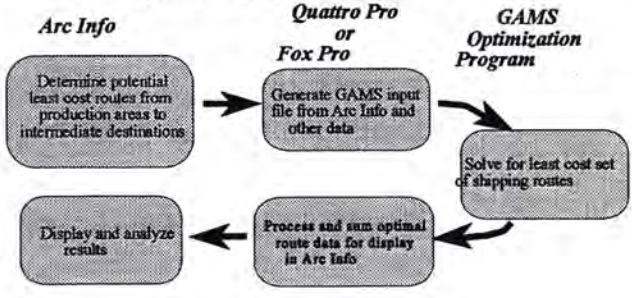
Several GIS software packages designed for transportation modeling and analysis do provide some limited internal optimization features. However, the

approach implemented in this analysis utilizes, for flexibility and robustness, an optimization package which is external to the GIS software. The process being modeled consists of one product (wheat), utilizing multiple modal options and passing through multiple intermediate destinations along several route options to different final destinations. The complexity associated with this transportation system necessitates a modeling procedure with tremendous flexibility at each phase of the transport process. Therefore, the optimization software used to allocate grain shipments on various modes and routes is called GAMS, an acronym for Generalized Algebraic Modeling System, and is external to the GIS software, Arc Info.

The method used to combine the GIS with the minimum cost transportation model is presented in Figure 3. Arc Info is used to generate a collection of minimum distance node combinations from township centers to elevators, township centers to ports, elevators to elevators, and elevators to ports. These distance tables are then exported to an intermediate program, such as Quattro Pro and Fox Pro, to generate cost coefficients which are used as an input file in the GAMS optimization model. At each phase of the transportation process, multiple shipment alternatives are incorporated into the optimization model to provide maximum flexibility. The nearest three intermediate destinations for each shipping point, whether shipping from township centers or elevators, are included in the choice set. Hence, should an optimization run, examining an alternative policy, preclude use of one of the three routes, the model still has several routing alternatives from which to choose. Once the set of minimum distance routes are compiled in ArcInfo, and associated cost components incorporated in Quattro Pro, the GAMS optimization software is used to determine the least cost set of shipping routes.

The GAMS model is a linear programming model where the objective is

Figure 3. Optimization Methodology using GIS and external optimization program, GAMS



to ship known quantities of grain from production points (township centers) to predefined destinations, while minimizing total transportation cost. The volume of grain supply (and demand) at each township (and final destination) is known. However, the volume of shipments on given routes and modes to reach the final destination is not known. The complexity increases with the introduction of intermediate destinations (elevators and river ports). The movement from production areas is predominately confined to truck shipments which generally haul directly to either river ports for barge transport or to elevators. Once the grain reaches the elevator, several possibilities exist for where and how it may move. If the elevator has rail access, the grain may be loaded onto rail for shipment to final destinations. If the elevator doesn't have rail access, then grain may be transhipped to another elevator with rail access or trucked to a river port for barge transport. The GAMS optimization model incorporates each of these modal shipment and route options at each stage of the grain marketing process, with the decision criteria at each juncture being cost minimization.

The optimization model also includes a variety of constraints which are constructed to maintain realism in the modeling process. A true optimization system would identify the origin points and the quantities to be shipped, the collection of possible routes on various modes, the cost associated with each route option, and the final destinations and then allow the linear program to solve for the least cost optimal solution. However, there are capacity constraints at the intermediate destinations which limit the amount of grain which can be handled at each location. There are also capacity constraints associated with usage of certain modes of transport, particularly for rail shipments. Therefore, to insure that these capacities and others relating to the origins and destinations are not exceeded, the following constraints are included in the optimization model.

Supply Balance Equation

$$\sum_{i=1}^{n} s_{ij} \leq S_j \quad \forall\ j \qquad \textit{Equation (1)}$$

Where s_{ij} is the ith grain shipment from township j and S_j is the available grain supply produced in township j. Thus, the supply balance equation prevents the total amount of shipments from any township from exceeding the available supply produced within that township.

Node Balance Equation

$$\sum_{i=1}^{n} x_{ij} = \sum_{i=1}^{n} y_{ij} \quad \forall \; j \qquad \textit{Equation (2)}$$

Here x_{ij} is the *i*th grain shipment into the *j*th intermediate location (river ports and elevators) and y_{ij} is the *i*th shipment leaving the *j*th intermediate location. Therefore, the total volume of grain flowing into intermediate locations must equal the amount flowing out of each location. This constraint abstracts from reality somewhat by preventing any grain storage. However, the analysis utilizes grain production and consumption volumes for the year and the majority of grain produced in a given year is marketed before the next harvest period.

Destination Balance Equation

$$\sum_{i=1}^{n} d_{ij} \geq D_j \quad \forall \; j \qquad \textit{Equation (3)}$$

This constraint verifies that the sum of all shipments (d_{ij}) to the *j*th final destination is greater than or equal to the grain demanded at each final destination.

Elevator Capacity Equation

$$\sum_{i=1}^{n} x_{ij} \leq C_j \quad \forall \; j \qquad \textit{Equation (4)}$$

This constraint assures that elevator capacity is not exceeded at any individual elevator. Here x_{ij} is the ith shipment into the *j*th elevator and C_j is the grain capacity at elevator *j*. Therefore, the sum of all shipments into a given elevator cannot exceed the capacity of the elevator.

Rail Capacity Equation

$$\sum_{i=1}^{n} r_{ij} \leq R_j \quad \forall \; j \qquad \textit{Equation (5)}$$

The rail capacity constraint controls the amount of grain which may be shipped on rail from any given elevator with rail access. The variable r_{ij} represents the *i*th shipment on rail from elevator *j* and R_j is the rail capacity at elevator *j*. Without a constraint on rail usage, the total volume of grain entering elevators

with rail loading facilities would likely be shipped on rail due to cheaper rates associated with rail transport. In reality, elevators in eastern Washington are forced to truck various amounts of grain due to market conditions and the limited availability of rail cars[1]. Thus, by constraining the amount of grain shipped on rail at each elevator, the optimization model closely represents actual grain movements in the region, and more importantly, produces shadow prices reflecting the marginal dollar value associated with relaxing rail constraints, the primary focus of this investigation.

The rail capacity constraint for each individual elevator represents the historical annual volume shipped on rail, as reported in the elevator survey[3]. These values represent the "base" scenario with increases and decreases applied later. Modifications to this constraint allows investigation of the sensitivity of shadow prices to changes in the quantity of rail shipments. The shadow price in this context represents the marginal value to the producer or grain shipper associated with relaxing the rail constraint (increasing the amount) one unit (bushel, ton, carload, etc.) Thus, increases and decreases of 10, 20, 30, 40 and 50 percent of the base value are examined to determine changes in shadow prices and the total transportation cost.

Results

Rail transport of grain is often cheaper than other modal options for most producers and grain handlers, except for those located within close proximity of a navigable waterway, such as the Snake/Columbia river system. These producers often truck grain directly to river ports for barge loading, usually avoiding handling and storage cost associated with movement through elevators, while realizing the full benefit of extremely low cost river transport[4]. Those producers located long distances from the river are limited by time and logistics during harvest season to either ship grain by rail, truck-barge, or storing the grain for future marketing. Rail car shortages for these producers and handlers increase the cost of transporting their crop to market, resulting in cost increases from storage, handling and transport rates.

It is not surprising, therefore, that the total cost of transporting all wheat produced in Eastern Washington to market consistently declines as the allowable amount of rail shipments increase, as displayed in Table 1. Transportation costs of $66.6 million with the most stringent rail constraint scenario decreases to about $66.06 million under the least rail constraining scenario, producing a savings of over $570,000. It is interesting to note the marginal changes associated with the total transportation costs for each rail use

situation. When rail capacity is heavily constrained to only 50 percent of

Table 1. Estimated value of rail car accessibility, rail volume and total transportation costs for different rail usage scenarios.

Scenario	Value Per Car $/Carload	Rail Volume (number of rail cars)	Total Transportation Cost ($)
50 % ⇓	128.9	2730.6	66,642,916
40 % ⇓	124.7	3248.9	66,575,471
30 % ⇓	121.1	3764.2	66,510,397
20 % ⇓	120.9	4279.4	66,447,949
10 % ⇓	114.2	4491.6	66,386,076
Base	126.3	5224.1	66,327,885
10 % ⇑	124.3	5648.1	66,270,066
20 % ⇑	122.6	6067.9	66,213,671
30 % ⇑	120.5	6465.4	66,159,093
40 % ⇑	111.6	6835.6	66,110,003
50 % ⇑	109.8	7171.6	66,065,905

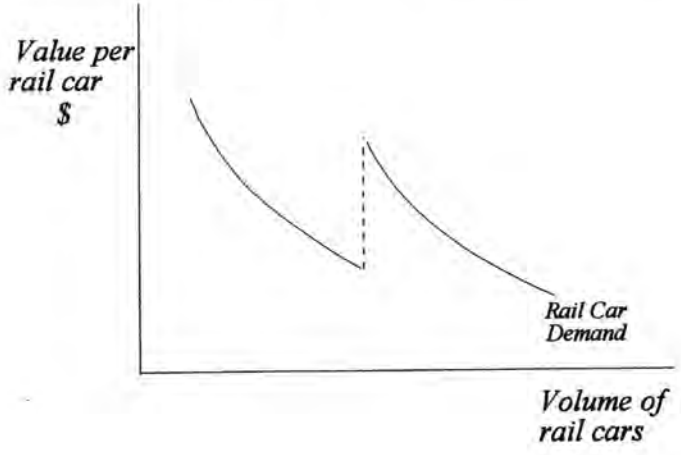
historical volumes, the decrease in total transportation costs associated with relaxing the constraint 10 percent is over $67,000. However, each additional increase in allowable rail shipments has a steadily decreasing impact on the magnitude of transportation cost savings. Increasing the rail constraint from 40 percent to 50 percent above the base scenario decreases total transportation cost only $44,098. Stated differently, rail car shortages increase transportation cost at an increasing rate. The cost, for example, to producers associated with a rail car shortage of one car is more than doubled when the rail car shortage increases to two cars. Grain producers and handlers, therefore, are severely impacted by large, prolonged rail car shortages.

The value per rail car associated with relaxing the rail constraint one car for each scenario is also included in Table 1, along with the volume of rail shipments in number of cars. In a sense, this schedule of values and quantities is an estimate of the demand relationship for rail cars used for grain transport. Each scenario represents a point on the demand curve, representing the quantity of rail cars for various rail car values. And, if the value per rail car

were assigned to the vertical axis and the quantity of rail cars attached to the horizontal axis and each of these points plotted, a downward sloping curve would result, as expected for demand relationships. It would be downward sloping to the right except for one noticeable "lump". The value per rail car declines as the rail constraint is relaxed up until the base scenario. Here the value per rail car has a dramatic jump in value, then declines again as rail volume is increased. This relationship, characterized generally in Figure 4, is unlike the smooth, continuous demand relationship we usually expect. The question to be answered is why does the value of rail accessability increase as the amount of rail usage increases.

The explanation for this phenomenon rests in the procedure used for estimating the value of rail car accessability and the nature of rail shipments and rail car allocation in the region. Each elevator in the region is limited to the historical annual amount of grain for rail shipments, as identified in the grain survey. Whenever this constraint is binding for an individual elevator, a shadow price is generated representing the difference between transporting grain via rail and the next cheapest method of reaching the final destination. Whenever this constraint is not binding the value associated with having access to an additional rail car has no value since there is currently unused rail

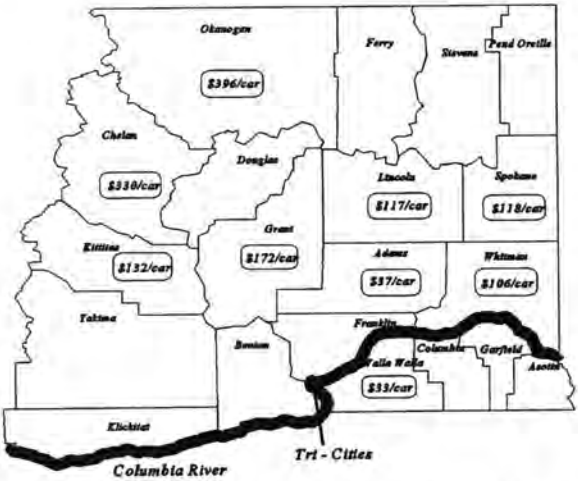
Figure 4. General shape of rail car demand for wheat shipments.



capacity. Only elevators with binding rail constraints, and therefore shadow prices, are used in evaluating the value of rail car accessibility. Elevators with rail capacity and no shadow prices are not incorporated into the estimation process because excess capacity at one elevator does not necessarily translate into additional rail cars for those elevators with car shortages. Each elevator is allocated rail cars by rail companies based upon their historical use, with limited opportunities for car transfers. There are opportunities for arbitrage through the purchase of certificates of transport (COTS) from rail companies at a premium, similar to buying an option to purchase or sell rail cars at a future date. There could also be some internal transferring of grain cars among elevators owned by a single firm. The extent of this practice and the additional price premium for COTS, difficult to implement into this modeling procedure, therefore causing these estimates to potentially over estimate, to some degree, the true value of rail car accessibility.

Increasing the allowable amount of rail usage generates more elevators with zero shadow prices, especially for elevators within close proximity of barge transport. When the rail constraint was increased from a 10 percent decrease to the base scenario those elevators located fairly close to the river (and not desiring to use rail) generated zero shadow prices, with the remaining shadow prices from further north of the river being considerably higher. Since the zero shadow prices are not included in the estimation process, the result is a higher value for rail car access. This situation is illustrated in Figure 5 where the value of rail car access is calculated for each county for the base scenario. Those counties without estimates were either void of elevators with rail access or the rail constraint wasn't binding. However, the value of rail access for those counties close to the Snake/Columbia river is less, compared to those counties further from the river. The difference in rail value is directly proportional to the distance from the river. Larger distances require increased trucking cost to reach the river or ship directly to market, thus producing larger shadow prices. The value of an additional rail car to an elevator who can use barge without incurring much additional cost is small compared to someone who must truck grain long distances in the absence of rail.

336*Figure 5. Estimated Value of Rail Car Accessibility for Wheat Shipments in Eastern Washington, by county.*



The estimated value per car for each scenario in Table 1 also represents a market for rail service above the current rail rates. While most of this value represents the additional transportation cost (trucking and barge rates) associated with transporting grain to market in the absence of rail, this value also includes storage, handling and interest cost from grain that must be stored for some period while waiting for shipment. Hence, this value also offers some measure of the opportunity cost associated with rail car shortages. Additionally, these estimates may provide producers, grain handlers and Washington State DOT officials with information regarding potential rail car investment opportunities.

Summary and Conclusions

This study has taken an unconventional approach to investigating the annual occurrence of rail car shortages in Eastern Washington. The approach is unconventional in the sense that both GIS and classical linear optimization technologies are used, but maintained separately, to model grain movements from production to final market and investigate the value of rail car access under different rail usage scenarios. This procedure offers considerably more flexibility in modeling transportation systems which require powerful optimization capabilities such as modeling grain movements in Eastern Washington. The GAMS optimization software is used in this analysis and is external to the Geographic Information System, Arc Info. Many different types

of policy analyses involving transportation modeling, planning and infrastructure investment decisions are natural using the approach incorporated in this study. Issues such as railline abandonment, road closures, highway impact analysis and river drawdowns are more completely evaluated and addressed using this type of modeling framework.

Eleven different rail usage scenarios are considered for estimating the value associated with rail car accessibility. Rail transport at each elevator is constrained within the optimization model to historical levels and increases (and decreases) of 10, 20, 30, 40 and 50 percent of this base level are analyzed. Total transportation costs decline considerably with each allowable increase in rail transport, as expected. However, the decrease to total transportation cost becomes smaller for each successive increase in rail access. Therefore, the adverse impacts to grain producers and handlers, in terms of increased transportation cost, storage and handling cost, and interest cost, increases substantially as rail car shortages become more severe.

The value of rail car access varied from $128.9 per rail car in the most restrictive rail use scenario to $109.8 per rail car when rail constraints are increased to 50 percent above historical levels. These estimates disregard elevators without binding rail constraints, assuming no transferring of cars between elevators which may exaggerate these values of rail access somewhat. However, these rail car values represent a market for additional rail cars above the current rail rate. Rail companies operating in the region may utilize these estimates to develop car allocation systems which serve this market more effectively while increasing profits.

References

1. Kenneth L. Casavant and Richard Mack. "An Economic Evaluation of the Performance of the Washington State Department of Transportation Grain Train Project." Prepared for the Washington State Department of Transportation. February, 1996.

2. William R. Gillis, Eric L. Jessup and Kenneth L. Casavant. "Movement of Freight on Washington's Highways: A Statewide Origin and Destination Study." Eastern Washington Intermodal Transportation Study Report #9. Washington State University/Washington State Department of Transportation, November 1995.

3. Jonathon R. Newkirk and Ken A. Eriksen. "Transportation Characteristics of Wheat and Barley Shipments on Haul Roads To and From Elevators in Eastern Washington." Eastern Washington Intermodal Transportation Study #5. Washington State University/Washington State Department of Transportation, March, 1995.

4. Freight Services Incorporated (FSI). "A Review of Eastern Washington Grain Car Supply, Impacts on Shipping, and Need for Governmental Intervention." Prepared for the Washington State Department of Transportation. September, 1993.

FARM TO MARKET GRAIN MOVEMENT

by Arthur Friesen and Jerry Fruin

Introduction

Every year Minnesota farmers haul nearly a billion bushels of grain from their fields. Our knowledge of how they complete this task generally has been based on anecdotes and opinions. Little research has been conducted on types of equipment, distance to markets, and the surface types of roads used for grain hauling. In this article we report some recent research that examines farm-to-market grain movement in Minnesota. A survey of 651 producers from three crop reporting districts helps us answer such questions as:

- What type of grain hauling equipment are producers using?
- How far do producers travel to deliver their grain?
- How important is custom hauling?
- Are there regional differences in grain hauling equipment and its use?
- Are farmers by-passing local elevators and hauling grain directly to river and lake terminals?

The USDA's Department of Agriculture Marketing Services funded this study. They recognized that since 1980, significant changes have occurred in the farm, grain, and transportation sectors of the United States but that little is known about how farmers have adjusted their grain hauling practices. USDA's hypothesis was that trucks move nearly all grain from the farm to the first point in the marketing channel. Gravity wagons were not considered and expectations were that semis would be used extensively. Our literature search in several on line databases failed to turn up current information on farm to market grain movement. Their intuitions were correct, in that little information is available on farmers grain hauling practices.

Background

We surveyed a random sample of Minnesota farmers in crop reporting districts 1 (northwest), 7 (southwest) and 9 (southeast), to analyze the movement of their 1994 grain crop. The telephone survey was conducted by the Minnesota Agricultural Statistics Service. Eligibility was defined as a combined corn, soybean, wheat, and barley acreage greater than 120 acres. Useable data was obtained from 212 eligible farmers in the northwest, 229 in the southwest, and 210 in the southeast. Figure 1 shows the location of each of these crop reporting districts.

Because the farmers were selected randomly, the survey is a statistically valid representation of each district. However, as this is not a "statewide" survey, results are only representative of each of the three districts. The districts were chosen to represent different types of grain production and differing distances from river and lake terminal elevators.

The northwest is predominantly a wheat, barley, potatoes, and sugar beet

growing region with relatively limited livestock production. Port facilities at Duluth/Superior and the Mississippi River are at least 200 and as far as 380 miles from points within the northwest district. Main line rail service to the west coast as well as to Duluth/Superior and the Mississippi River are available in the district. The average size of respondents' farms was 1,239 acres.

Figure 1 Minnesota



The southwest district is one where corn and soybeans dominate crop production and hogs are the most important livestock enterprise. River terminals at Savage on the Minnesota River and at various points along the Mississippi River are at least 100 miles and as far as 275 miles from farms in the district. Main line rail service is available in the southwest district with a number of subterminals that ship grain to the west coast as well as to the Gulf and the Twin Cities. The average size of respondents' farms was 565 acres.

The southeast is a corn and soybean growing district with substantial dairy, hog, and beef cattle production. The Mississippi River, along the district's eastern border is the location of several river terminals. These terminals, as well as those located at Savage on the Minnesota River, are at most 120 miles from points within the district. The southeast district has main line rail service to the Twin Cities and the Gulf. The average size of respondents' farms was 552 acres.

Equipment available for farmers moving grain ranges from gravity wagons to various types of trucks. Gravity wagons are hopper-bottom boxes mounted on a two axle wagon frame with capacities ranging from 150 to 700 bushels. Tractors and pickups are commonly used to tow, by law, a maximum of two gravity wagons. Straight trucks used to haul grain typically have a capacity of 200 to 400 bushels, and tandem axle trucks handle between 400 and 600 bushels. Tractor trailer combinations (semis) are the largest type of equipment used to haul grain with capacities ranging to over 900 bushels.

Grain marketing facilities, in addition to river and lake terminals, include local elevators, processors, seed companies, and neighboring livestock producers.

Equipment Used in Transporting Grain

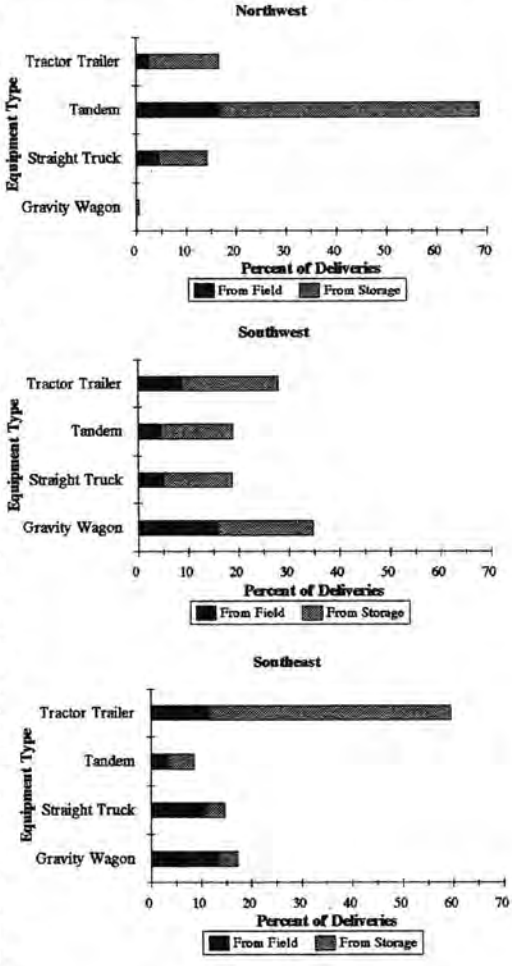
There are significant differences in the types of equipment used to transport grain in the three crop reporting districts. Figure 2 shows seasonal grain transportation by equipment type and by district.

In the northwest the most common means of transporting grain is by tandem truck. Tractor trailers and straight trucks are also used but to a much lesser extent. In southwestern Minnesota, gravity wagons are used to haul the majority of grain to

market. Here, each type of truck is also used, with tractor trailers hauling the most grain of the three types of trucks. Southeastern Minnesota's grain hauling is dominated by tractor trailers. Gravity wagons haul the largest proportion of grain delivered at harvest. In total straight trucks and gravity wagons are used for nearly equal proportions and tandems are little used.

With the exception of tractor trailers in the southeast, the use of grain hauling equipment is reflective of the number of units owned. Table 1 shows the number of units of grain hauling equipment owned and their average size by type and district. The ownership of tractor trailer units is not concentrated in any one of the crop reporting districts surveyed, although they are used extensively in the southeast. Extensive use of custom haulers in the southeast clarifies the apparent discrepancy between the number of units owned and proportion of grain hauled. Tandem axle trucks are by far the most numerous in the northwest. Gravity wagons are the most numerous type of grain hauling equipment in both the southwest and the southeast. Straight trucks, in terms of number per district and percent of grain hauled are the most uniform among the three districts.

Figure 2 Seasonal Grain Transportation by Equipment Type



Producers, frequently own multiple units of grain hauling equipment. One producer in the southeast owned nine gravity wagons. In the southwest and southeast district, 59% and 55% of producers interviewed owned at least three gravity wagons, and 42% and 36% owned at least four units, respectively. In the northwest, 65% of

producers owned at least two tandems, and 29% owned at least three. Few producers owned more than one tractor trailer, although one producer owned three.

The ownership of grain hauling equipment is related to farm size. Larger farms tend to own larger types of equipment, and also more units per farm. Farms in excess of 750 acres (36% of the respondents) owned 62% of the semis, 76% of the tandems, and 68% of the grain carts. This same group of farmers own on average 3.35 units per farm. Farms of less than 750 acres (64% of the respondents) owned 80% of the of the gravity wagons, 59% of the straight trucks and on average 3.0 units of grain hauling equipment per farm.

Table 1 Grain Hauling Equipment, Number of Units and Average Capacity Owned by Respondents

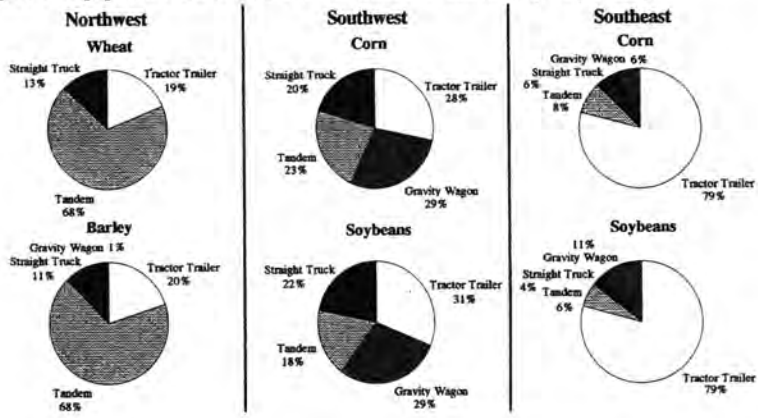
Type of Equipment	Northwest		Southwest		Southeast	
	Units	Capacity (Bushels)	Units	Capacity (Bushels)	Units	Capacity (Bushels)
Gravity Wagons	66	261	603	302	457	291
Straight Trucks	158	331	115	343	120	336
Tandem Axle	327	541	66	542	39	544
Tractor Trailers	21	919	20	842	17	852

The equipment used in grain hauling also reflects different transportation patterns between those used at harvest and deliveries from storage to market throughout the year (Figure 2). Only 24% of the grain was delivered to market at harvest time in the northwest but in the southwest and southeast 34% and 40% of the grain marketed was delivered at harvest. Deliveries to market at harvest are dominated by tandems in the northwest, gravity wagons in the southwest, and in the southeast, gravity wagons, straight trucks and tractor trailers deliver nearly equal proportions. Surprisingly, tractor trailers are used for a substantial proportion of deliveries at harvest. Deliveries to market from storage are dominated by tandems in the northwest, and tractor trailers in the southeast. Deliveries from storage in the southwest are not clearly dominated by one type of equipment as in the other districts.

The type of equipment used to deliver each type of grain to market at harvest varies, as shown in Figure 3. In the southwest and southeast, tractor trailers are used to handle more corn than soybeans and gravity wagons haul more soybeans than corn. In the case of tandems and straight trucks little variation between proportions of corn and soybeans delivered to market occurs. Between wheat and barley, tractor trailers are more dominant in wheat and tandems more dominant in barley. The use of straight trucks delivering grain to market at harvest is nearly equal for wheat and barley.

The type of equipment used to deliver grain from storage varies little by crop, as is shown in Figure 4. Between wheat and barley, the largest variation in proportions delivered occurs with straight trucks. In the southwest, each of the four types of equipment are used almost equally for both corn and soybeans. Tandems tend to be used slightly more for corn than for soybeans.

Figure 3 Equipment Used to Haul Grain to Market at Harvest, by Major Crop

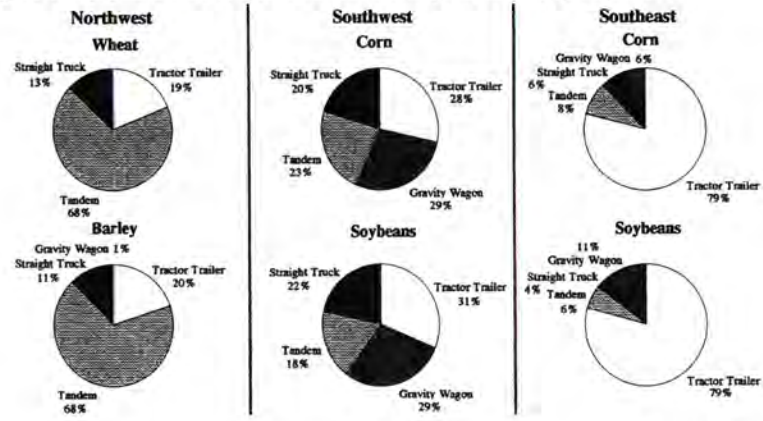


Not all farmers use their grain hauling equipment to the same extent. Based on the average size of the equipment and number of bushels hauled, we were able to calculate the average number of loads delivered, by district, by equipment type. With the exception of tractor trailers, farmers in the southwest used their trucks and gravity wagons to haul more loads per unit than in either of the other districts, as shown in Figure 5. Tractor trailers, used by farmers, received the most extensive use in the southeast where they averaged 79 loads per unit.

Custom Hauling

Custom hauling accounted for 23% all farm to market grain movement in the three districts combined. In the southeast custom hauling accounted for 45% of all

Figure 4 Equipment Used to Haul Grain from Storage to Market, by Major Crop



farm to market grain movement, 15% in the southwest and only 6% in the northwest. Custom haulers used tractor trailers almost exclusively.

A substantial portion of grain delivered from producers in the southwest (24%) and southeast (14%) by custom haulers was picked up in the field at harvest, as shown in Figure 6. Of the grain picked up by custom haulers in the northwest, less than 5% came from the field at harvest.

The producers interviewed made substantially more use of custom haulers to deliver corn than for any other crops. Custom haulers were responsible for delivering up to 30% of the corn crop, as shown in Figure 7. Twenty-three percent of the soybeans, 6% of the barley and only 5.5% of the wheat was delivered by custom haulers.

Figure 5 Average Number of Loads per Unit

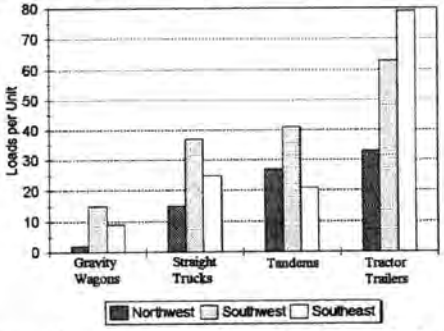


Figure 6 Bushels Delivered by Custom Haulers

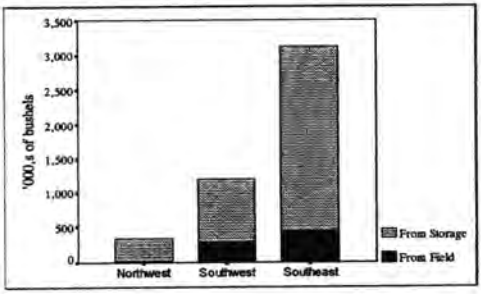
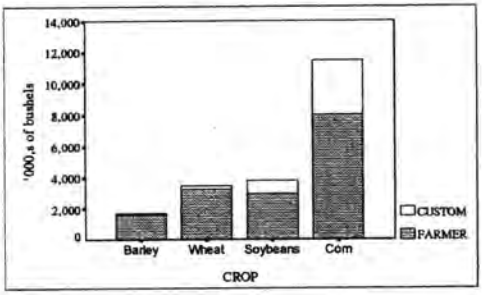


Figure 7 Bushels Delivered to Market, by Crop



Type of Markets

In the three districts combined, local elevators received nearly 72% of the grain delivered to market. Forty percent of the grain delivered to a local elevator was delivered at harvest and 60% was delivered from on-farm storage. Terminal elevators received the second largest proportion, 22%, of grain marketed in the three districts, 77% of this was from farmers in the southeast. Of the grain delivered to a terminal elevator, 13% was delivered from out of the field, and 87% from on-farm storage. Processors, seed companies, and neighboring farmers received the remaining 6% of grain delivered to market.

In the northwest and southwest districts, the local elevator is clearly the primary destination, receiving nearly 93% and over 79% of the grain delivered to market,

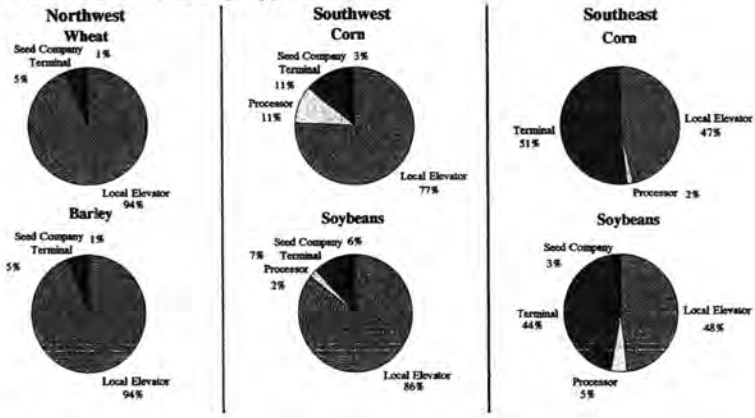
respectively. In the southeast, local elevators received just under half the grain delivered to market.

Farmers in the southeast delivered nearly 50% of their marketed grain to a terminal elevator. In the northwest, 4.5% of the grain delivered to market was delivered to a terminal elevator, and in the southwest, 10%.

In the northwest processors, seed companies and neighboring farmers received only 2.6% of the grain marketed, while in the southeast they received 4.1%. In the southwest, nearly 11% of the grain delivered to market went to these other facilities, with 8% going to processors. Figure 8 shows the percent of the total grain delivered to each type of market, by district, and by major crop.

Variation in the proportion of crops delivered occurred among the types of markets and districts, as shown in Figure 8 Wheat and barley marketed in the northwest and corn and soybeans in the southwest, are nearly all delivered to the local elevator. Terminal elevators and processors in the southwest receive a larger proportion of corn relative to soybeans. The marketing picture is substantially different in the southeast, where terminal and local elevators receive nearly all and equal proportions of the corn and soybeans marketed.

Figure 8 Grain Deliveries by Type of Market



By passing the Local Elevator

A concern with an increase in farmers using tractor trailers is that they will by-pass the closest local elevator for a better price or service in a larger center. When respondents were asked if they by-pass the closest local elevator when delivering grain at harvest, 17% responded that they did. In the case of deliveries from storage, a slightly larger proportion of respondents, 19%, said that they by-passed the local elevator.

We found that producers with the larger farms did not by-pass the closest elevator more often than those with smaller farms, but those with larger equipment did. Up to 30% of producers with tractor trailers by-passed the closest elevator. This

tendency was only true with 22% of producers with tandems, 18% with straight trucks and 18% with gravity wagons.

Ranking Markets

Producers were asked to rank distance, service, amenities, and best price or contract terms (best price) for each of the types of markets they delivered to. Surprisingly, producers ranked distance, over best price, as the most important reason why they delivered their grain to the local elevator. In the case of deliveries to processors, terminal elevators, and seed companies, best price was ranked as the most important and service second (Table 2).

Table 2 Weighted Index Ranking Types of Markets by Distance, Service, Amenities, and Price.

Type of Market	Distance (Rank Index)	Service (Rank Index)	Amenities (Rank Index)	Best Price or Contract Terms (Rank Index)
Local Elevator	3.12	2.19	1.37	2.92
Processor	1.87	2.62	2.12	3.45
Terminal Elevator	2.23	2.59	1.50	3.72
Seed Company	2.00	2.82	1.41	3.64

Transportation Distance and Road Surfaces

This study used three categories of rural roads: gravel (and dirt) roads, two-lane hard surface roads, and multi-lane hard surface roads. Our survey showed that producers in the three districts travel different average distances to transport their grain and that these distances vary with the type of equipment used and by the type of market delivered to.

Table 3 shows average distances by equipment type and by road surface for the three survey areas. The greatest distance is traveled by tractor trailers in the northwest, mostly on two-lane hard-surface roads. Contrary to our expectations, the southwest had the smallest average distance traveled by tractor trailers, most of it also on two-lane hard-surface roads. In the northwest and the southwest, tandem axle and straight trucks are operated over similar road types and distances. Gravity wagon trips average 5.4, 5.2, and 4.6 miles, respectively, about half of the distance over two-lane hard-surface roads.

The distance traveled to local elevators was less than half the distance to any other type of market in each of the three districts. Most of the distance traveled to local elevators was on two-lane hard-surface roads and on average, over at least 2 miles of gravel roads. Delivery distances on multi-lane hard-surface roads were longer than on two-lane hard-surface roads only on trips to seed companies in the southeast. In all other cases, delivery distance on two-lane hard-surface roads represented the longest portion of the trip to market. Unexpectedly, delivery distances to terminal elevators

Table 3 Distance Traveled by Equipment, by Road Surface Type

District		Tractor Trailer	Tandem Axle	Straight Truck	Gravity Wagon
Northwest	Gravel	3.7	2.4	2.5	2.9
	2-lane hard surface	47.5	6.2	5.2	2.2
	Multi-lane hard surface	32.2	.6	0.8	0
	Total	**83.4**	**9.2**	**8.5**	**5.4**
Southwest	Gravel	1.4	2.0	2.6	2.1
	2-lane hard surface	17.3	6.2	6.7	2.9
	Multi-lane hard surface	2.1	0.5	0.2	0.2
	Total	**20.8**	**8.7**	**9.5**	**5.2**
Southeast	Gravel	1.4	0.3	1.9	1.6
	2-lane hard surface	17.8	12.2	6.6	2.9
	Multi-lane hard surface	15.2	1.2	0.9	0.1
	Total	**34.4**	**13.7**	**9.4**	**4.6**

Note: The average miles listed are weighted by bushels carried on each trip.

were the longest only in the northwest. Delivery distances to processors and seed companies were the longest in the southwest and southeast, respectively. Table 4 shows the average distances traveled to markets, by road surface type.

In order to determine the impact on the road system from farm to market grain movement, we computed "bushel miles" by road type. Figure 9 shows that most of the bushel miles are over two-lane hard-surface roads. The largest proportion of the bushel miles moved on gravel roads is in the southwest.

The use of the road system by surface type does not reflect the mileage available. Gravel and dirt (gravel) roads represent 77%, 71% and 62% of the total mileage available in the northwest, southwest, and southeast, but are used for 12%, 18%, and 6% of the bushel miles, respectively. Conversely, hard surface mileage, which makes up the remaining mileage in each district, is used for 88%, 82%, and 94% of the bushel miles.

We were also able to determine what proportion of grain was never hauled on gravel or dirt roads. In the northwest, 22% of the grain marketed was not transported on such roads. In the southwest, 30% was not hauled on gravel or dirt roads and in the southeast, 36%.

Constraints to Grain Movement

In the state of Minnesota as in other northern states that go through seasonal thaws, spring weight restrictions are put in place to prevent damage to the road system. Nearly all farmers surveyed (97%) said they are affected by road restrictions at some point. Of those affected by spring road restrictions, 92% do not have an alternative route to market. Of farmers with alternative routes, those in the northwest must travel an additional 6 miles, those in the southwest travel an additional 5 miles, and those in

Table 4 Distance Traveled to Markets, by Road Surface Type

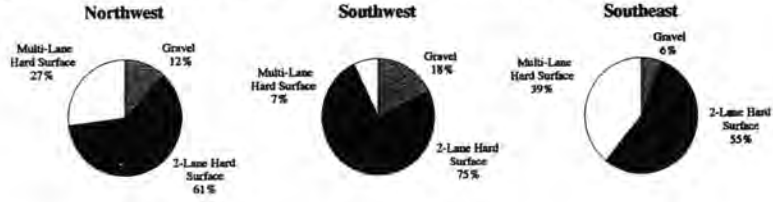
District		Local Elevator	Terminal Elevator	Processor	Seed Company
Northwest	Gravel	2.5	4.4	3.2	2.5
	2-lane hard surface	7.6	116.2	47.3	9.7
	Multi-lane hard surface	0.6	112.6	0	11.0
	Total	**10.8**	**233.2**	**50.5**	**23.2**
Southwest	Gravel	2.2	1.0	1.6	0.4
	2-lane hard surface	4.6	24.6	21.9	15.7
	Multi-lane hard surface	0.3	0.1	4.1	10.6
	Total	**7.1**	**25.7**	**24.6**	**26.7**
Southeast	Gravel	1.9	1.2	2.8	0.6
	2-lane hard surface	4.4	21.4	24.5	9.3
	Multi-lane hard surface	0.8	17.5	13.7	23.1
	Total	**7.1**	**39.2**	**41.1**	**33.0**

Note: The average miles listed are weighted by bushels delivered to each type of market.

the southeast an extra 11 miles. To avoid these extra costs, 76% of the farmers surveyed simply avoid transporting grain during the spring restriction period.

There are also specific restrictions placed on certain roads over the entire year. Apart from the spring and state wide restrictions, these occur on short road segments and on bridges. Physical constraints to grain movement such as bridge restrictions do not affect most of the farmers surveyed. Only 2% reported facing such physical constraints in delivering grain to market. The additional distance required to avoid physical constraints varies by the type of market to which grain is delivered. The additional distance was the least for delivery to local elevators, and greatest for delivery to terminal elevators and processors.

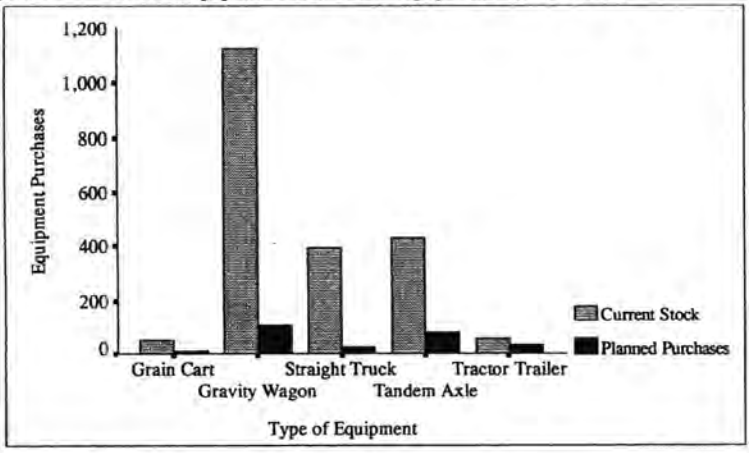
Figure 9 Proportion of Bushel-Miles, by Type of Road, by District



Equipment Purchase Plans

Producers were asked about plans to purchase additional grain hauling equipment (Figure 10). Thirty five percent of the producers surveyed plan to purchase more grain hauling equipment in the next 2 to 3 years. Planned purchases of tractor trailers represent a 60% increase over the 1994 inventory. Planned purchases of tandem axle trucks represent 18% of existing stock; grain carts represent 26%. As a proportion, plans for purchasing straight trucks and gravity wagons are much lower, equaling 7% and 9% of the 1994 inventory. With the excepting of grain carts, producers plan to purchase larger equipment, on average, than that which was in use in 1994.

Figure 10 Planned Equipment Purchase and Equipment Owned in 1994



Commercial Drivers License

Farmers delivering their own grain or farm products by truck within 150 miles of their residences and within their home state are exempt from having a commercial drivers license (CDL). Despite this exemption, 35% of the respondents said that they have a CDL. Are these farmers using their equipment for custom hauling or are they traveling farther than 150 miles to deliver their grain? It turns out that only 11% of farmers with a CDL, indicated they used their equipment for custom hauling, and 11% made deliveries to markets more than 150 miles from their farm.

Our Observations

Grain transportation practices differ greatly by region. Farmers in the northwest, characterized by Red River Valley agriculture, rely heavily on tandem axle trucks. Farmers in the southwest and southeast, producing corn and soybeans, rely much more on gravity wagons and semis. Larger capacity grain hauling equipment is correlated with increasing farm size.

We expected to find trucks and semis used to move most grain out of storage, but instead we found substantial use of gravity wagons for the purpose, especially in

the southwest.

Relative to farmers in the southwest, it appears as if farmers in the northwest do not operate their trucks as intensely. However, since farmers in the northwest also haul sugar beets with their trucks, they likely have more units than if they only hauled grain, resulting in an overall lower number of loads per unit.

A relatively small proportion of bushel miles are logged on gravel or dirt roads. Over half of the bushel miles in each area are on two-lane, hard surface roads. In the southeast and the northwest, 38% and 27% of the bushel miles are on multi-lane, hard surface roads. This is because of the large volumes moved to nearby river ports in the southeast and longer distance hauls to Duluth-Superior from the northwest. A substantial proportion of grain is never hauled on gravel or dirt roads but leaves the farm on a paved road.

Custom hauling varies in importance between regions ranging from 5% in the northwest, where farmer-owned tandems are the dominant mode, to 43% in the southeast where semis are the dominant transportation mode and numerous river terminals are located. Farmers hire custom haulers to deliver a larger proportion of corn than any other crop. Surprisingly, 24% of the grain hauled by custom haulers in the southeast was picked up in the field at harvest.

Local elevators are the dominant destination for farmer's grain, primarily due to the relatively short distance farmers must travel. Substantial direct marketing to river terminals is limited to farmers within less than 120 miles from such facilities. The most notable deliveries to processors were of corn in the southwest. Best price was ranked as the most important factor when farmers considered deliveries to terminals, processors, seed companies, and neighboring farms; distance was most important in the case of local elevators.

Of course, these results and conclusions must be interpreted with caution. This study covered only the 1994-95 crop year, and as such, will not incorporate price effects that alter grain marketing decisions. Farm-to-market grain flow transportation patterns and equipment use undoubtedly, vary substantially from year to year. However, this research provides some answers and insights on "farm to market grain movement."

"NOT WITH A BANG BUT A WHIMPER"

THE BIRTH, LIFE AND DEATH OF THE CROW RATES

Lessons for policy makers in an uncertain world

by

Paul D. Earl

Policy Manager

Western Canadian Wheat Growers Association

Disclaimer: The views in this paper are those of the author, and do not necessarily represent the views of the Western Canadian Wheat Growers Association.

Introduction

This paper is something of a personal reflection on the long and circuitous history of the "Crow's Nest Pass Rates" - or more correctly, since 1925, the "Statutory Grain Rates." Having personally spent a large portion of my career embroiled in western grain transportation issues, I have seen it transmute from an issue which was too sacred to discuss, to a fizzling squib as it died, in the words of T.S. Eliot, "not with a bang but a whimper."

It is *a propos*, therefore, to ask two pertinent questions: (1) Why did such a dramatic transformation occur? And (2) what can we as policy advisors and policy "decision-makers" learn from these events?

To answer these questions, we have to recognize that policy is never made in a vacuum, but always embodies society's underlying beliefs. And what I will argue in this paper is that the concerns and assumptions of the people who brought the rates into existence in 1897, were very different from those of the people who defended them from about 1920 to 1975, and both of these were very different from the concerns and assumptions of those who let them die in 1995. I want to uncover what some of those concerns were, and to argue the "Crow debate," at every stage of its evolution, was as much about public

philosophy, or ideology, as it was about either transport or economics.

The Birth of a Policy

To begin at the beginning, let's first look at why the rates were created in the first place.

The background to the original "Crow's Nest Pass Agreement" is fairly well known. The key objective was the economic annexation of the Kootenay region of British Columbia to Canada, and the arrest of further American control over the area. As such, the Agreement was a natural extension of the so-called "National Policy," whose objectives were to create an "inland empire" on the Prairies, to advance what was seen by the 19th century as "civilization," and to defend "British North America" from American expansion. Settling the "North West" - the vast thinly populated northern part the Great Plains - largely to provide a market for eastern manufacturers, was a key part of that policy, to be sure.

As such, the Agreement was consistent with one of the key assumptions of the National Policy, at least as Sir John A. Macdonald saw it, namely that railway development went hand in hand with national development. As Macdonald put it in a letter to CPR founder George Stephen in 1881, "in the long run [CPR's] interests and those of the Dominion are identical." (Friesen, p. 177.) This harmony of interest was assumed by the Crow's Nest Pass Agreement, in its implication that national sovereignty was to be exercised by the construction of the rail link from Lethbridge to Nelson.

However, if the Agreement's prime purpose was to cement Canadian sovereignty over the Kootenay area, why then did it also embody certain rate provisions? Were lowered rates required to encourage the prairie settlement necessary to implement the "National Policy?" Was the encouragement of western settlement present at all in the thinking of those who forged the Agreement?

If the Agreement itself is taken as evidence, it is doubtful. Its lengthy and legalistic preamble is silent on these issues, and only three of its 17 clauses relate to freight rates:

> Clause 10 specifying that rates over the Crow's Nest line, as well as rates between that line and the Company's main line, "shall first be approved by the Governor in Council or by a Railway Commission, if and when such a Commission is established."

Clause 11 specifying reductions on rates on a variety of commodities often referred to as "settlers' effects" (e.g.,agricultural implements.)

Clause 12 - the enduring provision - specifying that grain rates be reduced by three cents per hundredweight.

It is significant that nothing in the Agreement - and not much in the Parliamentary debate leading up to it - dealt with settlement of the prairie area, or with the role of reduced rates in encouraging western development. In fact, it is questionable whether, by 1897, grain rates were an obstacle to settlement. They had actually been dropping over the previous two decades - from 28 cents per cwt in 1888, to about 20 cents in the mid-1890s (Friesen, p. 192, footnote 34) - and an 1895 inquiry found grain rates on the CPR to be at the same level as those in the Dakotas. Later, they actually fell below the level of the Crow.

Settlement certainly did follow the Agreement, with a wave of immigration prior to the Great War. But it is unlikely that the rates were pivotal to this immigration actually happening.

So why the rate clauses? The answer seems to lie in the fact that, notwithstanding that the Agreement and the Crow's Nest line advanced Canadian sovereignty, the identity of interest that Macdonald had seen between the CPR and the country as a whole, had frayed a little. Whether grain rates were excessive by 1897, rates generally had been a broad source of complaint, and the objective of nation building did not bulk large in CPR President William Van Horne's mind when he told a U.S. Senate committee that: "The Canadian Pacific was built for the purpose of making money for the share-holders and for no other reason under the sun." (Friesen, p. 177.)

So by 1897, it looked to the government as if it had been optimistic about a harmony of interest between the CPR and the nation, and a little reigning was in order. A paper done for the University of Manitoba Centre for Transportation Studies in 1973 concluded that the subsidy given to the railways under the Agreement was in fact "a means of buying back from the CPR certain rights (i.e., a degree of freedom from rate regulation) which many felt they never should have had." (See Duncan.) This conclusion seems to be more in keeping with the language in both the Agreement and the debate preceding it, than the later interpretation of the rates as a great "Magna Carta" of Western Canada to encourage the development of agriculture. Undoubtedly, the motive of western development was present, but it was not, it seems, a

prime motivator of those who framed the original Agreement.

Several key points emerge from this analysis, which, as we shall see, stand in contrast to the assumptions of those who later defended the Crow Rates:

1. The Crow was not part of a "sacred trust" designed with the interests of western agriculture uppermost in mind.

2. Western settlement was without a doubt a goal of National Policy, but not particularly a goal of the Crow Agreement.

3. Despite friction over freight rates, and a desire to reign in railway market power, the partnership of the railways and the government to implement National Policy remained a key part of government thinking, and a clear division of interests between the railways and the broader interests of society as a whole had not yet developed.

The 1920s, and the legislation of grain rates:

By the 1920s, things had changed dramatically. To begin with, farmers had not experienced the warm cooperation with the CPR that Sir John A. Macdonald had. In fact, in 1902, in the famous "Sintaluta Case," the newly formed Territorial Grain Growers Association felt compelled to take the CPR to court for failing to distribute boxcars in accordance with the Manitoba Grain Act provisions. They won their case, and the railway was fined the princely sum of $50 and ordered to obey the law.

There were other less momentous matters of dispute with the railways, like their failure to control weeds along their rights of way, and disagreements over just who was at fault when livestock got run over by freight trains or grass fires were set by sparks from passing locomotives. The old joke about the farmer condemning the CPR for everything from hail storms to crop failure was not entirely without roots in reality. From the farmers' point of view, arrogantly rejected claims over loss of livestock, and a flagrant disregard of the law in regard to the distribution of boxcars, were bound to generate feelings of powerlessness and resentment.

As important as powerlessness in relation to the railways was powerlessness in relation to grain prices. Farmers found themselves whiplashed by the price instability which is characteristic of commodities with relatively inelastic short term supply and demand. In the early

1920s, grain prices collapsed rather dramatically, and farm groups felt the need to control their own destiny. Their new-found strength of purpose eventually led to the formation of the wheat pools and the Canadian Wheat Board.

Most importantly, underlying the creation of these institutions was not only a sense of resentment and quest for power, but also a shift in the predominant political and economic ideology of rural Western Canada.

In 1900, westerners were mostly *laissez faire* liberals in the 19th century mode, accepting free markets as the appropriate means for setting prices and allocating resources. In fighting with the railways and the grain industry farmers did not feel, in the pre-War years, that they were fighting the market system *per se*, but with what they saw as impediments to its proper performance.

EXHIBIT 1
(Arch Dale, *Grain Growers' Guide*, Feb. 5, 1919, p.6.)



"HE MUST BE WEANED"

The problem, as they saw it, was that powerful interest groups - manufacturers, railways and banks - had secured special privileges which enabled them to manipulate markets at the farmers' expense. And the chief evil of special privilege was "the Tariff." They felt, not without some justification, that the "National Policy" of promoting western consumption of protected eastern manufactured goods forced them into economic servitude. They expressed their outrage in a rich outpouring of cartoons, poetry and rhetoric, of which Exhibit 1 is a prime example.

But somewhere between the Great War and 1924, these beliefs shifted to the left. Farm leaders began to view the market economy, not as a malfunctioning institution that could be corrected, but as fundamentally corrupt. Initially, their criticisms focused on the grain marketing system - and in particular, the futures market. And again, the cartoons like Exhibit 2 capture their feelings. But by the late 1920s, the target was broadened from grain marketing to what they referred to as "the competitive system" *in toto*. (See Exhibit 3.)

EXHIBIT 2
(E.S. Russenholt, Scoop Shovel, Feb., 1927, p.9.)



"THE LAST OF THE WILD WEST SHOWS"

And just as they saw the market as corrupt, they began to view government regulation and cooperative enterprises as instruments of justice and fair play. After the disaster of 1929, this feeling deepened, as of course it did

EXHIBIT 3
(E.S. Russenholt, *Scoop Shovel*, June, 1931, p. 7.)



"Even a child can see that immediate action is required"

everywhere, but in the West it was already well entrenched in the wheat pools, who felt that they were operating above and beyond the dictates of the market. They claimed that they had attained enough power to control the flow of grain to market, and thus to control prices. Whether this was so is highly debatable, but that was the perception.

The political manifestation of this anti-market mentality was the "Progressive movement." This was a complex, nation-wide phenomenon, but Progressives across the country were united on one fundamental issue, namely the feeling that the existing political and economic system was not serving the interests of the people at large.

Whole books have been written about the Progressives, but the interpretation of historian Gerry Friesen will suffice to capture the essence of the movement, and its significance for the saga of the Crow:

> Its ideals underlay the organization of the wheat pools and the consumer co-operatives. Its successes included partial restoration of the Crow Rate. ... And its determination to counteract the rise of

> powerful industrial and merchant capitalists found an outlet in other better-organized, better-based political movements. ... Thus progressivism should be seen as a step in the development of a Canadian critique of monopoly capitalism. (p. 374)

What Friesen saw as the movement's "success" was made possible by the political power which the Progressives achieved electorally. The 1921 federal election, which brought Mackenzie King's Liberals to power, also brought 65 Progressives into the House, 37 of them from the prairie provinces. More to the point, the Liberals were in the minority, and they had to court the Progressives to stay in power. The Progressive leader was Thomas Crerar, President of United Grain Growers, former Minister of Agriculture, and an old *laissez faire* liberal, but also a firm proponent of public ownership of railways.

The "partial restoration" of the Crow Rate referred to by Friesen, took place in 1922, after a rather complex series of events. In 1918, the rates were suspended by an Order in Council passed under the War Measures Act as one of several rate increases to keep the railways solvent. In 1919, an Act was passed that would have ended the effect of the Crow's Nest Pass Agreement, by exempting the Railway Commission from the authority of Special Acts, but opposition to the move limited the application of this Act to three years. So in 1922, the Act was up for renewal.

The Progressives, however, hostile to the railways, and critical of a market driven economy, were not about to allow the Rates to expire. A special committee of parliament recommended that the Crow's Nest Pass Agreement continue to be suspended for a further three years, but reinstated the rates on grain. The Grain Growers Guide gave the Progressives credit for this victory with an appropriate political cartoon. (Exhibit 4.)

Of course, the whole issue came up again in 1925, and although the Progressives in Parliament were badly divided by this time, they still held the balance of power. So legislation was adopted which preserved the grain rates and made them applicable on all grain, to all ports, for evermore - or at least, as we now know, for 70 years.

The important thing which emerges from this brief survey is the degree to which the attitudes, assumptions and beliefs of the Crow's 1920s defenders differed from those of its originators in 1897. Specifically:

EXHIBIT 4
(Thorson, *Grain Growers' Guide*, July 19, 1922, p. 6.)



"Delivering the Goods"

1. Whereas, in 1897, the predominant economic ideology - in both Parliament and among farmers - was *laissez faire* liberalism, the Progressives and the farmers who elected them, were decidedly more hostile to the market, and more interventionist in their attitudes.

2. Whereas the government which signed the original Agreement still saw considerable unity of purpose between the railways and the nation, the rates' defenders in the 1920s had experienced a sharp conflict of interest with railways.

3. Whereas the objective of western settlement was hardly mentioned in 1897, the Crow's place in aiding and encouraging settlement featured prominently in the arguments raised in the 1920s.

4. Finally, whereas rail rates were in fact a fairly minor part of the original agreement, to the 1920s defenders of the Crow, the rates on both grain and eastbound goods were represented as central to the Agreement, with the Crow's Nest railway line relegated to a secondary issue.

In summary, the issues at stake for those who defended the rates in the 1920s - and the basic philosophies they brought to the debate - were substantially different than those of the original framers of the Agreement in 1897.

I contend that the defense of the Crow - with all that it implied by way of regulatory control, intervention in the market and antipathy to a free market, were part and parcel of a developing "grain ideology" that was to shape the development of grain policy, and to rule unchallenged, until about the late 1960s.

The 1960s and the death (more or less) of the Crow

The 1960s marked the beginning of the end for the Crow, even though it was not immediately apparent at the time. And what drove the change was the reality of the marketplace - which, to the grain industry, arrived in the form of opening markets in China and Russia. Grain marketing policy, not transportation considerations, was the key factor.

Since the 1920s and the formation of the Wheat Pools, a major underlying premise of grain policy was that Canada could drive up world wheat prices by withholding wheat from the market. This theory was stated with great vigour by farm leaders in the 1920s, and again during the hearings which led to the passage of the Wheat Board Act in 1935. J.D. McFarland, the first Chief Commissioner of the Board believed this theory passionately, as did Bill McNamara, Chief Commissioner in the 1950s. But the reality was that this policy led, not to higher prices, but to increased stocks. By the 1950s, wheat was stored in elevators, on farms and even in curling rinks - rinks which were built with government storage payments on the wheat inside them.

By the late 1960s it was recognized that this could not continue, and this recognition also coincided with the first large wheat sales to the communist countries: the Soviet Union and China. These large sales exposed the effects of almost three decades of neglect and stagnation in grain handling and transportation. In fact, the system very nearly broke down, and was only able to do its job because of a specially constituted industry committee with the power to commit their organizations to specific performance standards.

But the system itself was in sad shape. The network of elevators and rail lines had not really changed since the 1930s, and, under government storage policies, literally thousands of obsolete country elevators sat stuffed with grain.

I can well recall my own first visit to a country elevator. I thought I had stepped into a living museum. Large wooden levers protruded down from the ceiling at

the back of the elevator, with hand-carved handles. These controlled slides which opened spouting through which the grain flowed out of overhead bins. That such things still were being operated in the 1970s brought home to me in a vivid way that it was no idle talk to speak of a system from the horse and buggy era.

The system's poor performance for those large sales to Russia and China sparked an intense period of study and examination. Contrary to popular belief, it was farsighted people in the grain industry itself who recognized the system's shortcomings, and they began to drag the industry into the twentieth century. In about 1967, they organized a major conference in Minaki, Ontario. It was a watershed event, whose major accomplishment was to rationalize the logistics management of grain through a control system called "the Block Shipping System."

Not much else came of Minaki, but the realization began to grow that dramatic change was needed if the marketing needs of the future were going to be met.

The large Russian and Chinese sales also marked the end of the old "withholding" theories. Chief Commissioner Bill McNamara was appointed to the Senate, the Wheat Board became an aggressive world seller, and the pressure on the handling and transportation system continued unabated. Slowly - very slowly at first - the system began to rationalize.

In the late sixties and early seventies, a few brave voices began to be raised against the holy Crow. The McPherson Royal Commission gave the first formal recognition that the railways were losing money on grain, and a few farsighted people, who could see beyond the reigning ideologies, began to identify the role of a non-compensatory rate in the stagnation and decline of the transportation system.

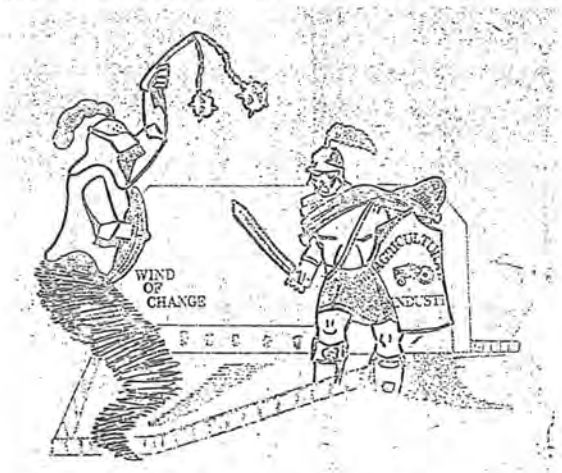
In 1969, the very activist Liberal government under Pierre Trudeau seized the initiative away from the industry, and set out to solve the grain problems itself. Otto Lang, then a junior Minister without portfolio, was given responsibility for the Canadian Wheat Board, and his was one of the voices prepared to criticize rate regime. In a 1974 speech to the semi-annual meeting of the Canada Grains Council, he said:

> It is indeed likely that the Crow Rate on domestic grain is harmful to western development in livestock, and the Crow Rates on export grain are discouraging the export of more meat and products of grain. They are also creating serious problems in

terms not only of maintaining a deteriorating system but in rebuilding a modern one.

This speech was greeted with a barrage of criticism, and just like the 1920s, the cartoons capture the flavour of the debate better than the more measured written comments. (See Exhibit 5.) In late 1969, Lang initiated

EXHIBIT 5
(*Western Producer*, Mar. 27, 1975, p. 72.)



"I am afraid we are in danger of losing (many of the Wheat Board's) desirable features in the general wind of change blowing over the industry"
- D.H. Treleaven, Assistant Chief Commissioner, Canadian Wheat Board

a long and protracted set of studies, inquiries, operational changes, and legislation which tried to deal with "the grain transportation problem." There is not space to go into detail, but a list of the major ones will give some idea of the intensity of work that went on:

- In 1973, a series of studies undertaken by the Canada Grains Council.

- In 1975, the Hall Commission, to study branch lines.

- In 1976, the Snavely inquiry into railway losses on grain.

- In 1977 the "Prairie Rail Action Committee" decide the fate of lines which Hall had left in limbo.

- In 1978, the Booz-Allen, IBI study into grain transportation operations.

- In 1980, the establishment of the Grain Transportation Authority, to take over car allocation from the Canadian Wheat Board and to introduce efficiency measures.

- In 1982 the Gilson negotiations, which finally came to grips with the Crow Rate.

- In 1984, the Western Grain Transportation Act (WGTA), which abolished the legislated rates of 1925, and set up an administered rate structure, with complex cost sharing between the farmers and the government.

All these activities were still not keeping pace with the realities of grain markets. The former critics of the Crow became critics of the subsidized WGTA rates, and they continued to focus on four themes: one, that the subsidized rates hampered efficiency; two, that they discouraged value-added, secondary processing and livestock; three, that they were inconsistent with trends in world trade agreements; four, that government fiscal constraints were going to make grain transportation subsidies untenable. The critics were proven right on all counts, and in 1995, largely in response to trade and fiscal pressures, the WGTA subsidy died. And it died without farmers marching in the streets.

So the last question we have to examine here is why it died with so little outcry after decades of passionate defense. Why were the defenders of subsidized rates so silent as the "Magna Carta of Western Canada" disappeared?

The answer lies in the broad shifts in public opinion occurring over this period, and the steady shift to the right in political and economic opinion. This shift was manifesting itself around the world, from the collapse of the Soviet Union and the Eastern European regimes, to the deficit cutting governments of all political stripes in Canada. These events were paralleled by trade agreements which embody free market principles, a falling faith in government, a reemphasis on the responsibility of individuals to look after their own welfare, and a general renewal of faith in open markets as the way that economies must run. In Canada, and in the transportation world, we see these same trends in air policy, marine

policy, and rail policy. The privatization of CN and ports are just two examples.

The Western Canadian grain industry underwent the same transformation, with various manifestations:

- the privatization of two large cooperatives: UGG and the Saskatchewan Wheat Pool;

- farmers risking civil law suits to run across the U.S. border with grain to avoid the Canadian Wheat Board;

- Saskatchewan Wheat Pool and Cargill grain, formerly companies that represented totally different philosophies on grain marketing issues, collaborating to build a terminal at the West Coast;

- senior officers in the grain industry developing an approach to logistics management for a post-WGTA subsidy world, (the so-called "SEO Package") which they think is the very antithesis of a regulated, centralized, transportation control system;

- a major shift in farm opinion away from supporting the centralized selling of the Canadian Wheat Board, with farmers in large numbers voting against Board monopoly selling in a recent plebiscite in Alberta, and a poll in Saskatchewan showing widespread support for allowing private grain companies to export grain.

The sum and substance of all this is that an increasing proportion of farmers see a deregulated grain marketing and transportation system as the solution to their problems. This combined with widespread support for deficit control and smaller government, meant that farmers were not in a mood to defend controlled and subsidized rates when the government announced the demise of the WGTA in 1995.

And once again we can see, just as the 1920s defenders of the Crow Rate acted out of a very different set of assumptions and concerns from the original architects of the rates in the first place, so too did those who let it die so ignominiously in 1995.

Of course, the revolution in economic and political thought was not total in the 1920s, and is not total today. There are still large numbers of farmers opposed to open markets, who desire the return of legislated, subsidized rates. Their impact on public policy is reflected in the continued existence of the so-called

"rate cap" which will continue to apply on grain for five years under the Canada Transportation Act.

So the Crow is not quite dead, even though the end, at the moment, is in sight, and a fully "commercial" transportation environment for grain seems just around the corner.

Or is it? I will close this paper with a few reflections on what this quick review of history shows us, and what lessons we might learn.

Lessons for policy makers in uncertain times

The first lesson, I hope, is quite obvious; I have already repeated it throughout this paper:

> 1. Policies are not made in a vacuum; they reflect the political, economic and social background in which they are implemented.

I have tried to illustrate the truth of this by describing the very different political and economic philosophies under which the Crow Rate was born, was sustained, and finally died.

The second is less obvious:

> 2. Policy initiatives grow out of a very few simple, but fundamental, assumptions.

The farmers who, in the 1920s, defended the Crow, built cooperative wheat pools and later created the Canadian Wheat Board, started from a few basic beliefs: that the few should not get rich at the expense of the many, and that people were inherently communal and cooperative, not individualistic and self-seeking were two of the most important. The elaborate arguments as to the effects that their grain marketing and transportation policies would achieve, were all elaborations on these few basic assumptions.

We see the same thing today in the rosy future promised if only we deregulate and let markets rule. The policy arguments are all elaborations around a few basic assumptions.

The third is a lesson which gets driven home after a long policy fight like the one over the Crow:

> 3. Reason is no match for myth, legend or ideology.

Mountains of paper were produced trying to prove - and disprove - the arguments of the Crow's critics that it discouraged efficiency and value added, and was untenable in the face of government fiscal problems. Presumably all that argumentation had some value, but it scarcely made any impact on those who were convinced by their basic underlying beliefs that regulated rates were a good thing, and that the Crow was the West's Magna Carta. In the end, it was not the rational arguments which prevailed, but the shift in public philosophy that saw markets, not centralized control, as the appropriate way to run an economy.

Lesson 4 should also be clear, now that we can look back with some dispassion:

> 4. Policies yield unexpected results, and everything has its downside.

No one anticipated that a legislated freight rate would so stifle innovation. To the extent that the Crow was seen as an instrument to promote development, its actual impact was negative: discouraging livestock and value added; distorting production patterns; stifling efficiency and costing farmers in high handling costs.

We should apply this lesson today, as we strive to find post-WGTA policies to promote those things that we believe a centralized and regulated system prevented. The old adage, "be careful what you wish for; you may get it," seems particularly apt. The current zest is for unfettered market forces, which are expected to bring efficiencies, accountability and justice. They will undoubtedly also bring something else that we did not bargain for.

This leads directly to the next lesson:

> 5. Don't get blinded by ideology.

One of the things we are not taught in economics is the degree to which our "science" is infused with values. It is not immediately apparent to those of us who were taught economics as a kind of science, that to say "markets drive efficiency" is an ideological, not scientific, assertion. However, the statement carries a whole number of assumptions about human behaviour that are only partially correct - or only partly explain the economic decisions which people make.

The current fascination with free market forces as the desirable goal of public policy is ideological to a far greater degree than we might think, and it would be fruitful for the public policy process to recognize that.

Finally, insofar as the seemingly imminent death of the Crow, and dismemberment of government intervention in grain markets, we must remember what Socrates said:

> 6. No one can pretend to be a statesman who knows nothing about wheat.

He might have added, "about livestock, fruits and vegetables - indeed about food in general." Governments have involved themselves in food since time immemorial, and will continue to do so. Anything that is so essential to human life will never be abandoned to the amoral actions of the market for any extended period of time. Remember that markets fundamentally are instruments for determining who gets what at what price. And those are moral - and hence political - decisions. If enough people don't get their due, politicians will intervene, and in so doing, will fall victim to all the pitfalls of policy making that are so vividly illustrated in the history of the Crow: that policies don't always give us what we bargained for; that they have undesirable side effects quite different from those foreseen; and that the policy process gets driven by underlying ideological beliefs, not by reason.

There is one further lesson to be learned from history - not from the history of the Crow *per se*, but from history in a broader sense - and it is extremely relevant to the immediate future as it seems to be unfolding.

Those of us who were unswerving opponents of the Crow, and who fought for change in grain transportation policies, studiously ignored one key factor, namely the impact of railway market power. And indeed, it is arguable that the so-called "SEO Package" put together by senior grain industry people to control grain logistics, contains the same blind spot in its enthusiastic embrace of market forces to determine the future shape of the grain handling and transportation system.

It behooves us to remember, therefore, that in the first two decades of this century, when we had the closest thing possible to an unfettered *laissez faire* system in grain marketing and transportation, farmers did not like it. In fact they fought rather vigourously to replace it with something else. Moreover, as you study that period and the farm leaders of the time, you come to recognize that they were not fools.

I believe it was Winston Churchill who said something like "Those who do not know history are condemned to repeat it." Someday, long in the future, someone will stand before a group like this, and will dissect the

results of today's policy developments. Perhaps they will point out just how foolish we were to place such faith in the market, and to forget the abuse of market power which led farmers to be so interventionist in the first place. And perhaps, as we repeat history, we will come to find out why farmers and shippers portrayed the system of the 1920s in the way they did in Exhibit 6.

EXHIBIT 6
(E.S. Russenholt, *Grain Growers' Guide*, Dec. 28, 1921, p. 6.)



"Separating the farmer from his profits"

References

Duncan, M., *The Crow's Nest Pass Rates as a Policy Tool: But What Policy? (An Historical Analysis)*, Centre for Transportation Studies, the University of Manitoba, 1973.

Friesen, Gerald, *The Canadian Prairies: A History*, University of Toronto Press, Toronto and London, 1984.

THE DEREGULATION OF AIRPORTS AND THE OPPORTUNITIES OF GATEWAY DEVELOPMENT

Fredrick Petrie

This paper explores the opportunity created by transport deregulation for airport management to play a more active role in the development of gateway transhipment traffic for their community.

The Deregulation of Airports

The economic deregulation of transport only began with the U.S. in 1978. In Canada, the Freedom to Move policy of 1984 was codified into the new National Transportation Act in 1987. Airports had been a de facto regulated industry because of the federal dominance in operating most major airports. Their deregulation began with the Conservatives' April 1987 Airports Policy which provided for transfer of airports to Local Airport Authorities, where there was interest. Five major airports were transferred to LAAs in the summer of 1992. A number of other communities, including Winnipeg, had formed local groups and were in the process of negotiating transfers when the Liberals were elected in October 1993. Everything was put on hold while the liberals developed their own policy. The early initiatives of Douglas Young saw the deregulation trend continuing with Open Skies and a more liberal international air policy and a commitment to "commercialize" the Air Navigation System. In keeping, his July 1994 Airports Policy completed the deregulation of airports by committing the federal government to completely withdraw from the business of operating airports by March 2000.

The Winnipeg Airport Authority is now expected to finally take over the airport by the fall. Of seven regional class airports in Manitoba, ownership of Brandon has already been transferred; Gillam, Flin Flon, The Pas, and Thompson have signed letters of intent for transfers possible before the end of 1996 and Lynn

Lake and Dauphin were also expected to enter negotiations. Very rapidly, Transport Canada will be out of the airports business in Manitoba and the communities will be responsible for the continuation of their own airports.
Airport economics are a special challenge for their new managements. Costs are largely fixed, at least short term, while revenues are variable based on traffic. Cost control is a first imperative. But business or commercial success will depend on marketing success in developing traffic. An airport has a quasi monopoly on origin-destination traffic but even this sector is not guaranteed. Brandon has lost scheduled air service because too many of its customers drive to Winnipeg for their flight; before open skies, some Winnipeg passengers would drive to Fargo. Traffic transferring or connecting is especially mobile and subject to inter airport competition. The deregulation of airports leaves airport managements free to compete for such traffic. The object of this paper is to provide a base of economic principles and a vision for future transportation which airport managers may wish to consider in developing their marketing plans.

The Gateway Concept

Transportation traffic processing facilities, for whatever mode, are commonly called terminals, as in the terminus of the journey. The distinction of a Gateway is that traffic is en route. A Gateway acts as a hub for traffic changing vehicles within a mode but is broader in concept to include traffic changing modes of transport. In either case, the destination is some further point. A passenger may be changing from a mainline to a regional flight or from a flight to surface transport. Cargo through an airport may also be connecting within the air mode but more often is changing modes. The term Gateway is also associated with international traffic as a port of entry. In fact the terms are somewhat analogous and even the term gateway hub is used.
Attracting gateway traffic is important to an airport because the additional user fees contribute to the airport's financial viability. But airports, while operating by business principles, are "not-for-profit" organizations with an objective to facilitate community economic development. Economic activity will locate at one of three places: either at the source of materials or at the locale of the market, or, because the locations of materials and markets are often diverse, they locate at transportation gateways. Expanding the scope of transport services available at a community, through developing gateway traffic, is the most important contribution airport management can make to their community's economic development.
Ports were the original gateways because of the dominance of the marine mode

in transportation systems and the necessity of transhipment to land modes for further transport. Coastal or inland ports remain our most important economic centres; New York and Tokyo are predominant examples. The development of railways in the 19th century facilitated the development of inland gateways, such as Chicago. In the 21st century, the ability of the air mode to traverse either land or water will further permit the development of gateway traffic almost anywhere. The Wayport concept promoted in the U.S. some years ago was based on this idea. The main failing of the wayport idea was that they were to be based only on connecting traffic; experience has shown that successful gateways also have significant origin-destination traffic.
Winnipeg originally developed as a meeting place because of its central geographic location and the intersection of two major river routes. Through the railway development in the late 19th century Winnipeg became an inland gateway between the industrialized east and the rural west. The decreasing importance of east-west flows in favour of free trade north-south traffic has reduced Winnipeg's gateway role. However, behind this apparent problem, there is new opportunity.

A Vision of Transportation in the 21st Century

A transport system has three elements: the **"way"** or route or infrastructure, the **"means"** or vehicles or carriers, and the **traffic**, be it passengers or goods. The transportation of physical traffic involves economic cost. It only takes place because it adds value to a trade process, getting the product to the market, or the tourist to the sun. It is a secondary or derived demand that takes place because of other economic activity that requires the value added of transport services. The value added for the activity must exceed transport costs, to leave a profit or return. The imperative for any transportation system is to keep its costs as low as possible. This is basic economics. Minimizing costs, in a competitive environment, will minimize price thereby maximizing demand. In a growing system, more traffic tends to reduce costs through economies of scale, leading to further price reduction towards an economic optimum. Traffic will gravitate to the most cost efficient mode. Increasingly, the most cost efficient alternative will involve a combination of modes that provide more optimal matching of shippers' cost and service needs.
Consider this example. Over the past fifty years, trucking has stolen the general freight business from the railways. Railways, through their intermodal divisions, instead of seeing truckers as competitors, are beginning to treat them as customers in the challenge of meeting the needs of the actual shippers. As trucking costs increase and the highway infrastructure further deteriorates, the

lower costs of rail, given sufficient traffic, see special trains carrying trucks, or containers, between the major hubs for transhipment by truck within a region. The train will carry the traffic Toronto to Winnipeg where it will be distributed by truck from Thunder Bay to Saskatoon. The train is more efficient for high volumes over the long haul but truck is more efficient for smaller volumes over shorter distances. The CN Rail - JB Hunt intermodal partnership is a harbinger of this pattern.

The costs of transportation are not only the dollar value of the waybill, but also the many elements of indirect costs such as insurance, financing, warehousing, pilferage and packaging. Indirect costs correlate with the time for shipping; they are a matter of service. Trains lost general freight business despite their inherent cost advantage because they failed to give the customer the service level they needed, while trucks, with their inherent flexibility, did.

The third variable is the value of the traffic. Generally, indirect costs related to time will be more important to higher value goods. Value may be inherent such as precious metals or due to perishability whether due to deterioration or fashion. Figure 1. illustrates the economic choices in transportation choices. Total costs are plotted on the Y axis. Direct costs are fixed for a particular modal selection but indirect costs are variable by time, determined by the value of the traffic, as plotted on the X axis. A lower value good will go by the lower direct cost (e.g Sea) mode while the higher value good will have a lower total cost (e.g. Air) by paying a higher direct cost to lower indirect cost by moving faster. The Intermodal line introduces a third transport option with a combination of the slow/cheap mode with the fast/expensive mode. Intermediate value goods can achieve their lowest total cost with the intermodal option, the "savings" being represented by the difference in the total cost lines for each of the three shipping choices. In this example, goods with a value between about $8 and $20 (or marks or yen) per kilogram would have a distribution cost saving by using the intermodal choice. (Note that these numbers are conceptual and not based on empirical research.) The implication for the community that aspires to increase its transfer traffic as a gateway hub is to develop its intermodal transfer capability.

The second economic principle behind gateway economics is the "hub and spoke" concept. This could be intermodal like the truck-train or sea-air examples above but it more commonly takes place within a mode. Between hubs, the greater traffic volume collected over a region allows more frequent service by larger vehicles with lower unit costs, lowering both direct cost and indirect cost by the enhanced frequency. For the spoke, concentrating all of its traffic to a myriad

of destinations on the one route to the hub again allows lower fares and higher frequency. This is illustrated in Figure 2.

Figure 1.

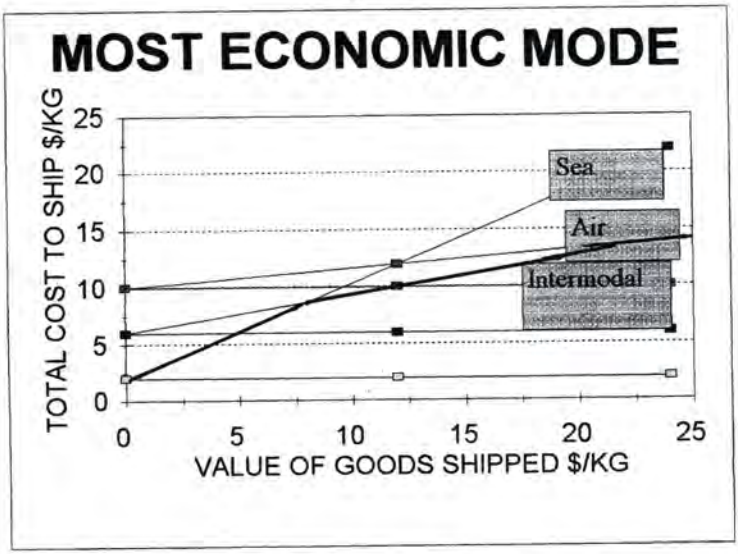
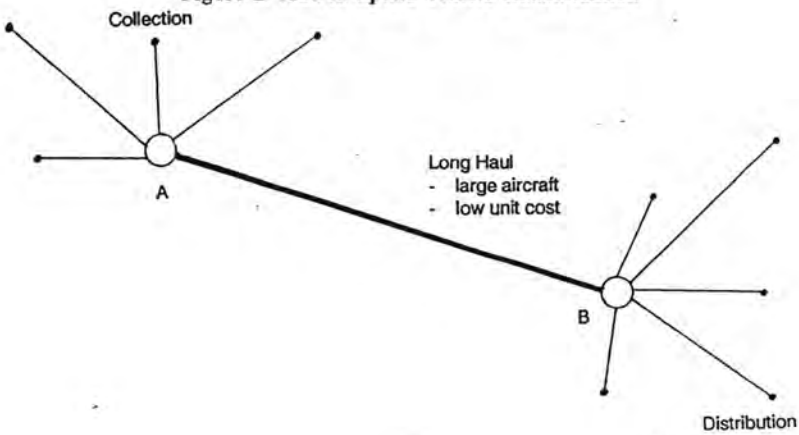


Figure 2. Hub & Spoke Traffic Consolidation



The development of transport systems into the next century will follow, albeit imperfectly in an imperfect world, these principles of minimizing total transport costs through modal choice optimization, including more intermodal choices, and concentrating traffic through gateways. The transport world's imperfections will improve through more refined JIT and EDI and facilitation and free trade. The challenge for tomorrow's airport manager is to appreciate the underlying economic principles while being open and prepared to exploit unfolding opportunities.

Applications

This section looks at potential gateway opportunities at different levels of scale for: a remote gateway, a regional gateway, a national gateway and for the future possibility of the intercontinental gateway.

A Remote Gateway - Churchill

Churchill was developed for an intermodal gateway role between rail and sea for a shorter shipping route for prairie agriculture. This role has suffered over the past ten years for a variety of reasons including the myriad of subsidies that distorted the comparative economic advantages. It also has a gateway role in serving the Keewatin region with transhipment from rail to air or barge. This is declining due to the GNWT favouring Rankin Inlet as the economic centre for the central arctic; Churchill is on the wrong side of the 60th parallel to fulfil this historical role. The GNWT would just as soon restore the former sea resupply from Montreal. The geographic rationale for Churchill as both a seaport and a regional gateway for the central arctic remains valid. However, leadership is required to overcome the administrative and political obstacles to its development. In an economic study of the airport for Transport Canada in 1989, I argued for the necessity of transfer to local control, not only of the airport, but of the port and shortline from Gillam as well. Only with a fully integrated transportation system would there be a chance to capitalize on the geographic and strategic advantages of Churchill. The December 1994 task force proposed a marketing body that might be a first step in this direction; the Gateway North Marketing Agency has now been established. The Akjuit project may also lend impetus towards a Churchill Transportation Authority.

A Regional Gateway - Thompson

Thompson is the principal service centre for northern Manitoba. This role has been facilitated by its central location but also by its economic mass based on mining; the more direct highway bypassing the circuitous route via The Pas also

helped. The City already operated its airport but will lose financial support due to the National Airports Policy. The new management will be interested in expanding its regional gateway role. One way it might do this is by continuing to supplant Churchill as the distribution centre into the Keewatin by facilitating the truck-air intermodal option. Another suggestion would be to promote year round truck-air into regional remote communities to take business from the annual resupply by winter roads.

A National Gateway - Winnipeg

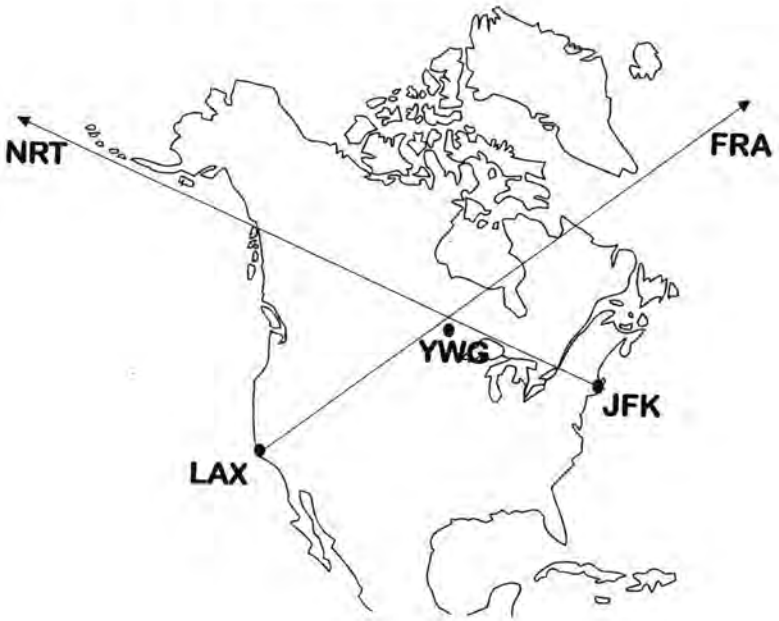
A focus for the WAA management will be to enhance and restore its traditional role as a national gateway. In cargo, this is happening with the principal courier companies using Winnipeg as a secondary hub from which traffic can be further distributed by smaller aircraft and by surface vehicles. Toronto will remain the principal national hub for domestic traffic but Winnipeg can encourage secondary connections due to its geographic advantage. When Canadian Airlines opened its new showcase terminal, it routed all of its flights through Toronto. Air Canada continued to offer a selection of non stop flights from secondary markets like Montreal and Ottawa. CP lost some market share in Ottawa where Air Canada retained non stop Winnipeg flights, where further regional connections could be made to Saskatchewan and the north. Such niche opportunities can be targeted by airport management for promotion to the airlines. However, it is unlikely that Winnipeg will ever regain its national gateway scope enjoyed in the heyday of the railways.

An Intercontinental Gateway

The decline in Winnipeg's traditional gateway role, with declining domestic east-west traffic due to the increase in north south traffic from greater trade liberalization, was referred to earlier as a new opportunity. To see this opportunity is a matter of perception. Step back from the map of Canada to see North America in the context of the globe. Now consider some of the most important global trade routes such as Tokyo-New York and Frankfurt-Los Angeles. Where do they cross? Where is the first point where transhipment from air to less expensive surface transport becomes possible? A 1990 study estimated the direct cost savings from air-truck, transhipped at Winnipeg, compared to all air, at 20%. The significance of this saving is made relatively more important by the probable pattern of indirect cost. It is depicted in Figure 1 as a linear function but in practical terms it is more likely S shaped. That is, the difference in indirect costs between 12 hours shipping time and 48 hours is likely negligible. Just delay costs in congested ports like LAX, ORD or JFK likely mean a 48 hour

practical door to door time even when shipped all the way by air.

Figure 3. The Centre of the World



In early 1993, Kleysen Transport took the initiative to start research into this concept that led to the formation of the Northern Hemisphere Distribution Alliance which was followed by the creation of Winnport Logistics to promote intercontinental transhipment via Winnipeg. This invaluable ground work, in combination with the transfer of the airport to local management in the next few months, has set the stage for Winnipeg to seriously pursue a role as an intercontinental gateway for the 21st century.

The Role of Airport Management

The traditional role of airport management was to respond to carriers and their perceptions of the traffic demand. Infrastructure was a reactive service usually provided by the public sector. This was satisfactory for most origin-destination traffic. Where gateways developed for transferring traffic was often determined as much for political reasons as economic (e.g. Montreal was the designated international air gateway in 1950s bilateral air treaties). This is now changed. The management of the newly deregulated Canadian airports have an opportunity to market their facilities for transfer traffic processing. (I use management in its broadest context to include the ideas of governance and ownership.) A free trade environment combined with cost control pressures on transport systems will increasingly make economics the basis for routing decisions. But it is an economically imperfect world and decisions are not always optimized because there may be incomplete information on availability of choices. This calls for the new role for airport management. In the competitive environment of the airlines, management does not always enjoy the luxury of being able to crystal ball the future. Airlines look to yesterday's loads and next week's schedule. Traffic is fickle. Carriers will move equipment to where they see the demand. It is left to the airport manager to take the lead in developing the gateway role of their airport. Airport Managers must become proactive in identifying opportunities and in selling these to the carriers.

The first task is to conduct the market research to support their city as the optimum gateway for certain traffic niches as compared to potential competitors. Unless airports start their own airlines, it is next necessary to partner with one or more carriers to develop the identified market opportunity. Finally, in partnership, the airport needs to take an active role in promoting and facilitating the initiative. One example of a facilitation role would be to bring together intermodal partners. Carriers still tend to see themselves as truckers or railways or airlines and not as transportation service providers. "Regulated" airports were also guilty of this error. "Deregulated" airport managers need to take a broader perspective. Their business is to process traffic between modes or transfers within modes. In the past, this involved providing runways and terminals. In the future, they may need to be more involved in providing roads, spur lines or even berthing, as well as the land on which to base distribution and value added processing facilities.

Conclusions

The National Airports Policy of July 1994 has deregulated airports in Canada. It is now up to new local managements to develop their airport assets and traffic, not only to be financially self sufficient, but in order to maximize their contribution to their region's economic development. Deregulation requires open minds and creative marketing and taking a broader perspective on the nature of the airports business.

The "laws" of transportation economics will be increasingly applied in an environment of liberalised global trade. This will increase both the tendency to concentrate traffic between gateways for distribution within regions and to offer more intermodal choices more closely matching modal cost-time trade-offs to shippers' needs, where transhipment will logically take place at the most strategically placed gateways. An understanding of transport economics will help airport managements to more realistically define their roles within transportation systems, be they regional, national or global systems.

The onus for the development of future gateways will fall more to the operators of infrastructure, rather than to the carriers in the system, to identify and meet the needs of tomorrow's shippers and travellers. Airport managers and directors will need to share such a vision to be successful in developing their community's "gateway" opportunities.

References

"Airport Plan Revisited", WINGS, Issue 6, Volume 36, December 1995.

"Regional Airports", WINGS, Issue 1, Volume 36, February 1995.

"The National Airports Policy - What does it mean or your community", COMMUNIQUE, Economic Developers Association of Canada, July 1994.

"Competition in the Canadian Airline Industry - Post Deregulation Issues for the 1990s", RTAC Annual Conference, St. John's, September 26, 1990.

"The Deregulation of Airports", AIR TRANSPORT MANAGEMENT, Volume 3, Number 4, September 1990.

Canada's Airports: Their Role as Cargo Gateways

Abstract

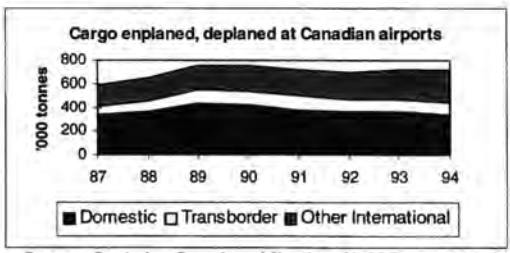
Air freight is becoming increasingly important as a means of delivering high-value, often perishable, goods to far-flung markets. There is at present no publicly available statistical series of comprehensive origin/destination data for air cargo, although several related data sources describe the movement of air freight, within Canada and between Canada and other countries. This paper draws from these data sources to illustrate the growing importance of air cargo. Also, a possible method of approximating international movements of air freight will be presented for discussion purposes.

Air cargo takes off

Using just about any yardstick (tonnage, value of goods, revenue earned, tonne-kilometres), it is difficult to dispute the recent growth in air cargo traffic. Factors ranging from industrial globalization to business practices like just-in-time inventory management and aggressive off-shore marketing of Canadian goods and services have contributed to this increased activity. As local groups contemplate the purchase or lease of community airports, they are being advised to secure a solid cargo base in addition to passenger traffic(1), the rationale being a more diverse revenue stream for the airport as well as a leg-up for local industry resulting from the economic stimulus derived from air connections.

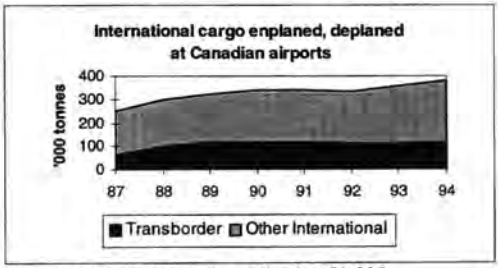
In the past seven years, air cargo traffic enplaned and deplaned at Canadian airports has increased at about 3% per year, on average (see Figure 1). Breaking this total into its components, it appears that international freight has shown the most improvement in terms of tonnage (see Figure 2). The cessation of Air Canada's dedicated DC-8 freighter service in 1994 hit the domestic side of the picture, although other carriers have recently increased cargo service in Canada.

Figure 1.



Source: Statistics Canada publication 51-005
"Air Carrier Traffic at Canadian Airports"

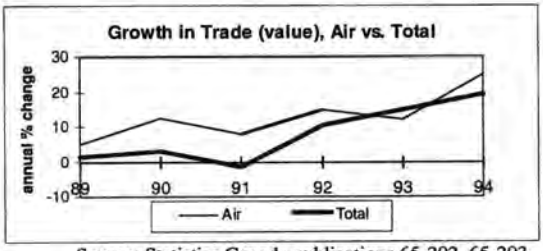
Figure 2.



Source: Statistics Canada publication 51-005

Looking at international air freight from a different point of view, it can be demonstrated that imports and exports transported by air have also grown, at a rate generally exceeding the overall growth in international trade for Canada (see Figure 3). In this instance, total air freight is expressed in terms of value, whereas the previous two illustrations presented traffic in terms of tonnage. A detailed examination of the trade database is presented later. For the time being, it can be seen from the gains made in the total value of merchandise shipped by air that more product appears to be moving in this manner.

Figure 3.

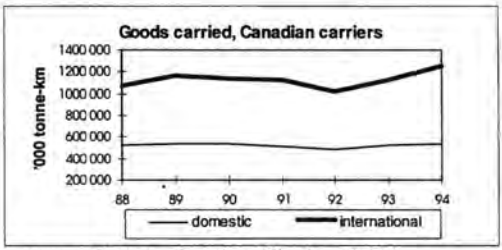


Source: Statistics Canada publications 65-202, 65-203
"Exports (Imports), Merchandise Trade"

A third indicator of goods transportation is the financial and operating information filed by Canadian air carriers (the following illustration includes only Canadian carriers, whereas the two previous ones included foreign carriers serving Canadian airports). Cargo service represents about 10% of total operating revenue, however, carriers see the value of attracting cargo business in terms of better utilization of capacity. In fact, about 85% of goods transported by air is carried as bellyhold cargo on scheduled or charter passenger flights; dedicated cargo flights account for the remainder(2). As a recent promotional pitch aptly phrased it, "... you shouldn't fly on an empty tummy".(3)

Canadian carriers saw their overall revenue picture darken during the recent recession. However, despite the disappearance in 1994 of the Air Canada freighter service, cargo revenue had almost regained its pre-recession peak by the end of 1994. In fact, the first half of 1995 saw goods transportation revenues up 8% over the same period in 1994 (total operating revenue increased by 6%).

Figure 4.



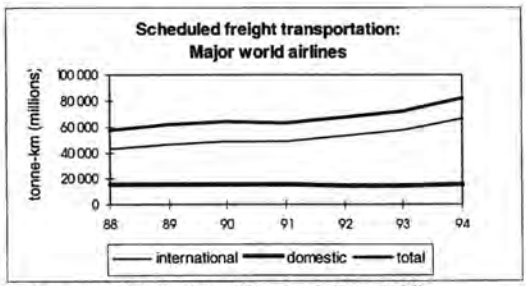
Source: Statistics Canada publication 51-206
"Canadian Civil Aviation"

Figure 4 shows goods tonne-kilometres performed by Canadian Level I-IV carriers since 1988. Overall tonne-kilometres grew by nearly 10% in 1993 and 1994, following two poor years. Decomposing the total reveals a sluggish progression for domestic cargo and more impressive growth in the transborder and other international sectors. Preliminary results for the first half of 1995 show overall goods tonne-kilometres up by 13% over the previous year. Domestic cargo grew by 7%, while other international freight was up 10% and transborder freight surged ahead by 66%.

Global perspective

The preceding illustrations depict what has been going on in Canada. To get a picture of what is happening the world over, it is useful to examine statistics produced by the International Civil Aviation Organization (ICAO). ICAO reports show overall improvement for carriers at the world level (see Figure 5).

Figure 5.



Source: ICAO Statistical Yearbook (Doc 9180)

In a repeat of the pattern exhibited in Canada, international cargo output has grown at a faster rate than domestic cargo tonne-kilometres performed in most countries. The size of many ICAO countries would make surface or perhaps even water transportation competitive with air transport for domestic freight. This may be a contributing factor to the superior growth of international cargo traffic.

Even though each of the preceding illustrations tell essentially the same story, the application of any of these sources on their own would be of limited use to someone who wanted to study cargo markets in terms of what is being moved and where. In order for a local economic development team to determine whether a particular airport operator would be well advised to pursue certain types of cargo, or for a shipper to evaluate the feasibility of locating a plant, storage facility or sales and support centre in a particular region, reliable, timely information is required on what is being produced and shipped to and from centres of interest.

The two principal data sources that lend themselves to this type of study are the Airport Activity Survey, produced by the Aviation Statistics Centre and the International Trade data series, produced by the International Trade Division, both at Statistics Canada. Neither currently provides a complete picture of what is going on at Canadian airports. However, the next section details how a useful composite data source for international air cargo might be developed using these two databases.

Airport Activity Survey

This is actually a collection of surveys covering a range of Canadian and foreign carriers using Canadian airports. The principal target population comprises major scheduled carriers and major charter carriers. Passenger information is also collected from regional and local carriers, but they do not file cargo data.

The major scheduled carriers file a report detailing the daily arrival and departure of every flight, including seats available, cargo capacity available, and passengers and cargo on board. These are rolled up to monthly reports, and released on a quarterly basis. Major charter carriers also report on a monthly basis; they file less detail, but they do report cargo information. These are census surveys - all carriers in these two categories are required to file this information.

Passenger and cargo traffic are calculated on an enplaned/deplaned basis for each airport (space restrictions permit the publication of only the top 50 or sometimes top 100 airports, but data can be obtained for airports not listed in the published reports). Both entity cargo (dedicated cargo flights) and bellyhold cargo (the use of space in the cargo hold on passenger flights) are filed for scheduled and charter flights.

The "to and from" part comes in with the reporting of route-related information, which is derived from the reported routing of the aircraft (next stop for departures, last stop for arrivals), although the derivation of the ultimate origin and destination of the cargo is not possible. For example, a flight with a routing of Vancouver-Edmonton-Amsterdam: "... the departure of the flight from Vancouver would be considered domestic, as would the arrival at Edmonton. The departure of the flight from Edmonton for Amsterdam would be considered as other international since the next stop of the aircraft is a foreign point."(4)

Using the next/last stop information, the Airport Activity Survey calculates, by airport, the tonnes of cargo loaded and unloaded for domestic, transborder and other international flights. Since the journey of the cargo may not coincide with the flight segment (and may indeed require more than one flight), the "true" origin and destination of these goods cannot currently be inferred from this data source. An examination of the survey output for major scheduled carriers shows the presence of a "flight destination" field, which often differs from the next/last stop field, but which does not figure in the present published output. This is the final origin/destination of the flight, which could give a better approximation of the "true" origin/destination of the goods on board.

The flight origin and destination will give more information on cargo for some flights, specifically those with one station stop (as in the Vancouver-Edmonton-Amsterdam example). The end points become less relevant on flights with several stops, where cargo is enplaned and deplaned at each stop. While there may be many non-stop or one-stop international flights, this aspect of the data needs further study in order to determine the quality of what is reported, and potential application for producing O/D information. The remainder of the traffic (the multi-stop "milk runs")would require alternate treatment, possibly the development of a model.

There is no detail reported on the goods carried, nor is the value of the cargo reported on the Airport Activity Survey. The financial data reported by Canadian carriers who remit financial statements to the Aviation Statistics Centre relate to the revenue earned from the transportation of goods; no information on the value of the cargo itself is captured at the Aviation Statistics Centre.

In terms of the coverage of the Airport Activity Survey, only Level I and some Level II Canadian carriers, and equivalent foreign carriers file cargo data (5). The absence of information on regional and small carriers results in an understatement of total cargo activity. Civil Aviation operating data indicate that about half the tonnage enplaned by Canadian carriers is not captured in the Airport Activity Survey. Only passenger traffic detail is required of the smaller scheduled carriers; the smaller charter carriers don't file traffic data at all.

Other aviation surveys can help in approximating the understatement of cargo activity in the Airport Activity Survey. If the objective is to derive cargo flows and not to account for the total (i.e., unduplicated) volume, it would not be inappropriate to show goods moving twice if that is in fact what happens. For example, goods coming in from the Pacific Rim to Vancouver may be delivered by a national carrier to an airport further inland, then fed to a regional or local carrier for shipment to their destination. Ignoring the last leg of the journey for these goods will not result in an accurate O/D, thus distorting cargo patterns. The same can be said for intermodal transfers (marine/air, air/truck, etc.) which have not been considered in this paper, but which would be necessary to really know the ultimate origin or destination of these goods.

Following on the earlier statement that most cargo is not carried on dedicated cargo flights (insofar as major scheduled carriers are concerned), if the same holds true for smaller carriers (who presumably would also want to maximize capacity, given the opportunity). Using Aircraft Movements Survey (AMS), counts of arrivals and departures for Level I to III and smaller carriers at selected airports show gaps between AMS and the Airport Activity Survey (see below).

Fourth Quarter 1994 - Number of Flights							
	Aircraft Movements Survey			Airport Activity Survey			
	Level I-III & foreign carriers	Level IV & V carriers	Total	Major Scheduled	Regional & Local	Major Charter	Total
Dorval	35,343	3,925	**39,268**	15,624	16,344	698	**32,666**
Mirabel	7,742	1,523	**9,265**	3,187	540	841	**4,568**
LB Pearson	66,364	3,938	**70,302**	42,756	16,624	4,575	**63,955**
Hamilton	3,060	4,528	**7,588**	98	1,038	97	**1,233**
Calgary	30,860	3,442	**34,302**	21,022	6,070	1,155	**28,247**
Vancouver	53,259	6,517	**59,776**	26,691	17,150	1,764	**45,605**

Source: TP-143, Aircraft Movement Statistics
Statistics Canada publication 51-005

Granted, the aircraft movements counts do not distinguish full from empty aircraft and passenger from cargo flights, but the apparent undercounting can be seen by the relative numbers of flights observed in both surveys.

To sum up, the Airport Activity Survey has some elements of origin and destination information, some of which have yet to be investigated. The presence of a flight O/D, in addition to the next/last stop data, could be used to produce a better approximation of some cargo movements (non-stop or one-stop flights, as noted earlier). The positive aspects of this database include full coverage of movements by major carriers (Canadian and foreign). The negative points to consider include the absence of information on the description and value of the goods, and the gap resulting from the fact that regional and local carriers are not obligated to file goods-related information.

International Trade Statistics

Statistics Canada compiles an extensive set of information relating to imports and exports of goods. This major economic series is derived from administrative data from Canadian and American customs and excise records. Under a Memorandum of Understanding (MOU) between Canada and the United States, the two countries "swap" their respective import data for the other country. Thus, Canada receives a database detailing American imports from Canada, which are then expressed as Canadian exports to the United States. This exchange (the MOU was signed in 1987, while the actual exchange began in 1990), which began in 1990, has resulted in access to additional data elements from the US file which are not available from the standard export document (B13).

Exports to other countries are derived from B13 reports, and all imports are derived from the B3, both of which are Revenue Canada documents.

Trade data are compiled monthly by country of origin (destination), and by type of commodity (using the Harmonized System of classifying goods). Other information available include the value of the merchandise, the province of origin/destination and the mode of transport. The mode of transport (MOT) refers to the means by which the goods left the country for exports, and the mode by which goods arrive in Canada. Most international

airports are also Customs ports of entry/exit, and a major assumption in the following analysis is that most merchandise transported by air clears Customs in either a Canadian or a foreign airport, as opposed to a sufferance warehouse (in which case air freight would then be categorized as road).

The Trade file contains the date (day, month, year) of the shipment, the eight or 10-digit commodity code, the Canadian port of entry/exit and the country of origin (and the country of export for importsOther fields include the quantity and a unit of measure (since some commodities are shipped in units other than kilograms); quantities are converted to kilograms, where appropriate. The value of the goods is also given, as well as the identity of the importer cr exporter, and the identity of the carrier (sometimes).). For US commerce, the origin and destination are given at the state level, and the shipping weight is required at the "line level" for marine and air shipments valued over $2,500 (as opposed to "document level", which is the requirement for other exports).

All merchandise entering or exiting Canada must clear Customs. The recent appearance of Foreign Trade Zones (FTZ) near some airports would be an exception. Goods may enter a FTZ in bond, where a manufacturer would re-assemble, label, re-package or somehow modify the product, then ship it out of the country. There are few FTZ's in Canada - Vancouver and Edmonton have them, Hamilton is developing one. They can be expected to proliferate as industry continues to segment production and distribution of materials, according to where expertise and efficient labour and facilities can be found. (6) The growth of this activity will have an impact on the use of Trade data to approximate airport-related activity, since these goods will flow through the airports (twice) but not through Customs.

Analysis of goods movement using Customs data for shipping and trucking has been problematic when goods movements are being reconciled between transportation and trade surveys, since product can come into the country and go into bonded storage for up to months at a time. A second assumption in the aviation analysis is that this factor is minimal, because of the general time sensitivity of air freight. This is not to say that no air freight waits around in a warehouse. It is likely, however, that the storage period would not exceed a month (and even less likely a quarter) for time sensitive material.

The comparison of Airport Activity and International Trade data

The following evaluation of the trade statistics for air freight, in comparison to the Airport Activity international cargo data, will demonstrate whether it is appropriate to combine these two data sources to make statements about the flow of goods by air. Coverage and composition of the data and the underlying concepts of each survey are factors which will be considered.

The initial study period was one quarter, but this was narrowed down to July 1994. In order to evaluate import and export data for the air mode, all records coded to air for July 1994 were extracted, which resulted in four databases, two each for imports and exports (US and other). Detailed output from the Airport Activity Survey was also reviewed for July 1994.

The empirical data

Six Canadian airports were selected, based on their importance to the overall international cargo scene: Dorval; Mirabel; Toronto; Hamilton; Calgary and Vancouver. These airports appear regularly (with the exception of Hamilton) in the quarterly Airport Activity tables, and all are served by a combination of major and regional or local carriers. A summary of the results for both surveys for July 1994 is presented below.

Cargo enplaned and deplaned, July 1994 International and transborder freight			
	enplaned	deplaned	total
Airport		tonnes	
Calgary	508	700	1 208
Dorval	148	287	435
Mirabel	2 689	3 257	5 946
Hamilton	22	-	22
Toronto	6 939	9 302	16 241
Vancouver	4 936	3 719	8 655

Source: Airport Activity Survey (unpublished)
Statistics Canada

Value of Trade, July 1994	Air mode		
	Exports	Imports	Total
Customs Port		$'000 Cdn	
Calgary	33,579	55,814	89,393
Dorval	60,630	151,461	212,091
Mirabel	495,880	236,712	732,592
Hamilton	2,433	69,952	72,386
Toronto	592,664	782,484	1,375,148
Vancouver	48,294	130,172	178,466

Source: International Trade Division (unpublished)
Statistics Canada

At a glance, Toronto dominates in terms of tonnage as well as value. Hamilton barely registers on the Airport Activity Survey (most of the tonnage reported is classified as domestic, possibly due to routing of the flights), yet there is about $70 million in goods moving through this port of clearance, just for one month. No American-bound cargo was recorded out of Hamilton, yet nearly two-thirds of inbound cargo (in terms of value) at Hamilton arrived on flights from the US. Vancouver placed second in the Airport Activity results on a tonnage basis, but Mirabel outdistanced Vancouver on a value basis for two-way trade.

Airport Activity Results for July 1994, US and Other International Flights*

	Dorval	Mirabel	Pearson	Hamilton	Calgary	Vancouver
Deplaned (tonnes)	287	3,257	9,302	-	700	3,719
% from US	100	20	26	-	63	25
Tonnes from US	287	646	2,463	-	442	947
Enplaned (tonnes)	148	2,689	6,939	22	508	4,936
% to US	100	24	31	100	32	21
Tonnes to US	148	650	2,131	22	162	1,052

* as determined by next/last stop
Source: Airport Activity Survey (unpublished), Statistics Canada

International Trade Results for July 1994, US and Other International Markets, Air Mode of Transport

	Dorval	Mirabel	Pearson	Hamilton	Calgary	Vancouver
Imports ($'000)	151,461	236,712	782,484	69,952	55,814	130,172
% from US	95	16	54	64	79	72
value from US ($'000)	144,358	37,792	422,507	44,491	43,937	93,118
Exports ($'000)	60,630	495,880	592,664	2,433	33,579	48,294
% to US	47	40	57	-	52	40
value to US ($'000)	28,439	196,651	337,387	-	17,345	19,448

Source: International Trade Division (unpublished), Statistics Canada

A few observations on the principal Trade information:

Toronto - major destinations were in the US (California, Texas account for 13% each of value of shipments; principal cargoes include precious metals, computers and other electronic equipment); 20% of inbound cargo is shipped from California (although many shipments of electronic equipment originated in Asia). Important cargoes unloaded included machinery and pharmaceuticals, precious metals, electronic goods and motor vehicle parts. Relatively low-value goods included plastic and rubber goods and textiles.

Mirabel - one-quarter of shipments were destined for Great Britain, another 17% for Switzerland; Britain and Germany were important points of origin for international air shipments at 13% each. Important commodities moving through Mirabel included aircraft and parts, chemicals and pharmaceuticals and precious metals.

Dorval - given the composition of airlines calling at Dorval in July 1994, it was not surprising to see American airports come out on top in terms of air cargo shipments in both directions. Mexico was also an important destination. Important high-value cargoes included aircraft and parts, computer-related equipment, pharmaceuticals and chemical products.

Vancouver - nearly one-third of inbound cargo was shipped from California - many shipments originated in Asia. Computer equipment, optical fibres and aircraft were important commodities delivered to Vancouver. Japan and Hong Kong were important offshore destinations; they accounted for 27% of shipments by value. Precious metals and computer equipment were important commodities; also registering significant dollar values were shellfish and ginseng bound for Hong Kong.

Calgary - nearly one-quarter of shipments into Calgary came from California, many of these were electronic goods which originated in Asia. Low-value cargoes included rubber and plastic products, some of which originated in Taiwan. Outbound cargo included telecommunications equipment for Britain and chemical products headed for California.

Hamilton - California and Italy each accounted for 13% of inbound cargo. Precious metals and electronics equipment were high-end commodities; plastic and leather products and printed material were relatively low-value commodities entering Hamilton from these two markets. Heavy construction equipment was an important outbound cargo category, significant quantities were destined for Brazil.

*** Coverage**

Trade data are based on administrative forms covering virtually 100% of goods shipped into and out of Canada (7). The Airport Activity Survey also covers 100% of its target population, which is nonetheless restricted to major air carriers. Some sort of link was sought which would show the relative coverage of these data sources, obvious candidates being quantity, time period, origin and destination. Links were also sought on carrier code, but this was not available on the export file.

*** Quantity**

The best link between the two data sources would have been the weight, but most trade records extracted had no entry in this field (8). Information on quantity is collected only for goods where the Customs Tariff and export classification deem it necessary. The value of the goods drives the calculation of duty, where applicable, and it is also a critical variable for calculating the balance of trade between Canada and other countries. Quantity is of lesser value (keeping in mind that the source is an administrative record collected for purposes other than describing cargo flows) to trade analysts if the value is present.

For July 1994, there were nearly 167,000 records in the import file, about half of which had no value in the quantity field of the extracted file (see below). For exports (some 36,000 records), the absence of quantity data was more pronounced. As mentioned earlier, quantity data is not required for certain types of commodities (for example, aircraft are measured in pieces). While it would be useful to examine a few more months' worth of trade records, it would seem that quantity is a variable that would be difficult to obtain on a continuous basis.

Results from Trade File - Counts for Quantity Field

July 1994	Total Records	No Quantity	Percent, no Quantity
Imports:			
Total	166,922	87,566	52
US	107,067	62,003	58
Other	59,855	25,563	43
Exports:			
Total	36,344	29,573	81
US	23,633	19,954	84
Other	12,711	9,619	76

*** Value**

While value was consistently present, it was difficult to substantiate the value of different types of cargo, since the quantity was not always available. Where quantities were present, a series of unit value calculations by commodity type were performed. Interestingly, not all the commodities chosen for unit value calculations appeared to be high-value merchandise (although there were several shipments of "hi-tech" materials, precious metals and electronic equipment noted); perishability appears to be a common characteristic of air freight (notably, food products) as well as time-sensitivity (machine parts). While this is not news to those who analyse aviation data, a closer look at the vast range of products that are shipped by air would likely reveal several niche market possibilities for local airport authorities, or even air carriers, producers and shippers.

*** Carrier**

Although it was not always possible to identify a carrier from the Trade data source, the more detailed import file carries a Cargo Control Number (CCN), where a carrier code is embedded. Though not always available (sometimes the carrier code is a default value), it also provides a potential link to the Airport Activity file. Knowing the frequency of service of a carrier between two points (the total number of flights for a given month are provided in the Airport Activity file for each routing), it may be possible to isolate all known records from both sources for a mechanical match. A small number of manual matches were made between the Airport Activity and Trade files for particular carriers. Few of these were successful - the foreign points were often not served by scheduled flights, according to the reference material used at ASC (mainly the Official Airline Guide), and less detail is available at ASC on charter cargo. The export file obtained via the exchange with the US includes a carrier code for southbound air and marine shipments, but this is dropped when the US data is merged with the other exports. The carrier code would be a useful tool for reconciling these two datasets.

*** Port code**

Most international airports have their own Customs facilities for clearance of cargo, although some of these do not have the capability to clear passengers. As a result, Mirabel, Pearson and Vancouver International are all recognized Customs ports, with their own geographic codes (i.e., as opposed to "Montreal", "Toronto", "Vancouver"), which enables an analyst to place inbound or outbound cargo at an airport, thus validating the assignment of the mode of transport (MOT) code. Since only six airports were examined in detail, no statement can be made as to the overall quality of the MOT indicator. Since the "other" mode is fairly high, it would be useful to examine it in detail before deciding to use only transactions coded to air. The "other" mode transactions could be scanned for the port of entry/exit; any records showing goods moving through Canadian or foreign airports should be followed up in greater detail.

*** Date**

There were two dates carried on the MOU file detailing exports to the United States, showing the date of exportation and importation. Also available, but not obtained in these extractions was the date of shipment versus the date of Customs clearance. A comparative study of these would be interesting, since this study assumed (but did not prove) that air freight would likely clear Customs in a shorter interval than goods shipped by other modes.

Conclusions/Recommendations

The principal topic of this paper was international cargo traffic. The International Trade data source has some promising characteristics in relation to aviation survey data for cargo movements. Unfortunately, there is no similar companion dataset on the domestic side (existing either in commerce or aviation), although periodic surveys of manufacturers may prove useful in analysing domestic flows.

Similarly, cargo data is not required at present from regional and local carriers - this is primarily an issue of respondent burden. Any additional requirements of air carriers must be either legislated through carrier filing requirements (by Transport Canada or the National Transportation Agency) or respond to a demonstrated requirement under the Statistics Act. Given the low priority on the part of major users (as noted above for domestic cargo), these data will not likely become part of filing requirements in the near future.

Other sources of cargo data exist which could also be compared to the Trade and Airport Activity sources. The On-Flight Origin and Destination (OFOD) and Traffic by Flight Stage (TFS) publications produced by ICAO would cover major international routes (in the OFOD series published routes must be served by at least two carriers and countries). While helpful, these statistics would not be complete. They are very useful in specific types of analysis if the above restrictions are taken into consideration.

The International Trade data source is developing as an increasing number of shippers and carriers adopt Electronic Data Interchange (EDI) for filing commercial documents. Staying on top of these developments will ensure that any improvements to this data source could be incorporated into the above analysis. The proliferation of standard EDI messages is expected to make the provision of this information less onerous on the part of the shipper or carrier.

A periodic, detailed micro match of air mode trade records and Airport Activity records should be done to compare coverage, but any ongoing O/D data program should be based on the aggregate statistics and the relative coverage of the two sources duly noted. This would save resources, as the two datasets will never be the same.

References

1. Taken from remarks made by Dr. Michael Tretheway at the "Airports Canada 1995" conference, Toronto, December, 1995

2. Aviation Statistics Centre, Statistics Canada - Airport Activity Survey: bellyhold and entity cargo accounted for 84% and 16%, respectively, of the total tonnage in 1994.

3. Taken from remarks made by Ms. Clare O'Brien, Marketing/Advertising Manager, McCarran International Airport, Las Vegas, at the "Airports Canada 1995" conference, Toronto, December, 1995.

4. Taken from notes on data quality and methodology, "Air Carrier Traffic at Canadian Airports" Aviation Statistics Centre, Statistics Canada, catalogue 51-005.

5. Canadian carriers are classified into reporting levels for statistical purposes, according to passengers carried and/or revenue earned from flying services. Level I carriers transport at least 1 million revenue passengers or 200 000 tonnes of revenue goods annually. Level IV carriers earn at least $500,000 annually from the provision of air services. The Civil Aviation Survey obtains financial and operating data for Level I-V scheduled and charter carriers. The Airport Activity Survey is completed by scheduled Level I-IV carriers , and by major charter carriers (mostly in Level II) only, and by foreign carriers of equivalent size. The report covering daily traffic is filed by the major scheduled carriers, Canadian Level I and some Level II carriers, and foreign carriers of equivalent size. Please refer to Statistics Canada catalogues 51-206 and 51-005 for further detail.

6. Taken from remarks made by Dave Frank, Horizon Pacific Ventures Ltd., at the "Airports Canada 1995" conference, Toronto, December, 1995.

7. Shipments valued at less than $2,000 are not captured from the B13 document. Goods entering Canada in transit to other countries are accounted for, but are not included in the import and export data presented in this paper.

8. Quantity (and unit of measure) is reported at either the "line" (commodity) or "document"(shipment) level, depending on the direction of the movement. Exports (B13) require document-level detail for all modes of transport. In this instance, the weight reported may encompass several types of merchandise, and no commodity-level quantity data will be available. For imports from the US, the line-level shipping weight (in kilograms) is required for marine and air shipments valued over $2,500.

The opinions expressed in this paper are solely those of the author, and in no way reflect the views of Statistics Canada, or of Revenue Canada.

Thanks to Maggie Armitage, International Trade Division, Statistics Canada for her contribution to this paper.

AIRPORT PRIVATISATION IN CANADA AND AUSTRALIA: experiments in structures of ownership and control

by John Street, BTCE Australia and UBC and David Smith, BTCE Australia.[1]

Introduction

In this paper we review developments in airport privatisation in a number of countries, notably Canada and Australia. We note some differences in the changes in government policies towards airport ownership and control, and consider what effects these differences might have on airport performance and competitive behaviour.

Central governments in Canada, Australia, New Zealand, Austria, Italy, Denmark and Great Britain, to name just a few, are withdrawing from direct involvement in the day-to-day management of the airport business. The biggest country in the airport business, the USA, never had direct Federal government involvement except in Washington DC.

Privatisation is probably the word which the most people would use to categorise this process of withdrawal, although it is privatisation in only a very loose sense, because for example in Canada and Australia, governments are retaining ownership of the major airports, in many cases the day-to-day management is simply devolved to another level of government or to a quasi-governmental organisation, and in general governments are retaining significant safety regulation, environmental controls and economic regulation. We will continue to use the term privatisation to mean "less direct central government involvement" while trying to draw out some of the differences in how this reduced involvement is being applied.

We find airport privatisation is interesting because even though it is being driven by hard economic reality, which is much the same everywhere, there are some significant differences emerging in how various countries are responding to this reality. This makes it an important experiment in different economic systems.

---

[1] Disclaimer: The views expressed in this paper are those of the authors and do not necessarily represent those of the Australian Bureau of Transport and Communications Economics, nor of the University of British Columbia.

What's happening? - Overview of developments in privatisation

Canada

In Canada, subsidisation of airports, other than for remote airports, is being phased out, and some 152 airports operated by Transport Canada have been or are being 'privatised' or devolved by means of leases from the Federal Government. Transport Canada envisages a two tiered system: a core of 26 key airports to be leased to Canadian Airport Authorities (CAAs), and the remainder to be transferred to local airport authorities. CAAs are to be not-for-profit corporations representative of the local community. Except for Vancouver, the two Montreal airports, Calgary and Edmonton, which are already run by local airport authorities, the CAAs will operate under new principles of community accountability (Transport Canada 1994). There is a hierarchy of bodies to whom Transport Canada will sell a regional or local airport, starting with provincial governments and finishing with private business or other interests.

The big issues for Canada are whether this 'privatisation' or devolution to quangos[2] will eliminate the subsidies and bring forward needed investments in new runways, terminals and airports in an economically sensible manner. It is also important to maintain links to all segments of the Canadian community, especially the remote settlements dependent upon air transport.

Australia

The Australian Federal Government currently owns and operates 22 primary international, regional and general aviation airports. The management of these airports is undertaken by the Federal Airports Corporation (FAC), a Government-owned corporation, which has been operating since the beginning of 1988. In 1994/95, the FAC handled about 54 million passenger movements and 3.1 million aircraft movements (landings and take-offs) across its network of airports (FAC, 1995).

In May 1994, the Australian Government released its white paper, *Working Nation*, which announced its intention to sell the FAC airports. A plan was adopted to privatise the 22 airports by way of 50 year leases. Over the following year, the details of the proposal were refined and the 'Airports Bill 1995' was introduced into Parliament in late September 1995. The Bill proposed sale of the airports in two tranches. The first tranche would include Sydney airport (plus Sydney West), Brisbane, Melbourne and Perth airports. The second tranche, for the remaining airports, would be undertaken following successful sale of the first tranche.

---

[2] quango = quasi non-government organisation

The Airports Bill 1995 sets out the regulatory arrangements that are proposed to apply to the FAC airports (and Sydney West Airport) following their leasing. A summary of the main points follows.

- Leases will be provided for a 50 year term, (with or without an option to renew for a further 49 years).
- Lessees for Sydney airport and a proposed Sydney West airport must have a common holding company. Note that the Australian government has to-date committed A$762 million to the development of Sydney West Airport, however, the project is currently subject to a environmental impact study.
- Airport leases cannot be transferred without the written approval of the Australian government.
- Airport lessees cannot carry out non-airport business.
- Majority ownership and control will be Australian. Foreign ownership of an airport operator company will be allowed to a maximum of 49 per cent.
- There will be a 5 per cent limit on ownership of an airport by an airline or associated interest.
- Ownership and control of the lessee of the Sydney airport(s) must be separate from that of either Brisbane or Melbourne airports.
- Airport master plans must be approved by the Australian government. Major developments and building activities must also be approved and consistent with master plans. Approval of major development plans will be conditional on the completion of a full environmental impact assessment process.
- Airport operators must develop, submit for approval and comply with environmental strategies. Environmental strategies will cover periods of 5 years.
- The Australian Competition and Consumer Commission (ACCC) will be responsible for prices oversight at the major airports. Prices surveillance will include monitoring of price caps (CPI-X)[3] set by the government at Sydney, Melbourne, Brisbane and Perth. Price caps will apply to aeronautical charges and will operate for five years - sufficient flexibility will be allowed to accommodate necessary infrastructure expenditure.
- The ACCC may also monitor and evaluate the quality of airport services and facilities, and publish reports relating to the quality of airport services and facilities.

---

[3] CPI-X = the Australian consumer price index less an efficiency dividend.

- The Government reserves the right to exercise certain powers relating to the management of demand at airports. These primarily include: the determination of capacity at an airport in a specified period (for example, the maximum hourly handling rate); and the introduction of demand management schemes (for example, prohibition of selected categories of aircraft movement, the allocation of slots, or limitation on the number of aircraft movements during specific times).

Recent developments in the sale of Australian FAC airports

The Airports Bill 1995 proposed the sale of the FAC airports in two phases. Phase 1 airports were to have been offered for sale in the second quarter of 1996, and the remaining 18 airports (phase 2) offered for sale in 1997. However, on 21 November 1995, the Australian Federal Opposition, backed by the Australian Democrats, blocked the passage of the Bill, preventing the sale process from commencing. The primary reason for blocking the Bill concerned a dispute over the management of aircraft traffic and the subsequent distribution of aircraft noise in the areas surrounding Sydney airport.

The Federal election of 2 March 1996 has resulted in a change of government, and while at the time of writing, firm details of the new government's policy on airport sales have not been made public, we do have some pre-election statements to go on, such as: [the new government] "supports the leasing of 22 FAC airports, but ... the leasing process will be deferred until ... the EW runway [at Kingsford Smith Airport] is reopened, and a genuine environmental impact study on Sydney West Airport is completed."

Australian withdrawal from local aerodrome ownership and assistance

For many years the Australian (Federal) Government owned and operated a number of aerodromes and also provided financial assistance to licensed aerodromes owned by local authorities or private organisations. For this latter group _ which by mid 1990 constituted some 234 aerodromes participating in the aerodrome local ownership plan (ALOP) _ the government provided funding for 50 per cent of the costs of approved maintenance works.

By 1990, responsibility for operating and maintaining Australia's major airports had been the progressively transferred to the Federal Airports Corporation, and the government felt it was no longer well equipped to maintain the remaining Australian aerodromes as a national network. Instead, it considered that local communities could do so more efficiently, and so in August 1990, announced its intention to invite local owners to take full responsibility for the management and operation of aerodromes participating in the ALOP, and also to transfer the 30 remaining Government owned aerodromes to full local ownership. The

intention behind the strategy was to enable local owners to better develop the commercial potential of their aerodromes to the benefit of the communities they serve.

The main terms under which aerodromes were to be withdrawn from the ALOP (or transferred from Government ownership) were as follows:

- full responsibility for the aerodrome (and funding) would belong to the new owner;
- the Government would stop collecting landing charges, and the local owner would develop his own overall charging regime;
- the Government would write off any past investment in the aerodrome;
- the Government would consider funding works necessary to meet aviation industry needs by providing a once-only non-attributable grant;
- responsibility for all site specific visual aids would be transferred to local owner; and
- the Government would provide a capitalised social benefit subsidy to those aerodromes which satisfied certain criteria (see box 1 below for discussion of this social benefit subsidy).

The program of transfers and withdrawals was initially costed, in 1990, at about $37 million, but in early 1992, the Government announced an additional $27.5 million would be made available for grants and social benefit subsidies in order to accelerate the program.

The program ended up taking approximately three years to complete, by which stage all 234 aerodromes participating in the ALOP had withdrawn from the plan and were the responsibility of their respective local authorities, and the Government aerodromes had been successfully transferred to alternative owners, or in at least one instance, had been closed.

Overall, Australia has eliminated its subsidies to the airport business, although there remain some loss-making airports. The major fix was the corporatisation of the Federal Airports Corporation in 1988. Difficulties continue with different perceptions of the urgency of needs to undertake further investments in airports and in raising sufficient funds to finance them, particularly at Sydney, Melbourne and Adelaide.

Other countries

The USA, the biggest in the airport business, has never had a strong level of direct Federal government ownership and control, but it is dominated by local government ownership and the federal government is involved in subsidizing

airports. There is a mix of various ownership levels but only a few privately-owned airports. Airlines frequently own or control their own terminals. The USA has experienced some difficulty in financing airport investments in recent years (Golaszewski 1992).

Great Britain, led by the Thatcher government, broke new ground with privatisation of its British Airports Authority. The British Airports Authority, which controlled a significant group of airports including all the major London airports, was floated on the stock exchange. RPI-X price controls were instituted.

New Zealand, being among the foremost countries in matters deregulatory, is keen on privatisation. It has corporatised its major airports and holds a minority share (25 per cent) in Christchurch International Airport, and majority shares in Auckland and Wellington.

Box 1 Social benefit subsidy

The Government recognised that some aerodromes (both Government and ALOP) could not be operated commercially[4]1, and so chose to provide a social benefit subsidy to the new owners of these aerodromes to ensure that the social access and equity needs of small or remote communities continued to be met.

In considering whether a subsidy would be provided the following factors were taken into account:

- the level of population served by the aerodrome;
- the proximity of the community to a population centre having services such as schools, medical services, fresh food and groceries;
- the quality of road access to the community; and
- the proximity of the community to another aerodrome of higher standard.

The subsidy, where provided, was paid as a one-off capitalised subsidy on the transfer to full local ownership of a Government aerodrome or the withdrawal of an aerodrome from the ALOP.

[4] The provision of a social benefit subsidy was only considered for aerodromes which were assessed as not being commercially viable. Aerodromes were assessed as commercially viable where potential revenue exceeded routine and cyclical maintenance costs.

Why privatisation? Government ownership has been found wanting

In Canada, Transport Canada failed to achieve cost recovery - a loss of about $130 million per annum was being recorded as late as 1993. Transport Canada apparently also found it hard to improve airports' efficiency, failing to resolve problems with having two airports at both Edmonton and Montreal when only one was needed for each city.

Governments almost everywhere have found it difficult to raise investment funds (for example at Vancouver, Toronto, Sydney, Melbourne, Adelaide). This experience may be compared with Vancouver, and Cairns in Australia, after privatisation where local authorities were quite successful in raising debt funding from the private sector.

Governments have also had difficulties in reconciling differences in perceptions of priorities for airport investments - the result has been wasteful over-investments existing side-by-side with resource-poverty and congestion.

Central government airport authorities were regarded as unresponsive to local communities' as well as users' and consumers' needs. In Australia, there were complaints that Melbourne's economic growth was stymied by failure to attract airline services. There was a similar experience in Vancouver.

The privatisation alternative: what will it achieve?

A list of claims for what privatisation may achieve, looks something like this:

- allow local airport managers to exercise initiative, respond flexibly to user and consumer needs, and promote the airport business;
- insert governance structures which encourage performance - linking rewards to effort and provide disciplines for poor performance;
- introduce competition among airports, allowing the economic law of natural selection to prevail in that the best airports will grow fastest, and encouraging airports to benchmark their performance.

So why not just sell?

If this list of claims for the virtues of privatisation and litany of failures for government-run airports are taken at face value, one might immediately conclude that immediate and complete privatisation is the only answer.

Others may doubt however: will the interests of the travelling public and local communities be taken into account by a new airport owner? Will access to facilities be ensured for competing airlines - facilitating competition in the airline business? What scope is there really for introducing competition?

Privatisation need not mean abdication of government responsibility moreover. While no-one doubts that Western-style capitalism has proved superior to Soviet-style communism in delivering economic growth and output, this is hardly evidence for the virtues of totally unfettered private enterprise. To determine more precisely how much privatisation is desirable, we need to consider more precisely how the list of claims made above will work in practice.

The first claim in the list: "allowing local management to exercise initiative" is a kind of "small is beautiful" statement. We have a little evidence that this may apply to airports, namely the apparently successful operation of Cairns airport in Australia and Vancouver in Canada. Note however, that the British Airports Authority represents a continuation of centralised decision-making over a large group of airports, whereas in Canada and Australia, we expect to see significant decentralisation. So examination of the before and after performance of airports in these countries may in the future provide more conclusive evidence.

The other claims depend upon appropriate governance structures and the scope for competition among airports.

Governance structures[5]

Every organisation, including an airport, needs a governance structure which provides an incentive for excellent economic performance - there should be rewards for good results, and controls which prevent the continuation of bad results.

There are some pundits who may argue that private ownership immediately provides improved governance through greater discipline to management, and therefore produces an improvement in performance. But this view should be tempered: private sector managers are certainly not motivated by fear of stockholders at large, and there is some controversy in Britain over the ability of management of newly privatised corporations to vote themselves large salary increases; moreover, airports will still be large corporations with many employees. Within a large corporation are many of the features which lead to inefficiencies in government - the difficulty of getting someone else to know your wants and needs, and to supply them, often called principal-agent problems.

A counterview is therefore possible, that there is no real reason why the same governance structures, the same rewards and punishments, cannot be instituted in government-owned enterprises as in private ones. Certainly there has been an upsurge of interest in improved performance management for government

[5] In this section, we have drawn on the ideas of Swan and Garvey 1993.

businesses in the Western world. In Australia, significant improvements have been observed in institutions such as the Federal Airports Corporation through corporatisation.

Ultimately, private enterprise seems to provide a mechanism whereby a link between good performance and rewards is more easily negotiated, and the sanctions for poor performance - for example, stock market buy-outs and subsequent sackings, or fear of bank foreclosures on debt - are more easily carried out.

We merely note here that it remains to be seen whether the Canadian local airport authorities can be adequately rewarded for good performance and sanctioned effectively for poor performance - are the governance structures adequate?

The question of airport competition

A possible concern with privatisation is that it merely replaces a government monopoly with a private one. What is the truth in this statement? There is of course little empirical evidence of what happens in practice because airports hitherto have had little opportunity or incentive to compete with each other. Nevertheless, to the extent that airports would compete, perhaps we can rely on market forces to keep prices in line with marginal costs and ensure that airports perform efficiently.

It could be argued that airports are monopolists in the origin-destination markets for their surrounding regions. That is, an airport is a monopolist for the traveller who "must go" by air to or from the nearby city. If you must go to Winnipeg to attend the CTRF then it is hard to avoid Winnipeg International Airport.

On the other hand some people argue[6], that there is scope for airports to compete; as 'gateways', tourist destinations and hubs. For instance, Vancouver competes in the gateway market to North America from Asia against Seattle-Tacoma, San Francisco and Los Angeles International Airport. Heathrow competes against Frankfurt, Charles de Gaulle and Schipol airports as the gateway to Europe.

There is scope for airports to compete in promoting tourist destinations in their surrounding regions. (This may be a collegiate effort in concert with other interested parties such as resort owners.) Because they are a "bottleneck" through which visitors must go, they are in a unique position to capture some of the benefits of such promotion, as well as determining whether such a

---

[6] eg: Professor Michael Tretheway, UBC, "Do Airports Compete?", Seminar to BTCE, Canberra, 1993.

destination is attractive. In determining whether a Tokyo tourist ends up visiting Australia through Cairns airport, or Hawaii through Honolulu, all kinds of things determine the ultimate choice, including the reputed convenience of getting through the gateway. For example, horror stories about strike-prone or congested airports are likely to influence tourists' decisions about their destination.

Hub airports may also compete against each other for an airline's and passenger's choice. However, in the USA, the country with the most developed domestic hubbing system, this competition is often subsumed into competition among airlines who 'dominate' their hub airports. (For example, Northwest airlines occupies 90 per cent of the landing and take-off slots at Minneapolis airport and is a virtual monopolist to and from this airport, but competes against a number of other hub systems such as the United Airlines and American Airlines Chicago hub.)

The possible effect on airport competition of pricing at the margin

Since what matters in pricing decisions is the marginal revenue and marginal cost then competition among airports may ensue even though each airport is a monopolist for a segment of its market.

Consider two airports, where each airport has excess capacity which it wants to sell, and each airport is a gateway or hub where only a proportion of that airport's traffic is captive to the airport. That is, only a proportion of the traffic is bound for, or departing from, that airport's surrounding region with no reasonable alternative entry or exit point. If price discrimination among classes of passengers is not possible, then the airport may not take this traffic into account in its pricing decision! Rather, the airport may price aircaft movements on the more elastic segment of its market: it could consider, at the margin, whether the additional revenue from inducing an additional aircraft to use its airport as a transit hub exceeds the marginal costs. In fact this is a highly elastic segment because the decision by an airline to hub at an airport is not a marginal decision — it either brings lots of additional aircraft landings or none. Therefore, to the extent that there is at least one alternative airport of equal quality, an airport could become a perfect price competitor.

Note that the absence of price discrimination is crucial because an airport might capture rents by charging different fees to different users or through peak period pricing. It could for example charge a higher price for origin-destination passengers through an entrance or exit fee to or from the airport other than via air. (Or charge parking fees which expropriate rents.) However, transit passengers are likely to be more or less uniformly distributed across all the

aircraft landing and taking off. The airport cannot therefore charge a different price for an aircraft carrying transit passengers.

Another critical assumption is that two competing airports be close substitutes. Then either airport will realise that it can capture almost all of the transit market through a small reduction in price. Given that both airports are in this position they would end up pricing at marginal cost.

However, foreseeing the above scenario, airports would strive to differentiate their products through additional investments and thereby to reduce the pricing tension between them. Eventually, one airport or the other may be forced to give up the investment race (because it runs out of funds, has no more room to expand, or is not chosen by the airlines). Nevertheless, the incentive for additional investment alone may be worthwhile from a social viewpoint and dissipate some of the rents from airport market power.

The scope for competition therefore appears to be highest if the airport can be identified as one of a number of gateways to a continent, or one of a number of alternative tourist destinations, and lowest if its only purpose is to serve a particular city.

In practice, competition is never a black and white thing. And the existence of scope for airports to compete does not necessarily imply that this will happen. Typically, the incentive for private owner of an airport would be to make profits, and for a Canadian local airport authority, presumably to satisfy the wishes of its parent bodies. In either case, competition is not an end in itself. The situation is one of rivalry, with the potential for this rivalry to manifest itself as either competition, or attempts to eliminate, or to collude with the rival. Again there is a question: whether a Canadian airport authority, being a not for profit organisation, will have sufficient incentives to engage in vigorous competition in the longer term?

The control of airport monopoly power

If an airport is a plain vanilla monopoly, then one may think that it is better for it to be a public one; however, the arguments concerning decentralisation and governance structures still apply; and it may be equally valid to control the exercise of airport market power; for example by controlling prices and preventing "gold plating".

This view of the airport monopoly issue was taken by the British government under Margaret Thatcher, which sold a bundle of airports in one package. It gave recognition to the monopoly problem by instituting a system of price controls known as "RPI-X". Moreover, the methods of privatisation used in Britain, Australia and Canada all tend to capture any economic rents from

monopolisation which are known beforehand, through the sale or transfer price to the new owners. However, there are problems with this system in ensuring that a satisfactory level of investment is undertaken. The issue is: how much more, if anything, should an airport be allowed to charge as an inducement to invest in further capacity? (Starkie 1991)

Concern about prices may be over-emphasised, when the cash costs of using airports are really only a minor part of total travel costs, and the convenience of using an efficiently run airport may be a far more important issue to the traveller than the cost of using it. Airport competition may manifest itself in attention to users' needs through timely investment in improved facilities (rather than in rock-bottom landing charges).

Investment in airports to deter entry or soften up competition

A possible dimension to airport competition is in the long run[7] to compete in capacity (investment in runways and terminals). Such investment may be characterised as the first stage of a two stage game.[8] The investment stage would be undertaken strategically with one eye on the direct benefits to the airport's bottom line and another on the effect on rival airports. Within this characterisation is a plethora of alternative strategies.

Firstly, there may be direct benefits to an airport in reducing congestion - lowering costs to users and thereby increasing demand from airlines otherwise turned away.

An airport owner might also have a strategic reason to consider investment: to hurt rival airports, either by blockading the entry of competitors or by softening up the existing competition through demand switching

On the other hand, an alternative possible strategy may be to avoid creating a competitive situation if subsequent competition (the second stage of the game) were characterised by price-taking. If investment only served to create extra pricing tension and increases the future likelihood of an unprofitable price war between airports seeking additional airline customers, then an airport owner might be deterred from further investment.

In general it is unclear whether a business will compete in prices or ration its capacity. The difference in these alternative competitive behaviours is quite critical for determining whether investments for strategic reasons are beneficial or harmful from the point of view of the airport decision maker, and also from the viewpoint of society as a whole. In the airport business however, as we have

---

[7] (or in the first stage of an airport competition game)

[8] (The game theoretic aspects of what follows are well known, see for example Tirole 1989).

already said, price may not be a major consideration when compared with the difference in quality of service at alternate airports, and once one airport is chosen over another, airlines may be reluctant to switch, leading to a gradual future reduction in competitive pressure.

For these reasons, investment competitions among rival airports appear quite likely, followed by a diminution in competition once the competition is decided. Furthermore, what can be done to remedy strategic investment behaviour is unclear. There are no laws banning over-investment[9], and no means short of public subsidy, which privatisation is meant to avoid, of counter-acting under-investment.

Conclusion

The above set of results may seem a bit mixed. Which privatisation experiment is best? Canada, Britain, Australia, Elsewhere?

There is reason to believe that all of the privatisation experiments will improve upon the current situation. In the first place, a "new broom sweeps clean" and any change could be an improvement by providing an opportunity to sweep out can't do attitudes and institutions. And in each case there are prospects of improved governance structures and improved monitoring of performance. It may be questioned however whether Canada has gone far enough in providing for private market disciplines for airport management.

The question whether there will be a manifestation of the other driver of improved performance under privatisation, the introduction of competitive market forces, is surprisingly complex. There is scope for competition, but this may diminish in the longer term as one airport or another becomes congested, or wins the investment race against its rivals; and in Canada, the incentive to compete may be diluted by the not for profit charter of its local airport authorities.

Bibliography

Airports Bill 1995, introduced into the Australian Federal Parliament in late September 1995.

Airports Task Force, 1986, *Report: the future of Canadian airport management*, Transport Canada, Ottawa.

Air Transport Association of Canada, (various years), *Annual Report*, ATAC, Ottawa.

[9] It might be argued that such behaviour is a form of predatory pricing, but it would be very hard to prove a case.

Baldwin, Blair, 1980, *The management structure of airport operations in Canada and the United States,* Centre for Transport Studies, UBC.

Buckingham, D, Address to the Airport Owners' Association by David Buckingham, First Assistant Secretary, Department of Transport and Communications, Port Augusta, 6 September 1990.

Assorted briefs and background papers of the Australian Federal Department of Transport and Communications, Port Augusta, 6 September 1990.□

Canada, Parliament, House of Commons Standing Committee on Transport, 1994, *Minutes of proceedings and evidence,* Ottawa.

Doganis, Rigas, 1991, *The airport business,* Routledge, London.

FAC 1995, Federal Airports Corporation Annual Report 1994/95, Botany, Sydney. Airports Sales Taskforce, Sale of the Federal Airports - Phase 1, October 1995.

Golaszewski, Richard, 1992, *Aviation infrastructure, a time for perestroika?* Logistics and Transportation Review, Vol. 28., no. 1, March, p75-99.

Harbison, Peter, 1995, "Trends in airport ownership", *paper presented to the Airports 95 conference,* 9 to 11 October, Sydney.

Starkie, David, 1991, *Airport investment: the Monopolies and Mergers Commission Report on BAA plc's SE airports,* Journal of Transport Economics and Policy, Vol.xxv, no. 3, Sept., pp303-306.

Starkie, David, 1994, *The US market in airport slots,* Journal of Transport Economics and Policy, vol. xxviii, no. 3. September, pp325-329.

Starkie, David and Thompson, D., 1985, *Privatising London's airports,* The Institute for Fiscal Studies, Report #16, London.

Swan, Peter and Garvie, Gerald, 1993, "Linking rewards to performance", *paper presented to Swan Consultants conference on Measuring the Economic Performance of Government Business Enterprises,* Swan Consultants, Canberra.

Tirole, Jean,1989, *The Theory of Industrial Organisation,* MIT Press, Cambridge, Massachusetts.

Transport Canada, 1994, *National airports policy,* Transport Canada, Ottawa.

Vancouver International Airport Planning Group, 1987, *Report,* Vancouver.

Whitlock, E.M., 1992, *Financing airport facilities,* Transportation Quarterly, Jan., vol. xlvi, no. 1, pp99-114.

Windle, and Dresner, 1993, *Competition at duopoly airline hubs in the US,* Transportation Journal, vol. 33. no. 2. Winter, pp22-30.

USER PAY TRANSPORTATION: FULL COSTS AND PRICING POLICY IMPLICATIONS

by
Neal Irwin, Lee Sims and Joseph Jones

This paper presents recent estimates of full transportation costs in Canada, by mode, and increases in user charges which would be required to recover them. It then deals with policy costing/pricing and institutional issues associated with cost recovery. It concludes by discussing the outlook for selected modes, with particular emphasis on road pricing.

FULL TRANSPORTATION COSTS BY MODE

The full costs of each transportation mode are made up of three components: **existing user charges** (what transportation users now pay in terms of capital and operating costs of vehicles and infrastructure, insurance, fares, tariffs, etc.); **basic subsidies** (infrastructure and other costs borne by government net of government revenues for the mode from user charges, transportation related taxes, etc.); and **external costs** (costs imposed on society by transportation - e.g. due to pollution, accidents - which are "hidden" in that they are not reflected in market charges and payments and/ or are not attributed directly to the transportation mode).

Exhibit 1 (exhibits follow the text) presents recent estimates of user charges, basic subsidies, external costs and full transportation costs by mode for Canada in 1994. These are drawn from a report titled ***Full Transportation Costs and Cost-Based Pricing Strategies*** (IBI Group and Boon, Jones and Associates, Inc., November, 1995) prepared for the Transportation and Climate Change Collaborative, a group sponsored by the Ontario Round Table on Environment and Economy, National Round Table on the Environment and the Economy, Environment Canada, Canadian National and Canadian Global Change Program. Estimates of full transportation costs such as these are subject to uncertainties reflecting data sources/gaps and assumptions regarding which categories of costs and revenues are included; the table in Exhibit 1 is, however, based on a number of generally accepted sources and provides a reasonable indication of the amounts involved.

The intercity rail freight estimate does not include federal subsidies paid under the Western Grain Transportation Act (these were terminated on August 1, 1995) and the passenger car estimates assume that fuel taxes paid to the federal and provincial governments (net of provincial sales tax levels) are a transportation user charge (although they are almost exclusively used as general government revenue by both levels of government rather than being dedicated to meeting road construction, rehabilitation and maintenance costs).

USER CHARGE IMPLICATIONS OF FULLER COST RECOVERY

Exhibit 2 presents the same material as Exhibit 1 but expressed in cents per tonne-km or per passenger-km in order to provide cross-modal comparisons per unit of transportation effort. Basic subsidies per passenger-km are largest for the intercity passenger train and for urban transit and are also significant for the intercity air passenger mode and for the marine freight mode per tonne-km. Percentage increases in user charges to cover **basic (government) subsidies** would range from negligible for the urban passenger car, intercity bus, urban truck and intercity rail freight to 3-5% for the intercity car, truck and marine modes, 17% for intercity air passenger, 118% for urban public transit and 237% for intercity passenger train. The large increases which would be required for the latter three modes would significantly affect their viability, which raises issues of international economic competitiveness (for the marine mode), urban transportation capacity, compatibility, and equity (for urban public transit) and intercity travel reliability and choice (intercity passenger train).

If user charges were raised to cover **external costs** only, they would have to increase by about 6-10% for most modes with higher percentage increases for some (e.g. 14% for urban public transit, 18% for intercity truck, 22% for intercity passenger train and up to 47% for the urban passenger car if additional external costs [e.g. for parking, congestion, land/urban sprawl] are included in addition to the pollution and accident costs which are included in the external cost estimates for all modes). The relatively high increases per passenger-km for intercity passenger train and urban public transit reflect the low volumes currently carried by these modes relative to the available capacity and would be significantly lower if higher passenger load factors and more favourable characteristics could be achieved through public policy initiatives, including road pricing.

Moving towards more cost-based transportation pricing raises a number of challenging questions. For example, increasingly severe financial constraints on governments require that basic subsidies be reduced to zero if possible,

but, as a society, do we wish to price public transit and intercity passenger rail out of existence or transform them into luxury services affordable only by higher income people? Can we recover full basic subsidies from marine transportation users and still have Canadian ports and marine carriers remain viable in a highly competitive international market?

POLICY ISSUES

Answers to some of the more critical policy issues related to increased user pay transportation will depend considerably on the objectives sought. For example, if the rationale for increased user charges is **to provide funding for accelerated transportation improvements**, an indirect tax such as a fuel tax or registration fee may be just as effective as direct pricing such as a road toll or other facility user fee. If the rationale is **to moderate demand, achieve more efficient use of transportation systems, and thereby reduce transportation costs**, then direct pricing, charging more for a congested facility/service or one that provides a premium service level, will be more effective than an indirect tax in affecting user behaviour. If **deficit reduction** is the main objective, user charge increases should recover basic subsidies at least and preferably full costs. If **sustainable transportation** (e.g. environmental quality, reduced energy consumption, etc.) is the main objective, increased charges should concentrate on recovering external costs. If **a more efficient and integrated transportation system** is a primary objective, revenues from increased user charges should be dedicated to transportation (rather than going into the government's general revenue fund) and should be applied to improving complementary or alternative modes if this achieves a more cost-effective overall system (e.g. using some highway toll revenues to improve transit facilities/services where this can provide the needed capacity/service more efficiently, as in our larger urban areas). Finally, if **both funding for accelerated transportation improvements and pricing incentives to moderate demand and achieve more efficient/sustainable transportation** are the objectives, they will be met more comprehensively and quickly by applying increased user charges to **existing** as well as **new** facilities and services, rather than to new ones only.

COSTING, PRICING AND ECONOMIC ISSUES

There is a clear risk that, if transportation prices become higher, then **parts of Canada or the country as a whole may suffer economically** relative to competing areas. Great care is needed in setting increased user pricing levels and, if necessary, phasing them in and differentiating them by region,

type of facility and/or congestion level or load factor, in order to minimize the risk of becoming uncompetitive. In urban areas, it may be possible to address these by providing parallel services which are less costly or free. In other cases, this may not be feasible and there may be a social impact on low income people which could possibly be moderated by income supplements in extreme cases. **Should users pay a premium to support a "buy Canadian" purchasing policy** (e.g. for new ice-breakers)? The basic issue is economic competitiveness, and it would seem logical to set a limit on such a premium to avoid pricing Canadian transportation out of the market. Finally, there are increasing numbers of studies and projects (e.g. toll roads, airport user fees, etc.) which provide quantitative information on the **extent to which increased user charges are likely to moderate peak period demand and thereby reduce transportation costs** including reduced capital costs for system expansion and reduced operating, maintenance and rehabilitation costs. Such quantitative information is essential for setting and adjusting transportation user charges for greater cost recovery.

INSTITUTIONAL ISSUES

The most basic institutional question is **what are the best administrative arrangements to collect user charges, allocate revenue, and manage transportation facilities and services** in a manner which is cost-efficient yet provides the necessary level of public planning and control? There appears to be a growing preference for a combination of special organizations (e.g. trust funds, utilities), complemented as appropriate by private companies and crown corporations, with governments' ongoing transportation role focussing on policy setting, broad planning, and setting and monitoring safety performance standards.

Another institutional issue is **whether transportation users, if they pay more, should have more say in decisions affecting transportation facilities and services.** While certain groups of users would undoubtedly like to have voting power in transportation management organizations, there appears to be a broader view that users should be consulted in advance of key decisions where feasible, but their input should be advisory only.

EXAMPLES AND OUTLOOK: NON-ROAD MODES

Air Mode

The main player is the federal government which, until recently, has owned and operated the country's 26 major airports (which carry some 90% of air

passenger traffic and virtually all air cargo) and a large number of secondary and local airports. Over the past decade Transport Canada has followed a policy of devolving its major airports to local airport authorities, which lease and operate the land and facilities. The purpose of this commercialization program is to achieve more flexible, proactive and efficient airport planning and management and reduce government subsidies. Cost recovery for federal airports is now about 65% of full annual costs, up from about 45% ten years ago. The intent is to achieve 100% cost recovery for the 26 major airports and significantly reduce subsidies on the secondary and local airports by a similar devolution approach or closure if there are no takers.

The federal government is in the process of negotiating the transfer of operation of the air navigation system to a private, not-for-profit organization which will operate under utility-type rules, charging airlines and airports for the services provided. Transport Canada will continue its critically important responsibilities for air safety standards, including performance standards for the air navigation system.

Marine Mode

Again the prime actor is the federal government, which has had a major role in owning and operating ports throughout the country and which has provided navigation facilities, ice-breaking, search and rescue services and pilotage. Federal cost recovery for the marine sector, including federal ports and Canadian Coast Guard services (the latter recently transferred from Transport Canada to the Department of Fisheries and Oceans) has been fairly stable at about 40% in recent years. A new fee structure of user charges for services has been developed and studied, with emphasis on the likely economic implications for the competitiveness of Canadian ports and marine services. It is intended that cost recovery for the marine mode will be significantly increased through such measures.

Rail Mode

While Canada's railways own their own infrastructure and pay for its expansion, maintenance and operation, they have traditionally received substantial subsidies from the federal government, generally aimed at assisting particular economic sectors (e.g. movement of some grains to export positions at Canadian ports) and geographic areas (e.g. the Maritime Provinces, to reduce the cost of rail and truck movements to central Canada). These subsidies are being phased out; in particular, the main transportation subsides under the Western Grain Transportation Act were eliminated as of August 1, 1995. This change alone will reduce government

subsidies by some $600 million per year and can be expected to affect the crops grown and agricultural product transportation patterns in Western Canada, probably leading to greater crop diversity, reduced overseas exports of grain, and more domestic consumption/processing of Western Canada's agricultural produce.

One of the major federal initiatives is commercialization of CN Rail, through sale of its shares by the government to private investors. In parallel with this, and to increase the financial viability of both CN and CP, Bill C-101 will relax economic regulations and provide greater flexibility for railways to exit from certain services through sale to shortlines or line abandonment.

VIA Rail

The federal government also has in effect a program of ongoing reductions in the annual subsidies paid to VIA Rail for providing intercity rail passenger services. Under this program, annual VIA subsidies have been reduced from $441 million in 1990 to $318 million in 1994, with further reductions expected, to $233 million in 1997. A recently published high speed rail study conducted by the governments of Canada, Ontario and Quebec, shows a projected rate of return which appears insufficient to justify the level of risk and the required private investment to provide such a service in the Quebec-Windsor corridor. It seems likely, therefore, that VIA Rail passenger services will continue to be rationalized, concentrating on the higher density corridors in Central Canada, with a minimum ongoing level of transcontinental passenger rail service.

Cost Recovery at the Federal Level

Transport Canada is carrying out a substantial downsizing and is instituting programs such as those outlined above to achieve more complete cost recovery through increased user charges and more efficient, commercialized operations. The intent is that transportation services will be more efficient and equitable, government deficits reduced, and excessive debt loads paid down while achieving a "level playing field" of public versus private charges. Transport Canada expects to increase its transportation revenues by some $450 million in the current year under its new cost recovery initiatives, with ongoing changes aimed at eliminating some $1.5 billion in annual subsidies within the next few years.

Urban Transit

Municipal governments have prime responsibility for providing urban transit in most of Canada's urban areas, but rely extensively on provincial financial aid. Urban transit has a high level of government subsidy, representing 30-75% of operating and capital costs, depending on the size of the urban area, level of cost recovery from users and type of provincial funding formula in effect (Exhibits 1 and 2). While continuing fiscal pressure can be expected to lead to reduced levels of government financial support, it is unlikely that this will be completely eliminated, since transit plays an essential role in moving people to and from the central areas of the country's major cities and the alternative of building more radial highways is not feasible owing to space limitations, high costs and strong public opinion in favour of achieving more sustainable urban transportation. A more likely outcome, given these pressures, is increasing adoption of road pricing in Canada's larger urban areas in order to provide funding both for ongoing road maintenance/ rehabilitation and selective expansion plus selective construction of new rapid transit lines, commuter rail improvements and implementation of priority bus services (on bus priority lanes where feasible, with traffic signal priority, and other "intelligent transportation system" features) to greatly improve the reliability and convenience of these "semi-rapid transit" services.

PRICING STRATEGIES

Two pricing/incentive strategies were developed and their implications broadly assessed for Ontario: a five year (short-term) strategy and a 20 year (long-term) strategy. Exhibit 3 provides a summary comparison of the short-term and long-term strategies. The strategies do not attempt to apply full cost pricing to each mode, but they do move in that direction for a number of modes, particularly those that impose larger external costs. There are three ways of moving towards full cost pricing for each mode:

1. Increasing user charges;
2. Reducing basic subsidies;
3. Reducing external costs.

The strategies were developed with all three approaches in mind, recognizing that there can be significant interactions among them.

The percent of full transportation costs (including basic subsidies plus external costs) paid by users would increase under both strategies for all modes. This reflects an increase in fuel tax of 3¢/litre per year for each of the five years of the short term strategy and the introduction under the long

term strategy of road pricing in Ontario's two largest urban areas (Greater Toronto, Greater Ottawa) to levels of 0-5¢/km in off peak conditions and 5-15¢/km in peak (congested) conditions. The percentage increases in user charges under the long term strategy tend to be higher for the urban auto (14.5%), air passenger (10.7%), intercity truck (7.1%), and intercity auto (6.1%) than for the other modes, which would have increases in the 1-4% range. It should be emphasized that, as shown in Exhibit 3, the strategies contain not only user charge increases but also a significant number of regulatory, voluntary/educational and transportation facility/land use practices as well as other economic instruments in addition to fuel tax increases and road pricing. Each strategy was designed to be an appropriate mix of measures. For example, significant improvements in urban transit were included to provide a reasonable alternative to the private automobile in the face of increased user charges for the auto, so that a reasonable alternative mode would be available for those wishing to change mode.

The estimates of carbon dioxide emissions in Ontario, shown in Exhibit 4, indicate that emissions from intercity truck, intercity rail freight, intercity passenger car, air passenger, intercity passenger train, urban passenger car and urban transit would decrease to about 33.2 megatonnes per year by the year 2000 under the short-term strategy, relative to about 36.3 megatonnes in that year under the base case. This would also be a slight decrease from the current (1994) CO_2 emissions from these modes of about 34.1 megatonnes. Under the long-term strategy, by 2015 the estimated CO_2 emissions would be about 38.0 megatonnes per year, considerably less than the 49.9 megatonnes under the base case projection by 2015, but some 4.0 megatonnes (or about 12%) higher than 1994 emissions of CO_2. The short term reduction is aided considerably by projected fuel efficiency and per vehicle emission reductions as mandated over the next 5-10 years, but these tend to be overwhelmed by projected vehicle-km growth in the longer term. Moderation in the growth rate of transportation demand would be required to hold CO_2 emissions at 1994 levels.

EXAMPLES AND OUTLOOK: ROAD MODES

Because roads carry over 90% of intercity passenger traffic, close to 90% of urban passenger traffic, close to 100% of urban goods movement and over one-third of intercity freight traffic (in tonnage terms), the last section of this paper focusses directly on the transportation modes which use roads.

Potential Road Pricing Concerns and Actions to Address Them

While initial public opinion has generally been positive regarding the Highway 407 toll road now under construction in the Greater Toronto Area and the Prince Edward Island Crossing which will also be a toll facility, more widespread road pricing, particularly on existing roads, will require careful study, public consultation and considerable political willpower. Surveys carried out in Canada and the U.S. suggest that about two thirds of those polled support road pricing if they are assured that the revenues will be dedicated to transportation improvements and will accelerate the construction of the toll facility itself. Support drops to about 10% if the tolls are seen as simply another general purpose tax.

There are a number of potential problems and concerns associated with the introduction of road pricing; possible approaches have been suggested to address each concern. For example, concerns that tolls are simply new taxes could be addressed by an offsetting reduction in fuel taxes in the area affected by the new tolls. Perception of "auto and truck bashing" could be addressed by demonstrated service level improvements for all users which have been achieved on other tolled facilities. The use of electronic toll collection systems with debit cards instead of cash payment or monthly billing in arrears can eliminate disruption/congestion from toll plazas and invasion of privacy concerns. Concerns about economic losses (for example to truckers and/or to an urban area) can be addressed by demonstrating that tolls will be set at moderate levels such that truckers may be able to offset the toll charges through increased operating efficiencies, and urban areas are likely to achieve net economic benefits through reduced congestion levels, increased transportation service/reliability levels and reduced transportation costs for both passengers and freight. Finally, concerns about social equity, as discussed earlier, can be addressed by providing a choice of routes and modes and, if necessary, by market/welfare programs to assist low income people.

Recent Road Pricing Experience

The Highway 407 toll road now under construction in the Greater Toronto Area has been mentioned earlier. Without tolls, the first 45 km of this highway would have required 25 years to construct. With tolls, the first 35 km is scheduled to be opened during 1996 and the entire 69 km central section by 1998. This will be the first North American fully tolled road to use entirely electronic toll collection. Under the relevant legislation, the tolls will be discontinued when the capital costs of Highway 407 have been paid off from toll revenues, expected to occur some 35 years following

opening of the highway. There is considerable support for the highway by residents, reflecting concerns about existing levels of congestion in the corridor, and the desire for more road capacity. There are also concerns, however, that the road will contribute to continuing urban sprawl and auto dependency. Others accept that the new road is necessary to provide trunk capacity and an effective Greater Toronto Area bypass as part of the provincial highway network and that the demand-moderating influence of the tolls plus complementary policies to achieve more compact, mixed-use urban development and improved transit services will help achieve an appropriate modal balance and contribute to more sustainable transportation. Time, and the ongoing programs of relevant governments, will determine the outcome.

CONCLUSIONS AND POLICY CONSIDERATIONS

The combined impacts of increasing fiscal restraints on governments at all levels (a situation which will get considerably worse before it gets better) and a growing public and government awareness of the need to "internalize" transportation external costs (e.g. pollution, accidents) by charging users for them are such that increasing user charges are a virtual certainty for most or all transportation modes during the coming decade. Extensive programs to achieve this have already been announced at the federal level. A number of provincial governments are actively studying the introduction of toll roads in key corridors and cost recovery from adjacent land owners to help fund new transit facilities, and municipal governments are implementing transportation and land use initiatives aimed at more sustainable transportation. The underlying rationale is that increasing user charges to more closely reflect the true costs of transportation, (including government subsidies and external costs) will provide dedicated funding for system operation, maintenance and improvements, and will lead to moderated growth rates in demand, reduced costs for capital expansion and operations, lower environmental, accident and other external impacts on society in general, and improved transportation service levels, reliability and modal choice.

Realistic prices relative to market demand and supply are critical. Full recovery of basic (government) subsidies, which already exists for intercity rail freight, the urban auto and the urban truck in Ontario as estimated in the ***Full Cost Transportation*** report, is likely to be achieved during the coming decade for Canada's major airports as current policies are implemented. Increased recovery of basic subsidies, but less than 100%, is also likely for marine freight and intercity passenger rail. It is likely that users will increasingly pay external costs to help address climate change and other sustainability issues, and the magnitude of increased user charges to achieve

this, if strategies such as those illustrated in Exhibit 3 were implemented, would be in the range 1-7% in the short term and 1-15% in the longer term, with the larger increases in this range applying to those modes with higher external costs.

More widespread road pricing is conceivable over the next 10-15 years, particularly in Canada's larger urban areas. This is likely to come about because of increasing financial constraints facing governments at all levels and the need to find a source of funding which increases as transportation demand increases; a vitally important spin-off effect of road pricing will be its moderating effect on the rate of growth of single occupant automobile use and a related increase in urban transit usage and cost-effectiveness.

Changes in transportation user charges will have to be introduced incrementally, with careful monitoring of economic and social impacts. A phased, integrated strategy will be necessary, with extensive inter-government and private consultation and coordination, to achieve modal, geographic and sectoral equity. Road pricing can be expected on **existing** as well as **new** roads, particularly in urban areas, in order to provide funding not only for road improvements/expansions but - more fundamentally - for operations and maintenance; deferred maintenance of roads and urban transit is an increasing problem as government financial constraints worsen, and a funding source must be found soon to prevent serious problems and greatly increased future costs for rehabilitation. Financial arrangements will therefore be required under which some of the revenue stream achieved from road pricing will be available for operations/maintenance as well as capital improvements and for public transit as well as for roads.

While there are concerns about how the increased user charges and more privatized transportation management/operations will be administered (e.g. to achieve lower overheads and greater management responsiveness) and about economic and social impacts if user charges are increased too much or too quickly, there appears to be general support for these moves by transportation carriers, and to a lesser extent, shippers. Informed members of the public also appear to accept these initiatives as a necessary step towards greater fiscal responsibility and more sustainable transportation. The key to maintaining this support and achieving the desired effect will be the manner in which increased transportation user charges are introduced and managed during the next few years and beyond. An informed public, transportation industry and government sector will be centrally important, and it is hoped that the information presented in this paper will help contribute to a successful outcome.

EXHIBIT 1

FULL TRANSPORTATION COST ESTIMATES CANADA - 1994

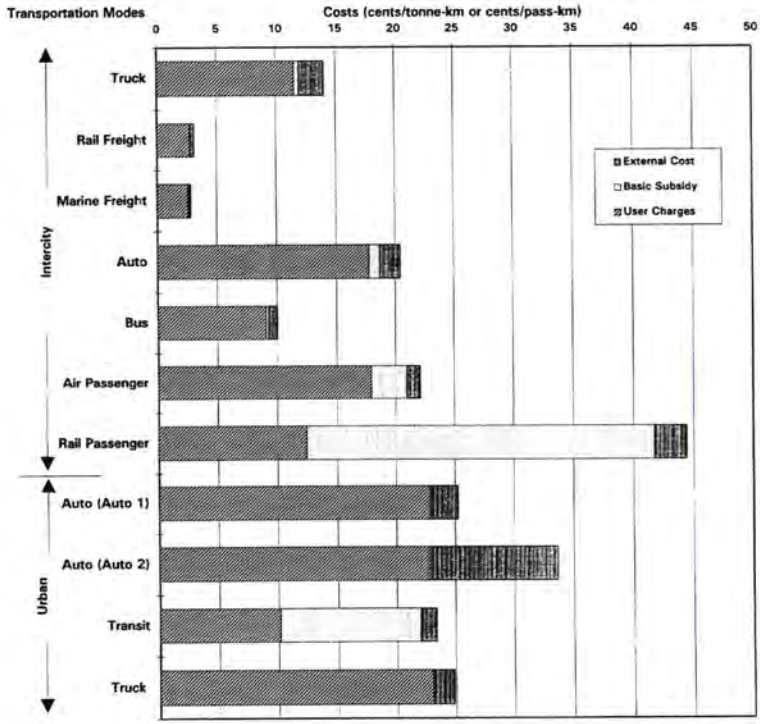
($1994 BILLIONS)

Mode	1. User Charges	2. Basic Subsidies	3. External Costs	4. Full Costs = 1+2+3
INTERCITY				
TRUCK	12.91	0.45	2.37	15.73
RAIL FREIGHT	7.04	(0.08)	1.06	8.02
MARINE FREIGHT	7.85	0.30	0.48	8.64
PASSENGER CAR	37.34	1.97	3.65	42.96
PASSENGER BUS	0.27	0.01	0.02	0.30
PASSENGER AIR	4.49	0.75	0.30	5.54
PASSENGER RAIL	0.17	0.41	0.04	0.62
URBAN				
PASSENGER CAR (AUTO 1)	56.01	0.29	5.66	61.96
PASSENGER CAR (AUTO 2)	56.01	0.29	26.24	82.54
TRANSIT (Excluding GO)	0.89	1.05	0.12	2.06
TRUCK	4.15	0	0.33	4.48

Numbers may not add to row totals due to rounding.

Source: *Full Cost Transportation and Cost-Based Pricing Strategies*, IBI Group and Boon, Jones and Associates, Inc., 1995.

EXHIBIT 2
COMPARISON OF CURRENT (1994) COSTS BY MODE - CANADA
User Charges, Basic Subsidies and External Costs



Notes: When Basic Subsidy is negative, User Charge bar is shortened by that amount.
External Costs for all modes (except "Auto 2") include emissions, accidents and related health care and policing costs since relatively consistent dollar value estimates were available for Canada, for these items. "Auto 2" illustrates the large increases in external costs attributable to the urban auto if several other items (parking, congestion and land costs) are included, drawing on more approximate estimates (i.e. Litman, 1994)

Source: **Full Cost Transportation and Cost-Based Pricing Strategies, IBI Group and Boon, Jones and Associates, Inc., 1995.**

IBI GROUP

EXHIBIT 3

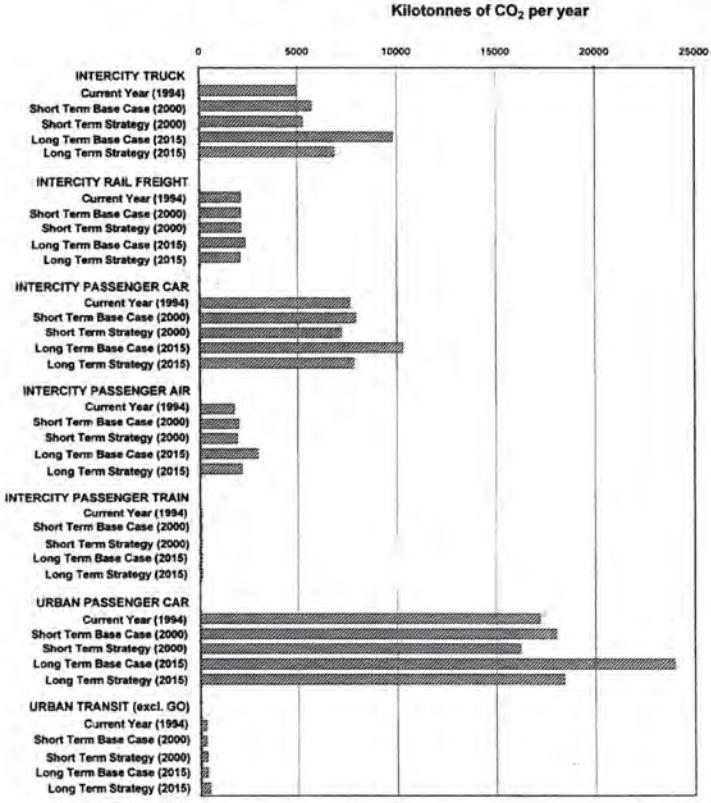
INITIATIVES TOWARDS SUSTAINABLE TRANSPORTATION: TWO STRATEGIES

MEASURE	SHORT-TERM (0-5 YEARS)	LONG-TERM (5-20 YEARS)
REGULATORY		
- IMPROVED FUEL EFFICIENCY STANDARDS *		
- IMPROVED EMISSIONS STANDARDS *		
- ENFORCE EXISTING HIGHWAY SPEED LIMITS	(X)	(X)
- REDUCE HIGHWAY SPEED LIMITS		
- EMISSIONS INSPECTION PROGRAM	X	(X)
ECONOMIC INSTRUMENTS		
- INCREASE MOTOR FUEL TAX	X	
- ADDITIONAL EMISSIONS CHARGES (CARBON TAX PREMIUM ON FUEL)		X?
- REDUCE/ELIMINATE DIRECT SUBSIDIES	X	X
- VEHICLE SCRAPPAGE PROGRAM	X	
- FUEL/TAILPIPE EMISSIONS PREMIUM	X	(X)
- INCENTIVES FOR ALTERNATIVE FUELS	(X)	X
- CONGESTION PRICING FOR ROAD USE		X
- WEIGHT-DISTANCE TAX		X?
- FULL-COST PARKING/PARKING SUPPLY MANAGEMENT	X	X
- TAX BREAK FOR EMPLOYER-SUPPLIED TRANSIT PASSES		X?
VOLUNTARY/EDUCATIONAL MEASURES		
- FLEET PROCUREMENT/MANAGEMENT DEMONSTRATION PROGRAMS	(X)	(X)
- VEHICLE EMISSIONS/LABELLING PROGRAM	X	X
TRAVEL BEHAVIOUR/LAND USE PRACTICES		
- PROMOTE TRANSIT-SUPPORTIVE LAND USE PRACTICES	X	X
- ENCOURAGE TELECOMMUTING, ALTERNATIVE WORK STRATEGIES	X	X
- IMPROVE/ENCOURAGE URBAN TRANSIT	X	X
- IMPROVE CYCLING/WALKING ENVIRONMENT	X	X
- TRANSPORTATION DEMAND MANAGEMENT	X	X
- PROMOTE INTERMODAL FREIGHT TRANSPORTATION	X	(X)
- DEVELOP HIGH SPEED PASSENGER RAIL		X?

NOTES: X = A COMPONENT OF THE STUDY EXPECTED TO HAVE A SIGNIFICANT EFFECT
(X) = A COMPONENT EXPECTED TO HAVE A LESSER EFFECT
X? = MAY BECOME A COMPONENT DEPENDING ON RESULTS OF MORE DETAILED STUDIES
* = PROJECTED IMPACTS INCLUDE IMPROVEMENTS MANDATED ELSEWHERE WHICH AFFECT VEHICLES IN ONTARIO

IBI GROUP

EXHIBIT 4
COMPARISON OF CO_2 EMISSIONS - ONTARIO



IBI GROUP

The Control of Carbon Dioxide Emissions from Freight Transportation: A Case Studies Approach

by
David Hackston, Richard Lake and Louis-Paul Tardiff
Research and Traffic Group

Introduction

The *Ontario Freight Movement Study: Component Two*, conducted by the Research and Traffic Group for the Ontario Ministry of Transportation, was one of the ten collaborative research studies from which the Ontario Round Table on Environment and Economy and the National Round Table on Environment and the Economy developed their report *A Strategy for Sustainable Transportation in Ontario.* The *Ontario Freight Movement Study: Component Two* uses *industry/company-specific case studies* to assess the prospects–in terms of carbon dioxide (CO_2) emission reduction–of alternatives to present freight distribution, especially (but not exclusively) alternatives involving the use of rail instead of truck.

Fuel consumption, CO_2 emission and (where possible) cost consequences were estimated. Railway fuel consumption was calculated for detailed routing descriptions using a model that computes route and service-specific fuel use based on the cars and locomotives used and the profile of the track. Truck fuel consumption was calculated for the type of vehicle and loadings involved from information provided by operators supplemented by published data. Estimates were adjusted for the conditions of the roads travelled.

Statistical data for Ontario freight transportation were analyzed and the following freight transportation users selected as representative.

> Green Forest Lumber Ltd., a Chapleau lumber producer,
> H.J. Heinz Company of Canada Limited at Leamington,
> General Motors of Canada at Oshawa,
> Suncor Inc. (Sunoco) at Sarnia,
> Canadian Tire Corporation operating from Brampton, and
> Mount Sinai Hospital in Toronto.

Green Forest Lumber

Green Forest is a lumber producer and wholesaler. As the cost of transporting lumber is a substantial portion of its delivered price, and the lumber market is very price competitive, lumber shippers tend to be very cost conscious in their transportation choices. Green Lumber also has to provide delivery that is convenient to its customers.

- For shipments direct to lumber retailers, who would rarely have a rail siding, truck provides convenient delivery. Also few would want a rail carload at one time; the size of a truckload is just about right for most lumber retailers.

- For shipments to Green's own *lumber transfer yards*, rail is generally preferred because of the lower rates usually charged by the railways. At the lumber transfer yard Green can load trucks for local delivery with a selection of lumber to exactly match customer needs.

- The transport equipment used must have a *flat bed* to enable easy loading and unloading of large bundles of packaged lumber with a fork lift truck. Rail cars are larger than trailers and often have bulkheads at either end to hold the load in place. Some also have a beam down the centre of the car to further secure the load.

- Two types of highway trailer are used–48 foot semi-trailers and *B-trains* which are two trailers with a total *deck* length of 65 feet. *B-trains* operate in Ontario and Michigan but not in other states adjacent to Ontario.[1] They have a carrying capacity of 85,000 pounds compared with 47,000 pounds for a semi-trailer.

The selected case focuses on the distribution, to Southern Ontario and Michigan, of lumber produced at Green Forest sawmills located at Chapleau in Northern Ontario:

- through its *lumber transfer yards* in Southern Ontario and the U.S., and

- directly from Chapleau to Ontario building supply retailers.

Over 80% of the lumber from Chapleau is now shipped by rail with much of the remainder trucked to northern Michigan and retail customers in Ontario. Two

---

1 While permitted in these other states, gross vehicle weight of 80,000 pounds makes them impractical.

prospective shifts from truck to rail and two possibilities where truck might capture traffic that currently moves by rail were examined. Potential CO_2 savings depend on whether the trucks concerned are already moving cargo to Northern Ontario and would otherwise return south empty.

Shipment to Retailers in Southwestern Ontario: Shift from Truck to Rail

Presuming:	**change in CO_2 Emission**
Fronthaul (trucks must return empty)	54% decrease
Backhaul (trucks would otherwise be moving empty)[2]	37% increase

Shipment to Grand Rapids, Michigan: Shift from Truck to Rail

Presuming:	**change in CO_2 Emission**
Fronthaul (trucks must return empty)	23% decrease
Backhaul (trucks would otherwise be moving empty)	129% increase

Shipment to Fort Erie Ontario: Shift from Rail to Truck

Presuming:	**change in CO_2 Emission**
Fronthaul (trucks must return empty)	177% increase

Shipment to Windsor, Ontario: Shift from Rail to Truck

Presuming:	**change in CO_2 Emission**
Fronthaul (trucks must return empty)	178% increase

As much of the lumber, particularly that destined to Southwestern Ontario, is believed to move in trucks that would otherwise travel empty, important opportunities to reduce CO_2 emission through a shift to rail were not apparent. Further, analysis of the costs for rail versus truck for the portion of the Chapleau lumber that now moves by truck suggests that switching to rail would be costly. As for the longer term prospects, there seems a danger that some of the 80% of the lumber now carried by rail might be captured by the truck mode.

Study of this case revealed some potentially important aspects of the CO_2 emission reduction problem:

- The availability of empty trucks returning from delivering loads can give trucking an advantage over rail. Unfortunately, it may not be practical to take advantage of this circumstance when it is available but use rail whenever it is not.

- Because trucks (and railway equipment) move in complex patterns and truckers accept relatively low rates for a load when they would otherwise move empty, the CO_2 emissions attributable to individual shippers cannot be accurately estimated in isolation from the total network of movements.

---

2 Green Forest reports that, for the most part, lumber is moved to Southern Ontario in trucks that would otherwise be returning empty.

- The ultimate CO_2 emission reduction from a transfer of Ontario freight from truck to rail would significantly exceed the local savings as a larger number of more efficient locomotives are introduced elsewhere on the system.

- Routing rail and truck traffic between Southwestern Ontario and the West through the United States would reduce CO_2 emission.

Heinz

H.J. Heinz produces a limited range of food products at its plant at Leamington Ontario. These products benefit from brand loyalty but must also compete with other similar commodities on supermarket shelves. In shipping its products, a company like Heinz would consider certain attributes most important.

- Heinz requires covered (box car or van) equipment to provide protection for the canned and packaged good(s) shipped. In winter, products must be protected from freezing. Railway box cars or semi-trailers that are insulated and heated are required.

- The cost of transportation is important because margins for food products are generally low. Damage to goods during transit is also a concern.

- Shipments to a Heinz warehouse, say at Calgary, are less time sensitive than those that go directly to the retailer (or wholesaler) since the latter would store smaller quantities. Because of its cost effectiveness and since transit time is less important, the use of rail for shipments to the warehouse would be preferred.

- In shipping to retailers (or wholesalers), truck or rail intermodal services would be preferred because of their better on-time delivery reliability. Also, most semi-trailer sized shipments would involve several stops.

Important movements into and from Heinz's Leamington plant include:

- Semi-trailers by road to customers in the Toronto area, 90% of which return with supplies for the plant;

- Railway carloads and semi-trailers on flat cars, as well as direct truck, to:
  - Heinz's Calgary distribution centre for Alberta and British Columbia,
  - customers in Manitoba and Saskatchewan, and

- customers in the Maritimes;

- Containers for export through the port of Halifax;

- Exports by direct truck to Pennsylvania and Michigan;

- Exports to California, Florida and New Jersey by railway boxcar;

- Imports from Texas, Minnesota and California by semi-trailer on railway flat car and direct truck; and

- Imports from Puerto Rico in semi-trailers moving intermodally by water, rail and road.

Potential operational changes selected for analysis of alternatives were:

- Increased use of rail carload, instead of *trailer on flat car* and direct truck, from Leamington to the Calgary distribution centre,

- Rerouting trucks, travelling from Leamington to Manitoba and Saskatchewan via the Canadian route, through the U.S., and

- Increased use of *trailer on flat car* to the Maritimes.

Predicted emission consequences are:

	change in CO_2 Emission
Canned goods from Leamington to Calgary: Shift from *trailer on flat car* to box car	47% decrease
Canned goods from Leamington to Winnipeg and Regina: Reroute trucks through Chicago	10% increase
Canned goods from Leamington to the Maritimes: Shift from direct truck to *trailer on flat car*	49% decrease

Unfortunately, the declining supply of suitable railway box cars and Heinz's customers' (who do not have railway sidings) preference for semi-trailer loads mitigate against increased all-rail movements. If emission levels are to be restrained, rail intermodal (instead of direct truck) appears to be the only way to do it. In this regard:

- New forms of truck/rail intermodal now emerging may make it possible for a larger proportion of traffic to move intermodally.

- CO_2 emission from direct truck to western Canada via the Canadian route is only less than emission for the shorter and better U.S. route because Canadian highway load limits are less restrictive. To the extent that Canada's higher load limits improve the competitive position of trucking *vis-a-vis* rail, CO_2 emission is not reduced.

General Motors

General Motors ships large volumes of automobiles and trucks from its Oshawa plant. These are transported to assembly points in Canada and the United States, and sometimes directly to dealers. Important considerations for General Motors would include:

- The carrier's price. Because of the number of vehicles shipped a small price difference can have a large effect on GM's profitability.
- Experience with damage to vehicles in transit. New motor vehicles are valuable and easily damaged. Rail cars are covered with screening to protect the new vehicles from vandalism.
- The small quantities shipped to individual dealers or smaller towns tie GM into truck delivery. More timely delivery is also a factor. Rail is preferred for more distant and larger markets where the economics support larger shipments to special transfer facilities. From there, vehicles are trucked to dealers.

Approximately 80% of new vehicles from the Oshawa plant are shipped by rail. Ontario (except the Thunder Bay area), western Quebec and two U.S. distribution centres are supplied by direct truck. Two possible opportunities to use more rail, including to one of the U.S. destinations (the other does not have nearby facilities to receive by rail), were selected for analysis. The consequences of truck capturing an existing rail shipment were also assessed. Predicted emission consequences are:

	change in CO_2 Emission
Cars and trucks from Oshawa to Montreal area dealers: Shift from truck to rail	54% decrease
Cars and trucks from Oshawa to distribution centre in Dearborn Michigan: Shift from truck to rail	56% decrease
Cars and trucks from Oshawa to Denver Colorado: Shift from rail to truck	121% increase

Unfortunately from the emission perspective, Oshawa to Montreal is a very convenient and economical trucking distance. With truck delivery from Ste Therese to local dealers, rail would be appreciably more expensive. The

Dearborn movement is about the same distance as Montreal; however attributable incremental cost does not include an additional local delivery stage. No doubt rail would still be somewhat more costly.

The practical prospects for GM to reduce the CO_2 emission caused by its transport of vehicles from Oshawa are limited. Within the truck mode, a modest emission saving could be achieved through relaxation of Ontario regulations that preclude *overhanging* to Canadian destinations.

Sunoco

Sunoco operates a refinery at Sarnia and retail petroleum outlets in Ontario and Quebec. It also wholesales fuel to other retailers. Sunoco ships large volumes of low-valued liquid bulk commodities to its retail outlets and the other retailers. Transportation considerations include:

- The products (mostly gasoline) are homogeneous, of low value, easy to store, and shipped in large volumes. For movement to Sunoco's regional depots, transport cost is more important than delivery speed or timeliness.

- Assured supply to maintain the competitiveness of its retail outlets (who do not have access to rail) and retain its wholesale customers indicates final delivery by truck.

- Safe transport that minimizes the risk to the public is important. Petroleum companies prefer pipeline transport wherever possible.

Sunoco's initial distribution is mainly by the pipeline and marine modes to terminals from which tank trucks deliver directly to its retail outlets and to its wholesale customers. There is very little truck movement of petroleum products directly from the refinery and, with the exception of chemicals, very little rail shipment. Marine distribution is to Sault Ste Marie, Montreal and for export.

We expect that Sunoco's product distribution offers significant opportunities for CO_2 emission reduction–perhaps more so than the other cases studied. Unfortunately, as Sunoco provided only very limited information, our assessment of opportunities for CO_2 emission saving was limited to a partial analysis of the substitution of direct rail for marine-pipeline-truck distribution through Montreal and Nepean to outlets in Eastern Ontario. The analysis suggested that emission attributable to the Great Lakes/St Lawrence segment of the move alone exceed what would apply to rail. Were the pipeline energy consumption–which can be substantial–to be added, rail's advantage would increase.

This case illustrated potentially important issues.

- Although emission reduction through the substitution of rail for general cargo delivery by truck could prove important, rail's strength is in bulk products transport. Particularly where truck and pipeline routes are circuitous, rail may be able to substitute for them at substantial CO_2 emission reduction advantage.

- The consequences in terms of CO_2 emission, when viewed incrementally in a total system context, may exceed what average per tonne-kilometre figures would indicate.

- Operational changes within modes may offer important emission saving opportunities.

Canadian Tire

Canadian Tire has a large number of retail outlets across the nation to support. It is a major importer, distributor and transporter. Its transportation requirements are focused on the needs of its retailers.

- Control over the entire movement is maintained to ensure timely and adequate supply (service) to each store. This requires frequent and often small shipments.

- The ownership of large numbers of semi-trailers ensures adequate storage wherever needed. It also assists with obtaining loads for the return to Brampton.

- Carriers working for Canadian tire are expected to provide low rates and excellent service with the driver unloading the truck at the store.

- Rail intermodal is used, but not to the extent possible because it does not always meet Canadian Tire's (delivery) requirements.

About 80% of goods sold by Canadian Tire stores come from suppliers in Canada, the U.S. and overseas to Brampton where they are consolidated. Each store in Ontario and Quebec receives daily shipments (if needed) primarily by truck from Brampton. Each truck serves 4 or 5 stores, not always following the same route. Outlets in the Maritimes and the west are served both by direct truck (in the case of the west using U.S. routings) and *trailer on* railway *flat car*. Most imports from Asia are unloaded from containers in Vancouver and reloaded into semi-trailers. Three possibilities for CO_2 emission reduction were analyzed in detail.

	change in CO_2 Emission
Shipments to Quebec stores through Montreal:	
Shift from truck to *trailer on flat car*	47% decrease
Imports through Vancouver to Brampton:	
Shift from *trailer on flat car* via CP Rail to *container on flat car* via CN Rail	25% decrease
Traffic between Vancouver and Brampton:	
Shift from truck to *trailer on flat car*	65% decrease

Issues raised in consideration of this case include:

- Even where a modal shift may not be practical, means to increase truck loading weights will save emissions.
- Meeting the market conditions for organizations like Canadian Tire intermodally would require enhanced service from the rail carriers.
- Containers (on flat car) are more fuel (and CO_2 emission) efficient than trailers (on flat car). Measures to enhance containerization would tend to reduce CO_2 emission.
- CN's transcontinental route is more CO_2 emission efficient than CP's. Thus, measures to shift freight towards alternatives that involve reduced emission would tend to disrupt the competitive balance between the two railways;
- There is an emission advantage when relatively lightly loaded trucks use U.S. routes to/from Western Canada.

Mount Sinai Hospital

The Mount Sinai is a moderate sized hospital in Toronto. It and other hospitals receive a wide variety of supplies in comparatively small quantities on a daily basis. Some of these supplies are of a more urgent nature than others. Urban hospitals like the Mount Sinai face transportation and logistics concerns.

- A regular guaranteed supply of items required on the hospital wards is essential.
- Maintenance of inventory and its management are costly.
- The urban area and the unloading docks at the hospital tend to suffer traffic congestion.

In cooperation with the Toronto Hospital, the Mount Sinai changed the manner in which it receives surgical/medical supplies. Other nearby hospitals may also join. Instead of individual suppliers–mostly courier companies–delivering to the hospital, shipments are consolidated at Livingston Healthcare at Oakville. The Mount Sinai now receives a single daily delivery. Suppliers and the hospital expressed satisfaction with the new system.

Effectively, although clearly sound logistics practice under the circumstances, this consolidation process represents a reversal in the general trend towards *just-in-time* logistics that has been credited with improving flexibility and competitiveness. Reduction in the number of trucks delivering to the hospital and the elimination of congestion at the hospital's loading docks not only facilitated speedier delivery for those shipments still coming to the hospital but it also improved patient and vehicular access to the reception area.

Thirteen of the 58 suppliers identified to us were interviewed by telephone and the movements for a sample of three were traced in some detail.

- A Montreal supplier that ships by Purolator,
- A Mississauga supplier that ships by Purolator, and
- A Pickering supplier that uses its own trucks.

In all of the cases examined, the supplies travelled further. However, because larger aggregate shipments were involved, it was concluded that CO_2 emission was, in all probability, reduced.

Discussion

Shippers consider a complex combination of cost and service factors in their choice of modes and carriers. While the factors are generic, the multiplicity of choices available and the weighting of them vary from shipper to shipper. Canadian Tire, for example, is most concerned with the timely delivery of goods to their stores, especially for special items advertised in their flyers. General Motors is concerned with timely receipt of parts at its final assembly plant so that its continuous production of vehicles is not disrupted, and will pay a premium for this service. For the shipment of finished vehicles, however, time is not as important a consideration as the freight rate GM has to pay and the condition of the new vehicles when they arrive. Shippers who need quick accurately timed shipments prefer trucking over rail while price conscious shippers or shippers with heavy loading commodities tend to prefer rail.

CO_2 Emission Reduction Prospects and Indicated Further Study

As the *real* (inflation adjusted) price of fuel fell, our industrial system developed in a pattern that depends on economical truck transportation. Now, recognizing the potential consequences of global warming, Canada is committed to reduce emissions. Transition to a system that uses less fuel will be difficult. Under various circumstances, rail is considerably more fuel efficient than truck; however, many Ontario industrial plants are located far from rail. Communities have developed around truck-dependent industry. The automobile manufacturers contract for parts production to manufacturers dispersed geographically on the premise of economical *just-in-time* truck delivery. These are not readily reversible processes.

Had the full cost of fuel consumption been recognized as the industrial infrastructure developed, the picture would be very different. Rail would be used more. Air freight would be used less. Trucks and trains would travel more slowly. Engines would be more efficient. Vehicles would be lighter. Industry would have located such that a great deal less freight transportation was used. We would be a more concentrated society. Now, however, we must face transition to a state of lower CO_2 emission, and determine how it can occur.

While it has been possible for us to determine that individual shippers could adjust their distribution modes to save CO_2 emission, the new distribution pattern that would result is more elusive. The case studies provide an examination of the potential for CO_2 reduction for what we believe to be a representative group of Ontario freight shippers. The question now is what these results might imply for CO_2 emission for freight movement in Ontario as a whole. It is not, as we might have hoped, simply a question of extrapolation. Hopefully the results from the case studies can now be extended and used to estimate the effectiveness of an emission restraining strategy–for example a *carbon* tax. Some implications of and barriers to adopting less fuel intensive alternatives to Ontario's present transportation and logistics systems, that may not have been discussed under the individual cases, include:

- Often, movements involve multi-carrier routings. Originating carriers tend to dictate circuitous routes which maximize their share of revenue.
- Any significant shift to rail will be limited by the availability of locomotives and railway cars, including specialized equipment.
- Within rail, boxcars are being supplanted by more energy-intensive *trailer-on-flatcar* technology.

- The cost of loading and unloading, and the need to use truck to deliver to customers, are barriers to increased use of rail. Future technology may alter this; however, for the present, these costs proscribe rail capturing traffic that consists of small volumes with dispersed origins or destinations.

- Ontario's high-quality highways have facilitated dispersed industrial development. It is not surprising that truck transport dominates the freight sector, and that this dominance is embedded in Ontario's industrial structure.

Regarding areas requiring further study, the case analysis approach taken in the present study seems the only practical way of continuing to address at least the modal alternatives and logistics aspects of CO_2 emission reduction for the freight sector. Here, we believe that the data developed for the six cases documented in this report should constitute a useful start. There is, of course, also the important *technology* dimension to emission reduction that must be integrated into the analysis. And, considerations of technology must go well beyond transportation vehicles and their energy efficiency. The fundamental approach to logistics would be involved.

From Isolation to Integration: Organizational Alternatives to Airport Environmental Planning

by

Anthony Perl, Director
Research Unit for Public Policy Studies
University of Calgary

1. Environmental Knowledge and Economic Capacity in Civil Aviation

In the last two decades, we have become more aware of the ways in which airport operations impact the environment. But during the same period, deregulation, privatization, and globalization in the air transport sector have transformed the economic context in which environmental impacts are assessed. The airlines of the 1970s and early 80s operated in a highly regulated and subsidized commercial context, where the cost of environmental initiatives (like quieter aircraft engines) could be passed along to consumers through regulated prices. But today's carriers face increasingly open and highly competitive markets. In the 1990s, few, air carriers can afford to look beyond the daily battle in the skies to retain (or increase) their market share. As a result, airport environmental planning has been caught between two opposing trends.

On the one hand, environmental assessment practices can yield a growing precision of information about the damages arising from civil aviation. This information can mobilize opposition to existing airport operations, and expansion plans. Neighbouring communities, environmental interest groups, and even environmental protection agencies from other levels of government are placing more demands on airport operators to address their environmental impact. On the other hand, airline competition has made carriers more demanding airport tenants. Airlines will strongly resist measures which would raise their costs or constrain productivity, since these burdens could make the difference between profit and bankruptcy. Ironically, when the economic climate was more receptive to optimizing civil aviation's net social benefits, through a combination of including environmental externalities in ticket prices and then investing these revenues in remediation measures, the technical information needed to specify objectives was largely lacking. Now that such technical information is at hand, the competitive economic exigencies facing civil aviation sharply constrain the adoption of environmentally sustainable policies.

While airlines have acquired an increasing freedom to expand their business, airports are constrained in addressing the environmental effects of airline competition. The negative environmental externalities of civil aviation have intensified due to competition in at least three ways. The hub and spoke operating pattern of major airlines, discussed below, has increased congestion both on the ground and in the air. Price competition has stimulated the aggregate demand for air travel, leading to higher growth rates than would have occurred under a more regulated regime. And the progressive

opening of markets has meant that older aircraft, which might have otherwise been retired, continue flying for new carriers. More air travel, greater congestion, and the longer life of old aircraft each increase the negative environmental impact of civil aviation in ways that are measurable.

This tension between environmental and economic trends forms one of the major challenges to successful airport management. As in other industries, the gap between environmental knowledge and the willingness or capacity to act upon it will bring increasing controversy and opposition to existing practices. With mounting evidence that air, noise, and water pollution from air transport poses significant local and global environmental impacts, when and how will airport environmental planning take this information into account?

In order to reconcile growth with sustainability, the relevant policy actors (i.e., airline companies, airport operators, and government officials) need to focus on a common set of economic and environmental objectives. Where these objectives recognize environmental protection as a shared responsibility, airport planning practices stand a far greater chance of yielding outcomes that are both environmentally sustainable and politically acceptable. By contrast, where airlines, airports, and governments pursue their transportation planning and development functions independently, environmental policy, if it is taken seriously at all, will be constrained by fragmentation and inertia. In such circumstances, political differences over the appropriate scope of airport operation will be far more difficult to reconcile and more likely to precipitate adversarial opposition.

This investigation compares three organizational approaches to planning for airport growth and development that can highlight the capacity of aviation policy makers to address environmental issues. The data is drawn from a policy document review and interviews with key informants conducted in Canada, France and Switzerland. The policy documents consulted are referenced below and cited where appropriate. Their information on the nature of environmental planning was complimented by interviews with key informants - airport and airline managers with planning and research responsibilities. To ensure candor, these interviewees were were guaranteed confidentiality.

The most immediate analytical objective is to determine the structure and content of the "policy network" in place for airport planning, and how environmental issues fit into that network. The policy network concept, as elaborated by Atkinson and Coleman (1989), suggests that the key to understanding what has happened, and then predicting what will happen, on a given policy issue is to identify the *relationship* between policy actors who take part in the economic transactions and political deliberations concerning that issue. These "rules of the game" govern the access to both material resources (what type of environmental analysis is funded) and non-material legitimacy (to what degree are environmental findings taken seriously). The rules at work in a policy network differ across issues (surface versus air transport sectors), over time (concerns over air emissions in the 1970s versus the 1990s), and between jurisdictions (tolerance for aircraft noise in Zurich versus Toronto). By contrasting the airport planning policy networks that now exist in Canada, France, and Switzerland, one can observe how their rules of the game can work to either constrain or to facilitate environmental management.

2. Three Approaches to Relating an Airport's Commercial and Environmental Goals: Convergence, Divergence, and Transition

In order to appreciate the ways in which a shared problem definition can enhance environmentally effective planning and policy development, we must first establish the context, the external economic and political environment in which our three case study airports are situated. Paris (CDG), Toronto (YYZ), and Zurich (ZRH) are already the principal ports of entry into their respective countries. They increasingly serve as transfer hubs, a phenomenon in which one or more airlines concentrate their flight schedules to create waves of arrivals followed by departures. This permits a route network with much more extensive market coverage through connections at the hub (Doganis and Dennis, 1989). But in operational terms, hubs mean that airports alternate between peak hour congestion and relative emptiness several times per day. This hubbing pattern usually requires infrastructure expansion (i.e., new runways and terminal space) just to meet existing traffic levels, since both flight and passenger movements through the airport have become concentrated (Transportation Research Board, 1991, chap. 6). When long term traffic growth, induced by greater price competition, is combined with the pattern of concentration encouraged by deregulation, the negative environmental impact of airport operation can increase. Either existing facilities will become congested, leading to higher pollution from planes idling in takeoff queues (or flying in overhead holding patterns) or new runways and terminals will handle the traffic increases more smoothly. A comparative analysis of growth scenarios at Toronto's Pearson airport demonstrates how increased atmospheric emissions will result (Patterson and Woodmansey, 1993).

At each airport, perceptions differ on the environmental significance of traffic growth and concentration. These differences arise from the way in which policy actors define their interests and view alternative options. Three patterns of relationships between air carriers, airport managers, and societal interests can be observed that demonstrate alternative policy networks in action. At ZRH, a combination of collaborative planning by the dominant air carrier and the airport authority, linked to democratic participation, has yielded a **convergence** of environmental and economic objectives. At YYZ, contested airport privatization plans and aggressive competition between the two principal air carriers have combined with a jurisdictional divorce of public input from planning efforts to yield a **divergence** of environmental and economic objectives. And at CDG, the decentralization of political power has made airport development dependent upon approval from local public officials. Facing this new necessity for acceptance in the surrounding communities, airport managers are now leading a **transition** toward reconciling environmental and economic objectives in their planning activities.

3. Zurich: Convergence of Economic and Environmental Objectives

In Zurich, both the airport authority and Swissair, whose route network is centred at ZRH, have been working on environmental planning in partnership. For Swissair, environmental responsibility is seen as a means to more efficient operation (Swissair, 1993). Swissair executives anticipate that the growth of air transport will eventually trigger stricter regulatory limits and/or externality pricing schemes in their core market of European operations, with a subsequent spread to North America. Swissair is positioning itself to develop a long run competitive advantage by implementing leading

edge environmental practices ahead of its rivals. This strategy begins at the airline's home base in Zurich.

Since the Swiss public exhibits an extremely high environmental consciousness (Inglehart, 1995), a proactive environmental policy has immediate economic benefits. In the short term, Swissair can only expand its operations at ZRH (essential if it is to survive the competition that other major European carriers provide from their hubs) with public approval. Switzerland's highly decentralized federal system and direct democracy make it effectively impossible to expand ZRH without putting the question before the public in a referendum. Such a vote was taken on June 25, 1995, when voters of the Canton of Zurich approved financing a major expansion of ZRH.

By committing itself to work with government and the airport operator to minimize the air, noise, and water pollution arising from increased operations, Swissair was able to campaign effectively in the ZRH expansion referendum. It was also able to have significant input in defining terms by which all other carriers using ZRH will have to abide. As a result, Swissair's environmental precocity will yield a long run advantage in its principal hub, as other airlines will either be taxed for various forms of pollution that they create or restricted from using ZRH. Swissair and the Zurich airport authority have a very close working relationship, and jointly pursue environmental research. The remediation measures that have been developed thus reflect a common set of priorities for both Swissair and the Zurich airport authority.

With the high degree of public input into its operations, the ZRH operating authority has been among the world's most environmentally protective airports. From noise restrictions and night time flight curfews, to a ban on the extended use of aircraft auxiliary power units, to the use of electric vehicles for ground handling functions, ZRH has pioneered innovations designed to reduce environmental impacts. The airport conducted its first comprehensive emissions inventory in 1989, and integrated these findings into its master planning process (Staffelbach, 1991). Expansion plans focused upon building a third passenger terminal and a major cargo handling facility. These new facilities were designed to minimize the net impacts of the additional traffic projected to pass through ZRH.

A key element of Zurich's environmental remediation strategy was to expand the already successful intermodal connection between air and rail transport at ZRH by siting the new passenger terminal's land side interface atop the existing intercity train station, an underground facility currently located adjacent to the airport's second terminal. All the airlines serving ZRH would use check-in facilities for passengers arriving by train in this new terminal. Additional gates in a mid-field boarding pavillion would be linked by a people mover. With no planned expansion of airport access roads, this project anticipated a significant increase in airport passengers arriving and departing by train.

In the process of ratifying ZRH's expansion, Swiss elected representatives had a relatively easy role to play, compared to their French and Canadian counterparts. Details of the plan were developed by a cooperative partnership between the airport and the major airline. Ongoing public consultation broadened input into the reconciliation of environmental and economic priorities, and has led to adaptation of the final proposal. And the project's financing has secured public approval in a referendum. All that remains is to implement the new infrastructure. An integrated and collaborative relationship between the airport authority, the carrier whose route network is centred at ZRH, and the region's citizens has worked to facilitate the integration of economic and environmental objectives into the aviation planning process.

4. Toronto: Divergence of Economic and Environmental Objectives

At YYZ, environmental management has been constrained by divergent interests and contested definitions of responsibility among airlines and the airport's operators. Economic rivalry has been exacerbated by a lack of democratic input into airport planning, compared to both the Swiss referendum mechanism and the growing authority of French local officials. As a result, Canada has an adversarial and competitive policy network which has been largely incapable of reconciling economic and environmental priorities, to the detriment of both objectives. Economic rivalry between airlines and prospective private developers has constrained the airport's physical development, while the isolation of environmental impact assessment analysis from infrastructure planning activities has left neighbouring residents and environmental advocates distrustful of airport expansion proposals. Elected officials are thus caught in the midst of polarized economic and environmental positions.

Increasingly intense and bitter competition between Canada's two principle air carriers is the second difficulty that YYZ planners face. Instead of being home base to a single dominant carrier like Swissair at Zurich, YYZ, Canada's largest air gateway to the U.S. and the rest of the world, is the shared hub of archrivals Air Canada and Canadian Airlines International. These companies have been locked in combat since deregulation, fighting for a traffic base that has yet to support both firms profitably. As well, Canada's principal carriers find themselves in increasing competition with U.S. carriers that have lower operating costs. Under such competitive pressures, each company perceives that committing to costly environmental initiatives would be a high risk strategy. Any initiative that might give an edge to either of YYZ's two principal tenants can be expected to draw fire from its rival. Such a volatile and competitive operating environment places extra demands on airport planners. But over the past decade, YYZ's future has been in the hands of an increasingly diverse and adversarial group of public and private managers.

YYZ's operations have become fragmented since the mid 1980s, with a mounting degree of uncertainty over just who is guiding the airport's long range future. Two of three terminals, as well as all airside facilities, are publicly owned and managed directly by the federal Ministry of Transport. The third, and newest, terminal is privately managed on a long term lease from the federal government. No other industrialized nation's principal airport infrastructure is simultaneously under the control of both private and public management. To Canada's Auditor General, this exceptional division of responsibilities was the product of a policy vacuum within the federal government about where and how to develop major airport infrastructure (Canada, 1990). Since that assessment, YYZ's planning efforts have been characterized by long impasses punctuated by periods of intense conflict.

In part because Canada's federal government has jurisdiction over airports but not urban and regional transportation, YYZ's planning efforts have not looked beyond the airport perimeter. Although intercity passenger trains fall under federal jurisdiction, and are managed by a federal Crown Corporation, Transport Canada has seriously discounted any possibility for integrating these two transport modes. According to a Transport Canada study (Transport Canada, 1993) intercity rail's potential to divert traffic from planes or cars has dwindled to the point of irrelevance. Assuming virtually no chance for modal substitution, Transport Canada has pursued the only development option left open in the face of air traffic growth.

In a 1990, the federal government announced a plan to expand YYZ to its maximum physical capacity (Transport Canada, 1992). The proposal called for adding three new runways and expanding terminal facilities. These plans triggered an arm's length consideration of the impacts of the proposed expansion. In Canadian practice, environmental assessment reviews are an *ex post* exercise, meaning that public input and expert analysis are expected to modify already existing development plans. Unlike the continuous collaboration pursued at ZRH, where government, industry, and public interest groups consult and negotiate over airport development from the pre-planning stage through post-project follow-up and oversight, at YYZ, environmental review represents a discrete stage of project development. Public input and expert analysis are weighed by a judicial-like panel which renders a verdict on the project as a whole. The panel's decision endorsed modifying the expansion to reduce environmental impacts, but its recommendations were quickly overshadowed by intense disputes over who should manage YYZ's future operations (Federal Environmental Assessment Review Panel, 1992).

Even before the environmental review was complete, Ottawa launched a "Request for Proposals" from private firms interested in redeveloping and operating YYZ's two publicly managed terminals. This privatization initiative came to fruition at the end of the Progressive Conservative party's electoral mandate, with a 57 year lease being executed three weeks before a federal election. Despite constitutional conventions that limit governments from taking major policy initiatives after a writ of election has been issued, the Rt. Hon. Kim Campbell pushed ahead with privatizing Canada's largest airport during the election campaign.

When the Liberals took office, they canceled the privatization contract, plunging Canada's largest airport into a state of administrative and commercial limbo. The government has been alternately praised and pilloried for pulling out of the privatization scheme, directly along partisan lines (Senate of Canada, 1995). An alternative "National Airports Policy" has proposed devolving airport management to non-profit authorities that would operate at arm's length from all levels of government (Transport Canada, 1994), but this transfer has yet to be completed at YYZ. In the meantime, YYZ's management remains divided and uncertain, and the physical expansion proposed in 1990 remains to be implemented.

Being partly private, partly public, and in the midst of ongoing debate and controversy over its future, YYZ management has taken a low profile on environmental issues. Thus, despite the Greater Toronto Area's serious air quality problems, and the Federal Environmental Assessment Review Office's warning that remediation efforts are needed to offset the impact of traffic growth and infrastructure expansion, no comprehensive environmental strategy has been adopted for YYZ. The "one off" review conducted by Federal Environmental Assessment Review Panel offers little opportunity for ongoing analysis and modification of plans in light of changing administrative and economic circumstances. Adjusting expansion plans drafted in the early 1990s might be necessary given the many changes that have occurred since the government proposed expanding YYZ. The precipitous move toward privatization followed by an even more abrupt repudiation, along with the falling off of record air traffic levels in the early 1990s have each suggested modifications to the initial master plan, opportunities to adjust the balance of economic and environmental goals, and to fine tune the means of achieving them.

Given the gap between YYZ's all-out expansion scenario and present administrative and economic realities, Canada's elected officials face a far more difficult

task in presiding over YYZ's redesign compared to their counterparts in Switzerland and France. The formal opportunity to bridge economic and environmental priorities at YYZ was passed by before the project's management and timetable had been resolved. Today's airport managers continue to await the results of YYZ's devolution to a non-profit authority. In the meantime, economically oriented policy actors, like private developers and airline companies, have grown frustrated with the commercial limitations of mixed management, while environmentally oriented actors, including community organizations and public interest groups, have lost faith in the planning process.

5. Paris: Building Environmental Priorities Into Airport Planning

The case of CDG illustrates an important middle ground between ZRH's convergence on the need to address environmental objectives along with commercial priorities and YYZ's divergent approach in dealing isolating these two domains. In Paris, airport environmental priorities have steadily risen in importance over the last decade, under the deliberate encouragement of the airport operator, Aéroports de Paris (ADP). ADP is a public agency which owns and operates all airports in the Paris region. Since France began to decentralize decision-making power to regional and municipal councils in 1982, through the famed "Loi Deferre" passed by the Socialists, local community concerns about airport growth could no longer be over-ridden. Environmental protection, symbolized by the creation of a "Maison de l'Environnement," and intermodal connections with France's network of high speed trains (TGVs) have become evidence of ADP's changing priorities (Aéroports de Paris, 1995).

CDG serves as the base of operations for Air France, the state owned carrier that works closely with ADP. Air France's recent economic difficulties have limited its ability to pioneer environmental initiatives, but there has been no discord with ADP's new environmental agenda. In this transition toward more active remediation measures, ADP is serving as a catalyst - promoting the advantages of new environmental practices among airlines, and serving as a go-between for airlines and the French National Railways, the operator of the TGV (Perl, 1995). ADP's goal is to embrace sustainable growth, the only kind that will convince recently empowered local officials that air traffic will not impose greater burdens on their constituents. As with most transitions, the results of this new strategy are not yet clear. It will take several more years to assess the impact of new intermodal links, as well as the noise and air emissions abatement policies being implemented at present. If future traffic growth occurs at CDG without increased emissons, noise, and water pollution, then ADP's acquisition of new environmental planning capacities can be said to have paid off.

6. Conclusions

In airport operations, environmental assessment techniques have generally outpaced the administrative and political capacity to remedy identified negative impacts. This lag challenges policy makers to adapt their practices to close the gap between environmental awareness and sustainable mobility. This analysis of airport planning at ZRH, YYZ, and CDG demonstrates that reconciling growth with sustainability requires airline companies, airport operators, and government officials to share a common agenda that includes both economic and environmental objectives.

Making the commitment to reconcile environmental costs with economic benefits gave policy makers at ZRH the public credibility needed to gain democratic approval for infrastructure expansion. CDG's environmental policies are pointed in the same general direction and appear likely to facilitate expansion in coming years. Yet at YYZ, sporadic attention to environmental impacts coupled with bitter disputes over the role of public and private policy actors have done little to close the gap between awareness of impacts and the capacity to remedy them. Sooner or later, such capacity will become necessary for sustainable air transportation in Canada.

Acknowledgements

Funding for this research has been provided by the Social Sciences and Humanities Research Council (grant # 410-94-0492) and the University Research Grants Committee of the University of Calgary. The author would also like to acknowledge the Government of France, Ministry of Foreign Affairs, which supported the French component of this project through a *Chateaubriand Scholarship*. Andrea Banks proofread this manuscript.

References

Aéroports de Paris (1995), **Agir Ensemble Pour L'Environnement: Plan Environnement d'Entreprise d'Aéroports de Paris**, Paris.

Atkinson, M. and W. Coleman (1989), "Strong States and Weak States: Sectoral Policy Networks in Advanced Capitalist Economies" in **British Journal of Political Science**, Vol. 19, Number 1, pp. 47 - 67.

Canada (1990), **Report of the Auditor General of Canada**, October, Volume 30, pp. 12, 28.

Doganis, R. and N. Dennis (1989) "Lessons in Hubbing" in **Airline Business**, March, pp. 42 - 47.

Federal Environmental Assessment Review Office (1992), **Air traffic management in Southern Ontario: Executive Summary of the interim report of the Environmental Assessment Panel**, Federal Environmental Assessment Review Office: Ottawa.

Inglehart, Ronald (1995), "Public support for environmental protection: the impact of objective problems and subjective values in 43 societies," in **PS: Political Science and Politics**, Volume 28, pp. 57 - 71.

Patterson, Judith and Gordon Woodmansey (1993), "Potential Environmental Impacts Related to Proposed Runway Expansion at Toronto's International Airport," in **Energy Sources**, Volume 15, Number 4, pp. 695 - 719.

Perl, Anthony (1995), "Redesigning an Airport for International Competitiveness: The Politics of Administrative Innovation at CDG", paper presented at the 7th World Conference on Transport Research, Sydney, July 16 - 21.

Senate of Canada (1995), **Report of the Special Senate Committee on the Pearson Airport Agreements**, December 1995.

Staffelbach, Hans Peter (1991) "How do Airports cope with Environmental Aspects?" Airports Association Council International, **Eur'Airport Conference**, Oslo, June 10 - 14.

Swissair (1993), **Environmental Audit 1992: Progress Report** , Swissair, Zurich.

Transport Canada (1992), **Aviation in Southern Ontario - A Strategy for the Future**, Transport Canada: Ottawa.

Transport Canada (1993), **Intermodal Optimization of Intercity Transportation in the Quebec City - Windsor Corridor**, Phase 1, Policy and Coordination Division, Economic Analysis, Ottawa.

Transport Canada (1994), **National Airports Policy**, Transport Canada, Ottawa.

Transportation Research Board (1991), **Winds of Change: Domestic Air Transport Since Deregulation**, National Research Council, Washington, DC.

GRAIN HANDLING AND TRANSPORTATION: CAPACITY, RATES AND TARIFFS

by John Heads and Arthur G. Wilson*

Handling and transportation charges on prairie grain are substantial in relation to the returns from grain production. Since the end of the rail transport subsidy in the current crop year, the handling and transportation charges on wheat[1] from primary elevator to terminal or transfer elevator are, for example, $49.73/tonne on the westbound movement from Rosetown, SK to Vancouver and $67.01/tonne on the eastbound movement to the St. Lawrence transfer houses. Even in the crop year 1995/96, when wheat prices have been high at $235/tonne handling and transportation charges are substantial relative to what the farmer receives.

During 1995, the University of Manitoba Transport Institute was able to carry out a considerable amount of research on grain handling and transportation. This work was largely funded by the Province of British Columbia and a number of stakeholders in the eastbound grain movement through the Great Lakes/St. Lawrence system. Flowing from this work and other Transport Institute research, we give some indication of likely developments over the next decade relating to capacity in the grain handling and transportation system and factors relevant to railway rates and elevator tariffs. The authors are, of course, solely responsible for any opinions expressed in this paper.

1. SYSTEM CAPACITY

Table 1 shows our projections of exports of major Canadian bulk grains - wheat, durum, barley, canola, oats, flaxseed and rye - by clearance sector. In making projections, we have to make the inevitable assumption that 1999/2000 and 2004/05 will be "average" years not unduly affected by unusual weather conditions or large random variations in market demand.

---

* Research Affiliates of the University of Manitoba Transport Institute.

Table 1: Projections of Exports of Major Canadian Bulk Grains by Clearance Sector			
	million tonnes		
	Average 1992/1995	Projected 1999/2000	Projected 2004/2005
Pacific Coast	17.6	20.6	21.6
Prairie Elevators	2.3	3.6	4.0
St. Lawrence	5.0	4.7	5.1
Thunder Bay Direct	2.4	1.7	1.9
Churchill	0.3	0.4	0.4
Atlantic	0.1	–	–
Total	27.6	31.0	33.0

Source: John Heads, Arthur G. Wilson, David C. Hackston and Richard W. Lake, Future Changes in Eastbound Grain Traffic, Report to Stakeholders in Eastbound Grain Movement, January 1996, p. 319.

Because of space limitations, only a brief explanation of the lengthy methodology behind Table 1 can be given. Forecasts of Canadian exports of each individual grain were compiled by the Transport Institute on the basis of regression analysis of time series data, modified by grain price expectations over the next decade and the effects of the end of the grain transport subsidy. These were then aggregated for the seven grains to give the total figures in Table 1. Our forecasts are very similar to those produced by the Canadian Wheat Board in its CWB Grain Trade Forecast 2004/05 of August 1995, although the CWB methodology was quite different, relying mainly on an analysis of trends in individual grain importing countries. Agriculture and Agri-Food Canada was less optimistic in its Medium Term Outlook of October 1995 at just under 29 million tonnes for 2004/05.

The methodology used by the Transport Institute to assign grain exports to clearance sector consisted of an examination of the current export destinations of each individual grain; the extent to which these exports would change in the forecast years; and an examination of how these exports were likely to move

by clearance sector. This examination was made for each individual grain and the totals are shown in Table 1.

Some brief comments are offered on the various clearance sectors:

- The Pacific coast now accounts for 64% of Canadian exports of major grains, against a 43% share a decade ago. The reasons for this development are well known: a change in Canada's grain markets to east Asia and increased use of larger ships more easily accommodated at the west coast. However, the Pacific coast share of the movement has not really increased much in the 1990s. Although this has been partly due to capacity constraints, there is not much grain still going through other transportation routes where the economics demand a west coast export. Wheat and canola exports should increase in the future, but the total movement through the west coast will be adversely affected by reduced Canadian exports of feed barley.

- Exports of grain direct to the U.S. from the prairies have increased considerably in recent years, causing much concern south of the border and the establishment of a Canada-United States Joint Commission on Grains, whose report was released early this year. Some may consider our projections of this movement optimistic, but it should be noted that these include U.S. exports routed in the past through Thunder Bay to benefit from the rail transportation subsidy.

- The eastward movement through the St. Lawrence and the Québec transfer elevators has fallen very substantially over the last decade. We see more stability in the future, with continued high exports of durum to the major markets in North Africa and western Europe. The direct movement of grain from Thunder Bay to the U.S. is already suffering substantially from the end of the transport subsidy, but the overseas movement in "salties" has been much less affected.

- The Churchill projections reflect marketing plans accepted by the CWB, but the future of this port depends largely on how governments apply the Transport Canada policy of insisting on the financial viability of local and regional ports. Grain shipments through the Atlantic Seaboard are already negligible and could disappear.

The discussion now turns to the ability of the Canadian transportation routes to accommodate the projected grain flows.

1.1 Pacific Coast

Table 1 projected an increase in the exports of major Canadian grains through the Pacific coast to 21.6 million tonnes in 2004/05. The question is whether elevator and railway capacity are adequate to deal with this projected volume of exports, recognizing that this forecast for 2004/05 assumes an average year and that exports in a heavy volume year would exceed this figure by as much as 3 million tonnes.

The B.C. grain terminals had a capacity of 1,139,000 tonnes as of August 1, 1995 - 929,000 at Vancouver and 210,000 tonnes at Prince Rupert. The record grain throughputs were in the crop year 1991/92 - 14.7 million tonnes at Vancouver and 5.3 million tonnes at Prince Rupert for a total of 20.0 million tonnes. In addition to these licensed elevators, Neptune Terminals at Vancouver also has the capability of transferring grain directly from railway cars to ocean vessels. It was announced in late December 1995 that Cargill Limited and the Saskatchewan Wheat Pool had formed a consortium to build a new facility at Roberts Bank capable of a throughput of 3-4 million tonnes per annum and expected to commence operations in 1999.

In recent years, there has been considerable debate as to what was the maximum bulk grain throughput that could be achieved in Vancouver. Various bottlenecks have been alleged, including limited hours of work at the grain terminals, railway delays, port labour disruption, and the failure of ocean ships to arrive on schedule to load grain. A recent study concluded that, with only minor logistical improvements, the existing elevators at Vancouver could handle 16 million tonnes a year and Prince Rupert could handle 6 million tonnes, for a total of 22 million tonnes.[2] With the announcement since that time of the construction of a new facility at Roberts Bank, it is rather academic to debate the adequacy of the elevator capacity on the Pacific coast. This is obviously satisfactory in the context of current projections of grain exports, even in the event that some of this capacity were used to accommodate U.S. grain.

Turning to railway services to the west coast, these do not cause any major capacity difficulties, apart from the ongoing problem of periodic shortages of rail cars.[3] Railway programs to increase main line capacity to the west coast include the extension of sidings, expansion of yard facilities, tunnel and bridge improvements, more effective motive power, and track gradient and alignment changes. Both CN and CP now have enough capacity to deal with the flows of the various commodities exported through the west coast. An additional flow of, say, 3 million tonnes of grain to Vancouver would add less than 6% to the annual exports of all bulk commodities through the port.

Railway operations are rarely a problem within the Port of Prince Rupert and shipments to the facility to be constructed at Roberts Bank will avoid much of the congestion of Vancouver. As far as the existing Vancouver elevators are concerned, there are places of potential railway congestion - Lynn Creek Yard in North Vancouver, Sapperton and occasionally other interchange facilities, and the Fraser River Bridge. However, the railways have managed these problem areas in the past with considerable efficiency and it is not envisaged that railway facilities will limit the future potential grain export through the west coast.

1.2 Great Lakes/St. Lawrence

The reduction in grain exports through the Great Lakes/St. Lawrence has already been documented and the problem in this part of the system is surplus capacity. As of August 1, 1995, the capacity of the terminal elevators at Thunder Bay was 1,487,000 tonnes. Bulk grain shipments from Thunder Bay for export and domestic use amounted to 10.1 million tonnes in 1994/95, implying a turnover ratio of only 6.8. Thunder Bay also has the capacity to load grain directly from rail to vessel at the facilities of Valley Camp and Thunder Bay Terminals, which are not included in these figures. There is considerable over-capacity at Thunder Bay.

Turning to the Québec transfer elevators on the St. Lawrence, capacity is currently 1,477,000 tonnes or much the same as the terminal capacity at Thunder Bay. Throughput of Canadian and U.S. grain for export and domestic use in Canada is little more than 8 million tonnes, implying a throughput ratio of about 5.5. Again, there is considerable over-capacity in the transfer elevator system.

With the reduced grain flow through the eastbound route and frequent railway complaints about excess capacity in eastern Canada, there are no problems of rail capacity. While it is quite likely that a merger of the eastern Canadian operations of CN and CP will occur over the next decade, this would not have repercussions on railway capacity to deal with the eastbound grain movement.

1.3 U.S. Transportation Routes

Although the Canadian transportation routes have adequate capacity to accommodate the projected level of grain exports over the next decade, there is also the possibility of accessing U.S. transportation routes. At the current exchange rate of C$1=US74¢, the U.S. routes to the west coast are not competitive for Canadian grain, but this could change with strengthening of the

Canadian dollar.[4] However, routes from the prairies to the U.S. Gulf ports are almost competitive with the eastern Canadian movement by rail and laker at current exchange rates and become much more competitive with any strengthening of the Canadian dollar. It is also worth noting that, within Canada, the direct movement of grain from the prairies to the transfer elevator at Québec City, where cleaning facilities are available, is already competitive with the Great Lakes/St. Lawrence route.[5]

2. RAILWAY RATES

On January 1, 1984, the *Western Grain Transportation Act (WGTA)* took effect. Railway rates on grain, paid partly by government and partly by shippers, were to cover railway costs. Railway costs were defined as the infrastructure costs of grain-dependent branchlines, the long-run variable costs of moving grain from the originating primary elevators to the terminal elevators at Thunder Bay, Vancouver, Prince Rupert and Churchill, plus a 20% addition to these long-run variable costs to make a contribution to railway fixed costs. These costs were indexed each year to allow for price increases on railway inputs and reviewed every four years to return the benefit of productivity gains to the shipper and to government.

The government started the new legislation with no increase in rates paid by shippers and a government subsidy met the shortfall between these rates and the costs incurred by the railways. The *WGTA* provided that in future the shippers would be faced with the full costs incurred in any additional movement of grain over and beyond the tonnage moved at the time of the legislation and that the shippers would meet a substantial share of any increase in freight rates attributable to inflation.

Table 2 shows the total freight rate applicable to grain for the average length of haul of 1026-1050 miles, together with the shares paid by government and by the shipper.

Table 2: Annual Rate Scale - $/tonne for a 1026-1050 mile haul			
Crop Year	Government Share	Shipper Share	Total
1986/87	27.03	6.47	33.50
1987/88	23.97	9.00	32.97
1988/89	23.69	9.07	32.76
1989/90	23.06	9.75	32.81
1990/91	21.72	11.04	32.76
1991/92	21.77	11.41	33.18
1992/93	20.77	12.36	33.13
1993/94	18.92	14.16	33.08
1994/95	15.63	14.72	30.35
1995/96	nil	31.82	31.82

Source: National Transportation Agency.

The total freight rate for moving grain over an average distance of 1026-1050 miles has actually fallen during the last decade. Inflation has been low and total factor productivity in the railway industry has shown impressive improvement. The large fall in the freight rate in 1994/95 was the result of incorporating railway productivity gains into the freight rates.

Since 1986/87, the producer has had to bear all the costs for the movement of any incremental grain in excess of the volume guaranteed in the *WGTA* and to meet the modest levels of inflation experienced since that year. The government commitment to subsidize the movement of western grain was effectively frozen at $720 million per annum. This continued until 1993/94, when the government introduced a 10% reduction in transportation subsidies over a wide range of programs, thus reducing the *WGTA* subsidy to about $648 million. In 1994/95, a further reduction in the government subsidy was made to $560 million and by that crop year the producer was paying almost half the total freight rate.

In the February 1995 budget, the federal government announced the complete abolition of the *WGTA* and the subsidy on the movement of grain by rail. As compensation, there was a $1.6 billion one-time payment to prairie grain

landowners and a $300 million adjustment program. Effective August 1, 1995, farmers are now paying the full cost of the freight rate for moving grain.

A number of other major changes were made to the Canadian grain handling and transportation system in 1995. We discuss rate regulation under the new *Canada Transportation Act* later in this section and note the other changes as follows;

- Canadian Wheat Board basing points have been changed from Vancouver/Thunder Bay to Vancouver/St. Lawrence. Farmers shipping feed barley are now assessed the lower of the freight rate to Vancouver or the freight rate to Thunder Bay plus onward water transportation through the Great Lakes/Seaway and the St. Lawrence terminal elevators of $23.75/tonne. For wheat, the alternatives are rail freight to Vancouver or rail freight to Thunder Bay plus $12.67/tonne for onward transportation to the St. Lawrence, with this figure scheduled to increase by 1998/99 to the full water costs of $19.38/tonne for wheat. Durum wheat and malting barley have only been marginally affected by the change in basing points, as there are still good markets for these grains through the eastern transportation routes.

- The Feed Freight Assistance program was terminated at the end of 1995. This subsidized the freight charges on feed grains moving from the prairies to the Atlantic Region, eastern Québec, British Columbia, Yukon and NWT. Approximately one million tonnes were moving from the prairies under this program, over half to B.C. with the balance to Québec and the Atlantic Region. This feed grain movement is expected to fall significantly.

- Route parity on grain freight rates from Edmonton and Calgary to Vancouver has been abolished. The Edmonton rate is now $3.03/tonne higher than the Calgary rate, reflecting the extra mileage.

- Port parity between Vancouver and Prince Rupert has also been abolished. The rate from Edmonton to Prince Rupert is now $4.22/tonne higher than the rate from Edmonton to Vancouver to reflect the additional distance. This extra amount has not been imposed in its entirety on Prince Rupert - CN has absorbed more than half the additional freight rate and the remaining $2/tonne is being absorbed on an equal basis by the CWB and the elevator.

- The government has announced its intention to abolish the Western Transportation Office (formerly the Grain Transportation Agency) and to end government ownership of grain hopper cars. The various levels of government provide 19,000 hopper cars for the transportation of grain - 13,000 cars owned by the federal government, 2,000 owned by the CWB, 2,000 cars leased by the CWB and 1,000 cars each owned by the Provinces of Alberta and Saskatchewan. Future ownership provisions for these government cars is currently the subject of considerable controversy; as the issue will presumably be resolved before the CTRF meets, this is not considered further in the present paper.

The discussion now turns to railway costs and rates. Under the *WGTA*, a distance related rate scale was calculated by the National Transportation Agency. For any given distance, a railway was not allowed to charge a rate higher than this scale. Every four years, there was a Costing Review to determine the extent to which railway costs had changed. In the years between the Costing Reviews, the rate scale was indexed for changes in the costs of the inputs used by the railways - labour, fuel, materials and cost of capital - and any grain-dependent branchlines which had been abandoned were removed from the costing base.

After each Costing Review, the costing base was revised to remove the effect of railway productivity gains made in the previous four years. Although Canadian railways are often compared adversely with U.S. railroads, their productivity gains have still been impressive, averaging nearly 3% per annum for over three decades. The Costing Review of 1992 established a rate of productivity increase even higher than this between 1988 and 1992. This saving was shared between government and the shippers.

The federal government is implementing further deregulation of transportation and Bill C-101, to be known as the *Canada Transportation Act*. Although this legislation was delayed when Parliament was prorogued early this year, it is expected to be law by the time the CTRF meets in May. Unless changes take place, the key features are :

- A Maximum Rate Scale for the transportation of grain in the crop year 1995-96, with the producer paying the entire freight rate. Freight rates will continue to be indexed each year for changes in the prices of inputs used by the railways and the cost base will be reduced by $10,000 for each mile of grain-dependent branchline which is abandoned. There will be no further Costing Reviews and no more reductions in the cost base for railway productivity gains.

- Grain shippers become eligible to use confidential contracts and the competitive access provisions presently available in the *National Transportation Act, 1987.*

The main issue to note in respect of the Maximum Rate Scale is that there are no longer any provisions for a sharing with shippers of the results of railway productivity gains.[6] As the railways continue to be compensated for changes in the price level of the inputs they use, they will retain the value of all productivity increases in the Maximum Rate Scale. Even if railway productivity gains were to be low as against past experience, say only 2.5% per annum, the Maximum Rate Scale would increase railway revenues on grain transportation by 10% in the year 1999/2000 and this over current revenues which already cover fully-allocated costs. In the real world, this 10% increase in revenues may not materialize, as the railways would increasingly offer incentive rates at high throughput points. However, these incentive rates would also lead to further reductions in railway costs.

The grain railway rate regulation system envisaged in the *Canada Transportation Act* is to continue until 1999 when the Minister is to conduct a review of the effects "on the efficiency of the grain transportation and handling system and on the sharing of efficiency gains as between shippers and railway companies" (section 155 (1)). The Minister may then decide to repeal the Maximum Rate Scale clauses and grain transportation would fall under the *Canada Transportation Act* like any other commodity.

It has been claimed with some justification that the new *Canada Transportation Act* will lead to more rapid rationalization of the western grain transportation system. The railways will have more scope and financial ability to offer incentive rates on multiple car shipments from high throughput elevators. There will be a wider difference between these rates and those applying on shipments from low density branchlines, which will increase pressures towards more rapid branchline abandonment.

Under the *WGTA*, railway productivity gains were fully reflected in the grain freight rates after each quadrennial Costing Review. There were costs to this process in the form of slower rationalization of the grain transportation system, continued operation of low density branchlines and slow development of multiple car shipments. The new legislation will speed up the rationalization. Some of the new efficiencies will be reflected in the rates charged to shippers, especially for high throughput elevators, for points served by or close to both CN and CP, and for points where U.S. railroads might provide a competitive service. Nevertheless, there is no guarantee that competitive forces will ensure

that shippers benefit substantially from railway productivity gains, as the requirement for this under the *WGTA* has not been carried forward into the new legislation.[7]

3. GRAIN HANDLING TARIFFS

3.1 Primary Elevators

The number of primary elevators in the prairies reached its maximum in the early 1960s at over 5,200 and there has been a continued reduction in numbers for over thirty years. At August 1, 1995, there were 1,340 primary elevators in the prairies, which was 24% less than a decade earlier.

In spite of this rationalization, the average prairie elevator only handles 24,600 tonnes of grain per annum and turns over its capacity only 5.0 times in the course of a year. There is a general agreement among the stakeholders in the grain handling industry that elevator costs would be reduced by higher throughput ratios. A given infrastructure with its semi-fixed labour complement can usually handle additional quantities of grain at very low marginal cost.[8]

A continuation of the trend of the last decade would leave the number of primary elevators at about 1,100 by the year 2000, but many expect the number to be down to about 800 by the turn of the century and a further large reduction by the year 2010. With the end of the WGTA, railways have more ability to offer incentive rates for multiple car shipments from high throughput elevators. The end of the rail subsidy has made truck transportation more competitive in moving grain longer distances to primary elevators. In reaction to these changes, there has been a considerable construction of high throughput elevators over the last year or so, mainly in Saskatchewan. These larger elevators are very efficient if they can attract enough grain, but it is difficult to recoup the substantial investment if throughput ratios are no better than the present industry average of 5.0.

There is also a general expectation that there will be a considerable increase in grain cleaning facilities in the prairies. At present there are eight major elevator companies operating primary elevators in the prairies - the three prairie pools, United Grain Growers, Cargill, Pioneer, Parish and Heimbecker and Paterson. Many commentators expect a reduction in this number within the next few years.

Many prairie points are served by more than one elevator. As of August 1, 1995, the 1,340 primary elevators in the prairies were located at 908 points.

There were 536 elevators at single company points and 372 at multiple company points. The single company points accounted for 59% of all points, but for only 40% of the total number of primary elevators in the prairies. Moreover, while companies at single company points may not have direct competition at the same location, they are facing competition from other elevators located in the same general area.

On the other hand, very few elevator points are served by two railways. Only 27 points are recorded with dual railway service and this amounts to only 3% of total elevator points. Admittedly, this statement underestimates the extent of railway competition. In railway tariffs issued before the WGTA and continued after this legislation became law, the railways would look at a specific point of origin and other points considered as "competitive or contiguous" to it and apply the lowest of the applicable rates to all points considered competitive or contiguous. This had the effect of increasing railway competition, as well as elevator competition. Nevertheless, even allowing for this, there are many grain farmers in the prairies who do not have access to a competitive railway.

3.2 Elevator Tariffs

Table 3 shows elevator charges for wheat at primary and terminal elevators.

Table 3: Elevator Charges for Wheat, $/tonne, 1995/96

	Manitoba Pool Elevators	Saskatchewan Wheat Pool	Alberta Wheat Pool
Primary elevators			
Elevation	9.46	7.78	9.09
Cleaning	3.20	3.20	2.70
Terminal elevators			
Thunder Bay	6.04	6.04	n/a
Vancouver	n/a	6.33	6.33

Source: Canadian Grain Commission.

Note: Elevation at primary elevator is for receiving, elevating and loading out, while cleaning is for removal of dockage at the terminal elevator with the

elevator company retaining the dockage. Terminal elevator charges are for receiving by rail, elevating and loading out by water; additional charges apply for receiving from truck and for loading out in railway cars.

Primary elevation charges are appreciably lower under the tariffs of the Saskatchewan Wheat Pool than those published by the pools in the other two provinces. The two pools are the price leaders in Saskatchewan and Manitoba. Pioneer tariffs are identical to the pools, while Cargill tariffs differ by no more than 2¢. UGG tariffs are slightly higher. Elevation charges levied by Alberta Wheat Pool are generally higher than those of competitors in that province, but this seems to be only to offset the low cleaning rate filed by the pool. While competition between primary elevators exists as to grading, dockage, and moisture determination and other service attributes, there is no open price competition. Each pool acts as the price leader within its province.

The same lack of price competition is evident in the terminal elevators. The rates quoted in Table 3 for Thunder Bay and Vancouver apply to the tariffs of all companies operating in each port. Prince Rupert Grain offers a slightly lower rate than Vancouver at $6.15/tonne and the Churchill tariff is $5.92/tonne.

The transfer elevators on the St. Lawrence are not owned by the prairie elevator companies. The bulk of the grain delivered to these elevators is received from ships and loaded out to ships, but to allow better comparability with Thunder Bay, it is more appropriate to consider the higher rate of $4.17/tonne for receipts in these elevators by rail and loading out by water.[9] It is the view of the trade that the filed rates at the transfer elevators are discounted for competitive reasons to a much greater extent than the rates in terminal elevators. The Thunder Bay terminal elevator tariff is almost $2/tonne higher than the comparable transfer elevator tariff. As this comparison excludes cleaning, it is difficult to see what extra services at Thunder Bay justify this difference.

Elevator charges in Canada are considerably higher than those applying in the United States. While a rigorous analysis of U.S. elevator charges has not been made for this paper, terminal elevator charges appear to be of the order of C$4/tonne. Primary elevator charges in the U.S. would also be about $4/tonne with this charge excluding cleaning.[10] The total of terminal and primary elevator charges in the U.S. therefore amounts to some C$8/tonne against a comparable figure in Canada excluding cleaning ranging from nearly $14/tonne to $15.50/tonne. While it is claimed with some justification that the private grain trade in the U.S. is marketing wheat as well as handling it and therefore able to recover additional revenue from the marketing function, nevertheless

elevation charges are much lower in the U.S. than in Canada. However, in fairness to Canadian elevator companies, it should be noted that there has been considerable U.S. government subsidization of elevator construction.

4. CONCLUSION

The main conclusions that flow from this paper are:

1. In the three crop years ending 1994/95, Canadian bulk exports of major grains averaged 27.6 million tonnes per annum. These are projected to increase to 31.0 million tonnes in 1999/2000 and 33.0 million tonnes in 2004/05. As in all grain trade projections, it is assumed that these future years will be "average" in the sense of not being unduly affected by climate variations and random fluctuations in markets.

2. The increased grain exports are forecast primarily through the Pacific coast at 21.6 million tonnes in 2004/05. Direct shipments from the prairies for consumption in the U.S. are also forecast to increase to 4.0 million tonnes. Exports through other clearance sectors are not expected to show any increase.

3. Grain handling and transportation capacity are sufficient to meet these export projections through all clearance sectors. With a new facility to be built at Roberts Bank to commence operations in 1999, west coast elevator capacity is more than adequate for the volume of grain projected. Although there may continue to be periodic shortages of rail cars, main line rail capacity to the west coast can cope with expected flows of the various commodities exported through the B.C. ports. Railway congestion can occur in moving grain cars through the existing Vancouver elevators, but the railways are managing these problem areas with considerable efficiency. It is not envisaged that railway facilities will limit potential grain exports to the west coast.

4. Turning to the eastbound grain movement, the problem is considerable surplus capacity in the terminal elevators of Thunder Bay and the transfer elevators on the St. Lawrence. The grain flow through the eastbound route has fallen dramatically over the last decade and, with general railway complaints about excess capacity in eastern Canada, the railways can accommodate future grain flows without any difficulties.

5. Railway productivity gains have been very impressive for many years. The average rail rate received by the railways for shipping grain is actually less now than a decade ago in spite of general inflation in the economy. Under the Western Grain Transportation Act, the railways were required to share

productivity gains with the shipper (and at that time the government) every four years. Under the new *Canada Transportation Act*, the maximum rate scale will be regulated to at least the year 1999, but there is no longer a requirement to transfer productivity gains to the shipper every four years. This causes considerable concern, as grain shippers are often captive to one railway.

6. There has been considerable rationalization of the primary elevator system in the prairies over the last 30 years. Yet, the average prairie elevator still turns over its capacity only 5 times in a year. The current number of 1340 primary elevators in the prairies will continue to fall, possibly to about 800 by the turn of the century and continuing to a much lower figure by the year 2010. Currently, there are eight major companies operating primary elevators in the prairies and many consider that this number will be consolidated in the next few years.

7. Tariffs at primary and terminal elevators are much higher in Canada than in the United States. Excluding cleaning charges, primary and terminal elevator charges in Canada are in the range of $14/tonne to $15.50/tonne, with an additional transfer elevator charge of $4/tonne for grain moving through the transfer elevators on the Lower St. Lawrence. Although it is not possible to be precise, U.S. terminal and primary elevator charges amount to about C$8/tonne.

Endnotes

1. These are primary and terminal elevator tariffs, cleaning, the rail rate for grain shipped in single cars, and for the eastbound movement what the CWB currently estimates will ultimately be the full cost of $19.38/tonne for the transport of wheat from Thunder Bay to the St. Lawrence.

2. John Heads, Arthur G. Wilson and James J. Eisler, Potential Changes in Grain Traffic Through British Columbia Ports, University of Manitoba Transport Institute Report for the British Columbia Ministry of Employment and Investment, November 1995, p. 9.

3. ibid., p. 10-24.

4. University of Manitoba Transport Institute, The International Competitiveness of Western Canadian Transportation, Report prepared for Western Economic Diversification Canada, November 1994. This report was prepared by a number of authors, with Dr. Wilson assisted by

Dr. Lorraine Hope responsible for Chapter 5, which examined grain.

5. Future Changes in Eastbound Grain Traffic, referenced as the source of Table 1, p. 281.

6. The costs of abandoned grain-dependent branchlines continue to be removed from the cost base. However, the $10,000 per mile per annum in the new legislation is less than the full railway saving ($13,300 per mile in 1994/95), which was previously all passed to the shippers.

7. On the dangers facing captive shippers in other industries, see John Heads, "Captive Shippers: The Coal and Sulphur Industries", Canadian Transportation Research Forum Proceedings, 1995, pp. 743-58.

8. See, for example, National Transportation Agency, The 1995 Branch Line Review, Report to the Minister of Transport, October 1995, pp. 12-13. This showed that the transfer of 0.67 million tonnes of grain from low density branchlines to alternate branchlines would lead to net elevation cost reductions of about $2 million annually, i.e., $3/tonne.

9. When the movement is from unit trains, the rate is $4.10/tonne at Quebec and $4.24/tonne at Montreal, for an average of $4.17/tonne. This is higher than the water-water rate of $3.87/tonne. Rail-water rates are higher at Sorel and Trois Rivières, but the movements there are much smaller. There are, of course, no rail-water rates for Baie Comeau and Port Cartier.

10. Terminal charges are readily available, but it is not easy to establish primary elevator charges in the U.S. The Upper Great Plains Transportation Institute informs us that their survey in 1994 produced a wide range of figures from US3¢ to US12¢/bushel. After discussion with this Institute, we took on average figures of US8¢/bushel, which is equivalent to C$4/tonne. This estimate is also consistent with data in IBI Group, Grain System Efficiency, July 1994, Table 1.1.

Thunder Bay - Grain Gateway to the East?

by Arthur G. Wilson and John Heads*

During the development period of farming on the prairies, the gateway for prairie grain was through terminal elevators located at the twin cities of Port Arthur and Fort William, later amalgamated into the city of Thunder Bay. Movement of grain eastward was in response to the pull of the export market in Europe, this movement assisted by low rail rates on grain. These rates arose from the Crow's Nest Pass Agreement reached with the Canadian Pacific Railway in 1897 and the action of other governments which fostered even lower rates by encouraging construction of competing rail lines. Markets for grain gradually became more diverse and grain terminals were constructed at Vancouver, Prince Rupert and Churchill, both in response to the changing direction of grain flow and the actions of government. The Crow's Nest rates later became statutory rates and these were extended to apply to grain movements to these ports as well as to Thunder Bay. These additional outlets for grain and the increased flow to markets best served by the Pacific ports has eroded the volume moving through Thunder Bay to such an extent as to relegate this port to the point of becoming a residual outlet. A further complicating factor is the fact that the port is about 1900 miles from tidewater, vessels plying the intervening distance being limited in capacity to less than 30,000 tonnes due to Seaway lock dimensions, whereas ocean ships tend to be much larger in capacity in order to capture economies in operation. All these factors detract from movement through Thunder Bay giving rise to the question of whether the port can remain a viable grain gateway to the east.

The Handling and Transportation System

Any assessment of Thunder Bay as an outlet for grain requires an insight into the complexities of the entire handling and transportation system for prairie grain. On the prairies, grain is assembled from about 125,000 producers who deliver to about 1400 primary elevators located at almost 1000 delivery points. These elevators are owned and/or operated by three cooperatives which receive grain within their own provincial borders, by another cooperative prairie wide

* Research Affiliates of the University of Manitoba Transport Institute

in scope and by four private firms. Grain delivered to these elevators is classed as Board, off-Board or non-Board, the former consisting of wheat and barley for domestic human consumption or export, off-Board grain being wheat and barley utilized as domestic feed and non-Board grain including oats, flax, rye and canola. Marketing of Board grains is the responsibility of the Canadian Wheat Board while the remaining grains are marketed by other merchandisers, primarily the elevator companies. Prices of these grains are determined relative to those established on the Winnipeg Commodity Exchange. The Board regulates producer deliveries of its grains through a delivery contract system. The elevator companies operate as agents of the Board when handling these grains. Deliveries of other grains reflect producer interpretations of the levels of prices.

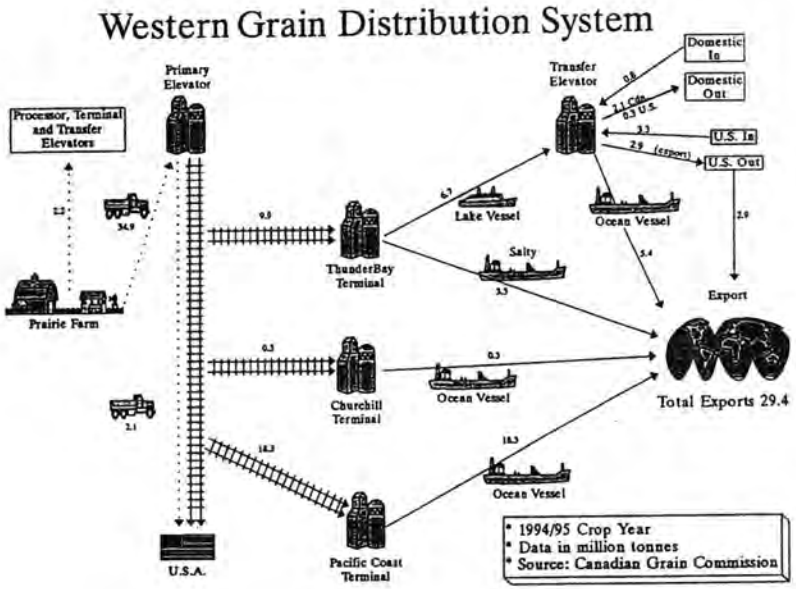
The Canadian Grain Commission administers the grade standards, supervises terminal weighing, allocates producer cars, maintains grain statistics, provides grain handling licences and issues a Certificate Final guaranteeing the quality of the grain exported. It defines elevators according to function, primary elevators being those receiving grain directly from the producer; terminal elevators being those who receive grain upon or after official inspection and weighing and which provide cleaning, treating and storage facilities; and transfer elevators being those which receive and ship officially inspected and weighed grain and which may also receive, clean, store and ship other grain. Tariffs for provision of these functions are filed with the Commission.

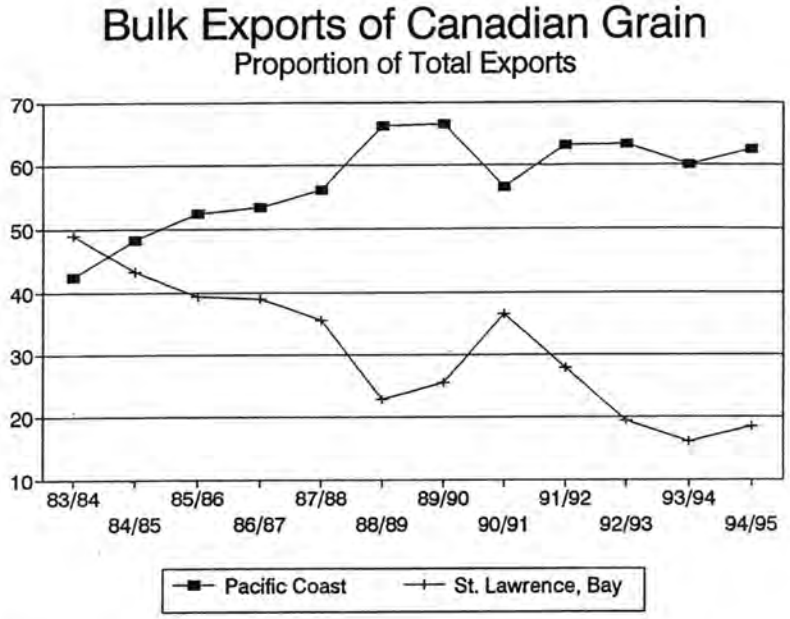
Given that grain is forwarded by rail to terminal position by the two major railways, Canadian Pacific and Canadian National and also by a provincial railway, British Columbia Railway, the movement must be coordinated if grain deliveries from the prairies are to be harmonized with export commitments. A highly complex planning procedure has been developed by the Western Grain Transportation Office in consultation with the Board, the elevator companies and the railways. Cars are allocated by the Office to the Board and to non-Board shippers essentially in accordance with confirmed sales. At terminal position, the cars tend to be pooled amongst the terminals by grain in order to improve railway efficiency and reduce car turnaround time. Terminal elevators at Thunder Bay may load grain to salty vessels for direct export, this constituting 32% of the total export volume during 1992/95; to lake vessels for movement down the Great Lakes to transfer elevators along the St. Lawrence Seaway; or to railway cars for movement elsewhere. Loading of grain on vessels is coordinated by the Lake Shippers Clearance Association.

Further comment on the grain movement system is appropriate, particularly in relation to the degree of regulation imposed. This regulation has affected the structure of the system. Potential new entrants have been discouraged while

activities of the existing firms have been curtailed. The high capital costs of the system in combination with the industry structure have hindered initiative and radical innovation which would reduce costs such as could be achieved by use of bulk loading facilities in combination with just-in-time delivery of clean grain from the prairies. In addition, there is little economic benefit to be retained by any firm or organization from introducing improvements which could reduce the costs experienced when moving grain through the ports. This situation works to the disadvantage of Thunder Bay in particular.

The complexity of the system is illustrated by the schematic diagram, Figure 1, in which the grain movements in 1994/95 are delineated. The relative division of grain movements through Thunder Bay and the Pacific coast ports over time is shown in Figure 2. This figure indicates the relative importance of each of the two port areas, this a reflection of the demand for grain by those countries most economically served by the respective areas. This situation cannot be considered comforting to Thunder Bay as a port.





Thunder Bay as a Port

The relative decline in the importance of Thunder Bay as a grain port has major implications for the port as a whole since grain is the major cargo handled. This is made apparent in Table 1. Furthermore, the decline in aggregate shipments has resulted in the terminal having a continued substantial excess capacity to handle grain even though aggregate capacity declined from 2.1 million tonnes in 1983 to 1.5 million tonnes in 1995. Further reductions in capacity are rendered difficult by the independent nature of terminal ownership. This also limits terminal specialization by grain which could reduce costs. The decline in port throughput and lack of terminal specialization have major implications for lake vessel owners. The capacity of the lake fleet for the movement of grain has been substantially reduced as owners have attempted to reduce costs by this means as well as by the consolidation of ownership. Lack of the opportunity to load a full cargo at any one terminal, this in part a reflection of the number of grades in store, further exacerbates costs due to the additional vessel movement required between the terminals. Other costs over which the owners have little control include vessel trimming, pilotage and port

fees are significant in aggregate. Costs are also influenced by the eight to nine month length limit of the shipping season through the Seaway.

Table 1: Cargo Handled by the Port of Thunder Bay, 1994

Commodity	Thousand Tonnes
Grain	10,491
Coal	2,245
Potash	605
Dry Bulk	153
Liquid Bulk	184
General Cargo	161
Total	13,839

Source: Thunder Bay Harbour Commission

Rail service to the terminals is quite complex involving both major railways, each terminal being serviced by one railway, the terminals being grouped within the port within three detached areas. While 35% of the grain arrives at the port on the CN line, 60% of the grain is destined for terminals serviced by this railroad necessitating a substantial interchange of cars. Switching costs are further increased by the need to switch non-Board grain received by CN to terminals serviced by CP. Recognition of the difficulties inherent in the movement system through the port is essential if costs are to be reduced so that the port and Seaway movement is to be competitive with other routes. This is important as projections of future movement through the port suggest there is little potential for any significant increase in volume during the foreseeable future.

Movement Options for Prairie Grain

Several options are available for movement of prairie grain to export. These include:

1. Rail to Thunder Bay and salty vessel direct to export.
2. Rail to Thunder Bay and lake vessel to St. Lawrence ports.
3. Rail direct from Manitoba/Saskatchewan to St. Lawrence ports.
4. Rail to Vancouver or Prince Rupert.

5. Rail to Churchill.
6. Rail to U.S. Pacific Northwest ports.
7. Rail to the Gulf of Mexico.
8. A combination of rail and barge to the Gulf.
9. Truck or rail to interior U.S. destinations.

While other routes are available these are not considered feasible at this time. Each of the routes identified will be considered in turn. The costs of using the feasible routes alternative to Thunder Bay will then be placed in perspective to allow the competitiveness of port to be ascertained. It must be recognized that the volume of movement by any route reflects the net return to the producer arising from delivery to the ultimate destination of the grain from within the tributary area.

1. Salty Vessels direct from Thunder Bay

The available fleet of salty vessels able to transit the Seaway is declining. While these vessels are used primarily for the export of non-Board grain, the potential for increased shipments by salty through Thunder Bay is very limited due to the number of vessels available and the costs experienced.

2. Rail to Thunder Bay and lake vessel to St. Lawrence Ports.

This is the traditional form of movement to the east. As indicated previously, excess capacity has resulted in a downsizing of the fleet. A backhaul of iron ore tends to complement the movement of grain thereby improving total vessel returns. Some of the costs experienced by vessels tend to be excessive. Terminal capacity is more than adequate but terminal costs and port rail costs are increased as a result of the structure of the system.

3. Direct movements by rail from the prairies to the St. Lawrence ports (Bunge transfer elevator at Quebec City).

The potential for these movements is substantial. These movements would require either that the grain to be cleaned on the prairies prior to shipment or the use of the cleaning facilities at Quebec City. To be economic, this movement would have to be by unit train. The Quebec elevator is conveniently located to rail and has considerable excess capacity. The depth of water in the slips allows very large ocean vessels to be loaded.

4. Rail to Vancouver or Prince Rupert.

The volume handled by this route has tended to be limited more by the ability to physically move the grain to and through the ports than by any other factor. Rail movement within Vancouver is very complex occurring within very congested areas along Burrard Inlet. Throughput constraints at the Pacific Coast have been somewhat alleviated by construction of the Prince Rupert terminal. These would be further mitigated by the proposed terminal at Roberts Bank. With the elimination of the WGTA rates, and the changes in the price basing points for wheat and barley, the hinterland of Vancouver for durum and malting barley receipts now extends to western Saskatchewan; for wheat to western Manitoba and for feed barley as far east as Portage la Prairie. The size of these hinterlands reflects both the location of markets and the relative cost of movement by this route relative to that to the east.

5. Rail to Churchill.

Use of this route is largely confined to the Canadian Wheat Board. The existing locations of markets suggest that the current annual throughput of less than 300,000 tonnes is unlikely to increase significantly. The port suffers from a limited shipping season.

6. Rail to the U.S. Pacific Northwest ports.

While movement to these ports remains a possibility, various institutional constraints must be overcome. In addition, current rail rates from prairie origins to these ports are higher than those to Vancouver. Total costs of using this route tend to be higher notwithstanding lower terminal costs. The costs of using this route are also highly dependent on the exchange rate. A rising Canadian/U.S. exchange rate increases the competitiveness of this route.

7. Rail to the Gulf of Mexico.

This route holds potential for areas in the southeastern prairies. Institutional constraints would have to be overcome with the economies of the route dependent on the exchange rate as well as the differentials in ocean freight rates between the Gulf and St. Lawrence ports to export destinations.

8. A combination of rail and barge to the Gulf.

While this route also holds potential, the economies of the route are dependent on barge rates which vary widely by season. Continuous access for Canadian grain to the Mississippi River system is not guaranteed. As in the case of other U.S. routes, institutional constraints must be overcome. The attractiveness of the route is dependent on the exchange rate.

9. Direct shipments to interior U.S. destinations by truck or rail.

These shipments from the prairies reflect demands for grain in contiguous areas of the U.S. and are made by both rail and truck. Such shipments hold the potential to increase under NAFTA but can be expected to vary in relation to U.S. production and farm policy. Since a substantial part of the volume is from areas within the hinterland of Thunder Bay, this represents volume diverted from the port.

Comparative Transportation Rates

Rates for using selected routes for Canadian grain to export were determined. These are presented below in Table 2 where Rosetown, SK is used as the point of grain shipment for rate comparison purposes. As inferred previously, this station lies approximately on the western margin for shipment eastward of durum and malting barley but far to the west of the margins for shipping wheat and feed barley eastward. In as much as the rates in Canadian dollars are substantially affected by the exchange rate for any American portion of the route, rates under two values of the dollar are provided.

Table 2: Rates[1] in Canadian Dollars Under Two Currency Values for Moving Grain by Selected Routes to Export from Rosetown, SK, 1996.

Route and Export Outlet	Rate	
	Can$1=US$0.74	Can$1=US$0.90
Rail to Thunder Bay - laker to Quebec City	55.49	55.49
Rail to Quebec City	54.51	54.51
Rail and barge to New Orleans	55.01	49.52
Rail to New Orleans	58.49	52.43
[1] by rail represent those for unit trains		

Source: Heads et al, Future Changes in Eastbound Grain Traffic.

The above data indicate that Thunder Bay is in a precarious competitive position with respect to exports through the St. Lawrence. Expansion of direct rail shipments to Quebec City is presently limited by the ability to ship unit trains and by concern over the most economic location for grain cleaning. In the longer run, since achievement of additional economies in lake vessel

operation is limited by the size of the locks on the St. Lawrence Seaway while economies in rail operation continue to be experienced, the competitive position of the Thunder Bay route can be expected to erode farther. While the routes to New Orleans are marginal at best under the lower exchange rate, their competitive position greatly improves as the exchange rate rises. However, shipments through New Orleans are subject to higher ocean rates to Europe than those exiting via Quebec City. Consequently, while the rate for shipment to New Orleans may be lower than that to Quebec City under the higher exchange rate, for shipments destined for Europe Quebec City may remain the most economical point of export.

Projected Exports Eastward

Exports of major Canadian bulk grains via the St. Lawrence and Thunder Bay averaged 7.4 million tonnes during 1992/95. The level of exports by this route is expected to fall to 6.0 million tonnes in 1996/97. By 1999/2000, exports are projected to rise to 6.4 million tonnes and to 7.0 million tonnes five years later. These projections do not take into account any diversion of grain via New Orleans. The total volume handled through the Great Lakes/St. Lawrence, which includes domestic grain, U.S. grain and special crops was 12.0 million tonnes in 1993/95. This is expected to fall to 10.5 million tonnes in 1996/97 but recover to 11 million tonnes in 1999/2000 and to 11.5 million tonnes in 2004/05. These volume figures hold little comfort for movement through Thunder Bay.

Measures to Improve the Competitive Position of Thunder Bay

The precarious competitive position of Thunder Bay as a grain port necessitates close scrutiny of all the attendant costs. Shipment through Thunder Bay involves a double handling of the grain and also shipment down the lakes by vessel (transfers from rail to rail are more costly). Costs of these operations must be reduced if the port is to remain competitive, namely those of rail at the port, terminals and lake vessels. Each will be discussed in turn.

1. Railways

Substantial costs are incurred in the switching of rail grain cars within the port area between the railways and to the different terminals. A joint terminal railway holds forth the prospect of reducing these costs significantly, particularly if associated with further terminal elevator rationalization.

Reduction of the average five day period for institution of demurrage to two days could also reduce costs by improving car utilization.

2. *Terminal elevators*

The low turnover ratios at the terminals are not conducive to minimizing unit throughput costs. While significant rationalization has already occurred, more is necessary. Formation of a voluntary consortium of the existing independent owners would enable further rationalization to occur benefitting all parties by increasing turnover ratios, enabling greater specialization, lowering the impact of local taxes and reducing the shifting of vessels. Specialization would also encourage the railways to block trains at Winnipeg for the remaining terminals thereby reducing switching at the port.

3. *Vessels*

In addition to the rationalization of the fleet and the formation of a consortium, which has occurred, further reduction in vessel costs in the light of the fixed dimensions of the Seaway locks is largely beyond the control of the owners. For example, net returns would be enhanced by greater complementarity of grain/iron ore cargoes. Other potential means of reducing costs include reduced shifting of vessels, improved terminal loading facilities, development of an internal pilotage system and lower port costs.

While the savings in any one of these areas could be limited, in total, they would be significant. Such a reduction could improve the competitiveness of Thunder Bay, at least in the short run.

Assessment of Thunder Bay as the Grain Gateway to the East

Historically, Thunder Bay has benefitted from the economies associated with use of vessels for a substantial portion of the distance to seaboard. In addition, the dominant markets in Europe were best served by the eastern route. The former advantage has been largely overcome by improvements in grain handling and rail technology while the dominant markets for Canadian grain are now best served through the Pacific coast. As a result, the previous attractiveness of Thunder Bay has been seriously eroded. Little improvement in the level of throughput at the port can be expected over the next decade even without taking into account any diversions of grain through the United States which could occur under a rising exchange rate. Maintenance of the current handling level is predicated upon reductions in the cost of using the Thunder Bay route commensurate with the continuing reductions in cost associated with the all rail route. The probability of this occurring over the long run is indeed remote.

Therefore while Thunder Bay will continue to be a major grain gateway to the east in the short run, its future as a major export grain port appears precarious and cannot be guaranteed even though it may continue to be used for special crops and domestic grain.

RAIL RATIONALIZATION AND THE GRAIN INDUSTRY IN SOUTHERN ONTARIO

David C. Hackston
Research and Traffic Group

Introduction

This paper is essentially derived from the Summary contained in the RTG report *Southern Ontario-Rural Rail Rationalization* which was prepared for the Ontario Ministry of Transportation and the Ontario Ministry of Agriculture, Food and Rural Affairs. The overall objective included the identification of practical options to support an improved distribution system for Southwestern Ontario's grain. Railways, elevator companies, grain industry associations, municipal economic development officers and rail unions were consulted during the study.

Grain Industry

Southwestern Ontario's grain industry accounts for 87% of provincial production of soybeans and for three-quarters of provincial production of winter wheat and grain corn. It faces uncertainty since, over the coming decade, a substantial portion of the system of rail lines that serve it will be abandoned. Approximately 970,000 tonnes of Ontario grain are shipped by rail annually — 170,000 tonnes to destinations within Canada and 800,000 tonnes to destinations in the U.S. This amounts to one-sixth of all Ontario grain delivered to elevators or directly to processing plants.

Because of the particularly dense network of railway lines belonging to six independent railway companies,[1] the outcome of rail rationalization in Southwestern Ontario is less predictable than for most instances of rationalization and abandonment. This uncertainty is having an unfortunate effect. Until the consequent pattern becomes known, the grain industry is reluctant to plan the needed rationalization of its grain handling facilities.

Elevator System

No Ontario elevator is able to load trains without uncoupling the cars and substantial (costly) switching. The largest sidings accommodate only about 25 cars. The 330 country elevators in Ontario, of which 256 are in Southwestern Ontario, have a total capacity of 2.7 million tonnes, and there is a further capacity of 0.4 million tonnes in the transfer elevators at Ontario ports. Of the Southwestern Ontario elevators, 58 have railway sidings. Currently 5.4 million tonnes of grain move through the Ontario elevator system and to processing plants. This implies an average elevator turnover of only 1.7, which is very low. Inevitably there will be fewer grain elevators and less railway track in southwestern Ontario. Both the grain industry and the railways recognize this. The grain producers envisage a smaller number of large elevators, increasing farm storage and direct delivery to processors and large terminals at ports and on main railway lines.

Rail Network

There are approximately 1835 kilometres of railway lines in the study area, not including yard trackage, line segments entirely within urban/suburban areas, sidings or industrial spurs. All this railway plant is concentrated within a region that is only approximately 300 kms long by 100 kms to 150 kms wide. The rail network in the study area is shrinking. Several lines have been abandoned relatively recently (including in 1995) — a trend that shows absolutely no indication of reversal. The network shrunk during the course of the study. Yet, the outlook for rail services in Southwest Ontario is far from negative. Large volumes of rail freight move through and originate in the study area, particularly from the petrochemical and automobile industries.

By mid-1995, rail access from Southwestern Ontario to the U.S. improved dramatically from a few years ago. Rapid under-river freight train transit that includes double-stacked containers is available at both Windsor and Sarnia. U.S. to U.S. transport via Ontario[2] is quicker. Container movements through Halifax and Montreal to the U.S. Midwest are quicker, as is the movement of a substantial portion of Canada-U.S. rail traffic. The competitiveness of rail intermodal versus direct truck should also have improved.

Elevator System Scenarios

Three grain elevator system scenarios might be:

- *Continuation of the status quo.* The elevator industry is changing, but very slowly. Very few elevators can accommodate more than five rail cars, and modifications to most existing elevators would not significantly enhance the situation. Nonetheless, fewer elevators with greater rail loading capability would constitute an improvement.

- *Accelerated elevator rationalization resulting from a known rationalized network of rail lines.* The number of high throughput elevators on rail capable of accommodating unit trains need not be great. Under this scenario one would presume dominance of those Ontario elevator companies that are members of large grain trade conglomerates, operating internationally and with ready sources of finance.

- *Multi-company cooperative initiatives jointly constructing large new elevators on rail.* A cooperative facility or facilities for efficient rail loading could achieve rationalization more quickly. Venture members would be unlikely to compete against the new facility. One to four terminals should suffice for the study area.

Railway Rationalization Scenarios

Two generic railway rationalization scenarios are:

- *Status Quo Piecemeal Abandonments:* The abandonment process as defined in the *National Transportation Act, 1987* would continue. Over a decade, successive uneconomic lines will be closed. Each railway company would continue to provide service over its remaining lines to points where it wished to continue to compete. Where duplicate lines were abandoned, shippers would lose competitive options.

- *Strategically Planned Regional Rationalization:* Through a cooperative process, in which shippers — including especially the grain industry — could play a useful part, a line rationalization scheme for the region would be developed. The railways collectively would be able to divest not only lines without prospect of becoming profitable but also duplicate profitable lines that serve the same points less efficiently than would a single line.

With the *status quo* approach, the process is slow, expensive and adversarial. Shippers can be expected to fight to protect lines serving their elevators.[3] The *strategically planned* approach would be quicker, less expensive and should result in a positive working relationship between the shippers and the railways.

The railways would obtain accelerated abandonment while the shippers would obtain a more efficient and responsive transportation system.

Study Conclusions

The salient conclusions from the study are:

- It is apparent that the principal inefficiencies in the elevator/rail system can be attributed to the elevator system. Small old elevators with short sidings do not permit efficient rail loading. Modifications to most existing elevators would face difficulties. Many are positioned such that an extension of their siding would have to cross a main access road at right angles. Location of many of the elevators in an urban (including village or town) situation renders it impossible to install efficient rail loading facilities. Notwithstanding, grain industry representatives recognized this deficiency. They stressed a willingness to invest in modern efficient facilities at appropriate locations when they know where there will be continuing good quality rail service.

- The Southwestern Ontario study area has a mature industrial and agricultural economy with a comprehensive transportation infrastructure. Within this area, there seems no reason to retain railway lines where they are not now needed against a hypothetical future. At best, excess railway track is a local nuisance. Rail crossings are expensive, road networks are disrupted and neighbourhoods can be isolated. Superfluous rail lines, and particularly the level crossings that they require, are also a safety hazard.

- The railways must collectively compete with trucking, which shares a common infrastructure (among companies and with the automobile). The added cost of branch lines maintained solely to provide access to traffic that could be more economically reached over the tracks of the other company, and of essentially parallel and redundant main lines, is an unnecessary burden. This is not only a burden on the railways; it also imposes a penalty on the economy of Southwestern Ontario, including its grain industry.

Study Recommendations

The essential recommendations of the study were that:

- The Ontario grain industry concentrate its rail loading facilities and take a cooperative approach to the shipment of grain by rail;

- A strategically *planned* (as opposed to *piecemeal*) approach — including the participation of all interested shippers and governments, as well as all involved railways — be taken to the rationalization of railway lines within the study area; and

- The Ontario grain industry, with the Province providing expert advice and assistance to facilitate problem solving and agreements, take a proactive approach to cooperation with the railways to achieve planned rationalization.

A collective approach, for the limited purpose of loading export grain to rail, could avoid the overbuilding of elevator facilities for loading grain to rail while creating an operation, or operations, of sufficient size to take advantage of the positive modal characteristics of rail, particularly its economies when moving large quantities of uniform bulk product. It might also achieve sufficient throughput to obtain economies from high utilization of the investment in rail loading facilities.

A successful collective rationalization planning process would require leadership and vision. In the interest of the carriers, the shippers and the communities alike, the rationalization job could be decided and done relatively quickly; then all parties would move on in relative certainty. The lines to be retained would be well known. The railways could focus their maintenance efforts; costs for the surviving lines would fall. The railways could proceed through a — hopefully expedited — regulatory process, not only with little opposition but with the overt support of cooperating affected shippers.

Implementation of the approach suggested would require a major consensus-building and negotiation process. Further, if it is to be successful, the rationalization planning process must proceed quickly. This will require proactive leadership, a role that the Ontario government might fill.

Table 1
Scenario Railway Line Survival
in the Southwestern Ontario Study Area

Sub division	Line Segment	*Status Quo* Abandonment Process	Strategically Planned Rationalization	Notes
CP Rail System				
Goderich	Hamilton-Guelph	abandoned	abandoned	low density line, no grain shippers
Waterloo	Galt-Waterloo	spur retained	spur retained	The southern portion would be retained as a spur to a large Toyota plant and an industrial park.
Galt	Guelph Jct-London	retained	retained	main line
Port Burwell	Tillsonburg-Ingersoll	abandoned	abandoned	low density line, no grain shippers
St Thomas	Wood-stock-St Thomas	retained	spur retained	Retain all for 1st option but only Woodstock to Putnam for *planned rationalization.*
Windsor	London-Chatham	retained	retained	main line, major line segment for elevator capacity
Windsor	Chatham-Windsor	retained	possibly abandon	The is the main line with access to the Windsor tunnel to the U.S. With a planned approach (and with improved connection) one might use the CSX from Chatham to Fargo and the CASO to Windsor and the tunnel.
CN North America				
Dundas	Hamilton-London	retained	retained	main line, large non-grain rail shippers

Sub division	Line Segment	*Status Quo* Abandonment Process	Strategically Planned Rationalization	Notes
Guelph	Guelph-London	retained	retained	medium density line with some shippers, serves as a connection to the Goderich-Exeter. Possible candidate for short line.
Talbot	St Thomas-London	retained	retained	This line provides CN's main access between the main line at London and the Ford plant at Talbotville. Norfolk-Southern may also use it if its operations are shifted from the CN's Cayuga subdivision to the main line.
Strathroy	London-Sarnia	retained	retained	main line connects to new tunnel at Sarnia, important grain capacity on line.
Chatham	Komoka-Chatham	retained	abandoned	substantial grain capacity, potential for rationalization with CP main line (less than 2 km apart).
Chatham	Chatham-Windsor	abandoned	abandoned	No shippers, may either be abandoned or sold to VIA.
Paynes	St Thomas-Glencoe	abandoned	abandoned	Although the line is currently an important through route, this may change with new tunnel at Sarnia. The only traffic originating is at a grain facility near St Thomas and the Ford plant at Talbotville, both of which could have line haul services via the Talbot subdivision.
Cayuga	St Thomas-Tillsonburg	abandoned	probably retained	Low density line, no shippers, part of through route, may not be needed after tunnel opens, do not need Cayuga and CASO.
Cayuga	Tillsonburg-Cayuga	abandoned	probably retained	Low density line, endangered by new tunnel and rerouting of trains, very few shippers, minimal grain, do not need Cayuga and CASO.

Sub division	Line Segment	*Status Quo* Abandonment Process	Strategically Planned Rationalization	Notes
Hagersville	Nanticoke-Brantford	retained	retained	Low density line, no grain but serves Stelco, Esso and Ontario Hydro at Nanticoke. Potential short line.
Fergus	Guelph-Cambridge	abandoned	abandoned	Low density line without grain shippers
Leamington	Comber-Leamington	retained in short run only	retained in short run only	will probably be retained as long as Heinz ships by insulated box cars. When cars have to be replaced will probably use containers and line will become surplus, Wheatley Elevators ships from Blytheswood.
CASO	Windsor-Fargo	probably retained	retained	Important grain originating line, very little other originating traffic, used for *bridge* traffic but could lose CN traffic to the new tunnel. Might prove the best choice for the (rationalized system) mainline to Windsor.
Joint CP Rail System and CN North America Section				
CASO	Fargo-St Thomas	probably retained	retained	Important grain originating line, very little other originating traffic, could pick up shippers if CSX line closed, used for *bridge* traffic but could lose CN traffic to the new tunnel.
CASO	St Thomas-Tillsonburg	abandoned	abandoned	One small elevator at Springfield, has not been maintained, only serves for through traffic, endangered by new tunnel.
CASO	Tillsonburg-Hewitt[4]	abandoned	abandoned	No shippers, has not been maintained, only serves for through traffic, endangered by new tunnel.
CSX Transportation				
Sarnia	Sarnia-Blenheim	retained	retained	Important line for chemical industry near Sarnia, substantial grain from Wallaceburg and Blenheim, maintain connection to CP at Chatham.

Sub division	Line Segment	*Status Quo* Abandonment Process	Strategically Planned Rationalization	Notes
Blenheim	Ruthven-Blenheim	has been abandoned	has been abandoned	Abandonment appeal disallowed during the course of this study.
Blenheim	West Lorne-Blenheim	retained	abandoned	The only substantial shippers are grain companies which could be connected to the CASO. If the Blenheim sub. were to be abandoned, the elevators at Blenheim could still be serviced from the Sarnia sub.
Goderich-Exeter				
Goderich	Goderich-Stratford Jct	retained	retained	Serves major salt mine, elevators and traffic from Exeter sub.
Exeter	Centralia-Clinton Jct	retained	retained	Substantial grain and fertilizer traffic, particularly at Hensall.

Endnotes

1. Seven railways — in approximate order of the scale of their local operations, CN North America, CP Rail System, CSX Transportation, the Norfolk Southern Railroad, the Goderich-Exeter Railway, the Essex Terminal Railway and the Port Stanley Terminal Railway — operate in the region. The Norfolk Southern has no track of its own.

2. In addition to its Canadian services over its own lines, the CSX operates from the tunnel in Windsor and through Niagara Falls. Also, the Norfolk Southern operates daily trains each way from the tunnel, mostly via CN track, through Fort Erie to Buffalo. These services carry approximately 500,000 tonnes annually.

3. Passage of Bill C-101, the *Canada Transportation Act*, would make abandonment much easier for the railways.

4. The CASO is jointly owned by CN and CP. The section east of Hewitt is operated exclusively by CP Rail. CN operates the joint section on behalf of CN and CP. West of Fargo the CASO is operated exclusively by CN.

Highway Infrastructure Capital and Productivity Growth: Evidence from the Canadian Goods-Producing Sector

by Bilkis R. Khanam*

I. Introduction

Does investment in public infrastructure stimulate national and regional economic growth? Can a link be quantified between public investment in infrastructure and private sector productivity? Are results robust to different specifications? These issues have received much attention from economists, regional scientists, and transport planners and continue to concern policy makers.

The literature on these issues began with the work of Aschauer (1989 a,b) and has been further explored by a number of researchers including Munnell (1990), Deno and Eberts (1991), Morrison and Schwartz (1992), Hulten and Schwab (1984, 1991), Garcia-Mila and McGuire (1992), Holtz-Eakin (1994), Mullen and Williams (1992), and Moomaw, Mullen and Williams (1995) among others for the United States. Wylie (1995) examined the issue for Canada using time-series data for total infrastructure. The focus of this research has been on public infrastructure as a whole, or specific components such as highway, sewer and water and other infrastructure. There is no published research for Canada which has used panel data and highway capital stock as an input. The objective of this paper is to examine the impact of highway capital stock in Canadian provincial goods-production using panel data.

Most research on this topic has used a production function approach which optimizes input utilization given fixed prices (i.e profit maximization). A few studies have utilized a cost function approach which optimizes input utilization given fixed output (i.e. cost minimization). In the production function approach, a Cobb-Douglas functional form is usually used to estimate the association between private sector economic growth and public infrastructure capital or investment. A time series, or cross-section of observations, on the aggregate level of private sector output is regressed against observations on the aggregate level of labour and capital employed by the private sector and public infrastructure capital.

The impact of public infrastructure on private sector output is measured by its elasticity: the percentage change in output resulting from a one percent change in public infrastructure capital, keeping the levels of private labour and capital fixed.

* Economist, Policy-Economic Analysis, Transport Canada

In the literature, the reported elasticities of output with respect to changes in **infrastructure capital** are ***very diverse***.

Although the existence of an important link between public infrastructure and private sector economic growth and productivity are widely recognised, there is much controversy concerning the size and significance of the relationship.

Aschauer (1989), using aggregate time series data, estimated output elasticities with respect to public capital ranging from 0.39 to 0.56. Munnell (1990a) reported an elasticity of 0.33 for labour productivity with respect to public capital. The magnitude of these estimated elasticities and their associated marginal products are generally considered to be extraordinarily large. The primary criticism of Aschauer's finding was that the sizeable elasticity merely reflected a spurious correlation between output and the public capital stock, and that once one controlled for nonstationarity of the national time series the relationship disappeared (Tatom 1991). McGuire (1992) and Eisner (1991) have argued that the empirical evidence from the aggregate time-series data is not compelling.

Researchers turned to panel data (i.e. time-series and cross-sectional) to improve their estimation procedure. Based on state level data, Munnell (1990 b) estimated a regional level output elasticity of public capital of 0.15 compared to her national-level estimate of 0.33 for the United States. A number of other studies using state level data confirm that aggregate public capital (as well as individual components such as highway, sewer and water, and other infrastructure) has a positive and statistically significant effect on regional economic performance. On the other hand, Hulten and Schawab (1991a) and Tatom (1991) used a panel of region level data and did not find any statistically significant relationship between the growth rate of productivity and infrastructure capital growth at the regional level.

What are the sources of diverging results? Research has identified five sources of divergence: the degree of aggregation; use of different technique; error in model specification; use of different functional form; and error in variable measurement.

Eakin (1994) argued that proper specification of the error structure was not investigated in previous econometric studies, and is the apparent source of conflicting evidence using state level data. He recommended inclusion of time and state specific characteristics in the estimating equation. Moomaw, Mullen and Williams (1995) argued that a translog functional form, rather than a Cobb-Douglas functional form, should be used, as the Cobb-Douglas specification assumes the output elasticity of public capital is constant. In other words, the Cobb-Douglas specification does not permit an interstate comparative analysis, while the translog specification does. Moomaw, Mullen and Williams (1995)

used a translog specification but did not capture the state-specific and time-specific effects in their estimation.

This paper utilizes a new set of data on Canadian public highway capital stock. It investigates the robustness of empirical results by using both Cobb-Douglas and translog functional forms. In addition, we incorporate time and province-specific effects in our analysis.

The present analysis offers several variations on Eakin's study (1994). We provide province by province empirical evidence for the association between highway capital and goods-producing sector output, rather than an estimate for the "average" province in the sample. We estimate provincial goods-producing production functions using both Cobb-Douglas and translog specifications with highway capital, private capital and private labour as the three inputs. Translog specification permits the estimation of the output elasticity of highway capital for each province and year. Panel data from 1961-1994 for 10 Canadian provinces are used to estimate the input coefficients of the production function, and to assess the nature of the interaction between highway capital and other inputs.

Section II of the paper presents the methodology, and discusses the issues of specification and estimation of the production function and nonstationarity of variables. Section III discusses the data and estimation results. Section IV concludes.

II. Methodology

This paper uses an aggregate **production function** to model the role of highway capital in provincial goods-production as:

$$Y_{pt} = \lambda * F(K_{pt}, L_{pt}, H_{pt}) \qquad (1)$$

where p represents province, t represents time period, Y is real output, λ represent the level of technology, K is goods-producing private capital stock, L is goods-producing labour input, and H is the highway capital stock. One of the benefits of building or maintaining a road is that it allows, at the margin, the goods-producing firm to raise output without increasing their own capital or labour input, or level of technology. This effect would be captured by a positive marginal product of highway capital.

To estimate the production function in equation (1) for Canadian goods-production, a generalized Cobb-Douglas specification is chosen. Alternately, a translog form is also explored, which allows us to estimate not only the marginal product of inputs, but also the substitutability and complementary between them.

The generalized Cobb- Douglas form based on equation (1) can be represented as:

$$Y_{pt} = \lambda * K_{pt}^{\alpha k} L_{pt}^{\alpha l} H_{pt}^{\alpha h} \varepsilon_{pt} \qquad (3)$$

where αk represents the output elasticity of private capital, αl is the output elasticity of private labour, αh is the output elasticity of highway capital, and ε is the error term. The elasticity coefficients measure the percentage change in output for a given percentage change in factor inputs (private capital, private labour, highway capital).

Restating equation (3) in logarithmic-linear form yields the estimating equation:

$$\ln Y_{pt} = \ln \lambda + \alpha k \ln K_{pt} + \alpha l \ln L_{pt} + \alpha h \ln H_{pt} + \varepsilon_{pt} \qquad (4)$$

An aggregate production function of the type in equation (4) has been estimated in the literature. The estimated elasticity coefficients (for public capital and its individual components such as highways) range from 0.04 to 0.20 depending on the set of data employed and the specification of the estimating equation. In an attempt to investigate the robustness of the estimates to differences in error specification and nonstationarity of data, several variations of equation (4) are estimated.

Specification and Estimation

1. One approach to the specification of the error structure when dealing with cross–section and time-series observations is to adopt a cross-sectional heteroskedastic and time-wise autoregressive model[1].

2. A second approach is to introduce time and/or province-specific dummy variables and estimate by OLS.

3. A third approach is the error component model. The basic assumption is that the regression error is composed of three independent components; one component associated with time, another associated with the cross sectional units, and the third varying in both dimensions.

This paper uses the first two approaches to check for the existence and importance of province as well as time specific effects in the estimation of the aggregate production function in equation (4). To allow for province and time specific effects, equation (4) can be rewritten as:

1 Pooling with the Kmenta model. The pooling technique described in Kmenta [1986, Section 12.2, pp. 616-625] employs a set of assumptions on the disturbance covariance matrix that gives a cross-sectional heteroskedastic and timewise autoregressive model. The POOL command in SHAZAM provides features for estimating this model.

$$\ln Y_{pt} = \ln \lambda + \alpha k \ln K_{pt} + \alpha l \ln L_{pt} + \alpha h \ln H_{pt} + u_p + v_t + w_{pt} \qquad (5)$$

where u_p is a province-specific component, v_t is a time-specific component and w_{pt} varies in both dimensions. The u_p capture unobservable characteristics of the production function in each province that are omitted from the equation but do not vary over time. On the other hand, v_t control for shocks to the production function that are common to all provinces in each time period. The properties of the estimators of the equation depend on whether the time effect (v_t) and the province effect (u_p) are specified as fixed or random. If these are assumed to be fixed, the dummy variable model is appropriate. It permits the intercept to capture the province effects and the time effects respectively. If province and time effects are assumed to be random, the error component model is appropriate for estimation because it takes explicit account of the variation over time and provinces in a random manner. Helms (1985) suggests that it is more appropriate to treat both the time and state effects as fixed in interregional studies. In this study we assume both the time and province effects are fixed.

The equation (5) is estimated using three different specifications: (5.1) a GLS specification assuming a cross-sectional heteroskedastic and time-wise autoregressive model; (5.2) an OLS specification with fixed time effects, which is common in the literature; (5.3) a dummy variable model where both province and time effects are assumed to be fixed.

Nonstationarity of Data

Use of a panel data set reduces the likelihood that data is nonstationary. If data is nonstationary the positive elasticity coefficients which emerge from estimation may reflect spurious correlation. To avoid the problem of nonstationarity the production function is estimated in first-difference form, a specification commonly used to address nonstationarity. Equation (5) is rewritten in first difference form as:

$$\nabla \ln Y_{pt} = \alpha_0 + \alpha k \nabla \ln K_{pt} + \alpha l \nabla \ln L_{pt} + \alpha h \nabla \ln H_{pt} + u_p + v_t + w_{pt} \qquad (6)$$

where $\nabla \ln Y_{pt}$ means the first difference of $\ln Y_{pt}$. Equation (6) is estimated using three different specifications: (6.1) an OLS specification with no time or province effects; (6.2) an OLS specification with fixed time and no province effects. (6.3) an OLS specification with fixed time and province effects.

Translog Production Function

The Cobb-Douglas functional form assumes constant and unitary elasticity of substitution across inputs. But a more flexible functional form allows input

substitutability to vary. Are inputs substitutes or complements in the goods-production process? The translog production function has a non-linear relationship between output and factor inputs which includes cross product terms indicating the substitutability or complementary of the inputs. This functional form does not impose a restriction of constant output elasticities, allowing a comparative analysis of output elasticities (across provinces) with respect to highway capital[2].

The translog specification of equation (4) can be written as:

$$\ln Y_{pt} = \alpha_0 + \alpha_l \ln L_{pt} + \alpha_k \ln K_{pt} + \alpha_h \ln H_{pt} + \frac{1}{2}\alpha_{ll}(\ln L_{pt})^2 + \frac{1}{2}\alpha_{kk}(\ln K_{pt})^2$$

$$+\frac{1}{2}\alpha_{hh}(\ln H_{pt})^2 + \alpha_{lk} \ln L_{pt} \ln K_{pt} + \alpha_{lh} \ln L_{pt} \ln H_{pt} + \alpha_{kh} \ln K_{pt} \ln H_{pt} \qquad (7)$$

$$+u_p + v_t + w_{pt}$$

The equation (7) is estimated using three different specifications as in the Cobb-Douglas case: (7.1) an OLS specification with no time and province effects; (7.2) an OLS specification with fixed time effects and no province effects; (7.3) and an OLS specification with fixed time and province effects.

III. Data and Empirical Results

Data

The goods-producing sector includes agriculture, forestry, fisheries, mines, quarries and oil wells, manufacturing, construction and other utilities. Real provincial output and labour input in the goods-producing sector are obtained from the Conference Board of Canada. Capital stocks for the goods-producing sector are from Statistics Canada's Fixed Capital Stocks and Flows series (end year, net stocks, based on geometric depreciation, in constant 1986 dollars). Highway capital stocks are obtained from Statistics Canada by special tabulation (end year, net stocks, based on geometric depreciation, in constant 1986 dollars).

Results from Cobb-Douglas Production Function

Table 1 presents estimates of the Cobb-Douglas production function of equation (5)[3]. Column (5.1) presents GLS estimates showing that highway capital stock is a significant contributor to goods-producing output, with an elasticity of 0.12.

2 Mullen and Williams have estimated output elasticities with respect to highway capital stock across states for U.S.A for the three years (1992,1995).

3 We estimated both unconstrained and constrained equations. We impose the constraint of constant returns to scale (CRTS) in a) private inputs, and b) in all inputs. The null hypothesis that the estimated production functions exhibits CRS has rejected in both instances. We only present here estimates from the unconstrained equation due to space restriction.

This indicates that a 1% increase in highway capital would raise goods-producing output by 0.12 percent.

Table 1
Estimated Parameters
Cobb-Douglas Production Function

Variables				First Difference		
	(5.1)	(5.2)	(5.3)	(6.1)	(6.2)	(6.3)
	Elasticity Estimates			Elasticity Estimates		
	GLS	Fixed Time Effect OLS	Fixed Province & Time Effect OLS	OLS	Fixed Time Effect OLS	Fixed Province & Time Effect OLS
Labour	0.76*	0.62*	0.65*	0.44*	0.62*	0.65*
	(0.04)	(0.06)	(0.07)	(0.04)	(0.06)	(0.06)
Private Capital	0.23*	0.31*	0.22*	0.42*	0.31*	0.30*
	(0.04)	(0.03)	(0.05)	(0.02)	(0.03)	(0.03)
Highway Capital	0.12**	0.10	0.14**	0.17*	0.09	0.08
	(0.07)	(0.07)	(0.08)	(0.06)	(0.07)	(0.07)
R^2	.995	.998	.998	.973	.980	.981
SE	0.064	0.064	0.053	0.072	0.064	0.064

Note: * Significant at 5% level, Standard Error of the estimates in parentheses
** Significant at 7% level

Column (5.2) shows an OLS specification with fixed time effects comparable to many of the early estimates of state-level production functions with public capital as an input (e.g. Munnell (1990 b) and Garcia-Mila and McGuire (1992))[4]. Column (5.3) displays an OLS specification with fixed time and province effects.

Controlling for time, but not province effects, the estimated coefficient of highway capital is 0.10, positive and insignificant. Once we control for time and province effects the estimated coefficient of highway capital is 0.14, positive and significant.

4 Munnell (1990b) does not use time-effects, instead including the unemployment rate as a measure of cyclical conditions.

Table 1 also presents regression results of equation (6) where the variables are in first differences form, as an adjustment for nonstationarity[5]. Column (6.1) presents an OLS specification where highway capital is a significant contributor to the goods-producing output, with an elasticity of 0.17. In column (6.2) an OLS specification with fixed time effects shows an estimated elasticity for highway capital of 0.09, positive and insignificant. Column (6.3) displays an OLS specification with fixed time and province effects with an estimated elasticity for highway capital stock of 0.08, positive and insignificant.

Results from Translog production Function

Estimates of the translog production function of equation (7) are presented in Table 2. Column (7.1) presents an OLS specification with no fixed time and province effects, showing an estimated coefficient of highway capital of 0.10, positive and insignificant. Once we control for fixed time effects in column (7.2) the estimated coefficient of highway capital is 0.14, positive and significant. The coefficients of the cross-product terms of labour and highway capital are positive and significant, indicating that they are complements, whereas the coefficients of the cross product terms of private capital with both labour and highway capital are negative and significant, indicating that they are substitutes. When we control for both fixed time and province effects in column (7.3) we see a large, positive and significant coefficient for highway capital with the substitutability and complementary relationships between inputs as in column (7.2).

Table 3 summarizes the output elasticities and associated marginal products[6] of highway capital of an average province. The output elasticities of highway capital, range from 0.08 to 0.36 and the associated marginal products of highway capital range from 0.36 to 1.20. The magnitude of the highway elasticity estimates vary substantially based on error specification of the estimated equations, use of functional forms and estimation technique. *Our first conclusion is that highway capital has a positive and generally significant effect on Canadian provincial goods-producing output for various specifications of the error structure and functional forms.*

5 When we apply the Augmented Dickey-Fuller test to the data, we reject the hypothesis of nonstationarity of variables at the 5% level.

6 The marginal product of highway capital is equal to the output elasticity of highway capital multiplied by the ratio of output to highway capital stock, calculated from both equations (5) and (7) as: $\frac{\partial Y_{it}}{\partial H_{it}} = \frac{\partial \ln Y_{it}}{\partial \ln H_{it}} * \frac{Y}{H}$. It measures the dollar change in goods-producing output resulting from a dollar change in highway capital at the margin.

Table 2
Estimated Parameters
Translog Production Function

Coefficient	(7.1) OLS	(7.2) (OLS) Fixed Time-effect	(7.3) (OLS) Fixed Time & Province effect
α_0	0.07	0.07	-0.11
	(0.50)	(0.62)	(0.13)
αk	0.41*	0.20*	0.19*
	(0.05)	(0.03)	(0.06)
α_l	0.56*	0.78*	0.60*
	(0.06)	(0.07)	(0.09)
α_h	0.10	0.14**	0.36*
	(0.09)	(0.09)	(0.10)
α_{kk}	0.02	0.09*	0.04
	(0.03)	(0.03)	(0.03)
α_{ll}	-0.53*	-0.38*	-0.13
	(0.10)	(0.09)	(0.10)
α_{hh}	-0.70*	-0.48*	-0.10
	(0.18)	(0.17)	(0.19)
α_{kl}	0.06	-0.04	-0.01
	(0.09)	(0.08)	(0.10)
α_{kh}	-.20**	-0.31*	-0.12
	(0.12)	(0.11)	(0.11)
α_{lh}	1.40*	1.20*	0.43**
	(0.24)	(0.23)	(0.27)
R^2	.997	.998	.998
SE	0.06	0.05	0.05

Note: In the translog production function α_h is not the elasticity of output w.r.t highway capital. Elasticity of output is calculated from eq. (7) as: $\frac{\partial \ln Y_{pt}}{\partial \ln H_{pt}}$

Standard Error of the estimates in parentheses
* Significant at 5% level
** Significant at 8% level

Table 3
Summary Results of Elasticity and Marginal Product

Pool Cross–Section & Time–Series Analysis			
Highway elasticity estimates (α_h)		**Marginal product ($\frac{\partial Y_{it}}{\partial H_{it}}$)**	
Cobb–Douglas Production Function			
GLS	0.12	GLS	0.51
Fixed time	0.10	Fixed time	0.43
Fixed time & province	0.14	Fixed time & province	0.60
OLS*	0.17	OLS*	0.69
Fixed time*	0.09	Fixed time*	0.38
Fixed time & province*	0.08	Fixed time & province*	0.36
Translog Production Function			
OLS	0.13	OLS	0.63
Fixed time	0.17	Fixed time	0.87
Fixed province & time	0.36	Fixed province & time	1.20

Note: The output elasticity of highway capital is derived from equation (7) as $\frac{\partial \ln Y_{it}}{\partial \ln H_{it}}$ and marginal product of highway capital is computed as $\frac{\partial Y_{it}}{\partial H_{it}} = \frac{\partial \ln Y_{it}}{\partial \ln H_{it}} \bullet \frac{Y}{H}$

* First difference

Province Specific Results

The results presented above are for the "average province". But is there variation among provinces? Table 4 presents output elasticities of highway capital for each province over four years[7]. Elasticities of output with respect to highway capital are mostly positive and ranges from -0.06 to 0.29 over time[8]. Table 4 also shows that highway capital is contributing less and less to output over time with the exception of British Columbia and Ontario. For most provinces the decline in output elasticity of highway capital occured in the period of the 1960s to early 1970s, corresponding to rapid highway construction. The more modest output elasticities of highway capital in the 1980s and 1990s reflect the relatively mature highway networks in place. The increasing output elasticities for highway capital in Ontario and British Columbia (and their relatively high values compared to

7 Results are presented for an OLS specification with fixed time effects (7.2), because results based on this specification are statistically more significant than the others. Results from other specifications are also available upon request.

8 Negative values of the elasticities for some states are reported in the literature. Helms, L. Jay, (1985) and Moomaw, Mullen and Williams (1995).

other provinces) perhaps reflects the continued strong population and economic growth in these provinces which might be outpacing the development of their respective highway networks.[9] *Our second conclusion is that with very few exceptions, the output elasticities with respect to highway capital for each province and time period demonstrate a positive, but diminishing contribution to provincial goods-producing output.*

Table 4
Output Elasticities of Highway Capital Stocks

Province	Elasticity of Highway Capital			
	1972	1978	1984	1990
Alberta	0.288	0.271	0.049	-0.005
British Columbia	0.058	0.197	0.117	0.188
Manitoba	0.098	0.100	0.132	0.036
New Brunswick	0.195	0.045	-0.008	0.053
Newfoundland	-0.063	0.070	0.090	0.183
Nova Scotia	-0.008	0.055	0.133	0.080
Ontario	0.123	0.163	0.131	0.139
Prince Edward Island	0.023	0.092	0.142	0.087
Quebec	0.189	0.116	0.070	0.040
Saskatchewan	0.236	0.106	-0.052	-0.088

IV. Conclusions

This paper investigates the role of highway capital in Canadian goods production. We estimate province-wide production functions using both Cobb-Douglas and translog functional forms with highway capital, private capital and labour as the three inputs. Several specifications of Cobb-Douglas and Translog production function are estimated. In order to provide a more detailed assessment of the role of highway capital a comparative analysis across province and time are conducted.

Generally, highway capital has a positive contribution on provincial goods producing output. This relationship holds for the various specification of the error structure and functional forms. Highway capital and private capital are found to be substitutes. Highway capital and labour are found to be complements. The size and significance of the estimates vary depending on specification of the equation, type of data used, and on the use of functional forms.

9 We make no attempt to explain the relatively large output elasticity for Newfoundland for 1990. This estimate fell to a more modest value of 0.03 to 0.04 in 1992-1993.

The conclusion that highway capital contributes to private output is obtained within a narrow framework, that being estimation of province-level Cobb-Douglas and translog production functions. It is clear that this approach does not exhaust all possible methods for examining the linkage between highway capital and productivity. For example, this approach does not allow for lags in the impact of highway capital on private output, nor does it allow for network effects, whereby the quality of the connections facilitated by investment in highway infrastructure may be more important than the level of the capital stock.

ACKNOWLEDGEMENTS

I am grateful to David Stambrook for reading an earlier version of this paper and providing helpful comments. I also thank Ghislain Blanchard for his helpful comments and encouragement. The views expressed are those of the author and do not necessarily reflect those of Transport Canada.

Bibliography

Aschauer, D.A., (1989a), "Is Public Expenditure Productive?", Journal of Monetary Economics 23, 177-200.

Aschauer, D.A., (1989b), "Public Investment and Productivity Growth in the group of Seven", Economic Perspectives, 13 (5) (1989b), 17-25.

Deno, K.T., and Ebert, R., (1991), "Public Infrastructure and Regional Economic Development: A simultaneous equation approach", Journal of Urban Economics, 30, 329-343.

Eakin*, D, (1994), "Public sector capital and productivity puzzle", Review of Economics and Statistics , Vol. LXXVI, February, 12-21

Eisner, R., (1991), " Infrastructure and Regional Economic Performance", New England Economic Review, 47-58

Garcia-Mila, T. and McGuire T.J., (1992), "The Contribution of Publicly Provided Inputs to State Economies", Regional Science and Urban Economics, 22, 229-241.

Helms, L.J., (1985), "Economic Growth: A Time Series– Cross Section Approach", Review of Economics and Statistics, 574-582

Holtz-Eakin, D., (1994), "Public sector capital and productivity puzzle", Review of Economics and Statistics , Vol. LXXVI, February, 12-21

Hulten, C.R., and Schwab, R.M., (1991), "Public Capital formation and the growth of regional manufacturing industries", National Tax Journal XLIV, 121-134.

* Eakin should be read as Holtz-Eakin

Hulten, C.R., and Schwab R.M., (1991), "Is There Too Little Public Capital"?, Infrastructure and Economic Growth, "Conference Paper, March.

Hulten, C.R., and Schwab R.M., (1984), "Regional Productivity Growth in U.S. Manufacturing, 1951-78", The American Economic Review, vol. 74, No.1, 152-162.

Kmenta, J., (1986), Elements of Econometrics, Second Edition, Macmillan.

McGuire, T.J., (1992), "Highways and macroeconomic productivity": Phase Two", Final Report. Federal Highway Administration, Washington, D.C.

Morrison, C.J., and Schwartz A.E., (1992), "State Infrastructure and Productive Performance", NBER Working paper No. 3981, 37p.

Moomaw, R., Mullen, J., and Williams, M., (1995), "The Interregional Impact of Infrastructure Capital", Southern Economic Journal, January, 830-848

Mullen J., and Williams, M., (1992), " The Contribution of Highway Infrstructure to States'Economies", International Journal of Transport Economics, Vol. XIX-No.2-June.

Munnell, A.H., (1990a), "Why Has Productivity Growth Decline? Productivity and Public Investment", New England Economic Review, Jan./Feb., 3-22.

Munnell, A.H., (1990b), "How does Public Infrastructure affect Regional Economic Performance", New England Economic Review.Sept./Oct., 11-33.

Tatom, J.A., (1991), "Public Capital and Private Sector Performance", St. Louis Federal Reserve Bank Review, May/June, 3-15.

Wylie. P., (1995), "Infrastructure and Canadian Economic Growth 1946-1991", Canadian Business Economics, Vol. 3, No. 2 Jan.-Mar.

THE ROLE OF TRANSPORT IN DETERMINING THE DEMAND FOR INDUSTRIAL LAND

by Larry F. Loreth
Policy Analyst, City of Winnipeg, Board of Commissioners

This paper examines the role of transport in determining the demand for industrial land. The research was originally carried out for The City of Winnipeg, as a thesis in the Economics Department at the University of Manitoba. An update was completed at the request of Mr. Robert Gabor, Chairman of The City of Winnipeg's long range transportation planning process, in order to provide TRANSPLAN with direction regarding strategic transportation infrastructure required to promote industrial growth in The City of Winnipeg. The author is solely responsible for any opinions expressed in this paper.

The Winnipeg Industrial Land Model was developed in 1988 in order to identify the determinants of industrial location decisions in the City of Winnipeg (Loreth, 1988). Because such determinants may have important policy implications for government at both the municipal and provincial levels, an understanding of what underlies location decisions is essential for policy makers. Analysis of land price determinants combined with the annual absorption and existing supply of vacant industrial land will enable civic policy makers to determine how Winnipeg can effectively meet industry's present and future needs.

An adequate supply of vacant land in appropriate locations is essential to promote industrial growth. However, effective development policy needs to consider factors that affect demand as well as the available supply of industrial land. Industry will not be enticed to develop in locations that are unable to provide the essential elements for sustained industrial growth. A thorough understanding of what these elements are in the Winnipeg marketplace will enable government to determine why industry chooses one specific site relative to another. The model developed within this study analyses price determinants of industrial land and clearly identifies the influence of transportation, location, municipal infrastructure and zoning on the demand for such land in Winnipeg.

Overview

In order to identify factors that determine industrial location decisions in Winnipeg a partial equilibrium function was originally developed, for the study period from 1971 to 1981. This model has been updated to 1995 and revised to reflect a structural change in the economy that occurred as a result of the 1982 recession. The model is a reduced form equation encompassing both demand and supply

considerations regarding the price determinants of vacant industrial land in the City of Winnipeg. As price is a function of both the demand for and the supply of industrial land, it is essential to incorporate both variables within the model as opposed to merely determining the effect of one or the other upon intra-urban industrial location decisions. Determining why industry has chosen to develop at specific locations in Winnipeg will enable the City to capitalize on existing industrial strengths.

The transportation industry has experienced extraordinary change over the past decade and will continue to experience change in the future. Air cargo/courier transportation has become a much more significant factor in Winnipeg's economy and holds great promise for the future. On the other hand, rail has undergone an overwhelming structural change/downsizing and will continue to do so into the twenty-first century. With change comes opportunity. Winnipeg must react to the changing industrial landscape in order to take advantage of the opportunities that exist within the transportation sector of our city. The **Winnipeg Industrial Land Model** provides direction regarding industrial growth opportunities identifying where as well as why the demand for industrial development will occur in the future. The 1988 study identified that the City's industrial development strategy be reviewed to accommodate growth in the north-west quadrant, adjacent to the airport. This confirms that recommendation.

The demand/supply relationship of industrial land in Winnipeg has remained virtually identical in the post '82 recessionary era, relative to what it was throughout the 1970's. That is, where the demand exists, the supply is extremely limited and vice versa. Although the absorption of industrial land dropped from 191 to 33 acres per year in the post '82 recessionary time period (1982-1995), land sales and development still occurred primarily in the north-west. Demand is the driver in a free market economy. Therefore, appropriate supply side policies are required to effectively promote industrial growth in Winnipeg. That is, strategically located land and infrastructure.

The City has responded with an amendment to Plan Winnipeg that establishes an Airport Vicinity Protection Area as well as a secondary plan entitled the "Winnipeg Airport Vicinity Development Plan". These plans are designed to protect the long term 24-hour operation of the airport and to promote compatible economic development within the AVDP zone. A Provincially mandated Airport Area Planning Committee is responsible for producing a north-west side airport industrial land use plan by the spring of 1996. The City of Winnipeg's industrial development strategy must be redesigned to accommodate the changing requirements of the transportation industry. The Winnipeg Industrial Land Model identifies location factors, proximity to transport and strategically located infrastructure as the variables that drive the demand for industrial land in this city. Direction regarding

policy designed to accommodate existing and future industrial requirements becomes evident upon reviewing the model's results. However, the cost of restructuring Winnipeg's industrial landscape is high. The city must now direct limited resources into those areas where it has the greatest likelihood of success. We must focus on priorities.

SUPPLY OF VACANT INDUSTRIAL LAND

Civic policy makers have attempted to provide sufficient land for a wide range of industrial and related uses in suitable locations throughout Winnipeg. However, based upon the changing industrial landscape, the distribution of available vacant industrial land does not adequately satisfy the City's industrial demands.

An inventory of vacant industrial land is an essential component required in developing an industrial development policy for the City of Winnipeg. The location, amount and type of vacant land available for development are supply side elements that the City needs in order to determine whether demand requirements may be adequately met in the present as well as the future.

Analysis

Land in Table 1 includes only industrial zoned land, either serviced, partially serviced or serviceable within two to five years. Regardless of ownership, public or private, servicing is available to industrial land contained within any one of the City's industrial neighbourhoods. Sewer, water and electrical trunk lines exist within immediate proximity to these locations and may be tapped into, within a reasonable time frame, if a serious development is identified. The time element associated with the short term would be considered six months to one and one-half years as long as the land had been subdivided and contained the appropriate zoning.

In December, 1989, the majority or 52% of vacant industrial land identified in Table 1 was located east of the Red River. Of this 738 acres, 74% was situated in the St. Boniface industrial area. The area north of the Assiniboine River and west of the Red River contained 21% of the total 1989 supply, of which only 95 acres or 7% was located in St. James/Assiniboia. The older inner city area, also located in this north-west sector and home of the C.P.R. marshalling years had a mere 6% of the 1989 supply. The balance or 374 acres was located in the south-west quadrant of the City. By April, 1995, the total supply had declined to 1,244 acres, with a similar distribution of what had existed six years earlier.

Possibly the most notable observation relating to Winnipeg's industrial land supply at this time was the fact that St. James/Assiniboia, the location of the International Airport and a substantial industrial base, contained but 73 acres or 6% of Winnipeg's serviced/partially serviced vacant industrial land supply. In 1989, St. James had virtually no designated industrial reserve.

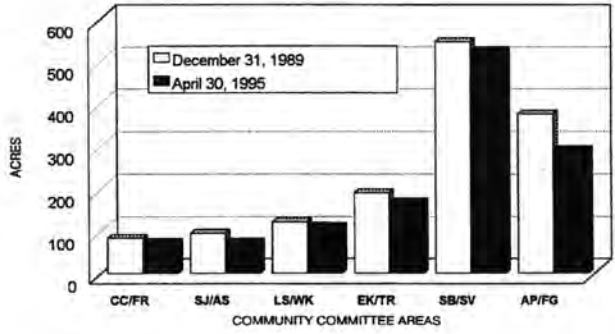
TABLE 1
INVENTORY OF SERVICED/PARTIALLY SERVICED VACANT INDUSTRIAL ZONED LAND CITY OF WINNIPEG*

December 31, 1989						April 30, 1995
83.06	(5.9%)	-	CC/FR	-	(5.9%)	73.59
94.61	(6.7%)	-	SJ/AS	-	(5.9%)	73.03
121.34	(8.6%)	-	LS/WK	-	(9.0%)	111.42
190.75	(13.5%)	-	EK/TR	-	(13.6%)	168.76
546.87	(38.8%)	-	SB/SV	-	(42.3%)	526.32
374.32	(26.5%)	-	AP/FG	-	(23.4%)	290.61
1,410.95	(100%)	-	Winnipeg	-	(100%)	1,243.73

Source: City of Winnipeg, Land and Development Services Department

Figure 1

Inventory of Serviced/Partially Serviced Vacant Industrial Zoned Land - City of Winnipeg



* Excludes all "unserviced reserve" industrial land that has been designated by the Development Plan Review.

Industrial reserve is not identified in Table 1. Such reserve consists of land either zoned or designated for industrial use by Plan Winnipeg. This land is considered long term reserve which ordinarily would not have access to servicing and transportation infrastructure until 20 to 25 years in the future. Although this land has an industrial policy designation within Plan Winnipeg, almost all of it is presently zoned for agricultural use. The vast majority of industrial reserve previously existed in Assiniboine Park/Ft. Garry and St. Boniface/St. Vital. However, the 1992 Plan Winnipeg Review redesignated 300 acres west of the airport to industrial, and on November 29, 1995 an additional 1400 acres was redesignated in order to accommodate the Winnport multi-model transportation initiative (I.D. Group, 1995).

PRICE DETERMINANTS OF VACANT INDUSTRIAL LAND

Winnipeg Industrial Land Model

This analysis was designed in order to determine what factors influence industrial location decisions in Winnipeg. The answer to this question will enable industry to capitalize on future industrial growth initiatives, determining where such development should be pursued as well as the type of industrial growth to be encouraged.

By analysing the determinants of industrial land prices in Winnipeg, the model is able to identify specific industrial land markets and the reasons why industry chose to develop in these locations. Once the essential elements for sustained growth have been determined the uncertainty involved in promoting new development ventures will be minimized thereby encouraging growth to take place.

The model contained within this study is a partial equilibrium function that focuses on the relationship between the price of vacant industrial land in Winnipeg and independent variables that affect the demand for and supply of such land. The demand for sites may be viewed as the price for location, that depends on individual site characteristics such as the year of sale, site area, zoning and density of industrial development. Neighbourhood characteristics such as population density, transportation variables, location factors, commercial influence and the effective tax rate also have a statistically significant impact on the demand for vacant industrial land in Winnipeg. The model was designed to ensure that all observations represented a place on the demand function. Zoning was identified for each observation, to ensure they were bona fide industrial sales. That is, representative of the demand for industrial development. However, each observation represents both demand and supply considerations in that zoning, the City's primary tool for restricting or promoting a specific form of development, has been incorporated into the model as an independent variable representing supply or municipal government interests.

The original model designed for this study analysed all vacant industrial land sales that occurred during the period from 1971 to 1981 inclusive (Loreth, 1988). This time frame was chosen because of the substantial amount of new industrial development that occurred in Winnipeg during the eleven year period. The '70s represented a period of time in which the economy was rapidly expanding, the business community was doing well, jobs were abundant and the average annual rate of absorption for vacant industrial land was 191 acres a year. The 1982 recession brought this period of expansion to a sudden halt. Industrial development in Winnipeg never recovered from the severity of the '82 recession. From 1982 to 1995 the average annual absorption rate of vacant industrial land declined substantially to 33 acres a year. Hence, a twenty-five year time series, which incorporates a period of expansion throughout the '70s as well as the post 1982 recessionary era, has been analysed in this analysis of vacant industrial land sales within the City of Winnipeg.

The model was developed in three basic stages. Originally, the suburban areas of the City were analysed, identifying specific variables upon which the price of vacant industrial land was dependant. Secondly, the older, established Inner City of Winnipeg was analysed and a model identifying the industrial characteristics of this part of Winnipeg was developed. Upon completion of the suburban as well as the Inner City equations, these two components were combined into one model, that identified the price determinants of vacant industrial land within the entire City of Winnipeg. The level of refinement achieved within the final version of this composite model would never have been capable without initially identifying the individual characteristics that exist within the suburban and Inner City markets, and how they independently affected industrial land prices in Winnipeg. The composite model encompasses individual characteristics representative of each of the industrial land markets in the City.

Industrial Land Analysis Revisited: Incorporate post 1982 recessionary era

In updating the model, which now incorporates all bona fide vacant industrial land sales in Winnipeg from 1971 - 1995, the overall model as well as the independent variables have remained stable and reliable. Although the original model was stable and considered statistically sound for purposes of establishing economic policy related to industrial growth, the updated version has incorporated changes to the independent variables which have simplified the regression equation. A proxy for "density of industrial development" has been incorporated into the model as well as an independent variable which isolates the commercial influence of Polo Park. The model was analysed using a group dummy variable for the post '82 recessionary era as well as the annual dummy variables in the final OLS. Although both versions of model were statistically significant, the use of annual dummy variables produced superior results. The changes have improved the model's forecasting reliability. Overall, the basis for policy direction of the updated version of the **Winnipeg**

Industrial Land Model remains unchanged. The north-west quadrant of the city is the foundation to industrial growth in Winnipeg. Proximity to all three modes of transport has firmly established industrial development in this part of the City. Access to transportation facilities with immediate proximity to the airport, the CP and CN rail lines and Route 90 drive the demand for vacant industrial land in this part of Winnipeg.

The Model: Statistical Results

The model has been extensively tested to ensure its statistical validity and in all cases, the coefficient values were unbiased and efficient. There is no systematic relationship that exists within this model between the residuals and any of the independent variables that would negatively affect the reliability and accuracy of the respective coefficient values of the model in general. There is also no correlation between any of the independent variables with each other.

The dependent variable, price, is a positive function of:

1. Time (1972 - 1995 land sales relative to 1971 sales).
2. Area - size of the lot. (Variables log Area and log Area HDUM)
3. Dwelling Units (proxy for population density-log Dwelling Unit).
4. Transportation variable which represents privately owned industrial land adjacent to the Winnipeg International Airport, which has immediate access to all 3 modes of transportation (Air/Rail/Highway). Only 2 neighbourhoods in Winnipeg have equal access to all 3 modes of transportation — St. James Industrial and Omand's Creek Industrial.
5. Commercial influence of Polo Park Shopping Centre.
6. Interactive Dummy Variable: Distance to the city centre from Inner City Wards 2 and 3. The inverse of this variable represents a proxy for density of industrial development (1/log distance to City Centre .W23).

Price is a negative function of:

1. M2·M3 zoning (relative to M1/MP zoning)
2. Effective Tax Rate (log eff. Tax Rate).
3. Locational variables identifying the industrial land markets of W2·3, the northwest quadrant, and east Winnipeg relative to the intercept variable shown as the southwest quadrant (W23, NW·Wpg, East Wpg).
4. Interactive Dummy Variable: M1·SW·Wpg (relative to all other industrial land sales in Winnipeg from 1971 to 1995).

An effective use of interactive dummy variables, has enabled the model to more appropriately reflect reality in the market place. In so doing, this industrial land model presents an accurate and reliable reflection of industrial land determinants in the City of Winnipeg. Within all versions of the model, the coefficient signs remained the same and their values remained very stable.

PRICE DETERMINANTS OF VACANT INDUSTRIAL LAND CITY OF WINNIPEG

Log Price = -3.444 + 0.201 (1972) + 0.225 (1973) + 0.373 (1974)
(1.94) (2.71) (4.28)

+ 0.493 (1975) + 0.584 (1976) + 0.824 (1977) + 0.946 (1978)
(5.25) (6.20) (7.97) (9.07)

+ 0.950 (1979) + 0.934 (1980) + 0.842 (1981) + 1.096 (1983)
(9.63) (8.43) (8.00) (2.92)

+ 1.256 (1984) + 1.309 (1985) + 1.264 (1986) + 1.579 (1987)
(9.23) (9.27) (9.916) (15.47)

+ 1.690 (1988) + 1.697 (1989) + 1.904 (1990) + 1.855 (1991)
(15.73) (15.58) (15.00) (12.86)

+ 1.895 (1992) + 1.641 (1993) + 1.731 (1994) + 1.866 (1995)
(13.64) (11.81) (10.58) (5.717)

+ 0.560 (log Dwelling Unit) + 0.557 (log Area)
(16.53) (39.55)

+ 0.068 (log Area·HDUM) - 0.488 (log Eff.Tax Rate)
(14.09) (-19.39)

- 0.109 (M2·M3) - 0.559 (M1·SW·Wpg) - 0.638 (W23)
(-2.75) (-6.07) (-7.07)

- 0.363 (NW·Wpg) - 0.265 (East·Wpg)
(-4.286) (-4.114)

+ 0.160 (1/log Distance to City Centre.W23) +0.328 (Air/Rail/Hwy)
(-6.888) (3.926)

+ 1.081 (Polo Park/Commercial Influence) + e_i
(4.694)

(Numbers in parentheses indicate the t values of the respective coefficients).

N = 1394 R^2 = 0.792 F = 147.295
Sum of Absolute Errors = 670.92 Standard Error = 0.634
Residual Sum = .43481 E -10 DW = 1.74

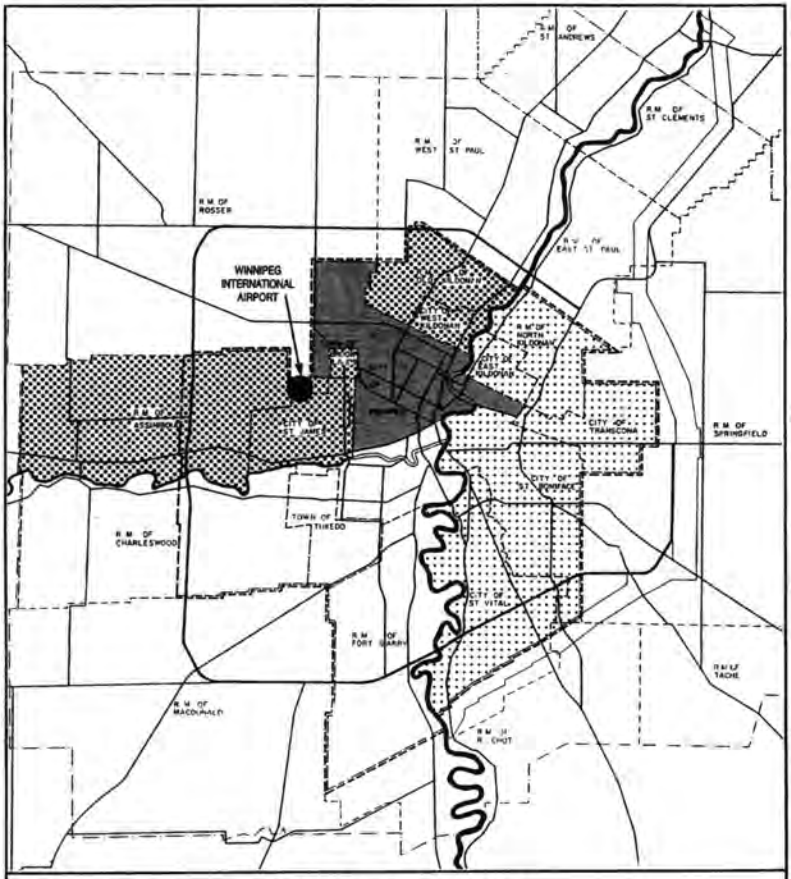


FIGURE 2 **CITY OF WINNIPEG INDUSTRIAL LAND MARKETS**

WINNIPEG INDUSTRIAL LAND ANALYSIS: OBSERVATIONS

North West Quadrant

Although there are numerous variables which influence industrial development, the model contained herein, clearly identifies location and proximity to transport as the prime determinants of industrial growth in Winnipeg. Due to the influence of prominent transportation facilities located in the north-west quadrant, the foundation to Winnipeg's industrial base has evolved in this sector of the City. For example, major trucking markets that exist north and west of the city play a significant role in the demand for industrial land in this part of Winnipeg. The C.P.R. marshalling yards are also situated in this quadrant and provide industry with an effective means to transport cargo to markets across Canada and into the United States. By itself, proximity to the airport is clearly more significant than either trucking and/or rail combined (Loreth, 1988). However, as of the 1995 update, immediate proximity to all three modes of transport produced a variable (air/rail/highway) that had a more significant impact on the dependant variable, price. Such major air, rail and trucking facilities generate spin off growth in the surrounding area, in order to service the needs of the transportation industry in this part of Winnipeg. Consequently, a critical mass of manufacturing and warehousing activities has developed in relation to the transportation industry in the north-west quadrant. This economic base now serves to attract additional industrial growth to this part of Winnipeg.

Growth in St. James-Assiniboia commenced in the 1950's due to a municipal incentive program that was designed to attract industry to the St. James area. Very inexpensive industrial land associated with extremely low property taxes combined with proximity to transport, to attract industrial growth to this part of Winnipeg. Financial incentives combined with exceptional proximity to transport and markets, resulted in a strong demand for industrial land in the north-west quadrant. However, since 1981, the supply of vacant industrial land in St. James has been limited, especially in proximity to the airport. 10.6% of Winnipeg's vacant industrial land sales occurred in St. James-Assiniboia from 1971-1981 and this percentage increased to 11.6% over the next decade. However, the supply of vacant industrial land in this part of Winnipeg declined from 6.6% (185.8 acres) in 1981 to 4.7% (103.5 acres) of the city total in 1990. As of mid-1995, this demand/supply relationship has remained virtually unchanged.

The strong demand relative to the limited supply of industrial land in proximity to the airport has had a positive influence on the value of industrial land in St. James and the surrounding area. Proximity to the airport has been identified in the **Winnipeg Industrial Land Model** as one of the most significant factors in determining the value of vacant industrial land in the City of Winnipeg.

Together St. James and the Inner City contained the vast majority of vacant

industrial land sales in Winnipeg over the last twenty-five years even though they held a limited supply of such land. The commercial influence of Polo Park, transportation infrastructure such as the airport, regional highway facilities like Route 90 and the CPR Marshalling Yards have combined with the strong demand for and limited supply of industrial land in this sector of Winnipeg, to make industrial land extremely valuable in the northwest quadrant. Over the last twenty-five years, 51% of the vacant industrial land sales occurred in St. James/Assiniboia, and Inner City Wards 2 and 3 (N/W Quadrant), although only 8% of the serviced/partially serviced land existed in this area. Whereas St. Boniface/St. Vital had only 17% of sales over the past quarter century it contained 48% of the serviced/partially serviced land in Winnipeg, 37% of land serviced/serviceable within 2 - 5 years, and 31% of the designated reserve vacant industrial land in Winnipeg. Where the demand for industrial land was located, the supply was quite limited and vice versa. The November 1995 designation of 1,400 acres of industrial land west of the airport to accommodate the Winnport multi modal transportation initiative (Winnport, 1995) will redistribute this supply.

St. Boniface/Transcona Industrial Sector

Another important industrial sector is located on the east side of Winnipeg. However, over the past twenty-five years, the prominence of this area has diminished relative to the north-west quadrant. The foundation to the St. Boniface/Transcona industrial area was based on Winnipeg's meat packing and transportation industries. CN Rail had located its Symington Yards and Transcona Shops immediately east of the "St. Boniface Stock Yards". Proximity to transport was of primary significance to the meat packing industry, which had immediate access to both CP and CN Railways, as well as regional trucking routes such as Lagimodiere Boulevard and the TransCanada Highway. When Canada Packers, Swift's and the Shell Oil Refinery closed their Winnipeg operations, development in the St. Boniface Industrial Area slowed down substantially. Over the last twenty-five years, regardless of how the economy was doing, the majority of industrial growth in the city occurred in the north-west quadrant. This was the case, in spite of the fact that available vacant industrial land was very limited in this part of Winnipeg. These circumstances clearly indicate that the demand side of the market place drives industrial growth. Regardless of where the supply of available industrial land may be located, development will not occur unless that supply satisfies industry's requirements.

Focus on Priorities

A policy designed to encourage development and job creation, by focusing on key private/public sector initiatives, is required to effectively promote industrial growth. **The city must now direct limited resources into those areas where it has the greatest likelihood of success.** Major capital expenditures should be considered an "investment" in Winnipeg's future economic well-being.

An application by the West Side Land Owners Association to amend Plan Winnipeg by redesignating some 1,400 acres of land west of the airport within the City of Winnipeg, from a rural to an industrial designation, has received final reading by City Council on November 29, 1995. The South Interlake Planning District has recently given third reading to a Winnpark application to designate 4,036 acres of land in Rosser, north-west of the airport to industrial. The Provincial Land Use Committee of Cabinet has established the "Airport Area Plan Planning Committee (APPC) which is required to complete an industrial land use plan for the area north-west of the airport in the City of Winnipeg and the R.M. of Rosser. This land use plan is to be finalized in the spring of 1996.

POLICY IMPLICATIONS: Land Use Management

Proximity to intersecting modes of transport, particularly the airport, has been identified as a critical element in promoting the demand for industrial land in Winnipeg. The single most important factor in determining the long term economic viability of an airport is based upon compatible land use management. Municipal government must ensure an abundant supply of serviced land in proximity to airports, which is zoned to accommodate airport-related development. Residential development in proximity to flight approach zones invariably generates noise complaints that could effectively limit aircraft movement to daylight hours. As has occurred elsewhere, Winnipeg's economic development opportunities would be capped by such restrictions. This is particularly true for air courier traffic, which relies on night service, to accomodate time-sensitive deliveries (Prentice, Loly, and Morrissey, 1995).

To assure the long term viability of this extremely important asset, Winnipeg's development plan was revised to ensure the maximum degree of compatibility and protection in flight approach zones with existing or proposed developments in close proximity to the airport. Plan Winnipeg's Airport Vicinity Protection Area policies have been combined with an "Airport Vicinity Development Plan", as well as zoning and acoustic insulation by-laws to accomodate compatible land use management in the vicinity of the airport. Without its twenty-four hour operation, Winnipeg International Airport (YWG) would lose the foundation to its economic advantage over competitors.

Proximity to Transport and Strategic Infrastructure Development

The **Winnipeg Industrial Land Model** identifies that access to all three modes of transport, air, rail and truck, in a common industrial neighbourhood, will drive the demand for industrial land in that sector of the City. Consequently, the availability of vacant industrial land **in proximity to intersecting modes of transport** is critical to effectively promote industrial development. If municipalities are unable to provide industry with serviced land at such crossroads economic development will

be limited in scope. The model provides clear direction regarding where industrial development should be promoted in Winnipeg. An overview of the results identifies that the north-west quadrant of Winnipeg is the foundation to industrial development, primarily as a result of immediate proximity to highway, rail and air transportation. However, due to very expensive infrastructure requirements, the supply of serviced vacant industrial land in proximity to the airport is extremely limited. Policy implications relating to how the City may effectively encourage specific types of industry to develop in Winnipeg are based upon establishing municipal infrastructure at strategic locations. Financing is the issue. Based upon limited municipal resources, a joint venture, public/private sector initiative is essential to finance infrastructure and transportation requirements west of the airport. Although the **Winnipeg Industrial Land Model** provides direction to accommodate west side YWG industrial development, the Winnport Multimodal Transportation Plan (I.D. Group, 1995) has provided the initiative to consider expensive infrastructure development at this location. Without the substantial return on investment that the Winnport plan promises to generate, a west side YWG industrial park would be based on user pay and very limited in scope at this time. The Airport Vicinity Landowners Association have developed a plan, known as "Winnpark" (Airport Vicinity Landowners Association, 1995) which seeks flexibility to accommodate airport compatible industrial development on the periphery of the multimodal footprint. The combined interests of the Winnport/Winnpark west side industrial initiative correlate very strongly with the industrial land model results.

To effectively promote higher wage job creation and tax base expansion, municipal economic development policy must co-ordinate land use management and strategic infrastructure development at locations that maximize the opportunities created by intermodal transportation activity . . . particularly in proximity to airports.

POLICY IMPLICATIONS: Economic Development

Property Tax Differentials

Property tax reductions have been used in the past by municipalities in an attempt to attract industry to their city. Although a municipal property tax reduction would reduce industry's cost of production, the inelastic response of the dependent variable (price) in this model, to a change in property taxes, clearly identifies that property tax reductions would have only a marginal effect on price.

The results of the Winnipeg Industrial Land Model identify that property tax reductions designed to influence the location of industrial development inside Winnipeg would be an ineffective economic development policy for the City to pursue. Municipal policy designed to promote higher wage job creation and tax base expansion clearly relates to establishing municipal infrastructure in strategic

locations throughout the city - such as the north-west quadrant in immediate proximity to the Winnipeg International Airport. An investment in strategically placed infrastructure would be the most effective policy for the City of Winnipeg to promote industrial development.

It should be noted that although property tax differentials are usually unsuccessful in relocating industry on an intra-municipal basis, a substantial gap in taxes between the City and Rosser could attract Winnipeg industry to the rural municipality, particularly if services were comparable to those inside the City. Immediate proximity to the airport, comparable transportation, sewer and water facilities to those contained within City limits, lower land prices combined with lower property and business taxes could result in an exodus of industry to Rosser ..... particularly industry presently located in north-west Winnipeg that might be interested in expanding operations. Policy designed to ensure comparable taxes in either jurisdiction is important to the City. Such policy may be accomplished in a number of ways.

Inland Ports and the Global Market Place

Winnipeg evolved as a transportation centre and eventually came to be known as the "Gateway to the West". The City became the strategic location for an inland port based upon two primary factors: location relative to markets and proximity to transport. Access to both CP and CN Rail combined with Winnipeg's central location between the resource based Provinces of Saskatchewan, Alberta and British Columbia to the west and the manufacturing base of Eastern Canada, resulted in substantial growth in the City during the first half of the 20th century. Almost fifty years later, the transportation industry, once again provides Winnipeg with renewed optimism for economic development. Air cargo/courier transportation has expanded the development opportunities that Winnipeg has access to. While just-in-time manufacturing has reduced the demand for warehousing activity, it requires a reliable, efficient, time sensitive movement of cargo to market. Air transport combined with truck and rail, is the critical element necessary to accommodate this need. What rail did for Winnipeg in the 20th century, air transportation can surpass in the 21st century.

Global rather than national markets have become an opportunity for strategic inland ports such as Winnipeg. In the latter part of the 20th century, air transportation has become a significant factor in moving products to market. Less restrictive international trade barriers and in some instances free trade agreements, combined with the cost-effective intermodal shipment of cargo will provide Europe and Asia with access to American markets through strategic Canadian ports of entry. Winnipeg is poised to take advantage of these global markets.

In the future inland ports may become equally as important to trade as ocean ports have been for centuries. Future research might focus on the impact air cargo shipments have had on inland ports by comparing the economic significance of the transportation industry located in cities like Winnipeg relative to those of traditional ocean ports.

Winnipeg is strategically located in proximity to international air cargo movement and has an abundant supply of designated industrial land adjacent to its airport. The political process has recognized this valuable combination and has established land use management tools to protect the long term economic viability of the Winnipeg International Airport. A west side Airport Area Plan is being designed to address inter-jurisdictional issues relating to legal structure, municipal servicing, taxation and trucking route policy, in order to capitalize on this extremely valuable economic resource. Other jurisdictions may be well advised to re-examine their own land use policies in light of the importance of transportation infrastructure and land use management to economic development.

REFERENCES

- Airport Vicinity Landowners Association, "Winnpark Concept Plan", 1995.
- City of Winnipeg, "Airport Vicinity Development Plan", 1994.
- I.D. Group (Manitoba) Inc. "Winnport Multimodal Infrastructure Study, Phase 1", 1995.
- Loreth, Larry F. "Vacant Industrial Land Analysis in The City of Winnipeg: Fiscal Implications and Policy Alternatives", (1988) M.A. Thesis, Department of Economics, University of Manitoba.
- Prentice, Barry E., Chris Loly and Robert Morrissey. "Economic Impact of a Potential Night Restriction at the Winnipeg International Airport" Canadian Transportation Research Forum. Proceedings Issue: 30th Annual Meeting (1995): 35-47

ACKNOWLEDGEMENT

The author wishes to thank Dr. James Dean, Associate Professor of Economics, University of Manitoba, for the guidance and endless patience he provided as my thesis advisor. His advice was invaluable in developing the original version of this econometric analysis. I would also like to express my sincere appreciation to Dr. Barry Prentice, Associate Professor of Agricultural Economics and Professional Associate of the University of Manitoba's Transport Institute, for the encouragement and helpful suggestions he provided me with in updating the model.

Highway Costs and Revenues in Québec: Evidence and Analysis

Michel Boucher

1. Introduction

For the last twenty-five years, both Canada and the United States have seen their productivity growth slowed dramatically. However, it is only since the late 80's that public capital stock is mentioned as a potential factor in productivity slowdown. An alleged infrastructure shortage is now part of the agenda that the political parties of various developed countries, including Canada, have put on their agenda when seeking election or reelection. Very little academic research has focused attention on the way to identify a shortage of infrastructure investment and on the way to determine whether there was a shortage.

The aim and scope of this paper are strictly limited to answering two simple questions, by using a subset of the tangible capital stock owned by the public sector. The first is the following: does the "road industry" run a surplus or a deficit? The second question is expressed in a like manner: is the state of real net capital stock on highways and streets optimal from an intertemporal economic efficiency? The statistical computations and the economic analysis are restricted to the Province of Québec for the period 1971-1993, original data being easily available for the Ministry of Transportation and municipalities.

Section 2 assesses the nature of the expenditures and costs undertaken by the Québec Ministry of Transportation and municipalities to provide and maintain highways and streets to different classes of users. The sources of the overall revenues, collected by both types public organisations and which can be imputed as user fees are also examined. A brief analysis of the results follows. Section 3 quickly explains how the real gross and net capital stock of highways and streets are estimated for both levels of government. Various ratios are then used to appraise the potential existence of shortage in the "road industry". Section 4 focuses on the possibility of imposing user fees on highway infrastructure and its usage. Section 5 offers some concluding remarks, keeping in mind the actual context of spending cuts by the federal and provincial governments and the necessity of sustaining a steady-state rate of growth of the economy for the coming years.

2. Québec Expenditures and Revenues

The methodology adopted here to define, choose and compute revenues and expenditures and costs on highways and streets is in keeping with Prest's study[1] on highways and roads in the United Kingdom. His empirical approach has been applied by various Canadian researchers in the 70s, leading to an unproductive debate on what should be included in the revenue side[2]. As consistency is very important in this exercise, the procedure used consists of matching a specific cost item to all the revenues associated to the latter. For instance, if fines levied for various infractions commited by drivers and vehicles owners are included, appropriate police costs are also included.

2.1 Revenues

The general principle allowing the inclusion of different revenues is based on the tax incidence theory that analyzes the effects of taxes on the relative prices of goods and factors. A general consumption tax, such as a sales tax or a value added tax, that is universally levied over a period on all goods and services in the economy, is therefore not specific to some particular goods such as fuel, vehicles and auto parts, for instance. The revenues collected on these particular items shall not be part of the overall imputed revenues. As a matter of fact, the existing sales taxes in Canada do not change the relative price of the "road industry". However, selectives taxes, duties and specific fees do affect the price of the road mode in relation to other modes.

The main sources that can be assessed as "user fees" for driving a vehicle on Québec highways and streets network are the selective fuel tax, various fees imposed on vehicle owners and drivers such as vehicle registration fees, drivers' and chauffeurs' licences, for-hire motor carrier operating licence fees, fines for infractions to the Motor Vehicle Act (Code de la sécurité routière) and the Criminal Code (Code criminel), and highway tolls. Provincial revenues come from the Québec Public Accounts and municipal revenues, fines and a percentage of the property tax, from an annual publication, Municipal Finances (Finances des municipalités), a catalogue produced by the Ministry of Municipal Affairs.

Some additional comments may serve explain our imputation procedure for municipalities. As such, municipalities do not collect or impose a user fee on vehicle owners when driving on their respective infrastructure facilities. A municipality is thus considered as an economic club[3] whose financing is based on an annual lump sum tax paid by local citizens, whether they own a vehicle or not. An average of 12 percent per year, based on the relative importance of street investments in total capital outlays for the period, is

taken as a proxy for the annual lump sum fee. As a matter of fact, home and buildings owners finance it directly when local infrastructures are incorporated in the price of land or indirectly when paying an additional sectoral tax for them. Each of the respective tax components, either provincial or local, is then computed in 1986 constant dollars, by using the Canadian consumer price index.

Tables 1 and 2 present revenues received by provincial and local authorities from roads users for the 1971-1993 period. It is worth noticing that the provincial revenues collected as user fees are almost at the same level in 1993 as in 1971, whereas municipal revenues roughly doubled over the same period.

Table 1

Québec Ministry of Transportation Revenues
(in constant million $)

Year	Fuel Tax	Fees	Tolls	Fines	Total
1971	1001.3	353.6	50.5	19.7	1425.1
1972	1024.3	357.5	50.6	20.4	1452.7
1973	1062.1	394.4	55.7	23.4	1536.7
1974	985.0	290.5	56.6	24.6	1356.6
1975	954.1	437.3	56.6	28.1	1476.0
1976	902.1	385.1	60.8	29.7	1377.7
1977	879.1	370.6	60.4	34.1	1344.2
1978	797.7	386.8	59.4	36.5	1280.3
1979	729.7	366.1	55.2	31.1	1182.1
1980	733.7	326.8	55.2	31.8	1147.2
1981	1095.2	368.3	50.2	31.7	1545.4
1982	1427.6	340.7	66.2	39.3	1873.8
1983	1364.4	292.9	74.0	46.6	1777.9
1984	1115.2	295.3	65.3	34.7	1510.5
1985	1129.3	295.2	22.8	36.7	1484.0
1986	1144.7	313.5	-	45.6	1503.8
1987	1134.0	353.8	-	49.8	1571.8
1988	1127.3	325.4	-	58.3	1511.0
1989	1102.5	333.9	-	55.8	1492.2
1990	962.4	383.9	-	45.2	1391.6
1991	885.3	405.5	-	57.8	1348.7
1992	972.8	436.1	-	56.8	1466.2
1993	964.0	421.8	-	53.1	1442.7

Source: Québec Public Accounts, various years.

Table 2

Municipal Revenues (in constant million $)			
Year	Fines	Property Tax	Total
1971	43.6	285.0	328.6
1972	47.9	274.6	322.5
1973	45.1	273.5	318.6
1974	40.6	297.5	338.3
1975	42.1	251.8	293.3
1976	56.2	313.1	373.3
1977	61.2	323.2	384.4
1978	64.9	265.1	330.0
1979	54.8	243.1	297.9
1980	72.3	289.7	362.1
1981	68.6	277.0	345.6
1982	63.7	262.6	326.3
1983	59.2	312.8	338.0
1984	58.9	314.0	372.8
1985	61.6	486.1	547.7
1986	56.0	349.3	405.3
1987	75.1	384.2	459.3
1988	90.3	444.7	535.0
1989	63.2	449.7	512.9
1990	85.0	439.4	524.4
1991	83.4	393.2	476.6
1992	86.5	484.2	570.7
1993	90.6	521.0	611.6

Source: Municipal Finances catalogue, Ministry of Municipal Affairs, various years.
Note: The percentage of revenues from the property tax is equal to the relative importance of highway investments in the overall investment budget of municipalities.

2.2 Expenditures

The main components of costs and expenditures incurred by the Québec Ministry of Transportation and different municipalities in providing and maintaining their respective network are classified as either current or capital. In the first category, only police traffic expenditures are imputed and the proportion of the Québec provincial police resources that go into road surveillance is estimated at 32.5 by Québec Treasury Board analysts. For Québec municipalities, the estimated percentage, which comes from Haritos'

study[4], isset at 45. These two types of expenditures are then computed in 1986 constant dollars by the Canadian consumer price index. Miscellaneous administrative expenses, like traffic court costs related to highway offenses and expenditures incurred by the Ministry of Transportation and municipal departments of public works for managing the road industry in general, are voluntarily neglected. Too many arbitrary allocation mesures are involved for a dubious end result. Therefore, our expenditures clearly underestimate the real picture, faute de mieux!

The overall capital cost component includes the following elements: depreciation, opportunity cost of capital and maintenance expenditures on the existing infrastructure system. Provincial maintenance expenditures come directly from an unpublished official data bank collected by the Ministry of Transportation for the Statistics Canada Capital and Repair Expenditures Survey. Municipal maintenance expenditures are directly taken from the annual publication of the Ministry of Municipal Affairs, Municipal Finances. Both maintenance expenditures are computed in 1986 constant dollars by the engineering construction price index. The other two elements are obtained, after various computations, from a Statistics Canada unpublished data bank that presents, for each province and for many classes of government assets, the same content as the catalogue Fixed capital flows and stocks, 1961-1994, which describes, in an aggregate manner, the overall Canadian government assets. So, the geometric depreciation cost comes directly from the computations done by the author and the cost of capital is based on an opportunity cost of 6 percent on the end-year net capital stock. Tables 3 and 4 show expenditures and costs incurred by both provincial and local governments to preserve and maintain their respective road network.

The exclusion of the value of land from this empirical exercise is founded on a very well known principle of cost-benefit analysis[5]: road improvements change the relative value of different spatial locations. Therefore, the value of adjacent property and the pattern of land use are positively affected when a public road is built. On the other hand, the same public investment has a negative impact, because competitive existing locations are depressed due to this new availability. As we are not able to isolate those aspects of change that reflect net benefits coming from public road improvements, we choose not to take into account the value of land.

Table 3

Provincial Expenditures and Costs (in constant million $)					
Year	Deprec.	Capital	Maint.	Police	Total
1971	612.2	427.8	394.4	56.4	1490.8
1972	662.2	459.1	393.4	67.7	1582.4
1973	705.1	480.9	390.0	66.8	1642.8
1974	734.5	489.4	385.1	75.4	1684.4
1975	764.4	511.8	430.9	79.6	1786.7
1976	789.6	514.3	438.0	88.6	1830.5
1977	795.6	509.4	472.4	81.5	1858.9
1978	795.7	504.5	463.7	81.6	1845.5
1979	794.0	497.5	506.8	93.0	1891.3
1980	788.0	485.3	459.5	97.3	1830.1
1981	773.7	467.9	418.0	105.6	1765.2
1982	752.1	446.7	453.6	100.6	1753.0
1983	729.0	428.4	454.0	100.8	1712.2
1984	609.3	355.3	441.1	109.8	1515.5
1985	685.6	392.7	443.1	112.3	1633.7
1986	538.0	305.2	429.0	110.8	1383.0
1987	648.6	361.8	498.5	126.7	1635.6
1988	611.7	338.3	495.0	134.2	1600.2
1989	519.7	285.8	563.8	138.6	1507.9
1990	525.0	286.6	489.2	150.1	1450.9
1991	447.4	244.7	532.0	132.0	1356.1
1992	508.4	276.2	583.9	131.9	1507.4
1993	548.3	294.2	551.1	102.8	1495.4

Sources: Unpublished data from the Ministry of Transportation and computations done by the author.

Table 4

Municipal Expenditures and Costs
(in constant million $)

Year	Deprec.	Cap	Maint.	Police	Total
1971	193.4	133.8	145.8	156.3	629.3
1972	170.0	117.3	148.4	161.4	597.1
1973	177.6	122.0	93.3	173.3	566.2
1974	201.3	136.2	149.8	63.8	551.1
1975	170.8	114.7	138.5	76.6	500.6
1976	192.9	130.6	144.0	90.2	557.7
1977	194.0	131.9	121.7	89.7	537.3
1978	234.0	153.4	125.3	92.9	605.6
1979	230.0	144.7	126.1	85.0	585.8
1980	180.7	117.4	134.0	94.4	526.5
1981	214.6	136.2	132.8	99.4	583.0
1982	197.1	124.3	131.3	94.4	547.1
1983	241.6	150.7	154.5	94.5	641.3
1984	279.5	172.7	143.9	188.2	784.2
1985	377.4	233.1	188.2	238.9	1037.6
1986	230.3	141.9	188.7	246.8	807.7
1987	259.5	159.0	204.3	273.8	896.6
1988	283.3	173.6	221.0	252.8	930.7
1989	281.5	171.9	224.7	268.2	946.3
1990	213.5	132.6	234.5	279.2	759.8
1991	300.8	179.4	245.9	274.7	1000.8
1992	442.3	260.8	239.9	302.1	1245.1
1993	423.2	247.8	304.3	316.7	1299.0

Sources: Municipal Finances catalogue. Ministry of Municipal Affairs and computations done by the author.

2.3 General Comments

A comparison of the data on provincial revenues and expenditures reveals that the highway network users have never born, for the 1971-1981 period, the full costs incurred by the Ministry of Transportation in providing and oprating the present highway system. As a matter of fact, the expenditures and costs incurred are greater than revenues, imputed as user fees, by a large amount. By and large, the vehicles owners and highway users have received subsidies from Québec taxpayers for all these years[6]. However, since 1982, the gap between costs and revenues is now far less important than before, so that

there is a tendency for highway users to pay more and more for the services received.

On the other hand, a relatively similar scenario is observed on the municipal side, where local taxpayers still give large subsidies to vehicles owners, the discrepancy between municipal revenues and expenditures persisting over the period, at a high level. It must also be noted that the suburbs and their respective street network have expanded considerably during the 1971-1993 period. Finally, it is possible that the considered lump sum fee is too low, which implies that local citizens, who own a vehicle or not, may be willing to pay more for benefits received from the existing city streets.

Table 5, which lists the aggregated road costs and revenues, expressed in 1986 prices, and the ratios of costs over revenues for the 1971-1993 period, helps us to answer our first question on the performance of this industry: yes, the Québec "road industry" operates with a deficit and the latter is paid by taxpayers who bear an additional burden to finance road users. However, this inefficient situation differs from one level of government to another: the provincial costs/ revenues ratio (Ratio 2) has steadly decreased over time; that is not the case for the municipal costs/ revenues ratio (Ratio 3) which is still at the same level as in 1971.

Table 5

Global Revenues and Expenditures and Costs/Revenues Ratios (in constant million $)					
Year	Revenues	Costs	Ratio 1	Ratio 2	Ratio 3
1971	1753.7	2120.1	1.21	1.05	1.92
1972	1755.2	2179.5	1.24	1.09	1.85
1973	1855.3	2209.0	1.19	1.07	1.78
1974	1694.9	2235.5	1.32	1.24	1.63
1975	1769.3	2287.3	1.29	1.21	1.71
1976	1751.0	2388.2	1.36	1.33	1.49
1977	1728.6	2396.2	1.39	1.38	1.40
1978	1610.3	2451.1	1.52	1.44	1.84
1979	1480.0	2477.1	1.67	1.60	1.07
1980	1509.3	2356.6	1.56	1.60	1.45
1981	1891.0	2348.2	1.24	1.14	1.69
1982	2200.0	2300.1	1.04	0.94	1.68
1983	1811.7	2353.5	1.30	0.96	1.90
1984	1883.3	2299.7	1.22	1.00	2.10
1985	2031.7	2671.3	1.31	1.10	1.89
1986	1909.1	2190.7	1.15	0.92	1.99
1987	2031.1	2532.2	1.25	1.04	1.95
1988	2046.0	2530.9	1.24	1.06	1.74
1989	2005.1	2454.2	1.22	1.01	1.84
1990	1916.0	2210.7	1.15	1.04	1.45
1991	1825.3	2356.9	1.29	1.01	2.10
1992	2036.9	2752.5	1.35	1.03	2.18
1993	2054.3	2794.4	1.36	1.04	2.12

Note: Ratio 1: overall costs on overall revenues
Ratio 2: provincial costs on provincial revenues
Ratio 3: municipal costs on municipal revenues

3. Considerations on The Net Capital Stock

Previous Canadian studies on the same subject had to estimate with accuracy the net capital stock, compute depreciation on the gross capital stock and find an opportunity cost of capital to apply to the net capital stock. To do so, two elements are generally needed, the determination of the service life of highway and street assets and consequently how far back to go in cumulating figures of gross capital stock. We can avoid these time-consuming computations by using a preliminary disaggregated data bank on the fixed

capital flows and stocks, made available to researchers by Statistics Canada. The level of disaggregation is listed by category of assets for each province and for all its municipalities. A category called "transportation engineering construction" has, among its components, highways and roads. Because we know the annual flow of investments on the provincial and the municipal networks in constant dollars, we are able to estimate their respective real gross and net capital stock, in constant dollars[7]. We use the geometric depreciation form that fits the deterioration of flexible pavements over time in Canada[8]. As a matter of fact, their life span is around 40 to 50 years, if maintenance work and resurfacing over a given life cycle is optimal. A 6 percent opportunity cost of capital is then applied on each year-end net capital stock. These are the foundations of these relevant elements contained in Tables 3 and 4.

FIGURE 1

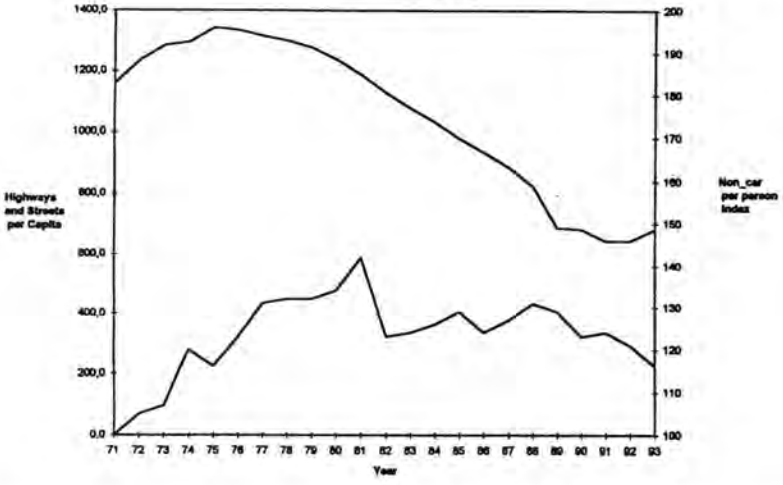


Figure 1 shows two per capita measures,one being the evolution of the net capital stock for the provincial and local governments, the second, the rate of growth of vehicles, excluding the automobile. The left-hand axis refers to the highways and streets per capita and the right-hand axis to a vehicle per capita index[9]. The net capital stock per capita rose from 1971 to 1978, then decreased sharply during the 80's and rose again since1990. The main reasons are, first of all, the near-end of building the provincial highway network; secondly, the depreciation of the previously built highways and finally, the increase in fuel tax by the government in 1981. The latter has apparently

leveled off and then slightly cut into the real number of non-automobile types of vehicles on the roads, as shown on the right-hand axis of Figure1, although both the auto park and the number of kilometres driven per capita have still increased. It is certainly not obvious from the Figure that there exists a highway shortage in Québec. More investigation is therefore required in order to give a definitive answer to our second question.

To this end, we focus on one of the four means used by Gramlich[10] in assessing the alleged shortage of infrastructure investment in the United States. Table 6 gives estimates of the percentage of pavement kilometres needing improvement and the percentage of peak hour kilometres under congested conditions for 1990 and 1994. In each case, the physical needs measure, the percentage of highway kilometres in poor condition, has declined. However, their respective levels in all categories are higher, by a factor of two, than those published by the Federal Highway Administration in 1993. On the other hand, the measures of highway congestion did rise in the four-year period from 14 percent to 20 percent, mainly on urban highways. But, by American standards, congestion observed in Québec is low and not all comparable. For instance, the level of congestion went up from 42 percent in 1987 to 47.2 percent in 1991 in the urban interstate category. In short, this needs assessment does not make a compelling case for there being a real shortage in highway and street networks. Sure, the situation described for the provincial government is border line.Therefore, our answer to the second question is the following: it **may be** possible that the intertemporal economic efficiency is not optimal because of underinvestments in highway infrastructure. This is a scotch verdict, for a lack of proof.

Table 6

Pavement Ratings and Peak Hour Congestion (Percentage of pavements kilometres or peak hour kilometres)		
System and Year	Needing Improvement*	Congested**
Highways		
1990	37.0	14.0
1994	22.0	20.0
National Roads		
1990	34.0	1.0
1994	24.0	2.0
Regional Roads		
1990	41.0	0
1994	26.0	0
Urban Collectors		
1990	30.0	1.0
1994	27.0	20.0
Total		
1990	33.0	6.9
1994	24.0	11.8

Source: Ministry of Transportation. 1994

* Percent of pavement kilometres rated in poor condition

** Percent of of peak hour kilometres where the peak vehicle-capacity ratio exceeds a given threshold

4. Marginal-Cost User Charges

The best way to achieve an economic efficiency in the "road industry" is to introduce user fees that will take into consideration the cost incurred by every class of road users. Because there exist important economies of scale in this particular industry, the basic component must be a variant of two-part tariffs. The latter are pricing schemes that involve a fixed fee which must be paid to get access to the highway network and then a variable fee based on usage of the network. The fixed fee has to be related to the road-wear costs caused by certain types of vehicles, mainly trucks and buses. For instance, vehicle registration fees of those configurations must therefore be determined by their weight per axle per kilometre, also called "equivalent standard axle loads" per kilometre or ESAL-kilometre. A by-product of this pricing policy is to reduce the heaviest axle weights that cause the most structural damages. For cars and light trucks, the fixed fee also has to be linked to the infrastructure costs

because the class of heavy vehicles by itself, being limited in number, cannot cover the overall initial investments and maintenance costs over a given road life cycle. By the way, both classes must also pay for the effects of weathering on pavement deterioration[11].

The variable fee must reflect the needs of each class of users when driving on the highway network. The criterion used to determine it must be founded on Ramsay's rule, the inverse of the demand price elasticity. In that context, there are in effect two different class of users and the division can easily be enforced. Each class pays a selective fuel tax that depends on its price elasticity. If the class of heavy vehicles has more substitutes than the category of car drivers because shippers can move their products by other modes, railway, ships and barges, it is thus charged a lower price. It is expected that car drivers must assume a higher price than the other class. That is actually the case in Québec, because of their low price elasticity. Mass transit and ride-sharing are in no way good substitutes.

Congestion measured by "passenger car equivalents" per kilometre or PCE-kilometre is mostly caused by cars because each of them creates an extra delay when going into the traffic stream. A peak-load pricing that takes into account estimates of vehicle operating costs and the values that people put on their time that causes an additional car to all other users will make peak-hour automobile driving less attractive on congested highways. The urban highway network is thus restored as a functioning component of the system of urban production.

A few comments must be made on the production side of the "road industry". All the components of the highway and street network have to be considered as valid assets whose usage by various classes of vehicles is determined by actual and future conditions. In short, the portfolio theory must be applied to its management. So the public manager objective should be to minimize total life-cycle cost of the network[12]. More specifically, it meansthat, at the micro level, the Ministry of Transportation has a complete inventory of its assets and it must manage its network with efficiency; secondly, it should possess relatively good estimates of the rate of growth of the demand on its main different components. This knowledge will allow public managers to act where the differential between the discounted marginal benefit and the discounted marginal cost on a given segment of the network is the largest. This optimal strategy represents the unique solution to solve the situation actually faced by the Ministry of Transportation. Adopting a different solution to please politicians, namely intervening where political benefits are equal, at the margin, to the marginal cost of public funds, only leads to an accelerated

deterioration of the network. The actual state of the infrastructure system reflects this pork-barrel philosophy.

5. Concluding Remarks

K. Small once wrote that economists' dreams can become politicians' nightmares[13]. In this particular case, the "the nightmare" consists of an unavoidably unpopular move, charging people for what has been free or for less than the opportunity cost of used resources. Our proposal for implementing charges associated both with scarce capacity and scarce durability is a natural economic response in answer to our two fundamental questions. The state of Québec public finances offers a golden opportunity to put in place a policy that shifts from reliance on fuel taxes and weight-graduated license fees to direct kilometreage charges steeply graduated with respect to axle loads. However, efficient pricing to regulate demand for highway services and efficient investment to minimize the total public and private cost of providing them should not be a way to increase taxes. Its implementation should necessarily be associated with a tax-reduction package, either on the provincial sales tax or on the personal income tax. Other short term political solutions, such as regulation to decrease the flow of traffic on some parts of the network, for instance, will postpone the adjustment process. As delayed intervention costs increase at an exponential rate, the financial burden will be higher for the taxpayers in the future. The time is now or never to break the loop!

Notes and References

Funding for the research upon which this paper is based was provided by the Québec Ministry of Transportation. This paper reflects the views of the author and not necessarily those of the Ministry of Transportation.

1. A.R. Prest, "Some Aspects of Road Finance in the U.K.", **The Manchester School of Economics and Social Studies**, vol. 31, Septembre 1963, pp. 223-241.

2. M.Q. Dalvi, "Highway Costs and Expenditures in Canada", Canadian Journal of Economics, vol. 2, November 1969, pp. 509-525; Z. Haritos, **Rational Road Pricing in Canada**, Canadian Tranport Commission, Ottawa, 1973 and "Transport Costs and Revenues in Canada", **Journal of Transport Economics and Policy**, vol. 9, 1975, pp. 16-33 and J.-L. Migué, G. Bélanger et M. Boucher, **Le prix du transport au Québec**, La documentation québécoise, Québec 1978, pp.74-80.

3. J.M. Buchanan," An Economic Theory of Club", vol. 32, **Economica**, February 1965, pp.1-14.

4. Z. Haritos, **Rational Road Pricing in Canada**, Canadian Transport Commission, Ottawa, 1973.

5. A.R. Prest and R. Turvey, "Cost-Benefit Analysis: A Survey", **The Economic Journal**, vol. 75, December 1965, pp. 683-735.

6. J.-L. Migué, G. Bélanger and M. Boucher had already observed this fact for the 1970-1977 period. **Le prix du transport au Québec**, op. cit., pp. 74-80.

7. For more information on the various computations done, see, M. Boucher, "Étude des revenus fiscaux prélevés et des dépenses engagées par le gouvernement du Québec au chapitre du réseau autoroutier", unpublished revised manuscript, January, 1995.

8. F.P. Nix, M. Boucher and B. Hutchinson, **Roads Costs**, Report of the Royal Commission On National Passenger Transportation, vol. 4, Ottawa, 1992, pp. 937-1059.

9. Vehicles are defined as commercial vehicles, buses and school buses,trucks, tractors and other non conventional truck types.These data

come from the Annual Reports of the Québec Automobile Insurance Board (Société de l'assurance automobile du Québec). Some adjustments had to be done because some changes in categories occurred over the period.

10. E.M. Gramlich, " Infrastructure Investment: A Review Essay", Journal of Economic Literature, September 1994, vol. 32, pp.1176-1196.

11. For a technical discussion of some existing models of pavement deterioration and their respective implications on financing, see, F.P. Nix, M. Boucher and B. Hutchinson, **Roads Costs**, Report of the Royal Commission On National Passenger Transportation, vol. 4,Ottawa, 1992, pp. 953-961.

12. K.A. Small, C.Winston, C.A. Evans, **Road Work**, A new highway pricing and investment policy, The Brookings Institution Washington, D.C. 1989.

13. K.A. Small, "A New Approach to the Gordian Knot", **The Brookings Review**, vol. 11, Spring, 1993, pp.113-116.

Analyse comparative des ports de Montréal et de Baltimore

Yannick Unvoas
Assistant de recherche
Université du Québec à Rimouski
Rimouski, G5L 3A1

Brian Slack
Professeur
Université Concordia
Montréal, H1G 1M8

Introduction

Sur le marché du conteneur de la Côte Est nord-américaine, les ports de Montréal et de Baltimore ont longtemps été considérés comme des ports concurrents. En effet, en plus d'avoir été très présents sur l'important marché du Midwest américain au cours des années 1970, ces deux ports présentent la particularité d'être éloignés des routes commerciales maritimes traditionnelles : Montréal est situé à 1 600 kilomètres de l'Atlantique et le port de Baltimore est localisé à plus de 10 heures de navigation de la haute mer. Cependant, ces ports présentent également quelques différences marquées. Les espaces du port de Montréal sont confinés sur une bande étroite de 25 kilomètres de long alors que les activités portuaires de Baltimore s'étendent sur quelques 70 kilomètres de côte. De plus, au niveau administratif, le port de Montréal a un statut autonome au sein de Ports Canada alors que le port de Baltimore est placé sous la tutelle de l'État du Maryland.

Au début des années 1980, encouragées par la croissance du trafic conteneurisé, les autorités de ces deux ports commandèrent des études en vue de se doter de grands terminaux à conteneurs. Quinze années plus tard, le port de Montréal ne dispose que de 70 hectares de terminaux à conteneurs malgré un trafic toujours croissant. Par contre, au port de Baltimore, le trafic conteneurisé est en déclin malgré la disponibilité de 240 hectares de terminaux.

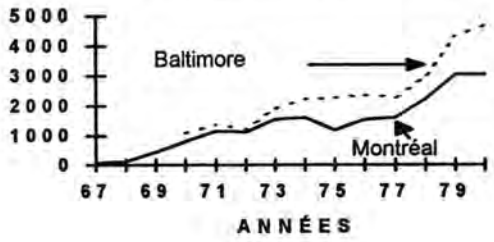
Cet article analyse alors la rapidité à laquelle le port de Baltimore a étendu ses espaces à conteneurs tandis qu'aucun nouveau terminal n'a été construit au port de Montréal depuis 1980. Cette étude comparative illustre également le fait que les infrastructures ne font pas le trafic. Pour ce faire, l'analyse du trafic conteneurisé au cours des années 1970 dans les deux ports permet dans un premier temps de mieux évaluer la nécessité d'y aménager des espaces à conteneurs. Ensuite, une étude comparée des plans d'aménagement proposés, du mode de financement de ces deux ports et de l'implication des autorités politiques dans la prise de décision permet de comprendre l'évolution de l'aménagement portuaire. Enfin, nous comparons la disponibilité des espaces et l'évolution du trafic conteneurisé depuis 1980.

Analyse du trafic conteneurisé des ports de Montréal et de Baltimore

La croissance du trafic conteneurisé dans les ports de Montréal et de Baltimore a été importante au cours des années 1970 (Figure 1). Tant et si bien qu'en 1980, ces deux ports luttaient pour la seconde place de ports à conteneurs de la Côte Est nord-américaine. La première explication de ce succès est leur localisation géographique. Éloignés de la haute mer, ces ports sont aussi plus proches des marchés terrestres (Carte 1) : Tandis que Baltimore est plus proche du Midwest que tout autre port de la Côte Est des États-Unis, la distance entre Chicago et l'Europe via Montréal est 500 kilomètres plus courte que via Boston ou New York (Brunet, p 88). De nombreuses compagnies se sont alors installées dans l'un des deux ports pour y offrir un service conteneurisé : Alors qu'au port de Montréal, l'arrivée de la compagnie CP Ships en provenance de Québec en 1977 a apporté un trafic additionnel annuel de l'ordre de 700 000 tonnes (Charlier, p 1598), le nombre de compagnies offrant un service conteneurisé au départ de Baltimore est passé de 8 en 1972 à 77 en 1982. Le Midwest est alors devenu le principal générateur de trafic de marchandises générales du port de Baltimore.

Le comportement des compagnies qui le desservait a aussi servi le port de Montréal. Les compagnies Cast et Canadien Pacifique offraient un service "porte-à-porte", type de service que les transporteurs états-uniens ne pouvaient concurrencer, la loi de ce pays interdisant leur intégration verticale. De plus, et à l'inverse des compagnies américaines, les compagnies canadiennes n'étaient pas tenues de divulguer leurs tarifs pour les services offerts. Connaissant les tarifs chargés pour le transport de conteneurs par les compagnies états-uniennes, elles ajustaient leurs prix en conséquence et attiraient du trafic états-unien. Quasi-inexistant en 1970, ce dernier représentait 46 % du trafic conteneurisé du port de Montréal en 1980 (Dagenais et Martin, p 16).

Figure 1
Évolution du trafic conteneurisé aux ports de Montréal et Baltimore
(1967 - 1980 ; En milliers de tonnes)



Carte 1
Localisation des ports de Montréal et de Baltimore



Évolution de l'aménagement des espaces à conteneurs

Pour accueillir le trafic croissant, les autorités de ces deux ports ont aménagé des espaces à conteneurs au cours des années 1970. Aussi, en 1980, le port de Montréal comptait 6 terminaux, tous de petite taille, pour une superficie totale de 40 hectares. La même année, à Baltimore, les conteneurs étaient manutentionnés dans 9 terminaux totalisant une superficie de 120 hectares. Cependant, plusieurs terminaux n'étaient pas adaptés à un tel trafic et dans le plus important de ces terminaux, le terminal Dundalk, d'autres marchandises étaient également manutentionnées (automobile, bois, vrac).

Aussi, à la fin des années 1970, le manque de grandes infrastructures destinées uniquement à ce trafic conjugué à la croissance soutenue du trafic conteneurisé et à la lutte pour la seconde place de ports à conteneurs sur la Côte Est nord-américaine ont amené les autorités portuaires de Montréal et de Baltimore à étudier la possibilité d'aménager de grands terminaux à conteneurs. L'étude réalisée en ce sens pour le port de Montréal concluait à une hausse moyenne du trafic conteneurisé de 5 % annuellement pour atteindre 13,9 M.T. en 2010 (Les consultants Dessau, p 36). Les prévisions de trafic conteneurisé au port de Baltimore étaient de 7,2 M.T. en 1990 et de 10,2 M.T. en l'an 2000 (Frankel). Surtout, dans les deux ports, les études indiquaient que les surfaces disponibles deviendraient insuffisantes et que l'aménagement de nouveaux espaces était par conséquent nécessaire. Ceci a conduit les autorités portuaires à rechercher des espaces disponibles pour un aménagement portuaire.

Plans d'aménagement proposés par les ports

À Montréal, plusieurs sites possibles d'expansion ont tour à tour été explorés :

- L'île Ste-Thérèse, située au nord-est de l'île de Montréal (Carte 2), fut tout d'abord pressentie dans une étude commandée par le gouvernement du Québec en 1975. Ce site, le "*seul possible pour le développement d'un terminal à conteneurs*" (Beauchemin et al), permettait l'aménagement initial d'un terminal d'une superficie de 69 hectares. Mais, le gouvernement du Québec, propriétaire de l'île depuis 1975, refusa aux autorités portuaires de la lui céder en vue de l'expansion du port. Lors de l'étude Dessau, ce site fut classé dernier à tous les niveaux, soient environnemental, opérationnel et technique.
- Cette dernière étude, commandée par le port de Montréal en 1980, analysa 11 sites possibles d'expansion sur l'île et en aval de celle-ci. Elle conclut, en 1983, que le site de Contrecoeur, situé à 40 kilomètres en aval du port, était le meilleur pour y implanter un terminal à conteneurs (Carte 2). Ce site présentait plus de 250 hectares de superficie, des accès routier et ferroviaire déjà en place, de bonnes conditions de navigation et permettait également de recevoir tout le trafic prévu jusqu'en 2010.
- Les sites Longue-Pointe et Tétreaultville, localisés sur l'île de Montréal, furent également explorés en 1985 au cours de l'étude Lavalin, étude commandée par le port. Le site Longue-Pointe permettait le développement de 30 hectares d'aires additionnelles d'entreposage mais présentait de nombreux inconvénients, tels que la relocalisation d'une douzaine d'entreprises et le déménagement d'une centaine de maisons. Le site Tétreaultville, situé à l'est du terminal Cast, a longtemps été pressenti comme aire possible d'expansion pour le port car il permettait la construction d'un terminal de 20 hectares. Mais, du fait de la présence d'un parc de 13 hectares et d'une fenêtre sur le fleuve, ce site n'était toujours pas aménagé en 1985.

En août 1988, en conclusion à ces différentes études, le port présenta son plan directeur. La stratégie proposée concernant le développement de ses espaces était la suivante (Port de Montréal, 1988, p 1) :

- Une exploitation optimale des installations portuaires sur l'île de Montréal;
- La mise en vigueur d'une politique d'acquisition de tout terrain disponible, contigu aux zones de manutention actives sur l'île de Montréal, et économiquement aménageable;
- L'aménagement d'installations portuaires, au fur et à mesure de la croissance des besoins d'ici l'an 2010, sur environ 150 hectares de terrains à Contrecoeur.

Ce plan rejetait définitivement le site Longue-Pointe mais pas le site Tétreaultville, site sur lequel le port "*n'insistera pas pour construire un terminal*" à

cause d'impacts négatifs sur l'environnement (Port de Montréal, 1989, p 39). Pour les autorités portuaires, "*Contrecoeur est le meilleur site pour la réalisation du projet d'expansion du port de Montréal*" (Port de Montréal, 1989, p 56). Le 15 décembre 1989, en réponse à la pression exercée par les citoyens, une décision du Bureau fédéral d'examen des évaluations environnementales rejetait la possibilité d'étendre le terminal Cast sur le site Tétreaultville. Dans le même temps, une commission formée par ce même bureau fédéral demandait au port de Montréal de réaliser une étude d'impact environnemental concernant l'aménagement du site Contrecoeur, étude qui n'a toujours pas été réalisée. Par conséquent, le site Contrecoeur n'a toujours pas été aménagé et seuls l'agrandissement et le regroupement de terminaux ont permis d'augmenter légèrement la capacité totale, qui atteint aujourd'hui près de 70 hectares (Tableau 1 et Carte 2).

Au port de Baltimore, les études réalisées en vue de l'aménagement d'un nouveau terminal se sont concentrées sur deux sites : Masonville et Seagirt (Carte 3).

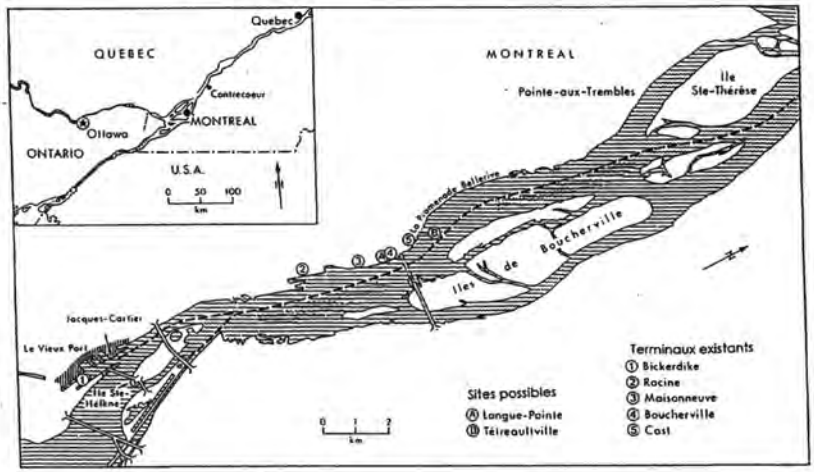
- L'étude d'impact environnemental pour le site Masonville, site vierge localisé au sud-ouest du port et propriété de ce dernier depuis 1977, préconisait, dès 1982, l'aménagement de ce site en un terminal à conteneurs de 150 hectares.
- Le site Seagirt, localisé dans la zone portuaire, fut choisi en 1980 pour recevoir 2,5 millions de m^3 de matériaux dragués lors de la construction du tunnel Fort McHenry, prolongeant l'autoroute 95 des 2 côtés des rives de la rivière Patapsco. Cette même année, la ville de Baltimore, responsable du projet, et l'État du Maryland conclurent un accord, accord qui stipulait que la Maryland Transportation Authority (MdTA) fournirait une assistance financière et éventuellement opérationnelle pour le tunnel à condition notamment que le site Canton Seagirt devienne propriété du Maryland Department of Transportation (MDoT) en vue d'un développement portuaire.

Des deux sites, Seagirt était le plus avantageux car la profondeur d'eau y était plus importante, et surtout, le terminal y serait fonctionnel plus rapidement. En mars 1984, la Maryland Port Administration (MPA) présenta un plan directeur prévoyant la construction d'un terminal à conteneurs d'une superficie de 40 hectares sur le site Seagirt. En 1987, un second plan directeur fut proposé après que la MdTA ait fait l'acquisition de 50 hectares additionnels en arrière du site en construction. Ce plan prévoyait un terminal d'une superficie de 95 hectares avec 3 quais ultramodernes complétés de 7 grues-portiques, la construction de facilités ferroviaires. Les travaux ont été complétés en décembre 1989 et le terminal Seagirt est ouvert depuis septembre 1990. D'autres investissements ont permis l'agrandissement de deux terminaux tandis que les autres cessaient leur activité conteneurs. Le port dispose donc actuellement de 3 terminaux totalisant une superficie de 235 hectares, terminaux qui ont été financés par des fonds publics (Tableau 1 et Carte 3).

Tableau 1
Profil des installations pour la manutention des conteneurs
Ports de Montréal et de Baltimore - 1993

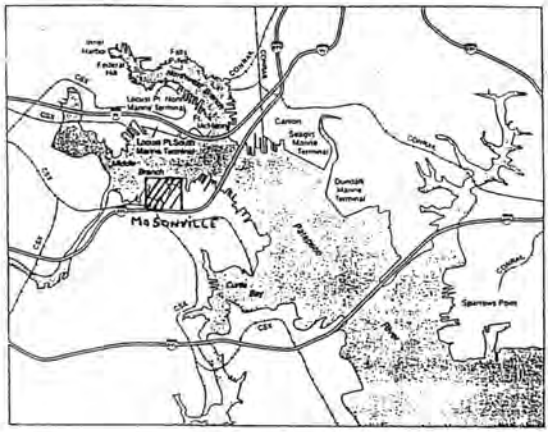
PORTS	TERMINAUX	SUPERFICIE (HA)
MONTRÉAL	Bickerdike	9.6
	Boucherville	5.0
	Cast	16.2
	Maisonneuve	17.9
	Racine	21.0
	TOTAL	**69,7**
BALTIMORE	Dundalk	81
	South Locust	31.7
	Seagirt	112
	TOTAL	**234,7**

Carte 2
Les terminaux à conteneurs du port de Montréal



Source : Mc Calla, p 130

Carte 3
Les terminaux à conteneurs du port de Baltimore



Source : Starr, 1991, p 172

Le mode de financement des ports de Montréal et de Baltimore

De tous les ports états-uniens, le port de Baltimore est celui qui dépend le plus de l'aide publique (Société Canadienne des Ports, 1991, p 54). L'aide dont il dispose provient du Transportation Trust Fund, fond géré par le MDoT, et dont les principales recettes proviennent des taxes sur l'essence et des obligations émises pour les projets de construction d'infrastructures de transport. En retour de cette aide, la MPA est tenue de réaliser des bénéfices nets sur ses opérations et de les reverser au Transportation Trust Fund.

Dans ce contexte de financement public, la MPA avait acquis le site Masonville en 1977 au coût de 10 M.$. US en prévision d'une expansion future. Cependant, le MDoT ne possédait pas en 1980-1982 les fonds nécessaires pour financer l'aménagement de ce site. Par contre, la MdTA, laquelle participait à la construction du tunnel Fort McHenry, disposait de fonds et accepta en 1984 de financer l'aménagement du site Seagirt. Le coût total de l'investissement s'éleva à 218 M.$. US. La capacité estimée du terminal Seagirt étant de 2,8 M.T., le coût par tonne est donc de $78 US.

Ce coût est bien supérieur aux coûts associés au développement des sites proposés au port de Montréal (Tableau 2). Ce tableau montre également que les sites proposés par le port de Montréal dans son plan directeur de 1988, Contrecoeur et

Tétreaultville, sont ceux dont le coût total d'aménagement est le plus faible. Ce port cherche en effet à minimiser ses dépenses car, depuis qu'il est devenu une Société Portuaire Locale en 1983, il se doit d'être financièrement rentable et ne reçoit plus aucune aide du gouvernement fédéral.

Aussi, de 1984 à 1994 inclusivement, le port a investi 52 M.$. dans l'aménagement de terminaux à conteneurs et l'acquisition de terrains à Montréal, investissement qui a permis un agrandissement de 30 hectares des surfaces destinées à la manutention de conteneurs. Cette somme est supérieure aux 40 M.$. qui permettraient de développer le site de Contrecoeur, soit 150 hectares. Désireuses de se doter de grandes infrastructures, les autorités portuaires montréalaises auraient alors construit un terminal à Contrecoeur si les gouvernements locaux ne s'étaient pas opposés à ce projet.

Tableau 2

Sommaire des coûts ($ 1985) associés à l'expansion des terminaux à conteneurs

	Ile Ste-Thérèse	Contrecoeur	Longue-Pointe	Tétreaultville
• Surface	42	42	30	20
• Capacité de référence (T)	3.3 millions	3.3 millions	1.3 million	1.5 million
• Coût d'entrée : acquisition, déblayage et accès	34 millions	4 millions	37.2 millions	1.4 million
• Coût du terminal : quais et remblais	42 millions	36 millions	19.3 millions	22.8 millions
COÛT TOTAL	**76 millions**	**40 millions**	**56.5 millions**	**24.2 millions**
Coût unitaire de la capacité ajoutée	23 $/T	12.2 $/T	44 $/T	16 $/T

Source : Port de Montréal, 1987

L'implication des différents gouvernements dans la prise de décision

Bien que le port de Montréal soit plus autonome depuis 1983, le gouvernement fédéral garde toujours un contrôle important au sujet des décisions portuaires car c'est le Ministre des transports qui nomme les sept membres du Conseil d'administration du port. Aussi, avant d'être poursuivi, tout projet proposé par le port doit être approuvé par le gouvernement fédéral. Depuis 1983, ce dernier a accepté tous les projets que le port lui a soumis. Quant à lui, le gouvernement provincial ne peut participer officiellement à la prise de décision car il ne dispose pas de poste au conseil d'administration du port. Cependant, le gouvernement s'est toujours intéressé au développement de l'un des acteurs économiques les plus importants de la Province.

Au cours des 20 dernières années, le gouvernement du Québec a toujours manifesté sa volonté que les installations du port soient consolidées sur l'île et dans cette optique, il acheta l'île Ste-Thérèse en 1975. Être propriétaire du site permettait de plus au gouvernement de pouvoir négocier un poste au conseil d'administration du port en échange d'un développement portuaire. Mais l'étude Dessau démontra que ce site n'était pas compatible avec un aménagement portuaire. En 1980, le sous-comité port/ville, mis en place par le gouvernement provincial, et dont l'objectif était d'étudier la possibilité d'expansion à long terme du port sur l'île de Montréal, concluait que "*L'Ile peut satisfaire les besoins du port jusqu'au delà de l'an 2000*" (Chapdelaine, p 10). La ville et le gouvernement du Québec s'opposèrent donc dès sa sortie à la conclusion du rapport Dessau. Ces deux organismes demandèrent alors au port d'analyser les sites aménageables sur l'île et celui-ci fut contraint de commander l'étude Lavalin. La pression des collectivités a ainsi conduit le port a présenté tardivement son plan directeur, soit 5 ans après la publication de l'étude Dessau.

Pour répondre aux différentes décisions prises depuis 15 ans, le gouvernement fédéral confiait, en 1992, à un comité regroupant différents intervenants (ville, port, gouvernements), le mandat d'analyser l'horizon prévisible d'affectation des espaces portuaires. Le comité conclut qu'il y a assez d'espace sur l'île à moyen terme. À plus long terme, le comité suggère le développement du site Longue-Pointe et possiblement la consolidation des terminaux Racine et Maisonneuve en un super terminal à conteneurs d'environ 65 hectares. Ces conclusions prouvent que le consensus fédéral-provincial-municipal, consensus que le port devrait obtenir pour pouvoir s'étendre à Contrecoeur, va dans le sens d'un maintien des activités portuaires sur l'île.

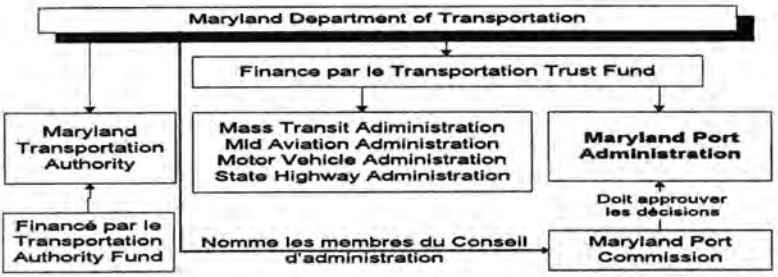
L'opposition des différents paliers gouvernementaux à l'aménagement d'un terminal à Contrecoeur se base sur des raisons d'ordre économique. Le trafic conteneurisé du port crée 2 995 emplois directs et génère des impacts de 320 000 $ annuellement (Les conseillers Adec, p 26). Un déclin important de ce trafic aurait donc des conséquences considérables pour la ville et la région. Or, la décision du port de construire un terminal à conteneurs à Contrecoeur menace la compétitivité du port et s'appuie sur une étude aux conclusions discutables.

- Les prévisions de trafic de l'étude Dessau (13,9 M.T. en 2010) semblent trop élevées. De nombreux experts (professeurs, ville) tablent sur un trafic de l'ordre de 9 millions de tonnes pour l'an 2010.
- Les ratios de productivité employés lors de cette étude (environ 6 000 TEU/HA) sont déjà largement dépassés par les compagnies maritimes, lesquelles manutentionnent parfois plus de 10 000 TEU/HA. La prise en compte de ces éléments réduisent le nombre d'hectares requis.

- Les prévisions de l'étude Dessau étaient que 1 600 emplois seraient créés d'ici 2010, dont les 2/3 dans la région de Contrecoeur mais cette étude ne mentionnait pas les effets négatifs pour l'emploi sur l'île de Montréal.
- Les avantages du port sont liés à ses liaisons intermodales et aux deux compagnies ferroviaires qui le desservent, CN et CP, la seconde transportant 95 % de tous les conteneurs passant par le port de Montréal (Slack et al, p 51). Le manque de concurrence entre compagnies ferroviaires qu'engendrerait un aménagement à Contrecoeur, où seule la compagnie CN est présente, entraînerait une perte de flexibilité et une hausse des coûts, ce dont ne fait pas mention le rapport Dessau.

Actuellement, les autorités portuaires justifient le choix de Contrecoeur par l'importance d'offrir des espaces à une grande compagnie qui viendrait s'installer à Montréal. Il est cependant peu probable qu'une telle situation se produise car les lignes desservant l'Atlantique Nord sont déjà implantées dans d'autres ports d'escale. Dans l'étude d'impact concernant son expansion, les autorités portuaires devront étudier précisément les impacts environnementaux et socio-économiques d'un aménagement à Contrecoeur. La plupart des éléments jouant en défaveur d'un développement à Contrecoeur, le port n'a pas encore réalisé cette étude et il semble qu'il ne la réalisera pas. Les autorités locales et gouvernementales poursuivent leurs efforts pour étendre les espaces sur l'île et le feront encore dans le futur. Dans ces conditions, l'aménagement de sites extérieurs ne sera pas nécessaire et le "rêve" du port de se doter d'un grand terminal à Contrecoeur ne se réalisera sans doute pas.

Figure 2
Le système de transport dans l'État du Maryland



Des liens étroits existent entre les différents organismes de transport de l'État du Maryland (Figure 2). La Maryland Port Administration qui gère les opérations

portuaires, est secondée par la Maryland Port Commission (MPC) qui doit approuvée les décisions prises par la MPA. De plus, le président de la MPC est également le secrétaire de la MPA et le secrétaire de la MdTA. Cet organisme gère et finance les autoroutes à péage de l'État du Maryland. Ses programmes sont financés à partir du Transportation Authority Fund, dont les recettes proviennent des autoroutes à péage.

Ces liens étroits entre les différentes organisations laissent présager que toute décision d'aménagement prise par la MPA et acceptée par la MPC est aussi acceptée au niveau supérieur. Ce fut le cas pour le choix du site Masonville, mais cette aire ne fut pas aménagée car le MDoT ne disposait pas des fonds nécessaires pour financer ce projet. La disponibilité de fonds à la MdTA permit enfin, quelques années plus tard, d'aménager le site Seagirt.

Concernant cet aménagement, le rôle de la MPA n'a pas été fondamental. En effet, l'État du Maryland a négocié avec la ville de Baltimore pour que le MDoT devienne propriétaire du site Seagirt. Surtout, sans l'intervention de la MdTA, cet espace n'aurait pas été aménagé. En 1987, cet organisme prit le contrôle de la compagnie de chemin de fer Canton Railroad, garantissant ainsi l'accès ferroviaire au terminal Seagirt. Par conséquent, la MdTA est propriétaire du terminal Seagirt et le rôle de la MPA est simplement de fournir l'expertise nécessaire pour son exploitation.

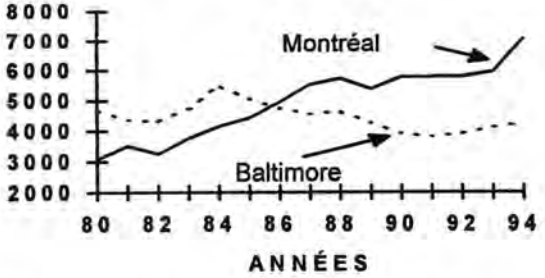
La raison pour laquelle les différents intervenants ont appuyé la construction de ce terminal est due à l'importance du port de Baltimore dans l'économie locale. En 1973, l'impact du port était de US $2.5 milliard et 1 emploi sur 10 de l'État du Maryland était lié directement ou indirectement aux activités portuaires. En 1980, le port de Baltimore était l'un des ports à conteneurs les plus importants au monde (18e) et l'État du Maryland, par l'intermédiaire de la MPA, voulait garder et améliorer cette position. L'aménagement d'un nouveau terminal, en améliorant la compétitivité du port était, selon les autorités politiques, le meilleur moyen d'attirer le trafic et de préserver cette position.

Évolution du trafic conteneurisé depuis 1980

Or, depuis 1984, le port de Baltimore a connu un déclin important de son trafic conteneurisé. Seulement 4,1 M.T. de marchandises conteneurisées y ont été manutentionnées en 1994 contre 5,5 M.T. en 1984, ce qui correspond à une diminution de 34 % (Figure 3). Pendant ce temps, le trafic conteneurisé a continué de croître au port de Montréal, passant de 3 millions de tonnes (M.T.) en 1980 à 7 M.T. en 1994. Cette croissance a surtout été importante au début de la période

(11 % annuellement entre 1980 et 1988) avant que le trafic ne se stabilise autour de 5,5 M.T. jusqu'en 1993. 1994 est alors une année exceptionnelle puisque le trafic a cru de 19 % par rapport à l'année précédente (Figure 3).

Figure 3
Évolution du trafic conteneurisé aux ports de Montréal et Baltimore
(1980 - 1994 ; En milliers de tonnes)



Ces résultats s'expliquent par la localisation géographique de ces deux ports. En effet, ce facteur est devenu un inconvénient majeur à la suite du vote de nouvelles lois en matière de transport aux États-Unis. D'une part, le Staggers Rail Act de 1980 permet aux transporteurs d'égaliser les tarifs entre des villes telles Chicago et Détroit et les ports de la Côte Est, indépendamment de la distance. D'autre part, le Shipping Act de 1984 autorise les transporteurs maritimes à offrir des services intermodaux intégrés.

La nouvelle réglementation a affecté le port de Montréal. Les chemins de fer américains, qui s'étaient adaptés lentement à la conteneurisation, ont réalisé d'importants investissements dans les liaisons intermodales et les compagnies maritimes se sont mises à offrir des tarifs porte-à-porte. Ces facteurs ont conduit au détournement d'une partie du trafic du port de Montréal vers les ports de la Côte Est américaine. Aussi, la position du port de Montréal est unique en ce sens qu'il est excentré par rapport aux routes commerciales maritimes traditionnelles. Il est ainsi le seul port d'escale sur la route commerciale qu'il dessert. Ce port est donc un cul-de-sac pour les lignes maritimes qui préfèrent des itinéraires permettant de charger et décharger à différents endroits (Slack, 1987, p 2). Tous ces éléments fragilisent la position du port de Montréal et constituent des obstacles à la croissance de son trafic.

La nouvelle réglementation a également eu un impact considérable sur le trafic du port de Baltimore : Dès 1985, en raison de la réduction des tarifs ferroviaires,

une partie du trafic a été détournée vers Norfolk, distant de 300 kilomètres de Baltimore mais localisé à seulement 25 kilomètres de la haute mer (cf. Carte 1, p 3). De plus, le port de Baltimore a été affecté par des facteurs internes. Entre 1988 et 1992, le climat d'instabilité permanent qui régnait entre les autorités portuaires et l'association des débardeurs a conduit au départ de 29 lignes, incluant quelques géants comme Farrell et Hapag-Loyd. Malgré une paix sociale retrouvée, de nombreuses compagnies ne sont pas revenues offrir un service en partance de Baltimore. Parmi celles qui sont revenues, plusieurs acheminent maintenant des feeders vers Norfolk, port qui est devenu le "point de concentration" du trafic conteneurisé dans cette région (Starr, 1994, p 225).

Tableau 3
Évolution du trafic aux terminaux Dundalk et Seagirt
En TEU ; 1990-1992

ANNÉE	DUNDALK	SEAGIRT
1990	354 700	48 000
1991	266 000	143 000
1992	212 000	180 400

Surtout, l'ouverture du terminal Seagirt n'a pas attiré de nouveau trafic mais il s'est produit un transfert de trafic du terminal Dundalk vers le nouveau terminal (Tableau 3). Ainsi, toutes les compagnies exploitantes au terminal Seagirt en 1993 (MSC, Evergreen, NPR, OOCL, Sea Land) offraient auparavant un service à partir du terminal Dundalk. De plus, avec un trafic de 1,4 M.T. en 1993, ce terminal est loin d'être utilisé à pleine capacité, estimée à 2.8 M.T. par les autorités portuaires. Conséquence de l'ouverture du terminal et de la chute du trafic conteneurisé, la productivité au port de Baltimore n'était que de 1 242 TEU/hectare en 1992. En comparaison, le nombre de TEU manutentionnées par hectare au port de Montréal la même année, soit 8 264, était le plus important des ports de la Côte est (Peat Marwick, 1993). Dans ce port, les compagnies se sont donc adaptées aux espaces dont elles disposaient et aucune d'elles ne menace aujourd'hui de déménager en raison du manque d'espace.

En fait, ce sont les autorités portuaires qui cherchent à montrer que les espaces sont insuffisants, ce qui leur permet ensuite de justifier leur volonté d'investir dans de nouvelles infrastructures. Disposer d'importants terminaux à conteneurs représente en effet une marque de respect dans le domaine de la gestion portuaire (Slack, 1993, p 851). Aussi, en arguant que le port de Baltimore était le plus près des marchés terrestres et par conséquent la voie de sortie naturelle des marchandises du Middle-west, l'État du Maryland, via les autorités portuaires, a construit

un terminal à conteneurs ultramoderne. Cependant, aujourd'hui, ce ne sont pas les ports qui contrôlent le transport des marchandises mais les compagnies maritimes. Ce sont ces dernières qui décident du lieu de passage de la marchandise en s'installant dans tel ou tel port et elles ne choisissent pas toujours le port le plus près des marchés. En effet, dans leur processus de sélection des ports d'attache, les compagnies analysent de nombreux facteurs (situation géographique, conditions de travail, services disponibles, frais portuaires, etc.) toujours dans le but d'être le plus compétitif possible et de maximiser leur profit. Étant des entités privées, elles peuvent déménager rapidement en emportant avec elles le trafic. La taille des terminaux n'est donc pas un facteur suffisant pour attirer ou maintenir le trafic, ce que n'ont pas voulu comprendre les autorités de l'État du Maryland. Dans ce cas, ce sont les relations de travail et la situation géographique du port qui ont conduit au départ de nombreuses compagnies maritimes le port, impliquant un déclin du trafic.

À Montréal, les autorités gouvernementales ont contraint le port a ne pas aménager à Contrecoeur. Elles ont compris qu'un tel investissement aurait réduit la compétitivité du port et que l'emploi et les retombées économiques auraient été affectés. Cependant, des millions de dollars auraient quand même été investis dans un terminal à conteneurs si la configuration du port de Montréal et des espaces alentours avaient permis la construction d'un terminal sur l'île de Montréal. La croissance actuelle du trafic prouve qu'un tel développement n'était pas nécessaire, car les compagnies maritimes s'adaptent aux espaces dont elles disposent.

Conclusion

Le port de Montréal a vu son trafic conteneurisé croître de façon importante depuis l'avènement de la conteneurisation pour atteindre 7 millions de tonnes en 1994. La superficie des terminaux n'a pas suivi cette évolution et la volonté du port d'aménager à Contrecoeur n'a pu se réaliser à cause de la pression des autorités locales, désireuses quant à elles de préserver l'exploitation sur l'île.
En comparaison, l'évolution du trafic et de l'aménagement des espaces du port de Baltimore a été totalement opposée. Après un trafic record de 5,5 M.T. de marchandises conteneurisées en 1984, celui-ci a décliné depuis (- 30 % en 10 ans). Cependant, le port s'est doté d'installations ultramodernes, installations qui ont été entièrement financées par des fonds publics.

Le fait que les investissements aient été réalisés dans un port et pas dans l'autre conduit à se demander quelle est la meilleure politique portuaire : Faut-il avoir une gestion publique du port, un système semi-autonome ou une gestion privée ? Financé par des fonds publics, le port de Baltimore a réalisé des investissements

très coûteux que n'auraient jamais pu se permettre un organisme se devant d'être rentable. La volonté de l'État du Maryland était simplement de permettre au port d'être le premier à disposer de telles infrastructures. Les autorités portuaires de Montréal auraient probablement investi à Contrecoeur si elles avaient été les seules à prendre la décision. Dans ce cas, l'intervention politique des autorités locales a été profitable, puisque cette intervention a conduit à ne pas aménager à Contrecoeur. Ce type de gestion semble donc plus adéquat car il évite le gaspillage de l'argent public tel que cela s'est produit à Baltimore. Pourtant, le port de Montréal ne pourra financer seul l'aménagement d'un super-terminal au niveau de Longue-Pointe si celui-ci s'avère nécessaire dans quelques années. Est-ce que les gouvernements l'aideront à ce moment là ? Aussi, le gouvernement canadien se départit actuellement des ports sous sa juridiction. Une entreprise privée sera-t-elle intéressée à acheter un port dont le potentiel d'agrandissement est limité ? Concernant Baltimore, quelle politique le port pourrait-il mettre en oeuvre pour que les terminaux soient plus utilisés ? Et que pense les décideurs du fait que le port de Norfolk soit en train de se doter d'infrastructures semblables, plus justifiées en raison de la croissance du trafic et moins coûteuses du fait de l'amélioration des technologies ?

Références

BEAUCHEMIN - BEATON - LAPOINTE (Décembre 1976) - "Étude sur l'avenir du port de Montréal : l'organisation interne du port" - *Gouvernement du Québec - Sous-comité interministériel pour l'étude sur l'avenir du port de Montréal* - 4 volumes

BRUNET, C. (1983) - "Analyse de la concurrence entre les ports à conteneurs desservant l'est canadien et le Mid-West américain" - *Centre de recherche sur les transports - Université de Montréal* - N° 318 - 116 p

CHAPDELAINE, H. (Janvier 1983) - "Le port de Montréal : Rapport du sous-comité Port/Ville - résumé" - *Gouvernement du Québec - Ministère de l'industrie, du commerce et du tourisme* - 11 p

CHARLIER, J. (Juillet 1985) - "L'évolution récente du système portuaire canadien face à la conteneurisation de Montréal en tant que porte du Canada central et du Middle-West américain pour le trafic conteneurisé transatlantique" - *Journal de la Marine Marchande* - N° 3420 - pp 1595 à 1609

DAGENAIS, M.G. - MARTIN, F. (Janvier 1985) - "Forecasting containerized traffic for the port of Montral (1981-1995)" - *Centre de Recherche sur les Transports - Université de Montréal* - 42 p

FRANKEL, E.G. , INC (Octobre 1980) - "Masonville Marine Terminal Master Plan Study, Cargo throughput forecast and terminal capacity assessment"

LAVALIN (1985) - "Port de Montréal : Plan directeur : Étude pour l'expansion du port sur l'île de Montréal"

LES CONSEILLERS ADEC (Février 1994) - "Table de concertation sur l'industrie maritime de Montréal - rapport final" - 234 p

LES CONSULTANTS DESSAU (1981) - "Étude du port de Montréal - Rapport d'étape : identification des besoins" - 66 p

MC CALLA, R.J. (1994) - "Water transportation in Canada" - *Halifax - Formac* - 259 p

PEAT MARWICK (Mai 1993) - "Évaluation des avantages compétitifs du port de Montréal dans le transport des conteneurs" - *Préparé pour la Table de Concertation sur l'industrie maritime de Montréal* - 20 p

PORT DE MONTRÉAL (Novembre 1987) - "Plan directeur : Présentation à l'Honorable Marc-Yvan Côté, Ministre des transports du Québec" - *Gouvernement du Québec - Direction de la planification et du Développement* - 16 p

PORT DE MONTRÉAL (Août 1988) - "Le port de Montréal se donne une stratégie de développement à réaliser d'ici l'horizon 2010" - 6 p

SLACK, B. - DESLAURIERS, P. - LAPORTE, N. (Mai 1987) - "L'industrie du camionnage face à la conteneurisation du transport maritime à Montréal" - *Ministère des transports du Québec* - 106 p

SLACK, B. (1987) - "Quelques réflexions sur les problèmes posés par les besoins d'expansion du port de Montréal" - 8 p - Non publié

SLACK, B. (1989) - "Gateway or cul-de-sac ? The Saint-Lawrence river and eastern canadian container traffic" - *Études canadiennes* - n°26 - pp 49 à 58

SLACK, B. (Automne 1993) - "Pawns in the game : Ports in a global transportation system" - *Grothw and change* - Volume 24 - N°4 - pp 579 à 588

SOCIÉTÉ CANADIENNE DES PORTS (1991) - "Towards a canadian intermodal system : recommandations for change : The final report of the container competitiveness committee" - 139 p

STARR, J.T. (1991) - "The port of Baltimore : off the beaten track ?" - *Maritime Policy and Management* - Volume 18 - N° 3 - pp 171 à 181

STARR, J.T. (1994) - "The mid-Atlantic load centre : Baltimore or Hampton Roads" - *Maritime Policy and Management* - Volume 2 - N° 3 - pp 219 à 227

RESTRUCTURING CANADIAN PORTS: PROSPECTS AND PROBLEMS

by Michael C. Ircha*

During the past several years, the federal government has taken significant steps in "commercializing" Canada's transportation industry, particularly in the air side, the removal of major subsidies, and the privatizing of CN. The final stage in this transportation rationalization process is reforming the marine sector. This paper examines current Canadian port reform evaluating the proposed restructuring of the Canadian ports system to identify both the benefits and potential pitfalls.

1. INTRODUCTION

Within Canada's federal system, constitutional responsibilities and authority are divided between provincial and federal governments. Under the *Constitution Act* of 1982 (formerly the *British North America Act* of 1867), ports and harbours along with navigation and shipping are federal government responsibilities. Despite this concentration of ports authority at the national level, current Canadian ports administration is anything but homogeneous. Rather, Canada's 356 commercially-oriented ports are a diversified, multi-layered and loose-knit mixture of Crown corporation ports (Canada Ports Corporation), harbour commissions, Transport Canada's public harbours and port facilities, and private industrial harbours. The common element among public ports is their link to the federal government through various statutory reporting relationships to the Minister of Transport.

By the late 1960s Canadian ports presented a picture of confusion and conflicting federal objectives ranging from the rigid centralized control of NHB ports to decentralized, semi-autonomous Harbour Commissions to subsidized departmental Public Harbours. The financial regulations effecting each set of ports vary considerably. As continental transportation issues became more complex in the 1970s (particularly with U.S. deregulation), concerns arose over how best to rationalize Canada's fragmented ports system.

* The Transportation Group, University of New Brunswick, Fredericton NB

For more than a decade, the federal government sought to establish a rational national ports policy. The 1968 Manning Report was the first of several analyses of Canadian ports; all arguing for the need to rectify ports administration.[1] The lack of government action in the ports field reflected the low priority given ports within the transportation sector. During this period, the government considered, but failed to adopt many recommended changes to the port system.[2]

Legislation passed by Parliament in February 1983 established the Canada Ports Corporation (CPC) as a Crown corporation with subsidiary Crown corporations at the local port level. The legislation sought to strike a balance between national coordination and local commercial responsiveness. A degree of local autonomy was provided to those ports of national or regional significance, which had achieved financial self-sufficiency, by incorporating them as subsidiary Local Port Corporations (LPC) with their own Boards of Directors (BoDs)(members appointed by the Minister). To date, seven ports have been granted LPC Crown corporation status: St. John's, Halifax, Saint John, Quebec, Montreal, Vancouver, and Prince Rupert. In addition, prior to adopting the *Canada Ports Corporation Act*, the federal government cancelled some $727 million worth of NHB debt and unpaid interest owed to Treasury Board to enable the CPC ports to operate efficiently without the full burden of past debts.[3]

CPC is responsible for 14 commercial ports, including the seven LPC facilities; many of them being Canada's largest seaports. CPC is governed by a national BoD appointed by the Minister. LPCs are incorporated as Crown corporations in their own right, but report to the Minister through the Ottawa headquarters of CPC. The seven non-LPC ports are administered by CPC in Ottawa on a divisional basis (a central department of the Crown corporation).

Despite Section 3 in the *Canada Ports Corporation Act* defining a national ports policy, the *Act* is silent on the role of the other forms of ports administration: Harbour Commissions, Public Harbours (Transport Canada ports), and private industrial facilities. The lack of any action in developing a national ports policy makes a mockery of this portion of the legislation. Further, in spite of the *Act*'s efforts to rectify the problems of the former NHB system, there is still no overall national coordination of Canadian ports.

In spite of the commercialisation tendencies of the *Act*, over time, bureaucratic rules, regulations and the financial strictures of the *Financial Administration Act*, prevented major ports from operating as true commercial entities. Delays in obtaining CPC and Treasury Board approvals for financing port development and dealing with land transactions resulted in Canadian ports being unable to quickly tap emerging opportunities (in contrast to their U.S. competitors). For example, the Vancouver Port Corporation (VPC) argued it must obtain federal cabinet

approval to spend its own retained earnings, a process of four to 26 months. Similarly, disposing of federal port land can be an expensive and lengthy process. Again the VPC pointed out that it took almost two years and cost more than $250,000 to dispose of a $95,000 parcel of land.[4] The creation of CPC and its subsidiary LPCs may have addressed the problems of the 1970s, but the legislation did not create commercialised and market-responsive institutions required to meet the turbulent pressures of continental and global economic competition of the 1990s.

2.0 RESTRUCTURING CANADIAN PORTS

During the 1990s, the federal government encouraged in-depth program reviews of all departments (including Transport Canada). Under the newly elected Liberal Government in 1993, there were to be no "sacred cows" in this review, all government expenditures were under scrutiny with the focus being to: improve efficiency; cut costs; and, do things differently. Although in Transport Canada, the initial emphasis was on major programs (airlines, airports, and subsidies), by late 1993, the review was broadened to encompass the marine transportation sector. The marine review was initiated by a senior level international port reform seminar examining port corporatisation and privatisation initiatives in New Zealand and Britain along with a review of the current U.S. and Canadian port systems.[5]

Although more than thirty percent of Canada's export trade is by water transport (the remainder shipped overland to the U.S.), the role of Canada's ports in the country's overall transportation policy framework has not been significant. The attention of Parliament, the Minister of Transport and the federal government has focused on other matters reflecting the continental nature of trade and transportation, rather than on more esoteric marine issues. As pointed out by the Minister of Transport, Doug Young in his charge to the Parliamentary Standing Committee on Transportation (SCOT): "the time has come to insist that we take directly into account the needs of those individuals and those companies which use marine transportation. Without wanting to sound unpleasant, it might be said that the marine element has been neglected within the whole system of transportation in Canada."[6]

2.1 Standing Committee on Transport (SCOT)

In late 1994, the Minister requested the SCOT to undertake a broad review of Canada's marine sector. The SCOT's terms of reference required them to consider Canada's port system, pilotage services, St. Lawrence Seaway, and Canadian Coast Guard based on five objectives:

> identify key competitive challenges; define essential federal roles and services; develop options to reduce subsidies and examine various commercialization options; obtain regional views on priorities, issues, and solutions; and build consensus on solutions, future directions, and development of a comprehensive national marine study.[7]

The SCOT undertook 17 days of intensive hearings in ten cities across the country during February and March 1995. During their review, the SCOT received 176 written submissions and heard from 260 witnesses representing 140 differing organizations. The port-related submissions to the SCOT hearings included representations from the CPC (LPCs and divisional ports), the Canadian Coast Guard (HPD), the seven LPCs, six harbour commissions and three other Transport Canada HPD ports. Verbatim minutes of the public hearings were published by the House of Commons. These minutes exceeded 1,600 pages of bi-lingual text in 20 separate bound publications.

A number of port-related themes emerged from the SCOT hearings, including: the ports' desire to maintain the status quo by remaining federal agents and having the Minister continue to appoint port directors; port competition; user requirements; dockworker labour concerns; and conflicts with municipalities.

Maintaining the Status Quo

A major theme emerging throughout the SCOT hearings was the strong desire by major ports to maintain the status quo with only minor modifications made to provide local port autonomy. The strong status-quo orientation of the port managers and their directors reflects the findings of an earlier ports survey.[8] The pervasiveness of the status quo theme led the SCOT to ask some senior port managers and BoD chairmen why they would not want to be more independent. For example, during the SCOT hearings in Quebec the following exchange ensued: [9]

> **Mr. J. Fontana (London East)**: What would you think of being totally independent, totally flexible, and not a crown corporation but another structure where the shareholders might very well be the stakeholders in your business, from the users of the system to the owners and all the people who are involved in the Port of Quebec, as opposed to having a single shareholder, that being the Government of Canada?
>
> **Mr. R. Gaudreault (President and CEO, Quebec Port Corporation)**: When you have a good model, you don't change it. As a whole the local port [corporation] works well.

> **Mr. Fontana**: In other words, the crown corporation suits you well as long as we get the CPC off your back?
>
> **Mr. Gaudreault**: That's right. You understand that very clearly.

A further measure of the desire to retain the status quo came from the recurring request to the SCOT that port directors continue to be appointed by the Minister. As shown in the following excerpts, this theme was set by some of the major ports:

> **Mr. R. Longstaffe (Chairman, Vancouver Port Corporation):** In order to retain our status as a federal agency, we believe the majority of appointments [to the BoD] should be made with the approval of the federal cabinet.[10]
>
> **Mr. A. Gingras (Chairman, Montreal Port Corporation):** ... submit the following recommendations ... that a board of directors be maintained with at least seven members who would still be appointed by the Minister of Transport and the Governor in Council....[11]

The consistent theme calling for ports to remain as federal Crown corporations, harbour commissions and Transport Canada facilities may be surprising to outsiders, however, as discussed earlier, the Canadian ports system has a long history of central control and dependence on public sector financial support. It is problematic to expect port managers and their directors to actively seek to cut their ties to the federal system.

The emphasis on status quo emerges partly from the current ports' mandate placing financial accountability at the bottom of the list of port priorities. The Quebec Port Corporation outlined this perceived mandate to the SCOT as follows:

> **Mr. R. Paquet (Chairman of the Board, Quebec Port Corporation)**: First of all, to promote and contribute to Canada's international trade. Secondly, to promote regional economic development. Thirdly, to offer efficient and equitable port services. Finally, to be financially self-sufficient.[12]

A fundamental shift in the governance of Canadian ports towards a corporatised or privatised model would likely force a re-ordering of these priorities by placing financial self-sufficiency near the top rather than at bottom.

Port Competition

During the past decade, competition among the differing Canadian port regimes has intensified. The issue is not competition *per se*, but rather that the financial obligations of each of these three types of ports differ distorting the "playing field" as shown in the following comments to the SCOT:

> **Mr. A. Gingras:** Public Ports and Harbours [Transport Canada HPD] don't have to be financially self-sufficient and they don't pay any grants in lieu of taxes. This enables them to charge rates lower than ours.[13]

> **Mr. M. Dulude (Executive Vice-President, ITT):** Certain cases never cease to astonish me: such as the example of the Port of Cacouna [Transport Canada HPD], where the federal government was ready to invest $20 million for a return of only $200,000 in additional revenues per year.[14]

It is apparent from these comments that current domestic inter-port competition creates inequities. Shipper concerns also focused on overcapacity and the spread of a limited amount of export traffic among a number of ports leading to higher unit costs for handling cargo and labour difficulties as throughput waxes and wanes depending on the vagaries of the shippers in this competitive situation. These concerns were best summarized by the Marine Task Force of the Saint John Board of Trade:

> **Mr. K. Davidson**: It is our view that Canada's national ports system is subject to gross overcapacity, cumbersome administration and burdensome legislation. It is in our view, ill equipped to meet the challenges of the 21st century.[15]

Port User Requirements

Although only a few shippers presented material to the SCOT, their concerns were strongly expressed:

> **Mr. C. Bales (Chairman, Marine Committee, Council of Forest Industries)**: Ports should be capable of making substantial financial commitments, subject to the constraints of the financial markets and the needs of users.... The board of the ports should be comprised of members drawn from the user community.... The management, organization, and mandate of the port should be customer-focused.[16]

> **Mr. E. Weinberg (President, PRR Transportation Consulting Services Inc.)**: We believe the Windsor Harbour Commission has outlived its usefulness and reason for being. It serves no useful purpose or function that private industry could not itself perform, although with greater efficiency and greater cost-effectiveness. It is a relic of a past era of privilege and patronage. It has every appearance of being too fat, inefficient and living too lavishly at user expense.[17]

As shown from these limited excerpts from the SCOT hearings, shippers are not enamoured with the centralized, non-business-like approach of the current Canadian ports system.

Port Labour

Although the landlord nature of Canadian reports removes the port authorities from direct responsibility for labour-management issues, this does not relieve the port administrators from concern over this key cost element. The general public, shippers and politicians typically expect the port's managers to ensure stable labour relations. These concerns were voiced by several ports during the SCOT hearings:

> **Capt. N. Stark (President and CEO, Vancouver Port Corporation):** VPC does not control or indirectly control or employ any longshoremen, foremen or grain handlers who work at the port, but their performance and reliability is key to the port's reputation and competitive positioning.[18]

> **Mr. R. Gaudreault:** Presently it costs more per ton to load general cargo in Quebec rather than in neighbouring ports which do not have archaic industrial relations system.... the present system doesn't give the port the opportunity to intervene in labour matters....[19]

The subsequent SCOT report directly addressed the ports' labour concerns by suggesting: "it is time for a comprehensive independent review of labour-management relations at our major ports."[20]

Port Conflicts with Municipalities

Several municipalities outlined their concerns to the SCOT about the ports within their jurisdictions. Some ports which pay grants-in-lieu of municipal property taxes also expressed concerns as they believed the municipal services provided did not match the funds being paid. In addition, these ports were concerned that the payment of such taxes led to increased cargo-handling rates and made them uncompetitive with nearby U.S. ports (which in many cases either pay no

municipal taxes or have taxing authority in their own right to raise revenues to subsidize their port operations). The following comments outlines some of the concerns raised by both municipalities and ports.

> **Mr. N. Hutchinson (Acting Commissioner, City of Oshawa)**: ... over the last 15 years many development opportunities have not been realized due to the jurisdictional gridlock between the Oshawa Harbour Commission and the City of Oshawa.... The Oshawa Harbour Commission... has lost the ability to change quickly or meet community demands or expectations because of potentially conflicting mandates.... the current operating mandate [of the Harbour Commission] does not allow or provide for prioritizing of local and community issues as compared with national transportation needs.[21].
>
> **Mr. R. Pearce (Port Manager, Fraser River Harbour Commission):** We have very strong competition from United States ports. They receive considerable breaks when it comes to taxation, and we need a lever playing field in taxation. Seattle and Tacoma collect taxes while Vancouver and Fraser pay.[22]
>
> **Mr. L. Kirby (Executive Director, Hamilton and District Chamber of Commerce)**: The federal government should review taxation, regulation, and financial treatment of ports in an effort to put Canadian ports on an equal footing with our U.S. competitors.[23]

Not all ports have these same concerns. LPCs and CPC divisional ports pay grants-in-lieu of taxes to adjacent municipalities. Harbour commissions do not pay property taxes nor provide grants-in-lieu, while Transport Canada facilities do provide grants-in-lieu but through Public Works Canada rather than as a charge against a specific port.

SCOT Recommendations

The SCOT report with its recommendations on a revised federal marine policy was tabled in the House of Commons on May 3, 1995. The recommendations were disappointing to those who had anticipated the emergence of a new, business-oriented, commercial era for Canada's ports. The SCOT reinforced the status quo with some modifications such as recommending the elimination of the CPC, that effectively promised more of the same but with differing titles and structures. Such an outcome is not surprising as the SCOT's *National Marine Strategy* indicated: "our role is to reflect what we heard and what most wanted in the way of reform and that is, that the federal government continue to have responsibility for a national ports system."[24] Effectively, Canada's major

commercial ports sought increased local autonomy without further corporatisation or privatisation.

2.2 Transport Canada's Regional Shippers' Hearings

There was little representation from the shippers' community to the SCOT hearings. To solicit these missing views Transport Canada held five regional workshops for invited shippers (and other participants) across Canada during May 1995. These one-day workshops served as focus groups soliciting views on the effect of the SCOT recommendations on ports, pilotage, St. Lawrence Seaway and Canadian Coast Guard. Several port-related themes emerged from the workshops including: concerns about federal appointments to port BoDs; the bureaucratic nature of the proposed ports system; and, the need for further privatization.

Each of the five workshops emphasized the need for local user representation to form the majority on port BoDs, not federally appointed members. For example, in Saint John, the participants "generally agreed that the local board must be representative of the stakeholders, and must be given authority at the local level.... board size should be kept fairly small."[25] Similarly, in Quebec: "everyone agrees that a majority of members of the board of directors should be appointed by local people, not the federal government."[26] This theme was reiterated in Winnipeg where: "the workshop was strongly of the opinion that the government should **not** appoint the majority of members of port Boards."[27]

A second ports-related concern was that the SCOT approach was too bureaucratic and could lead to a repetition of the current inefficient centralized port system. This concern was raised in Saint John were the participants expressed: "significant concern that the centralization characterized by the 'Ports Desk' and the 'Pilotage Desk' means the creation of sizeable central bureaucracies in Ottawa." The Vancouver group: "agreed that the Canada Ports Corporation should be replaced with a new ports desk, provided it only performs a facilitating role and does not turn into another large bureaucracy."[28]

A third concern was that the recommendations tended to stop short of the need to corporatise or privatise Canada's commercial ports to enable them to fully compete in the continental and global marketplace. One of the workshop groups in Ontario believed: "the changes recommended in the Standing Committee report don't go far enough, and wont bring about the efficiencies that are promised and necessary... the full privatization of ports should be fully considered."[29]

Overall, the shipper hearings did not support the SCOT port-related recommendations. Perhaps the best summation of the participant's views is provided by one of the Quebec groups who, "agreed with the principles of the Keyes Report [SCOT], but it must go further as regards autonomy..." The ambivalent support for the SCOT recommendations from this selected sample of the marine transport community contributed to Transport Canada's view that Canada's commercial ports need to shift further towards a corporate model rather than backwards to the semi-departmentalised model proposed by the SCOT.

2.3 Federal Port Reform Proposals

In August 1995, the Deputy Minister of Transport elaborated on the Minister's marine policy in a detailed presentation to the annual conference of the Canadian Port and Harbour Association (CPHA).[30] The overall objectives of the federal marine policy included: ensuring affordable and effective marine transport services; fair competition; greater say by users on port priorities; reduced overall infrastructure; and a continued commitment to safety and environment.

From the ports perspective, the proposed marine policy limits the federal government's involvement to those of national significance as Canadian Port Authorities (CPAs) and those smaller ports serving remote communities. All other regional/local ports are to be divested to provincial, municipal, community or private groups. CPAs will be part of a National Ports System (NPS) managed by autonomous BoDs with limited federal oversight. The CPC will be eliminated and a small ports secretariat provided in Transport Canada for the five year transition period following the legislation. The criteria for selecting CPAs include: financial self-sufficiency; being essential for international and domestic trade; having a diversified traffic base and serving a vast hinterland; and, being linked to major rail lines and highway infrastructure. In August, Transport Canada anticipated about 45 CPAs. When the Minister announced the National Marine Policy in mid-December, the only CPAs designated were LPCs and Fraser River Harbour Commission, although other ports could seek designation if they met the criteria.

Many elements of the Harbour Commission model were incorporated in the proposed CPA approach. The NPS incorporates the not-for-profit business corporation that Transport Canada had adopted for Canadian airports and the Air Navigation System. It reflects a commercial corporatisation model seeking to make cost-minimisation the top priority.

Incorporating CPAs as federal agencies rather than as agents of the Crown enables CPAs to "carry the Canadian flag" in overseas marketing (an issue raised in the SCOT report) and to retain federal status in dealing with property tax

concerns at the municipal level, but tries to ensure the federal government is not liable for any CPA debt. The CPAs will not be subject to the financial restrictions incorporated within the *Federal Administration Act*. As federal agencies, CPAs will not be eligible for federal guarantees of loans. Hence, the financial marketplace, not the federal government, will exert commercial discipline on CPAs. There will be no borrowing limits imposed on CPAs, however, they will only be able to use non-federal assets and projected cash-flow (including the use of federal assets to generate an ongoing revenue stream) as collateral.

Transport Canada's proposal for CPAs went further than the minor modifications proposed by the SCOT. At the CPHA Conference and in subsequent meetings with federal officials, the port managers and directors expressed dismay over the proposed port reform. Port Chairpersons, directors and mangers lobbied their federal members of parliament, ministers and in some cases, the Prime Minister to state their opposition to the Minister's proposed port reform.

The Minister's plan had been to introduce to Parliament in the fall of 1995 an omnibus Marine Policy Act incorporating the proposed ports reform, changes to the *Pilotage Act*, a not-for-profit commercialised *St. Lawrence Seaway Act*, increased cost recovery provisions in the *Coast Guard Act*, and other *Acts* as required. However, the Quebec Referendum led to delay with the legislation. Although the proposed legislation was to be introduced in early 1996, the recent federal cabinet shuffle replacing the Minister may lead to further delays in the implementation of this final major transportation sector reform. To date, only the proposed cost recovery formula for navigation aids (and subsequently for ice-breaking) has been announced (to the consternation of Eastern Canadian ports).[31]

3.0 CONCLUSIONS - BENEFITS AND PITFALLS

The main themes arising from the SCOT hearings included: the need to maintain the ports status quo (this was disregarded by the Minister in his National Marine Policy); improving port competition by levelling the playing field among differing ports (addressed by the Minister in making all competing ports commercially oriented); responding to shipper requirements (by making the BoD more local and limiting federal appointments to a minimum); port labour (left by the minister until the outcome of the West Coast port labour inquiry is completed); and, conflicts with municipalities (making all ports pay property taxes, but allowing for negotiations in terms of fee for services).

Other concerns raised by the regional shipper hearings included: the federally-appointed majority on port BoDs (the federal presence will be a clear minority); and, establishing an internal ports bureaucracy as a ports desk/secretariat

replacing CPC (this will be a short-term, small group negotiating the divestiture of regional/local ports).

A further concern about the proposed ports reform process is that it tends to be focused on getting the federal government out of operating "money-losing" facilities. This approach may put at risk the national transportation network that has been developed during the past century. On the other hand, the evolution of a viable, intermodal, continental transportation network may mean the federal government no longer has to support various elements of this commercial activity.

An essential issue from a Canadian perspective is how are regional interests and concerns to be weighted within the evolving port reforms? The country's national transportation infrastructure was developed to aid the economic integration of Canada's disparate regions. Does port reform mean the end of transportation as a regional economic development tool? The SCOT did recommend the continued subsidisation of ports from federal economic development funds. However, this recommendation was dropped from the Minister's proposal. Will it be revived in the House of Commons?

But what is best for Canada's ports? Today, Canadian ports face considerable competition from their continental U.S. counterparts. Canadian ports no longer operate in a semi-monopolistic mode with defined hinterlands as the development of a viable and efficient intermodal continental transportation system enables shippers to export and import cargo via cost-effective continental routings. Such routings may not include Canadian ports. To continue to provide effective service to Canadian shippers (and to attract their traffic), Canadian ports must focus on their primary business - ensuring efficient throughput. This means, the port administration must be focused on the business of their port - not on the red tape and bureaucratic wrangling accompanying governmental operations, nor on patronage appointments to port BoDs. Canadian ports must be freed from the strictures of the federal system to operate unfettered in a competitive commercial marketplace.

The Minister appeared to be taking ports towards a not-for profit corporate model. But is this going far enough? Should Canadian ports not be moved further towards full corporatisation with the federal government initially owning all shares. As corporate ports prove their commercial worth in competitive settings, some of the federal shares could be sold to enable both the employees and the local/regional community to gain partial ownership and thus a greater say in the ports' operations. Over time, Canadian ports could become candidates for full privatisation; an incremental approach allowing for a transformation without the need for another round of public hearings and Parliamentary input. Such a

phased approach for the full commercialisation of Canadian ports would smooth the ongoing operations and development of this important economic activity.

REFERENCES

1. W.J. Manning, *Study of Harbour Administration in Canada*, Department of Transport, Ottawa, 1968.

2. For further material on Canadian ports' evolution, see M.C. Ircha, "Institutional Structure of Canadian Ports", *Maritime Policy & Management*, 20:1, 1993, pp. 55-66.

3. M. Woodward and D.J. Fox, "Submission of the St. John's Port Corporation to the House of Commons Standing Committee on Transport Marine Policy Review", St. John's NF, March 1995.

4. R.J. Anthony, D. Frank and R. Frank, "Evaluation of Options for the Administration of the Port of Vancouver", Horizon Pacific Ventures Ltd., Burnaby BC, 1993.

5. M.C. Ircha, "Ports Evolution, Structure and Reform: U.S. and Canada", International Port Reform Seminar, Policy and Coordination Branch, Transport Canada, Ottawa, November 1993.

6. Hon. Doug Young, Minister of Transport, *Proceedings of the Standing Committee on Transport*, House of Commons, No. 21, Feb. 7, 1995, Ottawa, p. 6.

7. *Proceedings of the Standing Committee on Transport*, No. 21, Ottawa, Feb. 7, 1995, p. 5.

8. M.C. Ircha, "Commercialisation and Canadian Ports: Are They Ready?", *Proceedings*, Canadian Transportation Research Forum, Aylmer PQ, May 1995, pp. 714-728.

9. *Proceedings of the Standing Committee on Transport*, No. 24, Feb. 14, 1995, Quebec City, p. 19.

10. *Proceedings of the Standing Committee on Transport*, No. 26, Feb. 20, 1995, Vancouver, p. 16.

11. *Proceedings of the Standing Committee on Transport*, No.l 23, Feb. 13, 1995, Montreal, p. 39.

12. *Proceedings of the Standing Committee on Transport*, No. 24, Feb. 14, 1995, Quebec City, p. 6.

13. *Proceedings of the Standing Committee on Transport*, No. 23, Feb. 13, 1995, Montreal, p. 38.

14. *Proceedings of the Standing Committee on Transport*, No. 24, Feb. 14, 1995, Quebec City, p. 77.

15. *Proceedings of the Standing Committee on Transport*, No. 33, March 16, 1995, Saint John, p. 111.

16. *Proceedings of the Standing Committee on Transport*, No. 26, Feb. 20, 1995, Vancouver, pp. 129-130.

17. *Proceedings of the Standing Committee on Transport*, No. 28, Feb. 22, 1995, Hamilton, p. 104.

18. *Proceedings of the Standing Committee on Transport*, No. 26, Feb. 20, 1995, Vancouver, p. 8.

19. *Proceedings of the Standing Committee on Transport*, No. 24, Feb. 14, 1995, Quebec City, p. 10.

20. S. Keyes, Chairman, *A National Marine Strategy - Report of the Standing Committee on Transport*, Canada Communication Group, Ottawa, 1995, p. 21.

21. *Proceedings of the Standing Committee on Transport*, No. 28, Feb. 22, 1995, Hamilton, p. 95.

22. *Proceedings of the Standing Committee on Transport*, No. 26, Feb. 20, 1995, Vancouver, p. 85.

23. *Proceedings of the Standing Committee on Transport*, No. 28, Feb. 22, 1995, Hamilton, p. 7.

24. S. Keyes, *A National Marine* Strategy, Canada Communications Group, Ottawa, 1995, p. 8.

25. F.R. Wilson, "Marine Policy Workshop", Saint John, May 9, 1995.

26. R.B. Pelletier, "Summary: Marine Policy Workshop", Ste-Foy PQ, May 12, 1995, p. 4.

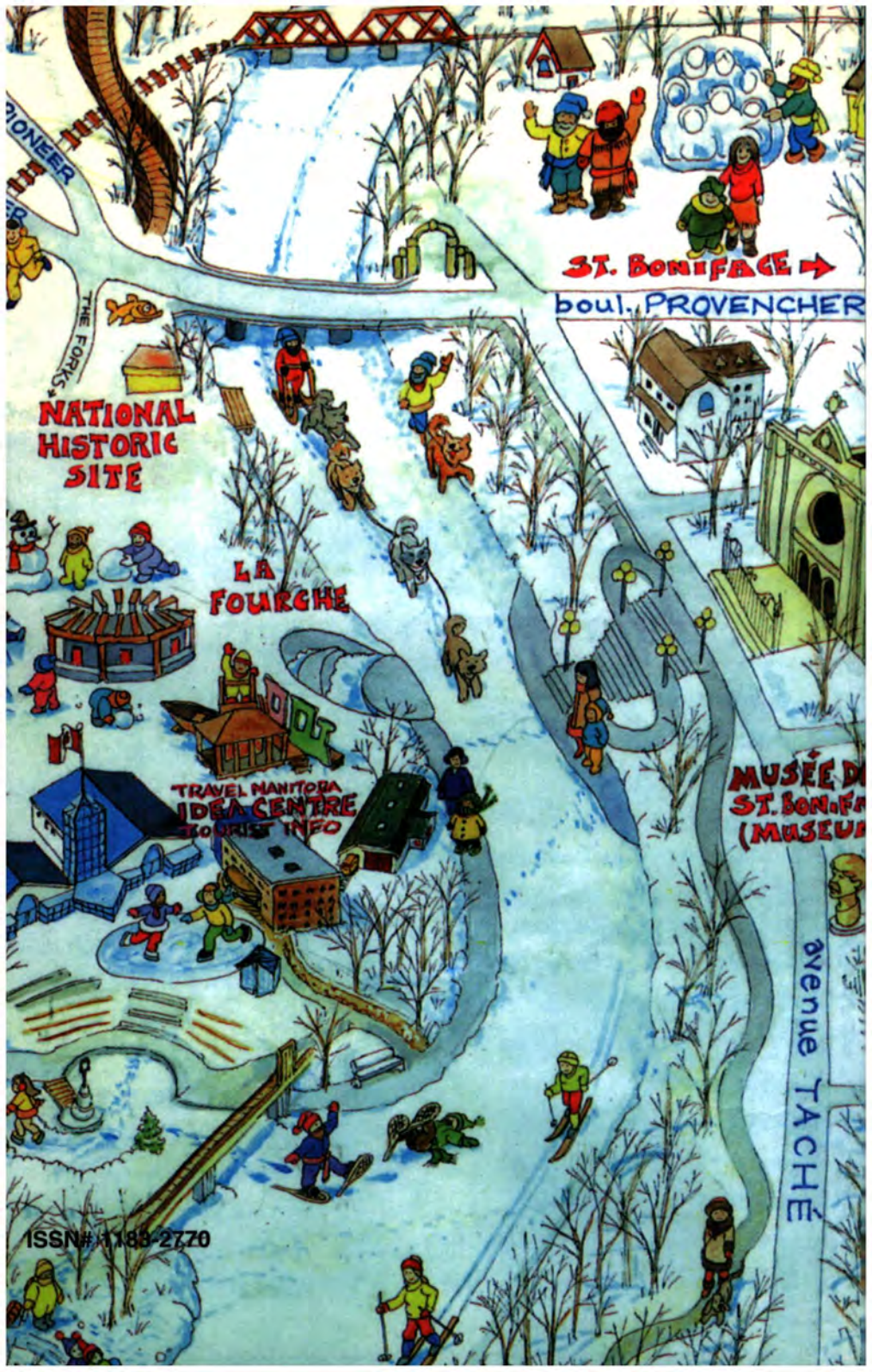
27. J. Heads, "Winnipeg: Marine Transport Policy Workshop", Winnipeg, May 24, 1995.

28. WESTAC, Marine Policy", Vancouver, May 31, 1995.

29. N. Mealing, "Marine Policy Issues Consultation Workshop", Thorold ON, May 18, 1995.

30. N. Mulder, "Marine Policy Reform", presentation to Annual Conference of the Canadian Port and Harbour Association, Chicoutimi PQ, August 27-29, 1995.

31. L. Ryan, "East/West Split Marks Cost Recovery Storm", *Canadian Sailings*, Jan. 22, 1995, pp. 40-41.



ISSN# 1188-2770