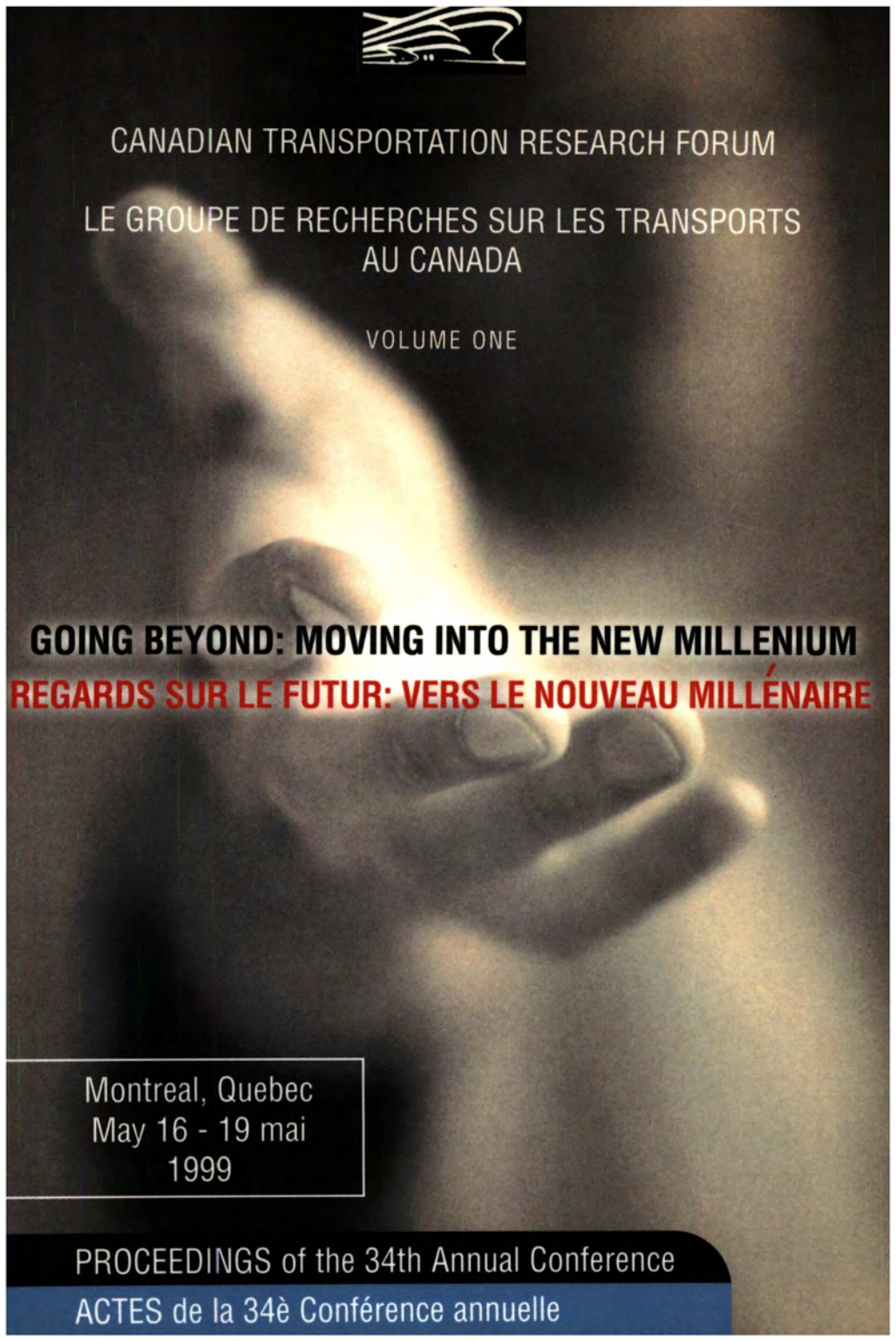


CANADIAN TRANSPORTATION RESEARCH FORUM

LE GROUPE DE RECHERCHES SUR LES TRANSPORTS AU CANADA

VOLUME ONE

GOING BEYOND: MOVING INTO THE NEW MILLENIUM

REGARDS SUR LE FUTUR: VERS LE NOUVEAU MILLÉNAIRE

Montreal, Quebec
May 16 - 19 mai
1999

PROCEEDINGS of the 34th Annual Conference

ACTES de la 34è Conférence annuelle

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President's Message

Welcome to the CTRF's 34th Annual Conference!

The CTRF Conference Proceedings stand as a permanent record of the ideas, issues and debates that have and continue to populate Canada's transportation landscape. This year's conference title "Going Beyond: Moving Into the Next Millennium" is not so much a theme as it is a challenge. As we prepare to enter into the next millennium, conference organizers are asking us to both pause and reflect on the ideas presented and captured in previous proceedings and dare to look over the precipice and catch a glimpse of what lies ahead. This year's exploration of the environment and the potential impact of the Kyoto Agreement certainly take us to the jumping-off point for the next millennium.

This year's Montreal team lead by Ron Rice, VP Program & Publications and Gerry Kolaitis, VP Meetings, attacked the conference with abounding enthusiasm. Accepting the conference title "Going Beyond" as their mantra, the 1999 conference is marked with the introduction of CTRF's first ever Professional Development Workshop. This year's workshop on International Marketing, lead by William Spur of Bombardier Transit Systems Division, deserves a special note reflecting both the dedication of the organizing committee to expand the meaningfulness of the CTRF and the commitment of the transportation sector. CTRF thanks Mr. Spur for volunteering his time, energy and experience.

The conference Proceedings present the membership's current work and include articles from the winners of the student paper competition. The preparation and printing of the Proceedings by the University of Saskatchewan is managed by Gail Sparks, CTRF Secretariat and we are grateful to Gail and the University for their collective efforts. A summary of the keynote address, panel discussions and the Bison Transport Cup Debate not covered within the formal proceedings will be distributed subsequently in the Forumation and at our website (www.vemax.ca/ctrf).

Finally, on behalf of the Board of Directors, thanks to all the CTRF members and conference sponsors for their continuing support.

Janet M Weiss, President

MESSAGE DU PRÉSIDENT

BIENVENUE À LA 34è CONFÉRENCE ANNUELLE DU GRTC

Les Actes de la conférence du GRTC constituent un registre permanent pour les idées, les questions centrales et les débats devant continuer à occuper et à aménager le paysage des transports du Canada. Le titre retenu pour la conférence de cette année, " Regards sur le futur: vers le nouveau millénaire ", constitue moins un thème qu'un défi. Alors que nous nous préparons à entrer dans le nouveau millénaire, les organisateurs de la conférence nous demandent à la fois de réfléchir et de méditer sur les idées fortes des Actes précédents et d'oser regarder par dessus le "précipice" pour entrevoir ce que l'avenir nous réserve .Cette année, le fait d'aborder l'environnement et les conséquences possibles de l'Accord de Kyoto nous conduira certainement au point ultime du saut vers le prochain millénaire.

L'équipe de Montréal de cette année, menée par Ron Rice, vice-président Programmes et Publications et Gerry Kolaitis, vice-président Conférences, s'est attelée à la tâche avec beaucoup d'enthousiasme. Faisant du titre de la conférence "Regards vers le futur" leur mantra, les organisateurs en ont marqué la conférence par l'introduction du tout premier Atelier de formation professionnelle du GRTC. Consacré au Marketing international, cet atelier dirigé par William Spur , de la Division Systèmes de transport en commun de Bombardier, mérite une mention spéciale reflétant à la fois le dévouement du comité organisateur d'élargir le champ d'intervention du GRTC et l'engagement du secteur des transports. Le GRTC tient à remercier M. Spur d'offrir ainsi son temps, son énergie et son expérience.

Les Actes de la conférence présentent le travail actuel des membres et les articles des gagnants de la compétition des étudiants. La préparation et l'impression des Actes à l'Université de Saskatoon sont dirigées par Gail Sparks , secrétaire du GRTC; nous sommes reconnaissants à Gail et à l'université pour leur effort commun. Un résumé du discours principal, les discussions en atelier et le débat de la Coupe Bison Transport , non inclus dans les Actes, seront rapportés ultérieurement dans *Forumation* et à notre site web (www.vemax.ca/ctrf).

Finalement, au nom du Conseil d'administration, j'adresse mes remerciements à tous les membres du GRTC et aux commanditaires de la conférence pour leur appui constant.

Janet M. Weiss, Président

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Facteurs de compétitivité et stratégies des transporteurs routiers au Québec[1]

par
Yvon Bigras, professeur
Institut de recherche sur les PME
Université du Québec à Trois-Rivières
et
Jacques Roy, professeur
Centre de recherche en gestion
Université du Québec à Montréal

1. INTRODUCTION

Conséquence de l'intégration économique de plus en plus poussée du continent nord-américain, l'industrie québécoise du transport routier est elle-même de plus en plus intégrée à une industrie d'envergure continentale. Les transporteurs québécois ont dû s'adapter à cette situation en modifiant leurs pratiques de gestion et leurs stratégies. Ils ont choisi de développer des niches de marché, de miser sur les nouvelles technologies de l'information et de la communication, d'implanter des systèmes leur permettant d'accroître la productivité de leurs équipements ou de contrôler leurs coûts, etc. Toutes ces stratégies n'ont certes pas eu le même succès, soit parce qu'elles n'assuraient pas un avantage concurrentiel à ceux qui les préconisaient, soit que certains facteurs de réussite dans les entreprises n'étaient pas présents. Après dix ans dans ce cadre plus concurrentiel, au moment où le secteur a connu des bouleversements profonds et où les ajustements ne semblent pourtant pas terminés, il apparaît opportun de tenter de comprendre les différentes stratégies qui ont été adoptées par les transporteurs routiers.

---

[1] *Nous voulons remercier le ministère des Transports du Québec (MTQ) ainsi que l'Association du camionnage du Québec (ACQ) pour nous avoir donné l'occasion de réaliser cette étude. Il nous aurait sans doute été difficile d'obtenir un aussi bon taux de réponse pour ce type de sondage sans la précieuse collaboration de l'ACQ.*

Cette communication fait suite à une étude qui nous a été confiée par le ministère des Transports du Québec (M.T.Q.) et l'Association du camionnage du Québec (A.C.Q.) et dont l'objectif est d'identifier les pratiques de gestion et les stratégies gagnantes. La communication fait donc le bilan des pratiques de gestion et des stratégies actuelles des entreprises de camionnage, afin d'identifier les facteurs de succès de ces entreprises dans cet environnement très concurrentiel. On cherche à identifier les pratiques de gestion et les facteurs susceptibles d'assurer un avantage compétitif à une entreprise de transport routier.

La cueillette d'information

La population visée par cette enquête est constituée des entreprises membres de l'Association du camionnage du Québec, auxquelles on a ajouté une centaine d'entreprises non-membres de l'A.C.Q. et possédant plus de 15 véhicules immatriculés. Nous nous intéressons aux principales entreprises de transport routier qui font du transport pour compte d'autrui et dont le siège social est au Québec, ce qui représentait environ 350 entreprises.

Les informations ont été colligées de deux façons, soit par des entrevues et un groupe de discussion et par un sondage postal. Le groupe de discussion était composé de 17 gestionnaires ou dirigeants d'entreprises de camionnage. C'est avec ce groupe qu'on a validé lors d'une première rencontre la liste des facteurs de compétitivité qui devaient être présentée dans le questionnaire. Suite à cette discussion, certaines corrections ont été apportées à la liste. Les entrevues ont été réalisées auprès du dirigeant de huit entreprises afin de valider les résultats du questionnaire postal. Il nous est en effet apparu nécessaire de faire ces rencontres plus poussées qui donnaient plus de latitude au répondant pour préciser, expliquer et nuancer ses réponses

Le questionnaire, envoyé aux 350 entreprises par la poste à la fin de février 1998, a été élaboré par l'équipe de recherche avec l'aide de représentants du M.T.Q. et de l'A.C.Q. Il comportait cinq sections et un total de 39 questions comportant parfois plusieurs sous-questions. La plupart des questions étaient fermées et le répondant devait cocher sa ou ses réponses. Un suivi téléphonique a été exécuté en mars par le personnel de l'A.C.Q. Un total de 83 questionnaires nous sont revenus dûment complétés avant la date de tombée. Cela représente un taux de réponse de 23,7%.

Caractéristiques des répondants

Donnons d'abord quelques caractéristiques des entreprises qui ont répondu au questionnaire. L'échantillon est composé d'entreprises d'âge très divers. La

médiane au niveau de l'année de création est 1977, ce qui veut dire que la moitié de l'échantillon est composée d'entreprises créées avant cette date. Par ailleurs 18 des 83 entreprises ont été créées en 1988 ou après. Au niveau du nombre d'employés, on constate que 53,2% des entreprises ont moins de 50 employés, la catégorie la plus importante étant celle des entreprises ayant entre 25 et 49 employés, soit 30,4% des entreprises. La moyenne d'employés pour l'échantillon est de 116 employés par entreprise, les plus nombreux étant les chauffeurs qui représentent 56,6% des employés, suivie par les employés de bureau et les manutentionnaires qui représentent respectivement 12,9% et 9,8% des employés. On retrouve par ailleurs une moyenne de 6 cadres par entreprise, ce qui représente 5,3% des employés.

Une autre variable de la taille des entreprises est le chiffre d'affaires qu'on avait regroupé en cinq catégories. La plus forte représentation est dans le groupe des entreprises de moins de 3 millions de dollars qui comptent pour 28,9% des répondants. Si on compte toutes les entreprises qui ont un chiffre d'affaires de moins de 10 millions, on y retrouve 71,1% de l'ensemble de l'échantillon. Une dernière variable qui mesure la taille des entreprises est le nombre de tracteurs et de camions qui appartiennent ou qui sont utilisés par les transporteurs. Les répondants au questionnaire exploitent en moyenne 49 camions ou tracteurs leur appartenant, près de 8 camions ou tracteurs loués et plus de 11 camions ou tracteurs appartenant ou loués par des voituriers-remorqueurs.

Il est par ailleurs intéressant de regarder d'où proviennent les recettes des entreprises par segments de marché. On peut d'abord regarder le pourcentage moyen que représentent les marchés sur une base géographique, soit:

- Local (même zone urbaine) 17,3%
- Intra Québec 40,5%
- Interprovincial 17,2%
- International 24,6%

Au niveau des types de marchandises, le pourcentage moyen des recettes est réparti de la façon suivante :

- Marchandises générales en charges partielles 12,7%
- Marchandises générales en charges complètes 51,0%
- Liquide en vrac 6,9%
- Autre vrac 14,6%
- Conteneurs 2,9%
- Autres 10,7%

Ce qui est aussi très intéressant c'est de regrouper les entreprises en segments de

marché aussi homogènes que possible. Pour faire cette segmentation, nous avons utilisé l'analyse typologique (« cluster analysis ») qui permet de regrouper les entreprises selon un critère statistique. Cela nous a permis de regrouper les entreprises en quatre segments selon l'importance des différents marchés géographiques desservis. On retrouve des spécialistes :

- du local et de l'intra Québec: 15 entreprises (18,8% des répondants);
- de l'intra Québec: 32 entreprises (40,0%);
- de l'intra Québec et de l'interprovincial: 11 entreprises (13,8%);
- de l'international: 22 entreprises (27,5%).

Au niveau des types de marché et des marchandises transportées, on a identifié quatre types de spécialistes :

- des chargements complets de marchandises générales: 38 entreprises (48,7%);
- des chargements partiels de marchandises générales: 16 entreprises (20,5%);
- du vrac liquide et autre: 16 entreprises (20,5%);
- les autres (transport hors norme, conteneur, spécialisés): 8 entreprises (9,6%).

2. PERFORMANCE FINANCIÈRE

Nous présentons d'abord les résultats rapportés par les entreprises participantes selon les trois critères de performance suivants : la croissance du chiffre d'affaires, le ratio d'exploitation et le rendement sur capitaux propres.

Croissance du chiffre d'affaires

En moyenne, la croissance du chiffre d'affaires prévue par les entreprises participantes pour l'année en cours s'établit à **12,4 %**. Ce taux est cependant très variable puisque 11% ont vu leur chiffre d'affaires baissé, 30% l'ont vu augmenter de 0,1 à 7,4%, 28% de 7,5 à 14,9%, 20% de 15 à 24,9% et finalement pour 11% il a augmenté de plus de 25%. Nous avons également analysé ces résultats selon le type de marchandises transportées et les marchés géographiques desservis. Les résultats sont présentés au tableau 1.

Malgré les variations importantes observées au tableau 1, il est important de souligner que les analyses statistiques ne révèlent pas de différences significatives dans les résultats obtenus selon les diverses catégories de transporteurs identifiées. Cette situation s'explique par la très grande variance observée dans les résultats. Ainsi, le fort taux de croissance moyen (22,7 %) observé chez les transporteurs oeuvrant surtout dans les marchés interprovincial et intra-Québec est associé à un écart-type presque deux fois plus élevé. Il en va

de même pour les autres catégories où les taux moyens de croissance sont particulièrement élevés. On ne peut donc pas affirmer que les transporteurs appartenant à ces catégories connaîtront nécessairement des taux de croissance plus élevés, même si en moyenne cela semble être le cas.

Tableau 1

Rendement sur capitaux propres selon le type de transporteur

Type de marchandises		Marchés géographiques	
▪ Générales (TL)	10,6%	▪ Local et intra	8,6%
▪ Générales (LTL)	10,4%	▪ Intra-Québec	8,9%
▪ Vrac	11,5%	▪ Interpro et intra	22,7%
▪ Autres	12,4%	▪ International	15,3%

Ratio d'exploitation

Pour les répondants, le ratio d'exploitation (dépenses/revenus) se situe en moyenne entre **0,95 et 0,974** pour l'année en cours. Il s'agit encore une fois d'un indicateur de performance très variable avec, par exemple, 17,3% qui ont un ratio supérieur à 1,00 et 9,3% qui ont un ratio inférieur à 0,90.

Les ratios d'exploitation étant très variés et relativement élevés, il devient encore plus pertinent de procéder à des analyses selon les différentes catégories de transporteurs. Le tableau 2 présente les résultats en fonction du type de marchandises transportées. Le total de chaque colonne étant égal à 100 %, il faut comparer chacun des résultats au pourcentage apparaissant dans la dernière colonne du tableau. A titre d'exemple, le premier chiffre du tableau se lit comme suit : 22,9 % des répondants appartenant à la catégorie TL (marchandises générales en charges entières) ont rapporté un ratio d'exploitation supérieur à 1,00 (i.e. les dépenses sont supérieures aux revenus) alors que seulement 16,9 % de tous les répondants ont rapporté un tel ratio.

On peut donc conclure que cette catégorie de transporteurs est sur-représentée parmi ceux qui ont un ratio d'exploitation supérieur à 1,00. Cependant, nos analyses statistiques ne révèlent pas de différences significatives dans les résultats obtenus selon les types de marchandises transportées, à cause du trop petit nombre de transporteurs observés dans chaque catégorie. Il se dégage néanmoins des tendances intéressantes. En effet, les transporteurs de charges entières semblent rapporter des ratios plus élevés que les autres alors que ceux oeuvrant dans le transport du vrac et des autres marchandises présentent au

contraire des ratios d'exploitation plus faibles.

Tableau 2
Ratio d'exploitation selon le type de marchandises

Ratio	TL	LTL	Vrac	Autres	Total
Supérieur à 1,00	22,9 %	13,3 %	7,1 %	14,3 %	16,9 %
Entre 0,975 et 0,999	31,4 %	13,3 %	21,4 %	0,0 %	22,5 %
Entre 0,950 et 0,974	25,7 %	60,0 %	14,3 %	42,9 %	32,4 %
Entre 0,925 et 0,949	5,7 %	6,7 %	21,4 %	0,0 %	8,5 %
Entre 0,900 et 0,924	8,6 %	0,0 %	21,4 %	14,3 %	9,9 %
Inférieur à 0,9000	5,7 %	6,7 %	14,3 %	28,6 %	9,9 %
# de répondants	35	15	14	7	100 %

Le tableau 3 présente les résultats obtenus en fonction des marchés géographiques desservis. Nos analyses ne révèlent pas de différences statistiquement significatives entre les résultats obtenus par les différentes catégories de transporteurs. On observe cependant quelques résultats intéressants comme le nombre relativement faible de transporteurs oeuvrant principalement au niveau local et intra-Québec rapportant des ratios moyens. Ils se situent plutôt aux deux extrêmes avec des ratios beaucoup plus élevés ou beaucoup moins élevés que les autres.

Rendement sur capitaux propres

Selon les résultats rapportés, le rendement moyen sur capitaux propres (revenu net/avoir des actionnaires) s'élève à **16,6 %** pour l'année en cours alors que la médiane se situe à 12 %. Il est intéressant de noter que, selon Statistique Canada, ce ratio s'établissait à 12,5 % en 1995. Encore une fois, d'importantes variations sont observées dans les résultats comme on peut le constater au tableau 4.

Nous avons également analysé les résultats obtenus par les transporteurs selon le type de marchandises transportées et les marchés géographiques desservis (tableau 5). Selon nos analyses statistiques, il existe des différences

Tableau 3
Ratio d'exploitation selon les marchés géographiques

Ratio	Local/ intra	Intra	Interpro et Intra	Inter-national	Total
Supérieur à 1,00	30,8 %	10,3 %	18,2 %	15,8 %	16,7 %
Entre 0,975 et 0,999	23,1 %	24,1 %	9,1 %	26,3 %	22,2 %
Entre 0,950 et 0,974	15,4 %	24,1 %	54,5 %	42,1 %	31,9 %
Entre 0,925 et 0,949	0,0 %	13,8 %	18,2 %	5,3 %	9,7 %
Entre 0,900 et 0,924	7,7 %	20,7 %	0,0 %	0,0 %	9,7 %
Inférieur à 0,9000	23,1 %	6,9 %	0,0 %	10,5 %	9,7 %
# de répondants	13	29	11	19	100 %

Tableau 4
Rendement sur les capitaux propres pour l'année en cours

Rendement	Pourcentage des répondants
Moins de 7,5 %	24,5 %
De 7,5 à 14,9 %	32,6 %
De 15 à 24,9 %	20,5 %
Plus de 25 %	22,4 %

significatives entre les résultats obtenus selon le type de marchandises transportées. A la lecture du tableau, il semble assez évident que les transporteurs de charges partielles (LTL) obtiennent des rendements largement supérieurs. Il en va de même pour les transporteurs dans la catégorie « autres marchandises » mais il faut être prudent dans ce dernier cas à cause du faible nombre de répondants dans cette catégorie.

Tableau 5
Rendement sur capitaux propres selon le type de transporteur

Type de marchandises		Marchés géographiques	
▪ Générales (TL)	12,0%	▪ Local et intra	29,9%
▪ Générales (LTL)	25,9%	▪ Intra-Québec	12,4%
▪ Vrac	12,6%	▪ Interpro et intra	21,5%
▪ Autres	32,3%	▪ International	13,2%

En ce qui concerne les marchés géographiques desservis, les analyses n'arrivent pas à démontrer de différences significatives à cause du faible nombre de répondants dans deux des quatre marchés, soient les segments « local et intra-Québec » et « interprovincial et intra-Québec ». Les variations sont également importantes dans les réponses obtenues dans ces catégories de marché.

Niveau de satisfaction par rapport à la performance

Nous avons demandé aux dirigeants d'évaluer leur niveau de satisfaction par rapport à la performance de leur entreprise au cours des cinq dernières années. Les résultats sont présentés à le tableau 6. Tout près de 40 % des répondants se déclarent totalement ou fortement satisfaits de la rentabilité de leur entreprise depuis cinq ans. Il est néanmoins quelque peu étonnant de constater que moins de 20 % des répondants soient faiblement ou pas du tout satisfaits de la rentabilité de leur entreprise quant on se réfère aux ratios d'exploitation présentés plus tôt. Il semble que les seuls mécontents soient ceux qui obtiennent des ration d'exploitation supérieurs à 1,00.

Le niveau de satisfaction est légèrement inférieur par rapport au rendement sur l'investissement, quoique 80 % des répondants sont totalement, fortement ou moyennement satisfaits de leur performance à cet égard. Les résultats sont encore plus satisfaisants au chapitre de la croissance des ventes alors que tout près des deux tiers des répondants se disent totalement ou fortement satisfaits de leur performance. Les résultats sont également très positifs en ce qui concerne la part de marché et le bilan de sécurité.

Tableau 6

Satisfaction par rapport à la performance de l'entreprise au cours des cinq dernières années (%)

	Totale-ment	Forte-ment	Moyen-nement	Faible-ment	Pas du tout
Profitabilité	11,0	28,0	42,7	12,2	6,1
Rendement sur l'investissement	8,5	24,4	47,6	13,4	6,1
Croissance des ventes	14,6	51,2	26,8	7,3	0,0
Part de marché	8,5	36,6	46,3	7,3	1,2
Sécurité	17,3	50,6	27,2	2,5	2,5

3. LES STRATÉGIES DE MARCHÉ

Plusieurs stratégies peuvent être adoptées par les transporteurs routiers de marchandises selon le segment de marché exploité. Les plus courantes sont les stratégies d'avantages de coûts, de différenciation, et de concentration ou spécialisation dans un créneau ou une niche spécifique (Allaire et Firsirotu, 1993).

La stratégie d'avantages de coûts consiste pour une entreprise à rechercher et à faire entrer en jeu des avantages de coûts dans un marché où les acheteurs sont très sensibles aux moindres variations de prix. Contrairement à ce que l'on pourrait croire à première vue, il s'agit d'une stratégie relativement peu répandue car elle est associée à des produits et services très homogènes pour lesquels il existe peu de segments d'acheteurs et peu de possibilités de différenciation.

La stratégie de différenciation consiste pour une entreprise à offrir un produit ou service supérieur quant à l'un ou l'autre de ses attributs jugés importants par les acheteurs d'un segment de marché ou, à tout le moins, persuader une partie des acheteurs que ses produits ou services sont effectivement supérieurs.

Enfin, les stratégies de niche ou de créneau peuvent prendre deux formes : la

concentration ou la spécialisation. Une stratégie de concentration dans un créneau consiste à cibler un groupe d'acheteurs qu'on estime mal desservis par les généralistes. Cette stratégie repose sur la négligence et l'indifférence des firmes en place ou des contraintes empêchant les généralistes de bien desservir certains segments d'acheteurs ou de territoires. Quant à la stratégie de spécialisation, elle se veut une attaque directe de la part d'une nouvelle firme spécialisée qui veut expulser les généralistes d'un segment de marché en concevant une nouvelle façon de desservir ce segment.

Les stratégies adoptées

Selon les résultats du sondage, les transporteurs québécois ont eu recours à différentes stratégies de marché depuis cinq ans. Les stratégies de différenciation semblent particulièrement populaires selon le tableau 7 puisque 100 % des répondants cherchent à se différencier des autres par la qualité et la flexibilité du service offert à la clientèle ! On peut cependant s'interroger sur la signification de ce résultat car il est évident que tous les répondants ne peuvent pas réussir à se démarquer des autres sur cet attribut ... malgré leur bonne volonté. Il est également intéressant de constater que près de la moitié des répondants cherchent à se différencier des autres transporteurs en ayant recours à des technologies modernes telles l'EDI, l'internet et le positionnement par satellite. Comme on sait que l'utilisation de ces technologies est appelée à croître de façon importante d'ici cinq ans, il sera donc de plus en plus difficile de se démarquer de cette façon. D'autre part, environ 35 % des répondants cherchent à se différencier en adoptant une démarche qualité comme la certification ISO 9002, et seulement 30 % en offrant une gamme élargie de services logistiques comme l'entreposage et la gestion des stocks, pratique cependant appelée à se développer d'ici cinq ans.

Plusieurs transporteurs ont également adopté des stratégies de niche ou de créneau dans les cinq dernières années. Ainsi, 56,6 % des répondants se sont spécialisés dans le transport de produits exigeant un soin particulier alors que 44,6 % ont concentré leurs activités dans une région ou un territoire spécifique. On remarque enfin qu'environ le quart des répondants 25,3% ont concentré leurs efforts dans un secteur industriel en particulier.

Par contre, lorsque l'on demande aux répondants d'identifier la principale stratégie adoptée par leur entreprise depuis cinq ans, on obtient les résultats indiqués au tableau 8. On constate que la réduction des coûts arrive occupe le premier rang des stratégies adoptées par les transporteurs routiers avec 41,3 % des répondants. Suivant de près au deuxième rang, on retrouve 38,8 % des répondants qui optent plutôt pour la différenciation. Loin derrière, au troisième

rang, on obtient 13,8 % des répondants qui ont choisi de se concentrer sur une niche ou un créneau. Enfin, on retrouve ceux qui ont préféré se différencier des autres transporteurs en diversifiant la gamme de services offerts à leur clientèle, soit un maigre 5 % des répondants.

Tableau 7
Éléments de différenciation

Élément	Pourcentage des répondants
Qualité et flexibilité du service	100,0 %
Recours à des technologies	49,4 %
Adoption d'une démarche qualité	34,9 %
Gamme de services logistiques	30,1 %

Tableau 8
La principale stratégie adoptée depuis 5 ans

Stratégie	Pourcentage des répondants
Réduire ses coûts	41,3 %
Se différencier des autres	38,8 %
Se concentrer sur une niche	13,8 %
Diversifier la gamme de services	5,0 %
Autres stratégies	1,3 %

Les stratégies gagnantes

Nous avons cherché à identifier les stratégies gagnantes, c'est-à-dire les plus performantes, en analysant les relations entre les stratégies adoptées par les transporteurs et les résultats rapportés selon les différents critères de performance utilisés, soit la croissance du chiffre d'affaires, le ratio d'exploitation et le rendement sur capitaux propres. Une seule analyse s'est avérée statistiquement significative, soit celle mettant en relation les différentes stratégies adoptées depuis cinq ans et le rendement sur les capitaux propres pour l'année en cours. Il est d'ailleurs intéressant de noter que, de l'avis des

transporteurs rencontrés lors des groupes de discussion, c'est ce dernier critère qui semble le plus pertinent pour évaluer la performance financière des entreprises de camionnage.

Selon les résultats de cette analyse, les entreprises ayant déclaré les rendements les plus élevés sont également celles qui se sont concentrées sur une niche ou un créneau. Celles-ci sont suivies de près par les entreprises ayant opté pour une diversification de la gamme de services offerts. En troisième lieu, on retrouve celles qui cherchent à se différencier alors que celles qui ont adopté une stratégie de réduction de coûts ferment la marche avec un rendement moyen inférieur à celui de l'échantillon. Nous préférons ne pas dévoiler le rendement moyen rapporté par chaque groupe d'entreprises à cause du nombre relativement faible de cas dans certaines catégories. De plus, à cause de la variance des résultats rapportés pour chaque catégorie, il faut éviter de conclure trop hâtivement à la domination de certaines stratégies par rapport à d'autres. En fait, certaines entreprises ayant poursuivi des stratégies de réduction de coûts rapportent également des rendements sur capitaux propres très intéressants. Néanmoins, on peut affirmer qu'en général, il ne soit pas suffisant pour une entreprise de transport routier de réduire ses coûts pour obtenir un rendement supérieur à la moyenne. Il lui faut de plus poursuivre d'autres stratégies comme la concentration sur une niche ou la différenciation par rapport aux autres transporteurs.

Les stratégies adoptées par segment de marché

Nous avons également analysé les stratégies adoptées par les transporteurs selon les types de marchandises transportées et les marchés géographiques desservis. Le tableau 9 indique les stratégies adoptées en fonction des principaux types de marchandises transportées. L'analyse statistique que nous avons réalisée ne révèle aucune relation significative entre les stratégies adoptées et le type de marchandises transportées. Il ne semble donc pas y avoir de différences statistiquement notables entre les stratégies adoptées par les entreprises selon qu'elles soient spécialisées dans le transport de charges entières, de charges partielles, de vrac ou d'autres marchandises.

Le tableau 10 présente les résultats de l'analyse effectuée en fonction des territoires géographiques principalement desservis. Dans ce cas, l'analyse statistique révèle des différences significatives entre les stratégies adoptées par

Tableau 9
Stratégies adoptées selon le type de marchandises

Stratégies	TL	LTL	Vrac	Autres	Toutes
Réduire ses coûts	36,8 %	46,7 %	56,3 %	37,5 %	42,9 %
Concentrer sur une niche	15,8 %	13,3 %	6,3 %	25,0 %	14,3 %
Se différencier	42,1 %	33,3 %	31,3 %	37,5 %	37,7 %
Diversifier les services	5,3 %	0,0 %	6,3 %	0,0 %	3,9 %
Autres stratégies	0,0 %	6,7 %	0,0 %	0,0 %	1,3 %
# répondants	38	15	16	8	100 %

Tableau 10
Stratrégies adoptées selon les marchés géographiques

Stratégie	Local/ intra	Intra	Interpro/ Intra	Interna-tional	Toutes
Réduire ses coûts	20,0 %	51,6 %	72,7 %	28,6 %	42,3 %
Concentrer sur une niche	26,7 %	9,7 %	9,1 %	14,3 %	14,1 %
Se différencier	38,7 %	9,1 %	40,0 %	52,4 %	38,5 %
Diversifier les services	13,3 %	0,0 %	0,0 %	4,8 %	3,8 %
Autres stratégies	0,0 %	0,0 %	9,1 %	0,0 %	1,3 %
# répondants	15	31	11	21	100 %

les transporteurs en fonction de leur territoire géographique desservi. C'est ainsi que les entreprises concentrées dans l'intra Québec sont relativement plus nombreuses à chercher à adopter des stratégies de réduction de coûts et moins nombreuses à se concentrer sur des niches. Les entreprises spécialisées à la fois dans le transport interprovincial et intra Québec adoptent sensiblement le même comportement. Au contraire, les entreprises oeuvrant surtout dans le transport local et intra Québec sont relativement moins nombreuses à adopter prioritairement des stratégies de réduction de coûts et plus nombreuses à se concentrer sur des niches et à diversifier leur gamme de services. Enfin, les transporteurs oeuvrant surtout à l'international ont un comportement semblable au dernier groupe et cherchent davantage à se différencier des autres.

4. CONCLUSIONS ET RECOMMANDATIONS

Certains résultats de l'enquête, qui n'ont pas été présentés ici, nous montrent qu'on assiste depuis quelques années à un phénomène de concentration de la clientèle qui se mesure de la façon suivante : les dix principaux clients d'une entreprise de transport représentent en moyenne 67,6 % du chiffre d'affaires. Cette forte dépendance des transporteurs envers un nombre restreint de clients les amène à adopter des comportements dont les effets ont été mesurés dans notre étude. Ainsi, dans un souci de mieux répondre aux besoins de leurs clients, les transporteurs élargissent de plus en plus la gamme de services offerts comme l'entreposage, la gestion des stocks et la préparation de commandes. On assiste également à une assez forte croissance dans l'utilisation de nouvelles technologies d'information et de communication dans le but, la plupart du temps, d'offrir un meilleur service à la clientèle. On n'a qu'à penser ici aux clients exigeant de plus en plus des communications en mode EDI ou internet. Enfin, les résultats de notre sondage indiquent clairement la priorité qu'accordent les transporteurs à la fiabilité et à la ponctualité du service offert à leurs clients comme facteurs de compétitivité.

On a par ailleurs vu l'importance accordée par les transporteurs à la réduction des coûts. Ils en ont d'ailleurs fait leur principale stratégie depuis cinq ans. Cette emphase sur les coûts se manifeste également par d'autres résultats de cette étude. Il en est ainsi de l'importance accordée aux systèmes de gestion financière comme un des cinq principaux facteurs de compétitivité. Il en va de même des ententes entre transporteurs qui ont pour but de mieux utiliser l'équipement et qui sont devenues relativement importantes. On assiste également à une utilisation accrue des voituriers remorqueurs et cette tendance devrait se maintenir durant les prochains cinq ans.

Le principal objectif de cette étude était alors d'identifier les stratégies et pratiques de gestion susceptibles d'améliorer la performance des entreprises de transport routier des marchandises au Québec. Or notre enquête révèle l'existence d'une très grande diversité de stratégies et de pratiques de gestion. Il ne semble pas y avoir de solution miraculeuse et universelle. On a certes identifié, lors de nos analyses, des segments de marché qui semblaient offrir de meilleurs rendements, comme celui des charges partielles par exemple. Mais la très grande variabilité des résultats observés, à l'intérieur des différentes catégories examinées, nous amène à interpréter ces analyses avec beaucoup de prudence.

Néanmoins, malgré l'importance qu'il faut accorder au contrôle et à la réduction des coûts pour demeurer compétitifs dans cette industrie, il semble que cela ne soit pas suffisant. En effet, nos analyses statistiques démontrent clairement que les entreprises ayant adopté des stratégies autres que la réduction des coûts sont également celles affichant des rendements les plus élevés. Ceci est particulièrement vrai pour les entreprises ayant adopté des stratégies de niche ou de créneau.

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Fee-setting in Canadian Domestic Air Navigation Services

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1.0 INTRODUCTION

Canada commercialized its air navigational system (ANS) in November 1996. Transport Canada (TC) personnel and equipment were transferred to a non-share corporation called NAV CANADA, governed by a board of directors drawn from stakeholder groups. Transport Canada retained a purely regulatory role, ensuring that safety standards were maintained. The transfer was effected by an act of Parliament known as "the ANS Act".[2]

NAV CANADA was expected to cover its costs by some form of fee structure, which would replace the Air Transportation Tax. The Act contained a number of constraints, but the corporation was also required to act within the norms of international practice. This paper concerns the consultation process, the safeguards in the ANS Act, and the early issues in implementing a fee structure in the commercialized ANS, particularly those that arose in the north.

1.1 Origins of Commercialization

In early 1994, the federal budget signaled the intention of the government to commercialize the ANS in order to improve efficiency without reducing safety. Stakeholders, including the air traffic controllers union (CATCA), the airline pilots' unions, the Air Transport Association of Canada (ATAC) which

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[2] Statutes of Canada 1996, Chapter 20, *An Act respecting the commercialization of civil air navigation services,* (hereafter the ANS Act).

represents air carriers, and the Canadian Business Aircraft Association (CBAA), had lobbied for the ANS to be run as a business. The idea had also been proposed by a Royal Commission on National Passenger Transportation,[3] and a ministerial task force.

The ANS employed over 6000 people, including 2300 air traffic controllers, 1000 Flight Service Specialists, and 1100 electronic technicians. TC maintained 105 Flight Service Stations and 55 control towers, as well as the radio aids to navigation (navaids), radar, and data processing systems required for the work.[4] The system provided services for the world's second largest country, and a considerable portion of the North Atlantic. Annual expenditures were $800 million,[5] which did not include related expenses incurred by a number of other government departments.

The system was funded by an Air Transportation Tax (ATT) levied on passenger tickets. This raised about $550 million in 1994. Revenues from fees on international flights generated another $50 million. The remainder of the expense was funded from general tax revenues.[6]

The general view of the user community was that the system was underfunded, and would not keep up with future requirements because of government austerity programs. At the same time, there was a feeling that government procurement, staffing, training, and labour relations processes were far too cumbersome and added unnecessary cost to the system.

1.2 Structure of the Corporation

The term "commercialization", as is it used by the Canadian government, refers more to a series of desirable traits than to a specific structure. Several models were discussed for the new entity, including a Special Operating Agency of government, a Crown Corporation, a government owned - company operated enterprise, a mixed enterprise, a not-for-profit corporation, and a fully privatized enterprise.[7]

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[3] Canada Communications Group. *Directions*. Volume 1, pp. 126-127.

[4] Transport Canada "Discussion Paper Number 1: Principles and Options for Commercialization" TP12203E, Appendix A, in *The Study of the Commercialization of the Air Navigation System in Canada*, p. 5. Hereafter, the documents in this study are referred to by their (TP) volume numbers.

[5] Costs and prices in this paper are expressed in Canadian dollars.

[6] TP12203E: 6

[7] TP12202E: 20-24

Eventually, NAV CANADA was incorporated as a non-share capital corporation. It is a not-for-profit corporation, reporting to a stakeholder Board of Directors. Any profits generated must be reinvested in the corporation, used to pay down debt, or repaid to the users in the form of decreased fees. The Board is composed of five members nominated by the industry, two by unions, three by the federal government, and four by the board itself, plus a Chief Executive Officer.

1.3 The ANS Act

The ANS Act contains a number of provisions that constrain the design of a fee structure. Perhaps the most important provision is that charges must not be structured in a manner that might encourage users to engage in unsafe practices to avoid a charge. This would exclude such forms as fees for flight plan filing or pre-flight weather briefings.

NAV CANADA is required to publish the methodology, with a clear explanation of its terms and conditions. The structure may not discriminate between Canadian and foreign air carriers, or between the domestic and international flights of air carriers. It must also be consistent with the international obligations of the Government of Canada.

The charges must, however, differentiate between the services provided for take-offs and landings, and those for the provision of in-flight services, and must allocate these costs reasonably. Charges for recreational and private aircraft must not be unreasonable or undue. Finally, the charges must not exceed a reasonable projection of the costs of operating the ANS, including the costs of capital equipment, operating expenses and financial costs.

1.4 ICAO Guidelines and International Practice

The International Civil Aviation Organization publishes guidelines for charging principles.[8] The need to respect the ICAO principles and to remain consistent with international practice placed constraints on the solutions available to the corporation. Canada is a large country, and its airspace is transited extensively by aircraft on Europe-to-US and -Far Eastern routes. The international charges, based on aircraft weight and distance flown in Canadian airspace, constituted new costs for these carriers. There was therefore a considerable concern that these be equitable.

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[8] Charging principles are found in ICAO: Statements by the Council to Contracting States on Charges for Airport and Air Navigation Services and Manual on Air Navigation Services Economics.

1.5 Northern and Remote Regions

The "northern and remote regions" referred to include the Northwest Territories, Yukon Territory, and northern Quebec.[9] The area is sparsely populated, and consists of widely scattered settlements, which are heavily dependent on air transport. The Nunavut settlement area of the Northwest Territories, for example, constitutes 20 percent of the Canadian landmass, but is occupied by only 25,000 people. The low population and large distances contribute to high transportation costs.[10] Northern air carriers derive a large portion of revenue from freight, rather than passengers.

The discussion papers which formed the basis for public consultation prior to the formation of NAV CANADA contained a clear recognition that some sort of cross-subsidy of the northern portion of the ANS was inevitable but also acknowledged the need to "insulat[e] an ANS corporate entity from the potentially costly and conflicting roles of managing in commercial and social environments simultaneously".[11]

The ANS Act included specific safeguards for northern regions. It states that "charges for designated northern or remote services ... must not be higher than charges for similar services utilized to a similar extent elsewhere in Canada".[12] This reflects the most central concern of the stakeholders at the time the Act was written, which was that the ANS operator would attempt to extract full cost recovery at the site level, imposing costs on many routes that were too high for the delicate market to bear.

2.0 PHASE ONE FEES

The ANS Act required NAV CANADA to announce a fee structure by the second anniversary date of transfer, which would recover its costs when the Air

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[9] The communities are specified in Schedule A of the *Department of Transport Agreement*, between NAV CANADA and Transport Canada.

[10] The characteristics of the northern system, and the strategic re-design of the ANS underway at the time of the fee consultations, are discussed in greater detail in Raymon J. Kaduck (1998), *NAV CANADA's Provision of Air Navigational Services in Northern and Remote Areas*, Selected Proceedings of the 8th WCTR, Antwerp.

[11] TP12204: 12. This concern reflected the sentiments of the Airways Corporation of New Zealand, which had prepared a working paper on the international experience (TP12205E), and which operated as a State Owned Enterprise in a much more interventionist government structure.

[12] ANS Act 35. (1) (g).

Transportation Tax (ATT) was eliminated.[13] NAV CANADA decided to introduce the new fees in two phases. During Phase One, to commence on 1 November 1997, large commercial aircraft were to be charged one half the eventual fee, with the remaining costs met by ATT. By November of 1998, large aircraft fees would rise to their final level, and the ATT would be reduced to zero. In the second phase, smaller aircraft would also be charged fees.

2.1 Phase One Fees: Initial Consultations

The first test of the legislation came in early summer of 1997, when NAV CANADA announced its proposed fee structure for Phase One. The proposal shifted the charging basis from a tax based on passenger tickets (ATT) to a fee based on maximum take off weight (MTOW) of the aircraft and distance.[14] At the same time, terminal charges were assessed on aircraft departing aerodromes served by NAV CANADA units.[15]

The Act recognized the need to switch from a tax base to a fee structure, and had included a number of constraints on the nature of fees, such as safeguards against discriminatory imposition of charges. At the same time it attempted to allow the Corporation as much flexibility as possible in going about its business.

The ATT applied only to the passenger carriers using large aircraft, and therefore these carriers, and their customers, carried the full burden of the system. The "ticket tax"[16] was inequitable because all-cargo operators used the same services as passenger carriers, but were not charged. The major scheduled carriers objected to the "free-riding" of cargo operators and general aviation and operators using aircraft of less than 8 tonnes.

2.2 Carrier Reaction and NAV CANADA Response

Northern operations have certain structural features that increased the impact of the transition to MTOW-based fees. Northern operators generally use larger

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[13] Users have pointed out that the tax is not eliminated, but merely reduced to zero, implying the ability of future governments to raise it again. This remains a concern in an industry already subject to heavy taxation.

[14] The proposed enroute charging formula was \$0.02174 x Distance x $MTOW^{0.9}$ in Phase One.

[15] The proposed terminal charge was \$7.74 x $MTOW^{0.9}$ in Phase One.

[16] The ATT calculation for a domestic or transborder flight is a fixed fee of \$6.00, plus 7 per cent of the price of the airfare, to a maximum of \$55.00. International (other than US) flights are charged a \$55.00 fee.

aircraft than would be used on a similar route in the south. Because they derive a large portion of revenue from freight, they tend to use combi configurations. The freight traffic is uni-directional, with next to no southbound cargo. The high proportion of freight, which had not been subject to the ATT previously, meant that the effect of the change to MTOW-based fees was more pronounced for northern carriers than for those in the south.

Under the NAV CANADA fee structure, the replacement of ATT may more than offset costs, allowing southern passenger carriers to reduce total ticket price. For northern operators, who carry relatively fewer passengers on large aircraft, the ATT reduction does not off-set the MTOW-based fees and, as operators were quick to point out, is applied equally to aircraft which are southbound, carrying no freight to off-set costs.

A second concern was raised by the proposal to charge terminal fees at Community Aerodrome Radio Stations (CARS). While NAV CANADA provides ANS services through ATC towers and Flight Service Stations (FSS), it also funds another service at smaller airports. The CARS are operated by territorial governments in NWT and Yukon, and provide basic traffic advisories, and limited weather information. Some users objected to paying user fees at CARS that were identical to those being charged at international airports, where ATC terminal units existed.

Northern carriers and stakeholders immediately criticized the new fee structure. NWTAir, in its initial CBC radio interview, suggested that it would result in a 20 percent increase in freight rates. Certainly, NWTAir was likely to be adversely impacted. Their fleet consisted of several B737 combi aircraft equipped for gravel runways, and a Hercules transport aircraft. The size of the aircraft, and the relative importance of freight to the bottom line, made them particularly vulnerable.

NAV CANADA had not anticipated this reaction since, in its estimation, the impact would be reasonably low. Since unit costs for smaller carriers are generally higher, the application of uniform fees would, if anything, be less significant. If NAV CANADA succeeded in reducing system costs, these savings would eventually be passed down as well.

The Government of the Northwest Territories (GNWT) led a coordinated effort against the fee structure. The NWT was clearly the most affected jurisdiction, and the government sought support from other provincial transportation

ministries, the Northern Air Transport Association,[17] and the individual carriers. The federal Department of Indian Affairs and Northern Development (DIAND) took a strong interest since its "food mail" subsidy program was capped by budget restraint, and could not accommodate a significant price increase.

NAV CANADA doubted that the impact was nearly as high as some stakeholders felt it was.[18] Further analysis revealed that the initial indications were, indeed, high. First Air would later attribute price increases of 3 percent on passenger tickets and 5.5 percent on freight to the impact of Phase One fees.[19] The airline indicated that in late 1997 its scheduled services were running at a loss.[20] By NAV CANADA's calculations, the net impact on First Air's operations would be close to 3 percent of operating revenues, but this would represent a cost to northern consumers of $2 million per year.[21]

On August 13th, 1997, NAV CANADA announced changes to the proposal. The implementation of phase one fees was deferred until March 1998 to allow the carriers more time to reprogram their computer reservation systems for the ATT changes. CARS were exempted from terminal charges for the period from March 1 until November 1, 1998, and NAV CANADA indicated that this exemption might later be extended, based on the results of user consultations. The aircraft size to which Phase One fees applied was raised from 5.7 metric tonnes to 8 tonnes, again until November 1, 1998.[22] These changes deferred,

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[17] The Northern Air Transport Association (NATA) is the trade association for northern air carriers. Although not all operators participate in NATA, the "majors" -- Canadian North, NWTAir, and First Air -- are members, as well as many smaller fixed wing and helicopter operations.

[18] NWTAir was later quoted as estimating the range from 20-30 percent, and this range became widely quoted ("New Fees mean 'staggering' jump in air freight rates", Nunatsiak News, August 1, 1997, p. 3).

[19] "First Air Prices Take Off" in News/North, 24 November 1997, p. A23. The NAV CANADA increases were to take effect on 1 March 1998. At the same time, the airline also announced tariff increases of 3 percent on passenger fares and 4.5 percent on cargo, effective 1 January 1998, which it attributed to overall economic conditions in the north.

[20] "Our Fares are Going Up in the New Year. We'd Like You to Know Why." Paid advertisement News/North, 1 December 1997.

[21] User Charges: Presentation to Northern Air Transportation Industry, Northern Governments, November 26, 1997.

[22] NAV CANADA News Release No. 17/97.

but did not eliminate the main cost issue, which was the impact of switching the charging basis from the ATT to user charges based on MTOW.

3.0 PHASE TWO FEES

The second phase user charges presented a more complex problem, both in terms of equity and ease of administration, and required considerable consultation with stakeholders. The Phase Two fee structure applies to smaller aircraft of types used by bush operators and private aviators. It had to be implemented by November 1998, at which time the ATT was to be reduced to zero.

NAV CANADA was faced with a conundrum. Ideally, it would charge small operators on a charging formula similar to the one established for the larger aircraft. Given the multitude of types in the lower weight category, however, this structure would have significantly increased bureaucratic overhead and complexity, for a relatively small increase in revenues. It would also likely have been too onerous for small operators and private owners. Finally, it was argued that these aircraft are generally flown under Visual Flight Rules (VFR) and do not consume the higher cost air traffic control services required when operating under Instrument Flight Rules (IFR).

3.1 Initial Consultations

In November 1997, NAV CANADA commenced its public consultation on Phase Two fees and, in February 1998, released a discussion paper that highlighted the major issues and some possible approaches to the fee structure.[23] The paper clearly indicated that it was not a proposal, but a means of facilitating discussion during the development of the fee structure.

The discussion paper highlighted the salient features of the less than 8 tonne class. Most (89 percent) are piston engined aircraft, the majority of these in the 0-2 tonne range, and they are flown approximately 50 hours per year.[24] Helicopters make up 8 percent, turboprops 3 percent and jets less than 1 percent of the class. Aircraft in commercial use typically log 2-7 times the hours of equivalent aircraft in recreational use.

NAV CANADA initially considered two charging methods. The first was a fuel fee levy on aviation gasoline for piston engined aircraft. This was

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[23] NAV CANADA Discussion Paper on Development of Phase II Service Charges.
[24] ibid. p. 6

attractive because the vast majority of the class could be covered by an avgas levy. Increases in hours flown (and avgas consumed) could reasonably relate to increased consumption of air navigational services.

The federal government collects an excise tax on avgas and turbo fuel and, in the minds of many aviators, this tax was collected to fund the ANS. In fact, the government did not earmark the funds for any specific purpose, but simply included them in the general tax revenues. The argument was based on the fact that turbo fuel is taxed at 4 cents per liter, while avgas is taxed at 11 cents per liter. Turboprop and jet aircraft use turbo fuel, and the large carriers, whose customers funded the ANS through the ATT, use these types almost exclusively. Most private small aircraft run on avgas. The 7 cent premium was assumed to contribute to the ANS.

NAV CANADA proposed that the federal government turn over these revenues to it as the contributions of small aircraft operators or, alternatively, drop the excise tax by 7 cents per liter, and allow NAV CANADA to impose an equivalent levy in place of a fee. It argued that the general tax revenues had supported infrastructure but, since the federal government had withdrawn from providing most aviation infrastructure, it was reasonable that taxes be reduced accordingly.

The other charging method considered in the discussion paper was a flat fee of some description, which would apply to various categories of aircraft. In its proposal for flat fees, NAV CANADA assumed that the 7 cent per liter fee for piston aircraft under 2 tonnes was a reasonable starting point. It structured fees on this "anchor" upward from that point, based on a number of factors including aircraft weight, powerplant and IFR versus VFR operation.[25]

The discussion paper approach was useful in a variety of ways. First, it allowed a discussion about various ways fees might be applied to reach a given revenue target, taking an example which might receive initial support, but without committing to the target. Second, it allowed a frank discussion of what disutilities were inherent in each approach. Third, it created a forum in which it was possible for stakeholders to work with NAV CANADA toward the preferred approach, which would cost them no additional charges. Finally, since there was no *a priori* basis for setting fees, this method allowed NAV CANADA to gauge the price sensitivity of the small aircraft operators.

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[25] Ibid. p.14. Instrument Flight Rules (IFR) aircraft are assumed to use the full range of ANS services, while Visual Flight Rules (VFR) use only a subset.

3.2 Carrier Reaction and NAV CANADA Response

NAV CANADA's attempt to fund small aircraft operations from an existing tax pool was met with predictable support from users. Also, predictably, the Department of Finance was less enthused. There were problems in directing tax money to a non-government corporation. The Finance department was not interested in reducing its revenues at a time when it was trying to balance the federal budget. Furthermore, there were legal impediments, at least in the opinion of Finance, to any entity other than government collecting a tax or levy.

One of the anticipated problems of a flat fee system is that there will always be issues over the definition of weight categories. In a number of cases, aircraft of different size are deployed in competition on the same routes, or bidding for the same business. For example, in charter service, the DeHavilland Twin Otter and Cessna Caravan have similar capacity, but one would fit in the 5-6 tonne range, the other in the 3-4 tonne. In scheduled service, the Beech 1900, an under-8 tonne aircraft, competes with the DeHavilland Dash-8, which is over 8 tonnes, and therefore subject to the Phase One fee structure. These sort of competitive issues led to a number of refinements of the proposal.

No matter how detailed the analysis and mitigations, however, there will always be distortions. Nothing constrains manufacturers from producing new aircraft or variants that confound the formula although, in the long run, operators will consider this factor in their aircraft purchases along with any other operating cost.

3.3 New and Revised Charges – September 1998

NAV CANADA received statutory approval from the federal Transport Minister on 11 September 1998, and published its new and revised schedules five days later. These charges would come into effect on 1 March 1999.

Small aircraft owners were charged an annual flat fee of $60 for aircraft up to 2 tonnes and $200 for those up to 3 tonnes. This represented a significant reduction from the initial figures used in the discussion paper, and did not discriminate between piston and turboprop powerplants. Aircraft of up to 3 tonnes that were not used for business purposes were assessed $60 annually. Foreign aircraft operating in Canada only part of the year were assessed 25 percent of the annual fee for each quarter they operated in Canada.[26]

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[26] NAV CANADA Announcement of New and Revised Charges, September 16, 1998.

Propeller aircraft and helicopters over 3 tonnes were charged a daily fee ranging from $30 to $1500 depending on weight category. This fee was to be levied on any day the aircraft operated from an aerodrome with a NAV CANADA FSS or ATC facility, or where similar services were provided by the Department of National Defence (DND). Helicopters were subject to a $60 daily maximum. All Canadian aircraft in the class were subject to a $300 minimum annual charge, and a 25 percent ($75) minimum fee was assessed quarterly on non-Canadian aircraft. Equity of the fee structure was further increased by the option of paying charges based on the jet aircraft formula, rather than the daily fee. For large aircraft operating at low frequencies, this could be advantageous.

Jet aircraft were subject to terminal and enroute charges similar in structure to those for the over 8 tonne aircraft in Phase One.[27] The exception to this rule was that terminal fees were phased in at a slower rate above 60 degrees north latitude. While southern fees were implemented on 1 March 1999, northern aircraft were charged 75 percent of this fee, effective November 1999, and 100 percent in November 2000.

The complexity of the billing process was reduced by the creation of web-based and CD-ROM billing software, but several innovations were also added to reduce the burden on users. Owners were allowed to calculate weight based on individual aircraft or on the average weight, by aircraft type, of the fleet.

Exemptions were continued for DND and Search and Rescue aircraft, but firefighting and air ambulance flights paid for by governments were now also exempted. Flights aborted due to weather were exempted from terminal charges.

3.4 Subsequent Discussions on Northern Services

In December of 1998, John Crichton, the President and CEO of NAV CANADA, made a trip to the northern capitals to discuss fees and charges in the north.[28] He had considerable experience with northern aviation in his

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[27] The Terminal Services Unit Rate was increased to $13.65 per charging unit on 1 March 1999, with the exception noted. Enroute fees increased to $0.03506 per charging unit

[28] Yellowknife remains the capital of the Northwest Territories, but the transition to territorial division on 1 April 1999 was already well underway.

previous association with First Air. Crichton's briefing addressed a stakeholder request that NAV CANADA demonstrate that the ANS fees being charged were fair in relation to its own costs.

NAV CANADA estimated that the gross fees for the year ending 1 November 2001 would be $13 million, the reduction of the ATT $8.5 million, with a resulting $4.5 million additional cost to NWT, Nunavut, and Yukon residents. This represents approximately 1.8 percent of northern air carrier revenues.

The year ending 2001 was chosen because all fees would be fully in effect in the north. Also, most of the changes proposed in the Northern Service Review would be implemented.[29] This comprehensive review of service requirements had included recommendations for the conversion of five northern FSS to CARS. The exemption of CARS from terminal charges reduced both terminal charges and enroute fees for some operators.

On the cost side, NAV CANADA projected a total cost of $22.9 million for the remaining ATC towers, FSS and CARS, and navaids. Indirect costs of $22.2 million were projected, although these overhead costs were not further elaborated upon. This figure did not include ATC services provided by the Area Control Centres in Winnipeg and Edmonton. In any case, NAV CANADA indicated that $21.0 million of the total cost could be allocated to terminal air navigation services, far in excess of the estimated gross revenues of $9.0 million for terminal and enroute charges combined. This revenue figure included all flights operating within the north and the northern portions of flights operating to and from the south, but excluded the revenues from overflights which did not originate or land in the north.

Crichton also pointed to savings through deferrals of fees. The general deferral from 1 November 1998 to 1 March 1999 was caused by an operating surplus, and applied to all users. This arose because of greater than expected volume, leading to higher revenues, and because of cost cutting at NAV CANADA. Under the ANS Act, NAV CANADA is required to return such excess revenue to the users in the form of reduced fees. In the north, this amounted to $2.0 million. More importantly, the phase-in of terminal fees to 1 November 2000 would save northern carriers an estimated $3.5 million.

Mr. Crichton visited the Nunavut capital of Iqaluit, which had also been the center of some of the most vocal opposition to the new fee structure.

[29] See Kaduck, ibid., for a description of the early process of the Northern Service Review. The review called for the conversion of 5 NWT/Nunavut FSS to CARS.

The continued exemption of CARS from terminal fees was estimated to produce a $2.0 million per year savings, compared with a scenario in which terminal fees were levied. Flights between CARS facilities are also exempted from the enroute fee, and the conversion of FSS to CARS would contribute to this total. A second saving of $1.5 million is indicated in the document, resulting from the conversion of FSS to CARS. Finally, the exemption of fire fighting, air ambulance and flights aborted due to weather is estimated to save an additional $1.0 million annually.

4.0 CONCLUSIONS

The transition from a ticket tax to a user fee based on aircraft weight increased the transparency and equity of the system by billing operators based on an understandable and consistent formula. For operators of large aircraft, this increased the equity by billing all users, rather than only passenger carriers. For propeller and small jet operators, allowing user flexibility through a mixture of movement-based charges and flat fees increased equity.

No system could bill based on actual consumption without increasing bureaucratic and information system overhead to unacceptable levels. In any case, the formula reflects the legislated charging principle that the fee structure could not contribute to a reduction in safety. A system based on charges for filing flight plans, for example, would have violated this principle.

The change affected the north more than other regions because of the distinct operational characteristics of northern carriers. This resulted in user and consumer concern, as northerners felt they had been given assurances they would not be made worse off by commercialization. Whatever the relative costs of the change may be, northerners have endured significant cost increases for air transportation in the last decade, and reacted with predictable unhappiness to another increase. NAV CANADA did a creditable job of attempting to explain the rationale, and involve users in the development of fee structures, particularly in Phase Two.

The technical nature of the issues at hand makes it difficult for consumers, who ultimately pay for the system through ticket prices, to take a meaningful part in the discussion. This is a general issue in the transition from taxes to user fees, and can be extended to airport improvement fees and any number of user charges that have sprung up since deregulation and commercialization of the sector. The role of the territorial government, in educating the stakeholders in

the north, was therefore very important. Organizations such as the Baffin Chamber of Commerce took a lead in orchestrating public response.

NAV CANADA showed considerable flexibility in the design of its fee structure. User consultations revealed preferences for certain forms, and experience with the potential categories caused the corporation to realign its structure to create a greater distinction between jet and propeller aircraft. The development of a transparent and reasonably equitable structure allows users to make adjustments in their operations and incorporate ANS costs into their general cost structures.

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COMPETITION AND CONCENTRATION IN CANADIAN-U.S. TRANSBORDER AVIATION MARKETS

For almost thirty years the Canadian and U.S. airline industries labored under a 1966 accord which severely limited their pricing and entry freedoms in transborder markets. In February 1995, Canada and the United States negotiated a new air services agreement (ASA). The 1995 accord represented a major step forward in the liberalization of transborder air services. While it contained some short-run restrictions on market entry (which have now expired), the new ASA promises to open the skies between the two countries, allowing freedom of entry and pricing in transborder markets. Moreover, it provides carriers with the opportunity to develop new services to meet the evolving needs of transborder travelers.

The purpose of this paper is to explore the impact of the February 1995 ASA on the market for transborder airline services. After discussing the provisions of the new ASA, the paper examines impact of the 1995 ASA on competition and concentration in the transborder air services market using three definitions of the relevant market. The paper concludes that while concentration has increased in many transborder markets subsequent to the signing of the 1995 ASA, the substantial increase in transborder service suggests that consumers have nonetheless benefited from the new ASA.

I. THE 1995 TRANSBORDER AIR SERVICES AGREEMENT

The basic ASA governing transborder air services was signed in 1966, although it was subsequently amended several times. The 1966 ASA, as amended, listed 83 separate point-to-point transborder routes on which service could be provided. Interflag competition was authorized on only 19 of these transborder city-pairs. Thirty-eight of the routes were reserved for U.S. carriers, while the remaining 26 were limited to Canadian airlines.[1] On most 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 transborder fares.

Over time the 1966 ASA increasingly failed to meet the evolving needs of the North American economy and the two countries' airline industries. The operating rights authorized by the accord reflected the North American economy circa 1966.[2] Because of the 1966 accord's lack of entry freedom, subsequent

shifts in regional economic activity in North America left many cities, particularly in Western Canada and in the Southern, Southwestern, and Western United States, with inadequate or nonexistent transborder service. For example, service was authorized between Toronto and Pittsburg but not between Toronto and Atlanta. Similarly, the transborder route awards made by the two governments to their flag carriers mirrored the then existing state of their domestic airline industries--i.e., prior to deregulation and prior to the development of extensive hub-and-spoke route systems. For example, Delta, not US Air, possessed transborder rights between Toronto and Pittsburgh despite the latter city's later status as US Air's primary hub.

In February 1995, the two countries agreed to a new, much liberalized ASA.[3] It grants Canadian and U.S. flag carriers freedom of entry in transborder markets, and neither country may unilaterally limit the capacity offered by any of these carriers. However, the pact offered the Canadian carriers a head start, for they were immediately free to fly between any U.S. and any Canadian city of their choice. Such was not the case for U.S. carriers. U.S. carriers were allowed immediate freedom of entry into any transborder market not involving Montreal, Toronto, or Vancouver (the MTV cities). U.S. entry rights to serve Vancouver and Montreal were constrained for two years and for three years at Toronto. During each year of the phase-in period, the U.S. government was allowed to designate a limited number of carriers to provide new transborder services to the MTV cities. In general, the U.S. government allocated these rights to carriers to fly between their U.S. hubs and the MTV airports. Most rights were given to the major U.S. carriers, although a few were also granted to post-deregulation start-up carriers such as Midwest Express, America West, and Reno Air.[4] As the phase-in period expired in February 1997 for Montreal and Vancouver and in Februay 1998 for Toronto, U.S. carriers are now able to offer whatever services they wish to any Canadian city they choose.

II. THE IMPACT OF THE NEW ASA ON COMPETITION

Although the 1995 accord promotes open skies between the two countries, the ability of an individual carrier to take advantage of the new accord is influenced by that carrier's route structure, its existing transborder services as authorized by the 1966 ASA, and other similar factors. Because of this path dependency problem, the impact of the 1995 accord on competition and concentration in the transborder market is an empirical question, which the remainder of this paper will focus on answering.

An important issue in making this assessment is defining the relevant market. We will use three definitions of the relevant market:

* the entire transborder market

- transborder service at individual airports
- service in individual transborder city-pair markets.

THE OVERALL TRANSBORDER MARKET

We first analyze whether competition and concentration in air services between the United States and Canada has increased or decreased considering the transborder market in its entirety. Table 1 depicts the number of weekly, non-stop transborder flights using jet aircraft offered by individual carriers in January and July from 1995 to 1998.[5] As the new ASA was signed in February 1995, January 1995 thus represents the status quo under the old ASA. Note that for all time periods presented other than January 1995, Canadian carriers were free to enter all transborder markets, while the phase-in restrictions were in effect on U.S.-flag service to the MTV airports through January 1997. U.S. carriers were free to serve all transborder markets involving Montreal and Vancouver after February 1997, and gained unlimited access to Toronto in February 1998. Thus July 1998 is the only period depicted in Table 1 for which U.S. and Canadian carriers had equal and free access to all transborder markets.

Note also that Table 1 utilizes flight share--the percentage of flights offered by an individual carrier relative to the total number of flights offered in the market--to measure the extent of competition and concentration. This is not a perfect measure of market power, because it is an input measure rather than an output measure. However, previous studies have shown that there is a high correlation between flight share and market share. Because timely flight share data are readily available from such sources as the *Official Airline Guide* while passenger share data are not, flight share data will be used.

As Table 1 indicates, Air Canada has been the dominant carrier in the transborder market, and its dominance increased during the time period shown in Table 1. In January 1995, it offered 33.8 percent of all flights between Canada and the United States. As a result of the new ASA and its restrictions on immediate U.S-flag service to the MTV airports, Air Canada increased its dominance in the overall transborder market. For the period depicted in Table 1, Air Canada accounted for 39 percent of the increase in transborder flights attributable to the new ASA. Its flight share in July 1998 reached 36.2 percent; however, just prior to the ending of phase-in restrictions imposed on U.S. carriers (i.e., January 1998), its flight share rose as high as 41 percent. Delta, the second-most important carrier in the transborder market under the old ASA, lost that status to Canadian Airlines. Despite a 10 percent increase in its flight offerings from January 1995 to July 1998, Delta's share of transborder flights fell from 19.0 percent to 11.1 percent, while Canadian Airlines' share rose from 5.2 percent at the beginning of our study period to 12.1 percent at its end.

The information presented in Table 1 can be used to calculate changes in concentration.[6] Concentration can be measured in several ways. The simplest measure is the four-firm concentration ratio: the percentage of market output attributable to the four largest firms in that market. By this measure, concentration in the transborder market declined over the time period depicted in Table 1, falling from 78.5 percent in January 1995 to 69.4 percent in July 1998. However, aggregating the market shares of the four largest carriers masks the increases in Air Canada's and Canadian Airlines' market shares with the declines of those of Delta, American, and US Air. A second, more complicated measure of concentration is the Herfindahl-Hirschman Index (HHI), which is the sum of the squares of individual carrier market shares. The HHI of a perfect monopoly would be 10,000; a perfectly competitive industry would have an HHI approaching 0. The primary advantage of the HHI is that it is more sensitive to the size distribution of firms than the four-firm concentration ratio is. The U.S. Department of Justice's merger guidelines suggest that an HHI over 1000 may raise antitrust concerns. As Table 1 indicates, the HHI of the transborder market rose from 1996 in January 1995 to 2185 in January 1998, and then fell substantially from January 1998 to July 1998. This suggests that the market was highly concentrated to begin with and that it became more concentrated as a result of the head start granted Canadian carriers in the MTV markets by the new ASA. However, after the ending of the MTV phase-in rules, the HHI has fallen below the level reported for January 1995--i.e. prior to the signing of the 1995 accord. Of course, as this statement is based on a single data point (July 1998), it remains to be seen whether this is a temporary or permanent phenomenon.

TRANSBORDER SERVICE AT INDIVIDUAL AIRPORTS

We next consider the second market definition, transborder service at individual Canadian airports.[7]

Table 2 reports the number of weekly nonstop transborder flights offered by individual carriers using jet aircraft to Toronto; all of these flights served Pearson Airport. As the table reports, in January 1995, carriers offered 627 weekly nonstop transborder flights to Toronto. Air Canada was the largest carrier in the market, offering 251, or 40 percent of the flights. The next largest carrier was American, with 122, or 19.5 percent of the flights. Both Canadian Airlines and Air Canada took advantage of the temporary constraints imposed on new services to Toronto by U.S. carriers. By January 1998--just prior to the ending of the phase-in controls at Toronto--Air Canada had more than doubled its transborder service to that city, while Canadian Airlines added a hundred new flights. Air Canada's share of the transborder flights offered to Pearson rose to

55 percent, while that of the second most important carrier, American, fell to 10 percent. The four-firm concentration ratio for transborder service at Toronto declined from 87.2 percent in January 1995 to 82.1 percent in January 1998; however, the corresponding HHI rose from 2437 to 3298 during this period.

Air Canada's dominance has been reduced somewhat after the phase-in period ended at Toronto. New services added by U.S carriers in July 1998 have reduced the four-firm concentration ratio and the HHI below their January 1998 levels. Compared to their levels in January 1995, the four firm concentration ratio at Toronto has fallen, while the HHI has risen. However, concentration at Toronto is likely to remain quite high in absolute terms, given Air Canada's construction of a domestic, transborder, and international hubbing complex there. While Air Canada clearly dominates the Toronto market, its dominance at this hub is no greater than that of many U.S. carriers at their domestic hubs.

Table 3 presents similar data for Montreal. As was the case with Toronto, all of the transborder services reported in this table are to a single airport (Dorval). As a result of the new ASA, Montreal has experienced a 34 percent increase in transborder service, from 326 weekly flights in January 1995 to 436 flights in July 1998. During the phase-in period at Montreal (i.e., comparing January 1997 with January 1995), new transborder service to Montreal increased by 24 percent; in the period after the phase-in expired, service increased an additional 8 percent.

Air Canada offered the most service to Montreal under the old ASA. Although it added 34 weekly flights during the time period reported in Table 3, its flight share in this market fell slightly, from 38 percent in January 1995 to 36 percent in July 1998. Delta Airlines, the second largest carrier in the market under the old ASA, retained this position. As Table 3 indicates, the carrier increased its transborder services to Montreal by 29 percent from January 1995 to July 1998, although its level of service fluctuated over this period. It expanded its services to Montreal in absolute terms more than any other carrier except Air Canada, although its flight share declined a bit (from 28 percent to 27 percent). Despite the expansion of service by these two dominant carriers, new transborder services launched by American, Continental, and Northwest have caused concentration at that city to lessen modestly. The four-firm concentration ratio for transborder flights serving Montreal declined from 89.5 percent in January 1995 to 85.5 percent in July 1998, while the HHI fell from 2633 to 2394.
The third of the MTV cities, Vancouver, has benefited immensely from the new ASA, as is shown in Table 4. New services to Vancouver increased 58 percent during its two-year phase-in period (January 1995 to January 1997), and, as of July 1998, an additional 64 percent after the phase-in ended. Indeed, Vancouver's transborder service has expanded so rapidly that as of July 1998 it

displaced Montreal as the Canadian city with the second highest level of transborder service.

Canadian Airlines maintained its status as the largest provider of service at Vancouver, although its service rose only modestly during the phase-in period, from 61 weekly flights in January 1995 to 72 weekly flights in January 1997. However, after the phase-in period expired it added another 103 flights. As Canadian-flag carriers faced no entry constraints during the phase-in period, Canadian Airlines' slowness to exploit the 1995 accord presumably reflects its precarious financial situation when the new ASA was first signed. As its financial situation improved, it has been better able to increase its transborder services. Its share of transborder flights serving Vancouver increased slightly, rising from 35 percent of such flights in January 1995 to 39 percent in July 1998.

Despite this modest increase in Canadian Airlines' dominance in Vancouver, concentration at Vancouver has fallen significantly using either the four firm concentration ratio or the HHI. Much of this decline in concentration is the result of entry by newer, smaller U.S. carriers at Vancouver. The most important of these carriers is Alaska Airlines, which has taken advantage of the 1995 ASA to become the second largest transborder carrier at Vancouver. Air Canada and several U.S. low-fare airlines, including America West and Reno Air, have also entered the Vancouver transborder market, while Northwest and United have beefed up their transborder services as well. As a result, Vancouver has enjoyed the largest percentage increase in transborder service among major Canadian cities and the most significant declines in market concentration.

Calgary has also achieved significant benefits from the new ASA, as Table 5 indicates. [Note: Tables 5 through 11 have been deleted to save space: they are available from the author.] New carriers serving transborder routes involving Calgary include Canadian Airlines, Northwest, Alaska, and Continental. As a result of these new entrants, the total number of transborder flights has increased 61 percent at Calgary, while concentration has declined significantly using either concentration measure.

Two other Central and Eastern Canada cities received transborder service under the 1966 ASA, Ottawa and Halifax. As Tables 6 and 7 indicate, Ottawa's transborder services have doubled as a result of the 1995 ASA, while Halifax's have fluctuated. At both cities, concentration has fallen using the HHI and remained the same using the four firm concentration ratio. New service by Air Canada, American, and Continental have offset US Air's service cutbacks to Canada's capital. Halifax's service has been very uneven over the time period of our study. Air Canada has alternatively increased and decreased its transborder

service to Halifax. Northwest entered and exited the Halifax market, while Continental began offering a single flight a day to that city at the end of our study period.

Four other Western Canada cities have received service under the new ASA. Under the old ASA, Saskatoon received no transborder services, while Regina was served by a single jet flight a day by a carrier affiliated with Canadian Airlines. Under the new ASA, Northwest has offered each of these cities two flights a day to its hub in Minneapolis-St. Paul (see Tables 8 and 9). Edmonton too has benefited from the new accord. Transborder service to that city doubled during the study period and concentration measured by the HHI fell, as Table 10 indicates; most of these gains are attributable to Alaska Airlines' entry into the Edmonton market. However, service to Winnipeg improved but modestly under the new ASA, due primarily to Northwest's addition of another daily flight to its hubbing complex at Minneapolis-St. Paul (see Table 11), and concentration (as measured by the HHI) has risen at that city.

Transborder Service in Individual City Pairs. We next consider the third market definition, transborder service in individual city-pair markets. Table 12 reports the number of carriers serving the twenty most important transborder markets, as well as their HHI for the study dates. Most of these markets have experienced some new entry. As a result, concentration levels (as measured by the HHI) have fallen--from a mean of 6483 in January 1995 to a mean of 5200 in July 1998--although they generally remain very high by the standards of the U.S. Department of Justice. Most noticeable is new entry into the West Coast markets of Vancouver-Los Angeles and Vancouver-San Francisco. Three carriers entered the former market, while two entered the latter one. Both these markets have seen significant drops in concentration measured using the HHI. It is also worth pointing out that much of the fall in concentration has occurred towards the end of our study period. This may be attributable to two institutional factors. First, 19 of these 20 city-pairs involve the MTV cities; the ability of U.S. carriers to enter MTV transborder markets was restricted during the time period under study. Second, most of the limited rights granted to U.S. carriers to enter MTV markets were allocated to brand new services from their hubs, not to these Top Twenty markets. These two factors suggest that entry into these markets might be limited until MTV phase-in period expired.

III. CONCLUSIONS

Despite the dramatic changes wrought by the 1995 ASA, the levels of concentration in the transborder market depicted in Tables 1 through 12 remain quite high, regardless of the market definition or the measure of concentration used. There has been some diminution of concentration in several markets, most

noticeably those involving Vancouver. These observations are not so surprising when one remembers the starting point. Transborder service authorized by the Canada-U.S. aviation accord in existence prior to February 1995 was extremely limited. Few city-pairs received service, and even fewer received competitive service. Those city-pairs that did receive service reflected the patterns of commerce between Canada and the United States circa 1966. Given the regional changes in the location of economic activity in North America in the ensuing three decades, it is not surprising that the Vancouver market, for example, would attract the attention of numerous new entrants. Nonetheless, despite the high levels of concentration observed three years after the signing of the new transborder air services agreement, transborder travelers are still better off with this agreement than without it, given the paucity of transborder services in many important North American city-pairs prior to February 1995.

FOOTNOTES

1. Lewis, Ira, "United States-Canada Air Services: The Role of Alliances in a Future Bilateral Agreement," *Transportation Journal*, Spring 1995, pp. 5-12.

2. Dresner, Martin, "The Regulation of U.S.-Canada Air Transportation: Past, Present, and Future," *Canadian-American Public Policy*, Number 9, March 1992.

3. See Kaduck, Raymon J. *Break in Overcast: The Negotiations of the 1995 Canada-US Open Skies Agreement*, the Norman Paterson School of International Affairs, Ottawa, Ontario, October 1996 (mimeo), which provides useful information about the progress of these negotiations and important insights into why it took so long to reach an agreement acceptable to both sides.

4. "Office of International Aviation, U.S. Department of Transportation, "The Impact of the New US-Canada Aviation Agreement at its First Anniversary," Washington, D.C., mimeo, March 1996. See page titled "Service Highlights."

5. Code share flights operated by strategic alliance partners were not double-counted. Rather, credit for the flight was allocated to the carrier actually performing the flight. Code share flights operated by affiliated carriers were allocated to the parent. For example, Comair's transborder services are credited to Delta in Tables 1 through 12.

6. In calculating concentration, we ignored the existence of strategic alliances between transborder carriers. We have chosen to treat any services offered by alliance partners as independent, for there is little public information regarding the extent of coordination between alliance partners in providing capacity in individual markets. See Oum, Tae Hoon, Allison J. Taylor, and Anming Zhang, "Strategic Airline Policy in the Globalizing Airline Networks," *Transportation Journal*, Spring 1993, pp. 14-30 for a discussion of the role of alliances in airline competition.

7. We focus only on changes at Canadian airports for two reasons. First, reporting changes at U.S. airports becomes cumbersome because of the large number of U.S. transborder gateways. Second, almost all new transborder flights added by U.S.-flag carriers involve service to their U.S. hubs. Accordingly, new transborder services tend to increase the

U.S. flag carrier's dominance at those hubs, and more elaborate analysis is likely to provide little insight beyond this statement.

Table 1
Total Weekly Flights, All Transborder Markets

	Jan-95	Jul-95	Jan-96	Jul-96	Jan-97	Jul-97	Jan-98	Jul-98
Air Canada	472	628	791	775	811	818	983	949
Canadian Airline	73	110	191	135	173	192	252	317
American	198	271	255	264	234	248	239	261
United	105	133	118	112	98	112	104	119
Delta	265	277	307	306	283	282	296	291
Northwest	124	236	214	250	180	230	200	230
US Air	160	164	157	149	144	126	126	130
Continental		28	14	27	28	46	59	119
Alaska		21	39	54	47	69	84	119
TWA				14	14	14	14	21
All other		66	39	46	45	46	38	65
Total	1397	1934	2125	2132	2057	2183	2395	2621
Air Canada's share	33.8%	32.5%	37.2%	36.4%	39.4%	37.5%	41.0%	36.2%
Canadian flag	545	738	982	910	984	1010	1235	1266
US flag	852	1196	1143	1222	1073	1173	1160	1355
Four firm conc ratio	78.5%	73.0%	73.7%	74.9%	73.4%	72.3%	73.9%	69.4%
HHI	1996	1771	2013	1948	2104	1967	2185	1850

Table 2
Total Weekly Transborder Flights to Toronto

	Jan-95	Jul-95	Jan-96	Jul-96	Jan-97	Jul-97	Jan-98	Jul-98
Air Canada	251	331	468	481	516	515	680	628
Canadian Airlines	5	53	100	70	98	80	105	128
American Airlines	122	124	136	138	123	132	121	133
United Airlines	42	42	41	42	42	42	48	42
Delta Airlines	90	88	97	69	96	110	117	118
Northwest Airlines	34	35	34	41	34	48	48	62
US Air	83	75	81	74	70	63	63	75
Continental Airlines	0	0	0	13	14	25	39	45
Alaska Airlines								
TWA				14	14	14	14	21
All other	0	12	11	12	11	12	11	28
Total	627	760	968	954	1018	1041	1246	1280
Four firm concentration ratio	87.2%	81.4%	82.6%	80.0%	81.8%	80.5%	82.1%	78.7%
HHI Index	2437	2497	2483	2961	2975	2862	3298	2788

Table 3
Total Weekly Transborder Flights to Montreal

	Jan-95	Jul-95	Jan-96	Jul-96	Jan-97	Jul-97	Jan-98	Jul-98
Air Canada	125	145	146	134	157	142	161	159
Canadian Airlines								
American Airlines	34	49	42	42	41	44	42	49
United Airlines								
Delta Airlines	91	98	112	118	96	109	109	117
Northwest Airlines	34	48	48	55	48	42	40	48
US Air	42	48	49	47	47	35	35	34
Continental Airlines		14	14	14	14	14	13	26
Alaska Airlines								
All other		27						3
Total	326	429	411	410	403	386	400	436
Four firm concentration ratio	89.5%	79.2%	86.4%	86.4%	86.4%	87.3%	88.1%	85.5%
HHI	2633	2095	2399	2324	2479	2494	2660	2394

Table 4
Total Weeky Transborder Flights to Vancouver

	Jan-95	Jul-95	Jan-96	Jul-96	Jan-97	Jul-97	Jan-98	Jul-98
Air Canada			49	40	35	45	34	35
Canadian Airlines	61	57	77	61	72	98	133	175
American Airlines	14	21	14	35	28	23	21	23
United Airlines	49	70	56	63	42	56	42	56
Delta Airlines	35	35	49	63	35	21	28	14
Northwest Airlines	14	21	14	28	14	28	14	29
US Air								
Continental Airlines		14				7	7	7
Alaska Airlines				14	14	35	63	77
All other		27	28	34	34	34	27	32
Total	173	245	287	338	274	347	369	448
Four firm concentration ratio	91.9%	77.2%	80.5%	67.0%	67.2%	67.4%	71.7%	76.6%
HHI	2586	1683	1826	1455	1562	1574	1967	2170

Table 12
Characteristics of Twenty Largest Transborder Markets

	Number of Competitors								Hirschman-Herfindahl Index							
	Jan 95	Jul 95	Jan 96	Jul 96	Jan 97	Jul 97	Jan 98	Jul 98	Jan 95	Jul 95	Jan 96	Jul 95	Jan 97	Jul 97	Jan 98	July 98
Toronto NYC	2	3	3	4	4	4	4	4	5461	4293	4361	3858	3806	3509	3489	3386
Toronto Chicago	3	4	4	4	4	4	4	4	3363	2047	1958	2662	2657	2869	3011	2788
Montre NYC	2	4	3	3	3	3	3	3	5286	3633	4079	4079	4149	4319	4229	3818
Toronto Los An	1	1	1	1	1	1	2	2	10000	10000	10000	10000	10000	10000	7093	7093
Toronto Miami	2	2	2	2	3	3	3	3	6867	5200	5128	5200	3541	3469	3487	3469
Vancou Los An	2	2	3	4	4	4	4	5	5102	5128	3795	3130	3086	3223	3373	3287
Toronto Boston	2	2	2	2	2	2	2	3	5185	5266	5288	5556	5212	5236	5236	3457
Toronto Tampa	2	1	3	3	2	1	1	3	5000	10000	3600	3984	5556	10000	10000	4306
Toronto San Fra	2	2	2	2	2	2	2	2	6250	6250	6250	6250	6250	6250	6250	6250
Montre Miami	2	2	2	2	2	2	2	2	5022	5000	5000	5000	5000	5022	5556	5556
Vancou San Fra	2	3	4	4	3	3	4	4	6159	3600	1797	2653	3333	3469	2593	2562
Calgary Los An	2	2	2	2	2	2	2	3	5556	5556	5000	5000	5000	5000	5000	3984
Montre Chicago	2	2	2	2	2	2	2	2	5401	5439	5400	5439	5401	5445	5089	5109
Montre Los An	1	1	1	1	1	1	1	1	10000	10000	10000	10000	10000	10000	10000	10000
Toronto Philadel	1	1	2	2	2	2	2	2	10000	10000	5016	5002	5016	5139	5139	5139
Montre Boston	2	3	2	2	2	2	2	2	5002	4064	5556	5868	5279	5301	5011	5080
Toronto DFW	1	1	1	1	1	3	3	3	10000	10000	10000	10000	10000	3889	3878	3703
Toronto Atlanta	0	2	2	2	2	2	2	2	n.a	5556	5450	6017	5398	5016	5016	5007
Toronto Honolul	1	1	1	1	1	1	1	1	10000	10000	10000	10000	10000	10000	10000	10000
Toronto Detroit	1	1	1	1	1	1	1	1	10000	10000	10000	10000	10000	10000	10000	10000
Mean HHI									6483	6552	5884	5985	5934	5858	5673	5200

STRATEGIC ALLIANCE AND PARTNER AIRLINES' PRODUCTIVITY, MARKET POWER, AND PROFITABILITY

Tae Hoon Oum,* Jong-Hun Park, and Chunyan Yu ***

Abstract: This paper empirically examines the effects of strategic alliances on partner airlines' productivity, output price, and profitability by using panel data consisting of 22 airlines over the 1986-95 period. We find that strategic alliances generally improved partner airlines' total factor productivity. The main sources of the productivity gains are from more efficient use of fuel and materials inputs, and better utilization of capital including aircraft. We find no evidence of increased market power due to a strategic alliance. We find inconclusive evidence that strategic alliances contributed to an increase in partner airlines' profitability.

1. INTRODUCTION

Like many other industries, the international airline industry is being increasingly exposed to pressures of the market place as deregulation and liberalization processes advance. To compete more effectively in the increasingly competitive global markets, major airlines have formed strategic alliances with foreign carriers. Strategic alliances would provide partner airlines with opportunities to improve productivity, efficiency, and service quality. Partner airlines share core skills, resources, and personnel to reduce operating costs. They can take advantage of increasing returns to traffic density by linking their networks and feeding traffic to each other. They can provide better services by increasing flight frequency and reducing waiting and transition times. Nevertheless, there exist some concerns about the anticompetitive aspect of strategic alliances. Some argue that in some cases, a strategic alliance reduces the number of competitors in a market, allowing the partners to abuse their market power in that market.

A growing body of research has focused on the effects of strategic alliances on the performance of the partners, using proxy variables such as stability, duration of alliances, survival ratio, or perceived satisfaction of

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managers (e.g., Geringer and Herbert, 1989; Kogut, 1989; Osborn and Baughn, 1990; Hamel, 1991; Blodgett, 1992; Parkhe, 1993; Dussauge and Garrette, 1995). To our knowledge, however, little study has systematically examined the effects of strategic alliances on productivity, market power, and profitability.

This paper empirically examines the effects of strategic alliances on the partner's productivity, output price, and profitability by using panel data consisting of 22 airlines over the 1986-95 period. We find that strategic alliances generally improved partner airlines' total factor productivity. The main sources of the improvement are from more efficient use of fuel and materials inputs, and better utilization of capital including aircraft. We find no evidence of increased market power due to strategic alliances. Rather, we find that partner airlines' output price decreased during post-alliance period. We also find inconclusive evidence that strategic alliances contributed to an improvement in partner airlines' profitability.

The rest of the paper is organized as follows: Section 2 describes the sample airlines and the data. Section 3 presents our empirical analysis and discusses the findings. Finally, Section 4 summarizes and concludes.

2. DATA

Sample airlines

Our data consists of annual observations of 22 international airlines over the 1986-95 period. The airlines are from North American, European, and Asia-Pacific regions. The data were collected and compiled mainly from the *Digest of Statistics* published by the International Civil Aviation Organization (ICAO), in particular, the annual series on *Traffic*, *Fleet-Personnel*, and *Financial Data*. Additional data were obtained directly from airlines, airlines' annual reports, the *Airline Monitor*, *IATA publications*, *Statistics Canada* publications, and other sources.

Table 1 shows 1995 descriptive statistics of the airlines included in our database. The airlines are all international carriers, and have significant involvement in scheduled passenger services. The size of the airlines, as measured by revenue tonne-kilometres (RTK) in 1995, ranges from 2.2 billion RTK for Scandinavian Airlines Systems (SAS), to 19.6 billion RTK for United Airlines. Aside from US carriers, most of the sample airlines provide mainly international services, while others do not provide domestic services at all. Qantas, Singapore Airlines (SIA), Cathay Pacific and Japan Airlines (JAL) serve mostly inter-continental traffic, while US Air and SAS have a large proportion of their businesses in domestic or intra-continental traffic.

Profitability performance varies greatly among the sample airlines. British Airways, SIA, Delta Air Lines and Northwest Airlines were the most

profitable in 1995, with net income of US$740 million, US$622 million, US$510 million, and US$ 506 million, respectively. Air France suffered the biggest loss, a net loss of US$581 million, in 1995. Iberia and Canadian Airlines International (CAI) also suffered losses in 1995 of US$361 million and US$143 million, respectively. All of the Asian carriers were able to achieve a positive net income in 1995.

In general, partner airlines cooperate on some routes, not all routes. Since our data are firm-level aggregate data (not route-specific data), it is impossible to disaggregate the effect of alliance on the partner's productivity, market power, and profitability to the route level. To alleviate this problem, we restrict our analysis to strategic alliances in which two partners link up their networks, cooperate at the network level, and feed connecting traffic to each other. In general, strategic alliances involve much wider and deeper cooperation between partners, as compared to simple route-by-route alliances in which two partners coordinate operations on a few alliance routes. The last column of Table 1 shows the post-alliance periods for the airlines that participated in strategic alliances. We identified the post-alliance periods based on the various issues of *Airline Business*. Fourteen airlines involved at least one strategic alliance during the 1986-95 period, while 8 airlines did not involve any strategic alliance during this period.

Outputs

Five categories of airline outputs are considered: scheduled passenger service (measured in RTK), scheduled freight service (measured in RTK), mail service (measured in RTK), non-scheduled services (measured in RTK), and incidental services. Incidental services include a wide variety of non-airline businesses such as catering, ground handling, aircraft maintenance and reservation services for other airlines, sales of technology, consulting services, and hotel business.

A quantity index was constructed for the incidental output to include the incidental services in our analysis. The index was computed by deflating the incidental revenues by a general price index constructed using the Purchasing Power Parity (PPP) index for GDP obtained from the Penn World Table (Summers and Heston, 1991) and U.S. GDP deflator. The PPP index adjusts for changes in market exchange rates and changes in real price levels of various countries relative to the U.S., and the U.S. GDP deflator ensures that the index is comparable over time.

A multilateral output index was formed by aggregating the five categories of outputs using the translog multilateral index procedure proposed by Caves, Christensen, and Diewert (1982). Output price was then computed by dividing total revenues by the aggregate output index.

Inputs

We distinguish five categories of input: labour, fuel, materials, flight equipment, and ground property and equipment (GPE). Labour input was measured by the total number of employees. Fuel input was measured by gallons of fuel consumed. For flight equipment, a fleet quantity index was constructed by aggregating different types of aircraft using the translog multilateral index procedure (Caves, Christensen, and Diewert, 1982). The leasing price series for these aircraft types were used as the weights for aggregation[1]. The annual cost for each aircraft type was estimated by the product of the lease price and the number of airplanes. Total annualized aircraft cost was then computed as the sum across all categories of aircraft. The real stock of ground properties and equipment (GPE) was estimated using the perpetual inventory method. Under the assumption that the flow of capital service is proportional to the capital stock, the annual cost of using GPE was computed by multiplying the real GPE stock by a GPE service price. The GPE service price was constructed using the method proposed by Christensen and Jorgenson (1969) which accounts for interest, depreciation, corporate income and property taxes, and capital gains or losses. Since the GPE costs are small relative to the costs of flight equipment, these two categories of capital inputs were further aggregated into a single capital stock series using the translog multilateral index procedure. The materials input contains all other inputs, not included in any of the input categories discussed above (labour, fuel, and capital). As such, materials cost is the catch-all cost category, and thus includes numerous items including airport fees, sales commissions, passenger meals, employee travel, consultants, non-labour repair and maintenance expenses, stationery, and other purchased goods and services. The materials cost was computed by subtracting labour, fuel and capital input costs from the total operating cost reported in ICAO's *Financial Data*. As in the case of incidental output, it is necessary to construct a materials quantity index in order to include the materials input in our analysis. Since the materials cost also includes numerous items and activities, the same general price index was used to deflate the materials cost to compute the materials quantity index.

As in the case of output, the five categories of inputs were aggregated to form a multilateral input index using the translog multilateral index procedure.[2] Note that total input cost here includes costs of labour, fuel, materials, flight equipment, and ground property and equipment (GPE).

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[1] Aircraft leasing prices were provided by AVMARK Inc.

[2] Revenue shares (cost shares) are used as the weights in aggregating outputs (inputs). As a result, higher weights are given to outputs with higher yields. Similarly, more expensive input factors are given higher weights in aggregating inputs.

Airline profitability (or airline revenue/cost ratio) was calculated by dividing total revenue by total input cost. This measure reflects economic profit rather than operating profit, since the economic costs of aircraft and GPE are included in the total input cost.

3. EMPIRICAL ANALYSIS

In this section, we examine the effects of strategic alliances on partners' productivity, output price, and profitability. To this end, we conduct a series of regression analyses. The results are discussed in the following order: (i) the effect on partners' productivity, (ii) the effect on partners' output price, and (iii) the effect on partners' profitability.

Effect of strategic alliance on partners' productivity

Total factor productivity (TFP) is measured by the amount of aggregate output produced by a unit of aggregate input. TFP is widely used to assess a firm's productive performance, and has been used in many airline studies including Caves, Christensen, and Tretheway (1981), Gillen, Oum, and Tretheway (1990), Windle (1991), Encaoua (1991), and Oum and Yu (1998).

If a strategic alliance helps partner airlines improve their productivity, their TFPs would improve during the post-alliance period. TFP can be, however, affected by numerous other factors including the output level, average stage length, and composition of outputs. For example, *ceteris paribus*, an airline with a longer average stage length is expected to have higher TFP than an airline with shorter stage length. Thus, to measure the pure effect of a strategic alliance on a partner's productivity, we need to control those variables which also influence TFP. For robustness of analysis, we run four alternative regressions[3].

The results are presented in Table 2. The dependent variable is TFP, while explanatory variables are total output, average stage length, revenue shares for freight, non-scheduled and incidental services, year dummies, and the post-alliance dummy. The coefficient for the output variable is positive and statistically significant, indicating that output growth tends to lead to higher productivity. As expected, the coefficients on the stage length variable are estimated as positive and significant. The positive coefficients on the %Non-schedule and %Incidental variables indicate that airlines with relatively larger non-scheduled and incidental services tend to show higher productivity. The coefficients on the post-alliance dummy variable are estimated as positive and significant, regardless of the specifications. The results indicate that partner airlines improved TFP by 8.6% to 10%, depending on the specifications, during

[3] Note that all regressions are in log-linear functional form.

the post alliance period – this suggests that partner airlines achieved productivity gains from forming strategic alliances. A further examination of the residuals from the regressions suggests that in the alliances between European carriers and US carriers such as BA/US Air and KLM/Northwest, the European partners achieved higher productivity gains following the alliance than their US counterparts.

Next, we examine the effect of a strategic alliance on partner airlines' partial factor productivity to identify the sources of the TFP gains. We consider five partial productivities: labour productivity, fuel productivity, aircraft productivity, capital productivity, and materials productivity. Table 3 presents the estimation results for those partial productivities. The coefficients on the post-alliance dummy variable are estimated as positive and significant for fuel productivity, aircraft productivity, capital productivity, and materials productivity regressions. Thus, strategic alliances allow the partners to reduce costs through economies of scale associated with ground facilities, maintenance, promotion, purchasing aircraft and fuel, and through the elimination of duplication and redundancy in operations.

Effect of strategic alliance on partners' output price

Partner airlines may exploit market power following a strategic alliance, which is harmful to consumers. To examine whether partner airlines exercise market power, we compare the partners' output prices between pre- and post-alliance periods after controlling for airline network characteristics, composition of outputs, and year effects. As described in the previous section, output price is computed by dividing total revenues by the aggregate output index.

The output price is regressed on the average stage length, composition of outputs, year dummy variables, and the post-alliance dummy[4]. The estimation results are reported in Table 4. The negative coefficients on the stage length variable mean that an airline's output price decreases with the airline's stage length. The negative coefficients on the %Non-schedule and %Incidental variables indicate that the airline output price decreases as revenue shares in non-scheduled and incidental businesses increase. In general, the coefficients on year dummy variables increase over time, implying that airlines' output prices increased in nominal term over the period due to inflation. The coefficients on the post-alliance dummy variable are estimated as negative and significant for specifications (1) and (2). These results suggest that airlines used strategic alliances as a means of competing more effectively, rather than exploiting market power, in the increasingly competitive global markets. This is consistent with the results of Waters, Oum and Yu (1998), which find that most of the

[4] The regressions are in log-linear form.

productivity gains are passed on to airline customers. The coefficient on the post-alliance dummy variable is estimated as positive for specification (3) which does not include the year dummy variables. This is because the post alliance dummy in this case reflects the combined effects of strategic alliance and the general time trend, thus the negative effect of strategic alliance on the partner's output price is offset by the positive effect of time.

A closer look at the cases of BA/US Air and KLM/Northwest appears to indicate that while the KLM/Northwest alliance led to a decline in output price, the BA/US Air alliance led to a slight price increase.

Effect of strategic alliance on partners' profitability

We have seen that strategic alliances allow partner airlines to improve their productivities and lead to lower output prices. However, it is not obvious how strategic alliances may affect partner airlines' profits. Profitability is one of the most important factors contributing to airlines' survival and prosperity. In the international air transport markets, the increased competition has, in many cases, led to a decline in profits since the monopoly positions of many carriers have been challenged. This sub-section examines whether strategic alliances will increase partner airlines' profitability.

The profitability is regressed on average stage length, composition of outputs, year dummy variables, and the post-alliance dummy variable. Table 5 presents the estimation results. As expected, airline profitability increases as average stage length increases. For each percentage increase in average stage length, profitability is estimated to increase by about 3%. Airline profitability also increases as the revenue share from freight services increases. Airline profitability is estimated to increase by about 4.7% for each percentage increase in the revenue share for freight services. In contrast, airline profitability declines as the revenue share for non-scheduled services increases. The estimated coefficients for year dummy variables appear to be associated with the economic cycle. Airline profits increased during the 1986-88 period, decreased during the 1989-92 period, and increased during the 1993-95 period. The coefficients on the post-alliance dummy variable are positive, but statistically insignificant for specifications (1) and (2). Although the results are inconclusive, they suggest that profitability of partner airlines improved by about 2% in the post alliance period.

Comparison of the BA/US Air alliance and the KLM/Northwest alliance shows that the KLM/Northwest alliance led higher profitability improvement than the BA/US Air alliance.

4. CONCLUDING REMARKS

This paper examines the effects of strategic alliances on partners'

productivity, output price, and profitability based on a panel data of 22 airlines over the 1986-95 period. We find that partner airlines improved their total factor productivity after forming strategic alliances. The partner airlines achieved the productivity gains through more efficient use of fuel and materials inputs and better utilization of capital. We also find that strategic alliances led to lower output price. The increasing competition in the international air transport markets seems to effectively prevent partner airlines from exploiting market power which could be strengthened by strategic alliances. We find inconclusive evidence that strategic alliance improved partner airlines' profitability by about 2%. Our results suggest that strategic alliances would likely improve economic welfare by improving airlines' efficiency and profitability, and reducing their output prices, as long as the international air transport markets are exposed to pressures of competition.

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Table 1. 1995 descriptive statistics of the sample airlines

Airline	Total Revenue (US$ Million)	Revenue Tonne-km (millions)	% International RTK	Stage Length (km)	Profit (US$ Million)	Post-Alliance Period
American	15,610	18,029	36.9	1,799	207.8	N/A
United	14,895	19,622	42.3	1,683	340.8	94-95
Delta	12,557	14,493	30.7	1,224	510.0	89-95
Northwest	8,908	12,429	47.8	1,362	506.3	93-95
US Air	6,985	5,944	7.4	904	33.0	93-95
Continental	4,919	5,896	20.0	1,315	223.5	93-95
Air Canada	2,532	3,453	67.3	1,536	38.4	93-95
Canadian	1,938	2,948	70.1	1,681	-143.9	N/A
Japan Airlines	10,884	10,204	85.6	2,348	5.1	N/A
All Nippon	8,737	4,583	41.2	1,112	31.9	N/A
Singapore	4,440	8,392	100.0	4,300	622.0	89-95
Korean Air	4,362	8,261	93.9	1,714	136.7	N/A
Cathay	3,696	6,144	100.0	3,283	385.0	N/A
Qantas	5,063	6,446	79.5	2,064	138.7	93-95
Thai	2,926	3,795	92.0	1,559	130.1	94-95
British Airways	10,716	12,215	98.1	1,863	740.1	93-95
Lufthansa [a]	9,231	12,205	95.2	1,131	133.0	93-95
Air France	6,510	9,701	91.1	1,846	-580.9	93-95
KLM	5,547	7,983	99.9	1,748	342.1	93-95
SAS	4,597	2,195	83.1	728	334.0	N/A
Swissair	3,483	3,574	99.0	1,268	3.5	89-95
Iberia	2,902	2,850	79.6	1,194	-361.2	N/A

[a] Lufthansa went through dramatic restructuring during 1994-95. Its Technical Services and Cargo divisions became independent public limited companies on January 1, 1995. The parent company Lufthansa AG is now purely a scheduled passenger airline company.

Table 2. The effect of strategic alliance on partners' total factor productivity (TFP)

	(1) TFP	(2) TFP	(3) TFP	(4) TFP
Constant	-1.763 ***	0.057	-1.752 ***	-2.576 ***
	(-7.88)	(1.19)	(-7.85)	(-10.18)
Output	0.159 ***	0.142 ***	0.156 ***	
	(9.86)	(6.97)	(9.87)	
Stage Length	0.282 ***		0.276 ***	0.331 ***
	(10.82)		(10.65)	(10.63)
%Freight	-0.029		-0.021	-0.074 ***
	(-1.34)		(-1.12)	(-3.28)
%Non-schedule	0.015 **		0.012 *	-0.001
	(2.08)		(1.76)	(-0.10)
%Incidental	0.059 ***		0.056 ***	0.045 ***
	(6.58)		(6.37)	(4.16)
1987	-0.005	-0.001		0.021
	(-0.12)	(-0.01)		(0.44)
1988	0.017	0.016		0.051
	(0.44)	(0.31)		(1.10)
1989	-0.002	0.007		0.039
	(-0.04)	(0.12)		(0.83)
1990	-0.037	-0.020		0.013
	(-0.96)	(-0.36)		(0.29)
1991	-0.065 *	-0.027		-0.010
	(-1.66)	(-0.49)		(-0.22)
1992	-0.041	0.011		0.024
	(-1.05)	(0.20)		(0.50)
1993	-0.031	0.021		0.036
	(-0.75)	(0.37)		(0.74)
1994	0.006	0.043		0.078
	(0.13)	(0.75)		(1.55)
1995	0.041	0.082		0.110
	(0.96)	(1.39)		(2.17)
Alliance	0.086 ***	0.094 ***	0.098 ***	0.100 ***
	(3.49)	(2.75)	(4.72)	(3.35)
N	215	215	215	215
R^2	0.66	0.32	0.64	0.49

All variables are in logarithmic form, except for the dummy variables
Numbers in parentheses are t-statistics.
* significant at the 10% level.
** significant at the 5% level.
*** significant at the 1% level.

Table 3. The effect of strategic alliance on partners' partial factor productivity

	(1) Labour factor productivity	(2) Fuel factor productivity	(3) Aircraft factor productivity	(4) Capital factor productivity	(5) Materials factor productivity
Constant	-2.563 ***	-0.421 *	-0.729 **	-1.23 ***	-1.861 ***
	(-5.56)	(-1.90)	(-2.39)	(-3.71)	(-4.19)
Output	0.201 ***	-0.048 ***	0.027	0.102 ***	0.190 ***
	(6.03)	(-2.97)	(1.24)	(4.24)	(5.92)
Stage	0.424 ***	0.101 ***	0.211 ***	0.268 ***	0.241 ***
Length	(7.91)	(3.89)	(5.96)	(6.94)	(4.65)
%Freight	0.110 ***	0.116 ***	0.170 ***	0.025	-0.158 ***
	(2.77)	(6.06)	(6.47)	(0.89)	(-4.14)
%Non-	0.004	-0.010	-0.005	0.023 **	0.013
schedule	(0.30)	(-1.47)	(-0.49)	(2.23)	(0.94)
%Incidental	0.024	0.044 ***	0.092 ***	0.087 ***	0.071 ***
	(1.29)	(4.93)	(7.58)	(6.66)	(3.97)
1987	0.025	0.060	0.030	-0.009	-0.030
	(0.31)	(1.54)	(0.56)	(-0.15)	(-0.39)
1988	0.098	0.074 *	0.030	-0.001	-0.027
	(1.24)	(1.95)	(0.58)	(-0.02)	(-0.35)
1989	0.100	0.093 **	-0.009	-0.039	-0.065
	(1.26)	(2.42)	(-0.17)	(-0.68)	(-0.85)
1990	0.064	0.089 **	-0.060	-0.115 **	-0.916
	(0.80)	(2.32)	(-1.13)	(-1.99)	(-1.19)
1991	0.044	0.099 **	-0.169 ***	-0.206 ***	-0.112
	(0.55)	(2.55)	(-3.18)	(-3.55)	(-1.45)
1992	0.088	0.126 ***	-0.190 ***	-0.214 ***	-0.096
	(1.09)	(3.22)	(-3.54)	(-3.65)	(-1.22)
1993	0.171 **	0.143 ***	-0.252 ***	-0.248 ***	-0.117
	(2.02)	(3.50)	(-4.50)	(-4.05)	(-1.43)
1994	0.219 **	0.158 ***	-0.258 ***	-0.220 ***	-0.073
	(2.53)	(3.79)	(-4.50)	(-3.51)	(-0.87)
1995	0.272 ***	0.175 ***	-0.218 ***	-0.189 ***	-0.037
	(3.11)	(4.16)	(-3.78)	(-2.99)	(-0.44)
Alliance	-0.039	0.051 **	0.152 ***	0.160 ***	0.149 ***
	(-0.78)	(2.09)	(4.53)	(4.38)	(3.05)
N	215	215	215	215	215
R^2	0.55	0.55	0.63	0.47	0.37

All variables are in logarithmic form, except for the dummy variables
Numbers in parentheses are t-statistics.
* significant at the 10% level.
** significant at the 5% level.
*** significant at the 1% level.

Table 4. The effect of strategic alliance on partners' output price

	(1) Output price index	(2) Output price index	(3) Output price index
Constant	3.101 ***	-0.065	2.940 ***
	(8.78)	(-1.09)	(7.81)
Stage Length	-0.446 ***		-0.397 ***
	(-10.24)		(-8.64)
%Freight	0.108 ***		0.068 ***
	(3.42)		(2.05)
%Non-schedule	-0.028 **		-0.023 *
	(-2.35)		(-0.81)
%Incidental	-0.050 ***		-0.034 **
	(-3.31)		(-2.16)
1987	0.088	0.083	
	(1.33)	(0.99)	
1988	0.147 **	0.146 *	
	(2.27)	(1.77)	
1989	0.182 ***	0.171 **	
	(2.78)	(2.07)	
1990	0.253 ***	0.225 ***	
	(3.87)	(2.73)	
1991	0.315 ***	0.262 ***	
	(4.80)	(3.17)	
1992	0.293 ***	0.222 ***	
	(4.44)	(2.69)	
1993	0.297 ***	0.233 ***	
	(4.31)	(2.70)	
1994	0.304 ***	0.264 ***	
	(4.31)	(2.97)	
1995	0.330 ***	0.274 ***	
	(4.64)	(3.07)	
Alliance	-0.086 **	-0.112 **	0.008
	(-2.06)	(-2.14)	(0.20)
N	215	215	215
R^2	0.44	0.08	0.32

All variables are in logarithmic form, except for the dummy variables
Numbers in parentheses are t-statistics.
* significant at the 10% level.
** significant at the 5% level.
*** significant at the 1% level.

Table 5. The effect of strategic alliance on partners' profitability

	(1) Profitability	(2) Profitability	(3) Profitability
Constant	-0.189 *	0.048 ***	-0.137
	(-1.81)	(2.98)	(-1.23)
Stage Length	0.037 ***		0.034 **
	(2.88)		(2.49)
%Freight	0.047 ***		0.048 ***
	(4.96)		(4.91)
%Non-schedule	-0.013 ***		-0.014 ***
	(-3.82)		(-3.82)
%Incidental	0.000		-0.001 **
	(0.00)		(-0.25)
1987	0.052 ***	0.046 **	
	(2.65)	(2.01)	
1988	0.081 ***	0.074 ***	
	(4.23)	(3.30)	
1989	0.052 ***	0.045 **	
	(2.68)	(2.01)	
1990	-0.007	-0.016	
	(-0.34)	(-0.69)	
1991	0.018	0.009	
	(0.94)	(0.42)	
1992	0.015	0.009	
	(0.78)	(0.41)	
1993	0.020	0.012	
	(0.96)	(0.52)	
1994	0.042 **	0.036	
	(1.99)	(1.48)	
1995	0.062 ***	0.055 **	
	(2.91)	(2.26)	
Alliance	0.019	0.023	0.023 **
	(1.55)	(1.61)	(2.13)
N	215	215	215
R^2	0.39	0.14	0.27

All variables are in logarithmic form, except for the dummy variables
Numbers in parentheses are t-statistics.
* significant at the 10% level.
** significant at the 5% level.
*** significant at the 1% level.

Aggregate demand for Canadian airports, 1986-1996: literature review and preliminary results

Since the inception of Canadian commercial aviation, passenger and aircraft movement levels have grown remarkably. Canadian airports handled nearly 74 million passengers and 5 million aircraft movements in 1996. Air transport contributes billions of dollars annually to Canada's Gross Domestic Product and enables connections between sites too distant to be practical by other transport modes. Of 50 million Canadian consumers of passenger transport (excluding private automobiles) in 1989, 46 percent flew, and although in 1991 Canada had a total population ranked only 31st in the world, it ranked ninth in number of air passengers (Statistics Canada 1993). The past two decades of Canadian aviation have been marked by exceptional regulatory dynamism including air carrier liberalization, bilateral and "Open Skies" agreements with other countries, and commercialization of parts of the airport system.

The two objectives of this paper are to review literature on air travel and airport demand and to describe preliminary results of the author's ongoing research on aggregate demand for major Canadian airport services between 1986 and 1996. Aggregate demand for air travel in Canada is largely unexplored, and although passenger demand for air transport has been researched in many places, few studies anywhere explicitly focus on demand for airport services. Although Transport Canada has been transferring responsibility for airports to local airport authorities since 1992, no known studies quantify the effects of this commercialization program or use the National Airports System as a study group. But this situation is bound to change. Though publicly owned, airport authorities operate as private businesses and cover expenses with their own revenues. An understanding of their clients' demand will be increasingly important to planners and airport managers.

Section 1 of this paper synthesizes and reviews literature on aggregate air travel demand modelling, infrastructure privatization, air carrier deregulation, airport choice in multiple-airport regions, and airport competitiveness. Section 2 discusses the data set and methodology of the author's study. Section 3 presents preliminary results of this study.

1. Literature review

1.1 Aggregation level and model form

According to microeconomic theory, transport demand is a derived demand that reaches equilibrium with supply (Kanafani 1983.) Demand for airport services is slightly elastic and depends upon regulatory, geographical, economic, social, and political factors (Doganis 1992, Gillen & Lall 1998.) Commercialization renders the actual situation of the market for Canadian airport services closer to this theoretical scenario.

Most related research of the past three decades accepts these theoretical foundations and focusses, instead, on the functional form of demand models and the selection of variables to include in them. A fundamental debate centres on the merits of the aggregate and disaggregate approaches to demand analysis. This debate is applied to the analysis of air transport by researchers including Verleger (1972), Oum (1989), and Miller & Fan (1991.) Different aggregation levels are suited to different purposes. Aggregate models, poorly used, may gloss over peculiarities of nodes within markets (Slavin 1996.) Their elasticities are generally not transferable from one time period, region, or mode to another. But they are indispensable for understanding the nature of market demand; they allow comparisons of individual nodes to industry or regional averages, and they are based on relatively inexpensive data.

In 1974, Thompson cited a lack of disaggregate air transport demand studies. But Kanafani (1983, 233) noted in 1983 an increasing prevalence of disaggregate models of air transport demand. By the early 1990s, according to Miller & Fan (1991, 1505), practically all transport demand models were disaggregated to some extent. In 1994 – in contrast to Thompson's observation 20 years previously – Fleming & Ghobrial (1994) cited a paucity of *aggregate* models of air transport demand. The future will show whether the research pendulum will swing back in favour of aggregate studies.

In addition to aggregation level, the suitability of various model functional forms is debated. A "more or less uniquely Canadian" field is comparison of the demand elasticities of different functional forms of inter-city travel demand model (Miller & Fan 1991, 1512.) Oum (1989) used train and truck freight transport demand data from 69 Canadian regions to compare linear, log-linear, translog, and logit models. The translog model produced the most reasonable elasticity estimates, but the log-linear model performed almost as well and is better suited to analysis of a single mode and to trip generation analysis. (Oum 1989, 168; Miller & Fan 1991, 1511.)

1.2 Aggregate air travel demand analysis

Thus, this study of demand for Canadian airport services extends the literature on aggregate air travel demand analysis. There have been few such

studies on *airport service* demand, though several studies examine air *travel* demand. At least one study addresses the Canadian airport demand question directly: Abouchar (1970) uses econometric models to estimate passenger and air carrier demand for Canadian airport services. His objective is price-setting to optimize airport congestion levels. Demand analysis as a means of price-setting for airport services is advocated by other researchers including Gillen (1997, 56.)

Several aggregate air travel studies are based on city-pair data and disaggregate models of air traffic between individual city pairs. Hsu & Wu (1997) use city-pair studies to estimate the size of an airport market. Airport market "catchment areas" are unpredictably sized and shaped. Fleming & Ghobrial (1994) use city-pair data to examine state-wide air travel demand in seven American states. Presence of a hub airport in a state, expenditure on tourism, and value of manufacturing shipments were statistically significant. Manufacturing shipments, a proxy for business activity, has an elasticity more than twice that of tourism expenditure, a proxy for discretionary travel. Ghobrial (1993) studies air travel demand in 47 city pairs with one city in the US and one in Europe, Asia, or Latin America. Market demand is elastic with respect to per-capita income but inelastic with respect to flight frequency and aircraft size. However, demand for individual airlines is elastic with respect to the latter two variables.

Methods other than city-pair analysis have been used to study aggregate air travel demand. Ghobrial (1992) estimates the aggregate demand for an American domestic airline. Significant determinants included numbers of aircraft departures and population density in the airline's network of cities. Kaemmerle (1991) develops a log-linear predictive tool for air transport demand in American communities with fewer than 200,000 inhabitants. Significant determinants of enplanement levels at 260 communities are income, attractiveness of driving to nearest connecting hub, weekly direct flights to all hubs, aircraft size, and airport hub status. Only the income variable had an elastic parameter.

The importance of aircraft size to short-haul air travel demand was established two years prior to Kaemmerle's study by Russon & Hollingshead (1989.) Ghobrial & Kanafani (1995) also find that passengers significantly prefer large jets to small and/or propellor-driven planes, though they also significantly prefer direct to non-direct flights. This suggests a routing and scheduling challenge for air carriers, since many direct flights are uneconomical except in small planes.

1.3 Socio-economic impacts of air travel

Aggregate demand analysis and estimates are often used to calculate airports' economic impacts including employment, stimulus to industry, and tax revenues. But researchers debate whether airports stimulate economic growth or economic growth stimulates airport use. Goetz (1992) confirms that the level of air service to 50 American cities is correlated with prior and subsequent population growth in those cities, but states that the causal direction is uncertain. Dempsey, Goetz, & Szyliowicz (1997) suggest that socio-economic growth causes increased

demand for airport services. On the contrary, Hansen & Gerstein (1991) establish that high levels of direct air service between Japan and American cities is a significant *cause* of high levels of Japanese investment in those cities.

One economic impact of airports is stimulus to industry. Dunning & Norman (1987) reveal that the presence of an airport is an important variable to international companies in deciding whether to locate branch or regional offices in the United Kingdom. Their conclusion is based on a survey of 83 international companies who rated the importance, on a scale of 1 to 4, of 40 factors influencing branch or regional office location. The "airports" factor received the highest average rating (3.5 out of 4) of all 40 factors. "Language" (3.4 out of 4) and "market size and prospects" (3.1 out of 4) were second and third.

A more general debate centres on the role of infrastructure in national productivity. In a series of papers, Aschauer (1989, 1991, 1993) estimates the elasticity of American goods productivity to be very high with respect to public infrastructure expenditure, and blames the US productivity slowdown of the 1980s partly on decreased infrastructure investment. This view is expanded by Nadiri & Mamuneas (1991), Kulash (1997), and Dahms (1997.) Wylie (1996) extends Aschauer's research into Canada, and estimates similarly high elasticities of Canadian goods productivity with respect to infrastructure investment.

However, other researchers claim that Aschauer's elasticities are too high. Gillen (1997) states that the causes of both the American and the Canadian productivity slowdown are unclear. Previous bursts of research activity, correlating the slowdown with factors other than infrastructure investment, produced results that were equally compelling but that ultimately failed to explain the slowdown.

1.4 Airport privatization, aviation deregulation, and "hubbing"

Some researchers apply the infrastructure investment debates specifically to airport privatization. Poole (1990) advocates privatization of large and medium-sized American airports to allow capacity increases, free up cities' capital, spur airline competition, and generate corporate tax revenue. Poole recommends restrictions on airport ownership by airlines to prevent airports acting anti-competitively, but opposes price regulation, since market equilibrium would set optimal price levels for airport services. Golaszewski (1992) agrees with the principle of airport privatization but argues for economic regulation because airports are likely to exist in monopolies or oligopolies. Ashford & Moore (1992) concur that the brief history of airport privatization worldwide suggests no insurmountable economic obstacles to privatizing American airports. However, they add that privatization may occur for political rather than economic reasons, as was the case with some British airports. Gillen & Cooper (1995) review studies comparing public and private airports and seaports. They conclude that most private airports and seaports operate more efficiently, and that Canadian airports are suitable for commercialization. However, privatized and commercialized airports and seaports function best in markets in which true competition exists.

Airline liberalization has been studied extensively (Oum 1996.) Such research relates to this study in two ways: first, the commercialization of the Canadian airport system is broadly analogous to the 20-year old global trend towards liberalization of air carriers, and second, air carrier liberalization produced major effects on airports including the emergence of "hubs" and "spokes." Oum, Zhang, & Zhang (1996) compare pricing structures in a defederalized system of hub-and-spoke airports. Demand at hubs and spokes is complementary, and optimal prices for airport services reflect this complementarity – to the extent that larger, more profitable hub airports should subsidize spoke airports. The Canadian airport commercialization program must be co-ordinated, since airports are transferred individually and have independence in price-setting.

Graham (1998) describes the geography of demand for the liberalized European air transport system. From an aggregate point of view, consumers have benefitted from liberalization. However, the distribution of these benefits is limited by disparities in regional development level, the most important determinant of air transport demand. Butler & Huston (1990) examine the effects of ten years of deregulation on service levels at American non-hub airports. Assuming that the number of attainable one-stop destinations from an airport is a more meaningful service indicator than the number of non-stop destinations, they show that service at non-hub airports has improved since deregulation in 1978.

A few studies focus on the post-deregulation airport phenomenon of fortress hubs – airports overwhelmingly dominated by one or a very few air carriers. Zhang (1996) explains the emergence of fortress hubs in terms of economic theory. Kling, Grimm, & Corsi (1991) propose effective operational strategies for non-hubbing air carriers operating at hubs dominated by a competitor. Their recommendations arise from a regression of strategies adopted by air carriers who successfully operate out of competitors' hubs.

1.5 Studies of airport competitiveness

The foregoing literature on infrastructure investment options and airline liberalization shows that around the world, the market for airport services is becoming increasingly competitive. This is reflected in the literature: a growing research stream evaluates individual airports' potential for competitive success. Such studies often focus on the likelihood of a particular airport being or becoming an hub or airport choice by passengers in multiple airport regions.

Park (1997) uses a "fuzzy linguistic" approach to determine the likelihood of nine major east Asian airports emerging as dominant hubs in the region. The most significant determinants are geographical characteristics and airport accessibility. Hong Kong's Chek Lap Kok, Singapore's Changi, and Seoul's Inchon airports are most likely to succeed. Berechman & de Wit (1996) study the likelihood of West European airports emerging as hubs as a result of air carriers changing their network structure after deregulation. Huston & Butler (1991) perform a similar study of American airports, using data from 212 television

markets. Proximity to a market is the most significant variable, followed by per capita income and status as a tourist or business centre. Minimum distance to nearest hub was nearly significant at the 10 percent level. Hansen & Kanafani (1988) use regression to estimate traffic levels at American airports under alternative hubbing strategies employed by airlines. Traffic level shows high sensitivity to choice of hubbing strategy. Dresner, Lin, & Windle (1996) explore the effects of the entry of a low-cost airline at a hub airport on other airlines at that airport as well as traffic at nearby, competing airports.

Harvey (1987) derives determinants of passenger choice among multiple airports in the San Francisco Bay area. Airport access time and frequency of flights to chosen destinations are the significant explanatory variables. Demand from business passengers is much more elastic with respect to these variables than demand from non-business passengers. Russon & Riley (1993) find that the availability of a substitute airport is a significant determinant of passenger demand for short-haul services at a particular airport among the 391 American city pairs they studied. A similar study from the point of view of air carrier demand is Dresner & Windle (1992), which examines the effects of an air carrier's market share at an airport on the carrier's yield. Results indicate that airport market share significantly affects air carrier yield.

1.6 Summary

Commercialization is creating a new, competitive situation for Canadian airports, but demand analysis of Canadian airport services is scarce. Literature suggests that this phenomenon is suited to an aggregate-level study using log-linear models. Many existing air transport demand studies use the aggregate approach, but most of these focus on passenger demand for air travel and few make specific reference to Canada. Elasticities and results from such research are useful guides for this study, but aggregate demand models are largely non-transferable from one region or market to another. A model of demand at airports of which some are commercialized or privatized must take note of a major debate in the literature on socio-economic effects of infrastructure investment. A few researchers have applied this debate specifically to the phenomenon of airport privatization. In addition, limited analogies may be drawn with the many studies of air carrier liberalization, of which some document effects on airports including emergence of the hub-and-spoke system. In response to these increasingly competitive forces acting on airports, a body of research is growing on the competitive potential of airports. To date, such research has focussed on American, European, and Asian airport systems, but no known studies focus on the Canadian airport system.

2. Data and methodology

2.1 Scope of data set

Data for this project come from 18 large Canadian airports for the 11-year period from 1986 to 1996. The airports are among the 26 defined by Transport Canada's 1994 National Airports Policy as forming the National Airports System (NAS), and, except for Gander, all are located in or near cities defined by Statistics Canada as Census Metropolitan Areas (CMAs.) Gander is a Census Agglomeration (CA.) NAS airports are located in the national capital or a provincial or territorial capital, and/or handle at least 200,000 passengers yearly. Together, the 26 NAS airports handle 94 percent of air travellers in Canada (Transport Canada 1994.) Transport Canada's intends to defederalize all NAS airports within five years of implementation of the National Airports Policy. Five NAS airports had been transferred before July 1996.

The distinctiveness of NAS airports was established statistically by some preliminary analyses of this study. Originally, Hamilton International Airport – not a NAS airport – was included in the data set. However, it had to be excluded because scatter plots of its annual aircraft movement and passenger levels on other variables were severely inconsistent with the rest of the data set. Although Hamilton is a busy cargo airport, its passenger levels are of a different order than those of NAS airports. Adequate cargo data for all airports and all years of the data set are not available.

Data applied to Ottawa are for the consolidated CMA of Ottawa and Hull, since this is much more likely to related to the catchment area of Ottawa's airport than either Ottawa or Hull alone. Data for both of Montreal's airports (Dorval and Mirabel) are for the CMA of Montreal.

The years 1986 to 1996 are the study period. This allows data from three censuses to be used (1986, 1991, and 1996.) Between 1986 and 1996, data collection practices by Transport Canada, Statistics Canada, and other sources did not vary to an extremely problematic degree. 1996 is the latest year for which some data are available. The 198 observations that an 11-year period allow (18 airports times 11 years) are sufficient for the regressions to be performed by this study, none of which are expected to have more than ten parameters. Preliminary regressions described in this paper contain no more than five parameters. Finally, between 1986 and 1996, five airports in the study group were defederalized. This allows examination of quantitative differences arising from defederalization.

2.2 Selection of variables

2.2.1 Preliminary data set

The independent variables of most air transport demand studies begin with measures of population and income. Average CMA/CA family income is used as the income measure in this study. The population measure is Census

Metropolitan Area population (and Census Agglomeration population for Gander.) Although the market "catchment area" of an airport is of unpredictable shape and size (Hsu & Wu 1997) and unlikely to fully correspond with CMA/CA borders, this measure shows significant explanatory power in preliminary regressions.

Market demand for air transport depends upon characteristics of suppliers and consumers in addition to population and income. One of the objectives of this study is to determine whether airport commercialization significantly affects airport demand, so a dummy variable was assigned the value of 1 for airports commercialized before July 1 of a particular year, and 0 otherwise. Further independent variables will be used in later regressions.

The distinct demand functions of passengers and air carriers for Canadian airport services has long been recognized (Abouchar 1970), and these are indicated, respectively, by passenger levels and aircraft movement levels at airports. Most studies of airport activity consider only the former measure, though some consider the latter instead (Hansen & Gerstein 1991, Goetz 1992.)

This study uses both, and its explanatory potential is increased by disaggregation of passengers according to origin/destination (domestic, transborder, and other international) and service type (scheduled or charter) and by disaggregation of aircraft movements according to gross take-off weight. Preliminary regressions use the three weight categories used by Benell & Prentice (1993.) "Small" aircraft have a gross take-off weight less than 5,671 kg; "medium" are 5,671-35,000 kg, and "large" are greater than 35,000 kg. In very rough terms, "small" aircraft include general aviation, business, and very small commuter aircraft up to the size of a DHC Twin Otter. "Medium" aircraft are mostly turboprop commuter planes (e.g., Dash-7, Dash-8, BAe Jetstream) and small regional jets (e.g., Canadair Regional Jet and Fokker F28.) "Large" aircraft consists of the vast majority of commercial jet traffic, including planes the size of a BAe 146 and larger. It is likely that these traffic types represent different markets with distinct demand functions.

2.2.2 Additional variables sought/proposed

Researchers including Fleming & Ghobrial (1994), Kaemmerle (1991), and Huston & Butler (1991) show that air transport demand is responsive to local industrial mix. As an indicator, this study will use labour force composition data, found by Kaemmerle (1991) to be a significant explanatory variable in a similar study of air transport demand in small US communities.

An indicator of price is important for air transport demand models (Verleger 1972) and this study will use the Consumer Price Index for public transportation as an indicator. Since, as Statistics Canada reports, 30 to 40 percent of passengers at Canadian airports in the study period were flights to or from the US, the state of the US economy is likely to influence aggregate airport demand in Canada. This will be controlled for with indicators of American economic activity.

To test for the responsiveness of demand for airport services to supply of these services, a measure of airside capacity will be obtained by combining runway dimensions with the number of gates and bridges at each airport in each year, and terminal capacity (in passengers per year) will also be used. In addition, it is hoped that this study will include data on revenues, total expenses, and capital expenses for each airport from 1986 to 1996. This would permit analysis of airport performance by examining the response of revenue/expense ratios and revenue/passenger ratios to policy changes, expansions, and other conditions. Such information could be of use to airport managers and government agencies.

2.3 Sources of data

Airport demand levels were obtained from government publications. The Aviation Statistics Centre of Statistics Canada publishes annual aircraft movements in ten weight categories in *Aircraft Movement Statistics* and passenger level, disaggregated by type of service and origin/destination in *Air Carrier Traffic at Canadian Airports*. Benchmarks for population and average family income were obtained from the 1986, 1991, and 1996 censuses. Population and income figures for non-benchmark years come from linear interpolation of benchmark figures. This assumes linear growth of both variables during five-year intervals, a realistic assumption. Dates of airport commercialization were obtained from an internet search and from a telephone and fax survey of airport employees.

Later versions of this study will include indicators of airport capacity, local labour force composition, relative price of transportation, airport revenues and expenses, and indicators of American economic activity. Airport capacity data are being assembled through telephone and fax surveys of airport employees, airport websites, and various publications. Detailed labour force composition is published by Statistics Canada for CMAs in census years. Regional and yearly variations in public transportation cost are published by Statistics Canada in *Consumer Prices and Price Indexes*. The Consumer Price Index for public transportation is published for CMAs prior to 1995, and for provinces thereafter. Airport revenues and expenses are obtained from annual reports of commercialized airports and from Transport Canada records and a telephone/fax survey of airport employees for all other cases. American economic indicators are available from American census and industry publications.

Financial data for commercialized airports is easily obtained from annual reports of individual airports, but for non-commercialized airports, this data is very difficult to obtain. An extensive telephone, fax, and e-mail survey is continuing.

2.4 Methodology

Before regressions were performed, the distribution of each variable in this study was checked for statistical normality. No variable except the income measure was normally distributed. Each non-normal variable was transformed logarithmically, and all these natural logarithms exhibited normal distribution.

Like analyses of air travel demand, this study uses log-linear regressions. Oum (1989) and Miller & Fan (1991) tested the relative suitability of several model functional forms, including log-linear. Although the translog model produced the best results using multiple transport mode or market-share data, the log-linear form produced results almost as good using data from only one transport mode. Therefore, it can be inferred that for analyzing the demand for a single transport mode, the log-linear model is highly appropriate.

Regressions were performed with the SPSS computer program. Variables were entered stepwise and retained if they were significant at the five percent level or better. Residuals were examined for abnormalities. Cases with values missing from any variable were excluded from the model. Therefore, of the regressions described below, those that specifically mention transborder passenger levels are based on 162 observations and all others are based on 198 observations.

3. Preliminary results

As base models, aircraft movements and total passengers were, in turn, regressed on population and income. Both models had good explanatory power, with coefficients of determination of .486 for the former (aircraft movements) and .706 for the latter (total passengers.) This confirms a relationship between airport demand and demographics corroborated by many other air travel demand studies.

3.1 Effects of airport commercialization on airport demand

The dummy variable indicating commercialization status was added to these base models to test for significance. It was insignificant with respect to total passengers, but was significant at the five percent level (p=.041) with respect to aircraft movements, improving the coefficient of determination from .486 to .499.

It is counter-intuitive that commercialization status of an airport should affect that airport's total aircraft movements, additionally so that it should affect aircraft movements without significantly affecting passenger levels. Closer examination reveals that it is mid-sized aircraft (i.e., those with gross take-off weight of 5,671-35,000 kg) most affected by commercialization status. Since, at the airports of the study group, this weight class would consist primarily of commuter aircraft, it is possible that the market for commuter aviation is more affected by airport charges or some other characteristic of airports that is likely to change as a result of commercialization than the markets for general, small business, and commercial jet aviation.

Figures 1 and 2 show that mid-sized aircraft movements grew more dramatically at most commercialized airports than at most federal airports after 1993, the year in which commercialization took place. However, the rapid increase in mid-sized traffic at Toronto's Pearson Airport (indicated on Figure 2 with plus signs), a federal airport during the study period, suggests that increases in mid-sized traffic may depend upon the *size* of an airport, not its commercialization status.



Figure 1

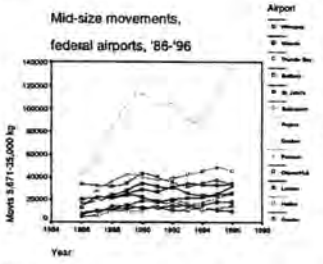


Figure 2



Figure 3

3.2 Total flights per capita

In addition to absolute numbers of aircraft movements, passenger flights per capita increased at most NAS airports. Levels at the five commercialized airports are shown in Figure 3. When per-capita flights (at all airports in all years) were regressed on commercialization status, CMA/CA population, and income, only income was significant. However, it is expected that indicators of local industrial mix will also be significant in future regressions. Per-capita airport use appears not to depend on CMA population, and commercializing an airport appears not to stimulate local use of it. It is possible that effects of airport commercialization on use rates will appear only after many years (Ashford & Moore 1992), since effects of other major aviation policy changes, such as American airline deregulation, take decades to appear (Butler & Huston, 1990.)

3.3 Determinants of transborder passenger levels

In 1994, Canada and the United States concluded the "Open Skies agreement", which removed restrictions on routes and volumes of commercial aviation between the two countries. At five of the seven largest airports in Canada, transborder passengers increased dramatically between 1994 and 1996 in absolute numbers and as a proportion of total passengers (Figures 4 and 5.)

To test for statistical evidence of the impact of the Open Skies agreement, transborder passengers were regressed on variables indicating year and CMA population. The income variable was not included, since it would likely be collinear with year. Data on transborder passengers are only available from 1988 to 1996 due to changes in the disaggregation of Statistics Canada data after 1987.

The year variable was significant at the five percent level (p=.029) and improved the coefficient of determination from .588 (with population as the sole independent variable) to .601. However, a greater number of independent variables is needed to reliably test for the effects of a policy change in a single year and control for other effects such as economic cycles. But the preliminary regressions just described imply that the relationship between policy changes and passenger and aircraft movement sub-group levels is worth further investigation.



Figure 4

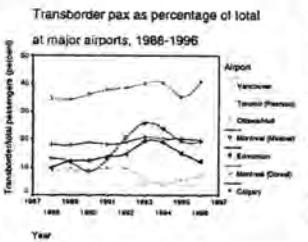


Figure 5

4. Conclusions

This paper reviews literature on air travel demand and discusses the scope, methodology, and preliminary results of an ongoing study on the aggregate demand for Canadian airport service between 1986 and 1996. The types of parameters to be included in the demand model are described. Collection of data, including airport revenues and expenses, is continuing.

In spite of the emerging competitive environment of Canadian airports, scant literature exists on either the Canadian airport system or aggregate demand for Canadian air travel. However, several research streams are related. Debate over aggregation level and functional form in transport demand models suggests that airport service demand can be suitably examined in an aggregate manner with log-linear models. Several studies explore aggregate demand for air travel by passengers, and other studies discuss airport commercialization both specifically and in the broader context of infrastructure investment. However, the role of infrastructure in national productivity is much debated in this literature. Many researchers have examined air carrier liberalization. Liberalization's effects on air carriers may be analogous to the effects of commercialization on airports. The hub-and-spoke airport system, which emerged as a result of liberalization, and the drive for airport commercialization explain why a stream of research is growing that evaluates the competitive potential of individual airports.

Preliminary results of this study imply that commercialization status, indicated by a dummy variable, significantly affects numbers of movements of aircraft with gross take-off weights between 5,670 and 35,000 kg. These roughly

correspond to commuter aircraft. However, commercialization status is not significant with respect to passenger levels, and further analysis is needed to distinguish the effects of airport commercialization from those of airport *size* on aggregate air carrier demand. Results from another preliminary regression show that a variable indicating year is significant at the five percent level with respect to transborder passenger levels. This may reflect service increases due to the Open Skies agreement between Canada and the United States, but the regression contained too few parameters to isolate the effects of a single policy or change in a particular year. These preliminary results suggest that the effects of commercialization and other policy changes are worthy of consideration in the development of a model of aggregate demand for Canadian airport services.

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Timely Railway Data – A Leading Economic Indicator for GDP?

by Harold Kohn and Yasmin Sheikh
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1.0 Introduction

Leading economic indicators are of interest to many in Canada and around the world. Investors, business people, financial analysts and others are accustomed to regular economic indicator announcements in Canada and the United States. The release of indicator information frequently affects the day to day performance of the stock and financial markets as well as having longer term economic impacts.

In its *Canadian Economic Observer*, Statistics Canada has put forward several criteria with regards to the behaviour of leading economic indicators.[1] These include:

- representing and accurately measuring important economic processes or variables;
- leading and conforming to business cycle movements;
- providing adequate coverage of major sectors of the economy; and
- being available frequently and promptly and not subject to major revisions.

Statistics Canada publishes information for a large number of economic indicators that are used for a variety of purposes. Well-known indicators include the:

- Business Conditions Survey;
- Composite Index;
- Help Wanted Index;

[1] "Statistics Canada's New System of Leading Indicators", P. Cross and F. Roy-Mayrand, *Canadian Economic Observer*, Feb. 1989, p. 3.5.

- Number of Building Permits; and
- Employment, Earnings and Working Hours.

2.0 Purpose of the Study

The purpose of this paper is to outline the results of preliminary research into the use of a potentially new economic indicator for Gross Domestic Product (GDP) - railway carloadings. The Railway Carloadings Survey is a monthly survey of eighteen Class I and II[2] common carrier railways operating in Canada. The survey contains information on revenue freight by weight (in metric tonnes), the number of carloads and the commodity, for Eastern and Western Canada.[3]

Monthly railway carloadings are available 35 days after the end of the reference period,[4] potentially making it one of the most timely economic indicators. Although revisions may occur, these are infrequent. Monthly carloading information is published regularly by Statistics Canada in *The Daily*.

Many commodities transported by rail are for export. Since there are few export related economic indicators, carloadings may make a valuable contribution. In addition, since both agriculture and mining are important users of rail transport, it may be that they fill a gap in the library of leading economic indicators.

The development of a leading economic indicator requires considerable research and debate. The indicator must stand the test of time in terms of its ability to estimate accurately. The research outlined in this paper should be considered preliminary and is presented with the intent of inviting discussion and debate.

3.0 The Importance of Rail Freight

The ability of a model to emulate reality depends on a statistical as well as an intuitive relationship between the economy and one or more variables, in this case transportation (rail freight).

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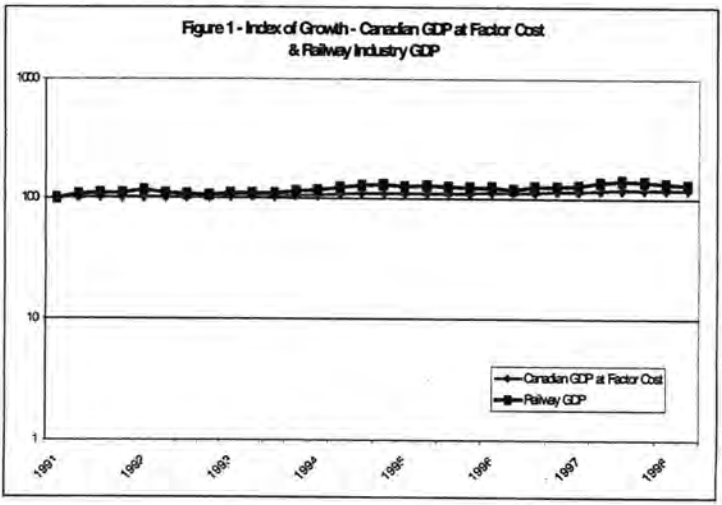
[2] Railway companies, falling within the legislative authority of the Parliament of Canada, are classified as follows: Class 1 – Canadian National Railway, Canadian Pacific Limited and VIA Rail Canada Inc., and their related operations. Class 2 – Other carriers involved in Canadian rail (freight) transportation. Class 3 – Other companies such as terminal, bridge and tunnel companies.

[3] Statistics Canada Catalogue 52-001. Also available on CANSIM, Matrix 1431.

[4] The reference period is the time period when the activity(s) occurred.

Ever since the building of the railway in the late 1800s under Prime Minister Sir John A. Macdonald, Canada has been dependent on its transportation system. The nation's vast distances, resource base and reliance on domestic and international trade are some of the reasons for the importance Canada has placed on its transportation system.

Although the railway industry's component of GDP is less than one percent of Canada's GDP,[5] there is a relationship between the growth trends of each as shown in Figure 1.[6]



[5] Source of GDP data: Statistics Canada CANSIM Matrix 4678: GDP at Factor Cost, Quarterly, Seasonally Adjusted, expressed in millions of 1992 constant dollars. Railway industry GDP includes passenger services but these are marginal in comparison to freight.

[6] The statistical correlation between Canada's GDP at Factor Cost and the railway industry's GDP is 0.6. Figure 1 is logarithmic.

Although the railway industry's GDP component of Canadian GDP is small, approximately one third of Canada's GDP is generated by goods-producing industries that utilize railways (as well as other modes in some cases). These industries include agriculture, fishing, trapping, logging, forestry, mining, quarrying, oil drilling, manufacturing, construction and other utilities.[7] Railways move a significant portion of this freight within the country and also transport freight to and from Canadian ports as part of the international trade distribution system. Canadian railways also handle freight between Canada and the United States. A portion of this trade links American points with Canadian ports for subsequent worldwide trade.[8]

In today's fast paced world, containers have become one of the most important means of transporting freight. In addition to being cost-effective and flexible, containers are intermodal in that they can be transferred with relative ease between ships, trains and trucks. They can be delivered to off-loading points and picked up later without requiring the truck or delivery vehicle to remain on site while the container is unloaded or loaded.

The key factor behind the growth in the use of containers is the increase in international trade. Reasons for the increase in trade include globalization, favourable exchange rates and the North America Free Trade Agreement (NAFTA). The major railways, Canadian National and Canadian Pacific, have responded by developing intermodal terminal facilities and buildings, expanding tunnels (to permit double stacking of containers) and introducing innovative technology to capture a share of the resulting traffic increase.

The distribution of container goods by rail (and truck and ship) represents the delivery of parts, supplies and finished goods to manufacturers, retailers and wholesalers, just in advance of fabrication or sale. In an era of Just-In-Time (JIT) delivery, money changes hands around the time of delivery or shortly thereafter, and, at least intuitively, the volume of goods carried in containers should represent the state of the economy in the short term. Containers travelling between Canadian ports and U.S. origins and destinations may not be

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[7] Source: Statistics Canada *The Daily*, based on data issued on Oct. 30, 1998.

[8] For a review of rail-marine commodity flows, interested readers may refer to "An Analysis of Marine-Rail Intermodal Commodity Flow in Canada, 1984-1990", *Shipping in Canada, 1992*, published by Statistics Canada. Statistics Canada's Transportation Division is intending to update this research within the next few months.

directly tied to the domestic economy, although there is a strong link between the American and Canadian economies.[9]

As can be seen in Figures 1 and 2, the railway sector has grown in a fashion that emulates the overall economy although its rate of growth has been more volatile. Since 1991, railway growth has been cyclical. Canada began to emerge from the recession in 1992, and despite strikes, the railway industry shared in this growth. Growth from 1991 to 1994 in Canada was dominated by strong exports and a weak domestic sector. Since railways are a key link in meeting export demand, the industry posted a similar upward trend with higher growth rates than aggregate GDP.

As export demand subsided and with domestic demand still flat, the economy began to slow its rate of growth beginning in 1995. The railway sector was particularly affected by strikes, poor weather and the abolition of subsidies under the Western Grain Transportation Act. The rail sector's GDP, therefore, suffered a plunge in 1995 that continued into 1996.

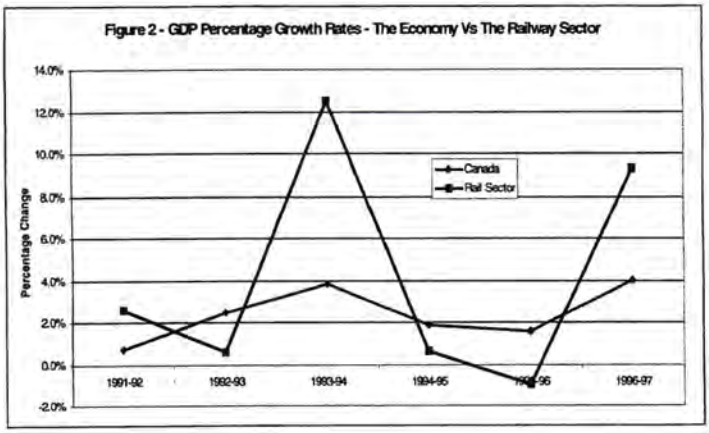
Since 1996, domestic demand has increased. Both the overall economy and the railway sector have shown strong growth, with the railway sector once again out-pacing the economy.

The analysis to date has used data from the 1990s although in future work, the time series will be expanded. Nevertheless, the 1990s were characterized by both growth and decline, and for initial research purposes, this time period is appropriate in terms of evaluating the feasibility of developing a potentially new indicator.

Based on Canada's dependence upon transportation and the importance of rail freight, it would appear that intuitively, at least, a link between rail freight and the economy could be made. In the next section, a closer examination is made of the empirical evidence.

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[9] An important aspect of a leading economic indicator is, in this case, the lag between the impact on GDP and the movement of freight contained in the railway carloading data. The research in this paper is based primarily on quarterly data, and because of JIT, the lag impacts are considered marginal. Lag effects may be greater with the use of monthly data and although some work has been done using these data, further work is required.



4.0 Railway Carloadings

The information collected from the Class I and II railways and published by Statistics Canada covers 69 different commodities. Most general freight commodities are included in the category called *Containers on Flat Cars (COFC)*. Figures 3A, 3B and 3C[10] compare Canadian GDP (shown as a growth index) to indices of growth for the top 5 commodities and all commodities carried by the railways.

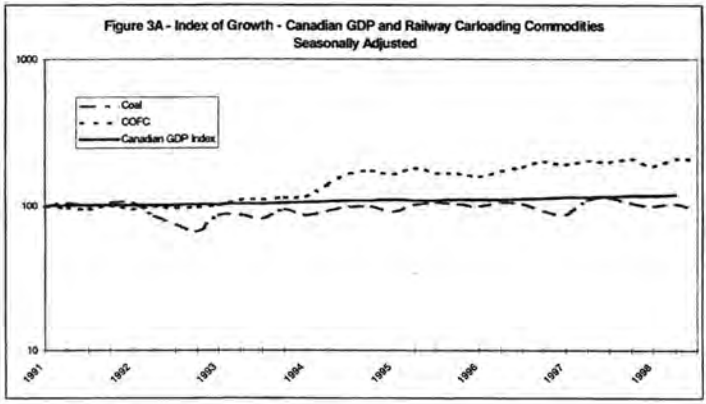
As Figures 3A, 3B and 3C show, COFC tonnage is the largest growing component of railway traffic, exceeding the growth of leading products such as coal, iron, wheat and potash. The rate of growth of coal tonnage has been less than the growth of the Canadian economy, and the tonnage transported of potash and wheat has shown large fluctuations.

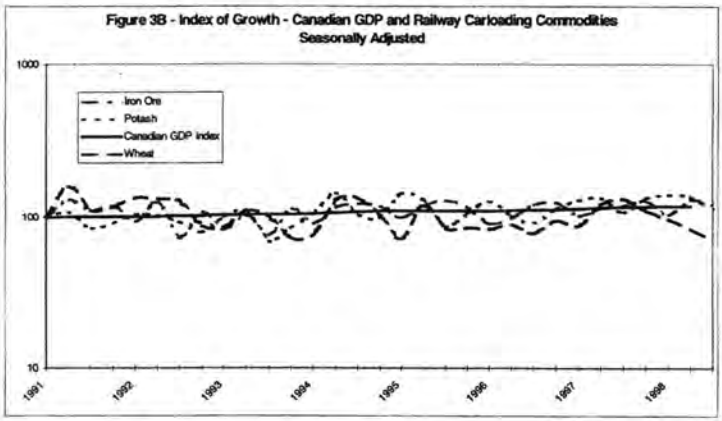
The top five commodities comprised 51 percent of the total tonnage in 1997.

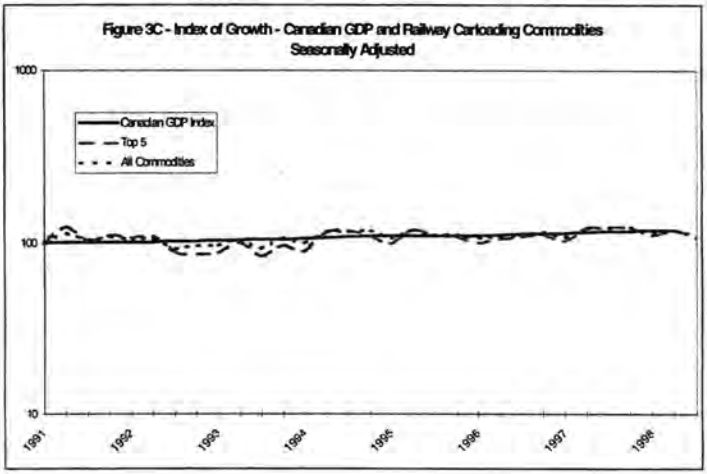
The three figures show that railway carloading tonnage carried is more volatile than Canadian GDP. The greater volatility of the carloadings data is caused by

[10] Figures 3A, 3B and 3C are logarithmic.

the cyclical nature of the tonnage loaded for the top five commodities that dominate the railway transport. The production and, hence, transport of these commodities is dependent on harvesting conditions, mining activity and international demand.







5.0 The Model

5.1 General Approach

To measure the quantitative relationship between railway carloadings and Canada's GDP, regression analysis was chosen as the analytical tool. The technique allows the use of one or more independent variables to explain the variation in the dependent variable (Canada's GDP).

This paper does not include a detailed review of all the analysis carried out; rather, highlights are presented.

Essentially, five different railway data variables, (the top 5 commodities in metric tonnes) were used to calibrate and test the model:

1. iron ore concentrates;
2. coal;
3. wheat;
4. COFC (containers on flat cars); and
5. potash.

Two additional variables were also tested:

6. total tonnage of the top 5 commodities; and
7. total tonnage of all commodities.

The analysis began by testing each of the 7 variables in single independent variable models. Quarterly data from 1991 to the second quarter of 1998 were used to calibrate the model.

The single variable analysis was followed by the use of multiple independent variables. Stepwise regression was used to choose the best variables and then complete multiple regression analysis was conducted.

The testing process included the use of two different GDP variables:

1. GDP at Factor Cost, Seasonally Adjusted in 1992 Constant Dollars (CANSIM Matrix 4678); and

2. GDP Expenditure Based, Current Dollars, Seasonally Adjusted (CANSIM Matrix 6521).

The above data sets are quarterly. The model was also tested using monthly data. Preliminary results using monthly data were encouraging but, as expected, more variation was found to exist than in the quarterly series model. Additional work is required.

The railway carloadings data used were both seasonally and non-seasonally adjusted. Non-seasonally adjusted independent variable data produced better statistical results. It may be preferable to use non-seasonally adjusted independent variable data because these data are timelier than the seasonally adjusted information (that must be calibrated, which takes additional time).[11] However, future research will evaluate both types of data.

5.2 Statistical Results

The following table shows the F ratio and adjusted R square value for each of the independent variables in the single equation models. Results are shown for

[11] The delay in obtaining seasonalized data can be several weeks although it might be possible to shorten the time required to produce seasonalized results.

both GDP indicators. Except for COFC, the R square values show that the variation in GDP as explained by the independent variables is low. In terms of the model's overall predictive power (the F ratios), both iron ore and wheat are not significant[12] although the other independent variables are significant.[13] The results for COFC are the best, because the model is statistically significant at the 99 percent level of confidence and the independent variable explains 92 percent of the variation in GDP.

In the next stage of the analysis, multiple independent variables were used (that is, combinations of the above 7 variables). It was not possible to combine all variables, such as "All Commodities" and the "Top 5", because these variables are highly correlated and their use would introduce statistical bias. Table 2 shows the correlation matrix.

Table 1
Selected Regression Results for Single Independent Variable Regression Models

	GDP Expenditure		GDP at Factor Cost	
	R Square	F Ratio	R Square	F Ratio
Iron Ore	0.10	4.08	0.09	3.76
Coal	0.15	5.97	0.14	5.78
Wheat	0.03	2.03	0.06	2.72
Potash	0.37	17.89	0.33	15.59
COFC	0.94	487.9	0.92	355.8
All Commodities	0.46	25.34	0.49	28.43
Top 5	0.22	9.28	0.25	10.53

[12] at the 95 percent level of confidence
[13] at the 99 percent level of confidence

Table 2
Correlation Matrix

	Iron Ore	Coal	Wheat	COFC	Potash	Top 5	All Comm
Iron Ore	1.00						
Coal	0.51	1.00					
Wheat	0.17	0.22	1.00				
COFC	0.46	0.44	-0.26	1.00			
Potash	0.22	0.26	0.03	0.58	1.00		
Top 5	0.80	0.77	0.48	0.58	0.51	1.00	
All Commodities	0.76	0.72	0.24	0.76	0.59	0.93	1.00

Combining COFC and All Commodities (the second best performing single independent variable) was not done because of the high correlation between these variables. However, Potash and COFC were combined in one model although the results produced only a marginal improvement over the use of COFC by itself, as shown in Table 3. As indicated by the F ratio, the multiple variable independent model has a lower F ratio although both models are significant at the 95 percent level of confidence. The R square values are the same. There is little statistical correlation between COFC and Potash, so that no statistical biases are introduced as a result of multicollinearity. The t statistic on Potash shows, however, that this independent variable is not statistically significant. It appears, therefore, that using COFC by itself in a single independent variable model is preferable.

The next step was to determine whether to use GDP at Factor Cost or the GDP Expenditure data series as the dependent variable. As can be seen from the above table, the results are not significantly different except that the GDP Expenditure data exhibits stronger F and t statistics. However, both are strong models. Since Statistics Canada normally publishes the Factor Cost series in *The Daily*, it was determined that this series would be familiar to more information users and should be used to build the model.

Table 3
COFC Versus COFC and Potash
Key Statistical Indicators

	GDP Factor Cost		GDP Expenditure	
	COFC Only	COFC & Potash	COFC Only	COFC & Potash
Adjusted R square	0.92	0.93	0.94	0.94
F ratio	355.8	185.9	487.9	240.3
t statistics on the constant	80.8	53.4	48.9	31.5
t statistics on COFC	18.9	14.7	22.1	17.3
t statistics on Potash		1.4		0.7

The model chosen generates a single variable regression model as follows:

$$\text{Canadian GDP} = 526215.1 + 0.041016048 \times (\text{COFC})$$

This model produced the following statistical results:

F ratio	355.8
R square (adjusted)	0.924
t statistic – constant	80.79
t statistic independent variable (COFC)	18.86
Number of observations	30

The F ratio and t statistics are statistically significant. The R square shows that over 92 percent of the variation in GDP can be explained by the independent variable. Both the constant the independent variable at statistically significant at the 95 percent level of confidence. The use of one independent variable eliminates the potential for some statistical problems and makes the model relatively simple to operate. Statistically, the model is strong.

The Durbin-Watson statistic is 0.96, indicating that further work is required.[14] Since the data are quarterly, and given that the lag between production, delivery and financing is minimal, the autocorrelation may be a phenomenon of the specification of the data and/or variables. Further work, in which, for example, a composite index is used, may alleviate the autocorrelation. Other techniques will also be utilized in future work.

Table 4 compares the model's predicted GDP values to the actual GDP for each quarter. As can be seen, the percentage error rates are low. Figure 4 presents the data in graphical format. Figure 4 shows, for each quarter, the actual GDP value at each quarter (represented by the "o") and the model's prediction for that quarter, represented by the "x". The difference between the "x" and "o" at any quarter is the residual (the difference between the actual and predicted GDP value for that quarter).

Some might argue that any model that predicts within 10 percent over a long period of time is dependable. In this case, the model always predicts within 5 percent and for some quarters; the difference between the actual GDP and the predicted GDP is less than one percent. The residual for the first quarter of 1997 was, for example, 0.1 percent. This is extremely accurate.[15]

Although more work remains to be done, the initial results show that there is a strong statistical relationship between COFC and GDP.

6.0 Future Work

At this point in time, the model and statistical relationship described in this paper should be considered preliminary. A significant amount of future work is anticipated including:

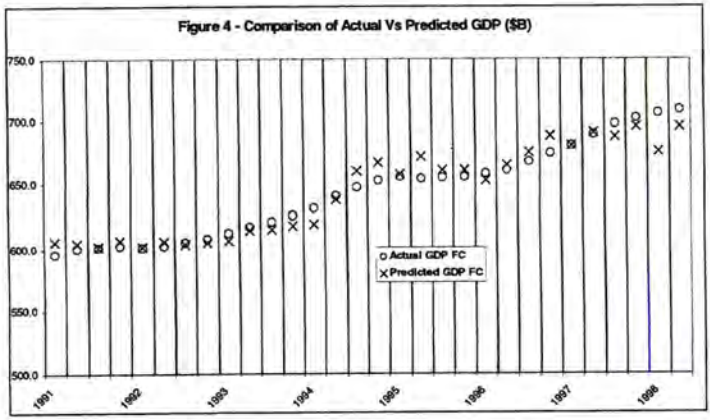
- the testing of other independent railway data variables; this may include developing a composite index of different carloading commodities;

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[14] As previously noted, this paper outlines the results of preliminary research and is designed primarily to encourage discussion and debate. The last section of this paper lists a number of topic areas for future work.

[15] In the construction and testing of econometric models, the prime consideration should be the success of the model in predicting the future. Some may argue that unless the assumptions are realistic, then the model has no value. The authors do not accept this latter view. Interested readers may wish to read "The Methodology of Positive Economics", by Dr. Milton Friedman, published in *Essays in Positive Economics*.

- using various combinations of independent variables in multivariate analysis;
- using seasonally adjusted data;
- testing the use of lagged data;
- using monthly rather than quarterly data;
- using weekly rather than quarterly data;
- updating the model using new data to ensure that the coefficients on the independent variables are consistent thereby testing the sensitivity of the model as well as its stability;
- testing for statistical anomalies;
- taking steps to ensure data quality;
- expanding the time series used for testing purposes as far back as 1970;
- preparing estimates to test the reliability of the model; and
- reviewing comments and criticisms.[16]



[16] Interested readers are invited to share their perceptions, views and comments with Statistics Canada. Please contact Mr. Harold Kohn at Statistics Canada, phone 613-951-0162, fax 613-951-0009 or by email at kohnhar@statcan.ca.

Table 4
Analysis of Results

Year	Quarter	COFC Tonnes	Actual GDP $M	Predicted GDP $M	Residual	% Error
1991	1	1,942,909	595,708	605,906	-10,198	-1.7%
	2	1,904,739	600,599	604,340	-3,741	-0.6%
	3	1,848,070	601,446	602,016	-570	-0.1%
	4	1,962,553	602,262	606,711	-4,449	-0.7%
1992	1	1,848,024	601,236	602,014	-778	-0.1%
	2	1,935,371	602,794	605,596	-2,802	-0.5%
	3	1,899,189	605,230	604,112	1,118	0.2%
	4	1,922,482	607,854	605,068	2,786	0.5%
1993	1	1,961,399	612,678	606,664	6,014	1.0%
	2	2,161,893	617,090	614,887	2,203	0.4%
	3	2,170,161	620,981	615,227	5,754	0.9%
	4	2,234,517	626,022	617,866	8,156	1.3%
1994	1	2,268,129	631,268	619,245	12,023	1.9%
	2	2,727,760	640,579	638,097	2,482	0.4%
	3	3,261,141	647,390	659,974	-12,584	-1.9%
	4	3,426,733	653,026	666,766	-13,740	-2.1%
1995	1	3,203,368	655,329	657,605	-2,276	-0.3%
	2	3,543,949	654,284	671,574	-17,290	-2.6%
	3	3,288,800	654,984	661,109	-6,125	-0.9%
	4	3,281,219	655,758	660,798	-5,040	-0.8%
1996	1	3,087,326	658,000	652,845	5,155	0.8%
	2	3,388,459	661,192	665,196	-4,004	-0.6%
	3	3,632,553	667,797	675,208	-7,411	-1.1%
	4	3,940,817	674,120	687,852	-13,732	-2.0%
1997	1	3,754,540	680,615	680,212	403	0.1%
	2	4,006,276	688,810	690,537	-1,727	-0.3%
	3	3,914,269	697,141	686,763	10,378	1.5%
	4	4,120,644	701,661	695,228	6,433	0.9%
1998	1	3,644,988	705,951	675,718	30,233	4.3%
	2	4,121,056	708,572	695,245	13,327	1.9%

IS THERE LIFE AFTER VIA?:
Privatising Canada's Passenger Railway

Dr. Mark Bunting
P.M. Bunting & Associates

VIA Rail, once seen as the future for rail travel, remains shackled to its past. In the 1970s, Canada's federal government pared CN and CP passenger services before handing them to VIA, but did little to address issues crucial to VIA's success: productivity, costs, market strategy, and provisions for effective operations on freight lines.

The effect was to validate outdated and costly operations unsuited to passenger markets of the late twentieth century. With deeper changes ruled out, service cuts became the corrective to rising subsidies, a roughly 20% cut coming in 1982, then a further 50% cut in 1990.

In the 1990s, VIA has become a leaner railway, while Ottawa appears committed to continued subsidy. But it would be wrong to see this as a basis for the future. Failing a forward-looking strategy germane to the railway's financial and market challenges, VIA's credibility will diminish, as will political support for continued operations.

Can VIA, as a public corporation, develop and give effect to a new strategy meeting such challenges? And if not (as argued here), what might be gained by privatising Canada's passenger railway?

The Financial Challenge

Figure 1 (next page) shows VIA subsidies, service levels (train-km.) and passenger-km. for 1980-1997. Since 1988, operating and capital support has been reduced from $637 million to $229 million, through service cuts, internal economies and revenue growth. Passenger-km. fell 48% in 1990, then increased (13% higher in 1997 than in 1990).

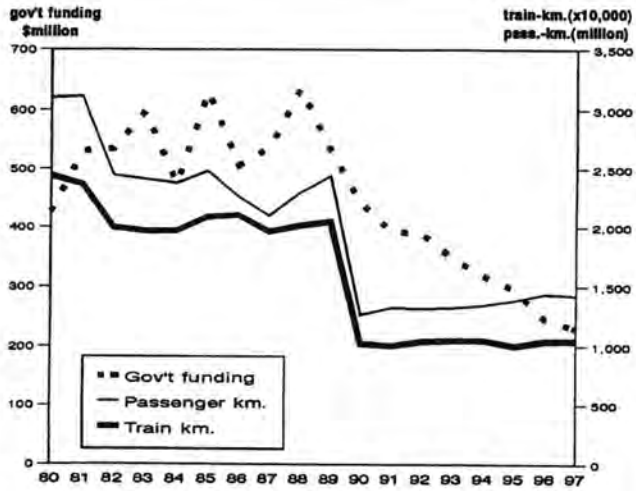


FIGURE 1: VIA Rail Subsidies & Operations

Source: VIA Annual Reports

A planned reduction in subsidies to $170 million[1] may require further service cuts. VIA has likely had most readily-secured economies[2] and presumably raised fares to market levels[3]. VIA might defer non-essential expenditures, though this only puts off the financial crunch.

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[1] 1997-98 Main Estimates for Transport Canada showed planned total spending on VIA Rail at $216.2 million in fiscal 1997-98, and at $170 million for the following three fiscal years.

[2] Costs might decline as a delayed effect of the 1990 cuts, but it is assumed that most such gains have already been had.

[3] VIA's revenue yield is low compared, say, with that for British rail operators, but North American markets might not sustain higher fares, especially if the intercity bus industry is deregulated, resulting in fare competition on routes paralleling VIA.

Moreover, VIA faces a large cost to replace its aging passenger fleet (in 1996, 344 cars, most over 20 years old, plus locomotives[4]). At a replacement cost of $700 million[5], spread over 10 years, VIA would each year need $70 million. If funded by borrowing or leasing, operations costs would rise by about $80 million a year[6].

If VIA needs $80 million per year for re-equipment and $20 million for other items (based on VIA's recent capital spending), and this is to come from a $170 million subsidy, a $196 million operating deficit (1997) must be cut to $70 million. New equipment may save servicing and maintenance costs, but a $126 million cost saving, 33% of total operating expenses of $387 million (1997), seems quite a stretch.

Moreover, when VIA's track agreements expire, CN and CP will want commercial (ie., higher) track charges. Track charges are now on the order of $8 per train mile[7], as compared with charges of more than $20 per train mile in Britain[8].

Thus, the financial challenge is not to hold the line, but to make large cuts in costs and/or gains in revenues, to accommodate new capital spending and increases in track charges.

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[4] Rail in Canada, Statistics Canada Catalog 52-216, for 1996.

[5] With a limited North American market for new equipment and not knowing VIA's future style of operations, it is hard to assess replacement costs, but as a rough estimate 344 new cars at $2 million each (based on British prices for diesel multiple units, excluding high speed tilt units such as those Bombardier is supplying to Virgin Rail) would cost $700 million.

[6] $700 million amortized over 20 years at 10% interest is equivalent to an annual payment of about $80 million: if Ottawa provides capital grants, VIA avoids interest charges, which are, in effect, passed to government. Lease costs would reflect lessor administration and profit.

[7] In evidence to the House of Commons Transport Committee in March, 1998, CN reported $46 million revenue from VIA ($14 million based on performance), while CP reported "less than $5 million". (Source: Parliamentary internet site.) Based on this, the average track access charge is about $7.70 per train mile. (VIA trains covered 6.5 million miles in 1997.)

[8] In 1996/7, Railtrack charged passenger operators roughly £2 billion a year for track access, equivalent to about £8.40 per train mile (based on 237 million train miles operated in the same period), or $21 Cdn/train mile.

The Market Challenge

VIA's trains now serve less than 1% of Canada's intercity travel market: trains touch fewer places and fewer Canadians than they did decades ago. So, while Canadians once accepted subsidy as necessary to maintain services they personally used, or might use, most now pay taxes for trains they do not ride, nor expect to ride in the near future.

The train's environmental or symbolic value may influence some, but most no longer have a personal reason for wanting rail service - that they might need it. And VIA's heavy reliance on subsidy (passengers pay less than half what it costs to serve them) does not help. Wider interests may justify support, but not to the present extent.

This implies two requirements. First, if subsidies are to continue, passenger trains must reach a much larger and wider market, not just as a commercial or environmental goal but as political necessity. Between 1993 and 1997, VIA increased passenger numbers by 5%, a creditable job, but far from what is required. Failing a strong market presence, VIA has little political basis for public funding.

Second, a politically sustainable passenger railway must operate at much higher cost-recovery levels. If passengers paid at least 70-80% of operating and capital costs, the remaining 20-30% *might* be justified on wider societal grounds, but Ottawa cannot be expected to pay for more than half VIA's costs on an ongoing basis.

So, the market challenge is not just to get more people on trains, as might be contrived by adding service and cutting fares, but to do so while improving financial results. This cannot be done by adjusting the present passenger railway: the railway must be re-thought with a new emphasis on commercial principles[9].

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[9] Commercial principles and their implication for public policy are further discussed in Bunting, P.M. Changing Trains: A Commercially Sustainable Railway Passenger Policy for Canada, CH Enterprises, 1998. (ISBN: 0-9691818-1-7)

Why Look Beyond VIA?

Given VIA's recent improvements, an obvious move is to strengthen VIA within the public sector. VIA might be guaranteed long-term funding, allowed to raise capital (through borrowing or private sector partnerships) and provided more flexibility to alter services and fares.

Yet a stronger VIA may not perform better. In the 1990s, subsidy cuts motivated economy and active marketing, but with secure funding and looser strings, the old VIA may be back! And, even if VIA performed better, would it perform as well as a privatised railway?

Shoring up VIA assures continued political and bureaucratic influence. Any publicly-funded business must satisfy its paymaster, but public enterprises especially so. Political appointees are accepted, investment plans are skewed by industrial policies, special duties are imposed, and competitive punches are pulled to avoid inflaming political tempers.

Equally important, Ottawa's bureaucracy cannot provide the technical and political support VIA needs to develop and sustain a consensus on strategy. As Ottawa reduced its role in Canada's transport system, it reduced its internal capability for strategic research and planning and cut external research funding. Even if this capacity were built up, it would take years of professional work to gain the external credibility required to hold successive governments to an agreed strategy.

Privatisation and Productivity

Given Canada's institutional reality, a public sector VIA is not the answer, but privatisation may not be either. If privatisation cannot lower subsidies to a politically sustainable level, the significant alternative is to phase out all but essential services.

The general evidence[10] suggests a potential for cost savings and market gains, but much of the evidence is for integrated freight

[10] Eg., see Thompson, L. & Budin, K-J, "Railway concessions: progress to date", Rail International, January/February, 1998.

enterprises, or urban or intercity privatisations in quite different markets and operating environments. And many are recent privatisations, for which longer term outcomes are yet to be seen.

To provide a sense of what might be involved, a partial (and rather crude) productivity measure for VIA - train-km. per employee - is compared with similar measures for British Rail.

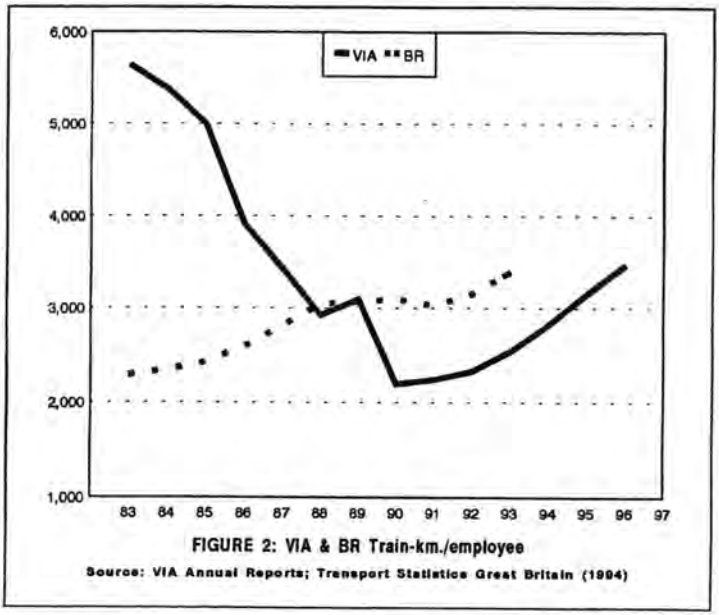


FIGURE 2: VIA & BR Train-km./employee

Source: VIA Annual Reports; Transport Statistics Great Britain (1994)

Figure 2 compares VIA's 1983-1996 figures with those for British Rail for 1983-1993. VIA's early numbers reflect a transfer of operating functions from CN and CP, so are not necessarily proof of declining productivity (though detailed analysis, eg., for overhead functions, might show this). So too, the early-1990s rise in VIA's productivity may be an artifact of labour adjustments due to the 1990 cuts, though mid-1990s numbers are more likely due to genuine productivity gains.

British Rail shows steady gains, reflecting a move to a business-unit structure and internal economies. As with VIA, BR figures show that improvements are possible within the public sector. So, if there is a case for privatisation, it must be that *further* gains are to be had.

VIA's figures are not strictly comparable with BR's[11], but the gap between them suggests VIA may have room to improve, as Table 1, which compares VIA with Britain's privatised railway, also does.

Operator	Employees	Train-km. (millions)	Train-km. /employee
VIA (1997)	2,969	10.4	3500
British Rail (1993/4)	113,400	384.2	3388
Britain Rail (est.1998)	96,000	384.2	4000
British TOCs (1994-6)	46,949	347.1	7395
Britain: 6 Intercity TOCs	12,745	72.4	5682
Britain: 6 TOCs (est.1998)	11,000	72.4	6500

Table 1: VIA/BR Train-km./Employee

In Table 1, the current (1998) estimate for Britain's rail system assumes a 15% cut from British Rail's 1993/4 staffing level. 1994-6 numbers are for train operating companies (TOCs) prior to their privatisation, based on Office of Passenger Rail Franchising (OPRAF) data released during the franchising process. Approximate staff and productivity estimates are also shown for selected intercity TOCs.

VIA's productivity (3500 train-km./employee), while similar to that for Britain's rail system (4000 train-km./employee), is much lower

[11] Unlike BR, VIA does not operate high-volume commuter services, which require fewer on-board and station employees (and thus exhibit higher productivity figures). On the other hand, VIA's employee count does not include track employees, while BR's does.

than for TOCs (about 7400 train-km./employee in the mid-1990s). The gap between VIA and *intercity* TOCs (6500 train-km./employee) is smaller, but still considerable.

Unlike VIA, British TOCs lease equipment and contract for many facilities and services. So, without detailed analysis for specific functions, it cannot be said for sure that privatised British operators are more productive than VIA (or could be so in Canada's market and operating environment). But the size of the gap between VIA and British operators suggests privatisation might bring large gains.

Option 1: Privatize VIA

We turn to the privatisation options, starting with an obvious move: sell VIA. To do so, VIA would require a profitable income stream or profit potential: since most services are inherently unprofitable, VIA would have to be sold with committed funding (say for 10 years). The latter might involve a contract for specified services, or an agreed process to establish services and funding, or a subsidized franchise.

This option continues VIA's national network (so long as funding continues), and is least disruptive for the public. Though new owners may alter operations and market strategy, at the beginning they can present a 'business as usual' image.

The mechanics of privatisation could greatly affect VIA's outlook and subsequent performance. A public share offering with limits on individual holdings could secure present management, while selling VIA to a third party (by public tender or other means) is more likely to result in management turnover. If the reason for privatisation is to promote change, the latter route is preferable, while the former might allow VIA to carry on as now, with less market or financial impact.

As with all privatisation options, selling VIA may raise track access issues, though perhaps not immediately. Track agreements with CN and CP reflect an earlier loss-compensation formula, which has been updated (eg., to add incentives), but not changed in its fundamentals. CN and CP may accept this framework for a time, but will inevitably press for much higher charges.

Privatising VIA may help cut costs and provide continuity, but there may not be much opportunity for market development: present rail users may be comforted, but those who do not ride trains may see a private VIA as more of the same, and thus not worth trying.

Also, a single railway passenger company will have considerable bargaining power with government, since a corporate failure would affect services coast-to-coast. Though Ottawa might feel it had an ironclad agreement - contract or franchise - with a privatised VIA, there are always unforeseen contingencies, which astute private managers could translate into increased payments from Ottawa.

Finally, as with most (but not all) privatisation options, Ottawa will acquire more responsibility for the relationship with VIA: specifying services, monitoring compliance, and responding to unforeseen problems. Government officials can rely on a publicly-owned VIA to handle much of this work, but not a private company.

Option 2: Contract with Independent Train Operators

VIA could be wound up and its services tendered to private operators. This option could be facilitated by encouraging VIA staff to form train operating units (and bid for contracts), and by packaging services to attract outside interest. Tendering, by introducing an element of competition, could lower costs, and dealings with several operators might be less politically charged than with one national carrier.

This option requires attention to operator qualifications, track access and equipment supply. Bidders could be left to make individual track deals with CN/CP, or Ottawa and CN/CP could negotiate a framework for all operators. Since few bidders would purchase equipment for short-term contracts, access to leased equipment would be required (eg., from a pool initially established with VIA's equipment).

Potential concerns are loss of a national network, confusion about services offered by multiple operators, and lack of co-ordination between operators. However, few trips require a *national* network, most taking place within defined *regions*: if contracts are issued for carefully selected packages of routes or services, passengers will

largely deal with one local carrier and have little need for inter-operator connections. If many passengers require national facilities (eg., inter-operator ticketing), these might be separately arranged.

While contracting should cut costs, it discourages adaptation to changing markets. Contracts may allow for adjustments during their life, but such changes are likely to be restricted[12]. Inevitably, some markets will be underserved (and related revenues lost) while others are overserved (needlessly adding to costs).

The contracting model and short contract terms (eg., less than 5 years) put market strategy in the wrong hands. Key decisions would be made by politicians and bureaucrats, whose commercial skills are limited and whose orientation is to basic transport needs. Where the need is basic (eg., access to remote areas), this may be appropriate, but VIA mostly operates in competitive markets, where access to alternative modes raises customer expectations far above the basic.

With Ottawa specifying services, and perhaps operational details, contractors would have little incentive to improve services or to innovate. Those who perform well may gain an edge in future tenders and contracts could reward innovation. But if Ottawa insists on a fixed service pattern and communicates unease about departures from accepted railway practice, contractors will proceed cautiously.

Finally, a competitive market demands strong relationships with customers, to inspire confidence and to establish customer needs. In a contracting model, the primarly loyalty is to the government client, passengers being a secondary concern, with inevitable ill effect on customer loyalty and prospects for market development[13].

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[12] Numerous changes, especially early in a contract's life, would likely result in re-tendering. Otherwise, losing bidders could claim that the original tender had used a bogus specification to tilt the award to a preferred bidder.

[13] 'Net cost' contracts, in which contractors retain revenues, would supply an incentive to attend to customer relations and build market demand, but only go part of the way: the dominant relationship continues to be with government.

In some ways, contracting is a throw-back to pre-VIA days, when CN/CP were compensated for passenger losses. The arrangement was not a contract, but had similar effect: through its regulatory body Ottawa specified services and committed itself to cover losses. VIA was a response to the failure of this arrangement, which provided little incentive for economy, customer service or strategic marketing, and had become a source of public dissatisfaction and rising subsidy.

Option 3: Rail Service Franchising

Several countries have franchised all or part of their railways, usually by tendering to secure the highest payment for a profitable franchise, or obtain unprofitable services at least subsidy. The franchise (or concession) assigns railway assets and partial or full market exclusivity for a defined period (say 30 years) for payment or, where the state pays, acceptance of obligations (eg., to run unprofitable services).

Few passenger operations are, or can be, profitable. In Britain, many intercity services approach break-even operation, due to relatively high fares and significant passenger volumes. However, only six of 25 passenger franchises will be making payments to the state by 2003, and only one of these (Gatwick Express) has made such payments from its inception. Most franchises thus require state support.

Nonetheless, franchising offers large savings. In 1994/5, prior to franchising, the British government and local authorities together paid British Rail £2.2 billion in grants for intercity and commuter operations[14]. By contrast, franchise agreements provide for a reduction to about £860 million by 2002/03[15]. Also, with subsidies

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[14] Dept. of Environment, Transport and the Regions (DETR), Bulletin of Rail Statistics.

[15] Feb. 1998 prices (Office of Passenger Rail Franchising, 1997-98 Annual Report). This figure is not comparable with BR subsidy figures prior to 1994/5. In the mid-1990s, BR was restructured into 25 passenger operating units, three equipment leasing units, a track authority (Railtrack), and other functions. In the new structure, operating units paid equipment and track charges that included returns on capital assets (approximately on a current value base). The result was, perhaps for the first time, a measure of the true economic cost, and associated subsidy, for British railway passenger services.

attributed to specific groups of services, it will be easier to plan future services to achieve the most good with limited funds.

Critics of Britain's privatisation program point to late trains, poor connections, delays in track renewal, and other issues. But while mistakes may have been made, many such problems originate in the pre-privatisation railway, and others are associated with a newly-restructured industry only now finding its feet. Moreover, contract incentives and regular performance reporting provide both a financial and moral spur to better performance.

In a Canadian application, Ottawa would likely specify minimum service levels and standards, and perhaps maximum fares, then call for bids to operate at least subsidy. Alternatively, Ottawa could establish a funding level, then seek bids for least fares, best service/investment plan, or a combination fare/service/investment package.

As with contracting, franchising requires access to leased equipment, while track access issues may be more prominent: CN/CP will want commercial charges and will resist access provisions that impinge on their freight business, while franchisees will want fair charges, reliable access to track (ie., better on-time performance) and flexibility to add trains. If operators cannot secure effective access, their market opportunity will be less, as will the prospect for reduced subsidy.

Short term franchises (5-10 years) with tightly specified service and operating obligations may offer few gains: these would differ little from service contracts. If, however, Ottawa is willing to commit funds for an extended period and allow operators to decide service and operational details within broad bounds, franchisees can work their franchises as businesses, adapting to customer needs, planning longer term investments (eg., in new equipment), and realizing related gains. Then, quite substantial cuts in subsidy may be possible.

Franchising may raise network/system issues, but these may not be as troublesome as they might seem: if there is market demand for system functions (service co-ordination, information, reservations, through tickets, etc.), operators not directly competing with one another are

likely to see value in co-operation. (Ottawa could *require* operators to co-operate, as Britain did, but this should perhaps be considered only if, and when, serious problems arise.)

With several operators, customers may initially be unsure about which to contact, but franchisees, in their own interest, will seek to clarify the new arrangements. Indeed, customers may appreciate the attention they receive from a multiple-operator railway: while franchising may preclude competition on individual routes, operators will undoubtedly compete for the customer's attention (eg., for vacation trips, where there may be a choice of destination).

At time of writing, Ottawa was pursuing the franchising option, and for good reason: it allows basic service levels and standards to be protected, while providing franchisees flexibility to reduce costs, market effectively and invest for the future. But franchising is not a magic bullet: apart from long term funding, what makes it work is acceptance of commercial principles. If franchise agreements, the franchise management process and/or associated regulation impede cost-reduction and marketing, little saving can be expected.

Option 4: Open Access

The preceding options assume that government (not the operator) will specify services (or a basic minimum requirement). And governments will invariably try to maintain *existing* services, to avoid visibly harming current passengers (even if few in number). This may meet a social demand in the short term, but does little to expand rail markets, and thus little to assure the railway's continuance.

If private operators are to build railway markets, they require freedom to decide what services to provide. Given this, limited public funds might better be paid to operators as an incentive based on marketing results, not, as now, to operate pre-ordained trains, some of which may have limited market effect.

With this in mind, a more radical privatisation option would be to phase out VIA's operations while opening railway passenger markets to any qualified passenger train operator. Subsidies would be paid,

not for running trains, but for the number of passengers attracted to rail travel[16].

This approach would raise difficult track access issues. While other options allow government and railways to discuss track access against a nominal service specification, a generic approach would be required here. CN and CP would resist this option if they saw it as opening the door to general access, including third-party *freight* operations.

An open-access model might first be applied to Canada's western transcontinental trains. These are currently operated year-round on a regular schedule, as a transportation service, yet patronized mainly by tourists, most of whom travel in summer at premium fares. If the requirement for a year-round schedule was dropped, reasonable track access assured, and a market incentive offered, private operators might well enter this market, and operate at much lower subsidy.

Conclusions

VIA has progressed in recent years, but not far enough to assure its longer term continuance. If subsidies are required for the long term, and few services could run without them, more people must benefit from rail service (ie, a wider market must be reached) and subsidies must play a less prominent role (reduced from half or more of VIA's revenues to no more than 20-30%). Without this scale of improvement, rail service will continue to be irrelevant to most Canadians, and inevitably a target for future cuts.

There is little reason to expect such improvement so long as VIA is within the public sector. Apart from the generic arguments against public sector operations, VIA cannot expect technical and political support from a bureaucracy whose principal policy thrust has been the

[16] This subsidy might be a fixed amount per passenger or passenger-km. travelled, in which case subsidies would increase if private operators succeeded in building market (and decrease if they failed). This arrangement would make budgeting difficult, as subsidy requirements could not be precisely predicted in advance. However, variants might work, such as an allocation of a pre-specified subsidy pool according to market results.

withdrawal of the federal government from active strategic direction of Canada's transportation system.

Privatisation may not succeed either. However, the evidence, such as it is, offers the prospect of large cost reductions and market gains. Rather than consigning VIA to the certainty of failure within the public sector, it would seem more reasonable to give the private sector the opportunity to show what it can do.

Four privatisation options are described in this paper, of which privatising VIA and service contracting are least effective. Prospects for franchising are better, but depend on the government's willingness to cede control over operations and market strategy: if Ottawa tries to replicate its present relationship with VIA in franchise agreements and the franchise management process, little will be achieved.

The fourth option offers more prospect of market gain and operating economy, but requires special attention to track access, an innovative subsidy mechanism, and a willingness to leave market and operating strategy entirely to the private sector. This option entails a political leap of faith that may be beyond expectation, but might be considered, as a trial, for western transcontinental trains.

This paper considers problems and solutions for one mode of intercity transport, but it must be said that the larger challenge is to make public passenger transport, as a whole, work better for Canadians, and for visitors to Canada. In times past, this might have been seen as a challenge for governments, but leadership is unlikely to come from this quarter. Today's opportunity is to open intercity and local transport markets, thereby providing private carriers the flexibility they need to match transport products to market needs. In this context, privatising Canada's passenger railway can facilitate the emergence of a healthier system of public passenger transport.

L'EXPÉRIENCE JAPONAISE EN MATIÈRE DE TRAIN À HAUTE VITESSE ET DE DIVERSIFICATION COMMERCIALE DES ACTIVITÉS FERROVIAIRES: UN MODÈLE POUR LE CANADA ET VIA RAIL?

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Chercheur indépendant

Lorsque la construction de la nouvelle ligne du Tokaido fut annoncée, plusieurs personnes doutèrent de la réussite du projet japonais de train à haute vitesse. Ce scepticisme se dissipa dans les semaines qui ont suivi l'inauguration du réseau. L'achalandage des trains Shinkansen démontra que les gestionnaires des Chemins de fer nationaux japonais avaient visé juste en misant sur la revivification d'une technologie considérée par les apologistes de l'avion et de l'automobile comme désuète.

Sans doute en raison des avantages indubitables qu'il offre, plus de trois milliards de passagers ont emprunté le train rapide depuis son ouverture. Dès sa seconde année d'opération, chaque jour, 110 rames de six voitures transportant en moyenne 84 841 passagers effectuaient la navette entre Tokyo et Osaka.

Trente-cinq ans plus tard, grâce à l'amélioration de la capacité d'accueil des rames, c'est 285 trains qui transportent quotidiennement sur le Tokaido en moyenne 368 000 personnes. En période de pointe, comme le jour de l'An, ce nombre est porté à la capacité maximale du tronçon. La route Tokyo-Osaka est la plus achalandée. En 1997, elle comptait pour 43 % de l'ensemble du trafic des lignes Shinkansen.

La croissance du trafic évolua en parallèle avec le Produit national brut et avec l'amélioration du niveau de vie des Japonais qui allait permettre l'élargissement du bassin de population ayant les moyens financiers de voyager avec ce système. Ainsi, à l'exception des années ayant suivi le choc pétrolier de 1973, l'achalandage sur le réseau a connu une progression positive. Cette tendance s'est accentuée avec l'ouverture des lignes Tohoku et Joetsu (1982), Yamagata (1992), Akita et Hokuriku (1997).

Cet attrait pour le réseau s'est maintenu jusqu'à nos jours, particulièrement pour les moyennes distances. Le succès du Shinkansen est imputable au fait que ce concept regroupe les forces ayant fait la popularité des autres systèmes de transport. Le train permet des déplacements avec un confort, une rapidité et un coût se comparant avec l'avion, avec un taux de sécurité inégalé. En fonction des quatre indicateurs suivants, les tarifs, le temps de parcours, le nombre de départs et les sièges disponibles, il appert que le Shinkansen détient une suprématie presque entière à l'égard de la compétition.

Les données comparatives démontrent que le seul véritable rival au train à haute vitesse est l'avion. L'automobile s'avère particulièrement désavantagée à tous les points de vue. Quant à l'autobus, hormis ses tarifs économiques, il est lent et, comme le chemin de fer conventionnel, offre peu de départs quotidiens, lesquels prennent place en soirée, ce qui s'avère peu commode.

La popularité du Shinkansen prouve qu'il est attrayant de choisir ce moyen de transport. Le public voyant ses avantages dans les six premiers mois d'opération du Tokaido, les Lignes aériennes japonaises (JAL) enregistrèrent une baisse majeure d'achalandage de cinquante pour cent sur cette route (1). Le même scénario s'est reproduit lorsque les lignes Sanyo, Tohoku et Joetsu s'ajoutèrent au réseau.

À l'exception du trajet Tokyo-Fukuoka, le voyageur pressé a tout intérêt à emprunter les trains Shinkansen en service ultra-rapide. Ils permettent des temps de déplacement surpassant la concurrence tout en offrant une ponctualité hors pair. En 1997, sur la ligne Tokaido, le retard moyen enregistré par les rames était de 18 secondes (2). Ce chiffre est infime en comparaison avec le temps perdu dans les embouteillages autoroutiers ou dans la congestion des aéroports.

En plus d'offrir une fréquence élevée de départs entre les différents points du réseau, le train s'avère très flexible pour sa clientèle qui est constituée à 70 % de personnes voyageant par affaire. Les gares du réseau étant localisées au coeur des cités, il permet des déplacements avec aisance d'un centre-ville à un autre là où sont regroupées les principales fonctions socio-économiques des agglomérations urbaines. Le transport aérien n'offre pas cet atout. Par rapport à celui qui emprunte l'avion, l'usager du Shinkansen sauve un temps précieux qui est gaspillé dans les déplacements entre l'aérogare et le centre-ville.

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(1) Japan's Airlines Step Up Service. *New-York Times*. 14 mars 1965. p.21.

(2) CENTRAL JAPAN RAILWAY COMPANY (1997) *Central Japan Railway Company: Company Profile 1997*. p. 17.

Les nombreux départs quotidiens offrent au voyageur une liberté de mouvement qui s'apparente à celle dont dispose l'automobiliste. Alliée à la fréquence élevée des départs, la capacité d'accueil des rames offre chaque jour à la clientèle du Shinkansen un nombre considérable de places sur l'ensemble du réseau. C'est ce précieux avantage qui positionne la concurrence très loin derrière. En comparaison, les appareils gros porteurs (p. ex. Boeing 747) des trois compagnies aériennes effectuant la navette entre Tokyo et Osaka ne peuvent proposer qu'environ six pour cent de ces sièges.

Les avantages du train rapide se reflètent dans ses statistiques d'opération. Il appert que c'est le mode par excellence pour les moyennes distances. Entre 1965 et 1998, le marché des déplacements par transport en commun sur le tronçon Tokyo-Osaka a été largement dominé par le Shinkansen. La balance revenant à son plus féroce compétiteur, l'avion.

Nonobstant, sur les longs parcours, le train à haute vitesse est déclassé par l'avion, qui s'avère alors le meilleur moyen de transport. Sur la liaison Tokyo-Fukuoka, les Lignes aériennes japonaises, Japan Air System (JAS) et All Nippon Airways (ANA) s'accaparent les trois quarts de ce marché. La mise en service entre ces deux points du train Nozomi a réduit cette domination. Actuellement, le trajet s'effectue en 4 heures 49 minutes en Shinkansen et en 1 heure 45 minutes par la voie des airs.

Finalement, le Shinkansen constitue un élément précieux qui concourt à un développement national s'effectuant en harmonie avec le respect de l'environnement. Malgré les reproches qui lui sont fait à l'égard de la pollution sonore et des vibrations créées sur son passage, il permet des économies d'énergie appréciables en favorisant le transport en commun. À cet égard, le train rapide est peu *énergivore*. Il ne consomme que respectivement 28,6 % et 22,7 % du carburant nécessaire au fonctionnement des avions et des automobiles [3].

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(3) CENTRAL JAPAN RAILWAY COMPANY (1992) *Central Japan Railway Company: Annual Report 1992*. p. 17.

I. LA COMMERCIALISATION DES CHEMINS DE FER JAPONAIS

Inspiré par le mouvement de réduction des activités des gouvernements britannique et américain au profit du secteur privé, le Japon amorça son propre virage en ce sens au début des années 1980. Répondant à des desseins plus pragmatiques qu'idéologiques en raison de l'état critique dans lequel se trouvaient les finances publiques, les Chemins de fer nationaux et d'autres sociétés d'État furent dénationalisés.

Ce processus a permis de réduire l'hémorragie des fonds publics pour une activité pouvant être mieux administrée par des intérêts non gouvernementaux. Du même coup, des millions de yens pouvaient être affectés à la réduction du déficit accumulé ainsi que vers des secteurs prioritaires pour le développement national.

De l'ensemble des activités ferroviaires de la société d'État, le programme Shinkansen est celui qui a le plus bénéficié de la création du Groupe JR. Les gouvernants japonais ont apparemment gagné leur pari visant à revivifier le secteur des chemins de fer de plus en plus paralysé par l'inertie de l'entreprise publique.

Soulagé de plusieurs handicaps qui minèrent le dynamisme de son ancêtre, le Groupe JR dispose des moyens en vue de poursuivre le programme en accord avec les objectifs de développement national, tout en bénéficiant des forces qui lui permettront d'affronter la concurrence. Ainsi, la régionalisation du réseau ferroviaire public favorise une meilleure sollicitude des nouvelles compagnies envers les besoins du milieu. Ce qui privilégie l'adoption de services adaptés aux exigences régionales.

L'amélioration des services, notamment par l'ouverture de nouveaux tronçons et l'augmentation de la vitesse commerciale, constitue pour le Groupe JR une préséance fondamentale dans un marché où sévit une rivalité agressive. Adhérant à une philosophie qui place le client au sommet des priorités, il applique cette bonne intention en valorisant le réseau de train rapide qui, au sein de la population, jouit d'une excellente réputation en vue de conquérir le coeur des voyageurs. Autant le programme Shinkansen a pu tirer des gains de la privatisation, autant les entreprises nées de ce processus entendent s'y arrimer afin de pénétrer avec confiance dans le XXI^{e} siècle.

II. LES GARES SHINKANSEN, DES PIVOTS D'AMÉNAGEMENT DU TERRITOIRE

Depuis son inauguration, le Shinkansen a eu des retentissements majeurs sur la structuration des mouvements de personnes. En parallèle, il facilite l'aménagement de régions considérées comme excentriques par rapport aux principaux pôles d'activités de la mégalopolis (Tokyo-Osaka), qui jadis avaient une faible valeur socio-économique pour les développeurs, les consommateurs et les résidents potentiels. Au fur et à mesure de son extension, les planificateurs prévoyaient que les déséquilibres existants au sein de l'archipel s'atténueraient par la naissance de centres de services régionaux qui permettraient à l'arrière-pays de s'intégrer et de participer à un vaste réseau d'échange pan-national. Cette approche fut proposée dans le *Plan de développement global du territoire national* de 1969, afin d'y diffuser la prospérité déjà présente dans la région de la capitale, tout en offrant au peuple japonais des *havres* où ils pourraient y trouver une qualité de vie bonifiée.

Sans contredit, la construction du réseau a provoqué une déconcentration efficace des activités réunies au fil des ans dans les trois principales villes du pays (Tokyo, Osaka et Nagoya) à la faveur de noyaux intermédiaires. Progressivement, ce nouvel ensemble multipolarisé contribua à former une grande artère commerciale et résidentielle d'appoint.

Toutefois, ce processus s'est limité à une distribution linéaire des activités socio-économiques autour des axes ferroviaires Shinkansen et, à quelques exceptions près, les petites communautés trop éloignées des villes-arrêt ne récoltèrent que peu de bénéfice de la nouvelle infrastructure. À cet égard, le train rapide a réorganisé la structure des échanges entre les pôles dominants de la mégalopolis et de la périphérie. Il a introduit une relation plus équilibrée et partagée entre quelques agglomérations de taille intermédiaire, lesquelles sont appelées à devenir des relais entre leurs zones d'influence et les trois *soeurs cadettes* de l'archipel. Néanmoins, ces rapports sont toujours l'objet d'un contrôle exercé à partir des foyers décisionnels traditionnels. Par exemple, la plupart des magasins à rayons qui s'établissent à proximité des gares régionales sont des succursales d'entreprises ayant leur principale place d'affaires à Tokyo et Osaka (p. ex. Daimaru), tandis que la restauration minute à l'américaine (p. ex. McDonald's) y domine.

Pôle de développement primaire pour un espace, une telle halte ferroviaire engendre une synergie avec le milieu dans lequel elle émerge. Dans sa périphérie immédiate, elle génère et retient des activités socio-économiques de grandes importances.

Dans plusieurs centres-villes matures l'avènement d'une halte Shinkansen fut l'occasion d'une transformation urbaine intensive de la zone immédiate. Ainsi, l'ajout du service de train rapide à une gare de chemin de fer traditionnelle a eu pour effet de modifier la structure commerciale environnante. Les cas d'Okayama (Okayama), d'Omiya (Saitama) et de Morioka (Iwate) constituent les exemples par excellence de ce rajustement. L'environnement de ces gares, longtemps dominé par les petits magasins spécialisés indistincts, a fait graduellement place aux complexes multifonctionnels, propriété de conglomérats japonais.

Par ailleurs, d'autres gares ont plutôt soutenu l'essor de fonctions déjà existantes. La croissance des stations balnéaires situées sur les lignes Tohoku et Joetsu est représentative de ce processus d'appui. Tout comme pour le modèle précédent, les promoteurs privés, appuyés par les pouvoirs publics, sont les principaux initiateurs des projets d'investissement immobilier. La privatisation des Chemins de fer nationaux a créé un nouvel acteur de taille en matière d'aménagement des espaces internes et adjacents aux gares. Les filiales ferroviaires du Groupe JR ont entrepris une diversification agressive de leurs activités, principalement dans le secteur lucratif des services aux consommateurs. À cet égard la philosophie de JR Central est claire:

> We have long worked to make our stations more than just departure and arrival terminals for rail passengers. Our goal in the area of station development is to create environments that everyone can enjoy. To fulfill this aim, we are striving to equip our stations with a number of services - including travel centers, restaurants, and shopping centers - that will encourage people to regard stations as a focal point of their daily activities. Our success stories in this area include Eki One at Nagoya Station and Asty at Shin-Yokohama and Kyoto stations. (4)

Dans cet esprit, JR Est gère depuis décembre 1990 le centre de ski Gala-Yuzawa, localisé sur la ligne Joetsu, à proximité de la gare Echigo-Yuzawa (Niigata). Cet investissement s'est avéré bénéfique pour l'entreprise et pour la petite communauté. Durant la huitième saison d'activité, 367 276 personnes ont fréquenté cette station balnéaire, dont 34 % y eurent accès par le train à haute-

(4) CENTRAL JAPAN RAILWAY COMPANY (1991) *Central Japan Railway Company: Annual Report 1991*. p. 22.

vitesse [5]. En plus de générer des revenus pour JR Est, les skieurs consomment localement plusieurs biens et services, comme les séjours hôteliers.

Cet exemple démontre l'impulsion économique que peut fournir un tel axe de transport sur un village des Alpes japonaises, jadis isolé, mais qui se retrouve à 80 minutes de la capitale nationale grâce au Shinkansen. Avec l'aide des promoteurs privés, c'est ce type de développement que les planificateurs gouvernementaux entendent créer dans l'arrière-pays.

À court et moyen termes, c'est le tourisme engendré par le Shinkansen qui est le plus susceptible d'imprimer une nouvelle vigueur aux petits villages. Trop minuscules pour devenir des centres d'affaires, ils doivent miser sur la valorisation des caractéristiques physiques de leur territoire (p. ex. sources thermales). On ne doit pas s'attendre à ce que ces centres isolés deviennent des cités industrielles ou scientifiques. En France, un phénomène similaire a été relevé sur la route du TGV PSE (Paris Sud-Est).

> C'est peut-être le développement des activités touristiques dans les régions traditionnelles qui est le plus lié au TGV. Le développement du trafic de groupe, location de places ou de rames entières, vers les Alpes ou le midi méditerranéen, le nombre de personnes qui n'auraient pas voyagé sans le TGV montre l'attrait de ce moyen de transport rapide, confortable, moins cher que l'avion. La clientèle du 3e âge est un client privilégié du TGV vers les lieux de loisirs. À côté de ce tourisme, qu'on peut qualifier de "réceptif" on pourrait noter des effets de "tourisme-excursion", circuits touristiques de cars au départ des gares dans des régions intéressantes (Bourgogne), tourisme gastronomique à Dijon et à Lyon. [6]

D'autres gares, comme celle de Shin-Yokohama, ont modifié complètement leur environnement, ayant été construites en zone rurale. Ce type d'installation avait pour ambition de contribuer à décongestionner les vieux quartiers surchargés de Yokohama (Kanagawa) par le biais de la multipolarisation des centres d'activités.

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(5) Information fournie par la compagnie ferroviaire JR Est.

(6) CARALP, Raymonde (1988) Transports et développement régional: Les cas du Shin Kansen et du TGV Sud-Est. *Homme et Terres du Nord.* 88 (1-2), p.18.

Cette gare constitue un exemple par excellence de l'importance que peut avoir ce type d'infrastructure pour un territoire. Construite à quelques kilomètres du centre-ville de Yokohama, cette halte ferroviaire a accueilli ses premiers voyageurs le 1er octobre 1964 et a transformé la vocation du territoire qui lui a donné naissance. Implantée au milieu de rizières, de champs et de forêts, au fil des années, la gare, telle un puissant aimant, a octroyé une plus-value aux terres environnantes jadis réservées à l'agriculture. Autour d'elle s'est développé un tissu urbain orienté vers l'industrie de services.

Autrefois abandonné à la nature, le quartier de Shin-Yokohama regroupe aujourd'hui des édifices à vocation commerciale, administrative et éducative, comme des hôtels, des restaurants, des institutions scolaires, des magasins ainsi que des banques. Facile d'accès grâce à la présence du système de transport à haute vitesse, cette halte était promise à un brillant avenir dès son ouverture.

III. LE RÉSEAU SHINKANSEN ET LE DÉVELOPPEMENT ÉCONOMIQUE RÉGIONAL

Qui pense aménagement du territoire songe aux impacts susceptibles d'être engendrés sur le développement économique régional par ces changements. En fonction de la politique japonaise d'aménagement du territoire, le programme Shinkansen s'est vu confier la mission de réorganiser les relations entre les régions de l'archipel. Ce processus n'a pas été sans conséquence sur l'activité économique de plusieurs agglomérations urbaines et préfectures. À cet égard, en décembre 1985, dans un article intitulé *Japon: l'effet Shinkansen*, le directeur adjoint du Service de la construction des Chemins de fer nationaux, M. Ryosuke Hirota, décrivait les principaux impacts qu'avait eu le réseau sur la vie japonaise:

> Indirectement, il concourt bien entendu à la *production nationale*. Le trafic du Shinkansen s'élève, jusqu'à présent, à environ 710 milliards de voyageurs X km, et le temps libéré, du fait de la réduction de la durée du voyage par rapport aux trains semi-express sur les lignes habituelles est estimé à 3 000 millions d'heures environ. La valeur en temps équivaut à 3,6 millions de yens à raison d'un salaire moyen de 1 200 yens par heure de travail. Il va sans dire que le Shinkansen a accru la productivité nationale et, ainsi, contribué au développement économique.

> Le deuxième effet indirect, c'est la contribution au développement des économies régionales. La stimulation du courant de trafic entre régions a non seulement apporté des améliorations sur le plan économique, culturel et du niveau de vie, mais elle a également apporté une plus grande compréhension des valeurs régionales par le développement du tourisme. (7)

Il est difficile d'isoler le degré d'influence du Shinkansen des autres programmes gouvernementaux d'aménagement du territoire (p. ex. autoroutes) et d'établir avec certitude le rôle original joué dans ce processus par ce mode de transport. Néanmoins, il appert que l'analyse de certains indicateurs économiques, lorsque replacés dans le temps, ont révélé des modifications quantitatives importantes coïncidant très souvent avec l'ouverture des tronçons. Une telle corrélation apparente, même si elle ne s'avère pas le résultat d'un rapport direct et absolu, mérite d'être considérée.

La vitalité de plusieurs activités économiques dépend de la qualité d'accès que leur offre la présence d'infrastructures de transport situées à proximité. Ainsi, en Amérique du Nord, la localisation des grands centres commerciaux aux carrefours des autoroutes n'est pas le fruit du hasard; c'est le résultat d'une stratégie planifiée de mise en marché visant à offrir un accès aisé à une clientèle largement motorisée. Bien que ce modèle de développement ait été transposé au Japon, il appert qu'en raison de l'importance des déplacements par chemin de fer, phénomène intimement lié aux contraintes spatiales de l'archipel, les gares ont conservé ce rôle traditionnel de polarisation des activités socio-économiques.

Sensible à la notion d'accessibilité, le secteur tertiaire, qui regroupe l'ensemble des entreprises de services et les commerces de vente au détail, est intimement lié à la présence de systèmes de transport efficaces. Facilement polarisée autour des haltes ferroviaires, la croissance de ce secteur constitue un indicateur sensible qui reflète l'influence économique qu'apporte le réseau à une région.

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(7) HIROTA, Ryosuke (1985) Japon: l'effet Shinkansen. *Transports*. 310, p. 681.

CONCLUSION

Depuis octobre 1964, l'expérience du Shinkansen s'est avérée un succès incontestable. Toutefois, il faut se rappeler les prémices fondamentales ayant présidé à cette réussite, lesquelles constituent les atouts de la performance du train rapide nippon.

Ce programme fut davantage dicté par des considérations immanentes à l'environnement interne du Japon. Les caractéristiques humaines et physiques du territoire ont fourni les conditions par excellence permettant de maximiser la rentabilité socio-économique d'un tel système de transport, probablement plus que dans toute autre nation.

Le pays du Soleil Levant possède un territoire densément peuplé où plus de soixante pour cent des citoyens sont concentrés dans la mégalopolis Tokyo-Osaka, soit 27,5 % de la superficie totale de l'archipel. C'est une déterminante fondamentale que trop de planificateurs de pays faiblement densifiés ont tendance à éluder lorsqu'ils discutent des avantages qu'un tel train pourrait procurer à leur nation. À cet attribut, il faut ajouter le coût d'utilisation de l'automobile et les nombreux inconvénients attendant le conducteur japonais sur les routes nationales (p. ex. embouteillages) qui rendent fort avantageux l'accès à ce moyen de transport.

Des facteurs qualitatifs expliquent la performance et la popularité qu'a connues le réseau ferroviaire Shinkansen dès son ouverture. La fréquence des départs quotidiens, la vitesse commerciale du train rapide, la sécurité des passagers ainsi que le faible rapport qualité/prix des modes de transport concurrents sur les parcours de moyenne distance sont à la base de sa compétitivité et de sa rentabilité.

Malgré les frais prohibitifs de construction de l'infrastructure en raison de ses voies dédiées et de ses nombreux ouvrages d'art, le peuple japonais a pu se permettre d'établir, entre les villes de Tokyo et de Fukuoka (Fukuoka), les lignes Tokaido et Sanyo, sachant que les centaines de millions de passagers qui l'utiliseraient chaque année assureraient des bénéfices. Hors de ce couloir populeux, il s'avère beaucoup moins lucratif d'implanter ce système, s'appuyant sur des moyens aussi exigeants en investissement et plus difficilement recouvrables à moyen terme.

Les dirigeants du Groupe JR le comprirent rapidement. Pour desservir l'arrière-pays et dans l'intention de rencontrer les objectifs gouvernementaux d'aménagement du territoire et de développement économique régional, ils se

devaient d'appuyer la mise en place de trains rapides permettant d'offrir à un tarif et à une fréquence raisonnables un service de qualité. Le Shinkansen conventionnel n'étant point adapté aux régions peu densifiées, il fallait trouver une alternative qui éviterait d'engendrer d'importants déficits d'exploitation pour les transporteurs ferroviaires. L'amélioration des infrastructures de chemins de fer déjà existantes et l'utilisation partagée des voies étaient la solution toute indiquée qui s'offrait en vue de prolonger le réseau à grande vitesse en dehors des corridors achalandés de l'archipel.

Compte tenu de ces paramètres, l'avènement du mini-Shinkansen était la solution tout indiquée pour desservir ces régions. Guidée par un même objectif d'efficacité ayant fait le succès du Shinkansen, cette technologie allait permettre d'étendre cette tradition d'excellence, tout en respectant les conditions des nouveaux territoires et marchés.

L'expérience globale du Japon devrait aider les pays souhaitant se doter d'un train rapide à considérer ces déterminantes avant de porter leur choix sur un type de technologie ferroviaire particulier. C'est le seul moyen qui permettra d'établir un service maximisant le rapport qualité/prix, critère tant recherché par le consommateur, tout en ménageant le trésor public.

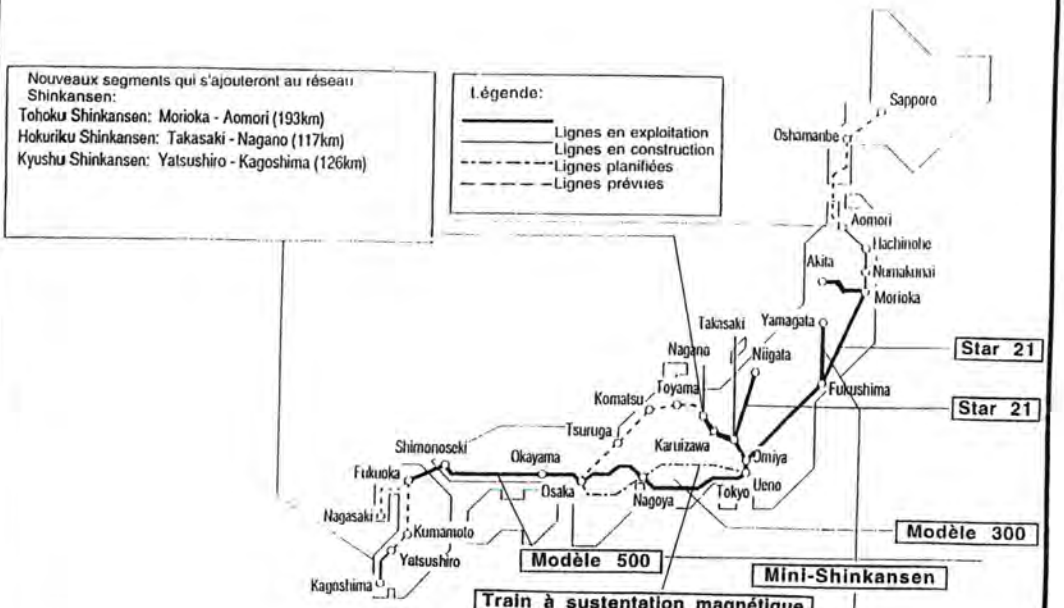
Avec le mini-Shinkansen, les aspects rentabilités financière et socio-économiques se voyaient conciliés. Dans ce même esprit, des nations comme la Grande-Bretagne, avec son train IC-225, l'état de la Nouvelle-Galles du Sud (Australie), avec son XPT, et la Suède, avec le X-2000, entendaient concilier les exigences des passagers avec du matériel ferroviaire adapté aux conditions de leur marché. Au moyen de systèmes d'inclinaison intégrés aux voitures, ces trains atteignent des vitesses commerciales variant entre 200 et 250 kilomètres.

Au Japon, la rentabilité des opérations des trains à haute vitesse repose également sur la diversification des activités des compagnies ferroviaires qui les opèrent. Ainsi, le Groupe JR ne fait pas que gérer des chemins de fer; il oeuvre dans plusieurs domaines connexes à son activité principale. Ainsi, ces entreprises récupèrent habilement les dépenses effectuées par leurs clients en devenant propriétaires d'établissements hôteliers, de restaurants, de centres commerciaux et de villégiatures localisés à proximité de leurs installations ferroviaires. Cette approche intégrée permet d'augmenter les revenus, tout en minimisant les risques d'une concentration dans un secteur peu profitable.

Sur tous les continents, l'avenir et, de surcroît, la survie du transport ferroviaire des voyageurs passent par une modernisation des grands réseaux de chemins de fer en faveur de tronçons permettant la circulation de rames à grande vitesse.

À cet égard, les décideurs nationaux doivent veiller à développer des solutions adaptées aux spécificités de leur territoire au profit de la simple *transplantation* de technologies performantes dans des environnements différents. C'est non seulement une question de maximisation des retombées socio-économiques et de rentabilité financière mais aussi un moyen visant à favoriser un développement durable et efficace.

Le réseau ferroviaire Shinkansen actuel et planifié (1999)



Source: JAPAN RAILWAYS GROUP (1992) High Speed Railways in Japan: Present and Future, p. 10.

"User Pay–User Say" and Marine Cost Recovery in Canada - Opening Pandora's Box: Evolution of the Coast Guard's Marine Navigation Services Fee

Introduction

In the final scene of Warner Bros.' classic 1942 film "Casablanca", Humphrey Bogart's Rick Blaine utters the now famous closing line to Claude Raines' Louis Renaud: "Louis, I think this is the beginning of a beautiful friendship".[1] The Canadian Coast Guard (CCG) may have certainly had a similar relationship in mind when, in 1995, applying the principle of "user pay-user say", it welcomed industry as a full partner in the development and implementation of its Marine Navigation Services Fee (MNSF) to help defray the costs of the provision of aids to navigation and Vessel Traffic Services (VTS) to ships operating in Canadian waters. However, as time went by, what began as a sincere attempt by the CCG to embrace the "user pay-user say" principle in working closely with industry to develop the MNSF, evolved into a multi-year process replete with regional rivalries, legal challenges, competing sub-sectoral expectations, political lobbying and large doses of moral suasion that unleashed unpredictable and uncontrollable forces that conspired to cast doubt on the partnership as a model for future cost recovery initiatives.

In theory, including clients in the design and the delivery of services they use and in the actual development and implementation of user fees that they will eventually be asked to pay is an essential pre-requisite for any cost recovery exercise. Although, in both cases, there are undoubtedly examples of the successful application of the "user pay-user say" principle in a Canadian context, embracing such an approach in the latter case does not always guarantee viable or workable results. In the case of the MNSF, the government-industry partnership approach to user charge rate making resulted in a rate structure that is complex, cumbersome, relatively more costly from an administrative standpoint and provides unique difficulties in administration, and enforcement/compliance.

In tracing the evolution of the MNSF from its introduction on June 1, 1996 through revisions made to it on July 1, 1997, and again on October 1, 1998, the

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***The views expressed in this paper are those of the authors and do not reflect those of the Canadian Coast Guard.**

authors will examine the concept of "user pay-user say" and the collaborative efforts of the CCG and the commercial shipping industry in developing what must be considered as one of the most complex marine user fees in existence today. The authors will argue that the respective roles played by both government and industry in the development of the MNSF cast doubt on the efficacy of the "user pay-user say" approach as a means of guaranteeing both government and industry benefit in a co-operative venture to establish a viable and administratively manageable user charge.

As Canada enters the new millennium, cost recovery will continue to occupy the collective minds of both the CCG and the marine industry. As a guide to future cost recovery initiatives, this paper will enumerate a number of problems that have surfaced as a result of the government-industry partnership, as well as highlight some of the benefits that have accrued from the development and implementation of the MNSF.

Evolution of the Marine Navigation Services Fee (MNSF)

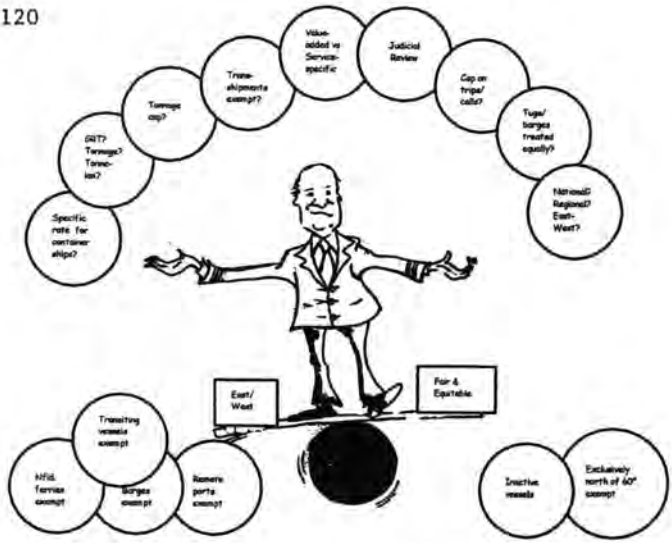
Drive to June 1, 1996

The twists and turns in the development of the MNSF are far too numerous to chronicle in a short paper. The paper will therefore focus on the key events that shaped the MNSF fee structure implemented in June of 1996. From the outset, the Commissioner of the CCG was hard pressed to convince the Marine Advisory Board and industry of the efficacy of a marine user charge for a number of services that the CCG had previously provided free of charge in support of industry. In the initial stages of the government-industry partnership, industry continually diverted the focus of discussions away from the structure and levels of the proposed user fee to that of levels of service, the need for these services, government accounting procedures, the level of CCG costs and what costs industry was expected to pay.

When most of industry finally acquiesced in its opposition to the fee and turned its attention to the actual fee structure, the CCG quickly learned the true meaning of "user pay-user say". In the twelve months leading up to June 1st, the CCG distributed close to 250 copies of its Public Consultation Document [2] on the Marine Services Fee to marine industry associations, shippers' associations, shippers, provincial governments, ports and ports associations as well as many other stakeholders. In exchange, the CCG was bombarded with over 550 submissions [3],complaining, criticizing, denouncing, condemning and recommending. The vast number of stakeholders consulted, and the frequent incongruity of their goals and objectives, was to exact a considerable price in terms of the complexity of the final user fee.

The CCG initially presented to its users a number of fee options, among them a U.S. Harbour Maintenance Tax (i.e., ad valorem) type fee, an omnibus fee with several rate structure variations, as well as service specific fees [4], some of which would have been easy to implement and administer in a Canadian context; however, it quickly realized that the disparate views of stakeholders precluded agreement on a simple fee structure. Unified, strong and persistent lobbying for a region based fee by the more dominant elements of the marine industry on Canada's West Coast, and later supported by the East Coast, persuaded the CCG to abandon a national vessel based Gross Tonne (GT) fee as a simpler and more viable option. Continued pressure, particularly from the West, who feared paying more than its fair share of services received, convinced the CCG to consider separate and distinct service based fees for navaids/VTS and icebreaking. Requests for special treatment of cargo carrying vessels, bulkers, tugs, barges, offshore supply vessels, cruise ships, and foreign flag vessels engaged in the Coasting Trade were also submitted for the CCG's consideration. Companies engaged in the transshipment of bulk cargoes in the Maritimes [5] and on Quebec's North Shore petitioned the CCG for special concessions for those vessels involved in these trades. Even shipping interests to the south were making known their uneasiness and discontent with the marine user fee initiative to the north through the media, the Canadian Embassy and letters to the Commissioner. As well, the CCG was asked to consider partial relief for wheat transshipments from the port of Quebec, exemptions from payment of the fee for Newfoundland ferries, vessels operating exclusively North of 60 degrees North Latitude, vessels operating in specific bodies of water such as Hudson Bay, Lake Athabasca and Ungava Bay, vessels operating between "remote" ports, vessels transiting Canadian waters and barges in the CCG's Western Region. As the illustration below aptly depicts, the CCG found itself attempting to balance the oftentimes opposing interests of numerous stakeholders while developing, on the one hand, a fee that was fair and equitable and, on the other hand, satisfying the effusive and persistent regional interests that constantly undermined the best intentions of the "user pay-user say" principle.

Perhaps the single most important concession made to users regarding the fee's structure was the decision to levy the fee on foreign flag cargo carrying vessels in Eastern Canada on the basis of the cargo tonnage loaded and unloaded. In keeping with the preference expressed by the association representing international shipping interests and many shipping agents in Eastern Canada, the CCG committed to a rate structure that resulted in total reliance, at a substantial cost, on shipping agents to bill and collect its fee.



On the home front, interests representing the largest domestic marine carriers in Eastern Canada initially refused to actively participate in discussions of fee options or an assessment of industry impacts. They preferred instead to prolong the consultation process and continue to oppose the fee in principle with the intention of delaying and ultimately quashing the initiative by way of the political process. When this failed, the association, in conjunction with other users, filed a motion for judicial review on June 27, 1996, less than a month after implementation, challenging the legality of the Marine Navigation Services Fee approved by Order in Council PC-1996-764 [5].

While users' competing interests definitely played a major role in making the government-industry partnership more tenuous, CCG actions also contributed to difficulties in the smooth application of "user pay user say". More and better planning on the part of the CCG, rather than the ad hoc approach that was taken, could have minimized many of the problems encountered. Moreover, delays in the passage of the ***Oceans Act*** necessitated the CCG using the ***Financial Administration Act*** as a legislative instrument for fee implementation further constraining the CCG from meeting its original deadline for introduction of the fee. By carrying out its initial impact assessment study in parallel with its industry consultation, the CCG also created confusion among users as to who was consulting and a modicum of distrust on industry's part regarding the CCG's intent and objectives. Emphasis was placed on getting the fee in place with little planning as to how all the concessions made by the CCG to the myriad industry

groups and last minute changes to the fee structure would impact the development of the MNSF billing, collection and information system.

Subsequently, in a March 15, 1996 press release, the Commissioner unveiled the modified MNSF saying, of the consultation with industry that "In keeping with the principle of "user pay-user say", we have listened to their feedback in modifying our proposal." [7] And, on June 1, 1996, the Marine Navigation Services Fees Regulations took effect and the fee schedule appearing below entered into force.

Table 1: Marine Navigation Services Fee Rate Structure [8]

(Effective June 1, 1996)

Vessel Type	Region		
	Atlantic	**Central/Laurentian**	**Western Region**
Foreign Flag (Cargo)	$0.176 per cargo tonne loaded/ unloaded up to 50,000 tonnes	$0.14 per cargo tonne loaded/unloaded up to 50,000 tonnes	All Foreign Flag Vessels regardless of size: $640 + $0.028 per GT per call, up to 9 calls in 1996-97 billing year or Annual fee of $300 + $5.00 per GT for vessels less than 1,000 GT
Foreign Flag (Cruise)	$845 per Canadian port call; maximum of three calls per 30 day period		
Foreign Flag (All Other)	$0.19 per GT of vessel to a maximum of 1 trip per calendar month		
Canadian Coasting Trade Vessels	$0.19 per GT of vessel for each 30 day period licence in effect		
Canadian Registered Vessels (Domestic)	$3.40 per GT of vessel per annum in 1996-97 billing year; invoices > $10,000 fee paid in 3 instalments (July, October and December) $1.12 per GT of vessel per first quarter or $4.48 per GT of vessel per annum in billing year 1997-98		1-Annual fee of $5,900 per vessel + $0.29 per GT for vessels of 1,000 GT or more 2-Annual fee of $300 + $5.00 per GT for tugs from 5 GT but less than 1,000 GT and other vessels from 15 GT but less than 1,000 GT 3-Annual fee of $150 for all other vessels
Transshipments	Cargo being carried by second or subsequent ship without intermediate processing to reach final destination is exempted from payment of fee $.0168 per cargo tonne of transshipped wheat loaded at Port of Quebec in 1996-97		Not applicable
Exemptions	Vessels transiting Canadian waters, trips between "remote ports", trips exclusively North of 60, trips on Hudson/Ungava Bay & Lake Athabasca ,Nfld ferries, and inactive vessels		Vessels transiting Canadian waters, trips between "remote ports", trips exclusively North of 60, inactive vessels & barges
Discount	5% for Precision Navigation Systems (PNS) on board with supporting documents		

The "user pay-user say" approach yielded a service specific fee (icebreaking was to be delayed a year) with regional components, variable vessel rates, multiple billing units, caps on trips, calls and cargo tonnages, not to mention a fee discount for on board operating Precision Navigation Systems (PNS). What began as a desire to consult with industry on a relatively straightforward fee

structure that could be easily administered and cause industry a minimum of anguish ended with a legislative patch work of concessions to a number of user groups representing specific and dominant industry interests. This onerous fee structure coupled with the CCG's commitment to review the fee after its first year proved to be a harbinger of more complexities to come.

Push Towards July 1, 1997

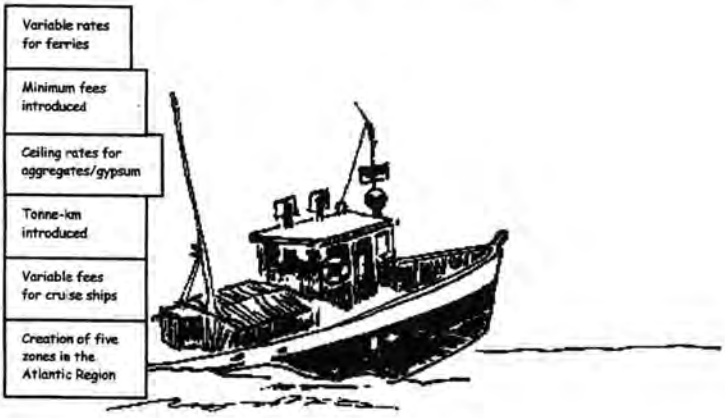
Coast Guard was still developing its billing and collection system based on the June 1st regulations when consultations began anew to revise the existing rate structure. A user fee that already possessed considerable complexity was about to get even more complex. Still dissatisfied with the structure of the MNSF, a number of major marine industry interests on the East Coast banded together and with the CCG's approbation, began to re-tool the MNSF to suit Maritimes regional needs. On the basis of their recommendations, it was proposed that the Atlantic Region be subdivided into five regional zones each with a different rate to be levied on foreign flag vessels loading/unloading cargo in each of the zones. Also emerging from these same deliberations was a recommendation to charge domestic ferries fees different from other domestic vessels that would also vary according to the regions in which these ferries operated. The identification of gypsum and aggregates, in the CCG's second impact assessment study, as commodities sensitive to such a user fee induced the CCG to consider special MNSF "ceiling" rates for vessels carrying these two products in the Canadian trades. Finally, complaints from operators of small foreign flag cruise ships calling Canadian ports regarding the June 1st single flat fee paid by all cruise ships regardless of size resulted in the creation of a three-tiered fee structure based on vessel Gross Tonnage (GT).

Regarding domestic billings, incessant pressure from domestic operators throughout Eastern Canada convinced the CCG to adopt a quarterly, as opposed to an annual, approach to invoicing most Canadian registered vessels. Interests representing the major domestic operators in Eastern Canada, whose challenge of the legality of the MNSF was still being considered in court, lobbied the CCG for a self-applied fee that would take into consideration the distinct nature and use of their vessels. This fee would also include, in its calculation, cargo tonnages loaded/unloaded and the distances these tonnages were carried based on figures they would provide to the CCG. Thus was borne the MNSF fee option of billing dry bulkers, self-unloaders and container ships according to a cargo tonne-kilometre formula or at a rate equivalent to that of foreign flag cargo carrying vessels whichever yielded a lower MNSF amount.

In the Western Region, where the CCG had approved a fee schedule proposed by the marine industry lobby on the West Coast, and despite the June 1st fee

structure and levels falling well short of the CCG's established 1996-97 revenue target for this region, no adjustments to either the structure or levels of the fees were considered or adopted.

In addition to adjustments to all fee levels, both internationally and domestically, the principal revisions to the June 1st fee structure proposed by the CCG were twofold. The CCG introduced a minimum fee in Eastern Canada per invoice (international) and per vessel per invoice (domestic). This change was made to correct an oversight in the first billing year and to alleviate the frequent and uneconomical issuance of invoices for amounts less than $5.00. Secondly, fee levels for Coasting Trade and "other" foreign flag vessels were aligned with that for Canadian vessels.



Further administrative confusion and complexity occurred at the end of the first year of billing as the CCG, because of extensive consultations with industry once again, was unable to implement the aforementioned changes to the fee structure and levels in synchronization with the commencement of the new MNSF billing year and the government fiscal year. The fact that the revised structure and rates were not in place until July 1, 1997 forced users, collecting agents and the CCG's Marine Services Fee Office to work with two fee schedules in a single billing year making the billing and collection of the fee in 1997-98 even more cumbersome and problematic.

Major revisions to the June 1st, 1996 fee proposed by industry right up to the deadline for the July 1st implementation caused the CCG to incur substantial

additional systems development costs as the system designed for billing and collection of 1996-97 fees had to be re-tooled for July 1, 1997. This work had to proceed in parallel with the ongoing 1996-97 billing and collection of the fee.

Between June 1, 1996 and July 1, 1997, while deeply engrossed in industry consultations regarding fee revisions, the CCG, at the behest of industry, commissioned yet another more costly and broadly scoped study of the impact of marine user charges on the marine industry. The study was completed prior to the July 1st implementation of the revised MNSF regulations but absorbed scarce resources that could have been more effectively utilized in the development of the billing, collection and auditing features of the fee.

On July 1st, 1997, Parliament enacted the "Fees to be Paid For Marine Services Provided by the Canadian Coast Guard" [9] pursuant to section 47 of the ***Oceans Act,*** appreciably revising the MNSF fee structure and levels of June 1st, 1996. As the fee schedule took effect, the CCG was rapidly losing the battle to balance its commitments to the government-industry partnership for a fair and equitable user fee with one that would be administratively cost effective and relatively uncomplicated and manageable.

The Final Solution? October 1, 1998

Just when it appeared that the CCG could see the light at the end of the pier, it was once again cast upon the shoals of the "user pay-user say" approach as industry was sending the message that it was not yet finished with the MNSF's structure. Representatives of small Canadian registered passenger vessels lobbied the CCG for a revision to the fee structure that would bring their fees in line with the number of months they operated within a billing year. The CCG countered with a fee structure that would limit their payment of the MNSF to a maximum of two billing quarters in a billing year provided they submitted their Transport Canada Safety Inspection Certificate validating their seasonal operations. As well, fees paid by ferries reverted to a set fee (although still different from regular domestic) per billing quarter regardless of the region in which they operated. The CCG did receive good news, however, with regard to the legal challenge of the MNSF Regulations. On July 18, 1997 a judgement on the motion for judicial review [10] was rendered in favour of the CCG against the domestic shipping interests who had initially launched the challenge. However, the same users appealed the decision on July 31, 1997 [11], only to have the judgement go against them again on September 17, 1998 [12].

To ensure that Coasting Trade vessels, other foreign flag non-cargo carrying vessels and domestic vessels were not discriminated against, maximum billable tonnages based on their GTs were proposed. In addition, on its own initiative,

the CCG proposed the establishment of separate fees for transshipped wheat, as in Quebec, at the ports of Montreal and Trois-Rivieres.

Having decided in 1997 that their separate approaches were no longer the most efficacious to achieve their objectives of solidifying the regional approach to MNSF and resisting the introduction of an icebreaking fee, the marine industry in Eastern Canada and the West joined forces as the National Marine and Industrial Coalition. The Coalition presented its report to the Commissioner on November 27, 1997 outlining "the overall principles and recommendations that must guide and direct CCG cost reduction and recovery"[13]. Also, industry and the CCG jointly explored the creation of an independent fee panel to review contentious matters related to the application of the MNSF.

After consultations with the CCG's collecting agent in the West, the Western Marine Community (WMC), the MNSF being charged to domestic vessels in the Western Region was raised. The West, however, held fast on foreign flag rate levels.

Despite not having attained the established revenue targets in either Eastern Canada or the Western Region in the first two years of the fee, but armed with updated traffic figures, the CCG decided to reduce MNSF fees for most domestic and some foreign flag vessels in Eastern Canada, increase fees for only domestic vessels in the West, and freeze the MNSF at these levels for the next three years. The latter was done in response to both industry's request for a moratorium and the CCG's desire to shift the focus away from cost recovery to other pressing matters. And so, with the passage of the revision of the "Fees to be Paid for Marine Navigation Services Provided by the Canadian Coast Guard" on October 1, 1998 (see Table 4), thus ended the long and tortuous saga of the evolution of the Marine Navigation Services Fee.

With each successive revision to the MNSF of June 1, 1996, the CCG's goal of achieving a fair and equitable, but relatively simple and administratively manageable, user fee receded rapidly into the past. The government-industry partnership had resulted in a complex user charge whose rate structure was made even more complex over a period of two years and three months. Looking back in the new millennium, while the MNSF will forever be considered a CCG initiative and user charge, there is no doubt that its fee structure is totally and unequivocally industry driven. In its haste to quickly implement a user fee that would recover a small proportion of the total costs of providing marine aids to navigation and VTS services, the CCG made an inordinate number of concessions to most elements of the marine industry in Canada. In so doing, it

created a marine user charge that is unequalled in complexity among those industrialized nations among which we count ourselves.

The complexity of a user charge can also be viewed from the perspective of the interfaces, both internal and external, necessary to administer (i.e., invoice and collect) such a charge. The diagram on page 15 illustrates the labyrinth of interfaces that makes up the MNSF billing and collection system. It also provides a backdrop for the identification of the unique problems that this product of joint government-industry partnership presents to CCG staff in billing, collecting, enforcing, and auditing the levy.

Unique Problems Associated With the Current MNSF Rate Structure

Since the June 1st implementation of the MNSF, the CCG has been presented with many difficulties in mastering the billing, collecting, enforcing and auditing of its user fee, the most important of which, along with their ramifications, are noted in the box below.

Table 2: Some Unique Problems Associated With Current MNSF Rate Structure

Total Reliance of CCG on Shipping Agents in Eastern Canada to Bill and Collect the Foreign Flag MNSF

- CCG has no timely access to export/import cargo tonnage information for billing purposes
- CCG reliant on 130 shipping agents to invoice and collect MNSF from foreign flag vessels
- CCG required to pay 5% administrative fee totalling $650K per annum for these services
- Additional costs incurred resulted from contract negotiations with agents, billing systems enhancements, increased paper burden, additional complexity due to monitoring/ auditing

Contracting of MNSF Billing and Collection in Western Region

- Billing and collection in the West contracted to WMCA at a cost of 2.25% of net revenues collected
- CCG had limited input into Western Region MNSF rate structure and levels
- Additional costs incurred due to protracted contract negotiations/requirements for ongoing monitoring from CCG HQ

Reliance Upon External Data Sources for Billing Information

- To ensure efficient billing and auditing of MNSF, CCG must rely on information from Transport Canada Ship Registry (domestic), domestic operators for fleet adjustments, shipping agents (international), Revenue Canada/Canada Transportation Agency (Coasting Trade), tonne-km. operators (vessel trips) and Statistics Canada (auditing of international)
- Additional costs due to requirement for interfaces and increased billing system complexities

Quality of Data Necessary for Efficient Administration of MNSF

- Problems with coverage, completeness and accuracy of Statistics Canada, Ship Registry and VTS information have added to administration costs and reduced MNSF billing/auditing efficiencies

Payment of MNSF by Domestic Vessels Based on Honour System

- CCG relies on domestic/tonne-km. operators to report fleet adjustments/vessel trips for accurate billings; creates CCG requirement for additional enforcement mechanisms/increased monitoring

MNSF Administration Costs Higher As A Result of Rate Structure Complexities

- Complex rate structure has increased staff, systems, enforcement/compliance and monitoring costs

(Contd. next page)

Complex Fee Structure Presents Difficulties in Enforcement and Ensuring Compliance
- Need for several different approaches to auditing to ensure compliance of all vessel types
- MNSF Regulations do not presently stipulate penalties for non-compliance

Fee Structure Overly Complex: Difficult to Administer, Interpret, Explain and Set Rate Levels Accurately
- Sheer number of distinct fee elements requires complex billing and collection system and numerous external and internal interfaces
- Different billing methods confusing to CCG clients and numerous provisions in MNSF Regulations provide the potential for misinterpretation
- Subtleties of MNSF Regulations/Fee Schedule difficult to explain to clients
- Complex fee schedule exacerbates problem of accurately setting fees to achieve revenue target
- Despite maximum automation still a large paper flow: billing system is cumbersome/onerous

Positive Results Emerging from the Introduction of the MNSF

While the MNSF has experienced its share of growing pains, there have been a number of positive outgrowths of the application of the fee specifically in relation to the disciplining of demand for CCG services, Canadian international waterborne commerce statistics, coverage, completeness and accuracy of information on Canadian registered vessels, strides in the design and development of automated billing, information and auditing systems and knowledge of the marine industry in Canada.

Table 3: Positive Outgrowths of the Implementation of the MNSF

Improvement in the Quality of Canadian International Transportation Statistics
- MNSF billings of foreign flag vessels have improved international tonnage information
- Accurate MNSF information has led to correction of Statistics Canada A6 statistics
- Benefits of improved A6 tonnage and agent/operator statistics enjoyed by CCG/DFO, Statistics Canada, Transport Canada and other users of the data

Improvement in Reporting of Changes in Status of Domestic Vessels to Canadian Ship Registry
- MNSF invoicing of domestic vessels has provided incentive to owners/operators to update status of their vessels in Canadian Ship Registry on a timely basis
- MNSF invoicing has increased coverage, completeness, and accuracy of information on Canadian registered vessels contained in Ship Registry

Working With Industry to Facilitate MNSF Billing and Collection
- Introduction of CCG electronic invoice template (E-Form) for use by shipping agents to expedite preparation of MNSF documentation
- Development of electronic upload of MNSF invoices prepared by shipping agents to reduce paper burden and manual entry of invoice data into MSF-IS
- Creation of Internet web application for billing of tonne-kilometre operators to reduce paper burden for clients and manual entry of billing information into MSF-IS

Acquisition of Knowledge of the Commercial Shipping Industry and its Sub-Sectors
- CCG senior management and billing and collection staff have become more knowledgeable of the workings of the commercial shipping industry
- CCG senior management and billing and collection staff able to more effectively and efficiently serve clients as a result of the knowledge gain

Some Final Thoughts on "User Pay-User Say"

In their report on federal cost recovery, "User Fees: Where Does the Buck Stop?", the sponsoring Canadian business groups emphasized the importance of "user pay-user say" "in helping to bring about improvements in government's cost recovery policy". However, the report's authors were quick to point out that "[w]hile there are consultations, those consulted are not being listened to".[14] In the case of the MNSF, nothing could be further from the truth. Despite the largely negative treatment in the media during the fee's evolution regarding the extent to which the CCG listened to industry, the latter was well-served by the partnership. While the CCG participated in the process and got its user charge, it was industry that determined the fee's final structure. If both parties view success from these narrow perspectives, then, on the surface, one might initially view the MNSF experience as a triumph of "user pay-user say". However, viewing it from a more practical and cost effective point of view, both parties have been strapped with a fee that is complicated, confusing, cumbersome, costly and difficult to administer.

Once the process was launched, the CCG was hard-pressed to rein in the considerable demands of industry, of which many of the ramifications regarding billing, collection and compliance were seen only after the fee was introduced. Aside from the obvious negative cost and administration implications, a number of outstanding issues still remain; namely, the application of the fee on movements between the Canadian north and the south, the scope of trips to which the application of the tonne-kilometre billing formula applies, types of vessels to be billed on a tonne-kilometre basis and the determination of the actual scope of the domestic vessel population to be billed. As well, one must question the extent to which the rate structure adequately reflects the interests of a number of smaller marine operators that could not be identified and therefore were not consulted. In the end, both stakeholders and the CCG have to ask whether or not the considerable additional administrative costs, both tangible and otherwise, incurred as a result of the excessive complexities of the MNSF rate structure are outweighed by the benefits accruing from the incessant drive for a fee acceptable to all. It is worth considering that all parties may have been better off with a simpler more manageable MNSF rather than the "hybrid" that "user pay-user say" spawned. As was the case with Pandora's box, all that is left for the marine industry and the CCG is hope.

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[1] Warner Bros., "Casablanca", 1942.
[2] CCG, Marine Services Fee Options, Presentation.
[3] CCG, Marine Services Fee Initiatives, Presentation.
[4] CCG, Consultation Paper: "Proposed Options for a Marine Services Fee", September, 1995, p.5.

[5] Statia Terminals, Submission on Canada's Proposed Marine Services Fee, December 27, 1995.
[6] Federal Court – Trial Division, Notice of Motion for Judicial Review, June 27, 1996.
[7] DFO Press Release "Coast Guard Modifies Marine Services Fee Proposal", March 15. 1996.
[8] Canada Gazette, Part II, Vol. 130, No. 12, 28 May 1996, "Marine Navigation Services Fees Regulations".
[9] Canada Gazette, Part I, Vol. 131, No. 29, July 19, 1997, "Fees to be Paid for Marine Navigation Services Provided by the Canadian Coast Guard".
[10] Federal Court – Trial Division, Decision of Hon. Mr. Justice P. Rouleau, July 18/97.
[11] Federal Court of Appeal, No. A-535-97 (T-1530-96), July 31, 1998.
[12] Federal Court of Appeal, Notice of Appeal Dismissal, September 17, 1998.
[13] National Marine and Industrial Coalition, Agreement on Canadian Coast Guard Cost Reduction and Recovery, November 27, 1997
[14] Canadian Business Groups, "User Fees: Where Does the Buck Stop?", p7.
[15] Canada Gazette, Part I, , Vol. 132, No. 42, October 17, 1998, "Fees to be Paid for Marine Navigation Services Provided by the Canadian Coast Guard".

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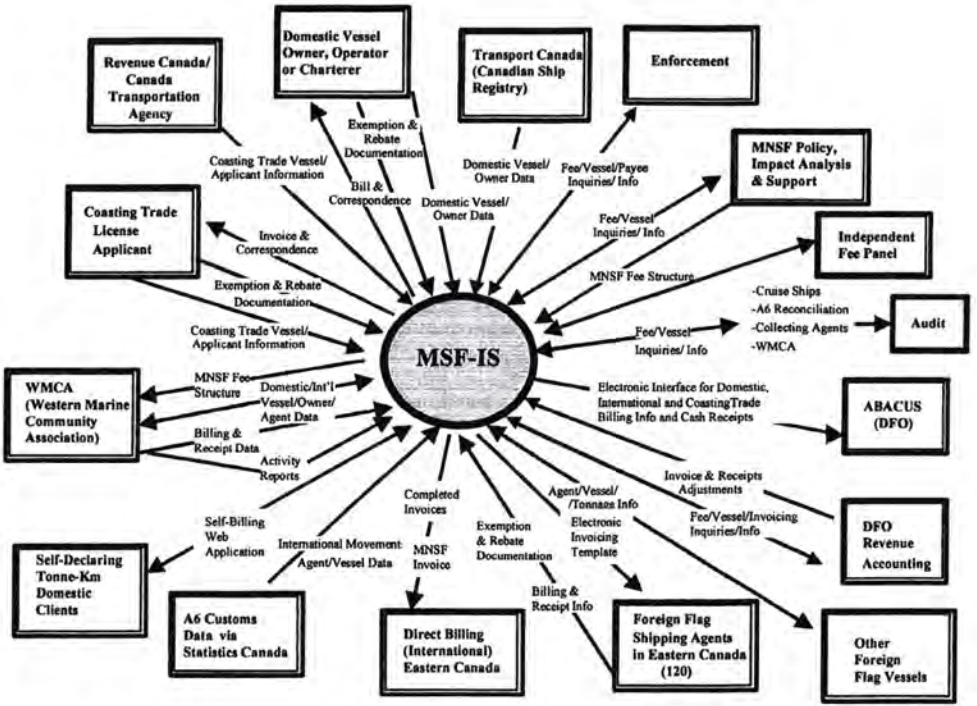


Table 4: Marine Navigation Services Fee (MNSF) Rate Structure [15]

(Effective October 1, 1998)

Billing Criteria	Regions (Eastern Canada)			Western Region
	Newfoundland	Maritimes	Central/Laurentian	(B.C., Alta., Sask.)
	All fees expressed in current Canadian dollars			
Foreign Flag (Cargo)	$0.152 per tonne of cargo loaded/unloaded up to 50,000 tonnes	Bay of Fundy - $0.089 East Coast N.S. - $0.107 Bay of Chaleur - $0.16 PEI/Northumberland - $0.216 Miramichi - $0.216 Per tonne of cargo loaded/unloaded up to 50,000 tonnes	$0.152 per tonne of cargo loaded/unloaded up to 50,000 tonnes	Applicable to all foreign flag vessel types: $640 + $0.028 per Gross Tonne (GT) of vessel payable 12 times per 12 month period or Foreign flag vessel of less than 1,000 GT: $300 + $9.50 per GT per 12 month period
Commodity Fee Ceilings	Gypsum maximum of $0.15 and Aggregates maximum of $0.05 per cargo tonne loaded/unloaded			
All Other Foreign Flag	$0.38 per GT of vessel per trip with maximum of 1 trip per calendar month			
Minimum Fee	$25 per billable invoice for cargo and "all other foreign flag" vessels			
Cruise Ships	Vessel GT of 150 or less = $300, vessel GT > 150 but less than or equal to 22,500 = $500, vessel GT > 22,500 = $1,500 payable a maximum of 3 times in a 30 day period			
Transshipped Cargo	Cargo carried by second or subsequent ship without intermediate processing to reach final destination exempted from payment of MNSF except transshipped wheat at Quebec City = $0.07, Montreal = $0.03 and Trois-Rivieres = $0.01 per cargo tonne loaded			Not applicable
Administrative Fee	5% of Net MNSF owing per invoice withheld by CCG collecting agents agents paid $50 per "No Charge" invoice for transshipments and 2nd and subsequent trips of "all other foreign flag" vessels prepared and submitted to CCG			WMCA withholds 2.25% of MNSF revenues collected on all invoices prepared
Canadian Coasting Trade	$0.38 per GT to a maximum of 50,000 GT for each 30 day period Coasting Trade licence is in effect			
Minimum Fee	$25 per vessel per invoice for Coasting Trade vessels			
Canadian Registered Vessels (All Other)	$1.14 per GT per quarter (3 months) up to 50,000 GT			1- Annual fee of $5,900 + $0.45 per GT for vessels of =>1,000 GT 2- Annual fee of $300 + $9.50 per GT for vessels between 15 and 1,000GT 3- Tugs of 5 GT or more but under 1,000 GT pay as (2) above 4- $25 per fleet rental boat 5- $200 per vessel other than above of < 5GT
Canadian Registered Ferries	$1.65 per GT per quarter (3 months) up to 50,000 GT			
Canadian Registered Seasonal Operators	$1.14 per GT per quarter (3 months) to a maximum of 2 quarters subject to operator providing Transport Canada SIC Certificate restricting vessel operations to 6 months or less			
Minimum Fee	$25 per vessel per invoice per quarter for "All Other" Canadian registered vessels including ferries and seasonal operators			
Canadian Registered Bulkers, Self-Unloaders and Containerships	$0.0070 per 100 cargo-tonne kilometres for each vessel trip; rate ceilings of $0.15 for gypsum, $0.05 for aggregates and $0.16 for "all other cargo" per cargo tonne apply; operators self-declare			
Fee Discount	5% for Precision Navigation Systems (PNS) on board with supporting documentation			
Exemptions	Vessels transiting Canadian waters; trips between "remote" ports; trips exclusively North of 60, Nfld ferries, vessels inactive for entire billing quarter			Same as Eastern Canada except Nfld. Ferries; barges exempt in Western Region only

Diagram 1: Marine Navigation Services Fee - External and Internal Interfaces



LA PME DANS LA CHAÎNE LOGISTIQUE : LES CAS DU MEUBLE DE MAISON ET DE L'APRÈS-VENTE AUTOMOBILE

Introduction

La gestion intégrée de la chaîne logistique est un concept à l'avant plan des réflexions et des débats actuels en logistique. Beaucoup d'universitaires, de consultants et de gestionnaires parlent de la nécessité de considérer l'entreprise non plus comme une entité indépendante, mais comme le maillon d'une chaîne beaucoup plus vaste comptant plusieurs acteurs et autant d'enjeux. Afin d'intégrer cette chaîne des plus complexes et d'y prospérer, on recommande généralement aux entreprises d'adopter certaines pratiques (par exemple le juste-à-temps et la mesure de la performance des activités logistiques) et d'utiliser certains outils (l'échange de données informatisé, la gestion intégrée des opérations, de l'entreposage, des approvisionnements, de la distribution, etc.). Mais comment les PME, aux ressources parfois limitées, performent-elles à l'intérieur des chaînes logistiques ? En relation avec cette question, cet article s'intéresse à la place que la PME occupe au sein de deux chaînes : l'après-vente automobile et les meubles de maison. Le secteur de l'après-vente automobile, comme d'ailleurs la plupart des secteurs de l'automobile, est l'un des plus avancés sur le plan logistique, contrairement à celui des meubles de maison, dont le système logistique pourrait être qualifié d'artisanal à bien des égards. De façon plus spécifique, cet article poursuit quatre objectifs : décrire ces deux chaînes logistiques, analyser l'évolution des PME au sein de celles-ci, dresser le bilan des deux chaînes et identifier les raisons qui expliquent la prolifération ou la relative absence des PME au sein de ces chaînes logistiques.

Méthodologie

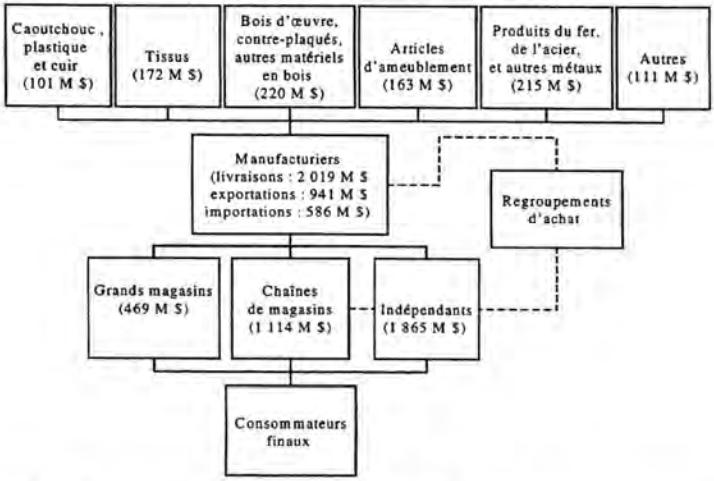
L'information requise pour atteindre ces objectifs provient d'une analyse approfondie de la littérature pour les deux secteurs. Les publications pertinentes de Statistique Canada, les ouvrages sectoriels ainsi que les rapports annuels disponibles de compagnies ont été analysés. De plus, des entrevues ont été réalisées auprès de sept informateurs-clés : deux conseillers du Ministère de l'industrie et du commerce (MIC), deux directeurs logistiques de grandes entreprises et trois dirigeants ou administrateurs de PME.

La place de la PME dans la chaîne logistique des meubles de maison

La première chaîne logistique considérée est celle des meubles de maison (figure 1). En 1996, les détaillants indépendants se taillent la part du lion avec

approximativement 1,9 milliards de ventes, soit 54 % de la totalité du marché, suivi des chaînes de magasins (33 %) et des grands magasins (14 %). Il est à noter que, selon une étude de Statistique Canada en voie de réalisation, 30 % des ventes de meubles, d'appareils ménagers et d'accessoires d'ameublement est réalisé dans des magasins ayant une superficie égale ou supérieure à 60 000 pieds^2. Pour des raisons de confidentialité, nous avons malheureusement aucune information quant à l'évolution des parts de marché des grandes surfaces.

Figure 1 : Chaîne des meubles de maison (données de 1996 en millions)



Le profil du secteur manufacturier, en ce qui a trait à la taille des entreprises, ressemble à maints égards à celui de l'industrie de détail : les PME manufacturières sont très nombreuses et responsables d'une part importante de la production. À titre indicatif, 85% des manufacturiers de ce secteur comptent moins de 50 employés et sont responsables de 27% des livraisons. À l'autre extrémité, les entreprises de plus de 100 employés, représentant 8% des producteurs, assument 55% des livraisons. Pour ce qui est des matériaux nécessaires à la confection de meubles (toutes catégories confondues), on ne s'étonne guère de l'importance, en termes de dollars, du bois et de ses produits dérivés, de même que des différents métaux (fer, acier, aluminium et autres). Ces deux intrants représentent à eux seuls 44% de la valeur des intrants, suivis par les tissus (18%), les articles de quincaillerie (17%) et les produits de caoutchouc, de plastique ou de cuir (10%).

Selon l'information recueillie lors des entrevues et d'un rapport produit par la société Aktrin (Wille, 1992), on constate que les détaillants s'approvisionnent surtout de deux façons : auprès des manufacturiers ou via un regroupement d'achat. Lors de l'approvisionnement auprès des manufacturiers, trois intermédiaires peuvent intervenir : la force de vente du manufacturier, les agents, ou la vente directe sur le lieu de production. Les grands détaillants et les groupes d'achat seraient les plus impliqués dans la vente directe alors que les représentants et les agents joueraient surtout un rôle auprès des détaillants indépendants. Les groupes d'achat semblent gagner en importance, notamment auprès des petits détaillants. À titre indicatif de cette importance grandissante, soulignons que le Groupe Cantrex a réalisé, à lui seul, des transactions d'une valeur approximative de 540 millions de dollars en 1997 (ces transactions n'incluaient pas exclusivement des meubles de maison, mais également des appareils électroménagers, des systèmes de son, des télévisions, du matériel de photographie, etc.). La croissance relativement récente des regroupements d'achat peut être considérée comme la riposte des petits détaillants à l'endroit des grandes surfaces, de plus en plus agressives à tous les égards.

Considérons maintenant l'évolution de la PME au sein de la chaîne logistique. À la figure 2, on observe que la courbe des ventes des détaillants indépendants suit celle des ventes totales. Cette situation n'a rien d'étonnant. Les détaillants indépendants, comme la plupart des PME, sont probablement très sensibles aux aléas de l'environnement. Plus flexibles, leur chiffre d'affaire augmente rapidement en période de prospérité. Plus précaires, un plus grand nombre d'entre elles diminue leurs activités ou ferme en période d'austérité. On remarque également que la part de marché des chaînes ne cesse d'augmenter depuis 1993, et ce, contrairement à celle des grands magasins qui diminue. Bien que l'on ne détienne pas de données détaillées pour les années 1997 et 1998, on peut supposer que les magasins à succursales ont continué de gruger la part de marché, non seulement aux grands magasins mais également aux détaillants indépendants. Cette formule de vente, compte tenu de ses ressources et de l'attention qu'elle suscite, devrait connaître de plus en plus de succès.

Sur le plan manufacturier (figures 3 et 4), la période d'austérité économique ayant caractérisé le début des années 1990 a beaucoup éprouvé les PME. D'une part, le nombre de PME de moins de 50 employés a décru de près de 50% entre 1990 et 1994. Par ailleurs, leur part de marché est passée de 34% en 1990 à 27% en 1995. Un scénario semblable est observé pour les PME de 50 à 99 employés. Entre 1990 et 1995, leur nombre a diminué de 44% alors que leur part de marché est passée de 25% à 17%. Même si cette période de crise semble plutôt néfaste, on peut penser qu'elle aura eu un effet d'épuration plutôt positif: seuls les PME les plus fortes et les mieux organisées ont survécu.

Figure 2 : Ventes au détail de meubles de maison par type de magasins

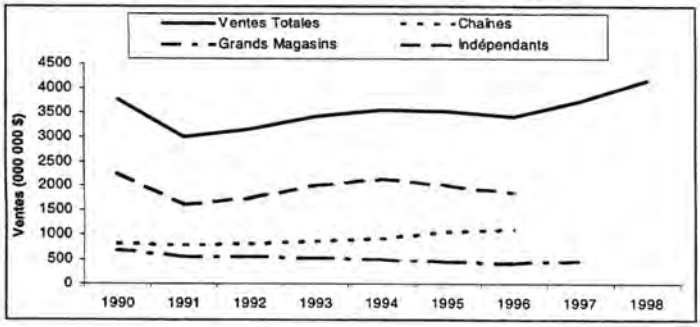
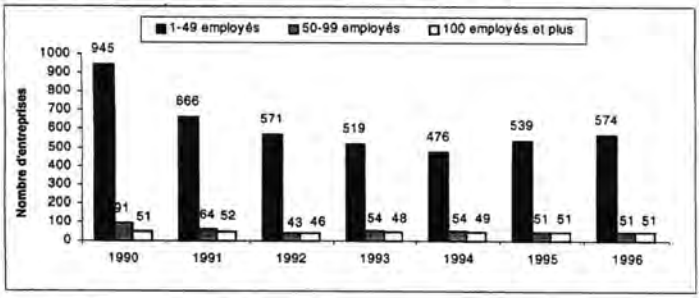
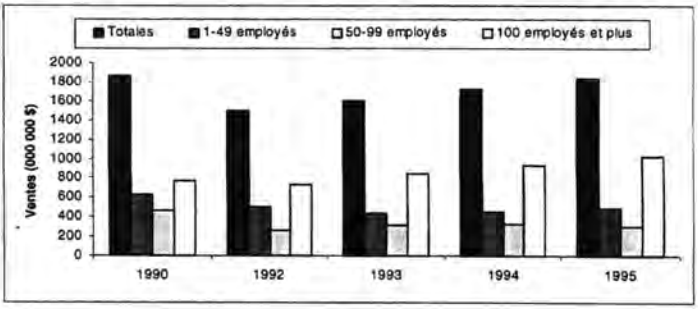


Figure 3 : Nombre de manufacturiers du secteur du meuble de maison



Les grands gagnants du secteur manufacturier sont définitivement les manufacturiers de plus de 100 employés. Leur nombre est demeuré sensiblement le même depuis 1990, et ce, en dépit de la récession de 1991, alors que leur part de marché n'a cessé de croître entre 1992 et 1995, soit de 48% à 55% des livraisons totales. En fait, des trois types de manufacturiers (selon la taille), ce sont les seuls qui ont enregistré une augmentation significative de leurs ventes entre 1992 et 1995. Cette augmentation est probablement attribuable au fait que la demande américaine a augmenté de façon marquée depuis le début 1990 (la dévaluation du dollar aidant, les exportations canadiennes ont augmenté de 652 entre 1993 et 1997). Or, il semble juste de supposer que ce sont les manufacturiers d'une certaine taille qui ont le plus profité de cette manne, ces derniers bénéficiant de davantage de ressources pour conquérir de nouveaux marchés.

Figure 4 : Livraisons des manufacturiers du secteur du meuble de maison



À la lumière des propos précédents, on peut conclure que la PME joue un rôle de première importance tout au long de la chaîne logistique des meubles de maison. Les détaillants indépendants détiennent la plus grosse part de marché, et les PME de moins de 100 employés assurent presque la moitié des livraisons. Les grands joueurs que sont les chaînes de détaillants et les grands manufacturiers, bien qu'ayant une importance grandissante, jouent un rôle relativement moindre par rapport à d'autres secteurs; seulement 3 % des manufacturiers du meuble de maison emploie plus de 200 employés.

Une des principales caractéristiques pouvant être associée aux PME est la réactivité, et ce, à presque tous les niveaux de la chaîne logistique du meuble de maison. Par exemple, les manufacturiers doivent leur croissance surtout à la faiblesse du dollar canadien; leurs initiatives et leurs produits semblent des considérations de deuxième ordre dans cette progression. De plus, les manufacturiers qui ont implanté des systèmes de communication avec leurs clients (EDI notamment) l'ont généralement fait à la demande et sous la supervision de grands détaillants (Sears, Wal-Mart, etc.). Dans la même lignée, les très grands détaillants de produits diversifiés semblent avoir une grande influence sur les manufacturiers, la plupart du temps de taille beaucoup plus petite. C'est ainsi qu'un des manufacturiers rencontré a dû construire un nouvel entrepôt afin de satisfaire des détaillants de plus en plus exigeants sur le plan des délais et des quantités.

Mais ce ne sont pas seulement les manufacturiers qui sont réactifs. Les détaillants, notamment les indépendants et les petites chaînes de succursales, donnent davantage l'impression de se défendre que d'attaquer. À titre d'exemple, les magasins Brault et Martineau occupent une telle place sur le plan de la visibilité publicitaire dans la région de Montréal que les chaînes de taille plus modeste semblent presque inexistantes.

La chaîne logistique des meubles de maison est aussi caractérisée par un faible recours aux nouvelles technologies et aux nouveaux modes d'organisation de la production. À titre indicatif, le salaire moyen d'un employé de production pour cette industrie ne représente que 67 % du salaire moyen de l'ensemble de l'industrie canadienne (Industrie Canada, 1996); ce faible niveau s'explique du fait que la production de meubles de maison nécessite peu de main-d'œuvre qualifiée. Sur la base de l'information recueillie lors de la rencontre de deux producteurs de meubles, il semble qu'une proportion relativement faible de la production soit réalisée à partir d'équipements à la fine pointe de la technologie; beaucoup d'opérations nécessitent toujours une implication humaine importante. De plus, le lien entre la conception assistée par ordinateur et la fabrication assistée par ordinateur est rarement réalisé de façon informatique. Soulignons également que rares sont les manufacturiers dont la production est organisée selon un système à flux tirés (juste-à-temps). La faible utilisation des technologies de pointe ne concerne pas uniquement la production. Les producteurs, de même que la plupart des détaillants, recourent très peu aux outils facilitant l'intégration logistique comme l'EDI, les banques de données relationnelles ou les systèmes de gestion intégrés. Dans cette perspective, on peut dire que la distribution et l'approvisionnement se font encore selon des modes traditionnels.

En somme, la chaîne logistique des meubles de maison est composée d'un grand nombre de petits joueurs entretenant peu de relations entre eux et qui sont organisés de façon traditionnelle. Leur survie à long terme semblerait donc compromise.

La PME dans la chaîne logistique de l'après-vente automobile

La chaîne logistique de l'après-vente automobile est fort différente de celle des meubles de maison (figure 5); elle comprend un plus grand nombre d'intermédiaires qui entretiennent entre eux des relations plus diversifiées. Cette relative complexité prend sa source dans plusieurs facteurs : la diversité des formules de service et de vente au détail, le défi de la disponibilité des pièces et le haut niveau de technicité des pièces et accessoires automobiles.

Premier facteur expliquant la complexité : la diversité des formules de service et de vente au détail. À cet effet, il existe principalement deux façons, pour un consommateur, de s'approvisionner en pièces automobiles : via un réparateur spécialisé ou généraliste (le segment des installateurs professionnels) ou via un magasin de détail (le segment des mécaniciens-bricoleurs). Le segment des pièces installées comporte principalement deux acteurs : le département de service des concessionnaires automobiles ainsi que les réparateurs spécialisés ou généralistes. Il y a quelques années, ces deux formules visaient des clientèles

différentes : les voitures âgées pour les réparateurs et les voitures récentes pour les départements de service. Les ventes de voitures neuves déclinant, les concessionnaires se sont accaparés, à l'aide de campagnes publicitaires agressives, une part significative de la réparation des voitures usagées (figure 6).

Les mécaniciens-bricoleurs, pour leur part, s'approvisionnent selon différentes formules de détail. Selon l'AIA (1997), on retrouve, par ordre d'importance, la chaîne Canadian Tire (42% des ventes de pièces et accessoires destinés au segment des mécaniciens-bricoleurs en 1996), les grossistes en pièces automobiles (19%), les magasins généralistes et spécialistes (12%) ainsi que les concessionnaires (8%). Les autres formules de détail, dont les grands magasins et les marchands de pièces embouties, se partagent le reste du marché, estimé 18%. Si on se réfère à la figure 6, on remarque que le segment des mécaniciens ne cesse de diminuer depuis 1990 (en termes de part d'emplois). Cette diminution tient au fait que les consommateurs font de plus en plus appel aux spécialistes pour réparer leurs autos qui sont de plus en plus complexes sur le plan technique. On observe également que les départements de services emploient de plus en plus d'employés alors que la part d'emplois des garagistes demeure relativement stable.

Deuxième facteur de complexité : la disponibilité des pièces. Les garagistes et les mécaniciens-bricoleurs doivent avoir à leur disposition, instantanément ou presque, un nombre faramineux de pièces. Or, afin de desservir le vaste marché canadien, et ce, dans de courts délais, les principaux distributeurs (UAP-NAPA, Carquest et Uni-Sélect), et les magasins de détail (Canadian Tire) ont établi des réseaux de distribution très complexes. À titre d'exemple, UAP-NAPA recoure à 14 centres de distribution et 652 entrepôts pour fournir en pièces et accessoires plus de 5 500 garagistes et carrossiers. Sa stratégie de transport est telle que tout garagiste ou carrossier peut s'attendre à recevoir les pièces demandées à l'intérieur de moins d'une heure. Pour les pièces plus rares, le délai maximum est de 24 heures.

Figure 5 : Chaîne de l'après-vente automobile (données de 1996 en millions)

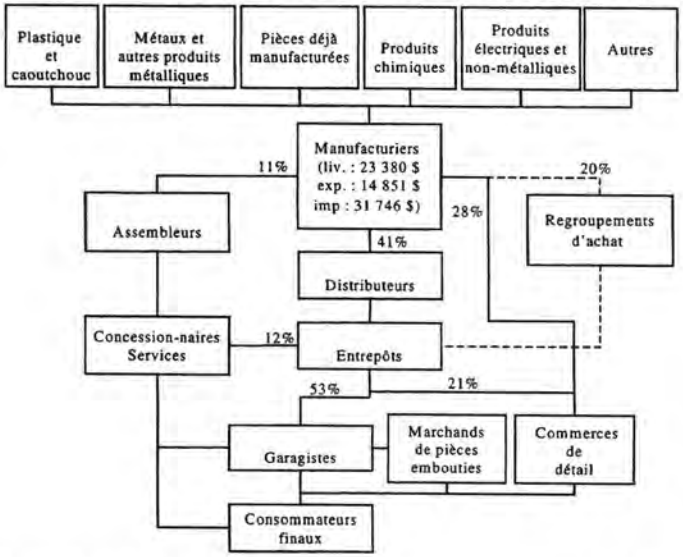
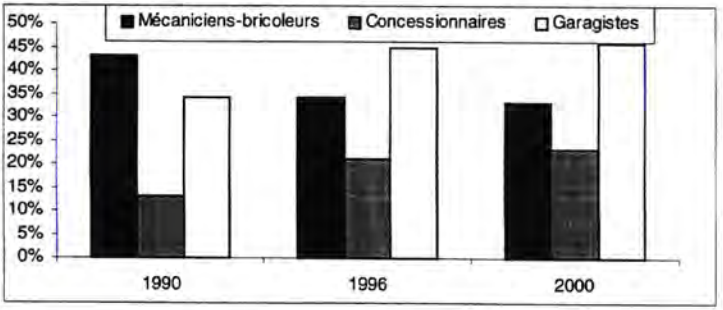


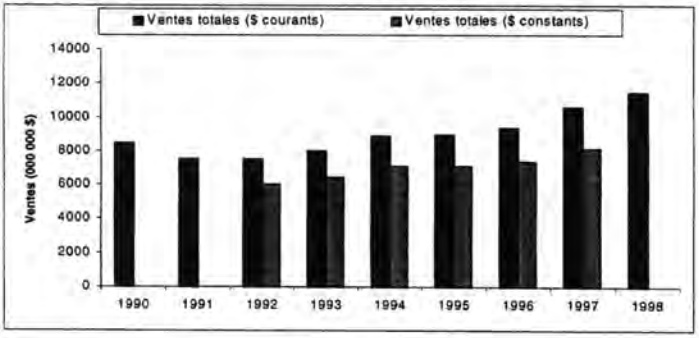
Figure 6 : Part d'emplois détenus selon les formules de services et de détail



Le défi de disponibilité auquel font face les grands distributeurs et les magasins de détail est d'autant plus important que le nombre de pièces de rechange ne cesse de croître. UAP-NAPA offre, à elle-seule, près de 300 000 pièces. En

plus de cette explosion du nombre de pièces, on observe un autre phénomène qui ajoute de la pression sur la disponibilité : le vieillissement du parc automobile. La figure 7 montre que les ventes de pièces et d'accessoires de véhicules automobiles n'ont cessé de croître depuis 1991 (valeur courante et constante).

Figure 7 : Ventes totales au détail des pièces et accessoires automobiles



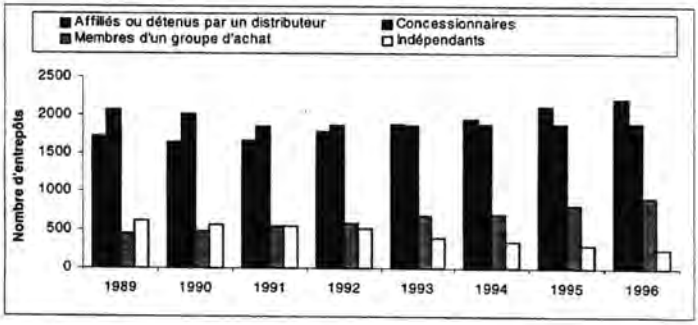
Dernier facteur de complexité, le haut niveau de complexité technique des composantes automobiles. La chaîne logistique n'est pas seulement complexe au niveau de la distribution des produits finis mais aussi au niveau manufacturier; une composante automobile comprend souvent plusieurs pièces comportant un niveau élevé de complexité technique. Dans cette perspective, on retrouve une longue chaîne de manufacturiers dont les produits des uns sont les intrants des autres et l'intrant « pièces déjà manufacturées » est probablement le plus important de la figure 5.

Pour ce qui est de la place qu'occupent les PME, les garagistes (spécialisés, généralistes et carrossiers) s'approvisionnent principalement auprès de quatre sources : les entrepôts (pièces neuves), les concessionnaires automobiles (pièces d'origine) et les marchands de pièces embouties (pièces usagées). Il est à noter que les garagistes s'approvisionnent parfois directement auprès du manufacturier. Cependant, ces transactions se font généralement sous la supervision d'une bannière ou d'un regroupement d'achat. Les différents commerces de détail, ayant comme mission la vente directe aux mécaniciens-bricoleurs, s'approvisionnent soit auprès des manufacturiers, soit auprès des entrepôts. Plus un commerce sera grand, plus il s'approvisionnera directement via le manufacturier. Les marchands de pièces embouties composent leurs stocks à partir des carcasses de voitures accidentées alors que les départements

de service font directement appel aux grands assembleurs (Ford, GM, Chrisler, Toyota, Honda, etc.) pour la majorité de leurs pièces.

Selon l'AIA (1997), les ventes des entrepôts se divisent de la façon suivante : 53% aux garagistes, 21% aux détaillants, 12% aux concessionnaires et 14% aux flottes privées de véhicules. Les entrepôts s'approvisionnent soit auprès des grands distributeurs, soit via des regroupements d'achat. À ce sujet, on observe que le nombre d'entrepôts membres d'un groupe d'achat augmente rapidement depuis 1990. La croissance de ce nombre explique le déclin du nombre d'entrepôts indépendants. Le nombre d'entrepôts affiliés à un distributeur demeure relativement constant alors que celui relatif aux concessionnaires offrant des pièces de rechange ne cesse de croître (compte tenu de leur nouvelle orientation « réparation »). Toujours selon l'AIA (1997), les manufacturiers canadiens de pièces et accessoires automobiles répartissent leurs ventes de la façon suivante : 41% aux distributeurs, 28% aux commerces de détail, 20% aux regroupements d'achat et 11% aux assembleurs. Le secteur manufacturier de cette industrie est définitivement une affaire de grandes entreprises (figures 9 et 10). Non seulement les producteurs de plus de 200 employés sont nombreux (26% de la totalité des entreprises), du moins pour des entreprises de grande taille, mais ils détiennent également une part écrasante du marché avec 80% des livraisons (données de 1995). De plus, leurs livraisons, en valeur courante, ont enregistré une forte progression depuis 1990. Les producteurs de moins de 100 employés (55% des manufacturiers) doivent se contenter que de 7% des livraisons. Il faut également préciser que l'importance des PME semble diminuer depuis 1990, tant en nombre d'entreprises qu'en part de livraisons.

Figure 8 : Évolution du nombre d'entrepôts selon leur type



La domination des grandes entreprises manufacturières s'explique en grande partie par l'influence américaine. L'industrie nord-américaine de l'automobile

ayant été complètement libéralisée depuis 1993, l'ensemble du territoire nord-américain doit désormais être considéré comme un vaste et unique marché. Pour s'en convaincre, il n'y a qu'à se référer aux exportations (14 milliards), aux importation (32 milliards) et aux livraisons (23 milliards) de l'industrie de l'après-vente en 1996.

Figure 9 : Nombre de manufacturiers pour l'après-vente automobile

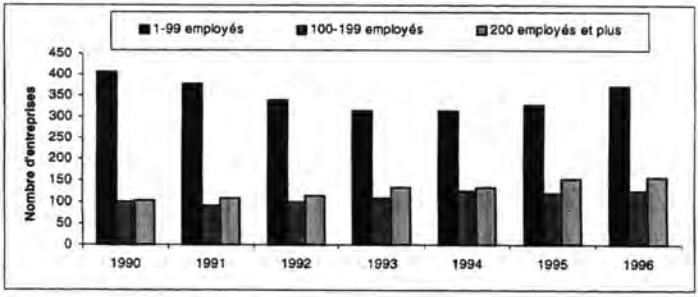
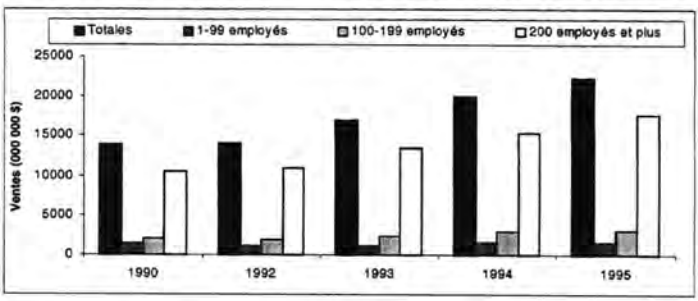


Figure 10 : Livraisons des manufacturiers pour l'après-vente automobile



Suite à cette description de la chaîne de l'après-vente automobile, deux mots viennent spontanément à l'esprit : consolidation et grandes entreprises. Cette tendance à devenir plus gros touche l'ensemble des acteurs de la chaîne, des manufacturiers aux détaillants. Dans ce cas précis, il n'y pas vraiment de domination de la part de l'un ou l'autre des acteurs, et ce, contrairement au secteur des meubles de maison. Entre les manufacturiers, souvent multinationaux, et les distributeurs, à la tête de vastes réseaux : match nul.

Il reste que beaucoup de producteurs canadiens sont en fait des filiales américaines, dont la mission n'est pas tant de desservir l'ensemble du territoire canadien en produits de toutes sortes que de fabriquer quelques produits spécialisés destinés à l'ensemble du marché nord-américain. À l'intérieur de ces méga corporations, au chiffre d'affaire de plusieurs milliards, la logistique interne est très bien intégrée, tant sur le plan de l'information que du mouvement des biens. Les filiales communiquent entre elles par EDI et agencent leur production en recourant au juste-à-temps. En contrepartie, la logistique est beaucoup moins fluide lorsqu'on sort des frontières de ces entreprises, c'est-à-dire lorsque ces dernières font affaire avec leurs clients ou leurs fournisseurs.

Si l'on compare les distributeurs de pièces de rechange à leurs pendants manufacturiers, on dénote certaines similitudes et différences. Sur le plan des similitudes, il y a la tendance à devenir plus gros qui se manifeste de deux façons : une couverture géographique plus large et une intégration plus intensive des intermédiaires situés en aval. Cette intégration ne se fait pas tant en achetant de nouvelles entreprises (des entrepôts ou des détaillants) qu'en développant des ententes d'approvisionnement à long terme avec des groupes de distributeurs ou en proposant à des indépendants d'adhérer à un groupe de franchisés.

Pour ce qui est des différences, on observe que la pratique du JÀT n'a pas le même impact chez les distributeurs que chez les manufacturiers. L'obligation des distributeurs de livrer dans un délai très court (maximum de 24 heures) fait en sorte qu'ils détiennent des inventaires considérables. Dans leur cas, on peut tout au plus parler de livraison en JÀT. L'élément qui a eu ou aura un effet important sur le fonctionnement des distributeurs n'est pas tant le JÀT que les systèmes informatisés de gestion de l'entreposage. La deuxième différence est que le contact humain entre les intermédiaires, notamment entre le magasin et le garagiste, est une considération importante dans le secteur des pièces de rechange. Compte tenu de l'atmosphère d'urgence dans lequel œuvre la plupart des intermédiaires, le téléphone demeure l'outil de communication le plus rassurant. Dans cette perspective, l'EDI semble avoir des applications plus limitées chez les distributeurs que les manufacturiers.

Prolifération ou absence des PME : des raisons

L'étude des deux chaînes logistiques précédentes permet d'identifier une tendance lourde ayant une influence sur le nombre de PME : une propension à se regrouper ou à devenir plus grand. Peu importe le secteur et le niveau de la chaîne auquel une entreprise se situe, on observe une vague de fusions, d'adhésions à des franchises ou à des groupes d'achat ou encore des projets d'agrandissement. Par exemple, les chaînes de meubles de maison ne cessent de gagner en importance; une plus grande proportion des manufacturiers de meubles comptent plus de 100 employés; les garagistes indépendants se

regroupent au sein de bannières établies; les entrepôts indépendants joignent des groupements d'achat; les distributeurs cherchent à agrandir leurs réseaux; d'immenses manufacturiers dans le domaine de l'automobile achètent des manufacturiers presque aussi grands. À l'ère de la libéralisation des marchés, l'adage « l'union fait la force » semble plus vrai que jamais. Un autre élément remarquable réside en l'incidence, sur la taille, du positionnement dans la chaîne logistique. Ainsi, on observe que les entreprises de services, soit les entreprises situées en aval de la chaîne, sont généralement beaucoup plus petites que celles positionnées en amont, notamment les manufacturiers et les producteurs de matières premières. Cette présence marquée des PME en aval s'explique du fait que les entreprises de services nécessitent généralement moins de ressources humaines, financières et mobilières pour opérer. Il faut cependant souligner que même ces PME trouvent le moyen de s'associer à des entités plus grandes, en adhérant à des franchises ou des groupements d'achat. Outre ces deux commentaires généraux, on constate que le secteur de l'après-vente automobile est un environnement moins propice au développement des PME que celui des meubles de maison. En se référant au cadre d'analyse de la concurrence présenté par Porter (1982), il est possible de détailler en quoi l'environnement concurrentiel de l'après-vente automobile favorise l'expansion des grandes entreprises et limite le développement des PME.

Première composante étudiée : la concurrence entre les entreprises de même type. À cet égard, deux éléments semblent avoir eu un effet important sur le développement des grandes entreprises du secteur de l'après-vente automobile : la présence américaine et le coût élevé des équipements de production et de distribution. Le secteur de l'automobile est l'un des premiers secteurs à avoir donné accès aux entreprises américaines. Ces grandes entreprises, disposant généralement de plus de ressources, ont exercé une pression constante sur les entreprises canadiennes. Ces dernières, afin de survivre, ont dû augmenter leur compétitivité et élargir leurs marchés. Elles sont ainsi devenues de grandes entreprises ressemblant, à bien des égards, à leurs contreparties américaines. Les entreprises du secteur des meubles de maison n'ont pas subi, jusqu'à maintenant, une très forte pression de la part des entreprises américaines. Trois raisons peuvent expliquer cet intérêt mitigé des américains. En premier lieu, la libéralisation des marchés est une notion relativement récente dans le secteur des meubles. Deuxièmement, la taille du marché canadien demeure relativement faible. Finalement, les manufacturiers canadiens offrent une opposition respectable compte tenu de la faiblesse du dollar.

Hormis la présence américaine, le coût élevé des installations et de la technologie de production des pièces et accessoires automobiles est également un facteur qui limite les chances de succès d'entreprises aux ressources plus limitées. Puisque les pièces comportent un niveau de complexité technique de

plus en plus grand, cette contrainte devrait gagner en importance. En ce qui a trait aux meubles de maison, la pression technologique semble de moindre envergure. Un manufacturier peut toujours se tirer d'affaire en produisant de façon plus traditionnelle, du moins pour le moment.

Deuxième et troisièmes composantes étudiées : les clients et les fournisseurs. Les distributeurs de pièces et accessoires automobiles sont généralement de très grandes entreprises couvrant l'ensemble du territoire canadien, si ce n'est pas tout le marché nord-américain. Ces grandes entreprises cherchent généralement à s'approvisionner auprès de manufacturiers ayant une grande capacité de production et étant en mesure de livrer à l'ensemble de leurs réseaux. L'inverse est également vrai : les grands manufacturiers accordent une plus grande importance aux clients ayant une grande capacité d'achat, et ce, pour des raisons évidentes. Pour le cas du secteur des meubles de maison, on retrouve parfois ce genre d'exigences de la part des grandes entreprises, mais à un moindre niveau.

En quatrième lieu, il y a aussi l'effet des nouveaux arrivants sur la taille des entreprises. Dans le cas de l'après-vente automobile, la menace des nouveaux joueurs est relativement faible; les barrières à l'entrée, notamment celles relatives à l'achat des installations et à la distribution des produits finis, sont très élevées. Il y a cependant une certaine menace pour les formules de vente s'adressant aux mécaniciens-bricoleurs. Des grandes surfaces américaines n'offrant que des pièces et accessoires automobiles, soit AutoZone et Pep Boys, pourraient être tentées par le marché canadien. La menace de nouveaux joueurs est beaucoup plus forte dans le secteur des meubles de maison, tant au niveau des détaillants que des manufacturiers. Les PME seraient probablement les entreprises qui souffriraient le plus de la venue de grands joueurs internationaux.

Conclusion

Après avoir analysé les éléments qui ont une influence sur la prolifération ou l'absence des PME, portons maintenant notre attention, en guise de conclusion, sur les PME qui ont su prospérer dans le cadre d'un environnement hostile, soit le secteur de l'après-vente automobile. Ces PME se démarquent de deux façons : elles possèdent un ou quelques avantages stratégiques clairs et sont en mesure d'intégrer facilement un réseau d'entreprises. Selon le niveau de la chaîne où on se situe, les avantages stratégiques à développer par les PME diffèrent. Les PME manufacturières peuvent se démarquer de plusieurs façons. Elles peuvent décider d'occuper un créneau délibérément laissé libre par les multinationales; les radiateurs neufs destinés au marché de l'après-vente ou le réusinage de différentes pièces sont des exemples de ce genre de créneaux. Toutefois, cette stratégie bénéfique dans plusieurs cas, peut sembler téméraire compte tenu du récent mouvement de libéralisation des grandes entreprises. Certaines multinationales sont désormais présentes dans des secteurs qui, il y a

quelques années, semblaient peu intéressants. Conséquemment, l'avantage d'une PME devrait davantage faire référence à son expertise de production plutôt qu'à sa gamme de produits ou à son réseau de distribution. Les commerces de détail ou de services, pour leur part, devraient compter surtout sur la qualité de leurs services comme arme stratégique. En contrepartie, détenir un avantage stratégique est une condition suffisante mais non nécessaire pour assurer la prospérité d'une PME. Comme nous l'avons vu, les acteurs se situant à tous les niveaux des chaînes étudiées ont tendance à se regrouper de plusieurs façons : partenariat, acquisition, regroupement au sein d'une même franchise, etc. Dans cette perspective, les PME doivent s'organiser pour être facilement intégrables, dans un ou plusieurs réseaux. Pour ce faire, certaines pratiques semblent particulièrement gagnantes : l'EDI, la production à flux tendus, les systèmes de gestion intégrée, les banques de données relationnelles, etc.

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The Microfoundations of Logistics: An Economist's Perspective

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(1) Introduction

Logistics is an area of much research among transportation analysts, engineers, operations researchers, and marketing analysts. All of these practitioners draw support, knowingly or unknowingly, from a common pool of microeconomic theory in order to form their logistical models. Hence there exist "microfoundations" of logistics. The problem is that these microfoundations have never been, to my knowledge, formalized. This paper is an attempt to establish, by way of specific examples, some foundations upon which logistical analyses rest. It is timely, therefore, to propose a new armor for the logistician: the logistician *qua* economist.

It is vital that the economic theory brought to bear in logistical discussions be soundly articulated and applied. In this sense, the logistician ought to possess a theory of: the firm, the consumer, the marketplace, and perhaps even the government for his models to have meaning. Without such theories, there can only be rules-of-thumb.

This paper will: (1) define logistics, and discuss how it has been practiced; (2) discuss how the concept of microfoundations has influenced

the discourse over many facets of modern economic theory; (3) lay out an economist's approach to logistics; and (4) discuss how to improve the pedagogy of logistical theory.

(2) Logistics: Definition and Practice

What has become a catch-phrase among logisticians is their *ethos*: get the right product to the right place in the right condition at the right time and for the right price. They recognize a series of supply processes--- a supply chain--- that links the firm to its consumers. Of course, getting one's logistics "right" is what competition among firms brings about. But what is competition? It is the strategic behavior among economic agents for the fulfillment of their rival objectives. And, in our modern economy, this behavior is conditioned by the *rules* of the marketplace.[1] The deviation from perfect competition--- as an ideal--- to imperfect competition--- as reality--- is based upon any or all of the following: superior control of a critical factor (i.e., information or a physical resource); operational "economies"[2]; industrial collusion; patent protection; or regulatory protection.

The Council of Logistics Management (CLM) defines "logistics management" as: "the process of planning, implementing and controlling the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption for the purpose of conforming to customer requirements".[3] An economist would simply summarize this managerial goal by saying: a firm should be *efficient* in its supply of commodities in accordance with current demand, and expected future-demand, of consumers in the marketplace.

Consider the CLM definition further. Logistics management requires the firm to achieve efficiency in commodity flow and storage. What--- precisely--- does efficiency mean? The economist breaks the term into two sub-components. *Allocative* efficiency requires the firm to supply commodities to the marketplace that fulfill the quality-demands of the consumer. In this way, demand for a commodity will beget a supply of that self-same commodity so that a "market" is opened up. The idea of supply conforming to demand is known, in economic theory, as consumer sovereignty. *Productive* efficiency, furthermore, requires the firm to use a

combination of factors of production for the commodity such that total costs of production are minimized. Why cost minimization? Because, if the firm faces competition, a rival that can produce the commodity at a lower total cost will be able to sell it for less and price that firm out of the target market.[4] It should be noticed that the CLM definition of logistics management addresses flow and storage but not production of the commodity. Only allocative efficiency is accounted for. Without the consideration of total production costs, there would be no proper method for the firm to decide upon a cost-minimizing supply-price at the marketplace.[5]

The practice of logistics thus requires: an understanding of the different forms of competition that may exist among firms in an industry; as well as an understanding of how a firm is to achieve economic efficiency within that industry. These are two microfoundations of logistics. The next section will elaborate further upon this term.

(3) Microfoundations: A Not-So-Quiet Revolution in Economics

What are microfoundations? Simply put, they are what an economist would call the first-principles underlying any model of economic behavior. All such models would require: an explanation of the utility function of the consumer; the objective function of the firm and, at times, the government; the nature of competition in the marketplace; and a method as to how all economic agents form their expectations about the future. In short, microeconomic theory is taken to be the foundation for all economic models.

Economic theory noticeably separated in the 1940s through the 1970s into two distinct sub-disciplines known as microeconomics and macroeconomics. Microeconomics, from its inception in **Smith [1776]**, focused on the theory of the firm, the consumer and their interaction. Macroeconomics, from its inception in **Keynes [1936]**, focused on national aggregates such as labour employment, price inflation, monetary and fiscal policies, and economic growth. Theories of aggregate consumption, saving, and investment developed in tandem to help explain, as well as stabilize, an economy's production and growth.

Macroeconomics into the 1970s, through a combination of theoretical and political influences, sustained criticisms along the lines that it, as theory, postulated group-behavior that was not consistent with the behavior of each of its individual members in isolation.[6] In other words, for macroeconomics to be consistent with microeconomics, aggregates had to have their roots in representative agents whose optimization behavior was well-understood.[7]

To understand the microfoundational link involved in modelling large group systems, consider the following example. An urban roadway is seen to be used by many delivery vehicles on a daily basis. Barring any random shocks to this system, it is likely that those vehicles will be observed there tomorrow as well. But suppose, instead, that the road is to be closed off tomorrow due to a pre-announced road maintenance operation. How will the vehicles respond to this policy? A reasonable answer would be found through knowing their destinations and the alternative routes available; in other words, knowing their behavioral decision method. While the analyst would have to decide whether or not one single vehicle is a good representative agent, the solution is to be found in the microfoundations of the system.

Indeed, the change in behavior of agents resulting from a change in policy has great implications for any aggregation procedure. Suppose a logistician, concerned about congestion and delivery times, wishes to develop an explanation for road usage in a particular region. Appropriate data would be gathered and the chosen variables would be assembled into a mathematical function designed to explain how these variables affect road usage (which is measured, say, in vehicle-kms per unit of time). Fitting the equation to the data through regression techniques brings about estimated behavioral parameters. What is important to note is that these estimated parameters are peculiar only to the data used to calculate them. These data implicitly carry all of the underlying microeconomic choice-behavior of the agents in the economy as well as the effects of current government policies. In other words, the road usage equation would be neither appropriate for extrapolation nor for predicting the effects on subsequent road usage arising from future policy changes (e.g., an increase in fuel taxes). This microfoundational criticism, applicable to any fixed-equation behavioral model, has come to be known in economic theory as the "Lucas Critique" of econometric models **(Lucas 1976)**.

A reasonable criticism against *strict* microfoundations, as applied to every facet of macroeconomics, occurs in using them to inadvertently commit the fallacy of composition. Basically, what may true for an individual need not be true for a group. For example, an increase in a farmer's harvest will, *ceteris paribus*, lead to an increase in his revenue. This representative agent is better off. However, if the increased harvest occurred over enough farmers, the marketing of this aggregate harvest might depress the crop's market price, possibly leading to a reduction in revenue for all farmers.[8] Such a possibility would have negative implications for a farmer's crop-flow and crop-storage decisions. In a competitive market it is the case that one or a few suppliers would have no effect on the commodity's price. In this regard, a logistician would do well to analyze the source of the increase in a farmer's harvest and determine whether or not there is sufficient information and coordination within the industry to keep this from being an isolated event. Any change within a firm's supply chain cannot lead to a discernible firm-specific supply decision without a prior understanding of the nature of inter-firm competition.[9]

Logistics has a closer affinity with microeconomic theory than with macroeconomic theory and, as such, is not as embroiled as is the latter in the issue of aggregation. Nonetheless, to the extent that some degree of group-behavior and market transactions are occurring in these logistical processes, there is a need to firmly establish the relationship between logistics and microeconomics. That is the purpose of the next section.

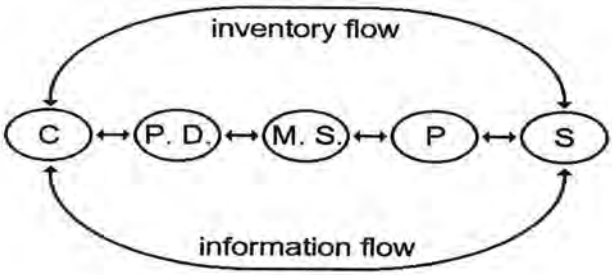
(4) An Economist's Approach to Logistics

There are three areas that will be covered in this section. First, the logistical supply chain may be further illuminated by way of the circular flow mechanism of the economy. Second, the holding of inventories and the goal of cost minimization may be appraised under the incentive mechanism afforded through the type of competition that is assumed to exist within the commodity market. Finally, non-price competition, through marketing, may be discussed and criticized in terms of current logistical models. Each of these points will be discussed in turn.

The Supply Chain and the Circular Flow

A cornerstone of logistical thought is supply chain management. What is the supply chain? It is the set of linkages connecting suppliers with their customers. It is a pipeline of commodity flows (goods, services and information, we recall) over all firms within an industry that serves to facilitate trade opportunities and create value-added for their customers.

Figure 1: The Supply Chain



where: C=customers; P.D.=physical distribution; M.S.=manufacturing support; P=procurement; S=suppliers.

Source: Bowersox and Closs (1996; p. 101).

Information in the form purchase orders flow from customers to suppliers. This information is incorporated into the suppliers' plans for procurement of factors and subsequent production. The availability of finished goods, held in inventory, to meet unexpected demands and prevent stock-outs creates value-added in the form of "customer service".[10]

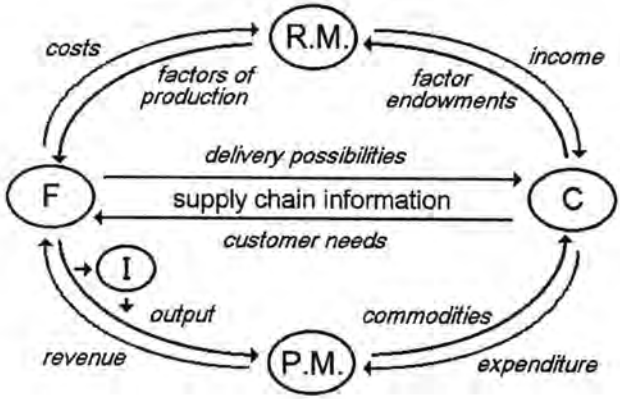
Coordination of price and inventory is essential to supply chain management. For example, a retail firm's claim of "everyday low prices"

reduces the need for sales promotion and may prevent short-term demand increases, both of which serve to stabilize the supply chain. The supply chain represents an attempt to create "virtual integration" instead of vertical integration. Synergy would be afforded without the need for mergers and acquisitions. Unlike vertically integrated firms, there would be no need for extra management layers, extra reporting, and no feeling of being locked-in. Of course, the supply chain must not be seen as a panacea. Vertical integration is a reasonable course when outside suppliers are small in number and tend to be opportunistic in their behavior. There may also be efficiency gains in terms of avoiding double mark-ups whereby, for example, the retailer's price and production decisions are based on the input supplier's marked-up price rather than the marginal cost of the input.

Of course, information sharing and joint planning between a manufacturer and his wholesalers or retailers will enhance the effectiveness of the supply chain. Following **Bowersox and Closs (1996; pp. 101-2)**, cooperation reduces risk and eliminates waste and duplication. Retailers maintain a relatively close contact with customers, to the benefit of the manufacturer whose product they stock; but, at the same time, retailers may hedge their risk by stocking the products of many manufacturers. These intermediary relationships are all part of the production and delivery process. Of course, the economist would note that suppliers are also, in fact, customers. A person may supply his own labour or capital to the very firm from which he purchases commodities. As well, a firm may supply commodities but it is also a customer regarding factors of production. This is where the circular flow mechanism comes into play.

The circular flow has the advantage of integrating the flow of factors of production, commodities, and money through their interaction in markets. In a sense, this flow represents a simple economy which is the microfoundation for all supply chains. Why? Because the supply chain leaves important factors implicit such as the role of prices (through monetary flows) and the role of competition that takes place in the markets for factors and commodities.

Figure 2: The Circular Flow Mechanism



where: F=firms; R.M.=resource market; C=consumers; P.M.=product market; I=inventory.

Firms and consumers are brought together through their interactions in the factor and commodity markets. Consider the counter-clockwise flow. Consumers, as factor owners, supply their factors to the firms that demand them. The firms, in turn, use these factors to produce commodities which are supplied to consumers to fulfill their demands. The clockwise flow shows money as a lubricant to the commodity flow.[11] The consumers receive payments for supplying their factors and use this income to purchase commodities from the firms that, in turn, use their revenue to pay for the use of the factors they have hired.

Note that the supply chain may be integrated into the circular flow. A direct connection may be made between firms and consumers indicating a

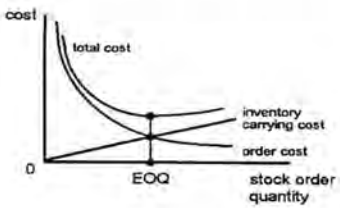
supply chain which feeds information back-and-forth relating to customer needs, inventory availability and delivery possibilities. This information aids in the circular factor and commodity flow. An integration of this sort implies a co-dependency in that: (1) the circular flow indicates the path of economic activity while the supply chain coordinates the time-and-space nature of that activity; and (2) the supply chain feeds information concerning logistical activities and by-passes the very markets that set the (exogenous) prices of those activities occurring within the supply chain.[12] Money facilitates physical trade while logistics establishes paths-of-trade and facilitates trade opportunities.

Inventories and the Commodity Market

The holding of inventories is part of the logistical process in the sense that customer demands are never certain and are seldom uniform. Of course, holding inventories to meet demand contingencies will incur a cost. Yet, inventory accumulation allows for uniform production runs in the face of non-uniform demand; that is, inventory build-ups occurs during off-peak demand followed by inventory draw-downs during peak demand.

Consider the economic approach to inventories within the performance facet of customer service **(q.v., *supra*-note 10)**. Two simplifying assumptions are made: (1) the quantity of the commodity demanded is fixed over a given time period; and (2) stock is replenished the moment it runs out based on a uniform (i.e., linear) draw-down. As the stock is enhanced, inventory carrying cost rises in a linear fashion while ordering cost declines at a decreasing rate. Why? A larger stock order quantity means less frequent ordering over the time period to satisfy a given quantity demanded of the commodity. But a larger inventory means higher carrying costs in the form of: warehousing, handling, insurance, spoilage, and potential obsolescence. On the other hand, there are fixed costs of ordering that are independent of the stock order quantity; for example, delivery charges and book-keeping. A larger stock order quantity allows those fixed costs to taper off on average. Thus, a cost trade-off exists. The vertical summation of these two cost curves gives the total cost of the stock order quantity. The familiar "economic order quantity" (EOQ) is the minimum point on this total cost curve.[13]

Figure 3: Economic Order Quantity

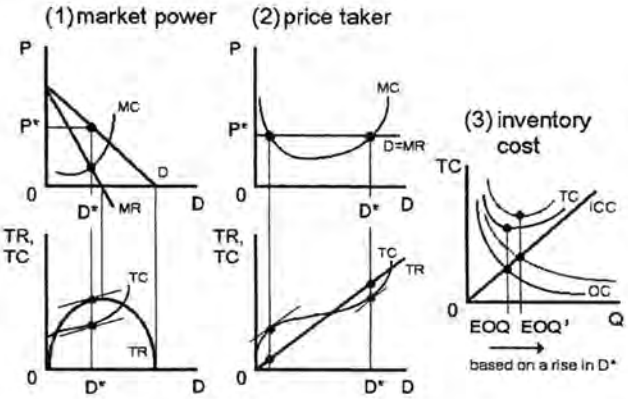


The total cost of the stock order quantity may also be a total cost of customer service if the latter is narrowly considered in terms of production for safety stock. However, a broader model of customer service will be provided in the next section. The question now becomes: what stock order quantity (Q) is optimal for the firm; that is, with a fixed quantity demanded over a given time period, by what frequency over this period should stock be built-up and drawn-down? One may be inclined to indicate the EOQ but this would be correct only if the assumed goal of the firm were to simply minimize inventory-related cost (which is, in fact, suggested in **Bowersox and Closs (1996); p. 259**). A further step taken by **Voorhees and Sharp (1978; p. 73)** is to calculate the incremental change in total cost and the incremental change in the firm's revenue as the safety stock is enhanced. The optimal order size occurs at the point where the marginal inventory cost equals the marginal contingency revenue to be earned through the carriage of that inventory.[14]

The equating of marginal cost and marginal revenue is quite correct for a firm that wishes to maximize its profits.[15] However, the analysis above may be improved by specifying an *endogenous* total sales revenue (TR) function to enhance the total inventory cost model. This is where microfoundations come into play because TR=PxD, and it is the firm's degree of control over the commodity's price (P) rather than the stock order

quantity (Q) that is now critical. The structure of the commodity market must now be considered.[16]

Figure 4: Total Inventory Cost and Total Sales Revenue



where: ICC=inventory carrying cost; OC=order cost.

In order to properly apply the total sales revenue function--- derived from sales in the commodity market--- to, what is in effect, stock order quantities derived from the *intra*-firm inventory market, some specifications must be made. The stock order quantity is a function of the quantity demanded of the commodity (D); that is, Q=Q(D) with Q'(D)>0.[17] If the firm is a price taker it will have no market power. The total revenue curve would be a ray from the origin with a slope of P as seen in panel (2). If the firm does have market power, total revenue follows a parabolic pattern as seen in panel (1).

With the commodity market included, the firm can now set its EOQ based upon the profit-maximizing quantity demanded (D*). As panel (3) shows, an increase in D* will serve to increase EOQ. If the firm is a price

taker, D is effected by a change in: its own production costs; and the market price of the commodity. If the firm has market power, D is affected by a change in: its own production costs; and the attributes of its consumers' preferences.

Non-price Competition

Firms that have market power may influence the market price of a good based upon their supply decisions. However, market power may also exist in the form non-price competition among firms. Economists label such a process to be product differentiation by way of marketing.[18] Consider the effect of marketing on logistical activity. Advertising campaigns raise distribution costs while the proliferation of brands certainly does not streamline the production process. The incentive for the firm to accept these extra costs comes from the possibility of increasing short run economic profit beyond that possible with an homogenous commodity.[19]

In the long run, economies of scope may occur such that the average costs of operation decline as the number of brands increase. For this to occur, the production process has to be sufficiently flexible so as to allow the introduction of different commodities while, at the same time, overcoming any extra promotional costs required.[20] Of course, government policy may also provide an incentive for product differentiation by way of firms developing rival products in order to avoid patent infringement.

The standardization of products would seem to be a natural process of logistical management. Of course, the degree of standardization would be tempered by the ability of the firm to succeed in capturing further market power. The role of advertising is an important one in this regard. There are two alternative ways of looking at advertising: (1) as a source of consumer persuasion on the part of firms; or (2) as a source of consumer information. Consider these two views. View (1) purports that advertising propagates a series of claims used to condition consumer preferences; that is, to induce a transaction that would not have otherwise occurred. View (2) purports that directly-provided commodity information helps to reduce consumer search costs and, as such, shortens the lead time for essentially pre-ordained transactions.

Both views do not infringe on the concept of consumer sovereignty *per se*--- consumer preferences *ex post* will drive supply even though they may face *ex ante* conditioning. These two views, however, do have different implications for efficiency. View (2) implies efficiency gains since transaction costs are reduced. View (1) may imply market inefficiency to the extent that advertising acts as a barrier to entry on the part of other firms. How so? Advertising campaigns become a cost of competition over and above production. Furthermore, consumers may face "switching costs" in terms of not easily altering their brand-loyalty-induced habits. As well, they may opt for *status quo* consumption in the face of the confusion of claims and counter-claims to which they are subject in an advertising war.

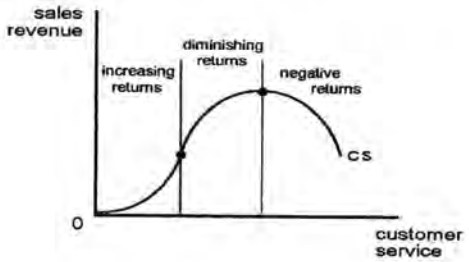
The importance of advertising for the logistician is in its net effect on sales. Advertising will definitely raise costs; but the effect on consumer demand is dependent upon which of the two views above is applicable.[21] Unless this is known, the effect of advertising on revenues and profits remains ambiguous. From the firm's point of view, advertising should perform three functions: (1) increase demand by attracting new consumers; (2) make the new demand more price-inelastic by creating the perception of fewer substitutes; and (3) make the good appear "new" by changing its aesthetic properties over and above its physical properties **(Miller 1994; pp. 568-9)**.

(5) The Pedagogy of Logistics: Some Room for Improvement

The previous sections have established the need for logistical processes to be seen in terms of market structures and with reference to the nature of consumer demand and competition. Getting the microeconomics right serves to provide for a sounder discourse when presenting logistical models that are dependent upon economic theory. This section offers some clarifications for logistical model-building using an example.

Consider the following model as presented in **Ballou (1999; pp. 92-7)**. With an increase in customer service (now broadly-defined; **q.v., *supra*-note 10**), sales revenue is taken to increase as shown below:

Figure 5: Sales Revenue and Customer Service: A *Caveat Emptor*



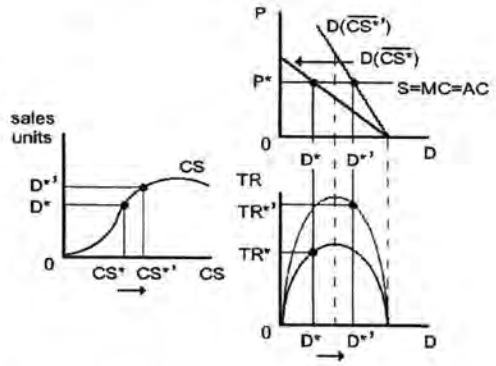
Source: Ballou (1999; p. 93).

There are technical difficulties with this construct but they may be rectified using basic economic theory. Ballou wishes to use such a curve, as compared with a logistics cost curve, to determine the profit maximizing level of customer service. The problem is that the curve in figure 5 would best be characterized as a customer service *productivity* curve. In other words, the vertical axis should be "sales units" and not sales revenue (which is measured in dollars). The curve exhibits regions of increasing, diminishing and negative returns which are typical for any factor of production in the short run. Each marginal unit of customer service will translate, *via* given marketing technology, into a level of marginal sales units.[22] If the curve in figure 5 may now be taken to be a total productivity function, then its mathematical dual is total cost which is precisely the logistical cost curve in Ballou's analysis! For the model to be meaningful, total revenue curves in the form of those suggested in figure 4 would be better suited to the analysis. But, as such, these curves would not occupy the cost and customer service graphical space.

Consider how customer service productivity relates to the commodity market. Sales revenue, recall, is price per unit multiplied by the sales

quantity. Since a firm's customer service (CS) is a form of non-price competition, any change in it would be expected to shift consumer demand for the firm's commodity. If CS works like view-(1) advertising, then the effect on the commodity's price is dependent upon the price-elasticity of the commodity supply. Figure 6 shows the situation when supply is completely price-elastic.[23] Rather than determining sales revenue directly, the customer service productivity function explains the degree of pivot in the demand curve when the level of customer service changes.

Figure 6: Customer Service and Commodity Demand



This analysis, again, highlights the dependence between logistical activities and the workings of the commodity markets for which they serve. While the analysis is more complicated, it does add more validity to the decision making process.

(6) Conclusions

With logistics being a subject of use in so many areas of business, it is little wonder that its theoretical edges are a bit blurry. Economic theory will

serve to sharpen these edges once logistics is accounted for in terms of the rules of the marketplace, and the incentives under which economic agents operate. This, in its simplest sense, is the power afforded through the understanding of microfoundations.

Microeconomics should serve as a framework to guide the logistician through the specific aspects of the supply chain he wishes to model. Indeed, the integration of the supply chain and the circular flow mechanism highlights the co-dependence between the supply chain and the commodity and resource markets. These markets set the prices of the commodity and the factors of production and, as such, a firm should wish to integrate those markets into its supply chain decisions. The models presented in this paper were an attempt to develop this integration.

Logistics is applied-microeconomics with the added dimensions of time, space and location. Indeed, logistical analysis serves to add flesh to the skeleton of economic theory. But this flesh must be added logically and supported by the rules of economic model building, if the skeleton is to provide proper form and solidification.

Endnotes

[1] These rules are established and enforced by the government in order to ensure a smoothly functioning marketplace. Establishment of property rights and enforcement of contracts are necessary precursors to market trade. Taxes and subsidies may also be used to prevent market failures. But, at the same time, the government's chosen set of regulations on business can take the form of a barrier to firm entry thus influencing the nature of competition.

[2] Operational economies mean that as a firm becomes larger its average cost of operations declines. In this way, size becomes a barrier to entry to other firms. While economies of *scale* is a well known term, other sources of importance to the logistician are economies of: vehicle size, distance and cargo weight, infrastructure, fleet size, and network density. A complete analysis of these terms is provided in **Prentice and Prokop (1998).**

[3] This definition comes from: ***What's It All About?*** **(1993)**. Oak Brook, IL: Council of Logistics Management. The term "commodities" will be used throughout this paper to encapsulate the firm's collective output of goods, services, and information.

[4] If one considers transportation services to be one of the firm's factors of production, then cost minimization would also account for the location of the firm, and its topographical spacing, relative to the marketplace.

[5] The one-to-one correspondence for the cost-minimizing supply-prices and the quantities of the commodity brought to market indicates the firm's supply function. Its existence is based upon competition forcing the firm to achieve productive efficiency. When this function is combined with a consumer demand function, an equilibrating process akin to an auction mechanism takes place bringing about allocative efficiency and market clearance. Of course, this equilibration process occurs properly only in markets that disseminate bid-ask information quickly and symmetrically. The markets for common stocks, bonds, currencies, and commodity futures provide the best examples. A solution to this logistical problem in typical retail markets may lie in the form of an "electronic market" **(Prentice and Mulligan, 1996)**.

[6] There is a large literature covering the "microfoundations" of macroeconomics. Some classic examples are: **Phelps *et al.* (1970), Lucas (1976), Barro and Grossman (1976),** and **Weintraub (1979)**. In particular, Lucas emphasizes that if one wishes to know how the economy will likely be affected by predictable events or policy changes, it is necessary to model the way that choices are made. The main controversies in macroeconomics centered around the ability of markets to clear in the short run, and the applicability of the rational expectations hypothesis to group behavior.

[7] It would not be fair to characterize *all* macroeconomic models from the 1970s onward as being so strongly imbued with representative agents. Indeed, the extreme is to use a single representative agent as the basis of a model. The more moderate macro-theorists in this vein discard such agents and use microfoundations merely as a guide to achieving consistency with choice-theoretic principles. Allowance is made for

different types of agents whose aggregation leads to a behavioral equation that need not apply to the individual agent. Critiques of the extreme view are found in: **Tobin (1980)** and **Leijonhufvud (1992)**. An excellent overview of an agent's behavioral change within smaller-group systems is found in **Schelling (1978)**.

[8] An effect of the increased aggregate harvest will be to lower the crop price; however, the effect on total revenue in the industry will be based on the price-elasticity of consumer demand for the crop.

[9] Short run macroeconomic theory, in particular, is very sensitive to this issue. It is reasonable to attribute more short run price-stickiness to manufactured products than to primary products. "The classical [economic theory's] teaching, according to which prices quickly react to excess supplies or demands, is more and more inadequate for short run macroeconomic analysis as we move to ever-higher degrees of organization of society" **(Malinvaud, 1977; p. 9)**. It was under this reasoning that the microfoundations of non-market-clearance was developed.

[10] Technically, logisticians view the enhancement of safety stock as fulfilling the "performance" facet of customer service. Two other facets are: customer service as an "activity"; and customer service as a "philosophy" **(La Londe and Zinszer, 1976)**. The activity facet relates to managerial processes such as order processing and complaint handling. The philosophy facet relates to customer-focus in such qualitative terms as friendliness, satisfaction, and support. The performance facet is the easiest customer service to quantify and is thus used in formal logistical models (see, for example: **Lambert *et al.* (1998), pp. 139-43**; **Bowersox and Closs (1996), pp. 267-71**; and **Voorhees and Sharp (1978), pp. 71-5**).

[11] Money serves three functions: a medium of exchange, a unit of account, and a store of value. The first two highlight money as a lubricant to the flow of commodities. As a medium of exchange, money eliminates the coincidence-of-wants necessary in a barter economy; it is an acceptable intermediary of payment. As a unit of account, all prices are in common units and all factors and commodities are conveniently valued in terms of this unit of currency.

[12] It should be borne in mind that logistical activity is a service imputed in the production and distribution of a firm's commodities. Thus, the information paths forming the supply chain in figure 2 represent the production of a service used, in part, to promote production and distribution of physical goods, as well as other services, in the circular flow. Economic theory has a well-developed literature concerning the production function---the transformation of inputs into outputs; however, it is better suited to the production of *physical* goods and not services. As the service sector continues to grow in importance, the onus is on the economist to develop sounder theories regarding a production function for services. What makes the matter complicated is that the production and provision of a service, for a client or patient as the case may be, is co-dependent with demand. Admittedly, this is a microfoundation of logistics that has yet to be developed.

[13] Specifically, $EOQ=(2DK/H)^{1/2}$ where: D=quantity demanded (assumed fixed) over a given time period; K=the fixed storage cost from placing an order (independent of the quantity in each order); H=inventory carrying cost per unit in stock per time period. Of course, EOQ is simply the first derivative of total cost (TC) with respect to stock order quantity (Q), set equal to zero.

$$TC=(DK)/Q + DV + (HQ)/2 \qquad (1)$$

where: V=variable storage cost per unit ordered. TC would be derived in the following manner. The total cost for placing an order is (K+VQ). Each stock order is depleted at time T=(Q/D) and, with the *average* inventory carried over the time period being (Q/2), total carrying costs become (THQ/2). Total inventory cost per time period held is: (1/T)[(K+VQ) + (THQ/2)] which, when T=(Q/D) is substituted in, gives equation (1).

The first term in equation (1) indicates a non-linear order cost curve with slope of $-(DK/Q^2)$; and the third term indicates a linear inventory carrying cost curve with a slope of (H/2). In fact, the order cost curve is a rectangular hyperbola and, as such, the inventory carrying cost ray would intersect it perpendicularly to the former's tangent line. The implication is that EOQ will always be at the stock order quantity where the lower two curves intersect. Of course, if inventory carrying cost were non-linear, the implication would only be true if the marginal cost of inventory carriage

equaled the marginal cost of ordering at the intersection. The simple symmetrical, saw-tooth function for inventory depletion over time is what brings about the linear inventory carrying cost because average inventory size is always (Q/2). Of course, a more complicated pattern of inventory depletion is always possible.

[14] Technically, Voorhees and Sharp do not use revenue in their calculations. Instead, they impose an exogenous profit margin of 2% which, in effect, implicitly creates a revenue function that is a monotonic transformation of the total cost function by the factor 1.02. While the goal of profit maximization may be accounted for, the microfoundations can be improved as will be seen below.

[15] The complete rule for profit maximization is: marginal revenue must equal marginal cost where the latter is rising with respect to quantity. If marginal cost were falling, losses would be maximized, as is shown in panel (2) of figure 4.

[16] This is in contrast to a popular extension of the inventory model using uncertainty with respect to the quantity demanded. While quantity demanded may be made uncertain, its probability distribution would still be exogenous. For applications, see: **Fetter and Dalleck (1961)**; **Zinn *et al.* (1992)**; and **Peterson and Silver (1985)**. In fact, the safety stock calculations used in the Voorhees and Sharp model were based upon quantity demanded probabilities being normally distributed. The model developed in this section has quantity demanded determined endogenously through the microeconomic structure of the commodity market.

[17] Proof for $Q'(D)>0$ is easily obtained by differentiating the EOQ--- the minimum cost Q--- with respect to the quantity demanded. Thus, $(dEOQ/dD)=(1/2)(2DK/H)^{-1/2}(2K/H) >0$. Total cost **(q.v., *supra*-note 13)** may be rewritten as: $TC=[DK/Q(D) + DV + [HQ(D)/2]$. Therefore, a rise in D brings about a rise in Q which further decreases the magnitude of the (negatively) sloped order cost curve. The slope of the inventory carrying cost curve would be unaffected. This substantiates panel (3) in figure 4.

[18] Marketing will be taken to mean the process of advertising and/or brand proliferation within a firm. Logisticians, however, expand the concept

to mean *all* activities specifically designed to meet consumer wants such as production and distribution.

[19] A full discussion of the nature of these short run profits is beyond the scope of this paper. Suffice it to say that what is being expounded here is the theory of monopolistic competition whereby a firm, through brand-loyalty, achieves short run market power. For an introduction to this theory, see **Chamberlin (1933)** and **Hart (1985)**.

[20] Economies of scope may be afforded in transportation as well as in product brands. Inter-city buses picking-up passengers within their origin and destination cities compete, in effect, with urban bus service. Likewise, a firm's private truck fleet may be used as a for-hire service in order to fill empty backhauls occurring as part of its deliveries.

[21] An overview of the evidence related to the two views is provided in **Schmalensee (1986)**. It should be noted that there is an even more extreme view than that expressed in view (1). If advertising promotes commodity production only for the sake of consumer status, such commodity ownership would be a source of negative externalities if utility functions are assumed to be interdependent. This point of view is discussed in **Galbraith (1969; pp. 158-64)**.

[22] For instance, consider customer service productivity in the form of an advertising campaign used to differentiate the firm's commodity from its rivals. Customer service may be measured in terms of the number of customers being "serviced". Increasing returns show that unit sales are rising faster for each extra customer reached. The "word of mouth" effect is occurring and/or sales are on the cusp of becoming a fad. With diminishing returns, marginal sales are tapering off though the campaign is still causing an increase in total sales. Familiarity with the commodity's attributes has now occurred. Finally, with negative returns, the campaign has saturated the market. The sending out of faxes and e-mails are annoying customers such that unit sales drop.

[23] Producing a curve relating customer service to total sales revenue, as Ballou intends, would require knowledge of the complete commodity price effect shown in figure 6. In fact, the shape of this proposed

total sales revenue curve would likely not retain the shape of the productivity curve since only the sales units on the vertical axis would be multiplied by a price that, at any rate, may or may not be in a state of flux.

Note that, for simplicity in figure 6, a supply curve (equal to marginal and average costs) is used along with a demand curve which pivots but does not shift. The firm is using marginal-cost pricing, perhaps because the market is fully contestable. While the analysis is not greatly affected, it does eliminate the need to specify marginal revenue curves.

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Logistics Practices and Requirements of Manufacturers: A Worldwide Assessment

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The globalization of the economy comes with new opportunities for Canadian manufacturers, carriers and third-party providers. Managerial practices, potential customers' requirements, and competitive environments vary in different parts of the world. A good understanding of these aspects remains a *sine qua non* condition to be successful. This paper's primary goal is to give an overview of international manufacturers' logistics practices and requirements. A database of 703 manufacturers spread in 23 countries around the world was analyzed to obtain the following results: (1) there is a higher rate of just-in-time (JIT) practices in East Asia; (2) respondents consider their logistics capabilities as win-order generators; (3) respondents value logistically based criteria in their supplier selection; (4) there is a high interest in logistics performance indicators; (5) respondents exhibit a low-level of integration of their operations within the rest of their supply chain.

Logistics management has gained in popularity in the past decade and will certainly remain a topic of interest as we begin the new century. Following this trend, academic interest in logistics and supply chain management issues has increased throughout the 90's. Logistics is now recognized as a source of competitive advantage (Stock et al. 1998, Fawcett et al. 1997).

This article's objective is to provide a general view of manufacturers' logistics requirements and practices around the world. National culture (Hofstede 1983, 1993), political environment, business relationships and inter-organizational networks (Ghoshal & Bartlett 1990) are elements that make managerial practices

different around the world (Lubatkin et al. 1997). Assessing these differences at a logistics level allows every Canadian firm to understand more rapidly what the market conditions are for successful business. This is true for manufacturers as well as for logistics providers.

Context

Christopher (1998) argues that the recent interest in logistics management has resulted from four challenges faced by firms in competitive markets. These challenges are: (1) the globalization of the economy; (2) the explosion of customer service requirements; (3) new time compression imperatives; and (4) the need for organizational integration. Let's briefly define these four dimensions.

Globalization of the economy—Logistics requirements expansion and competition from other economic blocs are direct results of economic globalization. Globalization has added complexity into supply chain management. New sourcing and selling opportunities from abroad are forcing local firms to increase the scope of their supply and distribution networks to the international level. It is becoming compulsory for firms to increase their knowledge about foreign managerial practices enabling them to fully benefit from these opportunities. To efficiently take advantage of the globalization, state-of-art and effective logistics systems are growing in importance (Stock et al. 1998, Fawcett et al. 1997).

Customers' service requirements—Supply chain requirements in the 90's are customer driven. Whether these customers are the end-users or industrial buyers, the conditions imposed by downstream entities are more service oriented. Customers demand more than a product's intrinsic value as it becomes more and more commodity-based (Sharma et al. 1995; Stank et al. 1998). Products are now required to be at the right place, at the right time, in the required quantity, and to meet customers' expectations. In order to keep their customers or to increase their market share, firms need to elevate their service standard, which is commanding improvement of their logistics capabilities.

Time compression—Time compression is directly associated with the management of logistics lead-time. The concept of logistics lead-time could be defined as the time needed to transform an order into revenues. Therefore time compression does refer to JIT practices, make-to-order production and inventory management.

Organizational integration—Firms should realize the benefits of being internally integrated. Here, we propose more than internal integration. In today's world, the combination of skills and knowledge between firms is becoming the

winning condition to compete internationally. The challenge goes beyond internal alignment and activities integration. Hence, the organizational integration in this paper will refer to inter-organizational integration that is associated with the supply chain management concept. A way to obtain inter-organizational integration is by creating logistical alliances. They are recognized as a way to increase logistics efficiency and as a risk-sharing managerial technique (Gentry 1993, 1996; Cooper et al. 1993).

These four challenges constitute the axes of this paper. Data used in this article are from the International Manufacturing Strategy Survey conducted in spring 1998. Seven hundred and three manufacturers from 23 countries responded. Data gathered are used to provide an overview of logistics requirements and supply chain practices around the world. Questionnaires were sent to firms belonging to the *"fabricated metal products, machinery and equipment manufacturers"* industry (ISIC code 38)[1].

For the purpose of this paper, the data were clustered into four distinct economic blocs: (1) North America (represented by countries involved in NAFTA excluding the new-comer Chile); (2) Latin America (excluding Mexico); (3) Europe; and (4) East Asia (including Oceanian countries).

Globalization of the Economy

This section undertakes the first challenging trend—the globalization of the economy. The sourcing and selling activities are geographically numerated in Table 1. Note that the European economic integration has an important effect on sourcing practices within the economic area. "From the country" coupled with "from the economic area" sourcing count for 90 percent of manufacturers' supplies in Europe. Other economic blocs' averages are around 85 percent for the similar type of sourcing.

Another difference is the higher "from/to the country" sourcing and selling patterns in East Asia. We can challenge this result by separating LDC countries from the rest of the economic bloc. By doing so, we realize that differences encountered between East Asia and the other blocs are fuelled by the Japanese manufacturers. Nearly 84 percent of Japanese manufacturers' supplies are from Japan. This high internal sourcing could be explained by the heritage of the Keiretzu culture. Oceanian countries have a relatively low "from the country" sourcing with 54 percent only. This last result is explainable by the fact that the sample contains a significant number of cases from New Zealand, an isolated country with few resources.

Table 1 Geographical Breakdown of Sourcing and Selling Activities (in %)

	North America	Europe	East Asia	Latin America
Number of cases	111	306	210	76
Sourcing from				
The country	60.7	58.9	66.0	77.6
The Economic Area	24.9	31.1	18.4	7.6
Outside Economic Area	14.3	10.1	15.6	14.8
Selling to				
The country	59.1	44.6	66.6	86.2
The Economic Area	28.2	36.0	18.1	6.4
Outside Economic Area	12.6	19.3	15.2	7.4

What we also realize is that nearly 40 percent of the sourcing and selling in North America are external to the country. In Canada, these ratios are greater since the United States' pattern of sourcing and selling is heavily concentrated within its boundaries and pulled down bloc's averages. For Canada, 55 percent of the sourcing are coming from outside the country and the international selling constitutes 68 percent of the total sales. But "outside the economic area" sourcing and selling proportions in Canada are similar to the overall economic bloc's results. The differences encountered between Canada and the United States are mainly due to the relative size of their economy.

Customers Service Requirements

Greater emphasis on services-based attributes in industrial and commercial transactions (Sherma et al. 1995) justifies a closer look at manufacturers' reaction to new customer service imperatives. A way to assess this reaction is to evaluate manufacturers' managerial decisions regarding their supply chain. We first look at the downstream relations by examining the respondents' perception of their win-order capabilities. In a similar way, upstream relations are analyzed by checking the criteria used by the manufacturers in their supplier choice. In both cases, downstream and upstream relations, the goal is to benchmark services-related items against other items. Finally, an investigation of manufacturers' performance appraisal practices and the importance that they devoted to different performance indicators is presented.

[1] Details are available in Appendix A.

Table 2 Importance of Operational Dimensions as Win Order Generator

	North America	Europe	East Asia	Latin America
Services-Related Items				
Faster delivery	4.11	3.97	4.29	4.04
Customer service	4.28	3.91	4.30	3.87
Dependable delivery	4.26	4.13	4.10	4.03
Order size flexibility	3.25	3.29	3.46	3.53
Average	***3.98***	***3.83***	***4.04***	***3.86***
Products-Related Items				
Product design and quality	4.40	4.22	4.38	4.15
Manufacturing quality	4.52	4.19	4.48	4.25
Wider product range	3.22	3.38	3.57	3.31
Number of new products	3.22	3.24	3.48	3.22
Average	***3.84***	***3.76***	***3.97***	***3.73***
Lower selling price	***3.74***	***3.62***	***3.86***	***4.08***

1 = not important, 5 = very important

Table 2 shows the importance given by manufacturers to different operational dimensions as their ability to develop win-order capabilities. It appears that every dimension, for each economic bloc, has a certain level of importance in absolute terms (scores higher than three). Nevertheless, service-related items pulled together are slightly more important than product related items for each economic bloc. It is noteworthy that price ranked higher than the average of services and product related items only in Latin America.

When taken individually, the two highest items are "product design and quality" and "manufacturing quality". The results from Table 2 do not allow a clear conclusion on which particular operational dimensions constitute a win-order. One difficulty with the data presented in this table is that it provides a snapshot of manufacturers' perception of operational dimensions as win order generator. A longitudinal perspective could lead to more insightful analyses.

Tables 3 and 4 are used to exhibit the changing attitude of manufacturers for the same operational dimensions exposed in Table 2. The survey asked the manufacturers how their attitude toward each potentially win-order item has changed in the past three years. Table 3 shows the overall results for this

question while Table 4 presents the proportion of respondents that experienced a high priority change.

Service related items have a bigger proportion of "higher priority" attitude change on average. The biggest proportion of "higher priority" change has been recorded for the items "faster delivery" and "dependable delivery". The two product-related items that had high scores in Table 2 also have attracted more attention from the manufacturers during the past three years. These two previous results force a mixed conclusion. It suggests that not only service-related items attracted more attention over the past three years but other components of win-order capabilities did grow in importance as well.

Table 3 **Operational Dimensions as Win Order Generator—An Overall Assessment of the Past Three Years Priority Changes (% of respondent)**

	No change	Lower priority	Higher priority
Services Related Items			
Faster delivery	32.0	5.5	62.4
Customer service	37.4	5.1	57.5
Dependable delivery	36.0	5.8	58.3
Order size flexibility	49.4	9.9	40.6
Average	***38.7***	***6.6***	***54.7***
Product Related Items			
Product design and quality	36.6	6.9	56.5
Manufacturing quality	35.7	6.8	57.5
Wider product range	51.3	15.1	33.3
Number of new products	49.4	12.5	38.0
Average	***43.3***	***10.3***	***46.3***
Lower selling price	***37.0***	***9.1***	***53.9***

The outlook of these priority changes is different when data are presented for each economic bloc. For example, the item, "product design and quality", has the biggest proportion of high priority change in North America. East Asian manufacturers exhibit higher priority changes than any other bloc except for "dependable delivery" for which they are closely following the leading bloc. Specifically, East Asian manufacturers put more emphasis on customer service, manufacturing quality and faster delivery.

Table 4 **Higher Priority Changes for Each Operational Dimension—Answer Rate per Bloc (%)**

	North America	Europe	East Asia	Latin America
Service Related Items				
Faster delivery	55.8	63.8	66.0	56.5
Customer service	54.9	48.9	71.2	57.6
Dependable delivery	55.8	60.6	59.2	49.2
Order size flexibility	38.0	40.6	43.5	36.5
Average	***51.1***	***53.5***	***60.0***	***50.0***
Products Related Items				
Product design and quality	56.2	51.4	62.1	61.9
Manufacturing quality	53.8	52.7	66.7	56.9
Wider product range	29.4	33.0	38.3	27.0
Number of new products	35.0	37.7	40.9	37.1
Average	***43.6***	***43.7***	***52.0***	***45.7***
Lower selling price	***42.9***	***55.2***	***58.8***	***51.5***

Another way of assessing customer-service oriented behavior is to observe criteria used by manufacturers in their selection of suppliers. Taking this perspective, the respondents are in fact industrial buyers—thus customers. Table 5 shows the level of importance attached by the manufacturers to different selection criteria.

Selection criteria importance levels show that "delivery reliability" is the most important figure considered by the manufacturers in the choice of their suppliers. "Delivery speed" is also an important component of supplier selection for every economic bloc. It is noteworthy that price remains highly important (second overall) with scores higher than 3.8 out of 5 for each economic bloc.

Table 5 also reveals that the manufacturers do not value transportation costs and related items, scoring these criteria under 3.00 in most cases. The conclusion is that delivery-related items are highly valued in each bloc, showing the importance devoted to logistics capabilities of suppliers. Logistics providers can help potential suppliers to design and/or operate a system that would guide firms toward efficient logistics processes and more successful industrial bids.

Table 5 Supplier Selection Criteria Importance

	North America	Europe	East Asia	Latin America
Lowest price bid	3.84	3.83	3.92	3.89
Delivery reliability	4.38	4.41	4.33	4.41
Delivery speed	3.79	3.78	3.77	4.10
Delivery flexibility	3.68	3.91	3.61	3.89
Partial delivery/Blanket orders	3.03	3.08	3.19	3.26
Transportation/storage costs	3.07	2.79	3.27	3.10
Equipment and container comp.	2.52	2.25	2.68	2.68
Physical proximity	2.90	2.62	3.07	2.79
Long-term innovation	3.25	3.22	3.34	3.13
Participation in the process/product design	3.53	3.36	3.32	3.20
Offer technology needed	3.70	3.55	3.46	3.51
Disclosure of financial and other information	3.14	3.11	3.12	3.23
Past performance record	3.71	3.56	3.68	3.80
Supplier development program	3.51	2.98	2.84	3.38

1= level of importance is none, 5 = level of importance is high.

The monitoring of performance indicators constitute a good proxy of the level of manufacturers' focus in customer service. Respondents were asked to scale the importance of certain performance indicators. The answers associated with logistics and services related performance indicators are presented in Table 6.

Table 6 Manufacturers' Importance Rating of Performance Indicators

	North America	Europe	East Asia	Latin America
Customer service	4.27	4.20	4.26	4.17
Customer satisfaction	4.66	4.65	4.41	4.41
Manufacturing lead time	3.91	3.91	4.07	4.09
Procurement lead time	3.54	3.64	3.46	3.54
Delivery lead time	4.06	4.18	4.01	4.25
On-time delivery	4.54	4.51	4.64	4.25

1 = very low importance, 5= very high importance

"Customer satisfaction" received a score above 4.50 across the economic blocs. Note that "on-time delivery" has ranked equally high with an overall average of 4.53 scoring at least 4.50 everywhere except in Latin America.

Respondents were also asked to indicate if they were, in fact, measuring these performance indicators. European manufacturers, along with their Latino-American counterparts, have a lower performance recording proportion in customer service and satisfaction items despite their relatively comparable importance rating (Table 6). "Procurement lead time" is, by far, less measured in Latin America with a low 44.8 percent of respondents measuring it. "On-time delivery" is more monitored than other performance indicators. This is particularly true in North American with an impressive 93 percent proportion of manufacturers that do measure "on-time delivery". Combined Tables 6 and 7 reveal that:

1. "On-time delivery" is not only important but also heavily tracked by firms around the world. The message is clear for logistics providers and suppliers—do not miss your delivery window!
2. "Customer satisfaction", despite its importance for most firms, is not widely measured. This lack of performance appraisal concerning customer satisfaction could constitute an important opportunity for logistics providers by acting as feedback channels for the shippers. This type of service could constitute a value-added activity particularly in Europe, where the gap between the importance rating and the actual appraisal practices seems to be large.

Table 7 Manufacturers Monitoring Specific Performance (%)

	North America	Europe	East Asia	Latin America
Customer service	72.0	58.8	74.2	59.7
Customer satisfaction	85.0	57.3	76.6	60.7
Manufacturing lead time	81.4	82.3	88.8	85.0
Procurement lead time	71.0	65.7	60.8	44.8
Delivery lead time	80.9	81.9	87.0	78.3
On-time delivery	93.1	85.6	87.8	83.6

Time Compression

In an ideal world, transportation would be the warehouse system (Tan et al. 1998). However, the world is not frictionless and inventory is a result of this imperfect world. Managers have tackled this problem by imposing and implementing just-in-time (JIT) practices and by operating in a make-to-order production mode. These managerial practices differ around the world as Table 8 is showing.

Most salient differences involve East Asian manufacturers' JIT practices. The level of required JIT delivery from the suppliers is significantly higher in East Asia, being above the overall average (39.2 %) by more than ten base points. Accordingly, even if it is less apparent, JIT delivery of end products is on average higher in East Asia. Surprisingly, East Asia's results are slightly driven-up by the JIT practices of LDC's manufacturers. The level of these practices could explain a lower late delivery rate recorded in East Asia (8.6 percent). Despite the very high importance that North American manufacturers gave to "on-time delivery" (Table 6), they exhibit an average late delivery rate. Latin American managerial practices concerning on-time delivery are deficient with almost one delivery out of six being late.

Make-to-order production are less popular in North America (56 percent), the only proportion under 60 percent. European manufacturers are the ones practicing the most make-to-order productions. This high ratio of make-to-order production could explain a higher level of input inventories. East Asian manufacturers have a higher level of output inventories, which is consistent with their higher JIT delivery of end products.

Table 8 **JIT Practices, Late Delivery and Make-to-order Production (% of total)**

	North America	Europe	East Asia	Latin America
JIT requirements for suppliers	35.5	33.2	50.7	37.9
JIT required for end products	50.3	50.0	60.0	55.8
Late delivery	12.7	12.6	8.6	16.3
Make-to-order production	56.0	74.2	65.2	70.1
Inventories of inputs (days)	27.4	36.4	28.9	26.1
Inventories of outputs (days)	16.4	15.9	21.8	16.7

Organizational Integration

As mentioned at the beginning of this paper, Christopher (1998) argued that one challenge of firms is to integrate their functional areas internally. This type of integration refers to the concept of integrated logistics (Ross 1998). Unfortunately, the survey does not provide internal integration specific data. However, the logical evolution of managerial practices suggests that integrated logistics is likely to be followed by supply chain management (Ross 1998, Tan et al. 1998). Supply chain management refers to the integration/coordination of

activities between organizations. In fact, supply chain integration is often used in the literature instead of supply chain management.

Indicators of the level of supply chain integration are provided in Tables 10 and 11. Respondents were asked to evaluate different dimensions of integrated operations with their customers (Table 10) and with their suppliers (Table 11). The initial reaction is to conclude that firms around the world do not have an integrated supply chain. Most of the items have scored under three, signaling a higher weight toward no integration of operations.

Table 10 Integrated Supply Chain—Customers

	North America	Europe	East Asia	Latin America
Joint production operations	1.84	1.63	1.91	2.00
Joint facility productions	1.55	1.33	1.70	1.85
Access to planning systems	2.67	1.85	2.15	2.38
Sharing production plan	2.85	1.93	2.22	2.33
EDI and network sharing	2.43	1.85	2.12	2.15
Inventory information sharing	2.53	2.06	2.29	2.49
Customized packaging	3.21	2.63	3.05	2.62
Delivery frequency	3.91	3.24	3.47	3.75
Common use of logistical equipment	2.53	2.10	2.28	2.31
Common use of 3PL	2.26	2.01	2.22	1.98
Average	***2.68***	***2.16***	***2.44***	***2.54***

1 = None, 5 = Extensive

"Delivery frequency" has a relatively (not absolute) high score for all economic blocs. Similarly, "customized packaging" is an activity where more interaction with suppliers exists in North America (average score slightly above three). If averages of the ten items' score could served as an overall indicator of the level of supply chain integration[2], than no economic bloc exhibit scores higher than the threshold of three. In relative terms, North American manufacturers have a higher level of integration practice particularly with their customers (2.65) and their suppliers (2.72).

[2] Cronbach-α statistics for the ten item was over 0.80 for each bloc under study. Hence, the interpretation through the average is acceptable.

Table 11 Integrated Supply Chain—Suppliers

	North America	Europe	East Asia	Latin America
Joint production operations	2.09	2.11	2.28	2.52
Joint facility productions	1.69	1.51	2.02	1.71
Access to planning systems	2.71	2.00	2.39	2.35
Sharing production plan	3.08	2.46	2.60	2.38
EDI and network sharing	2.50	1.89	2.12	1.71
Inventory information sharing	2.77	2.33	2.49	2.45
Customized packaging	2.90	2.56	2.90	2.37
Delivery frequency	3.67	3.48	3.67	3.52
Common use of logistical equipment	2.72	2.37	2.40	2.48
Common use of 3PL	2.40	2.05	2.37	1.91
Average	***2.72***	***2.37***	***2.63***	***2.44***

1 = None, 5 = Extensive

For logistics providers, these results might indicate the existence of several opportunities. First, information sharing between supply chain members is low. Is it because of a lack of compatible technology or because of a lack of managerial leadership? There is a chance for logistics providers to bridge this gap by offering value-added service through information systems capabilities (Ashcroft 1998).

Another way for 3PL to add some value to manufacturers' logistics processes is to get involved in the supplier-buyer relationship (Gentry 1996). The future of logistics is viewed as being an integrated supply chain where shippers, customers and 3PL will act together (Briggs 1998). Why don't 3PL take the leadership in that matter and create the value added from this type of associations?

Conclusion

Data were presented along challenges faced by firms in today's competitive environment. Data, segregated into four economic blocs, were analyzed to assess any differences and/or discrepancies across these blocs—thus around the world. A general overview of the results leads to the conclusion that neither systematic nor sustained patterns have emerged from the analyses. This conclusion shows some support to the "Universalist" hypothesis of managerial practices around the world (Mintzberg 1973). Nevertheless, some interesting differences were noted on specific issues.

- "On-time delivery" and "customer satisfaction" are two important performance indicators for manufacturers. Latin American and European firms do not measured these two performance indicators as heavily as other blocs despite their comparable importance ratings. North American manufacturers do heavily measure on-time delivery even if they have average late delivery rate. In fact, late delivery rate is significantly lower in East Asia than in any other economic bloc.
- JIT practices are more apparent in East Asia.

Besides these specific differences, some general findings were applicable to all manufacturers regardless of their blocs.

- Logistically speaking, faster and reliable/dependable deliveries are key components of logistics management. Results showed that they were considered as win-order characteristics and they have gained in importance lately. They are also valued criteria in the selection of suppliers.
- Integrated supply chain still a concept not widely applied by manufacturers. Nevertheless, "delivery frequencies" seems to be a dimension jointly managed by supply chain partners.

Throughout the paper we suggest ways for logistics providers to take advantage of certain situations. However, the author does not pretend that these suggestions are all suitable in every situation. In fact, more investigations are needed from firms desiring to apply these propositions. Similarly, the specific differences and general findings of this paper constitute potential research avenues for academics.

Appendix A

Table 9 Details of the database

	SIC CODE						Total
	381	382	383	384	385	Not given	
North America	36	0	17	7	6	45	**111**
Europe	78	62	80	36	26	24	**306**
East Asia	55	36	47	34	15	23	**210**
Latin America	40	2	13	7	2	12	**76**
Total	**209**	**100**	**157**	**84**	**49**	**104**	**703**

ISIC 381 Manufacture of metal products, except machinery and equipment.
ISIC 382 Manufacture of machinery, except electrical.
ISIC 383 Manufacture of electrical equipment apparatus, appliances and supplies.
ISIC 384 Manufacture of transportation equipment.
ISIC 385 Manufacture of professional and scientific and measuring and controlling equipment n.e.c., and of photographic and optical goods.

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L'IMPACT DES NOUVELLES TECHNOLOGIES DE COMMUNICATION SUR LA DEMANDE DE TRANSPORT AÉRIEN DES VOYAGEURS D'AFFAIRES[1]

1. INTRODUCTION

En 1995, une première analyse des facteurs pouvant avoir des incidences majeures sur le transport aérien, des incidences de nature principalement négative, a été réalisée par le département de recherche et de publication de l'Institut international de formation en gestion aéronautique civile (Roy, 1995). Les résultats de cette étude sont venus confirmer la pertinence et l'importance particulière de deux facteurs, soit les technologies de communication dont notamment la vidéoconférence ainsi que les nouvelles pratiques d'affaires, par rapport à la demande de transport aérien au Canada, comme aux États-Unis et ailleurs dans le monde.

L'objectif principal de cette étude est de mesurer l'impact des nouvelles pratiques administratives ainsi que des nouvelles technologies de communication sur les comportements organisationnels et individuels des voyageurs d'affaires.

Plus particulièrement, cette étude cherche à évaluer:

- les tendances récentes en matière d'utilisation du transport aérien pour affaires;
- l'importance et le type de mesures restrictives adoptées par les organisations afin de réduire les coûts de déplacement pour affaires;
- le taux et les motifs d'utilisation des nouvelles technologies de communication; et
- le taux de substitution actuel et prévu des voyages en avion pour affaires par l'utilisation de la vidéoconférence.

La méthodologie de la recherche comprend trois éléments: des entrevues personnelles, des groupes de discussion et un sondage. Un total de vingt-quatre entrevues personnelles ont été complétées auprès de vingt entreprises ou organisations, plus d'une personne ayant été rencontrées dans certaines. Deux

[1] Nous tenons à remercier le ministère des Transports du Québec, la société Air Canada ainsi que le Centre de ressources Sentor Inc. pour nous avoir donné l'occasion de réaliser cette étude.

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groupes de discussion ont ensuite été réalisés , un à Montréal et le deuxième à Toronto. Finalement, un sondage a été complété auprès de 1139 répondants dans sept aéroports canadiens, soit: Halifax, Québec, Montréal, Val d'Or, Toronto, Calgary et Vancouver.

Cet article se concentre sur les résultats du sondage portant sur l'impact des nouvelles technologies de communication et comprend trois autres sections dédiées à la revue de la littérature, à l'analyse des résultats du sondage et aux conclusions. Les résultats de la recherche qualitative sont publiés dans Roy et Filiatrault (1998).

2. REVUE DE LA LITTÉRATURE

2.1 Les nouvelles technologies de communication

On regroupe sous le vocable de « téléconférence » l'ensemble des procédés utilisés pour se réunir à distance et qui possèdent une complexité supérieure au téléphone. Ces technologies se distinguent avant tout par le moyen de communication utilisé, soit : le son, l'image ou l'écrit (Pavaux, 1995).

Deux procédés de téléconférence utilisent l'image comme moyen de communication : la vidéoconférence et la vidéotransmission. La vidéoconférence réunit des groupes déjà constitués, rassemblés dans des salles spécialement aménagées à cet effet, et qui communiquent entre eux par l'intermédiaire de l'image et du son, et non plus seulement par le son. Quant à la vidéotransmission (ou "business TV" en anglais), elle consiste en une transmission unidirectionnellle du son et d'une image analogique de type télévision. Son manque d'interactivité en limite l'utilisation à des réunions formelles dans le cadre desquelles on désire transmettre un message solennel.

2.2 Un marché en croissance

Il est difficile d'établir avec exactitude l'importance du marché de la téléconférence et d'en prévoir l'évolution future. Plusieurs observateurs estiment que l'on se situe encore au tout début du cycle de vie de cette nouvelle technologie, en particulier en ce qui concerne la vidéoconférence, et que sa croissance sera exponentielle dans les prochaines années. Les données suivantes nous permettent néanmoins d'esquisser une ébauche de la situation.

Une étude publiée par Douglas (1989) évalue à environ 1 milliard de dollars (U.S.) le marché de la téléconférence aux États-Unis, en 1989. De ce montant, on estime que 230 millions de dollars étaient reliés à la vidéoconférence. On prévoyait également, à cette époque un taux de croissance annuel de l'ordre de 20 % à 30 %

(Gantz, 1990). Au même moment, une enquête réalisée aux États-Unis auprès d'une centaine d'organisations révélait que l'utilisation de la vidéoconférence avait doublé depuis 1985 (Lehrman, 1991).

Le taux de pénétration de ces nouvelles technologies de communication n'est toutefois pas aussi élevé en Europe et ailleurs dans le monde. On estime en effet que les ventes reliées à la vidéoconférence aux États-Unis en 1990 étaient déjà plus que le triple des prévisions de 1995 pour toute l'Europe (Cook et Haver, 1994). D'autre part, au Canada, seulement 2 % des entreprises possédaient de l'équipement de vidéoconférence en 1990. De plus, seulement 5 % des non utilisateurs avaient l'intention de s'en procurer dans les trois années suivantes (Communications Canada, 1990).

Cette disparité dans l'utilisation de la vidéoconférence peut s'expliquer dans une large mesure par les coûts souvent très élevés liés à l'acquisition et à l'utilisation de ce type de technologie, surtout à leur tout début. Car la situation change très rapidement. On estime en effet que les tarifs horaires de transmission par satellite aux États-Unis sont passés de 8 000 $ en 1981 à moins de 300 $ en 1994 (Button et Maggi, 1995). Chez Bell Canada, on affirme que les prix ont baissé dans une proportion de dix contre un, depuis 1985. Récemment, l'essor a été encore plus impressionnant. Ainsi, par exemple, les coûts d'une vidéoconférence de deux heures, entre Montréal et Toronto, seraient passés de 940 $ à 330 $ (Veyron, 1994).

Un peu partout à travers le monde, l'accès à des salles publiques de vidéoconférence se développe rapidement. Bon nombre d'entreprises préfèrent cependant installer ce type d'équipement dans leurs propres locaux. Il leur en coûte entre 30 000 $ et 80 000 $ selon l'équipement choisi ; mais ces coûts diminuent rapidement et pourraient glisser sous la barre de 10 000 $ très prochainement (Button et Maggi, 1995).

2.3 La vidéoconférence comme substitut au transport aérien

La télécommunication et le transport sont intimement reliés entre eux (Mokhtarian, 1990). Si la vidéoconférence est pour connaître un essor prodigieux, d'ici l'an 2000, quel en sera l'impact sur la demande de transport aérien ? Ceux qui ont tenté de répondre à cette question jusqu'à présent sont arrivés à des conclusions parfois contradictoires. En effet, certains insistent davantage sur les économies réalisées grâce à la vidéoconférence (réduction des coûts et du temps de déplacement pour les réunions d'affaires) et prévoient un impact important sur le nombre de déplacements d'affaires par avion dans les années à venir. D'autres estiment que les gains obtenus en productivité ainsi qu'une efficacité accrue dans les

communications entraîneront une croissance dans le nombre de déplacements par avion ; de meilleures communications facilitent les échanges avec de nouveaux partenaires d'affaires (Apogee Research Inc., 1994).

Quoiqu'il en soit, relativement peu d'études ont été réalisées dans le but de mesurer l'impact de la vidéoconférence comme substitut au transport aérien. Une enquête menée en Grande-Bretagne (Cook et Haver, 1994) évalue à un peu moins de 1 % la réduction des dépenses de transport aérien associée à l'utilisation de la vidéoconférence. Les auteurs prévoient cependant que cet impact relativement mineur pourrait s'accroître rapidement au fur et à mesure que l'utilisation de la vidéoconférence se répand dans les entreprises interrogées. En effet, le quart des entreprises n'utilisant pas la vidéoconférence au moment de l'enquête ont affirmé qu'elles avaient l'intention d'y avoir recours dans moins d'un an. De plus, plus du tiers des entreprises utilisant la vidéoconférence deux ou trois fois par semaine ont indiqué qu'elles allaient accroître la fréquence à au moins une fois par jour.

L'étude réalisée par Apogee Research Inc. (1994) tente d'estimer le taux de substitution des voyages d'affaires par avion dû aux nouvelles technologies de télécommunication. Ce taux varie énormément selon le scénario retenu passant de 2 %, dans le cas le plus conservateur, à un maximum de 11 %, d'ici l'an 2005. Une autre étude (Arvai, 1994) prévoit des taux de substitution de l'ordre de 12 % pour 2005, de 25 % en 2010 et de 35 % en 2020, et ce, toujours par rapport au segment des voyages d'affaires par avion.

Une étude plus récente, et fréquemment citée, est celle réalisée par la firme Arthur D. Little Inc. pour la Massachusetts Aeronautics Commission aux États-Unis (Burger, 1995). Dès le départ, l'auteur affirme que toutes les études récentes portant sur la demande de transport aérien ont considérablement sous-estimé l'impact des nouvelles technologies de communication et, en particulier, de la vidéoconférence. Ainsi, l'auteur prévoit une réduction de l'ordre de 15 % dans la demande de transport aérien en l'an 2030. Cette substitution varie cependant énormément selon le type de déplacement envisagé. En effet, on ne prévoit presque pas de substitution pour les voyages d'agrément ou les déplacements discrétionnaires. Il en est tout autrement cependant pour les voyages d'affaires qui pourraient être réduits de 15 % à 40 % selon la distance et le motif de déplacement. L'étude démontre que le taux de substitution augmente considérablement avec la distance et affecte davantage les vols internationaux que les vols intérieurs.

Les résultats de l'étude de Arthur D. Little influencèrent à la baisse les prévisions de la demande de transport aérien en Nouvelle Angleterre et contribuèrent donc à la décision de ne pas aller de l'avant avec la construction d'un deuxième aéroport dans la région de Boston. Les conclusions de l'étude de Arthur D. Little sont

cependant contestées (Salomon, 1998) car elles reposeraient sur des hypothèses non fondées.

Au Canada, des enquêtes annuelles, menées par l'Institut canadien de recherche sur le tourisme, semblent indiquer que de plus en plus de gens d'affaires substituent des déplacements (surtout à l'intérieur du Canada) par des télécommunications. Ainsi, 28 % des répondants ont affirmé qu'ils avaient effectué moins de déplacements en 1994 à cause des technologies de communication alors que ce pourcentage était de 25 % en 1992 (Redekop, 1994).

3. ANALYSE DES RÉSULTATS DU SONDAGE

3.1 Échantillon

Un total de 1139 entrevues ont été complétées sur 3711 contacts faits, soit un taux de réponse de 30,7%; 708 personnes ont refusé de répondre au questionnaire, 627 n'étaient pas des Canadiens, 995 avaient fait moins de six envolées au cours de la dernière année et 243 autres ont été éliminés pour diverses raisons (employés d'une compagnie aérienne, employés d'un aéroport, les personnes avaient déjà répondu au questionnaire dans une autre ville, etc.). La marge d'erreur pour un échantillon de cette taille est de 3,0%, 19 fois sur 20. Il s'agit d'un échantillon aléatoire de voyageurs d'affaires.

Pour se qualifier comme répondant la personne devait avoir fait six voyages d'affaires au cours de la dernière année et être résidente du Canada. Les répondants ont été sollicités, au mois d'octobre 1996, dans les salles de départ d'Air Canada dans sept aéroports canadiens (tableau 1). La responsable distribuait le questionnaire aux passagers qui le complétaient eux-mêmes et le remettaient ensuite à la responsable. Le choix des aéroports résulte du double objectif d'avoir une connaissance de la problématique pan-canadienne et une connaissance plus approfondie du marché québécois, puisque le ministère des Transports du Québec était le plus important commanditaire de la recherche.

L'âge moyen des répondants est de 43,6 ans, et 86,2% sont de sexe masculin. Ce sont surtout des cadres supérieurs (président, v.-p. de secteurs), des professionnels (17,6%) et des directeurs de marketing/ventes. Ils sont très scolarisés, 39,2% détiennent un baccalauréat et 27,6% une maîtrise ou un doctorat. Plus de la moitié (54,0%) oeuvrent dans de petites entreprises (moins de 500 employés) et 25,1% proviennent de PME (ayant moins de 50 employés). Le tiers de ces entreprises (32,5%) ont des revenus inférieurs à 10 millions de dollars et 43,0% ont des revenus supérieurs à 50 millions de dollars.

Tableau 1
Distribution des entrevues par aéroport

Aéroport	Nombre de répondants	%
Vancouver	166	14,6
Calgary	157	13,8
Toronto	213	18,7
Montréal	263	23,1
Québec	111	9,7
Val d'Or	112	9,8
Halifax	117	10,3
TOTAL	1139	100,0

3.2 Résultats

3.2.1 L'utilisation des technologies de communication

L'utilisation des technologies varie beaucoup selon le type de technologie (tableau 5). Ce sont les fax/modem, les ordinateurs portatifs ou à domicile et le courrier électronique qui sont les plus utilisés. L'utilisation de l'Internet est plus récente que celle de la vidéoconférence et le taux d'utilisation est déjà élevé (47,3% au travail et 43,2% pour l'usage personnel). L'utilisation de l'équipement public de vidéoconférence (8,1%) est deux fois moins élevée que celle de l'équipement privé (17,7%), et 14,2% les répondants qui ne possèdent pas un équipement privé sont d'avis qu'ils en auront d'ici trois ans.

3.2.2 Les opinions sur les technologies de l'information et les voyages d'avion

Le voyage en avion est un mal nécessaire (tableau 2). Il n'est plus prestigieux, est moyennement agréable, mais est nécessaire pour maintenir de bons contacts personnels. Par contre, même si les coûts de la vidéoconférence sont élevés et surtout même si la technologie n'est pas à point, la vidéoconférence épargne du temps, entraîne des économies dans les frais de déplacement et peut accélérer la prise de décision. Mais les opinions sont partagées sur le remplacement des voyages d'avion par la vidéoconférence.

Tableau 2
Taux d'utilisation des technologies de communication

	Utilise maintenant	Depuis combien d'années	Utilisera d'ici trois ans	
	OUI (%)	Nombre d'année	Non (%)	D'ici trois ans
Internet pour usage personnel	43,2	1,7	33,2	23,6
Internet pour le travail	47,3	1,7	27,1	25,6
Courrier électronique au travail	69,0	3,8	20,9	10,1
Téléconférence	49,1	4,5	40,6	10,4
Vidéoconférence (équipement privé)	17,7	2,4	68,0	14,2
Vidéoconférence (salles publiques de compagnies de téléphone)	8,1	2,2	83,8	8,1
Vidéoconférence (dans les hôtels ou autres établissements)	4,0	2,1	87,4	8,6
Microconférence (Vidéoconférence avec ordinateur personnel)	2,6	5	83,5	13,9
Ordinateur portatif ou à la maison	75,8	5,03	18,7	5,5
Fax/modem	81,7	5,04	14,7	3,6

Tableau 3
Opinions sur les technologies de l'information

Échelle: 1 = formentement en désaccord; 7 = fortement en accord	Moyenne
Les déplacements en avion sont nécessaires pour maintenir de bons contacts personnel	5,66
Il est prestigieux de voyager en avion	3,14
Les programmes pour voyageurs assidus encouragent les voyages par avion	4,25
La vidéoconférence épargne du temps	4,81
Ma compagnie est davantage orientée vers la technologie que vers le marché	3,41
La technologie de la vidéoconférence n'est pas tout à fait à point	3,98
La vidéoconférence entraîne des économies dans les frais de déplacements	4,91

Échelle: 1 = formentement en désaccord; 7 = fortement en accord	Moyenne
Ma compagnie a connu une croissance rapide au cours des dernières années	4,63
Les coûts d'équipement de la vidéoconférence sont très élevés	4,65
Il est souvent possible de combiner voyages d'affaires avec voyage d'agrément	4.42
Les technologies de télécommunication seront de plus en plus utilisées en remplacement des voyages d'affaires dans l'avenir	4,53
Se déplacer en avion n'est pas aussi agréable qu'avant	4,41
Ma compagnie réagit rapidement aux actions des concurrents	4,90
Ma compagnie est davantage orientée vers la clientèle que ne le sont nos concurrents	5,01
Acquisitions, fusions et alliances stratégiques signifient davantage de déplacements par avion dans ma compagnie	4,16
La vidéoconférence peut accélérer la prise de décision en liant entre eux rapidement les principaux intervenants	4,72
Nous sommes moins nombreux à voyager par affaires dans ma compagnie aujourd'hui que par le passé	3,60
La rentabilité de ma compagnie est meilleure que celle de ses concurrents	4,69
Ma compagnie est un leader dans l'utilisation de la technologie	4,50

3.2.3 La vidéoconférence comme substitut au transport aérien

Tout d'abord, il est important de noter que 337 répondants (29,6% du total) ont répondu que leur organisation utilisait la vidéoconférence. De ce nombre, 223 répondants (soit 19,6%) ont affirmé avoir participé à au moins une vidéoconférence depuis un an. En moyenne, les utilisateurs de vidéoconférence considèrent que celles-ci remplaçaient un déplacement par avion dans 44,8 % des cas.

Si l'on compare le nombre de vidéoconférences constituant un substitut à un voyage par avion au nombre total de voyages d'affaires effectués par avion durant les derniers douze mois auquel on a ajouté les vidéoconférences se substituant à des voyages, on obtient un estimé du taux de substitution factuel de la vidéoconférence par rapport aux voyages d'affaires par avion. Ce taux s'établit à **9,4%** en moyenne pour les 219 répondants ayant utilisé la vidéoconférence depuis 12 mois. En d'autres mots, le taux de substitution factuel, c'est-à-dire

basé sur les comportements réels (fréquences réelles des voyages et utilisation réelle de la vidéoconférence) est de 9,4%. L'influence de la vidéoconférence sur la demande totale des voyages d'affaires est donc de 1,8% (soit 9,4% x 19,6% d'utilisateurs).

Une autre façon d'analyser cette problématique est d'évaluer le taux de substitution potentiel en s'appuyant sur l'opinion des voyageurs d'affaires dont l'organisation utilise la vidéoconférence, soit 29,6% des répondants. Ces répondants ont estimé le taux de substitution potentiel associé à différents motifs de déplacement. En pondérant ces taux de substitution par rapport au nombre de déplacements effectués pour chaque motif rapporté, on obtient un taux de substitution potentiel de 4,1% pour les déplacements reliés à des raisons externes à l'organisation et de 10,4% pour des motifs internes (tableau 4). À court terme, il semble donc que le taux de substitution potentiel de la vidéoconférence puisse être de l'ordre de 14,5% pour les entreprises et organisations utilisant la vidéoconférence. Ce taux s'établirait donc à environ 4,3% pour l'ensemble du marché des voyages d'affaires par avion, soit 14,5% x 29,6 %.

3.2.4 Profil des utilisateurs de la vidéoconférence

Selon les données du tableau 5, les utilisateurs de la vidéoconférence voyagent autant sinon plus que les non utilisateurs. Les utilisateurs appartiennent davantage à la haute direction. Le niveau de scolarité des utilisateurs de vidéoconférence est également supérieur à celui des non utilisateurs. Les institutions financières, les gouvernements et le secteur des communications sont de plus grands utilisateurs de la vidéoconférence. Le taux d'utilisation de la vidéoconférence augmente avec la taille des entreprises.

Nous avons également analysé le profil des utilisateurs de la vidéoconférence en fonction des opinions exprimées. Des analyses de variance ont été réalisées pour découvrir s'il existait des différences significatives entre les utilisateurs et les non utilisateurs. Nous nous attardons ici aux relations les plus statistiquement significatives. Ainsi, les utilisateurs de la vidéoconférence estiment que cette technologie leur épargne du temps (,001), ces mêmes utilisateurs sont d'avis que leur entreprise est davantage orientée vers la technologie (,001) que vers le marché. Par contre, les non utilisateurs sont davantage d'avis (,01) que la technologie de la vidéoconférence n'est pas tout à fait à point. Les utilisateurs sont cependant d'accord pour affirmer (,001) que la vidéoconférence entraîne des économies dans les frais de déplacement. Ils sont également d'avis (,001) que les technologies de télécommunication seront de plus en plus utilisées en remplacement des voyages d'affaires dans l'avenir.

Tableau 4
Impact potentiel de la vidéoconférence sur les voyages d'affaires par avion

Motifs de déplacements	Taux de substitution pondéré (%)
EXTERNE	
Développement d'affaires	0,8
Efforts de vente	0,3
Rencontres avec des clients ou fournisseurs	1,2
Formation des clients	0,4
Service à la clientèle ou appels de service	0,2
Résolution de problèmes techniques	0,6
Foires commerciales	0,0
Réunions par industries ou associations professionnelles	0,6
Sous-total "externes"	4,1
INTERNE	
Affaires internes à l'entreprise	6,4
Formation des employés	0,5
Réunions du service des ventes	0,6
Résolution de problèmes techniques	0,3
Visites d'usines	0,1
Réunions de la haute direction	1,9
Gestion de projets	0,3
Conférences ou séminaires	0,3
Sous-total "internes"	10,4
TOTAL	14,5

De plus, les utilisateurs de la vidéoconférence sont davantage d'avis que cette technologie permet d'accélérer la prise de décision en reliant entre eux rapidement les principaux intervenants. Enfin, les utilisateurs de la vidéoconférence perçoivent leur compagnie comme un leader dans l'utilisation de la technologie.

Tableau 5
Différences d'opinions entre les utilisateurs et les non utilisateurs de la vidéoconférence

	Utilisateurs	Non utilisateurs	Degré de signification
1. Les déplacements en avion sont nécessaires pour maintenir de bons contacts personnels	5,62	5,67	,561
2. Il est prestigieux de voyager en avion	3,13	3,14	,951
3. Les programmes pour voyageurs assidus encouragent les voyages en avion	4,21	4,28	,529
4. La vidéoconférence épargne du temps	5,21	4,61	,000
5. Ma compagnie est davantage orientée vers la technologie que vers le marché	3,67	3,30	,000
6. La technologie de la vidéoconférence n'est pas du tout à fait à point	3,79	4,07	,007
7. La vidéoconférence entraîne des économies dans les frais de déplacements	5,19	4,76	,000
8. Ma compagnie a connu une croissance rapide au cours des dernières années	4,45	4,70	,035
9. Les coûts d'équipement de la vidéoconférence sont très élevés	4,62	4,67	,621
10. Il est souvent possible de combiner voyages d'affaires avec voyages d'agrément	4,20	4,53	,004
11. Les technologies de télécommunication seront de plus en plus utilisées en remplacement des voyages d'affaires dans l'avenir	4,80	4,41	,000
12. Se déplacer en avion n'est pas aussi agréable qu'avant	4,40	4,41	,967
13. Ma compagnie réagit rapidement aux actions des compétiteurs	4,89	4,90	,854
14. Ma compagnie est davantage orientée vers la clientèle que ne le sont nos concurrents	4,98	5,01	,719
15. Acquisitions, fusions et alliances stratégiques signifient davantage de déplacements par avion dans ma compagnie	4,23	4,19	,403
16. La vidéoconférence peut accélérer la prise de décision en reliant entre eux rapidement les principaux intervenants	4,96	4,60	,000
17. Nous sommes moins nombreux à voyager par affaires dans ma compagnie aujourd'hui que par le passé	3,63	3,58	,674
18. La rentabilité de ma compagnie est meilleure que celle de ses compétiteurs	4,77	4,65	,239
19. Ma compagnie est un leader dans l'utilisation de la technologie	4,79	4,37	,000

3.2.5 Profil des répondants utilisant la vidéoconférence comme substitut au transport aérien

Nous avons constitué trois catégories de répondants: ceux pour qui moins de 20% des vidéoconférences constitueraient un substitut à un voyage en avion, ceux pour qui de 20% à 70% des vidéoconférences étaient des substituts et enfin ceux pour qui 70% et plus des vidéoconférences avaient remplacé un voyage par avion. Nous avons analysé le profil de ces trois groupes d'utilisateurs en fonction des opinions exprimées quant aux énoncés du tableau 5 et des données socio-démographiques. Des analyses de variance ont été réalisées afin d'identifier des différences significatives entre ces trois groupes.

En nous attardant aux relations les plus statistiquement significatives, on observe que les répondants pour qui la vidéoconférence constitue un substitut aux voyages par avion estiment que:

- la vidéoconférence épargne du temps (,000),
- la vidéoconférence entraîne des économies dans les frais de déplacement (,000),
- les technologies de télécommunication seront de plus en plus utilisées en remplacement des voyages d'affaires dans l'avenir (,000),
- la vidéoconférence peut accélérer la prise de décisions en reliant entre eux rapidement les différents intervenants (,002).

Enfin, on remarque que ceux pour qui la vidéoconférence constitue un substitut aux voyages par avion sont également ceux qui voyagent le plus (0,04). Cependant, il n'y a pas de différence statistiquement significative entre les données socio-démographiques des trois groupes d'utilisateurs.

4. CONCLUSION

Les résultats du sondage nous permettent de comparer l'utilisation des technologies de télécommunication aux tendances observées dans la revue de la littérature. Par exemple, alors qu'en 1990, on estimait que seulement 2% des entreprises canadiennes possédaient de l'équipement de vidéoconférence et que seulement 5% des non utilisateurs avaient l'intention de s'en procurer dans les trois années suivantes, les résultats du sondage nous apprennent que 17,7% des répondants possèdent un équipement privé de vidéoconférence et qu'un autre 14,2% prévoient en avoir d'ici trois ans. Au total, on obtient 29,6% des répondants qui affirment que leur organisation utilise présentement la vidéoconférence (équipement privé ou public). Le sondage nous révèle également que seuls 2,6% des répondants utilisent la microconférence

présentement. Par contre, 13,9% des non utilisateurs prévoient l'utiliser d'ici trois ans.

Enfin, les résultats du sondage indiquent que 24,2% des répondants affirment effectuer moins de déplacements présentement en raison d'une plus grande utilisation de technologies de communication comme les vidéoconférences et les téléconférences. Ces résultats s'apparentent à ceux obtenus par l'Institut canadien de recherche sur le tourisme avec des taux respectifs de 25% et 28% en 1992 et 1994. Les résultats de notre sondage indiquent cependant que ce pourcentage pourrait augmenter à 37,6% d'ici trois ans.

Chez les utilisateurs de la vidéoconférence, soit 19,6% des répondants, on affirme que cette technologie a constitué un substitut au transport aérien dans 44,8% des cas, dans les derniers douze mois. En comparant le nombre de voyages substitués par la vidéoconférence au nombre total de voyages effectués et remplacés, on peut établir à 9,4%, en moyenne, le taux de substitution attribuable à la vidéoconférence réellement observé dans les derniers douze mois. On peut donc affirmer que l'influence de la vidéoconférence sur la demande totale est de 1,8%, soit 9,4% x 19,6% d'utilisateurs.

Nous avons également recueilli l'opinion des voyageurs d'affaires dont l'organisation utilise la vidéoconférence, soit près de 30% des répondants. Ceux-ci ont estimé le taux de substitution potentiel lié à la vidéoconférence en fonction des différents motifs de déplacement. En pondérant ces taux de substitution par le nombre de voyages rapportés selon chaque motif de déplacement, on obtient des taux de substitution de 4,1% pour des motifs de déplacement externes à l'entreprise et de 10,4% pour des motifs internes. On estime donc à 14,5% le potentiel actuel de substitution de la vidéoconférence par rapport au nombre total de voyages d'affaires par avion au Canada. À court terme cependant, la substitution potentielle maximale basée sur les entreprises utilisant présentement la vidéoconférence (29,6% de l'échantillon) serait de 4,3% des voyages d'affaires, soit 14,5% x 29,6%.

L'utilisation de la vidéoconférence pourrait réduire sensiblement le nombre de voyages d'affaires par avion d'ici l'an 2000 si le taux de pénétration de cette technologie devait connaître la croissance spectaculaire qui est prévue dans la littérature. Il serait donc fort utile de mesurer le taux d'utilisation de la vidéoconférence au Canada dans les années à venir. Cela est d'autant plus vrai que le profil des utilisateurs actuels (grande entreprise, leader technologique, etc.) nous permet d'envisager que cette technologie est appelée à se développer rapidement au fur et à mesure que les coûts d'utilisation seront réduits, rendant ainsi la vidéoconférence plus accessible aux entreprises de moins grande

envergure. Les utilisateurs actuels sont d'ailleurs d'avis que les technologies de télécommunication seront de plus en plus utilisées en remplacement des voyages d'affaires dans l'avenir.

L'impact de la vidéoconférence comme substitut aux voyages d'affaires est fonction à la fois du taux de pénétration de cette technologie dans les entreprises et de son taux d'utilisation. Dans la présente étude le taux de substitution dû à l'utilisation de la vidéoconférence pourrait passer de 1,8% à 4,3% à court terme, si l'utilisation potentielle par motifs exprimés de déplacement se matérialisait. Si le taux de pénétration de la vidéoconférence prévu par les répondants d'ici trois ans se réalisait, soit le double du taux actuel, le taux de substitution varierait alors entre 3,6% et 8,6% en l'an 2000.

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COMPETITION IN SURFACE PASSENGER TRANSPORT: INTERPRETING THE BRITISH CASE

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Few transport markets have been as profoundly affected by pro-market policies as those in Britain. The 1980s and 1990s saw most bus markets deregulated, state-owned bus and rail carriers re-structured and privatised, and local government restricted in its ability to shape public transport. What do the results of these policies tell us about the sustainability and value of competition in surface passenger markets?

This paper interprets results in four markets[1], especially focusing on the scheduled intercity coach market (deregulated and privatised) and local bus services outside London (deregulated and largely privatised), but also touching on London buses (regulated, services tendered to private operators) and rail markets (regulated, services franchised).

The public sector's continued influence should be noted. Local, regional and national bodies still plan, regulate (less than before), fund and/or operate infrastructure (eg., highways and transit facilities) and subsidize services. Britain is not the economist's ideal free market.

As an example of major changes in passenger markets large enough to be worth contesting, the British case merits study, but there will be few like instances against which to test general intuitions. Moreover, policy impacts are sharpened or tempered by geographical, historical, cultural, and political circumstance. For example, if Prime Minister Thatcher had been reluctant to confront British labour, pro-market policies might have had quite different effects. So we cannot say that

[1] Developments are only briefly reviewed, but further discussion of coach and local bus markets and a bibliography can be found in Bunting (1995) and statistics in DETR (1997). Government sources of rail industry information and statistics are cited at the end of this paper.

Britain's reforms would equally work elsewhere, nor that they would have had the same effect in Britain at another time in its history. Thus cautioned, we proceed!

Intercity Scheduled Bus Market

National Express (NE), until 1988 part of the publicly-owned National Bus Company, dominates the coach market (approx. 80% share). In 1980, deregulation induced a brief but ineffective challenge from British Coachways, an alliance of private operators offering no-frills services. Deep fare cuts (roughly 50% on contested routes, Figure 1) were matched by NE, who also was upgrading services as part of a new business strategy, and Coachways was soon dispatched.

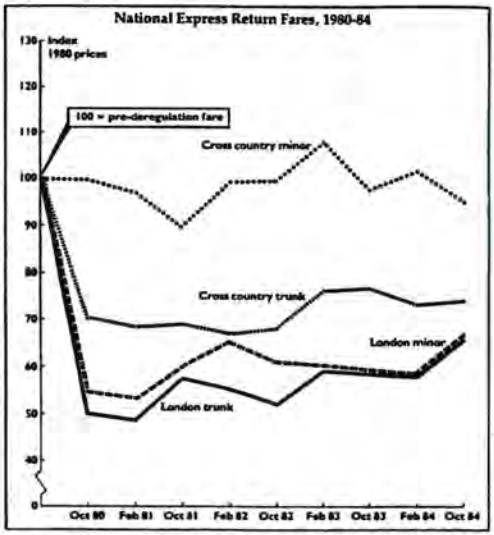


FIGURE 1: INTERCITY COACH FARES (Robbins & White, 1986)

Independents are active on some routes, but a network challenge is unlikely. NE has secured its position, acquiring Citylink (Scotland's main operator) in 1993, and absorbing or displacing smaller carriers.

NE's development reflects three phases. From 1980 to 1988, as the intercity unit of state-owned National Bus Company (NBC), NE not only fended off entrants, but also sought market growth by improving services, cutting fares and competing with British Rail. As a result, NE's market grew from 9 million passengers in 1980 to 15 million in 1985 (softening thereafter, partly due to BR's competitive response).

The second phase, a transition to private operation, began in 1988 with NE's sale to its management, who then sold (in 1991) to investors, who in 1992 floated the company as National Express Group PLC (NEG), and shifted the focus from market growth to financial performance.

The third period (NE fully privatised) saw rising real revenue yields (£9.39/passenger in 1993 vs. £7.33 in 1987), partly causing a market decline to 9.8 million passengers (1993). (The early-1990s recession also affected demand: coach traffic has since increased.) NEG also diversified its transport holdings, adding airport and international coach units, two airports, local bus operations, and five rail franchises.

In a mid-1980s study of fares in England (NE dominant) and Scotland (active competition), Jaffer and Thompson (1986) concluded: "*Our findings... are not consistent with the contestability hypothesis... incumbents have been able to maintain a price premium over entrants, and... where entrants have been able to achieve a significant share [Scotland], prices are significantly lower (in relation to the cost and demand characteristics of the market)...*". At best, British coach markets are imperfectly contestable, if contestable at all[2].

NE's position is not likely due to scale economies[3]. Given this, how is NE's dominance to be explained? Two possibilities are considered:

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[2] Thompson and Whitfield (1995) conclude, from 1984-88 data, that National Express earned excess rents equivalent to a 6-8% fare premium, but argued that elimination or gradual erosion of entry barriers will eventually produce a more contestable coach market.

[3] For example, Button (1986) estimated cost equations for 55 municipal bus operators in Britain, and found no significant evidence of scale economies. This result may not extend to scheduled intercity coach services, but is suggestive.

(1) National Express benefits from artificial entry barriers.

NE had privileged access to such terminals as London's Victoria Coach Station (an NBC subsidiary), while entrants settled for less desirable stops (eg., car parks, street-sides). Also, as part of a publicly-owned corporation (NBC), NE was less constrained by solvency concerns, hence had a financial advantage over smaller competitors. And, NE's reputation as an aggressive player helped deter would-be entrants.

Moreover, NE had a strategic head-start: before deregulation, a capable planning and management team had devised a strategy based on in-depth market research and were ready to act quickly to improve services, with evident positive effect on the market.

However, these barriers are now less relevant. NE no longer has a corporate link to Victoria Coach Station and legislation has eased common-user access to terminals. Now subject to the same pressures as other private companies, NE no longer has the luxury (if it ever had) of incurring losses to ward off entry. -And NE's strategic foresight can be copied and bettered by other transport organisations.

Of course, today's NEG is a large organisation with resources to fight entry: would-be competitors know this and will hesitate to try their luck. Yet this residual barrier is less effective now: several large transport groups have the resources to compete and NEG may be less resolute in an extended fight given its other interests[4].

(2) National Express' monopoly is a natural market phenomenon.

Artificial barriers seem insufficient to explain NE's hold on the British coach market, and we have already suggested that NE has no cost advantage over potential entrants. Given this, we should explore market factors, especially the impact of NE's role as *system operator*. This is not just to note the obvious fact that NE operates a network, but to draw attention to the company's functional organisation.

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[4] NEG's coach business, with less than £200 m. in annual revenues, is far exceeded by its 5 rail franchises (in 1996-7, £340 m. in passenger revenues and £570 m. in public subsidy).

NE began as NBC's planning and marketing unit for services operated by NBC subsidiaries: NE did not run buses, but performed functions necessary to an effective transport system. NE continued in this way as a privatised company, contracting for coach operations with former NBC companies and others. This approach minimized capital requirements, allowed NE to adapt operations readily to demand, and kept the corporate focus on system issues: market strategy, quality standards, system functions (information, reservations, ticketing, etc.), product branding, financial management, etc.

Evidently, this style of operation found favour with the public. That is, for scheduled bus service, customers prefer a competent system operator over many operators each serving few routes[5].

The implication is that travel decisions are based not only on the attributes of individual trips but also on the breadth of an operator's service array (simplifies consumer choice) and by quality expectations arising from past travel experience. These factors uniquely favour system operators (at least those that rigorously control quality), and are further reinforced by product branding and network-wide advertising.

If this view is correct, a system operator able to keep costs at or near industry levels has a distinct advantage. That is, a competition theory inspired by cost analysis misses the point: here, monopoly arises for market reasons, not for reasons of cost structure.

Local Bus Markets Outside London

If intercity bus deregulation did not sustain competition, its success in other respects encouraged the next step, local bus deregulation, this time as part of a package that included privatisation (to secure cost savings and support competition) and local government reforms (to limit local market interventions and reduce bus subsidies).

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[5] As in North America, the charter/tour market features many operators. Here, competition is more sustainable, presumably reflecting a different relationship with customers.

Under the *Transport Act 1985*, local markets were opened (in October 1986) to all comers meeting safety/competency criteria, with prior notice (42 days) of new or altered services. The Act also provided for the National Bus Company's privatisation as 54 separate operating companies and required that municipal bus operations be established as arms-length companies, most of which were later privatised.

Municipalities were required to tender socially required services, and only after commercial operators had given notice of services they would run unsubsidized (about 85% of route miles being so registered). These provisions helped cut subsidies by limiting the number of subsidized routes and ensuring competitive contracts, but also fragmented bus and multi-mode networks.

Here, competition would be expected given the size of the local bus market (revenues of roughly £2 billion, an order of magnitude larger than intercity revenues), the large number of carriers, and the nature of commuter markets (more opportunities for small operators to target individual routes). Indeed, there was competition, sometimes active, sometimes sustained over extended periods. However, overall, on-the-road competition affected only 10% of route miles (Preston, 1991).

Largely, operators defended historically-established territories against interlopers by flooding contested routes with buses and cutting fares. The result was often a stand-off, each company tacitly acknowledging the other's territory. So, while there are many bus companies (as may be seen in city downtowns), most routes are served by one operator.

This behaviour reflects a inward-looking focus on corporate survival, as found by McGuinness et al.(1994) in interviews with bus managers. Unlike NE, local bus companies often were not ready (technically or financially) to pursue a forward-looking market strategy, and thus responded by reactively defending markets and tightening their belts (by cutting costs and deferring capital spending).

The British government claimed local bus reforms would reduce costs and fares, and improve services. Bus unit costs (per km.) were much reduced (by 46% between 1985/6 and 1996/7) but gains were offset by

higher service levels (more bus-km.), which had little useful effect on demand[6]. As a result, cost *per passenger* hardly changed at all, and real fares increased, especially in larger cities, which had formerly subsidized fares at the network level to support public transport.

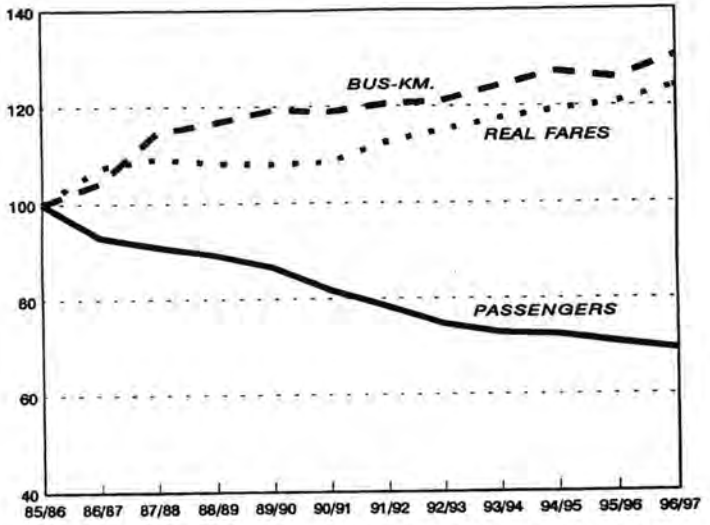


FIGURE 2: LOCAL BUS SERVICE LEVEL, FARES & DEMAND

It must be noted that the local bus market had been declining steadily prior to the 1980s. Market reforms were sold partly on the basis that this decline could be reversed, but clearly this would not be achieved so readily, and indeed some commentators have suggested that matters were worsened by these reforms (White, 1990).

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[6] Several reasons might be offered. On constested routes, competitors tend to match schedules, so choice of departure time is little improved. Also, competition tends to focus service on heavily used routes and peak hours, with less service on other routes at off-hours, thereby reducing network and schedule coverage.

In a shrinking market and with little opportunity to expand by market entry, many companies see their future in acquisition (acquiring or being acquired). Thus, a fragmented bus industry is consolidating into large holding companies, three of which control about a third of the bus market[7]. This process will continue for a time as the least successful companies, who cannot afford to replace aging equipment, face liquidation or takeover.

How are we to understand these results? Growing car use and cuts in public transport funding[8] are obvious explanations. Here, we briefly consider impacts of two other factors: an entrenched class of managers largely experienced in public sector operations, and weaknesses in institutional provisions for local public transport.

(1) The Impact of Entrenched Management

Public employees may be no less effective at what they do than private sector employees are at what they do, but the public sector inevitably selects for political acumen as much as for commercial skill. -And, in an endeavour offering scant hope of market or financial advance, even commercially-minded managers may find it best to develop and show competence primarily in operational or political matters.

Given this, privatisation should bring large changes in executive and senior management ranks, as those with commercial skill are preferred over those with other competencies. This is not to say that public sector managers cannot cope in the private sector - many former NBC managers are performing well in this environment - but one would not expect management to remain unaltered, especially in a weak industry.

This said, changes in the British bus industry would not come quickly. For one thing, the technical skills and practical market knowledge required to manage transport operations makes wholesale replacement

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[7] In 1995, Stagecoach's share was 13%, British Bus' 10%, Badgerline's 9% (Meacher, 1995).

[8] Between 1985/6 and 1996/7, public transport grants to local bus services outside London declined by 51% in real terms. (This excludes funding for concessionary fares and fuel duty rebates, which were not much affected.)

of public sector managers impractical. For another, the NBC's privatisation favoured management/employee buyouts, which tend to entrench incumbent management. Some buyouts produced successful enterprises, but others served only to postpone changes which would later be forced by corporate failure or takeover.

Earlier we noted the bus manager's focus on corporate survival (vs. market strategy). This reflects a difficult market, but perhaps we also see the influence of a cadre of incumbent managers uneasy in private-sector shoes. This unease cannot help but focus attention on external threats and encourage familiar (and reactive) responses, with ill effect on market and financial results.

If this view is correct, pro-market policies are not necessarily wrong, but need time (perhaps decades) to show their worth. Interim results may be unhappy, as an industry wastes itself in reactive tactics, but stronger players - better financed and more strategically oriented - will eventually displace the weaker.

The counter-examples in this otherwise dismal market give reason for hope. Stagecoach, a relative newcomer, invested in new buses (while others patched aging equipment), gamely contested markets and tried fare and service innovations. In Exeter, and soon elsewhere, bus operators used minibuses to build market and cut costs. -And in Oxford, two competing operators have between them increased bus ridership by at least 50%[9].

(2) Failures in Supporting Institutions

The foregoing may partly explain the bus industry's slow and unhappy adaptation to its market, but should not be over-emphasized. While public sector managers had a strong incumbent position, this was by no means solid, as private owners could at least leaven the mix (and stir it!) by importing managers from the part of the industry already in private hands (charters/tours).

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[9] Personal communication, R. Williams, Oxfordshire County.

Another potential cause of trouble, which can only be briefly touched on, is the institutional framework for local public transport. While Britain's conservative government may have been justified in reducing the public sector's role in transport operations, it did not sufficiently consider the public and private sector institutions and policies that would make local bus markets work effectively.

For example, we earlier alluded to a 50%+ gain in bus ridership in Oxford, for which local operators may take credit, but which is equally the result of local government policies and programs, such as traffic restraint in Oxford's city-centre and suburban park-and-ride facilities. Also, in other cities (and Oxford) local governments and private bus companies are entering 'quality partnerships' to make public transport more attractive.

More emphasis might also be placed on private institutions for joint ventures beneficial to travellers, especially in areas of service coordination and multi-mode packaging. For example, Newcastle area operators some years ago formed a joint company, Network Ticketing Ltd., to provide inter-operator tickets and passes (Moyes, 1993).

Defects in institutions are not reasons for a return to public operations: the processes by which Britain's bus industry is adapting to its market should be given a chance to work. Equally though, these defects may be partly to blame for the bus market's uninspiring performance so far, and thus worthy of both public and private sector attention.

London's Local Bus Market

Britain's government had intended to deregulate London's buses, but lost interest as it became apparent that competition was not working well elsewhere. As time went on, service tendering and privatisation were increasingly seen as the ways to reduce costs (and subsidies) as well as raise cash for the exchequer.

In London, bus operations were re-structured into ten companies, later (mid-1990s) sold to the private sector, including bus holding groups formed in the wake of the 1980s reforms. Service planning remains with the public sector (central government, likely to be passed to a

revived Greater London body), with services competitively tendered. Privatisation and tendering cut costs (40% between 1985/6 and 1996/7) while ridership has modestly grown (8% between 1985/6 and 1996/7).

While London's internal market is regulated, coach deregulation (1980) induced entry in the commuter market to/from London. Unlike other intercity markets (National Express dominates), the commuter market is more conducive to entry by independents, who hold a respectable market share[10]. Often, commuter entrants did not contest existing markets, but filled niches (ie., gaps in the established network). This should remind us that the value of deregulation is not just to promote competition, but to provide more scope generally for market initiative.

London is often given as evidence of the value of regulation (coupled with tendering), but this case merits closer interpretation. London has held a status quo as much due to physical constraint as good policy: buses are bound to do better where road congestion makes car travel less useful and where other public modes (subway/rail) are near or beyond capacity. In London, a more subtle competition policy (eg., requiring extended notice for service changes and participation in passenger system facilities) might risk little, and gain much.

Moreover, if Britain makes good on its present plan (DETR, 1998) to discourage car use (eg., through parking and vehicle taxes) while boosting public transport (eg., through bus priority measures), local bus markets could be profoundly altered. Fewer cars and bus priority would cut bus travel times and delays, increase transport capacity and cut costs. Apart from growing bus markets, this might justify a new market strategy especially focused on service quality (comfort, speed, ease of use and reliability). The question then would be whether such a strategy would be best devised by government (as now) or whether London's bus system should be re-thought by the private sector[11].

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[10] By the late 1980s, as much as 40% was held by independents (Bunting, 1995).

[11] As an occasional user of London's buses, this author is often overwhelmed by its labrynthine structure. If those who cram into the 'Tube', or drive, are similarly put off, a new approach may be required, not routine application of conventional service planning tools.

Passenger Rail Franchising

In the mid-1990s, British Rail was re-structured and privatised as a track authority, three equipment leasing companies, 25 passenger operators, several freight operators, and other companies providing support functions. The government considered a competitive access model for passenger service, which would have opened this market to any qualified train operator, but opted for franchising. This move reflected the rather dismal results from bus competition outside London, and more impressive results from bus tendering in London. Franchising also provided a way to control service levels and standards, a matter of considerable political importance.

While it is early to assess outcomes (franchises were issued in 1995-7), franchisees will require less support (less than £1 billion by 2003, in contrast with subsidies of £2.2 billion in 1995/6). Overall, service levels have increased, equipment is being upgraded, and other aspects of service improved. There have been complaints, notably about late or cancelled trains (partly due to consistent performance reporting), but service standards are no worse than BR's early-1990s' performance and rail patronage has increased markedly.

The rail industry's initial diversity is steadily giving way to a more concentrated structure. Of 25 passenger franchises, five were awarded to NEG and four to Prism Rail. Subsequently, FirstGroup, holder of one franchise, acquired two more from Great Western Holdings, and two other franchisees, Stagecoach and Virgin Trains, are developing corporate links (the former acquiring 49% ownership in the latter).

While opting for franchising, Britain provided for future competitive access to rail lines. (Limited entry will be allowed in 1999.) Since the British government insisted that certain network functions be provided by operators in common (through ticketing, etc.), it may be that rail markets are more contestable than intercity coach markets. How much actual competition will result remains to be seen, and might not be much, given the industry's trend to a consolidated structure.

This said, restructuring has produced a more diverse industry, and the franchising process has encouraged creativity in market strategy and

other areas. Among the innovations reflected in franchise agreements are improved customer service functions, intermodal links and through ticketing (intercity and local), innovative fares, and high-speed rail investments. Even if the industry becomes more concentrated and on-rail competition fails to develop, experimentation induced by BR's restructuring will set new performance standards for the future.

Conclusions

The foregoing suggests five general conclusions. First, a distinction should be made between tactical and strategic competition, the former evident in local bus markets outside London, the latter in the intercity coach market and perhaps the emerging rail franchise market.

Tactical competition, with its focus on short-term survival, takes most operating/marketing practices as a given. The financial ill effects of tactical reactions to actual or potential entry (eg., service increases and fare cuts) force economies (eg., wage and staff cuts), more intensive use of assets and deferral of capital spending (ie., dis-investment). If Britain's local bus market is indicative, passenger demand weakens as competitive action fails to address customer needs, and the industry concentrates, as corporate failure brings liquidation or takeover.

Strategic competition looks beyond present operations, aiming at a new relationship with customers through qualitative changes in service, while containing costs through re-worked operating practices. In doing so, strategic competitors aim at an unique market position requiring little ongoing defense of the kind typical of tactical competition[12]. Here too, the result may be a concentrated industry, but by reason of success, not failure.

Second, while artificial entry barriers may favour monopoly or oligopoly, equally important may be the customer's preference for an

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[12] Niche entry - filling network or service gaps - does not entail direct competition, but entrants may use niches to test service or operating concepts, or build transport organisations, thus setting the scene for wider, strategic competition. However, most niche players will prefer to avoid competitive notice, and may do little to innovate or to venture beyond their niche.

operator offering a comprehensive service array and consistent quality standards. Apart from incumbency effects, NE's attention to system issues seems to have given it a 'leg up' in coach markets, while operators in fragmented local bus markets have done less well.

This implies a more complex consumer choice mechanism than is often supposed and an equally complex relationship with transport operators. So, while network/system issues may seem to justify a strategic role for the state, this may only serve to break an essential link in the strategic marketing process, and thus weaken public transport markets.

Third, except where there is a strong player from the start (such as National Express), markets may be slow to adjust to new transport policies. In these 'sticky' markets, early outcomes may be misleading: if outcomes are unfavourable, the appropriate response may not be to intervene, but to wait, or if intervention is required, to move to reinforce markets, not undermine them.

Fourth, even if competition cannot be sustained, market reforms that promote diversity encourage innovative services and corporate forms. This diversity, evident in bus and rail markets, may diminish, perhaps even to the point of requiring monopoly regulation or a new round of industry restructuring, but for now has supplied welcome 'fresh air'.

Finally, governments have a continuing role, to guard against market abuse and to support emerging private markets in passenger transport. However, this should not be seen as a cyclical regression to traditional regulatory and strategic interventions, which may only serve to embed outdated market concepts and operating practices.

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HUMAN TRANSPORTATION AND THE TECHNOLOGICAL CHANGES IN COMMUNICATION AND INFORMATION DISSEMINATION

I Introduction

The last ten years have witnessed considerable improvements in communications technology and availability. In addition to much wider use of the fax machine, we have also seen the mass commercialization of electronic mail and especially, the Internet.

Many articles have discussed the Internet's potential for the advertising and retailing industry. In addition, the development of modem and CD-ROM use has made communication easier and increased our access to a vast amount of information.

The huge development in the intensity of competition in the telephone industry has substantially reduced the cost of long-distance phone calls.*

A number of studies have dealt with the effect of these technological and regulatory changes on business logistics (just-in-time policies, EDI, etc.). This article seeks to examine the type of effects that communicational developments might have on human transportation. It will be shown that, while both negative and positive effects are to be expected, a positive end result is more likely.

II Negative Effects

A) Effect on business travel

Greater and more convenient use of telecommunications might reduce the need for some business travel. In particular, if we look at the control and coordination requirements of larger businesses, a better communication and

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* Probably as a result, Canada Post recently launched an advertising campaign encouraging people to write to each other, stressing that the distinct and unique qualities of that particular for of communication.

information system allows people to reduce the number of trips needed to achieve the desired level of interaction.

But even if we look only at the communications associated with transactions between different firms, a lot can be carried out successfully by fax and with considerably cheaper phone conversations. Sales pitches and product demonstrations can be downloaded and Web sites sometimes provide a great deal of corporate information that would otherwise be difficult to obtain without some type of exploratory visit to the head office. Obviously the need for personal business travel will not disappear; face to face human contact is still necessary or highly desirable in certain circumstances. However, in many situations where a personal visit was previously unavoidable, the enhanced technology now available does reduce the need for it (and will do so even more in the future).

B) Travel to work

The above section dealt particularly (though not exclusively) with long-distance travel; however, the new technology also affects short-distance traffic. More and more people have decided to work from home, thereby avoiding the daily trip to the downtown office. This trend could not have occurred without easier communication and information gathering.

Consider the legal profession for instance: only a decade ago a solo practitioner needed almost daily access to a law library, whether through authorization from another private practitioner, the bar or university libraries generally located downtown. Today, the Internet and the databanks available by modem enable a lot of research to be done on a home computer. This reduces the need for frequent trips downtown.

The extent to which this phenomenon is widespread in the legal, academic or other fields has yet to be researched thoroughly. The overall impact of the new technology on short-distance travel is therefore difficult to assess. However, there is at least a potentially negative effect.

C) Visits to family or others

The huge reduction in long-distance telephone charges might create a negative effect on family visits and therefore long-distance human transportation. This hypothesis is based on the premise that telephone communication is a partial substitute for face-to-face interaction. If that is so, airlines and other long-distance transportation companies will have to reduce

their prices for this type of consumption in order to remain competitive. A point could however be made that the opposite is true, that where family contact is concerned, telephone, fax and personal visits are complementary products, insofar as more phone conversation between family members (assuming they like each other) could trigger a more intense desire to see each other. As they say, the more you eat, the hungrier you are...

Again, we are on shaky grounds and some interesting research in psycho-economics could shed some light on the issue.

III Positive Effects

In spite of the above arguments, human transportation might benefit indirectly from some of the effects of the technical revolution in information and communication.

A) Increased competition between transportation companies

Easier access to information, notably through the Internet, opens up unprecedented potential for price comparison between different carriers. This leads to price reduction, which should in turn bring an increase in overall human transportation demand. This phenomenon is likely to be particularly substantial in the pleasure-travel sector, where the demand is particularly sensitive to price changes. Simultaneously, greater competition will probably also lead some carriers to attract customers through service improvements, in order to create a degree of protection against price wars. In all likelihood, these «product differentiation» strategies should bring improvements in the quality and comfort provided by airlines, trains and bus companies for the non-business traveller, reversing the trend toward non-superior standards that has been observed for some time.

B) Economic effects on human transportation demand

Although the economic impact of the communication and information revolution has yet to become tangible for the majority of Canadians, there is no doubt that in the long run the greater efficiency caused by these developments should bring about positive economic effects. Indeed, improvements in the well-being of the overall population in some third world countries are certainly at least partly due to increased efficiency in communication. For instance, some companies now have part of their accounting work done in the Philippines. A better level of communication has facilitated outsourcing in foreign countries with cheaper labour, and in general, international trade has been favourably

affected by these developments. The resulting increase in global competition has certainly had a negative effect on individuals and organizations that previously enjoyed the benefits of a more protected economy; but in the long run, restructuring in the economies of first world countries should enable their citizens to enjoy a higher standard of living.

Demand for tourism and pleasure travel is very sensitive to income changes. It is to be expected that these industries and the related transportation enterprises will gain a lot from the wealth increase likely to result from improved economic well-being in the world. Some observers have already forecasted that the tremendous increase expected in the number of tourists from (previously) underdeveloped countries will mean that tickets for the Eiffel Tower have to be purchased six months in advance in the year 2025. Although this might seem overly pessimistic (or optimistic, depending on your point of view), these forecasts provide a good illustration of the likely positive effects of worldwide economic improvements (due partly to the communication revolution) on human transportation demand.

C) Increased number of tourist destinations

The information revolution (particularly the development of the Internet) gives small tourism-related business entities easy access to vast numbers of people. This might lead to increased tourist demand for locations that were previously little known and for which traditional means of advertising would have been too expensive.
Today, for instance, it takes just a few seconds to find out what facilities are available in Greenland, what to see, how to get there, etc., by clicking on the easily accessed Web site of the Greenland tourism office. The increased visibility of hitherto little-known tourist destinations will probably stimulate travel to these areas, creating new opportunities for the human transportation industry.

D) Increased globalization of the economy

The increased efficiency in telecommunications and information collection certainly does contribute to the globalization of trade and investment. This in turn has a positive impact on business travel, which obviously benefits the transportation industry (especially airlines). In other words, the argument is as follows: although new communication technology constitutes a substitute for business travel (at least to a degree, as shown), it does also increase the level of global trading and investment, which in turn increases the demand for human communication; this translates (at least partially) into an increased demand for business travel.

The question is therefore: which effects will be stronger? The direct or the indirect?

V Conclusion

This essay has attempted to show that both positive and negative effects on human transportation could occur as a result of the huge technological advances in the field of communication and information. On the one hand, the need for transportation for the purpose of human communication could be reduced, since other means of communication, cheaper both in terms of price and time, could constitute a transport substitute.
On the other hand, greater efficiency in communication and information could directly or indirectly trigger an increase, or at least a qualitative change, in travel demand, which should in turn have a positive impact on human transportation demand. In the author's opinion, the negative effects will be limited because the increase in global trading and overall economic well-being resulting from technological improvements will more than compensate for the substitute effect of non-face-to-face communication technology. However, further research into the present patterns of substitution between telecommunications and transport will permit more accurate forecasting.

Does Charter Chart the Way?

by
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Introduction

For approximately 20 years following World War II, rail and bus transportation were the primary means of intercity travel in Canada. Travel overseas was by large ocean-going ships. With the building of a national highway system and the introduction of the jet airplane in the 1960s, the automobile and the airplane became the dominant forms of passenger transportation.

Over the years, Canada has seen many changes to its passenger transport system, not only in terms of the modes of transport but also in the variety of fare and travel package choices offered to consumers. Competition and government policy and regulation have had a significant impact on these choices and on the supply and demand for transportation. This paper examines charter traffic in light of these factors and addresses the question of whether or not charter services open market gateways for scheduled services. The focus is transborder (US-Canada) charter aviation.

Competition and Regulation

In the years following World War II, regulations were introduced to protect fledgling air carriers[1] and the fragile domestic air transport system. The government of the day believed that Canadian carriers were in jeopardy because of high start-up costs, low population density (relative to the United States and Europe) and an immature market. The government recognized that Canada needed a reliable and dependable transportation system to permit the economy to grow.

[1] At that time, the government was primarily interested in protecting the government owned national airline then known as Trans Canada Airlines. Its main privately-owned competitor, Canadian Pacific, was restricted to a proportion of traffic handled by Trans Canada as well as having other restrictions placed on its operation.

In both the domestic and international[2] markets, entry of new carriers was restricted and routes were protected. Most nations, including Canada, required airlines to adhere to bilaterally negotiated agreements that protected air routes.

In the sixties, the face of aviation passenger transport changed forever. Wardair began to offer the travelling public the first international aviation charter services. The seemingly incompatible lower charter discount fares coupled with superior levels of in-flight service made charter operations an immediate success with consumers. The scheduled service airlines, such as Air Canada (then Trans Canada Airlines) and Canadian Pacific, took note.

As the transportation system in Canada became more mature, carriers began to recognize that while regulation provided a framework for continuation, meeting the needs of consumers was becoming increasingly important to the financial viability of airlines. Protected by regulation, Canadian carriers improved their financial performance, despite volatile business cycles, competition, the hardship of Canadian winters and the nation's low population density relative to the United States and Europe.

Government regulation was a two-edged sword in that it also inhibited the ability of carriers to compete and enter new markets. In the seventies and eighties, for example, some airlines began offering charter seats between the United States and Canada because they were not permitted by bilateral agreements to offer scheduled services.

When Canada introduced the *National Transportation Act, 1987*, it became easier for airline companies to obtain a licence to operate international charter services. Figure 1 shows that the number of charter carriers peaked in 1989 but then fell as competition and bankruptcies took their toll.

[2] In this paper, the term "international" denotes both transborder (Canada-US) and other international except where noted otherwise.

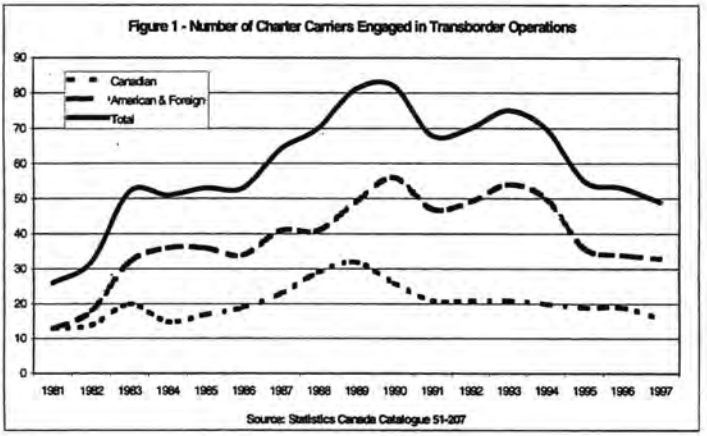
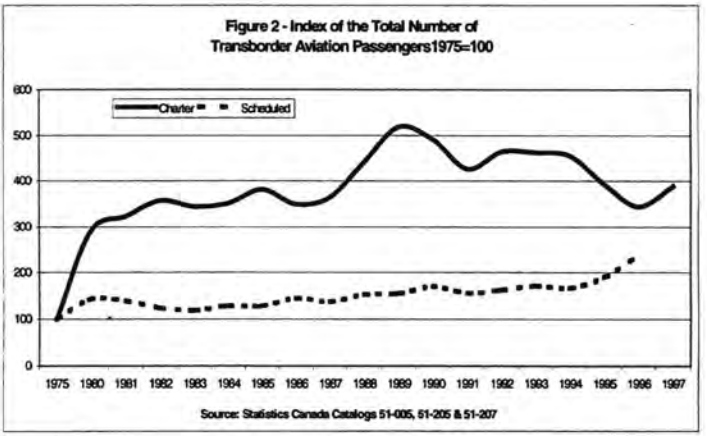


Figure 2 shows that with the increased seat capacity, the number of passengers peaked in 1989, but then fell again as competition reduced the number of air carriers.



The increase in the number of scheduled passengers after the signing of the "Open Skies" treaty in 1995 is also apparent in Figure 2. This treaty made it easier, in terms of legislation and regulation, for airlines to provide transborder services. It is estimated that over 100 city-pairs now have direct services that did not exist prior to "Open Skies". The treaty also resulted in a net increase in the number of passengers carried between Canadian and U.S. origins and destinations.[3]

Changes in the Charter Market

In the past, the traveller was often aware of the differences between the carrier that offered scheduled services (such as Air Canada and Canadian Airlines) and the charter carrier (e.g. Wardair). These differences were evident in terms of fares, reservations, restrictions on the length of stay, flight times and level of cabin service. Today, the airline passenger may not be able to distinguish the differences as easily because of the variety of fare packages, the increase in charter flight frequency, greater flexibility in terms of making reservations, etc.

Following the success of Wardair, other charter air carriers began operations by offering seats in low density and/or seasonal markets or where there was little competition from scheduled air carriers. Charters were able to take advantage of markets such as the winter traffic between Canada and various vacation sunspots, such as Florida.

At the same time, scheduled carriers began to offer their own charter flights. This was done for several reasons, including competing with the charters, supplementing revenue from their scheduled flights and improving aircraft utilization (especially on weekends and at night). Another reason was that charter flights provided a way to serve foreign markets where the bilateral agreements did not allow the scheduled carrier to operate. In some cases, charter flights were offered because the airline was not designated as an official carrier in the bilateral agreements.

Low overhead costs made some routes profitable for charter operators whereas the routes might not be profitable for scheduled carriers. This was because the airlines that offered scheduled services had higher fixed costs. Scheduled carriers needed to keep staff at all airports where they operated, and they flew regardless of whether the flight had enough fare paying passengers to cover marginal costs. They were required by government to operate non-profitable routes using financially lucrative routes to cross subsidize internal operations.[4] To protect the scheduled carriers, regulation was used to restrict competition and fares were regulated.

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[3] Interested readers may wish to read *Success of New Non-Stop Services in the Aviation Transborder Market*, by Robert Lund and Harold Kohn, CTRF Proceedings, Edmonton, May 1998.

[4] Government provided some subsidies.

Although the charter carriers were also required to obtain approvals from the government to operate each charter service, it was generally less costly for the charter carrier. This was because they did not need to fly a regular schedule and could cancel when the aircraft was not full. Overhead costs were lower because charter airlines could make agreements with fixed based operators to handle the airplane when it arrived (avoiding the need to maintain staff at all airports).

Initially the charter market was not of competitive concern to government regulators and the scheduled air carriers. The charter market was a small proportion of the overall aviation travel market. Charter did provide a way, however, for scheduled carriers to operate some services that they were not permitted to do under bilateral agreements. Once a carrier entered the scheduled service market, however, overhead costs often became higher.

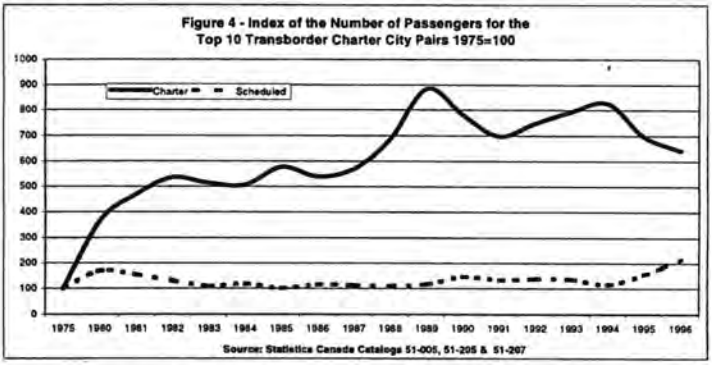
One of the charter airlines that entered scheduled service was Wardair. In 1989, however, Wardair was purchased by Canadian Airlines International. Figure 3 shows that when Wardair was purchased, it appears that many of its passengers were absorbed by several new charter companies.[5] Some believe that because of Canadian Airlines' continued focus on scheduled rather than charter service, the new charter companies were able to benefit from the gap left by Wardair.



[5] Data for Canadian Pacific and Canadian Airlines have been added together to show a continuous stream of passengers. The dramatic increase in traffic from 1986 to 1988 is a mostly a result of the absorption of Pacific Western Airlines traffic into CAL

The Current Environment

Figure 4 compares the number of passengers (in index form) carried by charter and scheduled carriers for the top 10 transborder charter city-pairs (1997 ranking).



The figure shows that coincident with the easing of regulations in 1988, charter traffic increased dramatically but fell shortly thereafter as competition took its toll on the number of charter carriers. The graph also shows that the number of scheduled passengers increased after the signing of the "Open Skies" treaty. This treaty, NAFTA and an improving economy all stimulated growth in the scheduled market.

The extent of this growth is shown in Table 1. Between 1975 and 1996, the number of passengers travelling by charter grew at a faster rate than the number of passengers travelling on scheduled services. However, since "Open Skies", this trend has been reversed. In 1997, charter traffic once again began to increase.

Table 1 - Average Annual Growth Rates for the Top 10 Transborder Charter City-pairs (1997 Ranking)

	Charter		Scheduled	
	1975-1996	1994-96	1975-96	1994-96
Top 10 Charter City-pairs	8.8%	-12.2%	3.5%	36.2%
Total All City-pairs	5.8%	-13.1%	4.0%	18.8%

Figure 5 shows that the top 10 charter city pairs represent an increasing proportion of charter traffic. This indicates that the charter airlines are concentrating their charter flights to a select number of cities.

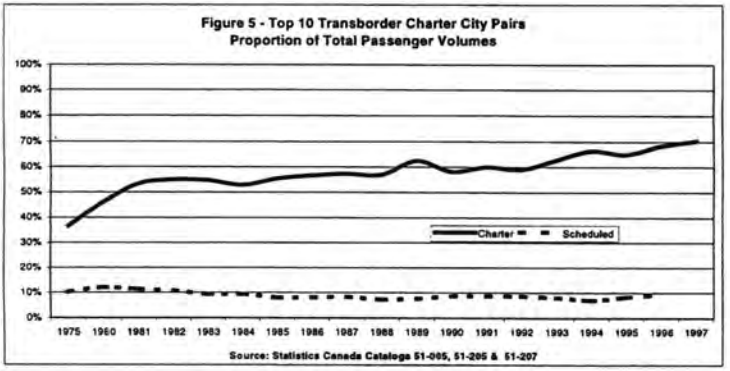
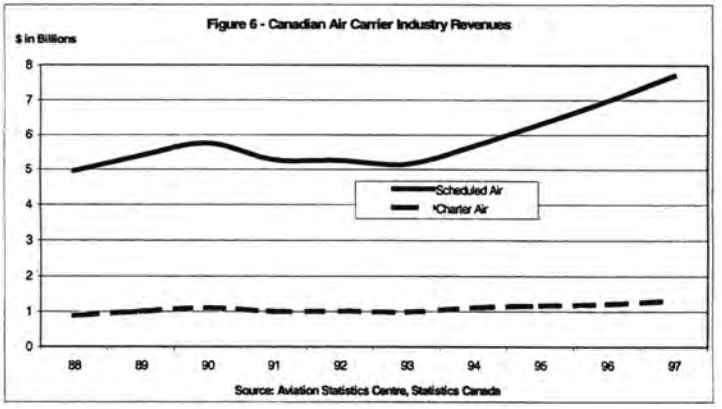


Figure 6 shows total revenues earned by scheduled air carriers have increased noticeably since 1995. Although charter has also enjoyed a revenue increase, the rate of growth has not been as significant. The proportion of revenues earned by the charter carriers has remained almost constant at 15 percent.



Does Charter Chart the Way?

In his article entitled "The Canadian Aviation Charter Market: Opening New Transport Gateways or Niche Market Pricing?"[6] Gordon Baldwin concluded "*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*". He noted that in 1974, the top 37 international charter markets had 51 percent of the routes also served by scheduled carriers and that in 1995, this proportion had increased to 73 percent.

Since 1995, the impacts of "Open Skies" have included an increase in the number of direct scheduled flights between city-pairs in Canada and the United States as well as an increase in the number of scheduled passengers.[7] It is estimated that over 100 transborder city-pairs have direct service that did not exist before "Open Skies". However, the impact on charter service must be studied in terms of the easing of restrictions in 1988.

In 8 of the top 10 busiest charter city-pairs (see Chart 1), charter traffic rose after Canada made it easier in 1988 for airlines to obtain transborder licences. In addition, there was a significant increase in the number of new charter airlines. As might have been expected, competition caused by market entry of multiple new companies and services caused numerous bankruptcies. As a result, there was a decrease in both the number of charter airlines and passengers in the years following the 1988 deregulation. In 1995, with the signing of the "Open Skies" treaty, there was a significant increase in the number of scheduled flights and passengers. Eight of the 10 busiest charter market city-pairs exhibited a decrease in the number of charter passengers at the same time as the airlines were increasing the number of scheduled flights and passengers. Also, the number of charter passengers began to decline, but in 1997, charter traffic has again started to rebound.

Conclusion

The increase in scheduled traffic following "Open Skies" was in part a stimulation of traffic but also came at the expense of charter traffic. Nevertheless, despite setbacks in the two years following "Open Skies", the charter airlines seem to have recovered and are now showing increases in passenger loads. Thus, it could be concluded that, in the era following "Open Skies", as was the case between 1975 and 1995, the charter carriers have

[6] CTRF Proceedings, Annual Conference May 26-29, 1996, Winnipeg, Manitoba Volume 1 page 212, by Gordon G. Baldwin.

[7] ibid. Lund and Kohn CTRF 1998

continued to create gateways and market opportunities for scheduled airline services. Charter airlines may continue to chart new ways that, in the future, will once again be targeted by scheduled carriers. Charter airlines have shown, over the years, the ability to adapt to changes in both regulation and competition. They have offered consumers many choices. Only the future will tell if the charter carriers have the ability to continue to adapt to change.

***

Methodological Note

Data sources: Scheduled data are based on the publication 51-205 "Air Passenger Origin and Destination, Canada-United States Report". Charter data are based on "Air Charter Statistics" (catalog number 51-207).

For 1996 and 1997, certain airline data were estimated by adding the Statement 6 "Daily Airport Activities Report" to charter data.

For the purposes of this study, charter carriers include those that utilize travel agencies to sell tickets.

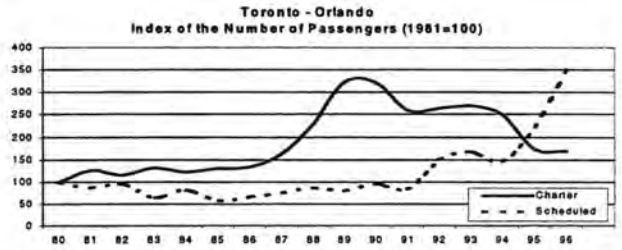
To prevent the identification of carriers in certain markets (that is possible after combining data from the Air Charter Statistics survey and the Daily Airport Activities Report) and therefore to protect the confidentiality of data, the authors have used indices rather than the number of passengers.

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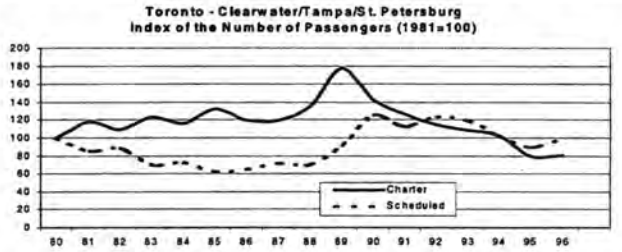
The opinions expressed in this paper are the views of the authors and do not necessarily represent the opinion of Statistics Canada or the Government of Canada.

The authors would like to thank Bob Lund, Rolf Hakka, Alain Poirier and Carole Daneau.

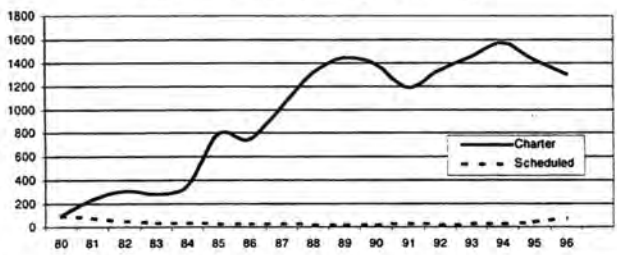
Chart 1 - Analysis of Historic Traffic
10 Busiest Charter City-pairs (1997 Ranking)



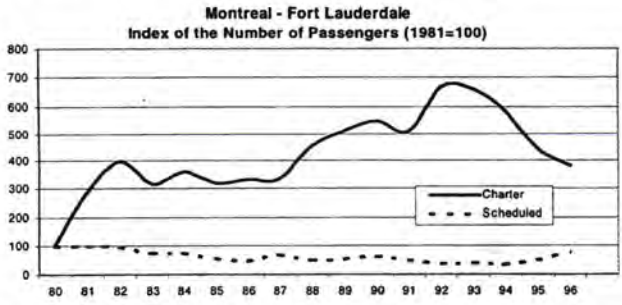
Charter traffic increased in 1988 after Canada's deregulation made it easier for carriers to obtain transborder operating licences. Consolidation of the industry then occurred. Scheduled service increased in 1995 as a result of "Open Skies". Air Canada converted its charter flight to a scheduled flight on this route in 1995. Canadian Airlines introduced a new scheduled service on this route at the same time. Although charter traffic dropped after the 2 airlines converted/added scheduled service, charter traffic has (in 1997) again begun to increase. Charter traffic declined with the addition of new scheduled service after "Open Skies".



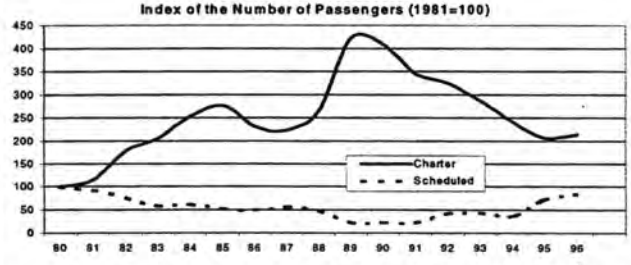
Both scheduled and charter traffic increased in 1988 after Canada's deregulation. Scheduled service fell starting in 1993 but began to increase in 1995 as a result of "Open Skies". Air Canada provided scheduled service prior to "Open Skies". Delta suspended its scheduled service on this route after "Open Skies". Canadian Airlines and American Airlines both started a new scheduled service on this route after "Open Skies" but suspended it later. Charter traffic declined as scheduled traffic increased both in 1989 and again after "Open Skies".



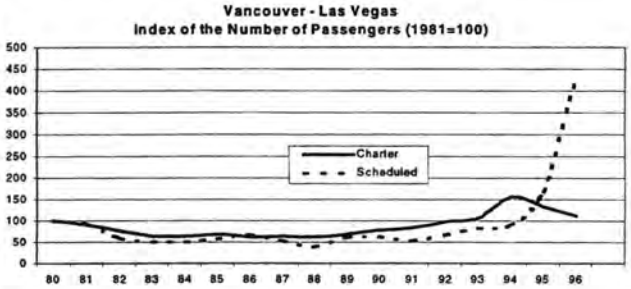
Air Canada introduced a new scheduled service on this route after "Open Skies". Charter traffic has increased steadily over the years although there have been periodic declines. Charter traffic did peak in the late 1980s consistent with regulatory changes in Canada that made it easier for airlines to obtain transborder licences. With the introduction of new scheduled services after "Open Skies", charter traffic declined.



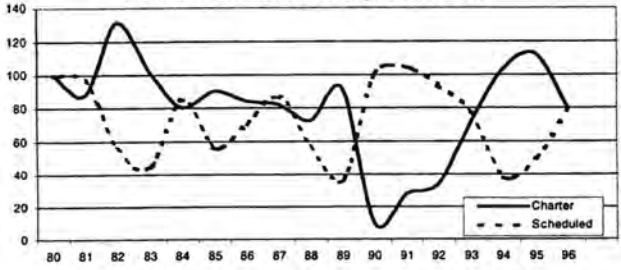
Air Canada converted its charter flight to a scheduled flight on this route after "Open Skies". Charter traffic experienced a decline with the introduction of the new scheduled service. As with the other city-pairs, charter experienced an increase with the 1988 deregulation and then a decrease because of the effects of competition.



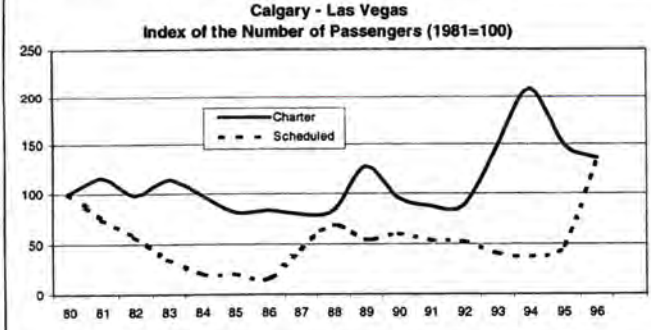
Air Canada converted its charter flight to a scheduled flight on this route after "Open Skies". Canadian Airlines converted this route from charter to scheduled but subsequently suspended the charter. Charter experienced an increase after 1988. Scheduled service increased after "Open Skies" and at the same time charter declined.



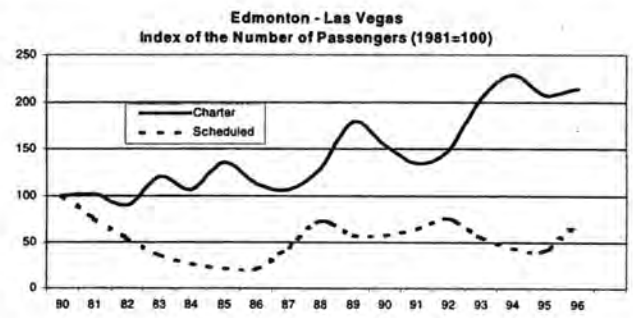
Alaska Airlines and Canadian Airlines introduced a new scheduled service on this route after "Open Skies". America West, which had started a new scheduled service on this route, suspended it later. Unlike the other city-pairs, charter traffic did not increase appreciably after 1988 but it did decline after "Open Skies" when the new scheduled services were introduced.



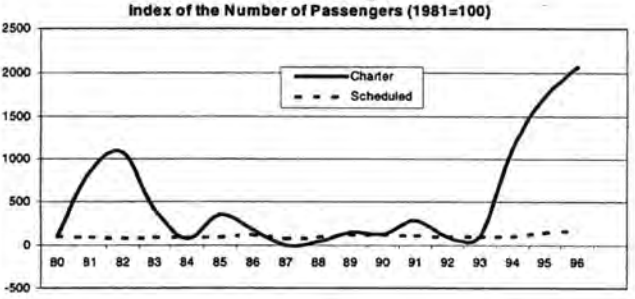
The Vancouver – Hawaii route has exhibited several peaks and declines since 1980. Charter traffic increased in 1988 but declined thereafter, rising again to peak in 1995 coincident with "Open Skies". As with the other city-pairs, charter traffic declined as scheduled service increased. Air Canada converted its charter flights between Vancouver and Honolulu and between Vancouver and Kahului/Maui to scheduled flights after "Open Skies". Canadian Airlines provided a scheduled service between Vancouver and Honolulu before "Open Skies". Once again, scheduled traffic increased at the expense of charter traffic.



As with the other city-pairs, charter traffic increased after 1988 but declined thereafter. Scheduled traffic increased after 1995 consistent with "Open Skies", and again, charter declined. Canadian Airlines converted this route from charter to scheduled after "Open Skies" but suspended this service subsequently. Delta also suspended its new scheduled service on this route.



Charter traffic increased after the 1988 deregulation and declined thereafter. In 1995, after "Open Skies", scheduled service began to increase and although charter traffic declined just before "Open Skies", it has shown a recovery even at the same time as scheduled traffic has increased. Canadian Airlines converted this route from charter to scheduled, but suspended this service subsequently.



As with the other city-pairs, charter traffic increased after 1988 and did not show a significant decline immediately thereafter. However, charter traffic increased substantially in 1993 prior to "Open Skies" and, as with the other city-pairs, scheduled services also increased as a result of "Open Skies". Air Canada, Alaska and United introduced new scheduled services on this route after "Open Skies". Canadian Airlines provided scheduled service prior to "Open Skies". Delta suspended the scheduled service it had been operating before "Open Skies".

Traveller Accommodation and Passenger Air Travel in Canada: The Management of Derived Demand for "Perishable" Products

Gordon G. Baldwin
Assistant Director, Services Division
Statistics Canada

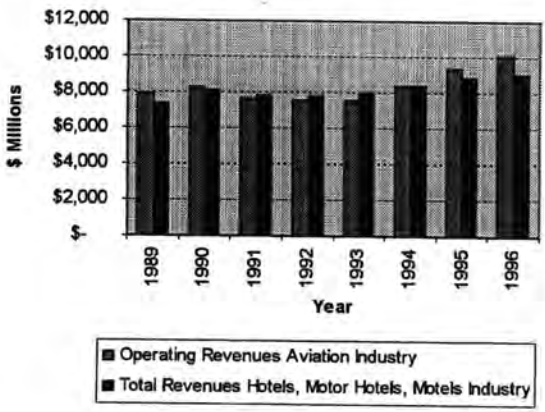
Introduction

The commercial aviation and the accommodation industries have much in common. Both reflect derived demand, they are both the result of consumption while doing something else: business or leisure travel. Both have much of their product sold by third parties (travel agents). Both industries attempt to segregate markets with the goal of generating the highest yield possible. Both have products with seasonal peaks and troughs, and the challenge of generating the highest yield possible for a product where inventories are impossible. "A common feature of each of these industries [the lodging, ... and airline industries] is that firms are selling to customers access to a limited number of spaces at a point in time".[1] If a room is not rented for a night, the revenue is lost forever. Once a flight departs, an empty seat cannot be sold. This paper examines the similarities and differences found in the Canadian marketplace for these two service industries and the relative successes that they have had in translating the management of derived demand for a "perishable" product into financial viability.

Industry Performance in the 1990's

Chart 1 shows the revenue performance of the Canadian aviation and Hotel & Motel industries during the period 1989-1996. Similar performance patterns are visible in both markets. From peaks in 1990, revenues declined during the period 1991-1993 as the recession affected demand from both the business and leisure travellers. With both industries, it was not until 1994 that revenues surpassed those of 1990.

Chart 1 Revenues, Canadian commercial Aviation Industry and Hotel & Motel Industry, 1989-1996



Source: Statistics Canada catalogue 51-206 and 63-204

While the revenue patterns appear to be quite similar at the total level, there are differences in the constituent components of the revenue. There is more diversity in the source of the revenues in the accommodation industry where only 55% of total revenues come from the provision of accommodation services.[2] Other key revenue areas include:

- meals, 18%;
- alcoholic beverages, 16%;
- other (telephone surcharges, video and film rentals, business services, etc,) 11%.

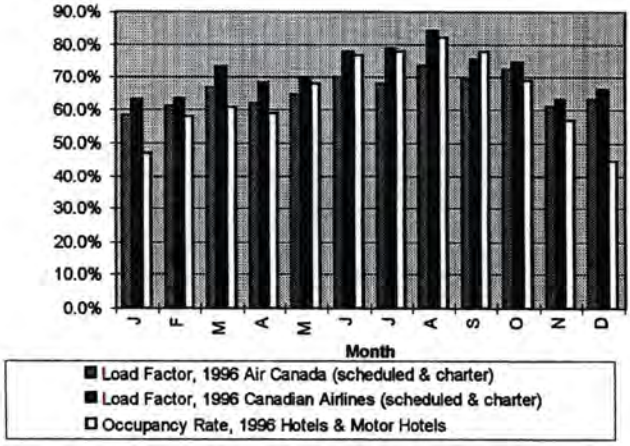
The major Canadian airlines' revenues are generated primarily from passenger revenues. For example, in 1997, Air Canada's operating revenues were made up of 81% of passenger revenue with the remaining accounted for by 7% of cargo revenue and 12% of other revenue (selling "maintenance and engineering expertise, materials and other services").[3] Canadian Airline International Ltd.'s revenue picture was similar with 85% of passenger revenue, 8% of cargo revenue and 7% of other revenue.[4] The hotel and motel industry's greater

dependence on non-accommodation revenue means that they are more susceptible to competitive pressure, not just from other accommodation providers but also from nearby restaurants, bars and coffee shops. For hotels and motels "competition from outside has been devastating to many a hotel dining room...".[5]

Seasonality in the Aviation and Accommodation Industries

The chart below shows the relative success at managing demand and capacity in both the aviation and accommodation industries. In both industries there is more demand during the summer months. For the aviation industry, the chart shows the load factors[6] (for both scheduled and charter services) for the two major Canadian carriers Air Canada and Canadian Airlines.

Chart 2 Seasonality in the Canadian Aviation and Accommodation Industry, 1996



Source: Statistics Canada, catalogue 51-004 Table 1 and catalogue 63-204 Table 9

There are similarities between the aviation and accommodation industries evident in Chart 2. For both industries, the demand, relative to supply, is

highest during the period June to August and lowest from November to February. There also are differences apparent. The range between peak and trough is twice as great in the accommodation industry, almost 40% versus 20% in the aviation industry.

Why is the seasonality, the range between peak and trough, smaller for the aviation industry? An airline has variable costs that are the direct result of their flight operations and fixed or non-operating costs that are incurred whether or not flights occur. When demand is soft, cancelling flights lessens the variable costs. This would not have an impact on the non-operating costs, at least for short-term cancellations (i.e. reducing the frequency of flights as opposed to pulling out of a market completely). If operating costs were large enough, relative to non-operating costs, it would make sense to lessen capacity as demand softens.

In commercial aviation, many of the costs are known as "direct flying costs". These are directly related to the operation of flights and would include items such as fuel and oil, landing and navigation fees, passenger food and supplies. In 1997, these three items alone accounted for almost one quarter of the total operating costs for the 27 largest Canadian commercial air carriers.[7] Given the significance of the variable, direct flying costs, there is an incentive to cancel flights in seasons during which demand is low.

If the downturn in demand was longer term, due to the business cycle rather than seasonal factors, there are other direct flying costs that could be saved including insurance, aircraft rental, and maintenance of flight equipment. These accounted for a further 22% of the total operating costs.[8] In a severe downturn, there could be savings in both flight crew and cabin crew salaries and expenses, if sufficient flight capacity was curtailed to require the lay-off of staff. These flying costs accounted for a further 11.4%.[9] With 57% of the expenses for the air carriers being dependent on flight activity, there is a very strong reason to try to match supply and demand to control costs.

Domestic versus International Business

In terms of passenger revenue, in 1997, 55% of Air Canada's passenger revenue came from flights to or from Canada and 45% of their revenue from domestic flights.[10] For Canadian Airlines International, the figures were the same.[11] By contrast, in 1996, for the Canadian hotel and motor hotels, 20% of their client base was foreign versus 80% of domestic clients. Motels were even more heavily weighted to domestic clients with 91%.[12] With a heavier dependence on foreign business (either foreign passengers or Canadians destined for foreign destinations), the aviation business is more susceptible than the accommodation industry to changes in exchange rates and the economic conditions outside Canada.

The major Canadian air carriers have been trying to lessen their vulnerability to changes in economic conditions outside Canada and to the seasonal nature of flying by emphasizing the higher yield, must fly, business traveller. Air Canada has attempted to lessen the impact of seasonality by concentrating their market expansion into less seasonal, higher yielding business markets. Air Canada's move from 28 to 72 Canada-United States routes over a three year period[13] was primarily into "short haul flights, using smaller aircraft, which catered to business traveller preferences for convenient and direct flights between business centres. Revenues from Executive Class service increased by over 50 per cent.".[14] A similar plan was in place at Canadian Airlines which "adjusted its transborder flying strategy to be in line with its focus on high-yield business traffic. The transborder network was realigned and refocused on business centres...This meant cancelling a number of non-profitable routes to 'sun' destinations where load factors were high but yield was low."[15]

Cost Structure

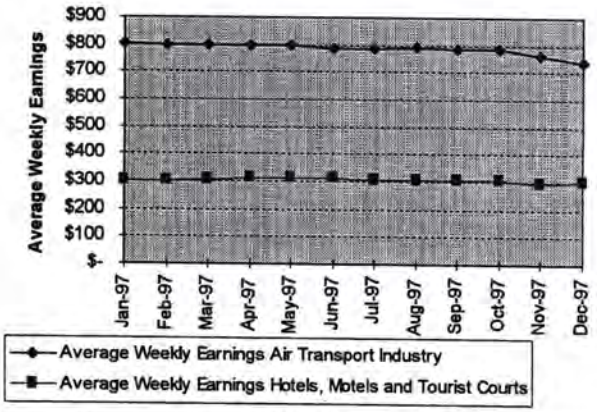
The labour component is important for both of these industries. For larger hotels and motor hotels (establishments with revenue greater than $250,000), 32% of their expenses are salaries, wages and benefits.[16] For the largest Canadian commercial air carriers (revenues greater than $500,000), wages and salaries account for 24% of operating expenses.[17]

While the labour components are both important, there are key differences. Chart 3 shows the average weekly earnings, excluding overtime, of all employees in the air transport industry and in the hotels, motels and tourist

courts industry. The average weekly salary in air transport is more than twice as high as that in the accommodation industry.

The higher average remuneration in the aviation industry could affect firm behaviour during either an economic downturn or a seasonal slowdown. Skilled, higher paid, unionized employees are less likely to be let go. This may explain the differences in the Labour Force Survey job tenure figures—the length of time with the current employer. While the accommodation industry had an average of 55 months, the transportation industry averaged 121 months.[18] There can be other reasons for the difference in the turnover rates. With lower paying jobs and many different establishments in the accommodation industry there may be more incentives for accommodation industry employees to voluntarily change employers.

Chart 3 Average Weekly Earnings, Air Transport and Hotels, Motels & Tourist Courts, 1997

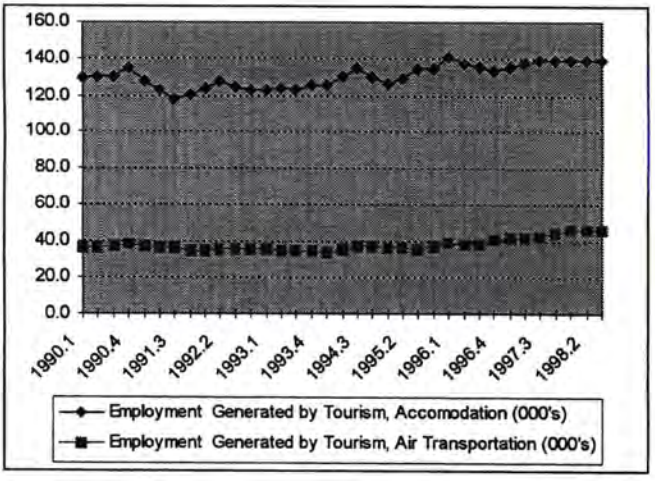


Source: Statistics Canada, CANSIM matrix L58684 and CANSIM matrix L58811

A few interesting things are visible in Chart 4, which shows the change in employment, as a result of tourism, by quarter for both the accommodation and air transportation industries[19]:

- during the period from the first quarter through the third quarter 1998, there were quarter to quarter declines in 12 quarters for the accommodation industry contrasted with 14 quarters showing declines for the air transportation industry;
- The volatility was much greater, however, with the accommodation industry, which showed a much greater variation between peak and trough. The stronger growth in the air transport industry in late 1996 on is likely due to the expansion in routes as a result of the new Canada-United States aviation bilateral agreement, which came into effect in 1995.[20]

Chart 4 Employment Generated by Tourism—Accommodation and Air Transportation Industries[21], 1990-1998



Source: Statistics Canada, CANSIM matrix D19215 and Matrix D19209

As was the case with the peaks and troughs in utilization (Chart 2), the employment change peaks and troughs in Chart 4 appear to be more extreme for the accommodation industry. The volatility of the employment may be due to the fact that 33% of the employment in the accommodation industry is part-time employment.[22] This compares with 19% for the Canadian economy.[23] It

may be easier for the firms to lay-off and re-hire the part-time employees thereby using the labour component as the way to adjust costs in response to changes in demand for the "perishable" product.

Conclusion

The Canadian commercial aviation and accommodation industries both cater to the leisure and business markets, both are subject to summer peaks and winter troughs and were both negatively affected by the recession in 1990-92. However, although the two industries have much in common, there are some differences. The two industries differ in that the sources of revenues in the accommodation industry are more varied, and it is less affected by changes in foreign economic performance. The accommodation industry has a work force that is appreciably lower paid and that tends to have more turnover in staff (less tenure with the same employer). Rather than putting the emphasis on the reduction of the supply of rooms available during periods of lower demand, there appears to be an attempt at cutting labour costs. The aviation industry has a high percentage of costs that are directly related to the supply of flights offered, building in a strong incentive to balance supply with demand, by cancelling flights, with less emphasis in cutting labour, during low demand periods. The factors result in the range between the summer peak and the winter trough being greater in the accommodation industry than in the aviation industry.

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, Bob Lund, Don Little, Mike Lynch and Janice McMechan for their valuable comments, corrections and criticisms while retaining all responsibility for any remaining errors.

Endnotes

[1] Michael W. Pustay, "Six Myths of the Contemporary Airline Industry", Proceedings of the Thirty-Third Annual Meeting Transportation Research Forum, page 557, October 1991.

[2] Statistics Canada, Traveller accommodation statistics 1996-97, catalogue 63-204, page 18, Table 3.
[3] Air Canada, Annual Information Form, May 6, 1998, pages 16, 23 and 24. Revenues are consolidated revenues for Air Canada, AirBC, Air Ontario, Air Alliance and Air Nova.
[4] Canadian Airlines Corporation, Annual report 1997, page 35. Revenues are consolidated revenues for Canadian Airlines and Canadian Regional Airlines Ltd..
[5] Rick Bruns, "The Power of Quality", Lodging Magazine, January 1998.
[6] A measure of passenger capacity utilization using revenue passenger-kilometres as a percentage of available seat-kilometres.
[7] Statistics Canada, Canadian Civil Aviation 1997, catalogue 51-206, Tables 3.10, 3.2 and 3.3.
[8] Statistics Canada, Canadian Civil Aviation 1997, catalogue 51-206, Tables 3.10, 3.2 and 3.3.
[9] Statistics Canada, Canadian Civil Aviation 1997, catalogue 51-206, Tables 3.10, 3.2 and 3.3.
[10] Air Canada, Annual Information Form, May 6, 1998, page 11; $1,268 million in US transborder revenues, $1,234 million in other international passenger revenue and $2,031 million in domestic passenger revenue.
[11] Canadian Airlines International Ltd., Annual Report 1997, page 20; $1,196 million in international revenues and $992 million in domestic passenger revenue.
[12] Statistics Canada, Traveller accommodation statistics 1996-97, catalogue 63-204, page 19, Table 4.
[13] Air Canada, 1997 Annual Report, page 6.
[14] Air Canada, 1996 Annual Report, page 24.
[15] Canadian Airlines Corporation, Annual Report 1997, page 10.
[16] Statistics Canada, Traveller accommodation statistics 1996-97, catalogue 63-204, page 18, Table 3.
[17] Statistics Canada, Canadian Civil Aviation 1997, catalogue 51-206, Tables 3.1 and 4.1.
[18] KPMG, Human Resources Study of the Canadian Accommodation Industry—Detailed Report, Fall 1995, page 43.
[19] Statistics Canada, CANSIM matrix D19215 and CANSIM matrix D19209.
[20] Air Canada, 1997 Annual Report, "Air Canada increased employees in 1997 mainly in relation to the 9 per cent growth in ASM capacity, excluding subsidiaries.", page 33.

[21] Data are based on the Survey of Employment, Payroll and Hours (SEPH) and Input/Output data. For a description of the methodology, see Statistics Canada, Guide to the National Tourism Indicators: Sources & Methods, catalogue 13-594, pages 8, 37-38.

[22] Statistics Canada, Traveller accommodation statistics 1996-97, catalogue 63-204, page 19, Table 4.

[23] Statistics Canada, CANSIM matrix D984840 and D984788, Canadian Labour Force Characteristics, annual averages, par-time and full-time employment, age 15+.

AIR TRAVEL DECISION MAKING, THE IMPORTANCE OF FREQUENT FLYER PROGRAMS

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Victor Rueda
Transport Institute, University of Manitoba.

Introduction

Several factors have been found to influence air travelers in their air carrier decision making process. Literature in marketing and transportation management report mixed results with respect to the extent frequent flyer membership programs influence air travelers in their air carrier perceptions and in selecting a particular airline over another in their decision making process. The general consensus is that such programs do influence travelers in their decision making. However, in a number of cases this influence is not great

Our research addresses the question related to the relative importance of frequent flyer programs. The thrust of our research question, however, focuses on the extent to which the degree of loyalty to a given airline serves as a barrier to enter for new carriers into established markets. Posing the question in terms of traveler's loyalty towards established carriers rather than on consumer preferences and decision-making processes provides managers a glimpse of the hurdles they may confront in challenging incumbents carriers.

A body of literature in marketing has suggested that conjoint analysis is an excellent method for ascertaining the relative and absolute importance specific factors play in a purchase choice situation. Based on several projects already completed by the authors, conjoint methodology presents an attractive approach to measuring the loyalty issue. In our study, we employ the conjoint methodology and ask passengers from Winnipeg, Canada, to asses their likelihood to choose a carrier for which they hold frequent flyer membership. We manipulate the values of several flight attributes in a quasi-experimental exercise to determine the relative importance of carrier loyalty with respect to these other flight attributes. The basic objectives of our study are discussed in the following section.

Study Objectives

The importance of frequent flyer programs as barriers to new air carriers to enter a new market is analyzed. As well, the influence of frequent flyer programs in passengers choosing longer or more inconvenient routes in order to collect more miles is studied. Specific research questions our study addresses are as follows: 1) Is the likelihood of selecting a particular air carrier enhanced given the responding traveler holds membership in that carrier's frequent flyer program? 2) Is the likelihood different if a responding passenger holds membership in more than one frequent flyer program? 3) If there was a perceived or actual price or service disadvantage between the carrier a respondent holds frequent flyer membership and a competitive carrier, would the respondent maintain preference for the carrier its membership is with?

Frequent Flyer Programs

Frequent flyer programs are a variation of the old trading stamps schemes where customers could collect grocery stamps according to how much they has spent, and trade them for a price when the card was full. In the same way, travelers who are members of a frequent flyer program can earn points for kilometers or miles traveled, and trade them for an upgrade in seating, or the occasional free ticket.

What were called "frequent flyer points", or "air miles," began in 1981 as an American Airlines Inc. initiative to gain the lucrative loyalty of the frequent business traveler has proved to be such a potent marketing tool that today no airline can afford not to have a frequent flyer program.[1] Currently, all airlines together in the United States have issued more than 80 million memberships. It is possible to earn points for the money spent by choosing to stay at selected hotels, using nominated car rental companies, or by paying for those items using specified credit cards.

Joining an airline frequent flyer program is simple-just complete an application form, pay the membership fee (if there is one), and quote the customers' membership number every time a flight is taken. The main objective of frequent flyer programs is to build customer loyalty. By offering free flights every certain amount of miles, customers are more likely to keep using the airline that gives them this service.

[1] Canadian Business. Jan, 1996, 69,2, pp. 95.

From the total revenues of the airline industry, 68% comes from business travelers. Therefore, airlines are particularly interested in targeting business travelers to know their profile, interests, income, and travel patterns. Given the big portion of revenues that comes from business travelers, this segment of the market is the one which airlines are more interested.

Literature Review

The literature assessing frequent flyer programs is found in both the academic and professional journals. While the academic work tends to address the relative importance of such programs in terms of improving consumer loyalty, writings published in professional journals and magazines tend to depict examples of new strategies and tactics airlines employ to compete for traveller loyalty. Mowlana and Smith (1993) report that American Airlines became the industry pacesetter in 1981 and was challenged by Braniff shortly thereafter. American's success has been dramatized by the growth in program membership from 2 million in 1984 to over 11 million by 1990 (O'Brian and Nomani, 1990). The program initially centered in North America has spread to other countries and is presently a major marketing effort worldwide (Rice, 1990).

In terms of effectiveness in increasing traveller loyalty, a recent survey has reported that respondents indicate that frequent flyer programs are the most important factor in selecting an air carrier (National Underwriter, 1994). Other writers report a strong effect for frequent flyer programs in increasing traveller loyalty (Bond, 1995; Napach, 1997; Churchill, 1996; and Sansoni, 1996). On the other hand, a growing number of writers are reporting less than spectacular performance for these programs. (Hu, Toh, and Strand, 1988; Dean, 1998; Stephenson and Fox, 1987; Kearney, 1990; Nako, 1994; Bruning, 1997; Bruning and Prentice, 1997a; and Bruning and Prentice, 1997b). Kearney (1990) reports that by 1986 24 of 27 major airlines offered a frequent flyer program. However, his analysis indicates these programs are strategic failures. Nine factors are offered for explaining the ineffectiveness of flying programs to increase traveller loyalty and participation. Nako (1994) corroborates Kearney's findings in his study of disaggregate travel data for the 1990-1991 period. One important conclusion is that frequent flyer programs are neutralized very easily by both large and small carriers. No significant differences were found between frequent flyers and non-frequent flyers regarding their preferences over fares and service characteristics. Bruning (1997), and Bruning and Prentice (1997 a,b), present results similar to Kearney and Nako. Participation in frequent flyer programs does not negate the effect of price, travel time, and on-time performance and dependability. While participation in a frequent flyer program

enters the decision process, it is not dominant and, furthermore, is easily neutralized by slight variations in other flight and carrier characteristics.

The growing body of work is indicating a marginal impact at best for flyer programs in increasing traveller loyalty. If this proposition holds, then should we expect frequent flyer programs to inhibit the effectiveness of entry by carriers not participating in such programs? In other words, with no frequent flyer program offering would a carrier entering a market anew face significant barriers? The remaining portions of the article outlines our attempt to answer this question.

Methodology

Following previous methods for addressing traveller loyalty in air carrier markets, we adapted our instruments to answer the above mentioned research question. The refining of our research instrument took place at the Winnipeg Airport. The personal interview questionnaire was pre-tested with a cross-section of air travellers at the airport and further reviewed and refined by airport personnel as well as by research staff of the Transport Institute at the University of Manitoba.

Once pre-testing was completed, a judgement sample of 361 respondents was drawn from the Winnipeg International Airport during the summer of 1998. Data were collected across a number of days, times, and flights in order to represent the nature of demand for the airport. Individual travelers were interviewed and a quasi-experiment was conducted. The interview instrument contained questions which related to the likelihood of selecting a carrier based on differences in price, service level, whether established or newly entering carrier, and whether the carrier offered a frequent flyer program. The quasi-experiment consisted of the manipulation of combinations of flight characteristics and asking respondent travelers to indicate their likelihood of selecting a carrier with each of sixteen attribute combinations. After data collection was completed, a statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS).

Sample Profile

In terms of age, only 11.2% of the sample are younger than 20 years. Respondents between 21 and 50 years old represent 71.7% of the sample, 15.2% of the sample are between 51 and 60 years old. Finally, only 1.9% of air travelers are over 61 years old. As for income, the sample under study is composed of average to high household income respondents. Only 9.5% of respondents have incomes below $29,999 per year. 90.5% of respondents

incomes are at least $30,000 on an annual basis. Groups are broken down in the following way: 28.5% of the sample range between $30,000 and $59,999, 28.9% are in the range of $60,000 and $89,999, and 33.1% of the total sample, representing the largest group in terms of income, make $90,000 or over per year.

In terms of gender, 58.4% of the sample are males, against 41.6% of female respondents. Passengers were interviewed at all times of the day at the gate areas of the Winnipeg International Airport. The sample is composed of primarily business passengers (around 70%), being the remaining 30% pleasure travelers. The most mentioned occupations are professional workers (30.6%), executive/management personnel (14.6%), and students (14.3%).

Frequent flyer programs, usage degree

To have a clear understanding of the importance of frequent flyer programs for passengers, the first issue is the degree to which passengers fly with an airline they hold frequent flyer memberships. On average, research findings show that 54.1% of respondents fly with an airline they hold frequent flyer membership in all of their trips. Approximately 50% of passengers fly collecting miles in half of their trips. Finally, 27.4% rarely fly with carriers with which they collect frequent flyer miles.

This information shows that a significant number of passengers fly with carriers with which they collect frequent flyer miles. Overall, this information suggests that frequent flyer programs are a significantly important flight attribute for passengers. The question that arises is the degree to which this flight attribute is important for different types of passengers, which will be discussed later.

Importance of frequent flyer programs

Frequent flyer programs play a role in decision making. Their degree of importance varies along different types of travelers. To assess the importance given to frequent flyer programs by themselves, everything else remaining constant, respondents were asked to rate the importance of the availability of this flight attribute on the following scale:

	Very Important						***Very Unimportant***
Availability of frequent flyer programs	*7*	*6*	*5*	*4*	*3*	*2*	*1*

Responses are widely distributed along the scale. Those passengers that consider the availability of frequent flyer programs an unimportant flight attribute (numbers 1 to 3) account for 28.2% of the sample. 16% of respondents remain neutral to this issue (number 4). Finally, those respondents that consider the availability of frequent flyer programs a very important flight attribute account for 55.2% of the sample.

In terms of demographic profile, supporters of frequent flyer programs possess the following characteristics: 1) higher incomes on a yearly basis, 2) mostly business travelers with executive/CEO, professional, and management positions, and 3) between 51 and 60 years of age. Another demographic characteristic that was found is that males consider mileage programs more important than do females.

The above information shows that frequent flyer programs are an important flight attribute for a significant number of passengers, if all other flight attributes remain constant.

Frequent flyer programs versus other flight attributes

Assessing the perceived importance of several factors that intervene in air decision making assists in understanding which are the most important decision making factors. On the same scale from 1 to 7 shown above, respondents were asked to rate the importance of the following flight attributes: Time of departure, time of arrival, on-time performance, number of stops, recommendations of travel agents, availability of frequent flyer programs, and ticket price.

Results show that ticket price is the most important flight attribute for passengers, closely followed by on-time performance and number of stops. There is a small gap between these three attributes and the next two, time of arrival, and time of departure. Another gap follows, and next is the availability of frequent flyer programs. The last attribute is the recommendations of travel agents.

As shown, there are several flight attributes that can play a more important role than frequent flyer programs in carrier decision-making. When situations in which passengers have to trade flight attributes to make a decision, it is possible to see the real value and importance of flight attributes with respect to one another.

The above results are relatively consistent with passengers' answers when asked which are the three most important flight attributes that come to their mind when making a decision on which airline to fly. Most frequent

responses are the following, in this order: Ticket price, number of stops, and on-time performance.

Ticket price and the number of stopovers were the most important decision making attributes when choosing an air carrier, everything else remaining constant. Hence, we analyzed passengers' traveller choices when changes were made among several different flight attributes involved in the decision making process.

Frequent flyer programs and carrier choice

To assess the importance of frequent flyer programs, among other factors, on airline decision making, a conjoint analysis was used. As previously mentioned, the conjoint analysis consists of the rating by passengers of sixteen different flight situations in which levels of four flight attributes were allowed to vary. The purpose of this exercise was to see if a given flight attribute has the same effects for travellers choices when on different flight flight attribute combinations were active.

The following is the description of the conjoint analysis that appeared on the research instrument:

TRAVEL SCENARIO

You are scheduling a trip for yourself from Winnipeg to a certain destination in North America. The total length of the trip is approximately 2,000 miles. There are two flights that depart from Winnipeg on the date you wish to travel. Each of these two airlines has similar gate, baggage handling, ticketing, and ground support processes. Four particular flight attributes distinguish the two airlines:

1. Price[2]	*Low = $560*	*High = $779*
2. Stops Before Destination	*Non-Stop*	*Two Stops*
3. Frequent Flyer Program	*Member*	*Non-Member*
*4. Type of Carrier**	*Established Carrier*	*New Carrier*

[2] Amounts are in Canadian dollars.

**The established carrier has been providing its services for several years in Winnipeg, while the new carrier has been in operation for a few months.*

Before completing the tasks that will be asked of you in a few moments, imagine your ideal combination of flight attributes and apply a rating of nine (9) to that combination. For example, a traveler may prefer a combination of attributes that included low price, was non-stop, with an established carrier, and with the airline the traveler has frequent flyer membership.

Please assume that all features of the flight situation are identical, except for the differences in the four attributes noted above.

The sixteen different combinations were presented to passengers by way of personal interviews at the Winnipeg International Airport. This exercise presents respondents with choice situations in which it is necessary to rate the available flight attributes and trade off those that are least important for those that are the most important. As well, this analysis provides the opportunity to find out if passengers are willing to choose longer routes in order to collect more miles.

We also inquired as to the degree to which frequent flyer programs represent a barrier to new entrants to the market as well as the extent to which they act as decision making drivers for passengers, even if there are differences among competitive carriers in other flight attributes such as price, number of stops, and type of carrier.

Several groups of passengers were analyzed in order to assess the different degree of importance each of them give to different flight attributes. Groups studied are business travelers, pleasure travelers, males, females, frequent travelers, and travelers flying on tickets purchased by their employers.

Responses given to the travel scenarios are shown in figure 1:

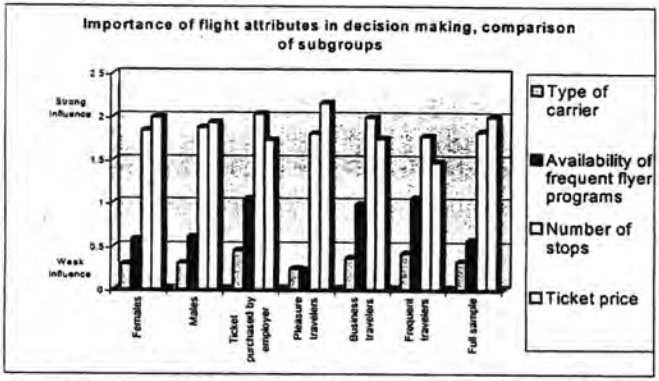


Fig. 1- Importance of flight attributes in decision-making, comparison of subgroups.

Results for the full sample under study show that ticket price is the most important flight attribute when making a decision, closely followed by number of stops. The availability of frequent flyer programs appears to be significantly less important than the above factors. The least important flight attribute on decision making is the type of carrier. This means that frequent flyer programs have a relatively small role in airline decision making. However, this information involves responses of several heterogeneous passengers. Hence, the best course of action is to analyze the importance of this flight attribute in decision making for each of the different types of travelers.

Business travelers clearly have a different set of preferences from the full sample under study. For them, the most important decision making driver is the number of stops of their flight. This is due to the often tight schedule in which business people travel. The second most important flight attribute is the ticket price, but number of stops is more important than price for a significant difference. Frequent flyer programs appear on the third place, but they are highly rated.

This suggests that for business travelers, number of stops and ticket price remaining constant, frequent flyer programs play an important role in the decision making process. The last factor that plays a role for business travelers on airline decision making is the type of carrier.

Business travelers are a very important group for airlines, since 68% of their revenues come from them. Business travelers are usually the passengers who pay full fare on the most frequent basis, due to the unexpected issues that arise on their activities.

Pleasure travelers have a different set of preferences compared to business travelers. The most important flight attribute for this is ticket price. Consistent with past research, pleasure travelers are very price sensitive. This is due to the fact that pleasure travelers pay for their trips themselves, compared to business travelers, who usually get to fly with tickets purchased by the company they work for.

The second most important flight attribute is number of stops. By a significant difference, the third most important factor is type of carrier. This information suggests that pleasure travelers are more aware of type of airline and brand name than the average traveler. The least important flight attribute for pleasure travelers in the availability of frequent flyer programs.

Given that pleasure trips are usually taken with less frequency than business trips, these passengers are the group that gives the least support to the availability of frequent flyer programs. Pleasure travelers often fly with those airlines that offer chartered flights to the different resorts. Usually, these airlines do not offer frequent flyer programs.

The importance of the four attributes analyzed in this conjoint analysis is also studied in terms of gender. There is a fairly small difference in responses in terms of gender. *Male travelers* assign the highest value to ticket price, just before number of stops. A major gap follows, and the availability of frequent flyer programs comes next. Finally, the least rated factor is the type of carrier.

As for *female travelers*, response trend is the same as for males; the major difference found is the higher concern existing towards ticket price by females. Another small existing difference is that males consider the availability of frequent flyer programs slightly more important than females.

An important group analyzed is *frequent travelers*. Similar to responses given by business travelers, frequent flyers give the highest rate to number of stops, followed by ticket price. Although frequent flyers give the highest ratings to number of stops and ticket price, they are rated lower than those ratings given to these flight attributes by business travelers. Frequent travelers are the group that gives the highest ratings to the availability of frequent flyer programs. Although still being in the third place in terms of importance, frequent flyer miles play an important role in decision making for this group of travelers. If competitive airlines offer the same prices and number of stops, frequent flyers

will fly with that airline that gives them the most convenient frequent flyer program.

The last flight attribute for these passengers is type of airline. Frequent travelers do not seem to be concerned with the issue of how long an airline has been operating in the market.

One of the most interesting groups of travelers for airlines is *passengers flying on tickets purchased by their employers*. The relative importance of the various flight attributes on decision making can be influenced by the person who makes the final ticket purchase. Similar to business and frequent travelers, passengers flying on tickets purchased by their employer give priority to the number of stops, closely followed by ticket price. The availability of frequent flyer programs is third in importance, which is given a high rating as in the case for frequent travelers. The last important factor is the type of carrier. Frequent flyer programs are, all flight attributes remaining constant, strong decision making drivers for this group of passengers. Since they fly on a frequent basis, it is crucial for them to collect as many air miles as possible in each of their flights.

There is an important factor consistent in most of the groups of travelers above analyzed, which is the fact that frequent flyer programs act as a third-level entry barrier for new carriers trying to get into a particular market. Ticket price and number of stops are the first two most important flight attributes that passengers take into consideration when making a decision regarding airline preference. If these two factors are the same for competitive airlines, the availability of frequent flyer programs comes to play an important role in the decision making process. Several conclusions are explained later in this analysis.

Frequent Flyer Programs and Airline Preference

The extent to which the collection of air miles with a specific air carrier makes air travelers prefer an airline over others is an important issue to consider when studying major factors influencing airline decision making.

Respondents mentioned the airlines in which they currently have frequent flyer membership. Given that this study was done at the Winnipeg International Airport, the air carriers that appeared in the research instrument are those that fly into Winnipeg and offer frequent flyer memberships, namely: Air Canada, Canadian Airlines, Northwest Airlines, and United Airlines. 44.8% of the sample collects air miles with Air Canada, 36.8% with Canadian Airlines,

and 13.6% with Northwest Airlines.[3] These three airlines share the largest portions of the Winnipeg market.

Several cross-tabulations were done to see if there is a direct relationship between the collection of air miles and airline preference. Research findings show that these two factors are strongly correlated. When passengers mentioned their first two choices when traveling by plane, a relationship was found between frequent flyer programs' membership and airline preference. This tendency was present mostly on passengers flying on tickets purchased by their employers, and on frequent and business travelers.

Frequent flyer programs can act as an important barrier to new carriers in a given market, but it is important to mention that they act only as a third lever barrier, influencing decision making if ticket price and number of stops remain the same among competitive airlines.

Conclusions

There are several conclusions that can be outlined out of the research findings of this study. As for the importance of the availability of frequent flyer programs. they appear to be much more important for business travelers than for pleasure travelers. Passengers flying for business reasons usually fly on a more frequent basis than pleasure travelers do, and most of them usually have their tickets purchased by their employers. Hence, passengers flying on tickets purchased by their employers and frequent travelers consider this flight attribute to be very important in the decision making process. However, these passengers are unlikely to choose longer or inconvenient routes, out of their own initiative, in order to collect more miles.

Research findings show that number of stops and ticket price are the most important flight attributes for business travelers. Given that these passengers are usually on busy schedules, the number of stops is clearly the most critical factor for them on airline decision making, followed by ticket price, although this factor plays a significantly less important role on the decision making process.

Air travelers will prefer carriers that offer better price and service features. An open ended question in the research instrument asking respondents

[3] Passengers were interviewed at the gate areas beyond security at the Winnipeg International Airport, where flights depart to all national and international destinations, except the United States. All flights going to the U.S. depart from different gates beyond U.S. Customs and Immigration. Had passengers in these gates been interviewed, the number of respondents collecting miles With Northwest Airlines could have been greater.

to mention the most important factors for them when selecting an airline shows that in-flight service and meals play a major role on airline reputation and decision making. Price and service are major influences on the choice of air carrier. However, given no differences in price or service offered among competitive airlines, passengers will prefer to fly with the carrier with which they hold frequent flyer membership. If all other relevant factors remain constant, therefore, the evidence suggests mileage programs may act as a substantial entry barrier.

Research findings show that there is a strong correlation between the availability of frequent flyer programs and airline preference, mostly present in particular groups of travelers: Business travelers, frequent travelers, and passengers flying on tickets purchased by their employers. Cross tabulations including airline preference and importance given to the availability of frequent flyer programs show that these groups of passengers prefer those airlines they hole frequent flyer membership.

Results suggest that loyalty varies for the respondent sample along several dimensions. Therefore, the likelihood of frequent flyer programs serving as an entry barrier depends on the specific passenger segments as well as attributes associated with the flight and airline. These findings suggest several alternative strategies for airport and carrier managers to employ with respect to loyalty programs and passenger preferences.

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THE ORIGIN, EVOLUTION AND CURRENT STATUS OF CABOTAGE

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ORIGIN OF CABOTAGE

CONCEPT

There are some sources that say "cabotage" comes from the Portuguese word ***cabo***, meaning cape or tip. Yet, there are others who say it is derived from the French verb, ***caboter***, which means to coast.[1] For literally centuries, before the airplane was invented, sailors from northern Europe en route to the Mediterranean Sea would stop at prominent capes along the coast of Portugal to drop off and pick up cargo and passengers, making their trips more profitable. In an effort to protect their own sea trade, the Portuguese outlawed the practice to outsiders and were the first to develop cabotage laws.[2]

In trying to describe what led up to this situation, the reasons are buried in antiquity. For instance, according to the **Black Book of the Admiralty**, the deputies and lieutenants of newly ordained Admirals must have constituted the first Admiralty Court in England. Sir Thomas Beaufort, Earl of Dorset and Duke of Exeter and who was to be appointed "Admiral of England, Ireland and Aquitaine" in 1412, was appointed Lord High Admiral in 1425. He had a regular Tribunal subject to the legal forms of procedure then in force and endowed with a marshal and other law officers. With the passage of time, the Courts of the various Admirals were merged in one Court of Admiralty for the whole of England.[3]

There were continuous struggles between the Courts of Common Law and the Admiralty Court. These were generated by the efforts of the Courts of Common Law to gather unto themselves as many maritime disputes as possible. That is, they were attempting to become the court of original jurisdiction in all maritime matters. As a foundation for their reliance, the Act enacted in 1400 by Henry IV was used as a precedent because it provided for remedies against any encroachments by the Admiralty Court. It provided that the "the statute and the common law be holden

against the Admiral and his Lieutenant and that the party aggrieved shall have his action on the case against him that doth unlawfully pursue."[4]

At this point in time, the fifteenth century, a law has been established which includes remedies for breech of its code and a court system has begun to evolve. By the seventeenth century, the Admiralty Court was successful in exercising a very wide jurisdiction. The prevailing thought of the day was expressed aptly by the Admiralty Judge of the day, Dr. John Exton, when he said that "Justice had two wings, one of which spread itself over the land and the other over the water, which was this Admiralty Court"[5]

C. John Colombos states that "Custom is the most important source of the international law of the sea and the usages of the great maritime States must therefore always exercise a weighty influence on its development."[6] The literature indicates that the value of custom as a source of international law was underscored in a speech by Chief Justice Marshall of the United States Supreme Court in 1833 when he said that: ". . . the usage of nations becomes law and that which is an established rule of practice is a rule of law."[7]

A second major source of international law is to be found in treaties. An initial serious attempt to codify the principles of the international law of the sea was conducted at the Congress of Paris in 1856. It was there that the famous Declaration of Paris identified the four fundamental rules of : abolition of pirateering, on the immunity of neutral goods in enemy vessels, of enemy goods in neutral vessels and on the effectiveness of blockades. The literature points out that these rules have been constantly treated as binding by all nations including the United States, which, while it was not a signatory, adopted its principles in all the wars in which it has been engaged after the termination of the American Civil War.[8]

The end of World War I witnessed the establishment of the League of Nations which attempted to codify various portions of maritime law for peace time efforts. Within that effort was an attempt to embody "freedom of communications and of transit and equitable treatment for the commerce of all members of the League"[9] However, World War I advanced the technology of aviation and demonstrated its military potential. As a result, the states recognized the necessity of adopting uniform principles to foster the development of international air transportation. However, the

threat which aviation posed to their security also led them to affirm their sovereignty over the airspace above their territories and territorial waters. The Paris Convention of 1919 granted to the contracting parties the freedom of transit - - - ultimately to become known as the "First Air Freedom" - - - it provided no information about the "Second Air Freedom," the freedom to land on foreign territory. In articles 2 and 15, it granted the freedom of innocent passage but the last paragraph of article 15 provided that the establishment of international airways was subject to the consent of the states flown over. Interestingly, the United States signed but did not ratify the treaty. Yet, it has followed the foundations of Customary International Law by abiding by its tenants.[10]

Throughout time, international law evolved from "Customary Rules" which have, in turn, evolved from a long historical process resulting in their recognition by the international community of nations. However, the volume of customary rules has diminished because of a large number of law-making type of treaties that have been negotiated between and among nations since the middle of the last century. These numbers will continue to decline as the International Law Commission continues its work of codifying and restating customary rules and converting them into treaties such as the Vienna Conventions of 1961, 1963 and 1969, the topics of which were Diplomatic Relations, Consular Relations, and the Law of Treaties, respectively.[11]

While the terms "custom" and "usage" are commonly used interchangeably, there really is a clear technical distinction between them. Barry and Trimble describe "usage" as the twilight stage of custom. Custom, then, begins where usage ends.[12] Usage is an international habit of action that varies among nations which has prevented it from receiving full legal recognition. While usages vary and conflict, custom must be consistent and unified. As regards the intent of the law, custom is a usage that has obtained the force of law.[13]

EVOLUTION OF CABOTAGE LAW

The first serious attempt to codify the principles of the international law of the sea was at the Congress of Paris in 1856. Other attempts at codification of the law included the Geneva Convention and Declaration of St. Petersburg in 1864; the Hague Conferences of 1899 and 1907; and the Declaration of London in 1909. Codification of maritime law was an important element of the Conventions signed under the

auspices of the League of Nations in 1914, 1921, 1923, and 1925. It was in article 23 of the Covenant of the League in 1914 in which an important clause was inserted that said that "subject to and in accordance with the provisions of international Conventions existing or hereafter to be agreed upon, the members of the League will make provision to secure and maintain freedom of communications and **"of transit"** [emphasis added] and equitable treatment for the commerce of all members of the League." In relation to this clause, a Conference met at Barcelona in 1921 and agreed on two Conventions and Statutes relating to **"freedom of transit"** and the "regime of navigable waterways of international concern."[14]

The Hague Conference of 1930 was the result of a report by the Committee of Experts which recommended that such a conference should be convened for the purpose of codifying three subjects: (1) nationality; (2) territorial waters and (3) the responsibility of States for damage done in their territory to the person or property of foreigners.

In America, attention was first directed toward the importance of codification of international law by the Panama Congress in 1826. This attention was focused on a series of Pan-American Conferences initiated in 1889 at Washington, D.C. and have continued since that time. Conferences in 1906, 1927, 1928, 1933, and 1948 continued to dwell on aspects of codifying international law.

As mentioned earlier, the Paris Convention of 1919 identified the first air freedom, i.e, the freedom of innocent passage. For instance, the first sentence of article I stated: "The high Contracting Parties recognize that every Power has complete and exclusive sovereignty over the air space above its territory."[15] However, the Convention did not define "sovereignty" or delineate fully its implications for purposes of regulating international air transportation. Sovereignty, as commonly understood in international law, is the right of a state to exercise exclusive jurisdiction over persons and things to the exclusion of the jurisdiction of other states.

The Paris Convention established an incomplete basis for international aviation in the post-era of World War I. While it granted to the contracting parties the freedom of transit - - - ultimately to become known as the "First Freedom" - - - nothing was mentioned about the "Second Freedom," the freedom to land on foreign territory. While some researchers have indicated that, as a result of the second

freedom not being mentioned, it was not granted. Others have indicated that it was implied. A more important defect of the Convention was its failure to come to grips with the problem of commercial aviation.

Because of the lack of clarity regarding the second air freedom, the 1929 Convention amended its articles to provide that "[every contracting State may make conditional on its prior authorization the establishment of international airways and the creation and operation of regular international air navigation lines, with or without landing, on its territory."[16]

Of course, there was a substantial amount of consideration for economic preservation in the minds of the framers of the articles of the Paris Convention of 1929 because they had begun to realize the potential of commercial aviation and thereby sought to protect their own national airlines. As a result, they excluded regulation of commercial aviation from the provisions of the Paris Convention, making it subject to other arrangements, notably bilateral agreements!

Another world event was to shape the future of aviation; the second world war. World War II advanced aviation technology significantly in every aspect; range, capacity, speed and even the accuracy of aircraft navigation. It was at the close of WWII that the Allied Powers began to develop the legal and organizational foundations of the fledgling international civil aviation industry. The war had provided the United States with a clear position of dominance in aviation capability which placed most of the rest of the world, especially the United Kingdom, at a tremendous disadvantage. Most of the rest of the world was fearful of the emergence of an American monopoly in the commercial airline industry.

As a result of this fearfulness and as much of a desire of the United States to put a handle on the rules under which all countries would be playing, the United States conferred with several other countries and convened at Chicago on November 1, 1944. This conference produced two principal multilateral agreements, the Convention on International Civil Aviation has been ratified over a period of time by more than 175 states (countries) and the International Air Services Transit Agreement (the Transit Agreement), has been ratified, again over a period of time, by more than 100 states (countries).[17]

The evolving nature of protecting a country's borders was initially the responsibility of maritime law. With the advancement of flight technology, the focus shifted from maritime law to aviation law for the protection of a country's air space. In order to appreciate a perspective of the chronology of the multitude of conferences that were needed to define the limits of the evolving concept of international aviation law, Table I provides a litany of these conventions. One of the points that is evident in researching cabotage is that a notion surfaces in one convention but does not come to fruition until, often times, years later. For instance, at the Aeronautical Commission of the

1919 Paris Peace Conference which established the Paris Convention Regulating Aerial Navigation, the British Government **had proposed** in Article 3 of its **draft** international convention on international aerial navigation that "the nationality of an aircraft shall be determined by the nationality of its owner."[18] But the test of registration (i.e., the country where the airplane is registered) ultimately prevailed in the Paris Convention, 1919 (Article 6), which accepted the same principle as that now to be found in Article 17 of the Chicago Convention, 1944 and this test has also been adopted in English law.

Treaties and Agreements

TABLE 1 provides some insight into the complexity of the world of international aviation as expressed in bilateral and multilateral agreements or treaties. The table is ample evidence that there was a continuous effort to refine the rules and regulation of international flights. It has evolved from a very rigid attitude that aviation was mainly a military consideration at the Aerial Navigation of 1910 in Paris, France to the creation of an **International Air Transport Association (IATA)** at a Conference in Havana, Cuba in 1945, to the adoption of the Montreal draft convention of carriage by air when carriage is performed by someone other than the contracting party.

FREEDOMS OF THE AIR

Air routes and the accompanying infrastructure of airports and support facilities are
developed at a substantial cost to airlines, counties, cities and others. In this respect,

airline firms are more like railroad companies because they want to be assured that it will be able to reap the fruits of its investment without the interference of competitive airline companies in their lanes or routes. As a result, states tend to protect their own civil aviation industries and to restrict the freedom of foreign airlines in their ability to over fly territories subject to their jurisdiction.(Cheng, Bin. P.8)

Prior to World War II, the non-scheduled airline business was virtually non-existent. Scheduled airline service had to advertise its schedule as widely as possible in order to attract any travelers. Consequently, there was little attention paid to the non-scheduled airline sector by those developing post-war international civil aviation activities. The major emphasis was placed on the scheduled sector of international air transportation.

These individuals considered scheduled international air services to have three major regulatory problems:

(1) The freedom of the air; i.e., To what extent should foreign airlines be permitted to enter a country and operate there commercially?

(2) Capacity; i.e., If a foreign airline has been granted permission to operate commercially on a specific route, how much of the traffic (passengers, mail and freight) along that route should it be allow to transport?

(3) Tariffs; i.e., Should there be any regulatory control over the fares and tariffs which the foreign airline charges? (Cheng, Bin. P. 9)

By the time the Chicago Conference took place in 1944, the privileges a State could grant to foreign commercial carriers to operate scheduled international air services to and from its territory were separated into what was being commonly referred to as the five freedoms of the air. Subsequently, further refinements in the classification of air traffic have led to the development of the sixth, seventh, and eighth air freedoms. (Cheng, Bin. P. 9) These freedoms of the air are defined in **TABLE 2.**

The first three Air Freedoms are referred to as the **Transit Rights** Freedoms. These simply allow a foreign air carrier to (**First**) over-fly a country without benefit of landing privileges (**Second**) to over-fly a country, with traffic, and be allowed to land only for non-traffic purposes (emergency conditions or to take on fuel, etc.) and (**Third**) to fly into a territory ("grantor state')and discharge revenue traffic coming from the flag-state of the carrier.

Air Freedoms Four through **Eight** are known as the **Traffic Rights** Freedoms which allow specific rights regarding revenue traffic being brought into the grantor state by a carrier flying the flag of another state. **Freedom number Four** simply allows a carrier to fly into the grantor state and pick up revenue traffic which is destined for the Flag-state of the carrier.

The **Fifth Freedom** is divided into three subcategories of **Anterior-Point Fifth Freedom** where the carrier is allowed to discharge or take on revenue traffic coming from or destined for a third State situated in an anterior position to the Flag-State; **Intermediate-Point Freedom** is the ability to discharge or take on revenue traffic coming from, or destined for, a third State that is situated between the Flag-State of the carrier and the Grantor State; and **Beyond-Point Freedom** is the right to enter the Grantor State and discharge or take on revenue traffic coming from, or destined for, a third State situated somewhere beyond the Grantor State.

The **Sixth Freedom** has been a very controversial freedom because it involves the Flag State carrier discharging or taking on revenue traffic in the Grantor-State:

- ★ which the Flag-State carrier has brought to the Flag-State from a third State on a different service, or
- ★ which the Flag-State carrier is going to take to a third State on a different service.

The **Seventh Freedom** provides a Flag-State carrier, which is operating completely outside the territory of its own Flag-State, the right to enter a Grantor-State and discharge, or take on, revenue traffic coming from, or destined for, a third State or third States.

The **Eight Freedom** is the **Cabotage Freedom** which allows an air carrier to transport revenue traffic from one point in the territory of a State to another point in the same State while flying the Flag of a different State.

CURRENT REGULATORY STATUS

It is common knowledge in most transportation circles tha t, according to the Federal Aviation Act of 1958, a domestic U.S. air carrier can not be controlled by a

foreign entity. The Department of Transportation, in attempting to identify what constitutes a foreign entity, defined a

TABLE 2
FREEDOMS OF THE AIR

TRANSIT RIGHTS

First Freedom

The right to fly, and carry traffic, non-stop over the territory of the grantor state.

Second Freedom

The right to fly, and carry traffic, over the territory of the grantor State, and to make one or more stops there for non-traffic purposes.

Third Freedom

The right to fly into the territory of the grantor State and there discharge traffic coming from the flag-State of the carrier.

TRAFFIC RIGHTS

Fourth Freedom

The right to fly into the territory of the grantor State and there take on traffic destined for the flag-State of the carrier.

Fifth Freedom

The right to fly into the territory of the grantor State for the purpose of taking on, or discharging, traffic destined for, or coming from, third States.

- **Anterior-Point Fifth Freedom:** The right to fly into the territory of the grantor State and there discharge or take on traffic coming from, or destined for, a third State situated on the agreed route at a point anterior to the flag-State of the carrier.
- **Intermediate-Point Fifth Freedom:** The right to fly into the territory of the grantor State and there discharge or take on traffic coming from, or destined for, a third State situated on the agreed route between the flag-State and the grantor State.
- **Beyond-Point Fifth Freedom:** The right to fly into the territory of the grantor State and there discharge or take on traffic

coming from, or destined for a third State situated on the agreed route at a point beyond the grantor State.

Sixth Freedom:

The right to fly into the territory of the grantor-State and there discharge, or take on, traffic ostensibly coming from, or destined for, the flag-State of the carrier which traffic the carrier has either brought to the flag-State from a third State on a different service or is carrying the traffic from the flag-State to third-State on a different service. [This particular Air Freedom has generated a significant amount of controversy)

Seventh Freedom:

The right, for a carrier operating entirely outside the territory of the flag-State, to fly into the territory of the grantor State and there discharge, or take on, traffic coming from, or destined for, a third State or third States.

Eight Freedom: (CABOTAGE)

The Right of an air carrier to transport traffic from one point in the territory of a State to another point in the same State while flying the flag of a different State.

SOURCE: Adapted from: Cheng, Bin. **The Law of International Transport** The London Institute of World Affairs, pp.14-15

"Citizen of the United States" as:

1. An individual who is a citizen of the United States or one of its possessions,
2. A partnership of which each member is such as individual, or
3. A corporation or association created or organized under the laws of the United States or of any State, Territory, or possession of the United States, of which the president and two-thirds or more of the board of directors and other managing officers thereof are such individuals and in which at least 75 per centum of the

> voting interest is owned or controlled by persons who are citizens of the United States or of one of its possessions (Thomas D. Grant, p. 68).

Any foreign proposal to take over an American air carrier is governed by the Federal Aviation Act and must be reviewed by the Department of Transportation (DOT). This agency has a wide circle of discretion in fulfilling the mandate that ". . . 75 percent of the voting interests of an air carrier be owned or controlled by persons who are citizens of the United States or of one of its possessions, . . ".

The Clinger Amendment (H.R. 782) to the Federal Aviation Act attempted to change the 75
percent ownership requirement to not less than 51 percent (Grant, pp. 109-110). However, the interpretation of this amendment by DOT in conjunction with the Open Skies concept has been inconsistent (Grant, p.109).

OPEN SKIES CONCEPT

Secretary Andrew H. Card, Jr. defined open skies in a speech by stating that the United States ". . . will now offer to negotiate open skies agreements with all European countries (that are) willing to permit U.S. carriers essentially free access to their markets.

As a result of a DOT order requesting comments on open skies which was issued to all certificated air carriers, all foreign air carriers, and interested U.S. agencies and industry groups. This order identified eleven basic elements that DOT would tentatively include in

its open skies definition:

1. Open entry on all routes
2. Unrestricted capacity and frequency on all routes
3. Unrestricted route and traffic rights,
4. Double-disapproval pricing, in Third and Fourth Freedom markets and price leadership in third country markets.
5. Liberal charter arrangements (the least restrictive charter regulations of the two governments would apply, regardless of the origin of the flight.
6. Liberal cargo regime
7. Conversion and remittance arrangements
8. Open code-sharing opportunities
9. Self-handling provisions
10. Procompetitive provisions on commercial opportunities, user charges, fair competition and intermodal rights, and
11. Explicit commitment for nondiscriminatory operation of and access for computer reservation systems (Grant, pp. 79-80).

The Final Order on Open Skies expressly excluded the elements of ownership/control and cabotage under justifications given by DOT. Exclusion of these elements has identified them as crucial unresolved questions in U.S. aviation policy (Grant, p.82).

SUMMARY

The original intent of this paper was to develop an

understanding of the term Cabotage. The evolution of the concept of cabotage appears to have started in the 15th century when maritime shipping became a legal source of conflict among trading nations. The word (cabo) came from a Portuguese word meaning cape or tip. Admiralty Law developed from maritime legal disputes. Admiralty Law and its historical development is traced from approximately 1412 to the modern coagulation of air transport treaties and agreements, international aviation conventions from 1910 to the Open Skies Agreement of 1992.

The 1944 International Civil Aviation Conference, Chicago, IL., created the five "Freedoms of the Air" which have since been expanded to a total of eight and divided into two categories: Transit Rights (Freedoms 1-3) and Traffic Rights (Freedoms 4-8); with the Eight Freedom being Cabotage. They have stood the test of time as well as created a heavy burden to articulate a clear conceptual understanding and to grasp the full impact of the concept on the aviation industry. In addition, the questions revolving around ownership/control and cabotage remain unresolved elements of U.S. aviation policy.

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TABLE I
INTERNATIONAL AVIATION CONVENTIONS

YEAR	CONFERENCE	LOCATION	MAJOR RESULTS
1910	Aerial Navigation	Paris, France	Developed a rigid attitude, based mainly on military considerations.
1919	Peace Conference	Paris, France	Aeronautical Commission; Granted Freedom of Transit - 1st Freedom
1925	1st International Conference on Private Air Law	Paris, France	Private Air Law: Development of a code of private international air law through draft international conventions; finalized at international conferences
1929	2nd International Conference on Private Air Law	Warsaw	Private Air Law
1933	3rd International Conference on Private Air Law	Rome	Private Air Law
1938	4th International Conference on Private Air Law	Brussels	Private Air Law
1943	Dominion and Empire	London, England	Unanimously agreed *ad referendum* to a blueprint of Commonwealth post-war international air transport policy; **Created Commonwealth Air Transport Council;**
1944	Commonwealth Consultations	Montreal, CA	Refinement of Commonwealth Air Transport Council.
1944	Commonwealth Consultations	London, England	Refinement of Commonwealth Air Transport Council.
1944	**International Civil Aviation Conference**	**Chicago, IL**	**Created four treaties: (p.24-25)** **1. Interim Agreement on International Civil Aviation;** **2. Created INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO);** **3. International Air Services Transit Agreement (Two Freedoms Agreement)** **4. International Air Transport Agreement (Five Freedoms Agreement)**
1945	Conference for the Creation of IATA	Havana, Cuba	**Creation of International Air Transport Association (IATA)**
1946	**Civil Aviation Conference (UK-USA)**	**Bermuda**	**Developed 13 Articles defining "the Agreed Services" (the Bermuda Agreement) between UK & USA to which was attached an Annex of five sections of explanations and clarifications.**
1948	Conference on Air Navigation	Geneva	Recommended that the ICAO Council enter into an

	Services in Iceland		agreement for financial support of Icelandic Area Control, Communications and Meteorological Services for air navigation support services.
1949	ICAO Conference on Air Navigation Services	Greenland & the Faeroes, London	Recommended that the ICAO Council conclude an Agreement with Denmark similar to the one with Iceland for the same type of services.
1949	2nd Conference on ICAO North Atlanta Ocean Stations	London	ICAO passed and signed the Agreement with Denmark for air navigation support services but contributing states had no direct contractual relationship with the assisted State; but responsible for contribution money for the Council to finance the contract.
1953	3rd Conference on ICAO on North Atlantic Ocean Stations	Brighton	Air Navigational Support Services
1953	Australia, New Zealand & United Kingdom Conference	Christchurch, N.Z.	British Commonwealth Pacific Airlines (BOAC) was merged with Qantas Empire Airways Airlines which became the Australian airlines responsible for Trans-pacific route from Australia to San Francisco.
1954	**Co-ordination of Air Transport in Europe**	**Strasbourg**	**Established the European Civil Aviation Conference (ECAC) as a subordinate organization to the ICAO**
1954	4th ICAO Conference on North Atlantic Ocean Stations	Paris	Air Navigational Support Services
1956	Airport Charges Conference	Geneva	Recommended: 1. Continued study of economic analysis of international airports 2. Maximum take-off weight as basis of landing charge scales 3. Any passenger charges for facilities be included in price of ticket; not a separate charge. 4. Landing/take-off charges be computed on the basis of cost of landing operation. 5. Study all possible developments of concession revenue at airports. 6. Identification & location of airport accounting information. 7. Deferred discussion of collection of airport statistics by ICAO.
1958	Route Facilities Charges Conference	Montreal, CA	Recommendations for air navigation facilities & services. 1. Charges & System of charges; 2. Exceptions to charges; 3. An analysis of charges for flights over high seas; 4. Create a definition of international flights to permit harmonization of national practices regarding charges; 5. All charges be published & communicated to ICAO; 6. Oversight of non-governmental agency charges; 7.

			Review cost of route air navigation facilities & services at 3-year intervals.
1959	Regional Civil Aviation Conferences	Rio de Janeiro	The Conferencia Regional del Aviacao Civil **(CRAC)** -Eight countries (Argentina, Brazil, Chile, Colombia, Ecuador, Peru, U.S. & Uruguay - was created & made provisions for their next meeting.
1960	5th ICAO Conference on North Atlantic Ocean Stations	The Hague	Determined the allocation of responsibilities to be 80 per cent on aeronautical benefits & 20 per cent on non-aeronautical benefits in calculating the contributions of member states.
1961	International Private Air Law	Guadalajara, Mexico	Adopted the Montreal draft convention relating to carriage by air performed by a person other than the contracting person.

Source: Developed from: Cheng, Bin, **The Law of International Air Transport**, Oceana Publications, New York, 1962, pp. 3-5, 19, 23-26, 57, 62, 72-73, 76, 78-80, 82, 85, 87-89, 91, 160-163, 169, 238, 246, 255, 266, 682.

Truck Safety: Assessing the Impact of the National Safety Code

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Introduction

A decade ago, federal, provincial and territorial governments agreed to new commercial vehicle safety standards -- the National Safety Code (NSC). As yet, there has been no real attempt to measure the impact. This paper looks at available data on truck safety, it looks at comparable statistics in the United States and efforts in that country to measure the impact of safety regulations, and it concludes with a suggestion as to how the impact of the NSC might be measured in Canada.

The number of collisions (all vehicles) has been falling for quite some time in Canada. Casualty collisions fell from 193,605 in 1988 to 152,689 in 1997; the number of persons killed fell from 4,154 to 3,064 in the same time period.[1] The difficulty is in explaining this decline: better roads, better vehicles, better driver training, better licensing (graduated), an aging population, an increase in various enforcement programs (drinking/speeding/vehicle inspections/etc), higher levels of seat-belt usage, etc. There are so many possible explanatory variables that any analysis of aggregate statistics has difficulty sorting out causality.

Isolating the truck component of road safety does not make the job any easier. While provincial politicians and enforcement agencies sometimes make claims about the effectiveness of their truck-enforcement programs, the truth is that it is difficult to sort out cause and effect when looking at truck safety.

National Safety Code

The NSC was agreed to in 1987 as federal legislation was about to deregulate the trucking industry. The fear was that, without tougher safety regulations, competition would lead some companies to operate in an unsafe manner. The Code itself consists of 16 standards, one of which is voluntary, covering everything from hours of work, driver licensing, vehicle maintenance, roadside truck inspections, load security, carrier audits and safety ratings.

The NSC has no legal status. It is just an agreement that is supposed to form the basis of provincial and territorial regulations and practices (the federal government only has regulations in one area). Implementation of the NSC has not been without problems. There are differences, some of them major, among the provinces and territories and there are aspects of the standards that are still not in place.

While all the standards are important, three stand out as these are the enforcement mechanisms under the code: roadside inspections (where trucks or drivers can be placed out-of-service if something is wrong), carrier audits (where inspectors check the management's safety procedures), and safety ratings (where carriers are assigned a rating on the basis of accumulated convictions, collisions, out-of-service events, and audit findings). This last one -- safety ratings -- has not been implemented in any jurisdiction yet, although several plan to have it in place sometime in 1999 and two are now giving ratings based on a partial implementation of NSC #14.

The question, then, is this: is the NSC, and these three standards in particular, having the desired impact on truck safety? One reason for focusing on these three standards is that they all cost, or can cost, significant money to implement. It is legitimate to ask if this money, much of it public, is being well spent.

Motor Vehicle Transport Act

The ability to monitor truck safety -- and specifically the impact of various causal factors such as safety regulations -- becomes more urgent as the time approaches for the federal government to amend the Motor Vehicle Transport Act. This legislation, since 1954, has given the provinces and territories the authority to regulate trucking where any operation extends over a provincial or territorial border -- a federal responsibility under the constitution. In the latest proposed version[2], the federal government will continue to give the provinces and territories the responsibility of regulating trucking. But, it will make this contingent on having in place a safety regime consistent with NSC #14 (safety rating). Further, there will be a requirement that the impact of the legislation be assessed four years after being proclaimed. A mechanism for assessing the impact of safety ratings -- and other NSC standards this rating process invokes -- will have to be found.

Experience in the United States

It helps put the subject of truck safety in context by examining statistics from the US and by explaining several regulatory differences. The numbers in the first row of Table 1 are based on estimates developed from a sample of all police-reported crashes. "Trucks," are vehicles with a manufacturers' gross weight rating of more

than 10,000 lb. Because these are estimates, there are sampling errors; this may mean that the year-to-year changes are not quite as precise as implied by the figures. The numerator in second row is based on a census of all crashes involving fatalities and is considered reliable. The source for the denominator in the second row (miles travelled) is based on an estimate developed from vehicle-use surveys.

TABLE 1: Statistics from the United States[3]

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Trucks involved in collisions ('000)										
	398	415	385	330	376	395	461	377	395	444
Trucks involved in fatal collisions per 100 million kilometres										
	2.3	2.1	2.0	1.8	1.6	1.7	1.7	1.6	1.6	*

* Not available

It is not clear that the first row demonstrates an improvement in safety. There are so many other factors at work -- particularly fluctuations in the economy -- that it is not surprising that total vehicles involved in collisions do not prove much. The second row, where collisions involving a fatality are divided by a measure of truck activity, is better. This shows an improving trend, although there has not been much change over the past five years.

Motor carrier safety regulations and vehicle regulations are broadly similar on both sides of the border. However, American regulations and enforcement efforts -- particularly federal -- are different than Canadian in at least two major respects. First, the United States has had many more years experience at auditing carriers and assigning safety ratings. In Canada, while several provinces have a decade or so of experience with auditing, only two have limited experience assigning safety ratings. And none has yet fully implemented NSC #14. Second, for years the US federal government has being giving states considerable money to conduct roadside inspections. In fiscal 1995, federal and state governments between them spent $US 342 million weighing trucks and conducting safety inspections. The federal contribution to the roadside safety inspections was $US 49 million.[4] The comparable Canadian amounts, while not available, are minuscule by comparison and there are no federal funds involved. (Transport Canada's latest annual report shows the provinces spending a little over $CDN 300 million, but this is "soft" and it covers all road-safety programs -- ie, automobiles as well as commercial vehicles.[5])

All other things being equal, then, one would think truck safety should be better in the United States than in Canada. Of course, all other things are not equal. For one thing, there are other areas of regulation -- driver training, driver licensing, longer hours of work in Canada, truck weight and dimension regulations -- that also affect safety. For another thing, there are many other factors -- climate, traffic volumes, road geometry, etc -- that mean the playing field may not be level. International comparisons are probably not too meaningful but, as they do raise intriguing questions, this subject is re-visited below.

Research from the United States

There is another important difference between Canada and the United States. In the United States, research has been conducted into the effectiveness of safety regulations and enforcement efforts. In Canada, there has been no research into the impact of the NSC. There may be minor qualifications to this (some work in some provinces may qualify) but, and certainly at the national level, there has been no empirical investigation on the question of whether or not NSC regulations over the past decade have had any impact.

Just looking at the more important American research, Moses and Savage show that audits of motor carriers and roadside inspections are both effective in terms of the ability to identify trucking firms with higher than average collision rates.[6] This is important: if poor audits and high out-of-service rates were not associated with "high risk" carriers, there would be little point in engaging in this enforcement activity. In other work, they calculate benefit-cost ratios for these programs.[7] Using the audit results of 85,000 carriers that had been audited up to 1992, they calculate the BC ratio of this program at 4:1. Firms that were audited and received a less than satisfactory rating are targeted for further "educational" visits by government inspectors. On average, they improve their collision rate experience by 43% as a result. Using the results of all roadside inspections for 35,000 carriers in 1991 and 1992, they conclude that it is difficult to show a positive BC ratio for roadside inspections. This conclusion, though, has to be understood in terms of the massive effort the Americans put into this program (ie, it may just be the scale of the activity in the US that is called into question).

More recent research from the United States shows that just the process of conducting an audit (compliance review) on a carrier has a positive impact on collision rates.[8] This study looks at all motor carriers in the United States that had two or more audits between April 1993 and June 1997. Only carriers where the time between audits was from one to two years were selected -- in other words, a long enough period of time for any new safety procedures introduced by

management to have an impact. Altogether, 1,738 carriers were included in the analysis. The average collision rate at the time of the first audit was one every 2.1 million kilometres. The average rate at the time of the second audit was one collision every 2.4 million kilometres -- a 12% improvement. In related work, it is shown that roadside inspections have a direct effect on truck collisions estimated to be worth $US 47 million in 1996 (the savings realized from fewer collisions) and a significant indirect effect in the sense that the very existence of the inspection program means more safe trucks and drivers on the road than would otherwise be the case.

Canadian Evidence on Truck Safety

Trucks involved in collisions in Canada fell from 46,564 in 1991 to 45,166 in 1996, a period when, presumably, activity (distance driven) was increasing. "Trucks," in these numbers, are straight trucks and tractor-trailers with a registered weight over 4,500 kg. While a manufacturer's gross weight rating of "over 10,000 lb" and a registered weight of "over 4,500 kg" are similar concepts, they are not identical. There may be a slightly larger proportion of small, two-axle trucks in the Canadian definition than there is in the American because of the registration policies in some provinces. It is not known if "collision" means the same thing on both sides of the border. For here, it is assumed that it does.

The period 1991-1996 is used in the above numbers as this is the longest period for which there are consistent national data. However, if Québec is excluded, numbers on NSC trucks involved in collisions are available for a longer period -- 1984-1996 -- and these show a peak in 1989 and a decline since to about 30,000 (excluding Québec) per year.[9]

If just tractor-trailers (no straight trucks) are considered, total collisions have fallen (Canada-wide) from 21,253 in 1989 to 19,233 in 1996 -- a decline of about 1.5% per year.[10] These numbers are "total collisions" unlike the previous "total vehicles involved in collisions."

This seems to suggest that, since deregulation in 1988, truck safety has marginally improved. Such a conclusion, however, is tenuous as a simple comparison of the number of vehicles involved in collisions or the number of collisions says nothing about the activity of these vehicles. It may be that kilometres of travel has doubled over this period and, as a consequence, there really has been a tremendous improvement in the collision rate (although given the 1990/91 recession, and its impact on truck activity, this seems unlikely).

Collision Rates

Until there are measures of exposure, it is difficult to draw conclusions about the number of vehicles involved in collisions. There is a new effort by Statistics Canada (a survey of vehicle usage) that may provide activity estimates some day. In the meantime, Table 3 contains collision rates -- with the warning that the denominators in some calculations are of questionable accuracy.

The first line shows the change in total trucks involved in collisions for two time periods (1991-1996 and 1988-1996 without Quebéc). Again, without a measure of exposure, it is difficult to draw conclusions on the basis of these numbers, particularly since the American economy has out-performed the Canadian since the last recession. (Truck activity is closely related to the growth in GDP.) But, and this difficulty aside, the decline in collisions in Canada does seem to be greater than in the United States.

Table 2: Canada-United States Collision Statistics Compared

		(1996 data, unless otherwise noted)	
		Can	US
1) Trucks involved in collisions			
	Total	45,166	394,740
	Fatal	461	4,740
	Change, 1991-1996	-3.0%	+19.5%
	Change, 1988-1996 (Can excluding Que)	-9.4%	-0.9%
2) Trucks involved in collisions per 100,000 population	Total	150.7	148.9
	Fatal	1.5	1.8
3) Trucks involved in collisions as % of all vehicles involved in collisions		(1995) 3.9%	(1997) 3.7%
4) Trucks involved in collisions per 1,000 registered trucks			(1995)
	Total	63.47	54.85
	Fatal	0.65	0.65
5) Trucks involved in collisions per 100 million kilometres of travel	Total	141.9	133.9
	Fatal	1.4	1.6

The second line shows the number of trucks involved in collisions per 100,000 people. While population is probably not a good measure of exposure, the numbers are surprising in that they do not show much difference between Canada and the United States. This could be for any number of reasons: possibly the

earlier and more intensive experience with roadside inspections, carrier safety audits and safety ratings in the United States is not having much impact? Possibly safety levels in the United States were worse than in Canada and this American safety effort has brought collision rates down to the Canadian level? Or, more likely, there are so many other factors at work that this simple comparison is not accurate enough to isolate the impact of safety regulations.

The third line shows trucks involved in collisions as a percent of all vehicles involved in collisions. Again, it is perhaps surprising that the two figures are so similar and, again, it is difficult to know if this says anything about the relative effectiveness of safety programs or other causal factors.

The fourth line compares collisions per 1,000 registered trucks. In the case of the Canadian figure, the estimated fleet size is 711,000[11]. While total collisions per 1,000 trucks appears higher in Canada than in the United States, the fatal collision rate is identical.

The fifth line is speculative, at least for the Canadian figures. There is no good estimate of kilometres of travel in Canada. For here, it is estimated that the figure might be 31.8 billion.[12] If accurate, the total collision rate is higher in Canada than in the United States but the fatal collision rate is lower.

Provincial/Territorial Comparisons

Another way of looking at these data is to compare provinces and territories (Table 3). In the first two columns, total trucks involved in collisions are shown as a percentage of the 1991 numbers (the longest period where it is possible to make such a comparison nationally). But these cannot tell much about differences among the jurisdictions -- there is no information on relative changes in activity. There is the added problem of small numbers in some cases (in PEI the number of trucks involved in fatal collisions in 1996 was 3 versus 2 in 1991; there were no trucks involved in fatal collisions in the NWT in either year). And, of course, selecting just two years (1991 and 1996) may happen to hit upon a particularly good or bad year for some jurisdictions.

Nevertheless, the numbers raise questions. Is truck safety "worse" in Alberta than, say, British Columbia? Trucks in collisions in Alberta have increased by 46 percent between 1991 and 1996; the comparable figure in British Columbia has been a decline of 34 percent. Is the change related to the way some provinces have implemented the NSC? (Alberta exempts a larger proportion of its truck fleet from the NSC than any other jurisdiction.) Or, more likely, is it just that there are so

many other factors at work that it is impossible to use aggregate statistics to reveal anything about one single causal factor?

The numbers in the last four columns of Table 3 show collision rates. None of the denominators used is perfect. Registered trucks may not be an accurate indication of activity. The Prairies, for example, have large populations of farm trucks and these may not accumulate as many kilometres as the fleets in other provinces.

TABLE 3: Provincial/Territorial Comparisons[13]

	NSC trucks in collisions: 1996/1991		NSC trucks in collisions, in 1996, per:			
	fatal %	total %	1,000 registered trucks	100,000 population	million litres of diesel fuel sold	10,000 tonnes of for-hire freight
Nfld	25.3	52.7	36.3	45.7	1.84	3.34
PEI	150.0	97.4	25.2	81.9	3.13	1.25
NS	54.6	74.5	43.0	68.4	2.05	1.00
NB	74.1	56.7	20.9	88.3	1.82	0.79
Que	102.4	93.4	115.4	195.9	5.37	3.20
Ont	87.3	105.1	92.6	133.7	4.58	1.65
Man	93.3	81.1	29.1	103.4	2.71	1.62
Sask	100.0	93.3	14.9	147.5	2.26	1.53
Alta	77.5	145.9	44.8	259.4	4.23	2.29
BC	76.1	66.4	68.0	101.2	3.33	1.45
Yukon	100.0	87.7	32.1	106.3	1.54	6.82
NWT	*	56.7	33.2	162.4	0.97	
Canada	96.6	97.0	63.5	150.7	4.13	1.97

Population is probably only loosely related to truck activity: some provinces are corridor provinces and, as a consequence, have higher levels of truck activity than others; some provinces (notably Alberta and Saskatchewan) have very large populations of trucks in relation to the number of people; etc. Litres of diesel fuel sold might be a good measure of exposure. Data on diesel sales are only for fuel on

which road tax has been paid so some of the other "noise" can be eliminated (diesel sold to other modes or off-road uses). However, there remain problems: some automobiles and most buses also use diesel, trucks can buy diesel in one jurisdiction and travel in another; the ratio of gasoline trucks to diesel trucks is probably not the same in all jurisdictions; etc. Finally, while roughly only one out of seven trucks is a for-hire freight truck, total for-hire tonnages may be a good measure of exposure if there is some constant relationship between for-hire activity and total truck activity in each jurisdiction. But, since this is not known, the last column of the table -- as with the others -- is just one more possible way of looking at collision rates and, like the others, probably less than perfect.

The numbers in Table 3 do raise more interesting questions . Why, for example, do most measures show Québec in a worse state than other jurisdictions? On the other hand, why are all four measures of collision rates lower than the national average in Prince Edward Island, Nova Scotia, New Brunswick, Manitoba and Saskatchewan? In particular, why are the rates so significantly lower in New Brunswick? But, to repeat an earlier point, it is difficult for any of these aggregate measures to reveal something about causality.

Trends in Collision Rates

As one final attempt to use aggregate statistics on truck collisions, the numbers in Table 4 show the collision rate, by jurisdiction, from 1991to 1996. The numerator in this case is million litres of diesel fuel sold. This may or may not be the best measure of exposure, but it is readily available and quite reliable. To account for changes in new truck fuel efficiency over time, the denominator (fuel sales) has been inflated by 0.5% per year. (NRCan's latest forecasts use a figure of 0.4%.[14])

In addition to all the possible problems with using diesel fuel sales as a measure of exposure mentioned in the discussion of Table 3, for the numbers on Table 4 to mean anything, there would have to be some assurance that the number of diesel trucks and gasoline trucks -- and the activity of these two populations -- were relatively constant over time. Since this information is not available, the trends shown in Table 4 have to regarded as interesting but not conclusive. That qualification aside, it is encouraging that all rates are trending downwards. What would be more useful, however, is to know if the relatively good performance in NWT, NB, Yukon and BC -- these four jurisdictions show the greatest rate of decline -- was an indication of safety regulations or enforcement efforts. That, however, is pushing the data farther than it should be.

TABLE 4: Trends in Collision Rates

	NSC trucks involved in collisions per million litres of diesel fuel sales (inflated by 0.5%/year to account for improved fuel efficiency)					
	1991	1992	1993	1994	1995	1996
Nfld	2.93	2.69	2.18	2.00	1.80	1.80
PEI	4.09	3.67	3.21	3.12	3.00	3.06
NS	3.27	2.80	2.87	2.73	2.21	2.00
NB	4.16	3.42	2.73	2.35	2.21	1.78
Que	6.91	6.50	6.69	6.87	6.03	5.23
Ont	6.14	5.96	5.26	5.25	4.45	4.46
Man	4.49	3.44	3.04	2.77	3.02	2.64
Sask	3.29	2.83	2.44	2.19	2.29	2.20
Alta	4.47	4.99	4.52	4.13	3.83	4.13
BC	6.33	5.69	4.80	4.76	4.33	3.24
Yukon	3.11	2.95	2.47	1.80	1.71	1.50
NWT	3.15	2.01	2.80	2.63	1.36	0.94
Canada	5.66	5.38	4.98	4.88	4.35	4.03

Measuring the Impact of the NSC

This paper has shown that available statistics on truck collisions are not particularly useful in evaluating the effectiveness of safety programs and enforcement efforts. It is suspected that this will still be true when a measure of kilometres of travel becomes available (Statistics Canada's new survey). How, then, to measure the impact of the NSC?

The answer, it is suggested, lies in the example provided by research in the United States. Safety impacts have to be measured by looking at the performance of individual carriers. Do carriers given a "Conditional" rating -- which is more-or-less equivalent to a warning notice that the carrier had better shape up if it wants to stay in business -- improve (lower collision rates) in subsequent years? Is it true that carriers with a "Satisfactory" rating -- the highest rating under NSC #14 -- perform better (lower collision rates) than other carriers. Is there a relationship between carriers receiving a high number of out-of-service events during roadside inspections and accident rates or safety ratings? What about carriers in Ontario's proposed "Excellent" rating category or Alberta's PIC program -- these ratings or premier-carrier designations go beyond the requirements of NSC #14?

The means to perform this type of research are not yet available in Canada, but soon will be -- at least if all jurisdictions implement NSC #14. To rate carriers, each jurisdiction has to maintain a profile on carriers. This file contains the history of convictions, roadside inspections, collisions and usually audits. Since carriers also have figures readily available on distance travelled (they use these data to prorate fuel tax and registration tax), the means to develop good statistical measures of the performance (collision rates) of different groups of carriers will soon be available. Problems, of course, abound. Most jurisdictions will probably not make the contents of these profiles public. In the buildup to implementing NSC #14, it is suspected many jurisdictions are having problems with the accuracy of the information contained in the profile. (In 1997 the Provincial Auditor in Ontario found that 25% of the convictions arising from roadside inspections and audits were not correctly being recorded in the profiles[15]). It is not clear that data on distance driven from individual trucking companies can be made public.

These problems can be overcome. In fact it is known that at least one province (Ontario) has started preliminary research in this direction.[16]

Summary Observations

A simple comparison of the total number of vehicles involved in collisions, over time or among jurisdictions, reveals little about collision causation or the effectiveness of safety regulations/efforts. Even a conversion of these collision statistics to collision rates -- preferably collisions per million kilometres of travel by road class,as this is the best measure of exposure -- will probably still present difficulties to those trying to assess the impact of safety regulations. The need to assess the effectiveness of safety programs is growing: (i) substantial public funds and industry costs are being incurred to support these programs, (ii) public pressures require governments to do something about the "truck problem"; and (iii) proposed federal legislation will require an examination of the impact of safety ratings.

There will have to be a new research effort in Canada -- something that probably should have been thought of a decade ago. The methods used in the United States to evaluate various safety programs provides a model. What is required now is a statistical examination of the performance of individual carriers.

Endnotes

1. www.tc.gc.ca/roadsafety/

2. Transport Canada, *Review of the Motor Vehicle Transport Act, Position Paper*. Feb, 1998, Ottawa.

3. Office of Motor Carriers, 1997, *Truck Crash Profile: The National Picture 1996*, FHWA, US Department of Transportation, Washington, DC; and Office of Motor Carriers, 1998, *Large Truck Crash Profile: The 1997 National* Picture, FHWA, US Department of Transportation, Washington, DC.

4. US Department of Transportation, *1997 Comprehensive Truck Size and Weight Study, Volume II, Issues and Background*, draft, June 1997. Washington, DC.

5. Transport Canada, *Transportation in Canada 1997*, TP13198, Ottawa, pp 94-95.

6. Moses, L.N. & I. Savage, 1996, "Identifying dangerous trucking firms," *Risk Analysis* 16(3), pp 359-366.

7. Moses, L.N. & I. Savage, 1997, "A cost-benefit analysis of United States Motor Carrier safety programs," *Journal of Transport Economics and Policy*, 31(1), pp 51-67

8. The work, as reported in the OMC's MCSAFE Newsletter (Vol. 3, No. ii & Vol. 3, No. iii) is being done by the Volpe National Transportation Systems Center and Tom Corsi at the University of Maryland.

9. Data for 1991 to 1996 are from Transport Canada's TRIAD; data from 1984-1990 (excluding Québec) as reported in Transport Canada, circa 1994, *Commercial Vehicle Safety in Canada, Fourth Annual Report to Parliament*, pg 18.

10. Special Senate Committee on Transportation and Safety, *Report*, Jan. 1999, Table IV.

11. Nix, F.P., 1998, *Commercial Vehicle Program Threshold*, Road Safety & Motor Vehicle Regulations, Transport Canada, Ottawa

12. NRCan's latest figures (presentation by Joycelyn Exeter, Feb 15/99, Ottawa) suggest that in 1996 there were 532,000 diesel trucks in Canada and that these trucks accounted for 28.0 billion vkt. This suggests, then, if

the estimate of the total fleet of trucks > 4,500 kg is accurate, there are 179,000 gasoline trucks > 4,500 kg (711,000 - 532,000). NRCan's figures for average annual km of travel for all gasoline trucks (including the small ones) is 21,135. Assuming it is appropriate to apply this to the heavy gasoline trucks, this adds another 3.8 billion km to the large (>4,500 kg) truck population for a total of 31.8 billion km.

13. Sources: collisions from Transport Canada (TRIAD); truck population from Nix op. cit.; population from StatsCan's web site; diesel fuel sold from StatsCan #53-218; for-hire freight from StatsCan #53-212 as aggregated in trucks.xls on Transport Canada's web site.

14. NRCan, *Canada's Energy Outlook, 1996-2020*, April 1997, Ottawa.

15. Office of the Provincial Auditor, *1997 Provincial Auditor's Report*, Toronto, p 228.

16. The Ontario Ministry or Transportation engaged the services of Gordon Taylor and Frank Saccomanno to examine its CVOR files. Although the Ministry has not released the report, which was finished in the spring of 1998, it is known that this work made an analysis of data in the carrier profiles.

National Safety Code

By Darrell Richards

Executive Summary

This paper investigates and compares the state of the National Safety Code in the different provinces. It analyzes the history of the National Safety Code, and what developments might be expected in the next two to three years. It makes a similar examination of efforts to develop uniform weights and dimensions based on performance-based standards of vehicular stability, control and infrastructure damage.

The Canadian economy is becoming increasingly integrated with that of the United States, yet Canada maintains a very different regulatory structure for trucking. Trucking is the only mode of freight transport with inter-provincial activities under provincial control and oversight. Provinces may no longer be able to effectively regulate the safety of motor carriers because many of these truck and bus companies do not operate within provincial borders.

When Parliament passed legislation to deregulate the trucking industry, it planned to have a National Safety Code in place by 1990 to protect public safety. At best, the results of NSC implementation may be described as imperfect. An examination of the situation today is timely because the Government is also planning to deregulate bus entry/exit controls.

Government officials from different jurisdictions are genuinely concerned about safety, but as a group they have been unable to implement a uniform National Safety Code. The process of meshing split jurisdictions appears to be dysfunctional. In contrast, legislation and regulations for dangerous goods are consistent across the country. This is probably because the Federal Government has threatened to apply its dangerous goods regime unilaterally to trucking.

Safety Regulation in Canada

Overview of Truck Regulation

Trucking developed under provincial regulation in Canada because it was originally viewed as a local activity. The Federal Government introduced legislation to regulate trucking, proposed in 1937 and again in 1940. These attempts were withdrawn when truckers and shippers argued that traffic crossing a provincial border was only three to five per cent of trucking business. The Royal Commission of 1951 recommended that Parliament consider taking over control of trucking, but the Government felt that the majority of industry activity was still local or provincial. [1]

A bus company in New Brunswick challenged the province's authority to regulate its operations. In 1954, the Judicial Committee of the Privy Council determined that all activities of interprovincial operators were in federal jurisdiction. As a result, the Federal Government passed the 1954 Motor Vehicle Transport Act (MVTA) which delegated the federal authority for interprovincial carriers to the provinces. The 1967 National Transportation Act did provide a mechanism for the Federal Government to regulate trucking. The Minister at the time said the Government would not take back this regulatory administration unless the provinces agreed. [2] The Federal Government again delegated control to the provinces in the 1987 Motor Vehicle Transport Act which phased in the deregulation of trucking.

Trucking is no longer just a local activity. Roads have been paved and improved. Trucks are bigger and capable of carrying large loads across the continent. The just-in-time logistics system has resulted in trucks hauling more product longer distances.

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[1] A.W. Currie, Canadian Transportation Economics (Toronto: University of Toronto Press, 1967, 1976), p.461
[2] ibid

By 1990, traffic crossing provincial or international borders made up 69.4 per cent of inter-city for-hire truck traffic measured in tonne-kilometres. Local provincial traffic was just 30.7 per cent. By 1996, truck traffic crossing a border grew to 75.8 per cent of all truck traffic and local provincial traffic had declined to 24.3 per cent.[3] Interprovincial carriers accounted for 81 per cent of for-hire trucking revenues, while intraprovincial (operating within one province only) carriers made up only 19 per cent.[4]

Trucking Safety Standards

The Federal Government regulates the standards for new truck design through the Motor Vehicle Safety Act. But once the truck is on the road, the Federal Government is more or less out of the picture. Although it is responsible for the safety of interprovincial trucking operations, the Federal Government has delegated this responsibility to the provinces.

The Federal Government does have legislative authority to regulate the safety of truck operating practices under section three of the Motor Vehicle Transport Act, but the only regulation it has published concerns hours of work for interprovincial carriers. Even here, it leaves enforcement up to the provinces. Alberta and Saskatchewan do not enforce the federal regulation on interprovincial carriers when the driver does not cross a border.

Human Resources Development Canada regulates the health, safety and labour conditions for interprovincial carriers. It requires that these companies pay overtime to highway drivers who work over 60 hours a week, and to non-drivers who work in excess of 48 hours a week.

Thus, the provinces regulate the safety of operating practices. This includes driver testing and licensing, equipment maintenance and inspection, carrier and driver safety records and carrier safety audits.

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[3] Transport Canada, Transportation in Canada, 1997 (Ottawa: Minister of Public Works and Government Services, 1998) table 11-1
[4] ibid, p.163

When the Federal Government deregulated entry/exit control of the trucking business with its 1987 Motor Vehicle Transport Act, the Senate approved this on condition there would be a National Safety Code (NSC) applied to truck and bus operations. The Council of Federal/Provincial/Territorial Ministers of Transportation and Highway Safety stated in 1987 that the National Safety Code standards would be implemented by 1990.[5]

In 1993, the National Transportation Act Review Commission found that insufficient progress had been made:

> *"Past experience indicates the process for achieving agreement among Canadian jurisdictions, and their subsequent implementation of regulatory change in trucking, is not only lengthy but produces imperfect results. We believe this to be unacceptable where the safety of all highway users may be compromised."*[6]

> *"In the event that implementation and enforcement of an acceptable standard of safety regulations, including the National Safety Code for Motor Carriers, have not been achieved by March 31, 1994, then the Federal Government, with respect of jurisdictions not in compliance, should withdraw the delegation to administer extraprovincial trucking regulation and/or withhold federal contributions to highway infrastructure."*[7]

The Federal Government has attempted to lead the provinces to consistent implementation of the National Safety Code. But it appears that moral persuasion has been insufficient. The following table shows the provincial progress in implementing the National Safety Code.

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[5] Communique, February 12, 1988, Toronto, Ontario
[6] National Transportation Act Review Commission, Competition in Transportation: Policy and Legislation Review, Volume I (Ottawa: Minister of Supply and Services, 1993) p.49
[7] ibid, p.50

Table Illustrating Provincial Progress in Implementing the National Safety Code.

	Number of NSC standards fully implemented (16 total)	Number of provinces with fully implemented NSC standards
December 1989	3	0
July 1993	2	0
January 1997	2	0

Source: Minister of Transport reports to Parliament on Commercial Vehicle Safety

The National Safety Code was to include safety audits of carrier facilities and record keeping in order to determine carrier compliance with safety standards. Ministers dropped mandatory audits as part of the NSC audit standard in 1998, because some provinces were unable or unwilling to pay for them. Instead, the provinces have agreed to setting targets for random audits. It is not clear if all provinces have identified resources to meet the targets. As a result, some carriers will be assigned a satisfactory safety rating without an audit.

The appendix at the end of the paper shows that some NSC standards have been partially implemented. The Minister's Report to Parliament classifies some deviations as minor. Others are more serious. For example, Saskatchewan and Alberta have not implemented NSC limits on weekly hours of work. Truck drivers in Saskatchewan can work 104 hours a week, and those in Alberta 105 hours. A recent scientific expert panel concluded that an 84 hour week would produce a truck driver who is a danger to him/herself and to others.[8]

The National Safety Code was to apply to trucks with a gross weight over 4.5 tonnes. Alberta applies it to trucks over 18 tonnes. Saskatchewan applies it to trucks over 11 tonnes.

[8] Vespa, Rhodes, Heselgrave, Smiley, Baranski, Options for Changes to Hours of Service for Commercial Motor Vehicles, Sept 1998

When entry controls on new trucking operations were phased out, there was to be a compliance review system to determine how well carriers were performing with respect to safety standards. The tool for doing this is currently defined as a carrier safety rating system. Regulators have postponed the deadline for implementing the national motor carrier safety rating system several times. The latest deadline of January 1, 1999, has not been met. The national safety rating system is not expected now for another two to three years, and even then it will not be a uniform national system, but four different provincial systems. Sample carrier safety data fed into the four rating systems in 1998 produced different safety ratings.

In theory, the Federal Government, the provinces and territories sit down at the Canadian Council of Motor Transport Administrators (CCMTA) to develop and implement a National Safety Code that is uniform and consistent across the country. In practice, individual provinces can do what they like because the National Safety Code has no legal authority. Transport Canada does have some financial leverage, but appears to have not secured uniformity as condition of funding. Between 1987 and 1992, it provided $24 million to the provinces to implement the National Safety Code. It will provide another $20 million between 1995 and 2000.

Truck Size and Weight

In the late 1940's, a typical truckload had a 10 tonne payload on 25 foot long trailer. By the 1970's, trucks could have two trailers and a payload up to about 40 tonnes. Today, the regulated maximum is 62.5 tonnes gross (about 44 tonnes max payload) and 82 feet long. The prairie provinces and Quebec issue permits for trucks with two or three trailers up to 120 feet long.

Ontario adopted a large increase in gross truck weight in 1970. This put pressure on other provinces for similar increases. This resulted in a national Vehicle Weights and Dimensions Study under CCMTA initiated in 1984 and completed in 1986. It established national standards for truck safety performance such as braking, rollover, offtracking and jackknife. Implementing the report would have led to a reduction of weights in Ontario and eliminated a number of heavy trucks with non-conforming axle groups. It also recommended an increase in trailer length from 14.65 metres (48 ft) to 16.2 metres (53 ft). The provinces (except Nova Scotia) implemented the increased lengths, but Ontario did not implement the weight reductions or eliminate the triaxle and quad axle trailers that are more inclined to cause infrastructure damage, jackknife or rollover.

In 1993, the National Transportation Act Review Commission found insufficient uniformity and said:

> *"We recommend that the Minister of Transport negotiate with provincial governments to standardize operating and technical specifications affecting the trucking industry's efficiency. If such standardization can not be achieved by March 31, 1994, the Minister of Transport should introduce legislation providing for uniform operating and technical standards for extraprovincial trucking, to be administered by the provinces."*[9]

The Eastern Provinces tried again in 1995 to eliminate trucks that cause excessive infrastructure damage, or that fail safety performance standards for jackknife or rollover. Ontario did not sign the October 1995 agreement. Quebec implemented the agreement on new equipment in November 1998, with a schedule of weight reductions for existing equipment. Ontario is still studying the issue.

The prospect of nationally uniform weights and dimensions is now more remote than ever. Ontario is unlikely to reduce its weights anytime soon. Provinces and States will increasingly focus their efforts on regional cross-border harmonization. But even true regional harmonization is unrealistic, because no State or Province will reduce weight limits. Technical harmonization cannot occur if there is only a floor and no ceiling. That is the lesson of more than a decade of workings under the Canadian Memorandum of Understanding which has no legal authority to limit weights.

Dangerous Goods

Provinces have agreements compatible with Federal legislation and regulation on dangerous goods. Canadian regulations are in turn compatible with international standards. Spills and accidents involving all modes are reported to Transport Canada.

The national consistency for dangerous goods is in place because the Federal Government threatened to apply its regulations unilaterally to trucking under its power to make law for the "peace, order and good government of Canada." This consistency is, however, lacking in regulations that affect the safe operation of the truck itself, whether or not it carries dangerous goods.

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[9] ibid, p.67

Safety Regulation of Other Modes

The Federal Government regulates the safety of commercial airline operations, including pilots and aircraft, even where traffic does not cross a provincial border. It also regulates the safety of airports and air navigation. The Federal Transportation Safety Board investigates and reports on air accidents and is independent of the safety regulator. This avoids the conflict of interest in regulators investigating their own regulations.

The Federal Government regulates the safety of federal railways, including construction of lines and operations and maintenance of trains under the Railway Safety Act. All regulations are consolidated in one source document. Railways under federal jurisdiction account for about 95 per cent or more of railway activity. For example, Class I federal railways CNR and CPR account for 91 per cent of rail activity measured by tonne-kilometres.[10] The Transportation Safety Board investigates and reports on federal railway accidents, independent of the safety regulator.

The Federal Government regulates the safety of marine navigation and marine shipping. The Transportation Safety Board investigates and reports on marine accidents, independent of the safety regulator.

The Transportation Safety Board investigates and reports on pipeline accidents, independent of the safety regulator.

In 1994, the Canadian Accident Investigation and Transportation Safety Board Review Commission recommended that the Transportation Safety Board be given authority to investigate interprovincial motor truck collisions. In 1998, the Senate considered a proposal to allow the TSB to investigate truck collisions at the request of the province. This was not accepted. The 1999 Senate Special Committee (interim report) on Transportation Safety again recommended that the TSB mandate be expanded to include highway accidents, especially those involving large trucks.

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[10] Statistics Canada, Rail in Canada 1996, XPB 53-216, (Ottawa: Minister of Industry) p.52

Compared to the United States

The individual State role and responsibility is to implement the Federal and State policy through enforcement of the Federal truck size and weight laws in order to preserve Federal and State infrastructure investments. The U.S. Federal Government does not allow trucks over 80,000 pounds (36.3 tonnes), single axles over 20,000 pounds (9.1 tonnes) nor tandem axles over 34,000 pounds (15.4 tonnes) on the Interstate highway network.[11] Federal law requires States to allow a minimum 48 foot single trailer and double 28.5 feet trailers in combination. But it has frozen the limit on box length of combinations of trailers to that in effect in 1991. It has also frozen the operation of longer combination vehicles (LCVs) to the States and roads where they operated in 1991.

States with law or regulations inconsistent or incompatible with Federal ones are subject to financial sanctions, up to 50 per cent loss of the Federal safety grant. The Federal Highway Administration is responsible for developing truck policy and regulations affecting safety. This includes standards for new vehicles, weights and dimensions on federal aid highways, hours of work for interstate carriers, and safety standards such as mechanical inspections.

The U.S. National Transportation Safety Board is an independent Federal agency that investigates every civil aviation accident and significant accidents involving railroads, highway, marine and pipeline. It issues recommendations to prevent future accidents.

[11] there are some exceptions, for example to allow trucks at higher Canadian weights into Buffalo, N.Y., Michigan, and Shelby, Montana.

Summary Comparison of Truck Safety Regulation in Canada and the U.S.

	Canada	U.S.
New truck standards	federal	Federal
Safety regulations	provincial	Federally directed with sanctions
Hours of work	federal for interprovincial otherwise provincial	Federal for interstate Otherwise state
Truck size & weight	provincial	Federally directed with sanctions
Accident investigation	Police Coroners report in case of death Transport Canada investigates serious accidents, but reports are not public	Transportation Safety Board investigates and reports on major truck accidents, independent of safety regulator

Conclusion

The Canadian economy is becoming increasingly integrated with that of the United States, yet Canada maintains a very different regulatory structure for trucking. Trucking is the only mode of transport with inter-provincial activities under provincial control and oversight. Provinces may no longer be able to effectively regulate the safety of motor carriers because many of these truck and bus companies do not operate within provincial borders.

When Parliament passed legislation to deregulate the trucking industry, it planned to have a National Safety Code in place by 1990 to protect public safety. At best, the results of NSC implementation may be described as imperfect and inconsistent. The Government is now stating that it will implement a uniform national safety rating system to protect the safety of bus operations that will soon be deregulated. It is not clear how it can achieve a uniform national safety rating system when uniformity of the National Safety Code generally has been so elusive.

The government officials from different jurisdictions are genuinely concerned about safety, but as a group they have been unable to implement a uniform National Safety Code. The process of meshing split jurisdictions appears to be dysfunctional. In contrast, legislation and regulations concerning dangerous goods are consistent. This is probably because the Federal Government threatened to use its constitutional authority to apply its dangerous goods regime to trucking unilaterally.

Appendix – Status of Safety Code Implementation

	Fully Implemented	Significant Deviations	Minor Deviations	Not Implemented	Total Standards
Nfld	12	2	0	2	16
P.E.I.	7	3	1	5	16
N.S.	11	2	1	2	16
N.B.	10	1	3	2	16
Quebec	7	3	4	2	16
Ontario	4	7	4	1	16
Manitoba	12	2	1	1	16
Sask	7	4	3	2	16
Alberta	6	5	4	1	16
B.C.	7	3	5	1	16
Yukon	10	2	1	3	16
N.W.T.	9	3	1	3	16

Source: Transport Canada survey as of January 1, 1997, tabled by Minister in Parliament in September, 1998

Towards a Generalized Predictive Model for Annual Aircraft Emissions at Airports

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Abstract

Combustion of fossil fuel in the transportation sector is an important factor in the increasing production of pollutants, with attendant air quality problems in urban areas, and the global growth in concentration of greenhouse gases. The contribution of aviation has historically been relatively small, but is increasing. The aviation industry is presently growing at approximately 5% per annum worldwide, and is predicted to continue to have positive growth rates. The relative proportion of the aviation component in emissions attributed to transportation is predicted to increase significantly in the near future.
To establish and attain emission reduction targets, and for meaningful environmental impact assessments, it is important to have predictive models for emission inventories. Previous studies have demonstrated that a linear relationship, with very good correlation coefficients, exists between the maximum allowable takeoff weight of aircraft and the quantity of gas produced. That is, the greater the amount of work done in lifting the aircraft (weight of aircraft), the more pollutants and greenhouse gases are produced, relative to a lighter airplane. In this paper, that relationship has been extrapolated to the annual aircraft emission inventory at airports. Here, the total weight lifted annually is plotted against the total annual quantity of each gas produced. This has been done for six airports, ranging in size from small city centre airports (Toronto Island Airport) to large international airports (Charles de Gaulle, Paris). Results show that statistically significant linear relationships exist between the products of combustion (uncombusted hydrocarbons, carbon monoxide, oxides of nitrogen, sulphur oxides, and carbon dioxide) and the total aircraft weight moved annually. The linear equations derived can be used to estimate the annual

emissions produced by aircraft at an airport, knowing only the fleet mix that will be using the airport. Modelling exercises can be done for the future enabling predictions of annual aircraft emissions, for use in environmental impact assessments.

Introduction

Atmospheric change as a result of anthropogenic activities has been, and continues to be, an important area of investigation in environmental science. Two major areas of concern are the negative changes in air quality, particularly in urban areas, and potential climatic problems due to increased concentrations of radiatively active gases (GHG's). The combustion of fossil fuels in transportation produces a significant proportion of total global pollutants and greenhouse gases (GHG's). Although aviation presently only produces a relatively small proportion of these emissions (e.g. 10.0% of total CO_2 emissions in the U.S. transportation sector in 1995; Grant *et al.*, 1998), the aviation industry is in a prolonged phase of positive growth, approximately 5% per annum globally, and is growing faster than the global economy. The relative proportion of emissions from aviation in the transport sector will thus likely increase (see Patterson and Perl, in press 1999, for an enlarged discussion).

Most large airports are located near major urban centres, and thus are a contributing factor to metropolitan airsheds. Consequently, for more than the past decade, proposed changes to airports have in many countries been subject to approval from environmental impact assessments. Environmental impact assessments (EIA) are generally required when expansion is planned at an airport. Some examples of plans that can trigger an EIA are runway expansion (e.g. Toronto's international airport, Transport Canada, 1991; Manchester, Manchester Airport PLC, 1993), terminal expansion (e.g. London Heathrow, Terminal 5, ongoing), or a change in fleet mix allowed at an airport (e.g. Toronto City Centre Airport, Patterson, 1997). Most expansions involve projections for increased total annual aircraft movements, and thus a potential increase in aircraft emissions.

It is the purpose of this paper to present a generalized predictive model for annual aircraft emission inventories at airports. This model may be used to make quick, order of magnitude estimates of the expected annual aircraft emissions with the proposed changes, and requires knowing only the planned fleet mix and projected number of movements by model of aircraft.

Aircraft Emissions at Airports

Emissions of gaseous pollutants and greenhouse gases from the combustion of fossil fuel in aircraft engines are classified by provenance; those emitted at airports, and those emitted during flight. The emissions from aircraft operations at airports occur below the boundary mixing layer of the atmosphere, and are the focus of this paper. The gases considered are HC (total hydrocarbons), CO (carbon monoxide), NO_x (the oxides of nitrogen), SO_x (the oxides of sulphur), and CO_2 (carbon dioxide). The impacts and quantification of in-flite aviation emissions are the objectives of several large collaborative efforts (e.g. the European AERONOX programme, and NASA's Subsonic Aviation Assessment) and are not considered here.

The procedure for the calculation of aircraft emissions at airports is well defined. The emissions considered are those produced during the landing and takeoff cycle (LTO), up to a height of 900 m (EPA, 1985, 1992; ICAO, 1993). There are four components to the LTO; approach, ground taxi-idle-queue, takeoff, and climbout. All these operations are defined as occurring below the boundary mixing layer (900m average). The times spent in each of these four modes is standardized (ibid), except for the ground time, which varies for each airport and must be determined in each airport study. Emission data is available for many engines, and emission indices are published in tables for the engine thrust levels characteristic of each of the four LTO modes (EPA, 1985, 1992; ICAO, 1995).

To calculate the emissions generated by a specific model of aircraft during an LTO, it is first necessary to match the engine to the aircraft. Information on all the world's airplanes is published annually in *Jane's All the World's Aircraft*, and *jp fleet guides*; from these sources engines can be matched to the specific model of aircraft. Using the emission indices and known times-in-mode, emissions can be calculated for a specific model of aircraft with a specific engine. This methodology is given in more detail in EPA(1985, 1992), ICAO (1993), Woodmansey and Patterson (1994), and Perl *et al* (1997).

For situations where the emissions are not available for a specific engine on an aircraft, there are different solutions. The traditional approach to this problem has been to substitute a similar engine for which emissions were known (Segal and, 1988; Moss and Segal, 1994; EDMS, 1997). However, there can be tremendous variability amongst even very similar engines (Woodmansey and Patterson, 1994), and thus a new technique was developed (ibid). Plotting the maximum allowable takeoff weights of aircraft against the calculated emissions for those aircraft (with known engine emission indices) shows linear relationships (ibid). As the weight of the aircraft increases, so too does the amount of work required to "lift" the aircraft. The quantity of fuel burned and

emissions generated also increases with the aircraft's weight and the amount of work done. Linear regression equations are calculated in the form

$$y=mx + b$$

where
- y - is the quantity of emissions
- m - is the slope of the line
- x - is the maximum allowable takeoff weight of the aircraft
- b - is the y-intercept

Thus, in the case of aircraft with unknown engine emissions operating at the airport under study, the calculation of linear regressions based on known emissions at that airport enable the estimation of emissions for all aircraft for a given airport. Knowing just the maximum allowable takeoff weight of an aircraft (and this is available for all aircraft in *Jane's*) it is possible to estimate the LTO emissions. The full explanation of this technique is given in Woodmansey and Patterson (1994).

The calculation of the annual aircraft emission inventory for an airport is straightforward. The number of LTO's performed annually for each model of aircraft is multiplied by the emissions for that model of aircraft, and summed for the annual total. In practice, the situation is actually more complicated, because quite often more than one type of engine can be mounted on the same model of aircraft. Thus, there can be a range of emissions for each aircraft model, and therefore a range in the annual totals. To include a sense of the degree of variability that there can be in the final values, a new technique was developed in the course of studying Charles de Gaulle (Patterson, 1996) and Lyon-Satolas airports (Perl *et al*, 1997). For an airport, maximum and minimum values can be derived for the annual emission totals, and reflect the range possible in the emission inventory.

A Predictive Model for Annual Aircraft Emissions at Airports

In the preceding section, the relationship between weight of an aircraft and the quantity of emission produced during an LTO was described. In the course of a comparative analysis of the annual aircraft emissions for Toronto's Lester B. Pearson International Airport (LBPIA) and Charles de Gaulle (CDG) airport in Paris (Patterson, 1996, submitted), another aspect of aircraft weight and emissions emerged. Although Toronto's international airport has more annual LTO's than CDG, more NO_X, SO_X, and CO_2 is produced at CDG. The explanation for this was sought through an examination of fleet mix (Patterson, submitted). For each airport, the total annual weight "lifted" was calculated.

The maximum allowable takeoff weight for each aircraft was multiplied by the total annual number of LTO's made by that aircraft, and then summed for all aircraft for that year. Although CDG experienced fewer LTO's than Toronto, the fleet mix is dominated by the larger trans-Atlantic and trans-continental servers, and annually more "work" is done at CDG. This then accounted for the higher emission totals at CDG, in spite of fewer aircraft movements.

In this paper, this analysis is now taken farther. The airports considered are Toronto City Centre (TCC; formerly Toronto Island Airport), LBPIA, CDG, and Lyon-Satolas, France (LYS). Table 1 shows the results of emission inventories for different airports for several years. For all of the inventories, except the Toronto ones, maximum and minimum estimates are given (the Toronto airports were studied before the maximum/minimum technique was developed). The total amount of work done at each airport for each year was calculated in the form of the total weight lifted, as described above. For each gas considered, the annual total of emission produced was plotted against the total weight lifted. Very good linear relationships exist.

Table 1. Total annual weight lifted and tonnes of emissions produced by airport.

Airport	Wt kt lifted	HC tonnes	CO tonnes	NOx tonnes	SOx tonnes	CO2 tonnes
TCC scenario 1	171	0.64	294	8.3	0.6	3.7
TCC scenario 2	165	0.54	223	8.3	0.6	3.5
LYS 1987 min	1078	21	77	97	5	27000
LYS 1987 max	1078	62	179	161	9	41000
LYS 1990 min	1645	19	102	180	8	49000
LYS 1990 max	1645	69	216	256	12	55000
LYS 1994 min	1736	40	157	286	9	69000
LYS 1994 max	1736	76	242	374	12	75000
LBPIA 1991	11162	1577	4168	1975	88	529900
CDG Max 1993	14940	965	3022	2394	109	569120
CDG Min 1993	14940	751	2487	2263	105	553322

The resulting linear equations are shown in Table 2. The equations are in the form

$$y=mx + b$$

where
- y - is the quantity of annual emissions (tonnes)
- m - is the slope of the line
- x - is the total annual aircraft weight lifted (kilotonnes)
- b - is the y-intercept

Table 2. Linear equations for the prediction of total annual aircraft emissions at airports.

Gas Emitted (tonnes)	Predictive Equation
HC	y = 0.0769x - 26.216
CO	y = 0.2236x - 7.2203
NO_X	y = 0.1611 - 9.1869
SO_X	y = 0.0074x - 1.2762
CO_2	y = 39.956x - 3751.13

Statistical analyses were run, and the results are shown in Table 3. The t-test values (t) and correlation coefficients (r) are excellent for all five gases examined, and all equations are statistically significant. The results are best for NO_X, SO_X, and CO_2, and less strong for HC and CO. However, this follows on the conclusions of Woodmansey and Patterson (1994), where it was demonstrated that the correlations were best for those gases which are produced in the greatest quantity when the engines are doing the most work (NO_X, SO_X, and CO_2). As most of the CO and HC produced in an LTO is during the ground mode, the power to weight relationship is less strong, and the correlations are weaker, although still statistically significant.

Table 3. Results of statistical analyses on the regressions.

Values	HC	CO	NO_X	SO_X	CO_2
r	0.861	0.904	0.999	0.998	0.991
r min	0.602	0.602	0.602	0.602	0.602
t	5.080	6.378	33.42	44.49	22.2
t min	1.83	1.83	1.83	1.83	1.83
n	11	11	11	11	11

This means that simply knowing the fleet that is using the airport, and knowing how many LTO's are made annually by model of aircraft, an approximation of the annual emissions produced by aircraft can be made. This technique enables quick and reasonably accurate estimates to be made for the purposes of environmental impact assessment, for runway, fleet mix, or infrastructure changes at an airport.

Conclusions

Concern over deteriorating urban air quality and increasing greenhouse gas concentrations have led to analysis of the major sources of these emissions in order to define and attain emission reduction targets. Although aviation has previously been a relatively small transportation source, its contribution is increasing as the industry continues to experience positive annual growth rates, exceeding that of the global economy. To accommodate this growth, expansion at airports is generally required, with new runways, terminals, or a change in fleet mix allowed to operate at the airport. These proposals for change generally trigger an environmental impact assessment.

The previously documented relationship (Woodmansey and Patterson, 1994) between weight of aircraft and quantity of emission produced was expanded in this paper to examine total annual aircraft movements and the annual aircraft emission inventories at airports. For the airports studied, the maximum allowable takeoff weight of each model of aircraft was multiplied by the total annual number of movements of that model, and summed for all aircraft at the airport, to attain the total aircraft weight moved for that year at that airport. These values were plotted against the total annual emissions. A strong linear relationship exists between the aircraft weight moved and annual quantities of HC, CO, NO_X, SO_X, and CO_2. From this, linear equations were derived to predict total emissions, that can be used knowing only the fleet mix and total annual aircraft movements.

This analysis has resulted in a generalized, predictive tool for annual aircraft emissions at airports. The model can be used to make quick, order of magnitude estimates of the expected annual aircraft emissions, and requires knowing only the planned fleet mix and projected number of movements by model of aircraft. The ability to make quick aircraft emission estimates may prove valuable in future environmental impact assessments at airports.

Acknowledgments

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"Green Corridors?: Meeting Kyoto Targets through Regionally Integrated Strategies to Reducing Greenhouse Gas Emissions, The Mid-Continent International Trade Corridor, A Case Study."

A Paper Presented to
The Canadian Transportation Research Forum
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by

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I:Introduction

The need to study and examine trade corridors as something more than a quick fix— the shortest, fastest, and cheapest method of moving finished products or commodities along a supply system between the point of production to final destination— is becoming increasingly apparent at the turn of the millennium. In fact the writing is already on the wall for company officials and planners alike, for the next century will be filled with a myriad of challenges to 'conventional' approaches to conducting business. For instance, as traditional non-administrative trade barriers such as quotas and tariffs fall, they will increasingly be replaced by all sorts of Administrative Trade Barriers (ATBs). Understanding how these barriers are erected and devising strategies for their dismantling within the existing political and legal system will become a critical tool towards enhancing opportunities for international trade. Among the many changes the future holds, perhaps none will be as important as environmental challenges.

II:Trade Corridors

A. NAFTA

Since the 1980s, with NAFTA, GATT and deregulation of the various transport sectors in both national and international contexts, new global competitive pressures in trade are forcing a reorientation of markets. In North America new trade opportunities now exist in a North-South context between Canada, United States and Mexico.

In light of these developments thirty-eight (38) corridors have been identified across and throughout North America.[1] Some of these include the Central North American Trade Corridor, the Superhighway Coalition and the Canamex Route.

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1 The concept of transportation and trade networks is not recent. A brilliant environmental study of trade, corridors, and the relationship between city and region is, William Cronon, *Nature's Metropolis: Chicago and the Great West*, W.W. Norton & Company: New York, 1992. More recently, the European Union has been exploring and funding these types of networks for a number of years. Trans-European Networks linking up regions via transportation and telecommunications links is part of an overall development plan for the member-states. See Trinnaman, J., 'Trans European Networks', in Lodge, J.(ed), *The European Union and the 1996 IGC: Crisis or Opportunity?*, Representation of the European Commission (UK), 1996.

In doing so, trade-related actors are attempting to integrate the way in which they conduct business in order to benefit from government involvement in, for example, corridor infrastructure. The development of these strategies only heightens awareness that, even with the presence of certain similarities, each corridor has an equal number of unique characteristics. To this end the Mid Continent Corridor is no different.

B. Mid Continent International Trade Corridor Uniqueness

The Mid-Continent International Trade Corridor (MITC) is a vast swath of land that extends from Murmansk, Russia to Monterey, Mexico and beyond. In early 1998, the Right Honorable Lloyd Axworthy, Minister of Foreign Affairs, and Ronald Duhamel, Secretary of State for Western Economic Diversification, asked a group of Manitoban stakeholders – members of government and industry – to consider public policy and business aspects of the MITC with the intended goal of strengthening international trade and economic expansion opportunities.

A result of this request was the establishment, in February 1998, of a Federal Task Force charged with locating ways in which the Manitoban economy could be expanded through trade opportunities. One primary result of this Task Force was to identify a corridor of potential trade and social interaction opportunities that exists in a North-South geographical area. In truth, trade relations between Manitoba firms and those based in both the United States and Mexico already exist, and as the report indicates, are expanding year-by-year. For example, Manitoban trade to the US (corridor-specific) tripled from 1990 to 1996, with a total value of 2.1 Billion. Likewise, trade between Mexico and Manitoba rose from only thirteen to eight-seven million in the same period.[2] Examples of such movement include the building of a New Flyer (motorcoaches) plant in Minnesota and a Mexican branch plant for Palliser Furniture, a leading company in its industry.[3]

However, it was also indicated that such trade was based more on *ad hoc* firm-by-firm relations and contacts rather than a strategic plan that could, and should

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2 Other indicates of trade increases such as truck traffic volume and rail movement have also expanded at a rate of two and three times during the same period as well. See *Report of the Mid Continent International Trade Corridor Task Force*, 1998, p.10.

3 Ibid., p.16.

involve industry and government, as well as academic and research facilities throughout this geographical area that are involved in trade-related issues. A corridor, therefore, is more than just the sum of all existing and future trade relations between firms in this geographical area that extends from Churchill in the North to Monterey, Mexico, in the South. A corridor is also the development of a strategic plan that can take advantage of the special features of this geographical area, both human and physical, and develop trade-related opportunities of a long-term nature.

The MITC corridor is no exception. It is an attempt to identify the key players and resources of this geographical in order to assist in the expansion of trade, albeit in a coordinated and strategic manner. Trade will always occur throughout this corridor in part because of the obvious geographical similarities. However, the corridor is an attempt to make sure that such trade is not the result of *ad hoc* or by chance encounters, but foresight and planning.

This increase in trade in a planned manner throughout the MITC is possible because of these already existing trade relationships and patterns, but also its unique nature. These features include:

- accessibility from all directions
- state-of-art inter-modal facilities
- geographical window larger than most corridors
- favorable flat, dry terrain with few weather-related interruptions
- shortest travel distance between Mexico and Western Canada
- traditional role of Winnipeg as transportation center and gateway

In light of existing trade flows and the unqiue characteristics of the MITC area, the Task Force suggested that four areas of importance exist with respect to the creation of a corridor-specific strategy. These include the harmonization of rules and procedures; development of infrastructure and investment; education and training; and the need to strive for corridor-related innovations.[4]

All of these strategies, coupled with the following recommendations, are attempts to increase existing trade relations between Manitoban firms and their counterparts in both the United States and Mexico, and initiate new ones in the same region. This, however, presents a problem. Conventional wisdom is that, regardless how one trades goods and services, some type of transportation will be required. Regardless of whether the train is better than a truck, the trading of goods necessitates the expenditure of fossil fuels. One direct result of this

[4] Ibid., pp.21-22. Specifics can be found on pp.23-31.

activity is an increase in greenhouse emissions. The fact that the corridor initiative is an attempt to expand trade opportunities rather than simply maintain existing ones indicates that even more fossil fuels will be emitted over time if the corridor initiative in successful.

In and of itself the corridor project presents few difficulties. However, it is the indirect result of increased trade may present a number of problems in light of recent international environmental developments.

III:North America's Environmental Commitment

Environmental history, or the study of the relationship of human engagement with the physical world has undergone a significant transformation in the past couple of decades. In earlier times when Canadian history strove to include an environmental theme it often focused on overcoming the physical limitations the environment put upon us as civilization advanced. When the environment was not something to be overcome popularized in the writings of a Pierre Berton or in the more conservative writings of Donald Creighten, then it was often portrayed as part of our unique and peculiarly Canadian feature that made us different from our neighbors south of the border in the writings of W.L. Morton.[5] Up until the 1990s the Canadian historical profession really lagged behind the movement in natural sciences towards an environmental interpretation of our place. In fact it was not until 1995, that the first reader on Canadian environmental history was put together which had "brought together a collection of controversial articles that outlines the reactions of First Nations and white explorers to the astonishing bounty of North America and that traces the apparently inevitable cycles of ruthless exploitation of degradation of resources that followed." As J.L. Granatstein noted, "Environmental history is a new field of study in Canada (and elsewhere, too), and the articles collected here open up doors that have remained closed far too long. No one who reads this volume in the *New Canadian Readings* series will have any doubt Canadian environmental history is well worth study, and is full of possibilities for innovative research."[6]

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[5]See, W.L. Morton, *The Canadian Identity,* (Originally published 1961) 2nd Edition, Toronto, University of Toronto Press, 1972., esp. "The Relevance of Canadian History,"

[6]See Chad Gaffield and Pam Gaffield, *Consuming Canada: Readings in Environmental History,* Copp Clark: Toronto, 1995.The quote is from J.L. Granatstein's "Forward" launching this series. This work should be read alongside, Carl Berger's *The Writing of Canadian History: Aspects of English-*

However, it was not until the early 1970s that the environment as a study moved from a geographical topic to a global issue. The first United Nations-sponsored conference on the environment brought the concern onto the international stage for the first time. It encouraged countries to think of the environment in more than simply geographical language, and tourism-oriented terms. Nonetheless, the recession of the mid to late 1970s, coupled with right-of-center governments in both the United States and Britain in the 1980s, combined to derail the environment as an active global concern.

Political changes in the United States and Europe, coupled with new evidence concerning the state of the rainforests and ozone layer, gave impetus for a second international conference on the environment. The UN Conference on Development and the Environment (Rio 1992) reiterated many of the suggestions of the early 1970s, as well the new position that the world must develop within an environmentally sustainable context. Both industrialized and developing countries must commit themselves to thinking about economic, as well as environmental, costs and benefits.

Following on from the work of Rio 1992, the *Kyoto Protocol to the United Nations Framework Convention on Climate Change* was successfully negotiated in December 1997. It establishes a commitment period between 2008 and 2012 in which Annex I (industrialized) Nations are to reduce emissions on average to 94.8 percent of 1990 levels. The basis for emission reduction quota's at Kyoto was purely political, Canada is to reduce its emissions by six percent; the US by seven percent; European Union nations by 8 percent.[7]

The *Kyoto Protocol*, although an important step in the right direction, is just one of a series of promises and commitments made to reduce Greenhouse emissions (GHE's) made by the Federal Government. As an editorial in the *Winnipeg Free Press* pointed out at the end of last year, the Mulroney government had early on made a promise that by the year 2000, Canada's emissions would drop to 1990 levels: the editor noted that 'Canada will miss that target by a country mile." Similarly unless steps are taken now to begin to coordinate municipal, provincial, federal and even transnational matters in transportation, we will likely fall considerably short of the mark. As the free press editorial noted, it is

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Canadian Historical Writing since 1900, (second edition), University of Toronto Press: Toronto, 1986.

[7] See Rolfe, C., *Turning Down the Heat:Emissions Trading and Canadian Implementation of the Kyoto Protocol*, West Coast Environmental Law Research Foundation, Vancouver, BC, 1998.

likely that the Chretien government will not be in office to face questions towards its promise in 2008-2012 when targets come do. Since that is likely the case, "This may help account for the ease with which governments make long-term greenhouse gas promises and then omit to fulfil them."[8] The author of this editorial insisted that with provincial power utilities, highway departments, industry executives, municipal councils and others making decisions every week that will affect future pollution, Ottawa's present responsibility should at least be "to ensure that rational methods are available for measuring atmospheric impact, so that those who want to inflict less harm on the future can estimate the costs and benefits of doing so."[9]

As a signatory to the Kyoto Protocol Canada is responsible for reducing Greenhouse Gas Emissions by 6 percent from 1990 levels between 2008 and 2012. While undoubted, reducing GHE's will likely mean turning to more efficient engine types, improving fuels, and perhaps turning away to more environmentally friendly forms of transport, there are other, perhaps less radical, possibilities that could improve current emissions, avenues that could be pursued to the benefit of societies as a whole. I am essentially suggesting that in trying to 'green' corridors the goal should be to try and make it as 'painless' as possible for those individuals, companies, and communities who will ultimately share the burden of the responsibility while at the same time trying to make it as effective as can be achieved. These two positions need not be contradictory, but will require that the canvas be broad and its colours as rich as possible.

A. Greening Corridors

"Greening" the corridors is essentially the process of trying to enhance the quality of life in specified regions, cultural, economic and geographically defined but amorphous, without rigidities, in terms of boundaries. "Greening" can occur in areas such as technological transfer and sharing of information through science and research in universities. For instance, the linking of centres to share information and to ease problems in a much more cooperative fashion, knowledge-based, is one example. A second might be developing environmentally friendly eco-tourism systems.

B. Two Schools

[8]Editorial "Getting a start," *Winnipeg Free Press*, 29 December 1998, p. A12.

[9]Editorial "Getting a start," *Winnipeg Free Press*, 29 December 1998, p. A12.

These suggestions represent, to one degree or another, an attempt to broker a peace between two often divergent strands of thought within the environmental movement, and between this movement and industry. The first strand is 'shallow', whereas the second is considered 'deep'. The former school considers it important to be environmentally sound, albeit without a tremendous cost to business.[10] Its concerns are '...the fight against pollution and resource depletion...central objectives [are]...the health and affluence of people in the developed countries...'[11] One example of this perspective would be, with respect to the transportation of goods, the use of rail instead of land. However, this decision would only be taken if the cost of rail is less than that of land, as well as more efficient. It would not be made on the basis of environmental considerations alone. In comparison, 'deep ecological' thinking stresses a fundamental shift in lifestyle thinking with respect to the environment rather than making policy changes at the margins. Principles include the '...rejection of the man-in-environment image in favor of the *relational, total-field image*...[and] a deep-seated respect, even veneration, for ways and forms of life...'[12] The subsequent platform has eight points, the sixth being '...significant change of life conditions for the better requires change in policies. These affect basic economic, technological, and ideological structures...'[13] The example with the rail/truck decision would be, in this scenario, made on the basis of environmental costs rather than efficiency savings or economic benefits. If rail was better to use with respect to the reduction of greenhouse gases, then this mode of transportation would be used, regardless of any other costs or benefits. Simply put, the environment would come first, and 'strict' business concerns second. This represents not so much a compromise with industry, but rather an 'ecosophy' with respect to the relationship between industry, man, and nature.

C. Areas of Green development

The results, with respect to the MITC, may be something that is less than 'deep', but more than 'shallow' in environmental orientation. The results will be so because the US and Canada must conform to Kyoto commitments, but do so in a way that does not harm their equally shared interest in enhancing and expanding trade opportunities in general, and throughout the Mid Continent Trade Corridor. For this reason, three general areas have been identified as those where

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10 Hooker, C.A., 'On Deep Versus Shallow Theories of Environmental Pollution', in Gare, A.(ed.), *Environmental Philosophy*, London:Pennsylvania State University Press, 1983, pp.58-84.

11 Maess, A., Ecology, community and lifestyle, New York:Cambridge University Press, 1989, p.28.

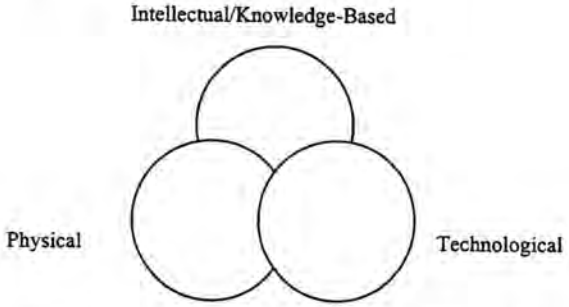
12 Ibid.

13 Ibid., p.29.

the development may be able to occur, albeit in an environmentally-friendly manner. These areas are:

- Intellectual/ Knowledge-Based
- Physical/Geographic/Spatial
- Technological/Mechanical

It should be a priority of 'green' thinking to not only identify general areas in which sustainable development should be encouraged, but do to so in a comprehensive manner. Therefore, rather than positioning these above areas in some *ad hoc* order of importance, they should be instead considered in relation to each other in both general, and specific, terms. One result of this type of thinking should be, at a macro level, the identification of these areas in the following frame of reference:



This, however, creates an oxymoronic situation. On one hand the Canadian and US governments have committed themselves to the reduction of greenhouse emissions. On the other, they are both committed to expanding trade opportunities for industry in such a manner that greenhouse emissions will be maintained, if not increase. The result will be, if left unresolved, a situation whereby industry will prosper at the expense, as it has been in the past, of the environment. But this does not have to be so. The potential for increased trade between companies along the corridor and the resulting emissions output should encourage, if not force, both government and industry to work towards the trading of goods in an environmentally sustainable manner. In this respect all actors involved in the corridors should work towards a situation where the

means by which goods are transported are 'green/clean' in orientation given the distances that these goods will be transported.

IV:Policy into Practice

A number of areas in which green corridors may be developed, in general, were indicated above. To this end a number of specific project areas have been identified within the corridor relevant to the reduction of greenhouse emissions and therefore a 'green/clean' environment. These project areas include:

- Electronic freight markets
- Energy efficient fuels
- Multi-use container facilities
- Educational links
- Eco-tourism

A. Multi-Use Container Facilities

Inter-modal freight container facilities are not new. They exist in a number of US/Canadian facilities such as Huntsville, Alabama and along the so-called Iron Highway, in both the Toronto-Montreal and Chicago-Detroit areas. These facilities are attempts to strategically locate container facilities that will bring together all forms of trade transportation, including air, land, sea and rail.

Prior to the establishment of these facilities, these different types of trade transport operated almost entirely independent of each other. In many locales this was not a conscious development, for these cities were served by only a number of these transportation types rather than all four. This has not changed in most of these locations. However, in locations where all four types of transportation are in heavy demand, or the geographical location dictates a transportation-dominant economy, new forms of container facilities may be welcome as a means of creating efficiencies in the movement of goods. This is certainly the case with the above mention locales. Goods are transported by all four forms, and it was considered useful to incorporate all four of them into one facility.

This is not the case with Winnipeg. The transportation of goods by sea is not a priority within the context of Winnipeg. The priorities are land, rail and air, with the former two dominant. But what the city lacks in one area it gains because of its geographical location. Situated in the middle of Canada, a substantial volume of goods are transported by land or rail from east to west, or

visa versa, through Winnipeg. This has assisted in making the city the home to a number of the countries largest trucking companies, as well as a number of homegrown ones as well.

Having said this, the transportation of goods from, to and through Winnipeg lacks coordination. This is a glaring omission given its geographical location, but even more so within the context of the MITC. Given that the MITC is a corridor with unique characteristics that lends themselves to the enhancement of trade opportunities throughout the area, transportation facilities, and their efficiency, become even more important. Simply put, trade will be hindered if the means by which it is transported is inefficient in its organization.

Already, the two major rail companies, CN and CP, have existing arrangements with local/national trucking firms. However, it is precisely because of the lack of coordination between the rail companies as seen by the presence of specific relationships that discussions concerning the building of a comprehensive integrated rail container facility in Winnipeg. The development of the MITC has further spurred the consideration of such a facility, given the ease it would bring to companies already or interested in developing trade relations in the US and Mexico.

Located near the airport authority, the two major rail companies would utilize the same facility. Through the creation of this facility, Winnipeg will have a container port that would be able to integrate, and therefore take advantage, of its strength in land, air and rail transportation. A seamless web between the three will develop, assisting in rather than inhibiting the trade in goods in both North-South and East-West directions.

There are, nonetheless, benefits accruing from such a facility beyond those of a trade-related manner. Through the development of an integrated container facility, companies will be encouraged to use the most efficient means of transportation.[14] Further, industry can also be encouraged to use the method of transportation that is the cleanest with respect to environmental concerns. Statistics illustrate that rail meets both of these criteria. With respect to the former, it is calculated that in distances of 700 miles or more, there is at least a twenty-five percent reduction in costs in comparison to trucking. Further, double-stacked containers reduce highway traffic by 200 trucks, with a

14 It is calculated that rail is the cheapest means of long-haul delivery, whereas truck is with respect to short haul delivery. An intermodal facility that links rail with land would be able to foster a seamless relationship between the two, with reduced costs.

corresponding emission reduction of one-fifth of diesel and hydrocarbons per billion ton miles, and an additional reduction by half of nitrogen oxide and carbon monoxide per billion. Simultaneously, the reduced wear on highway infrastructure may be factored into the equation, as well as the fact that rail transportation is safer than that of trucking.

However, these savings are primarily associated of haulage in the 700 mile range. With respect to the MITC, this would be equivalent to the distance between Winnipeg and Minneapolis (726 miles). With this in mind, intermodal facilities could have a definite and helpful role in facilitating trade between locales within the corridor.

Again, connections between various types of transportation delivery systems already exist within the Winnipeg context. They do not, however, exist in a coordinated fashion that is inclusive of all interested partners. The lack of such a facility that does so does nothing but inhibit trade. The development of an integrated inter-modal container facility, working in coordination with the MITC, would not only bring economic benefits to the city and corridor, but ones that are green in nature, thus enhancing the ability of the corridor to act as a 'model' in more ways than one.

B. Electronic Freight Markets

There is nothing novel in the concept of establishing electronic freight markets in industry. They have been used by travel agencies (for ticket purchasing), real estate agents (use a Multiple Listing Service to post potential home vendors under municipal boards), and financial brokers (trade of grain futures).[15] According to one noted authority on the subject, electronic freight markets must have specific institutional characteristics: 1) membership rules, 2) a price generating mechanism, 3) classification and quality checking and; 4) centralized transaction processing.[16] It has then been illustrated that even with the potential

[15]While it is obvious from examples cited above that there has been considerable debate about the influence within communities of these so-called markets (good and bad) and although we do not endorse them equally. We are simply suggesting that precedents exist and that furthermore in a new and increasingly green global community we have to make choices.

[16]Kai Reimers, *Eine transaktionskostentheoretishe Analyse von Normungsprozessen*, Dissertation an der Universit Et Wuppertal, (Juni); also cited in Dr. Barry E. Prentice and John O. Mulligan, *An Electronic Market for Truckload Freight: Economic Definition, Existing Structure and Missing Prices,*

negative costs associated with such systems, such as free riding and the complexity of product description on the market board itself, the benefits of this bulletin board-type system are greater.

With respect to the trucking industry there are a number of specific issues where a market of this type could benefit the industry as a whole in terms of its efficiency, and add to its ability to act in a green manner. Specifically speaking, the primary concern is the front haul – back haul problem. This is when a load is delivered to a destination point without a load transported in return. The consequences of this are multiple inefficiencies, added costs to haulage firms and an increase in emissions detrimental to the environment.

In response, an electronic freight market would allow a truck to identify possible back-haul opportunities one its return journey. Instead of a second haulage firm sending a truck with another front haul out with the possibility of an empty back haul, one truck would be able to perform both. Instead of having two trucks on the highway, only one would be used, decreasing inefficiencies, reducing emissions and saving trucking costs.

Aside from the general benefits of such a system[17], haulage firms in North America are well situated to take advantage of such efficiencies because of the changes to the industry brought out by deregulation through NAFTA. The unique characteristics of the MITC, as described above, would allow for the firms in the corridor to make even greater use of both their own assets and those of the region for benefits of both a business and green variety.

Finally, it should be suggested that an electronic freight market system should not be devised in isolation of other types of transportation systems, such as sea, rail and air. Therefore such a system should not only be devised with the trucking sector in mind, but also take advantage of whatever inter-modal facilities are already in operation. For example, it would be useful if the system

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Research Bulletin No.15, Transport Institute, University of Manitoba, October 1996.

17 It must be noted that haulage companies rely on brokers to connect trucks with cargo. An electronic freight market would reduce, if not completely eradicate, the need for brokers. Much opposition would stem from this sector of the industry. It would therefore be sensible to establish a market, but with the assistance of brokers. Fees based on information provided to the electronic market by brokers could be a means through which the industry could survive as is, while attaining greater efficiencies, a reduction in costs and hazardous environmental emissions.

carried information concerning goods being transported in and out of a location by air or rail, so that a potential connection could be made, again avoiding the front haul – back haul problem. Further, a truly comprehensive and integrated inter-modal facility, coupled with an equally comprehensive electronic freight market, would even further enhance trade opportunities in general, increase efficiencies and the green aspect of haulage. Again, given the trade and geographical characteristics of the MITC, the possibilities could appear to be endless.

C. Energy Efficient Fuel Systems

Both the United States and Canada, but the US in particular, have begun to encourage industry leaders to develop fuel efficient automotive technology. One result of this encouragement has been the talk of battery-operated cars appearing on a mass consumption basis in the second decade of the 21st century. Without a doubt this area of technology is an emerging one, with great potential for development throughout the continent.

The provinces and states of the MITC are especially well-placed to access funds with respect to efficient and clean fuel sources because of a number of existing government and industry initiatives. These include, in Manitoba, New Flyer Industries, Manitoba Hydro and Kraus Industries. All three companies are already industry leaders in the selling alternative energy products, with Manitoba Hydro active in the northern plains area of the MITC.

Again, however, the question is whether or not these activities have been and are today coordinated, or *ad hoc* in nature? It may be simply coincidental that all three of these companies are a) active in the alternative fuel sector of the economy and b) developing relationships in US business and c) specifically active in the MITC region. It may be, however, that this activism is not coincidental, but the result of a business plan coordinated by employees of all three companies and their US counterparts.

It is more than likely that these activities are a result of ad hoc one-off relationships rather than anything coordinated and strategic. However, this does not have to be the case in the short and long-term. With both Canada and the US agreeing to emission reductions through Kyoto, there should be an interest on the part of government (especially federal) to ensure that the use of alternative and energy efficient fuels is encouraged. Further, this encouragement should result in a coordinated plan so as to take advantage of strengths not in one sector of the industry, but in many of them. Such a plan would assist communities such as Dallas in its attempt to reduce greenhouse gas emissions. In order for this to take place, however, the physical necessities of this green fuel corridor must be

put into place. This includes alternative fuel filling stations the length of the corridor, as well as hydro and gas lines.

The concern with respect to alternative fuels is the inability of Mexican industry, because of its lower level of development and infrastructure, to take advantage and access of this leading edge technology. It is suggested that its green credentials can be assisted by the buying of 'credits' from other corridor cities, once their emission levels have been reduced. But this it and of itself will not assist Mexican industry in its being able to access the technology of, for example, Kraus. One answer may be, because of the involvement of Mexico in the corridor, the accessing of the UNEP Global Environmental Fund. Established in 1987 after the Montreal Protocols, the GEF allows lesser developed countries such as Mexico to access subsidies in their attempt to industrialize. These countries are encouraged to industrialize, albeit in a green fashion. Therefore an identification of Mexican industrial requirements that can be met by companies located in the corridor can then be further matched with green technology, also supplied by MITC companies. Given the existence of such technology and expertise in green technology, the potential trade benefits could be tremendous, as well as long-term in light of the coordinated nature of the relationships.

D. Educational Links

The MITC Report made three recommendations concerning education and training links throughout the corridor.[18] Each identified problems relating to the lack of skilled employees and of the related need for educational and training facilities in order to develop these skills for the benefit of the corridor. It is suggested that both of these suggestions can be accomplished in a manner that benefits the MITC, albeit in a green manner.

One way in which these skills can be developed is through the creation of 'centers of excellence' throughout the corridor. It is obvious that different educational facilities have varying degrees of strength in both teaching and research. For this reason many universities throughout the world have created linkages by partnering with other like-minded universities for the benefit of both academics and students. It is not unfamiliar to hear of a Canadian student studying abroad in Britain or a year, or a similar exchange between faculty. Often, this develops into the sharing of research through conferencing and joint workshops. The benefits of these exchanges and linkages are, for both partners, greater than the sum of the information that has been exchanged.

18 *Task Force Report*, 1998, p.19.

It may be the case that universities and research facilities throughout the MITC have, over time, established such links with other like facilities in the corridor. However, if such is the case, it is on an *ad hoc* basis that such links have been established, without concern for the corridor itself or the trade interests of MITC-related industry. Because of this situation, the overall skills requirements of the corridor are not being addressed in a strategic manner. For this reason the establishment of links between facilities in a corridor-oriented approach can have immediate and long-term benefits to the corridor and its constituent educational and research facilities.

Industry officials note that within Manitoba there is a lack of undergraduate and graduate programs in both transportation and logistical training.[19] Further, no comprehensive center exists within this or any other province dedicated to the study of these issues. One suggestion has been to create such a center of excellence within Manitoba, so as to develop the necessary knowledge in these areas for the benefit of industry within the province. Given the transportation aspect of the MITC, a center of excellence dedicated to transportation and logistics would benefit industry already, or interested in becoming, involved in the MITC.

In the mean, however, such a center of excellence does not exist. However, they do exist in the United States, and in specific, within the corridor. It is precisely because of this information gap within Manitoba that a coordinated linkage of educational and research facilities throughout the MITC would be of utmost benefit to MITC industry. Trade engineered as a result of educational linkages will not only illustrate the benefits of such linkages, but linkages that are strategically devised.

Already, such linkages exist in the corridor between a series of US universities. These include North Dakota State, Iowa State, University of Iowa, Kansas State and Kansas University, University of Missouri, Texas A & M, Texas Southern and University of Texas. However, if the MITC is to act as an international corridor, and Manitoba is to benefit from that international dynamic, it too must have its educational and research facilities access this series of already existing networks. There appears to be no counter-argument with respect to the need for enhanced educational links between facilities inside Manitoba[20] as well as between these facilities and her corridor partners. The question then becomes

19 *Task Force Report*, 1998, pp.27-28.

20 See Zahradnitzky, G., 'Mid Continent Trade and Transportation Corridor:Educational Requirements', in Prentice, B., Butt, M., Derkson, W., (eds.) *Research Report Prepared for the Mid Continent International Trade Corridor Task Force*, 1998.

how will these links be established, and can they be created in such as way that they are, in part or whole, green in nature?

For this greening of educational linkages to appear, one must go beyond the traditional notion of linkage between facilities. As mentioned above, this practice often means that physical movement of people for the sake of short-term exchanges, joint workshops and conferences. However, given the technology that all of these facilities have access to, non-traditional linkages *should* be considered. If we are to green the MITC, then such methods *must* be considered. These possibilities include the video linking of students to lectures, as well as similar use of technology for joint projects. Not only would such ventures be green in nature, but also cost-efficient to the participants.

D.1. Virtual Corridors

The linking of organizations in order to share and create information in a cooperative fashion is one example of where green issues can be readily linked to that of a regional corridor. Transportation-related institutions throughout the corridor become more than the sum of their collective parts through this form of collaboration, leading to the development of new knowledge in green/clean areas of research.[21] Additionally, this knowledge is produced in the most efficient and clean manner, without the costs, both financial and environmental, associated with traditional research and teaching collaboration.

These virtual corridors are established through the creation of knowledge-based networks.[22] Minimally speaking, a network is referred to as a combination of people, usually dispersed over a number of geographically separate sites, with appropriate communications technology. Often, these networks take a number of forms, ranging from the most informal to highly formalized. The former can be any number of *ad hoc* relationships that may already exist between, for example, academics at different universities who are hooked up via email. Beyond that exist *information* networks, such as university library systems that provide access to information. Neither of these networks create new knowledge. An *open* network is one that has a well-defined theme, is invitation-based with respect to participation, a formal constitution, and is created for the undertaking of research and generation of knowledge. The most formal of these networks, a *developmental* network, includes all of the latter, as well as is interested in

21 Strong, M., 'Connecting with the World:Priorities for Canadian Internationalism in the 21st Century', International Institutional for Sustainable Development, 1996.

22 Clark, Howard, *Formal Knowledge Networks: A Study of Canadian Experiences*, International Institute for Sustainable Development, 1998.

creating knowledge and accelerating its application for economic and social development. It is important to note that the key difference between the most informal and formal networks is the interest in generating knowledge, rather than simply passing it on from one locale to another.

To this end, formal networks have a number of specific characteristics. These include:

- Main purpose is to create and disseminate knowledge for use beyond network membership
- Structure and operations are designed to maximize rate of knowledge
- Network must provide for recognizable benefits to all participants
- Formal organization and well-defined management structure must exist
- Participation is by invitation
- Well-developed communication strategy exists
- Reduction in boundaries between sectors such as university and industry will occur

Additional elements of a formal network may also be:

- Culture shifts within institutions towards collaborative work between institutions and sectors
- Network participation and audience may be multidisciplinary, multi-sectoral and multinational
- Strong involvement in graduate education and training
- Cost effectiveness in operation
- Considerable contribution to sustainable environment
- Production of knowledge at faster rate than otherwise possible

The benefits are multiple, cost-effective, environmentally sound and more often than not produce a 'culture shift' within and between participating institutions with respect to existing geographical and psychological boundaries. In a world of virtual knowledge networks, academic research and student course choice will be defined by technological rather than geographical realities.

In truth, an informal knowledge network already exists in a primitive form. All of the transport institutes within the region[23] have web sites that are accessible,

23 These institutes include University of Manitoba Transport Institute, University of Denver Intermodal Transportation Institute, Texas A & M

containing contact information, bulletins, research programs, publications, teaching programs (if applicable) and current information. As well, one can email each of these institutes for additional information, again through these web sites. However, if the goal is to establish a formal knowledge network in order to create a true virtual corridor, the network must move from its existing primitive phase to one where there is 'live' interaction between researchers, academics, students and industry.

In this respect all of the actors who will benefit from this development must be involved in its creation. These include all of the already mentioned transportation institutes and its directors, faculty employed by and attached to the institute and their related students. As well, and in order to establish this network so that existing knowledge gaps are reduced, industry must be included in order to grasp what gaps exist, and how they might be closed. Finally, technology experts will be required in order to assist in the attainment of the software and hardware required.

The creation of a virtual knowledge corridor should result in an exponential growth in the amount of research conducted and produced, as well as course-based knowledge attained by students throughout the region. Multi-site courses, virtual publication libraries, video-based conferencing and multi-actor (industry, academia and government) hookups are but some of these end-products on a practical level brought about by a 'culture shift' in what these users will consider their institutional boundaries.

Strong institutions, as well as strong linkages between these institutions, will be essential to the creation of new knowledge in the field of transportation, broadly defined. The establishment of a formal virtual knowledge network will assist in ensuring that Manitoban interests, and those of the Mid Continent Corridor, will be expanded in the long-term with respect to the development of both ideas and projects that are both trade enhancing and sustainable in orientation.

University Texas Transportation Institute, University of Texas at Austin Centre for Transportation Research, North Dakota State University (Fargo) Upper Great Plains Transportation Institute, Iowa State University Center for Transportation Research, University of Arkansas University of Arkansas Mack-Blackwell National Rural Transportation Study Center, University of Tennessee Southeastern Transportation Center, Mexican Institute of Transport, Professor Jerry Nagel at the University of Minnesota-Crookston and Northeast Midwest Institute (Washington DC).

E. Eco-Tourism

Statistics illustrate that in worldwide terms tourism is the one of the largest import/export industries worldwide. The definition of what constitutes 'tourism' is often limited to either business or vacation travel, and the costs associated with this travel to and from home and destination countries such as accommodation expenses and the like. However, and within Western Europe, this conception of tourism is changing to met certain economic realities that should be of great interest to the MITC.

Almost half of the budget of the European Union is spent on the Common Agricultural Policy (CAP). This policy assists in subsidizing the incomes of farmers throughout the fifteen member-state organization, and is in addition to subsidies that are national in application. It is widely recognized that this level of assistance, at least at the level of the European Union, cannot continue into the future for a number of reasons. A first is that within the European Union there is the presence of excess in a number of dairy related products such as cheese and butter, as well as 'southern' products such as wine. A reduction in production-oriented subsidies in thought to be one way that these excesses can be curbed over time.[24] Second is the expansion of the EU eastwards, with Poland, Hungary, Slovakia and the Czech Republic becoming member-states by the year 2010. In and of itself such expansion is of no concern to the CAP. However, almost thirty percent of Poland's employment is within the agricultural sector, and regardless of the nature of the reforms that must be implemented, the CAP of the European Union will be stretched to its limit.[25] Only a series of reforms that will decrease the amount of assistance delivered to farmers in existing member-states will make Poland membership possible.

One policy response to this situation is the encouraging of present-day farmers to stop farming and take up another, albeit still rural, employment opportunity. Through CAP and other regional cohesion and structural funds, the European Union is attempting to assist farmers in the transition from an agricultural to a non-agricultural dependent lifestyle. One means of doing so is to convert existing farms into tourist locations such as rurally-located bed and breakfast guest houses, nature retreat locations, campgrounds and tourist farms, no cite only but a few of the options that have been suggested by the EU. This is the process of developing eco-tourism. Through the use of natural resources and the natural landscape, farmers are able to maintain a certain level of income while

24 'Farmers in EU face cuts in subsidies', *Financial Times* January 19, 1999.
25 See European Commission, 'Agenda 2000', (europa.eu.int/comm/dg06/ag20000)

simultaneously reducing the CAP assistance budget and expanding an industry in a non-traditional manner that is also environmentally-friendly.

The European Union is not the only area of the industrialized world where the agricultural sector is in financial difficulty. Only recently it was reported that Midwestern farmers in the United States are in financial difficulties, whereas[26] the Canadian government is being encouraged to provide a large sum of capital to the farmers of Western Canada because of their financial difficulties.[27] It is becoming more apparent that it is becoming increasingly difficult to maintain a certain level of income from agricultural-related employment. Other types of employment and sources of income must be located if large areas of the MITC are to survive. The movement to eco-tourism, as has been encouraged in the European Union, is one direction that should be contemplated for these farming communities.[28] However, there is a point at which a geographical area must ask how many guest houses are enough? For farming communities throughout the MITC to encourage a shift to eco-tourism without the development of an overall strategic plan throughout the corridor will do no more for these farmers than staying on the farm will. Like the other projects already discussed, an eco-tourism policy employed by one state or province should not be devised in isolation of the farming sector throughout the MITC as a whole.

If, however, such a policy is encouraged and devised, then the move to eco-tourism on the part of existing in-need farmers will prove beneficial on many fronts. A first would be the redevelopment of a sector that is currently facing financial hardship. A second would be to allow this sector to maintain itself, albeit in a non-traditional manner. A third would be that this non-traditional manner would be environmentally friendly, as well as financially viable, therefore illustrating the ability of private industry to be both developmentally creative and green simultaneously. Fourth, success at this level would suggest that an MITC-wide tourism policy would also be beneficial. Again, tourism already exists within and throughout the corridor, but only on an ad hoc basis. A move to eco-tourism at the level of the farm could encourage the development of a corridor-wide strategic plan in tourism in general, so as to take further advantage of this eco-tourism.

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26 'Export outlook more bad news for farmers', *Associated Press*, Feb. 24, 1999

27 '$460 million bailout touted for producers', *Winnipeg Free Press*, Nov. 04, 1999

28 See, for example, 'Portugal:Community support framework 1994-199', European Commission DGXVI, Brussels, 1994.

V:Summary

The above policy prescriptions are indicative of at least two important points with respect to the possibility of 'greening' trade corridors. The first is that there does exist a range of options that are potentially viable, as well as presently on the market. Alternative fuel motorcoaches and city transit buses are already in use, and this practice could be expanded. Eco-tourism in the manner spoken above is being implemented in the European Union, and no doubt can be transferred to North American circumstances. Virtual knowledge links already exist, but only in a primitive form. The upgrading of technology on a corridor-wide basis involved capital and resources, but the technology to do so is available. Finally, CNG centers are being sold to as far away places as China and Egypt. There is no reason, therefore, why this and other like innovations cannot be used for local (regionally-speaking) benefit.

A second point to take from the above is that disagreement between 'deep' and 'shallow' environmentalists will not disappear over time. Deeply held philosophical differences are apparent, and cannot be easily remedied. However, the options described do illustrate that, without bending one way or the other, it may be possible to create and expand a trade corridor like that of the MITC, but do so in a 'green' fashion. Many of the projects are, nonetheless, more 'shallow' in orientation for they do not address lifestyle issues or promote options that would do away with the need for a corridor, such as the 'trade locally' notion. However, when possible, 'green' thinking of a slightly 'deep' nature is used. This is true with respect to suggestions concerning alternative fuels and eco-tourism. Therefore there may be the possibility of brokering a peace between these two schools of environmentalism, while enhancing and expanding the trade opportunities of Manitoba-based companies.

VII:Conclusions

Corridors are becoming a means by which governments are seeking to enhance and expand trade opportunities. They appear, potentially, as the shortest, fastest, and cheapest method of moving finished products or commodities along a supply system between the point of production to final destination. However, these corridor projects must face numerous challenges, not the least of them a host of environmental issues that have also been created by government fiat. How the two projects can be married will mark the success or failure of creative governmental, business and educational thinking at the turn of the millennium.

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A World Approach to Motorization: Structural vs Behavioral Factors at the Horizon 2025

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Purpose and scope

This paper is an attempt to adress the question of the evolution of motorization globally, at the level of large areas in the world (divided in countries of the North and countries of the South) and attempts to identify structural and behavioral factors of motorization increase, by mode, at the horizon 2025.

We first base our analysis on three case studies (Montreal, Marrakech, Puebla) representative of three levels of economic development, and propose a simplified travel demand long term forecasting model of travel demand by mode which is centered on two main factors: the structural effects which can be considered as heavy tendencies and therefore may be incorporated in simulations, and the behabioral factors which are more difficult to predict but nevertheless determinant in future world demand of motorized vehicles and subject to the influence of policy making. The results illustrate the importance of demographic structural tendencies on motorization, which are greatly enhanced by behavioral factors factors which are more difficult to predict but nevertheless determinant in future world demand of motorized vehicles and subject to the influence of policy making.

We also attempt to generalize the approach to adress the issue of world motorization, at the level of 13 large areas in the World (divided in countries of the North and countries of the South) and try to identify some important environmental issues in the next decades in terms of motorization and sustainability.

Structural vs behavioral factors which would induce growth of motorization in the world?

In a concext of lack of data we look forward to isolate a certain number of *structural factors* which will induce motorization growth, the most straightforward begin:

- Demographic growth
- Change in the age structure

- Urban form (centralized vs sprawl)

To these we could add *behavioral factors* linked to income level and life-style which could induce:

- Changes in the number of trips (mobility factor)
- Changes in modal split (Choice of mode)

However, these latter factors are difficult to measure at a global level and we will start with a simpler approach.

Modelizing travel demand

We propose a simplified travel trip general model which puts into relation population structures and travel behavior, i.e.:

Demand (mode "m") = Pop x Mobility x Choice of mode

$$D(m) = P \times D/P \times Dm/D$$

The proposed model is a direct trip generation model by mode, and assumes the following form:

$$D_m^{t+n} = P^{t+n} \times D_m^{t} / P^{t}$$

$$= P^{t+n} \times D^{t}/P^{t} \times D_m^{t}/D^{t}$$

where:

D_m^{t+n} = total nb of trips by day, mode m, at time t+n

P^t = existing population at time t

Pt+n = future populatin at time (t+n)

D^t = total nb of trips per day on all modes at time t

As indicated, this model equation may be applied for any number of selected strata (age, sex, geographic region, socio-economic grouping), on the assumption that trip generation rates by mode differ for each stratum. Global travel demand, then, may be obtained by a simple summation of the disaggregated demand, as follows:

$$D^{t+n} = \sum\sum\sum\sum D_{a,r,s,m}^{t+n}$$

Three case studies: Montreal (Canada), Puebla (Mexico), Marrakech (Morrocco)

We applied the precedent model to three case studies representative of contrasted socio-economic situations: a high standard of living (national income per capita of $20 320 US) with high levels of mobility and motorization (Montreal, 1993), an intermediate case with an intermediate level of income ($3 479 US) and medium motorization (Puebla, Mexico, 1993-4) and finally the case of Marrakech, 1993 (Morroco) representing low income ($1 040US) and very low automobile motorization but a strong presence of two wheels (motorized and non motorized). This contrasted situation was used as a starting point to develop a more general approach. The travel data of the cases of Puebla and Marrakech was extrated from surveys directed by the author with collaborators.

We observe also a very contrasted situation in demographic structures and tendencies for the future: low growth and aging due to the backlash of the baby-boom in Montreal, characteristic of "rich countries" of the West, medium growth in the case of Puebla, characteristic of emerging countries, and, finally, very high demographic growth, characteristic of the poorer countries. Table 1 summarizes these characteristics for the three case studies. Even though the periods vary for the three case studies, the three periods represent long term evolution.

Table 1 : Comparative age structure in Montreal - Puebla - Marrakech

a)- Projected population growth: Montreal – Puebla - Marrakech

Δ %	**Montreal 1986-2011**	**Puebla 1993-2010**	**Marrakech 1982-2017**
Total	15.0%	34.0%	125%
Annual	0.6%	1.7%	2.3%

b)- Age structure changes - Montreal – Puebla - Marrakech

Age	**Montreal** 1986	2011	**Puebla** 1993	2010	**Marrakech** 1982	2017
0-14	18.6%	14.2%	26.8%	17.8%	35.4%	27.5%
15-64	71.2%	70.5%	68.3%	75.5%	60.9%	67.0%

65- +	10.2%	15.3%	4.9%	6.7%	3.7%	5.5%

Sources: Census and projections by INRS

Travel behavior calibration

The travel behavior is summarized by the general mobility and modal choice in tables 2 and 3.

Table 2: General mobility - Daily trips per capita (5 yrs +) --

Montreal (1993)	Puebla (1994)	Marrakech (1993)
2.66	1.89	1.85

Table 3: Choice of mode in the three case studies

Mode	Montreal	Puebla	Marrakech
Walking	15%*	27%	64%
Public transport	17%	48%	9%
Auto	63%	19%	7%
Taxi	0.4%	1%	2%
Bicycle	x	2%	8%
2 Wheels Motorised	x	x	10%
Other	5%**	x	x
Total	100%	100%	100%

Sources: Calculed from O-D Surveys. * Walking and bicycle
** School bus.

Long term travel demand projections: Montreal, Puebla, Marrakech

Applying the preceding travel behavior to the population growth by quinquennal age groups to take into account the life cycle, gives us, at constant behavior, the results presented in table 4. These results take into account the composition of the population as well as the urban form, the three case studies having been divided in zones representing the center, the inner suburbs and the

outer suburbs. The results gives a relatively stronger growth of motorization in the poorer countries due to the important effect of the age structure.

Variable	Montreal	Puebla	Marrakech
Population	0.4%	1.7%	2.3%
Trips:			
· Total	0.35%	1.68%	2.21%
· Auto	0.43%	2.14%	3.35%
· Pub.Tr.	0.22%	1.55%	2.83%

(*) Montreal: 1986-2011
Puebla: 1993-2010
Marrakech: 1982-2017

We could summarize the preceding results by introducing the concept of the *demographic multiplier*, which we could be defined here as being the relative growth of a mode compared to population growth. Table 5 summarizes these results. We find a non negligeable demographic factor in the case of poor countries, represented here by Marrakech, where, for a population growth of 1%, we encounter a growth of 1.43% for the automobile and 1.21 for the transit. The demographic factor appears to be an important strucutural factor enhancing motorization and it could have a strong impact in emerging economies where motorization is progressing rapidly by changes in revenue and behavior patterns.

Table 5: Annual Growh rate by mode for a population growh of 1%

	Montreal	Marrakech	Puebla
Total trips	0.88	0.94	0.97
Walking	x	0.79	0.72
Bicycle	x	1.09	1.70
Taxi	x	1.21	1.07
Total auto	1.08	1.43	1.24
Auto driver	*x*	*x*	*1.52*
Auto passenger	*x*	*x*	*0.67*
Pub. Tr.	0.55	1.21	0.89
Motorcycle	x	1.35	1.21
Other	x	x	1.66

Source: INRS-Urbanisation.

Generalization of the approach on World regions (North vs South)

The purpose of trying to generalize the approach to other world regions is to adress the following question: Where will be the environment issues be in the future?

- ✓ In which regions of the world will we see the strongest population growth?
- ✓ Where will we see the fastest growth of motorization and for what modes?
- ✓ In what type of urban areas will we see the fastest growth?

Demographic forecasts in different World Areas
- North vs South -

We classified according to revenue per capita and cultural affinities, the world poulation in 13 world regions (GNP per capita in $US, from The World Bank Atlas, 1994).

North America and New Zeland ($21 731)
Latin America ($2 743)
Eastern Europe ($2 245)
Western Europe ($19 673)
North Africa ($1079)
Black Africa ($533)
China ($380)
India ($310)
Indenosia ($670)

Japan ($28 220)
Hong Kong and Singapour ($15 565)
Rest of Asia ($1742)
Others ($1 092)

The Graph 4 illustrates the demographic contrast of the evolutions of these world regions, which we used (by quinquennal age) to do simulation at the horizon 2025.

Motorization forecasts in 13 World regions
- North vs South -

The hypothesis:

- Choice of 13 world regions according to different levels of economic development
- Demographic projections of the World Bank: 1995 - 2025
- Calibration of Behavior of travel behavior (mobility and choice of mode) :

  ✓ Mobility: general mobility data observed from various surveys ventilated by 5 year age groups to reproduce a life-cycle curve for each region of the world based on observed life-cycle from the surveys of Montreal (high income) Puebla (medium income) and Marrakech (low income).

  ✓ Choice of mode: data from various surveys and reproducing life-cycle curves by age groups as above.

Perspectives in World Motorization

3 SCENARIOS:

SCENARIO 1- *Paradigm of low motorization (actual behavior)*
Simulation applying future demographic changes to estimated structure of actual behavior - measures structural effects due to demographic changes in the case of low motorization in developing countries.

SCENARIO 2- *Paradigm of strong motorization (behavior of Montreal)*
All behavior in the world would be identical: South behavior reaches North actual behavior. Estimated by applying Montreal actual behavior to all regions -

measures structural effects of extreme strong motorization in developing countries.

SCENARIO 3 - *Intermediate Paradigm*
More realistic situation, situated between both extremes.

Results - Scenario 1 (low motorisation)

Estimation of the number of daily trips (5 yrs +) in the world in 1995 and 2025:
('000)

	1995	2025	Δ
Total Popul.	5 716 424	8 294 338	45%
Auto + taxi	1 576 081	1 868 203	19%
2 Wheels Motorized	1 980 000	3 013 386	52%
TOTAL	3 556 081	4 881 589	37%

Results - Scenario 2: (strong motorization)

Estimation of the number of daily trips (5 yrs +) in the world in 1995 and 2025:
('000)

	1995	2025	Δ
total Pop.	5 716 424	8 294 338	45%
Auto + taxi	1 576 081	12 409 148	687%
2 Wheels motorized	1 980 000	3 013 386	52%
TOTAL	3 556 081	15 422 815	334%

Results - Scenario 3: Intermediate Paradigm

(OR most probable situation???

It would be foolish to pretend forecasting future motorization with precision. However, these simulations give us a highlight of the forces at play.

Discussion and conclusions

Forces at play

The preceding results show the importance of the demograhic factor, not only the level of growth, but the importance of the evolution of its composition by age groups. However, the demographic multiplier as shown below will have an impact only when motorization has begun, which may sound trivial but is crucial. We can also see that change of behavior illustrated by scenario 2 is extremely important. This means that, as behabior changes, motorization may increase considerably, and it will be accelerated by the demographic multiplier effetcs.

Demographic multiplier effects:

Ratio: Δ mode / Δ total popul.

Scenarios	Auto + taxi	2 Wheels Motorized
1- Actual Behavior	0.41	1.16
2- Paradigm Mtl.	1.19*	**

* with rates much higher in Economically Emerging Developing countries (India: 1.41;'Indonesia; 1,42) ; and lower elsewhere, China; 1,14).

** does not apply since the level of 2 wheels motorized in Montreal is too low to be representative and not significative because the O-D Surveys are done in late fall when the use of motorcycles is ending.

Growth much higher in medium-sized cities

The megalopolis account for only 4 % of the world population and this proportion should be stable at the horizon 2025, even in a context of strong demographic growth (graph 5).

Motorization and Pollution

Local effects: Mainly affects large urban centers in the North and in the South. (Mexico - 16 millions; Paris - 10 millions, Le Caire - 10 millions; New Delhi - 10 millions (air pollution; deterioration of the patrimony; health problems).

Global effects:

The umulative effect at the level of the world population is less perceptible since it is not always visible locally (on environment or health). However it generates irreversible effects:

- Global warming effect
- Degrades the ozone layer

Conclusion

We may conclude that even though health problems due to motorization will inevitably be concentrated in large megalopolises such as Mexico, New Delhi, Jakarta, ... the more global environmental effects of motorization such as the global warming will be generated mainly in mid-sized cities of the South where travel demand management is difficult, if not impossible. Futhermore, a large part of the growth in motorization will come from the motorized two wheels, a tendency generally neglected.

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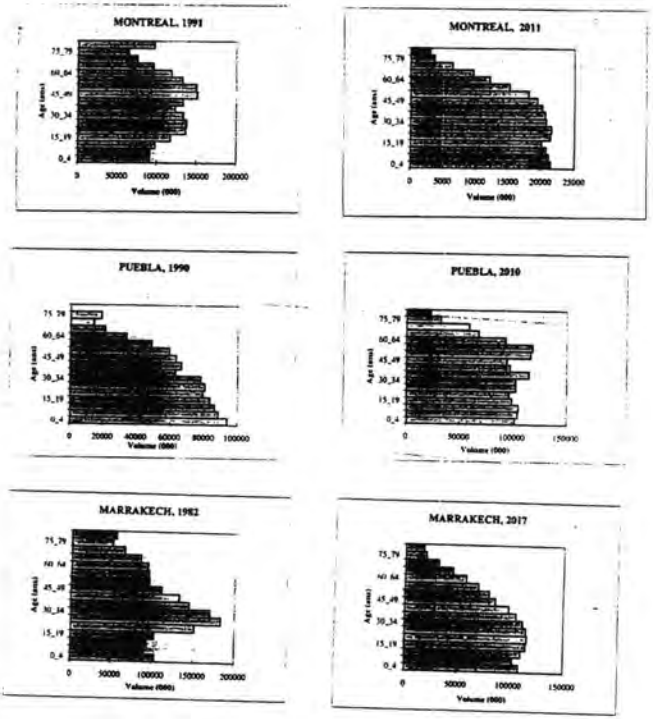
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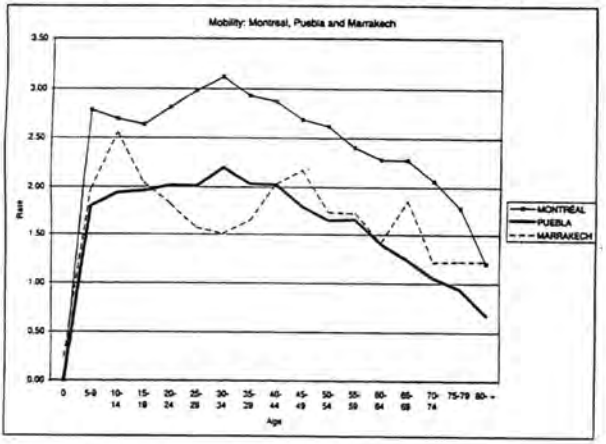
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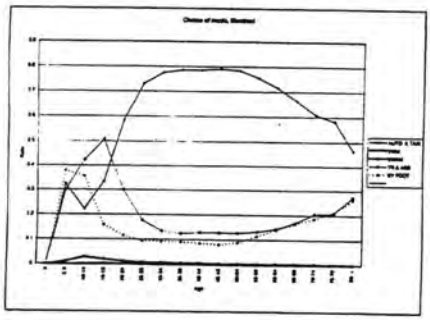
Graph 1: Population growth by age, in the three case studies

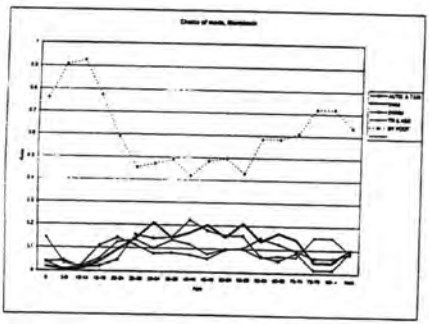


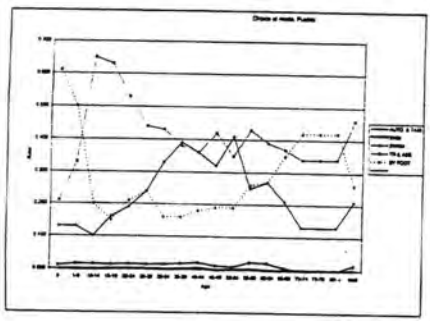
Graph 2: General mobility by age, in the three case studies



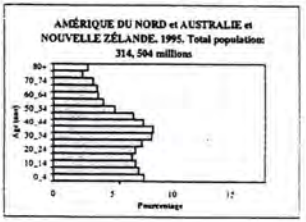
Graph 3: Modal choice by age, in the three case studies

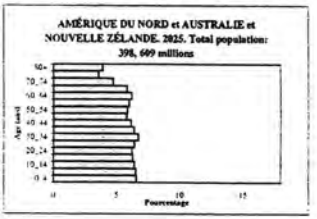


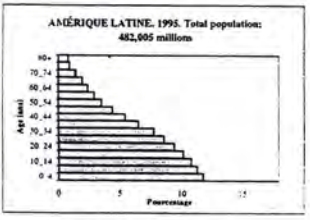


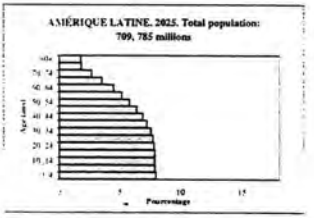


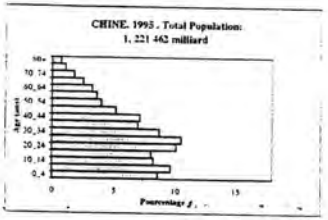
Graph 4: Populatin growth by age, in various world regions. 1995- 2025

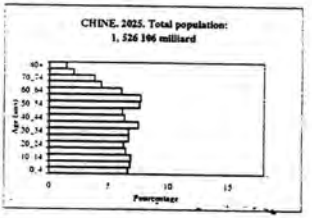


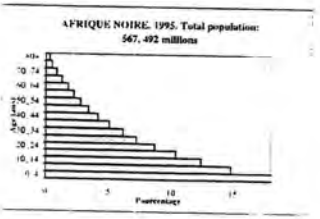


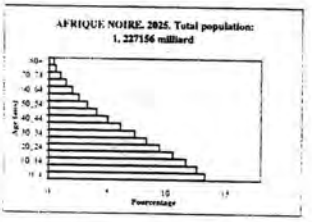






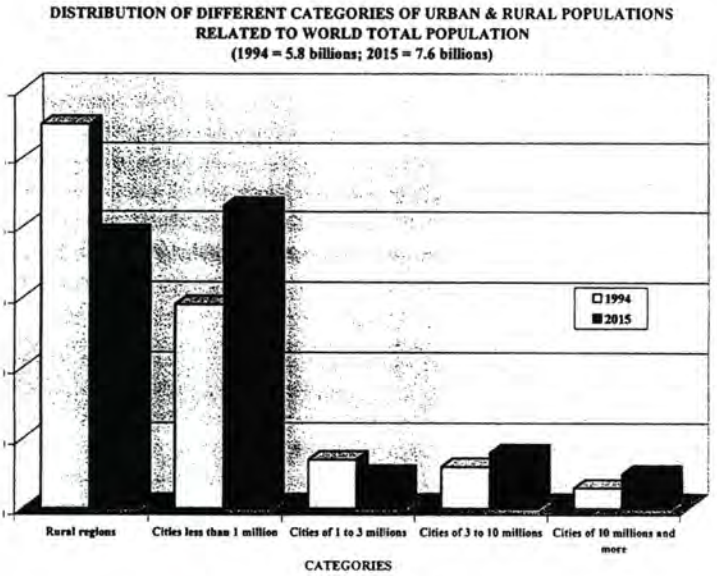






urce: United Nations, the sex and Age Distribution of the World Populations, 1994

Graph 5: World population growth by city size, 1994-2015



Sources
United Nations. Urban agglomeration, 1994.
United Nations. World population prospects, 1992.

TESTING THE OFFSET HYPOTHESIS

Anindya Sen: Competition Bureau, Industry Canada[1].

1. Introduction

The enactment of mandatory seatbelt legislation may be significantly correlated with a decline in total driver fatalities. However, increased seatbelt use by drivers may also impose costs on society if it results in offsetting behavior. The possibility of such behavior was suggested by Peltzman (1975). His hypothesis is that vehicle safety regulation such as mandatory seatbelt laws may have no impact on overall traffic fatalities. This is because vehicle safety legislation may give drivers an increased sense of security. Consequently, they may be more willing to engage in risky driving, possibly resulting in an increase in non-occupant deaths. This leads to a scenario where declining vehicle occupant deaths/injuries may be offset by a commensurate rise in non occupant deaths and injuries. In the extreme case if the increase in pedestrian deaths exceeds the fall in vehicle occupant fatalities, vehicle safety legislation may then have the perverse effect of increasing total traffic fatalities. Any benefits of vehicle safety legislation in the form of declining occupant deaths may then be outweighed by the rise in non occupant or pedestrian deaths.

I investigate the extent of offsetting behavior by estimating the econometric effects of mandatory seatbelt laws on total, driver and pedestrian fatalities in Canada between 1975 and 1992. In doing so, I attempt to extend the literature on vehicle or traffic safety initiatives in the following manner.

First, I use province specific information on different traffic fatalities over an eighteen year period (1975-1992) in order to assess the impact of seatbelt laws. Previous empirical research have predominantly used cross-sectional data to analyze the effects of vehicle safety legislation. However, this approach may result in biased coefficient estimates due to unobserved heterogeneity.

Second, I attempt to minimize potential omitted variables bias by including an array of traffic safety initiatives. The enactment of seatbelt laws are often correlated with other deterrence mechanisms such as license suspensions, monetary fines, and imprisonment which are aimed

at general traffic safety. The enactment of such penalties could lead to safer driving habits among the population and thus lead to a reduction in traffic fatalities. Excluding such legislation in any evaluation of vehicle safety laws could consequently lead to biased estimates of the true impact of vehicle safety legislation.

The results in this study suggest evidence contrary to the Offset Hypothesis. Mandatory seatbelt legislation for drivers has been responsible for reducing driver fatality rates, vehicle occupant fatality rates, and total traffic fatality rates but has an insignificant effect on pedestrian fatalities.

This study is organized as follows. The next section discusses different highway traffic safety legislation. The empirical model is presented in Section 3. Estimation results are in Section 4. Section 5 looks at the impact of various control variables. Finally, the study concludes with a summary of the main results in Section 6.

II. Highway Traffic Safety Legislation

- Seatbelt Laws, Speed Limits, and Graduated Speed Fines

Ontario in the beginning of 1976 was the only province with mandatory seatbelt legislation in effect. By 1988, all provinces had enacted seatbelt laws for drivers. Substantial variation in maximum highway speed limits existed among provinces in 1975. Maximum speed limits ranged between 100 km/hr (in Prince Edward Island and Manitoba), to 96 km/hr (60 mph) in the other provinces. By 1992 there were six provinces with a speed limit of 100 km/hr, two with a speed limit of 80 km/hr and two with a 90 km/hr speed limit[2]. Provinces also differ with respect to graduated speed fines. The main feature of these fines is that they increase by the amount which drivers exceed maximum speed limits. Alberta, Manitoba and Ontario had this system of fines in 1975; by 1992 only Ontario and Quebec used them. Further information regarding the above discussed laws is in Table 2.

- Impaired Driving Legislation

The period in question witnessed a considerable increase in the severity of punishment given to first time impaired driving offenders. This was evident in the increase in average duration of license suspension (in months) across provinces and over time for having a Blood Alcohol Content (BAC) level exceeding the legal limit of .08% (breaking the illegal per se law) and refusing to take a breathalyzer test (breaking the implied consent law).

Some provinces also impose temporary license suspensions, termed as administrative license suspensions, on impaired drivers. Administrative license suspensions require the automatic suspension of an individual's license after a Criminal Code impaired driving offense. Police officers can suspend an individual's license from 12 to 24 hours when his/her BAC exceeds a specified level (generally .05%). Thus, unlike other laws, a conviction is not required for automatic license suspension. It is important to emphasize that a police officer may revoke an individual's license merely on the suspicion that the individual is under the influence of alcohol. No test for drug or alcohol content is necessary. Three provinces had this law in 1975, and by 1992 there were three more.

In certain provinces, vehicles of drivers charged of a Criminal Code Offense relating to impaired driving may be impounded by police for periods ranging from 24 hours to three months. There were no provinces impounding vehicles in 1975. By 1992, British Columbia, Alberta and Manitoba were impounding vehicles for varying lengths of time.

- Alcohol Control Policies

Laws which affect drinking behavior will impact impaired driver fatality rates. With respect to drinking, provinces increased the minimum legal drinking age between 1975 and 1992. In 1975, most provinces had a legal drinking age of 18 years. By 1992, with the exception of Alberta and Quebec, all provinces had a legal drinking age equal to or exceeding 19 years.

Similarly, the increasing enactment of open container laws across most provinces seems to be capturing a trend of diminished tolerance towards impaired driving. This law forbids the presence of open containers of alcohol in automobiles. Five provinces had open container laws in 1975. Three more provinces enacted this law by 1992.

- Other Traffic Safety Initiatives

The key Criminal Code provisions relating to traffic safety are (1) Failure to Stop and Assist and (2) Dangerous Driving. The Failure to Stop and Assist Law is meant to discourage drivers involved in a traffic accident from escaping the scene of an accident with the intent to escape criminal or civil liability. Dangerous Driving legislation is intended to promote safe driving habits. Individual drivers may be charged under the provisions of this law if they engage in unsafe practices such as speeding over the posted limit, running traffic lights and dangerous passing. Drivers convicted for violating any of these laws may experience any one of or a

combination of the following types of punishment: (i) license suspension, (ii) monetary fine, and/or (iii) jail term.

Failure to Stop and Assist is also an offense under the relevant highway traffic acts of most provinces. This gives provincial courts the option to punish transgressors without the additional penalty of a criminal record. Offenders may once again be punished with license suspension, monetary fines and/or jail terms. Table 1 documents the minimum monetary fines and maximum jail terms which could be imposed on first time offenders in 1975 and in 1992[3]. There exists cross-province and time variation in license suspensions. In 1975 two provinces imposed one month license suspensions, two had three month license suspension, and three had six month license suspensions. In 1992 there were one province with one month, two with three month, four with six month and finally four provinces with twelve month license suspensions. Provinces are also identified by cross-province and time variation in monetary fines and jail terms for first time offenders of this law. Manitoba, New Brunswick and Nova Scotia imposed minimum fines and maximum jail terms on first time offenders in 1975. The same provinces with the addition of Quebec and Newfoundland had these penalties in 1992.

Most provinces also impose license suspensions, monetary fines or jail terms for Failure to Drive with Due Care. This is strictly a provincial legislative initiative which is intended to promote safe driving and is meant to deal with traffic offenses which are of a less serious nature than those falling within Dangerous Driving. Table 1 details license suspensions, maximum monetary fines and maximum jail terms which could be imposed on first time offenders in 1975 and in 1992[4]. There is no cross-province variation in the duration of license suspensions. Provinces use a uniform one month license suspension to punish offenders. However, Table 1 does show significant cross-province and time variation in minimum fines and maximum jail terms which could be given to first time offenders. Saskatchewan, Manitoba, Ontario, New Brunswick and Prince Edward Island imposed minimum fines in 1975. With the exception of Saskatchewan and Alberta all provinces imposed minimum fines by 1992. There is some temporal variation in terms of the number of provinces which impose maximum jail terms. Alberta, Saskatchewan, Manitoba and Ontario used jail terms in 1975. Although Saskatchewan did away with this legislation by 1992, British Columbia, New Brunswick and Quebec had enacted legislation setting maximum jail terms by the end of the sample size.

- Automobile Insurance Laws

Automobile insurance laws are denoted by mandatory third party liability insurance and first party liability accident benefits. Minimum third party liability insurance is mandatory. This provides financial protection if policyholders are held liable for injury or loss suffered by others arising from the operation of their vehicles[5]. In 1975 this liability ranged from $35,000 to $75,000 across provinces. With the exception of Quebec, all provinces in 1992 had compulsory minimum third party coverage of $200,000[6]. The overall impact of these legislative changes is difficult to predict. For example, a mandatory increase in third party policy coverage may give drivers a heightened sense of security. This could lead to increased accidents through careless driving. On the other hand, experience rated insurance premiums encourage safer driving and declining traffic fatalities. First party liability accident benefits may also affect trends in traffic fatalities. In this study, first party accident benefits are used to capture the impact of no-fault insurance schemes. No-fault insurance schemes permit accident victims, regardless of fault, to claim compensation from their own insurers for injuries[7]. The injured party is compensated by his/her insurance company. The objective of no-fault coverage is to minimize the involvement of courts through tort suits. The involvement of courts is meant to decrease with higher no-fault thresholds[8]. Quebec introduced the first "pure" form of no-fault automobile insurance in North America in 1978[9]. In 1975, provinces had first party accident benefits from $35 to $70 a week. By 1992, the maximum amount payable on a weekly basis ranged from $1000 in Ontario to $140 in the maritime provinces. Of course, one must also take into account the year when such accident benefits became mandatory. In 1975, accident benefits were mandatory in Alberta, British Columbia, Saskatchewan, and Manitoba, and by 1992 it was mandatory in all provinces except Newfoundland. The net effect of this movement towards higher accident benefits, is again difficult to predict. As drivers are no longer liable for injuries inflicted on others under the no-fault insurance, an increase in first party accident benefits may increase traffic accidents[10]. However, this behavior may be offset by experience rated premiums.

The above discussion indicates that provincial governments have been active in implementing measures aimed at promoting general traffic safety. By the end of the sample period most provinces had (1) mandatory seatbelt legislation for drivers (2) stiffer penalties in the form of longer license suspensions and jail terms and higher monetary fines for first time

offenders of general traffic laws (failure to stop and assist and failure to drive with due care) and (3) mandatory third party liability insurance and first party accident benefits.

III. Empirical Model

Based on the previous literature, it is possible to derive the following relationship between traffic fatalities and various deterrence mechanisms[11];

$$fatalities_{it} = \mathbf{b}_0 + \mathbf{b}_1 seat_{it} + \mathbf{b}_2 speed + \mathbf{b}_3 penalties_{it} + \mathbf{b}_4 liquor_{it} + \mathbf{b}_5 auto_{it} + \mathbf{b}_6 control_{it} + \mathbf{b}_7 prov_{it} + \mathbf{b}_8 time_{it} + v_{it} \quad (1)$$

where $i = 1,\ldots..,$ 10 and $t = 1975, \ldots\ldots\ldots 1992$; i being provinces and t being time.

$fatalities_{it}$ denotes different traffic fatality rates; $seat_{it}$ is the presence of mandatory seatbelt legislation for drivers; $speed_{it}$ consists of speed laws; $penalties_{it}$ are variables capturing the severity of punishment (license suspensions, fines and imprisonment) implicit in provincial traffic and impaired driving laws; $liquor_{it}$ represents alcohol control laws; $auto_{it}$ represents automobile insurance laws; $control_{it}$ includes exogenous variables which measure traffic density, road conditions, demographic trends, education levels, medical care, economic conditions, and alcohol consumption and availability; $prov_i$ comprises of province effects; $time_t$ represents time effects and v_{it} is an error term.

Fatality rates data are available for seven provinces (B.C., Alberta, Saskatchewan, Manitoba, Ontario, P.E.I. and Nova Scotia) from 1975 till 1992 but only from 1987 onwards for Quebec, from 1985 onwards for New Brunswick and from 1986 onwards for Newfoundland. Consequently, my results are based on an unbalanced time series of cross sections. Table 3 provides summary statistics for all explanatory variables used in the analysis.

Total fatality rates (driver, passenger and pedestrian) from motor vehicle accidents are used to assess the overall impact of provincial traffic safety initiatives on society[12]. Driver and vehicle occupant (driver and passenger) fatality rates measure safety gains from initiatives such as mandatory seatbelt use which are expected to reduce vehicle occupant fatalities. On the other hand, pedestrian fatality rates may be used to test whether drivers react to vehicle safety legislation with rash driving. A decline in driver and vehicle occupant fatalities accompanied by a significant increase in pedestrian deaths arising from vehicle safety legislation, may be seen as a confirmation of the offset hypothesis. All

fatality rates are per 100,000 licensed drivers.

$seat_{it}$ is a dichotomous indicator which is one when a province has mandatory seatbelt legislation (SEATBELT) and is zero otherwise[13]. $speed_{it}$ consists of the maximum highway speed limit (SPEED) in kilometers per hour, and a dichotomous variable indicating whether a province implements graduated speed fines (SPFINE). Seatbelt and speed control laws are expected to reduce traffic fatalities.

The $penalties_{it}$ variables capture the severity of punishment embodied in provincial penalties for highway traffic and impaired driving laws. The impact of failure to stop and assist and failure to drive with due care legislation is measured by the penalties for first time offenses. Punishment for failure to stop and assist consists of license suspensions (FSTOP), minimum monetary fines (FMONMIN), and maximum jail terms (FJAILMAX). Penalties for failure to drive with due care consists of maximum monetary fines (DMONMAX), and maximum jail terms (DJAILMAX). All license suspensions are in months, monetary fines are in constant 1986 dollars, and maximum jail terms are in days. Impaired driving laws are represented by administrative license suspensions on suspicion of impaired driving (SUSPECT) and license suspensions for implied consent and illegal per se laws (LICENSE). A binary variable is used to denote the presence of administrative license suspensions. License suspensions for implied consent and illegal per se laws are empirically represented by the number of months of suspension for first time offenders. All these variables are expected to have a negative impact on fatality rates. Finally, I capture enforcement effort with the number of police officers per 100,000 of population (POLICE). This variable possesses obvious deterrence effects and hence, should have a negative relationship with fatality rates.

Alcohol control policies $liquor_{it}$ are captured by the minimum legal drinking age (MINAGE) and open container laws (OPCONT). Higher minimum legal drinking ages could lead to a drop in teenage traffic fatalities. Open container laws should have the same effect on all age groups. Empirically, the minimum legal drinking age is the actual legal drinking age within a province while the presence of open container laws is denoted by a dichotomous variable.

The final category of laws relate to automobile insurance ($auto_{it}$). For this category, I create two variables. COMP is compulsory minimum third party liability insurance for drivers. This variable is in thousands of dollars and is deflated by an implicit price index. The second variable

(DISABILITY) is obtained by interacting disability income benefits (per week) in real terms for injured drivers with a dichotomous variable indicating when such accident benefits become mandatory in a province. The impact of these laws on traffic fatality rates is difficult to predict. An increase in minimum mandatory coverage might lead to greater accidents. This effect, however, might be offset by experience rated premiums. I leave discussing the variables in $control_{it}$ till Section V. Excepting binary variables, all explanatory variables and the dependent variable are in natural logarithms[14].

IV. Ordinary Least Squares Estimation

This section sets an empirical baseline for evaluating the impact of mandatory seatbelt laws and the offset hypothesis. Table 4 contains OLS estimates of equation (1) using the natural logarithm of the driver fatality rate as the dependent variable. Different sets of control variables and highway traffic laws are introduced to a base specification which includes provincial and time effects. The control variables in each column of Table 4 are alcohol control policies, insurance laws, police presence, road conditions, demographic, economic, education levels, and medical care. Column 1 looks at the impact of mandatory seatbelt laws (SEATBELT), and highway speed limits (SPEED) on all driver fatalities. Column 2 introduces mandatory third party liability insurance (COMP) and first party accident benefits (DISABILITY). Impaired driving legislation and liquor laws in the form of administrative license suspensions (SUSPECT), license suspensions for first time offenders of implied consent and illegal per se laws (LICENSE), minimum legal drinking age (MINAGE), and open container laws (OPCONT) are included in Column 3. Finally other traffic laws (maximum monetary fines (DMONMAX) and maximum jail terms (DJAILMAX) for failure to drive with due care and license suspensions (FSTOP), minimum monetary fines (FMONMIN) and maximum jail terms (FJAILMAX) for failure to stop and assist and graduated speed fines (SPFINE)) are added in Column 4. The purpose is to isolate and examine the effects of each set of laws on driver fatality rates.

Column 1 shows that both seatbelt laws (SEATBELT) and speed limits (SPEED) are significantly and negatively correlated with traffic driver fatalities[15]. The negative coefficient on SPEED is counter intuitive. This could be because the SPEED variable is capturing the deterrence effects of other traffic safety laws. Coefficient estimates of seatbelt laws

(SEATBELT) and speed limits (SPEED) basically remain unchanged in Column 2 with the introduction of automobile insurance laws. Mandatory third party liability insurance (COMP) and first party disability benefits (DISABILITY) are insignificant. However, mandatory third party liability insurance (COMP) becomes significant with the inclusion of impaired driving and liquor laws in Column 3, suggesting a significant correlation between impaired driving and automobile insurance legislation. Open container laws (OPCONT) are significantly associated with a reduction in traffic driver fatalities. Seatbelt laws and higher speed limits are also negatively correlated with driver deaths. Speed limits (SPEED) are no longer significant with the addition of other highway traffic laws in Column 4. Graduated speed fines (SPFINE), minimum monetary fines for failure to stop and assist (FMONMIN) and administrative license suspensions (SUSPECT) are significantly correlated with declining driver fatalities. Seatbelt laws (SEATBELT), open container legislation (OPCONT) and mandatory third party liability insurance (COMP) are also significant.

In summary, the seatbelt law (SEATBELT) is consistently significant at 5% and has the expected negative sign. This result is robust even after the addition of auto insurance laws in Column 2, impaired driving laws and alcohol control policies in Column 3 and other traffic laws in Column 4. On the average, the enactment of mandatory seatbelt legislation in a province is associated with roughly a 13% (30 lives) drop in driver fatalities. Maximum speed limits are significant till Column 3. Its negative coefficient may therefore be due to correlation with other unaccounted for provincial initiatives which have reduced traffic fatalities. This seems to be the case as maximum speed limits become insignificant with the introduction of other traffic laws in Column 4. Among insurance laws, compulsory minimum third party liability is negative and significant at 5%. A 4200 dollar increase in third party coverage is correlated with a 1 person decline in driver fatalities for a province in a given year. This may be the result of experience rated premiums which force drivers to be more careful, leading to a drop in driver fatalities. Some laws aimed at reducing alcohol consumption and impaired driving also have a significant impact on driver fatalities. Administrative license suspensions and open container laws are negative and significant at 5%. Administrative license suspensions result in a 21% (49 lives) per province drop in the driver fatality rate. Coefficient estimates imply nearly a 130% fall in driver fatalities with the enactment

of open container laws. However, this number is probably overstated and is most likely due to the fact that open container laws are capturing the effects of other unobserved traffic safety initiatives. Of the remaining traffic laws, graduated speed fines (SPFINE) and the minimum fine for Failure to Stop and Assist (FMONMIN) in the event of an accident are also significant at 5% and possess negative coefficients. The enactment of graduated speed fines (SPFINE) results in a 16% (38 lives) fall in driver fatalities per province. A $1.20 rise in monetary fines for failure to stop and assist (FMONMIN) leads to a 1 life fall in driver fatalities. Province and time fixed effects are significant at 1%, suggesting considerable unobserved province and time specific heterogeneity. This could be the product of provincial and/or national initiatives designed to promote traffic safety.

Table 5 evaluates the impact of the above mentioned laws on different fatality rates. The dependent variable in Column (1) is the total fatality rate: driver, passenger and pedestrian. The dependent variables in the remaining columns are; the driver fatality rate in Column (2), the vehicle occupant fatality rate (driver and passenger) in Column (3), and the pedestrian fatality rate in Column (4). All columns include province and time effects. OLS is used to evaluate the impact of different traffic laws[16]. Aside from some minor differences, the patterns between Columns (1), (2) and (3) are quite similar. One difference is that administrative license suspensions seem to have little impact on total fatalities. Another difference is that the minimum legal drinking age is significantly associated with fewer total and vehicle occupant fatalities. A 1 year increase in the minimum legal drinking age is associated with a twenty to twenty-five fold decline in total and vehicle occupant fatalities. Maximum jail terms for failure to drive with due care (DJAILMAX) and failure to stop and assist (FJAILMAX) and minimum monetary fines for failure to stop and assist (FMONMIN) are significantly related with a reduction in pedestrian fatalities. A $1.80 increase in monetary fines (FMONMIN) is correlated with a 1 person decline in pedestrian fatalities. A 1 day rise in maximum jail terms (FJAILMAX) leads to a 6 person per province fall in pedestrian deaths.

The major implication of the above results is that mandatory seatbelt use for drivers seems to have been responsible for a significant decline (11% to 13%) in total, driver and vehicle occupant fatalities without causing any offsetting rise in pedestrian fatalities. Most provinces instituted mandatory seatbelt legislation for drivers and passengers around

the same period. So it is not surprising that the seatbelt variable is significantly correlated with both driver and vehicle occupant fatalities. The other interesting result is the significant impact of traffic safety laws (DJAILMAX, FJAILMAX, and FMONMIN) on pedestrian deaths. Thus, traffic safety laws may play an important role in promoting general traffic safety which may result in fewer vehicle occupant as well as pedestrian deaths.

The objective of this section was to test Peltzman's Offset Hypothesis by estimating empirically the impact of mandatory seatbelt legislation on different fatality rates. The important result is the consistently significant and negative effect of mandatory seatbelt legislation on total, vehicle occupant and driver fatalities and the insignificant impact on pedestrian fatalities. This result is robust even after controlling for other traffic, impaired driving, liquor control and automobile insurance laws, and province and year specific fixed effects. Therefore it may be reasonable to conclude that the enactment of mandatory seatbelt legislation does not seem to be significantly correlated with offsetting behavior by individual drivers. Another interesting result is the significant impact of general traffic safety initiatives on pedestrian fatalities, underlying the usefulness of including such legislation in any study of trends in traffic fatalities.

V. Control Variables

$control_u$ consists of a variety of control variables which may impact traffic fatalities. These variables proxy alcohol consumption and availability, traffic density, road conditions, demographics, economic conditions, education levels and medical care. Their inclusion is meant to minimize possible measurement error which may result in biased coefficient estimates of the above discussed laws[17].

Alcohol consumption and availability is represented by the composite price index for alcoholic beverages in 1986 dollars (ALINDEX) and the number of beer and liquor stores per 100,000 of population over fifteen years of age (ACCESS). An increase in alcohol prices could reduce traffic fatalities by reducing alcohol consumption. More liquor stores might increase motor vehicle accidents by increasing alcohol availability, but it may also decrease accidents by reducing the average distance between liquor outlets.

Traffic density is proxied by average fuel consumption of motor vehicles and urban population. Average fuel consumption is constructed

by taking gross amount of fuel sold to off-road and on-road vehicles in thousands of litres and dividing it by the number of registered vehicles (FUEL). Urban population (URBANP) is the percentage of provincial population living in cities with more than 100,000 inhabitants. An increase in both these variables may lead to more traffic fatalities. Road maintenance (HIGHEXP) is expressed in terms of real per capita expenditure on road (urban and rural) construction and repair. Higher per capita expenditure may imply better road quality and hence, fewer traffic accidents.

To control for differences and changes in the demographic composition of drivers, I use the percentage of males aged between 15 to 24 (PM1524) and the percentage of population aged over 65 (P65) as explanatory variables. Compared to others, drivers within these age categories may have a greater probability of causing traffic accidents. For example, young males are generally associated with risky driving. On the other hand, elderly drivers may react slowly to unexpected road situations. Consequently, an increase in younger male or elderly drivers may result in a higher number of traffic fatalities. Elderly people constitute an increasing percentage of the population, while the share of young males has been declining.

Economic conditions are quantified by the real per capita income (PCI) and the unemployment rate (UNEMP). The net impact of these variables is ambiguous. An increase in economic well being (higher per capita income and/or low unemployment rate) may be positively correlated with traffic fatalities if these variables capture the impact of higher alcohol consumption. However, increased prosperity may also lead to investment in safer, more durable motor vehicles which could reduce traffic fatalities. Both real per capita income and the unemployment rate are on an upward trend.

Two variables are used to measure education levels; the number of secondary school graduates per 100,000 of population aged between 15 to 19 (SECP) and the number of post secondary graduates per 100,000 of population between 20 to 24 years (POSTSEC). Education may have a deterrent effect on risky behavior such as impaired driving. This is because high schools and universities have active anti-impaired driving programs which are designed to discourage such behavior. Thus higher per capita education levels might lead to less traffic accidents. Yet, education may also share a positive relationship with traffic fatalities if the effect captured is higher alcohol consumption by younger people.

Accessibility to medical care is approximated by real per capita hospital revenue (HOSP) which should share a negative relationship with traffic fatalities. Quick medical attention could save the lives of traffic accident victims.

Table 5 suggest that these control variables exhibit similar effects on total, vehicle occupant and driver fatality rates. An increase in average fuel consumption expectedly leads to an increase in traffic fatalities. More per capita post secondary graduates also imply rising traffic fatalities. This could be a result of increased drinking and/or risky driving by young people. Demographic variables in the form of percent of elderly people, young males and urban population display a positive and significant impact on fatality rates. An increase in any one of these variables by 1% leads to a three to four fold increase in different fatality rates. Per capita hospital revenue is positively and significantly correlated with traffic fatalities. This be could be an example of reverse causality. More traffic fatalities could lead to a greater need for hospital revenue for patient care. Per capita income shares a positive and significant relationship with driver and vehicle occupant fatality rates. Thus, economic prosperity may lead to reckless behavior, and ultimately rising traffic fatalities. Per capita liquor stores is significant and negative. An increase in liquor stores may imply fewer traffic fatalities, as people drive shorter distances in order to purchase liquor. Coefficient estimates imply nearly a 100% drop across fatality rates with a 1% increase in per capita liquor stores.

VI. Conclusion

Using information from Canadian provincial statutes, I construct a unique dataset rich in cross province and time series variation of mandatory seatbelt legislation and other traffic laws. I then use this data to estimate the impact of seatbelt laws on a variety of fatality rates. I obtain results which fail to confirm Peltzman's Offset Hypothesis. Seatbelt laws result in a significant decline in total, vehicle occupant and driver fatalities, without any offsetting increase in pedestrian deaths. On the other hand, pedestrian fatality rates are affected by general traffic safety initiatives such as monetary fines (failure to stop and assist) and maximum jail terms (failure to drive with due care and failure to stop and assist). These results are robust to the presence of other traffic, impaired driving, alcohol control and automobile laws, province and year specific fixed effects and a wide array of control variables designed to minimize unobserved heterogeneity and omitted variables bias.

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Table 1: Summary of Federal and Provincial Laws

Government Policy	Empirical Variable	1975 (Excepting Quebec, Nova Scotia, and Newfoundland)[18]	1992 (All Provinces)
1) Provincial Penalties for Impaired Driving Criminal Code Offences			
a) Implied & Illegal Per Se Laws (Automatic License Suspensions - 1st Offence)	LICENSE	BC[19]-1 month; ON-3 months: ALB, SASK, MAN, NB, PEI-6 months	NB-4 months; SASK, MAN, NB-6 months; BC, ALB, ON, PQ, NS, PEI-12 months
b) Driving while Disqualified (Automatic License Suspensions - 1st Offence)	DISQ	BC-1 month; ALB, SASK, MAN, ON-6 months; NB-12 months; PEI- not exceeding 60 months (5 years)	NS-1 month,; PQ-3 months; NF-4 months; SASK, MAN, PEI-6 months; BC, ALB, ON, NB-12 months
c) Monetary Fine for Driving while Disqualified (Monetary Fines-1st Offence)	MONMIN	SASK ($50), MAN ($50), PEI ($100)	NF ($100); PEI ($200); BC ($300); SASK, ON ($500); PQ ($600); NS ($2500)
d) Jail Term for Driving while Disqualified (Minimum Jail Terms-1st Offence-in days)	JAIL	MAN (7), PEI (7)	BC (17), NS (30), PEI (7)
2) Special Provincial Impaired Driving Laws			
a) Special Breath Laws (Monetary Fines and Jail Terms)	BREATH	ALB, PEI	MAN, PEI
b) Administrative License Suspensions	SUSPECT	BC, ALB, SASK	BC, ALB, SASK, MAN, ON, NB
c) Impounding of Vehicles	IMPOUND	None	BC, ALB, MAN
d) Special Programs		ALB(Checkstop)	BC(Counterattack), ALB(Checkstop), ON(R.I.D.E.)
3) Alcohol Laws			
a) Minimum Legal Drinking Age	MINAGE	ALB, SASK, ON, PEI-18 years; BC, NB-19 years; MAN-21 years	ALB, PQ-18 years; BC, SASK, ON, NB, NS, PEI, NF-19 years; MAN-21 years
b) Open Container Laws	OPCONT	ALB, SASK, MAN, NB, PEI	ALB, SASK, MAN, ON, PQ, NB, NS, PEI, SASK, MAN, NS
c) Dramshop/ Social Host Laws		BC, SASK, MAN	

5) Highway Traffic Laws			
a) Seatbelt Laws for Drivers	SEATBELT	None	All Provinces
b) Speed Limits	SPEED	BC, SASK-80 km/h; ALB, ON, NB-60 mph;	BC, SASK, NB-80 km/h; MAN, PQ-90
c) Graduated Speed Fines	SPFINE	MAN, PEI-100 km/h	km/h; ALB, ON, NS, PEI, NF-100 km/h
d) Failing to Stop and Assist	FSTOP	ALB, MAN, SASK	ON, PQ
(i) License Suspensions	FMMIN	BC, PEI-1 month; ALB, SASK-3 month; MAN, ON, NB-6 month	PEI-1 month; ALB, NF-3 months; SASK, ON,
(ii) Minimum Monetary Fines (1st Offence)	FMAX	MAN ($25), NB ($100), PEI ($50)	NB-6 months; BC, MN, PQ, NS-12 months MAN ($25), PQ ($600),
(iii) Maximum Jail Terms (1st Offence-in days)	DSUSP	MAN (60), NB (10),	NB ($100), PEI ($100), NF ($450)
e) Failing to Drive with Due Care	DMMIN	PEI (60)	MAN (90), NB (10), NF (25)
(i)License Suspensions	DJMAX	BC, ALB, MAN, ON, PEI (1 month)	
(ii) Minimum Monetary Fines (1st Offence)		SASK, MAN, NB, PEI ($50); ON ($100)	BC, ALB, MAN, ON, PQ, PEI (1 month)
(iii) Maximum Jail Terms (1st Offence-in days)		SASK, PEI (30); MAN ($90); ALB, ON (180)	MAN, PQ, NB, PEI ($50); BC, NS ($100); NF ($120); ON($200) NB (6); BC (7); PQ, PEI (30); MAN (90); ALB, ON (180)
6) Insurance Laws			
a) Compulsory Minimum Third Party Liability	COMP	In $ ' 000: ALB, SASK, PEI, NB-$35; BC, MAN, ON-$50	In $ ' 000: All provinces excepting Quebec $200; PQ-$50
b) Maximum Accident Benefits payable per week	DISABILITY	NB, PEI-$35; BC, ALB-$50; SASK-60, ON-$70; MAN-$75; Compulsory in BC, ALB, SASK, MAN	NF, PEI, NS, NB-$140; ALB, SASK-$150; BC-$300; MAN-$350; PQ-$539; ONT-$1000; Compulsory in all provinces except Newfoundland

Table 2: Legislation Relating to Impaired Driving, Highway Safety and Alcohol Control (1975-92)

Jurisdiction	Sources of Motor Vehicle Legislation	Source of Alcohol Related Legislation
Provinces	**Sources for:** Provincial License Suspensions for Implied Consent & Illegal Per Se Laws; Provincial License Suspensions; Max. Monetary Fines, and Max. Jail Terms for Failure to Drive with Due Care ; Provincial License Suspensions, Min. Monetary Fines, and Max. Jail Terms for Failure to Stop and Assist; Administrative License Suspensions; Breath Laws; Impounding of Vehicles; Suspect Law; Seatbelt Law; Maximum Speed Limits; Graduated Speed Fines	Minimum Age Laws, Open Container Laws and Dramshop Laws
Alberta Source: Statutes of Alberta (S.A.) and Revised Statutes of Alberta (R.S.A.)	Highway Traffic Act (R.S.A., 1970, C.-169; R.S.A., 1980, C. H-7) & Motor Vehicle Administration Act (R.S.A., 1980, C. M-22)	Liquor Control Act (R.S.A., 1970 C.-211) & Liquor Licensing Act (R.S.A. 1970, C.-212; Liquor Control Act (R.S.A., 1980, C.L-17)
British Columbia Source: Statutes of British Columbia (S.B.C.) and Revised Statutes of British Columbia (R.S.B.C)	Motor Vehicles Act (R.S.B.C., 1960, C.-253); Motor Vehicles Act (R.S.B.C., 1979, C.-288)	Government Liquor Act (R.S.B.C., 1960, C.-166); Liquor Control & Licensing Act (R.S.B.C., 1979, C.-237)
Manitoba Source: Statutes of Manitoba (S.M.) and Revised Statutes of Manitoba (R.S.M.)	Highway Traffic Act (R.S.M., 1970, H-60); Highway Traffic Act (S.M., 1985-86, C.-3)	Liquor Control Act (R.S.M., 1970, L-160); Liquor Control Act (Reenacted Statutes of Manitoba 1988, L-160)
New Brunswick Source: Statutes of New Brunswick (S.N.B.) and Revised Statutes of New Brunswick (R.S.N.B)	Motor Vehicles Act (R.S.N.B., 1973, C. M-17)	Liquor Control Act (R.S.N.B., 1973, C.L-10);
Newfoundland Source: Statutes of Newfoundland (S.N.) and Revised Statutes of Newfoundland (R.S.N.)	Highway Traffic Act (R.S.N., 1970, C.-152); Highway Traffic Act (R.S.N., 1990, C.H-3)	Alcoholic Liquors Act (R.S.N., 1970, C.-8); Liquor Control Act (R.S.N., 1990, C.L-18)
Nova Scotia Source: Statutes of Nova Scotia (S.N.S.) and Revised Statutes of Nova Scotia (R.S.N.S)	Motor Vehicles Act (R.S.N.S., 1967, C.-191) Motor Vehicles Act (R.S.N.S., 1989, C.-293)	Liquor Control Act (R.S.N.S., 1967, C.-169); Liquor Control Act (R.S.N.S., 1989, C.-293)

Ontario Source: Statutes of Ontario(S.O.) and Revised Statutes of Ontario (R.S.O.)	Highway Traffic Act (R.S.O., 1970, C. -202); Highway Traffic Act (R.S.O., 1990, C. H-8)	Liquor Control Act (R.S.O., 1970, C-249); Liquor License Act (R.S.O., 1970, C.-250); Liquor License Act (R.S.O., 1990, C.-15)
Prince Edward Island Source: Statutes of Prince Edward Island (S.N.P.E.I) and Revised Statutes of Prince Edward Island (R.S.P.E.I)	Highway Traffic Act (R.S.P.E.I., 1974, C. H-5); Highway Traffic Act (R.S.P.E.I., 1988, C. H-5)	Liquor Control Act (R.S.P.E.I., 1974, L.-17); Liquor Control Act (R.S.P.E.I., 1988, L.-14)
Quebec Source: Statutes of Quebec (S.Q.) and Revised Statutes of Quebec (R.S.Q.)	Highway Code (R.S.Q., 1964, C.-231) & Highway Victims Indemnity Act (R.S.Q., 1964, C.-232); Highway Safety Code (S.Q., 1986, C.-9)	Liquor Control Act (R.S.Q., 1964, C.44); An Act Respecting Offences Relating to Alcohol (S.Q., 1979, C.-71), an Act Respecting Liquor Permits (S.Q., 1979, C.-P.9.1)
Saskatchewan Source: Statutes of Saskatchewan (S.S.) and Revised Statutes of Saskatchewan (R.S.S.)	Operation of Vehicles Act (R.S.S., 1965, C.-377); Highway Traffic Act & Vehicles Administration Act (S.S., 1986, C. H-3.1)	Liquor Act (R.S.S., 1965, C.-382) & Liquor Licensing Act (R.S.S., 1965, C.-383); Alcohol Control Act (S.S., 1988-89, C.-A.-18.01)

Table 3: Summary Statistics of Explanatory Variables[20]

Variable	N	Mean	Std. Dev.	Min	Max	Acronym	Natural Log
A) License Suspensions							
1) Implied Consent & Illegal Per Se	130	7.0846	2.9571	3	12	LICENSE	Yes
2) Failure to Stop and Assist	147	5.6054	3.5201	1	12	FSTOP	Yes
B) Monetary Fines and Jail terms							
1) Minimum Monetary Fine (Failure to Stop and Assist) -1986 $	147	0.6212	1.1343	0	5.571	FMONMIN	Yes
2) Maximum Jail Term (Failure to Stop and Assist)	147	12.129	25.171	0	90	FJAILMAX	Yes
3) Maximum Monetary Fine (Failure to Drive with Due Care) - 1986 $	147	4.0192	4.1795	0	20	DMONMAX	
4) Maximum Jail Term (Failure to Drive with Due Care)	147	63.558	71.922	0	180	DJAILMAX	

C) Special Provincial Impaired Driving Laws							
1) Impounding of Vehicles	130	0.6307 7	0.4844 6	0	1	IMPOUN D	No
2) Administrative License Suspensions	130	0.1307 7	0.3384 5	0	1	SUSPEC T	No
D) Highway Traffic Laws							
1) Speed Limit	130	91.385	9.2472	80	100	SPEED	Yes
2) Seatbelt Law	130	0.7	0.4600 3	0	1	SEATBE LT	No
E) Liquor Law							
1) Minimum Legal Drinking Age	130	18.985	0.8714 7	18	21	MINAGE	Yes
2) Open Container	147	0.8231 3	0.3828 6	0	1	OPCONT	No
F) Economic Variables							
1) Unemployment Rate	130	9.9862	3.5993	3.8	20.2	UNEMP	Yes
2) Per Capita Income - 1986 $	130	171.18	43.077	84.74 1	277.8 7	PCI	Yes
G) Demographic Variables							
1) Percentage of Population over 65 years	130	11.03	1.6574	7.145 5	14.17 3	P65	Yes
2) Percentage of Population Males 15-24 years	130	8.8911	1.0851	6.872 6	11.33 3	PM1524	Yes
3) Percentage of Population living in cities exceeding 100,000 inhabitants	130	41.292	22.245	0	70.25 2	URBAN P	Yes
H) Alcohol Related Variables							
1) No. of Liquor Stores (Per 100 000 of population aged 15 and over)	130	1.6649	0.7597 7	0.803 85	3.652 8	ACCESS	Yes
2) Alcohol Price Index	130	96.772	6.9377	76.68 5	110.1 6	ALINDE X	Yes
I) Traffic & Road							
1) Average Fuel Consumption Per Registered Vehicle (in litres)	130	2.3419	0.4253 2	1.477 7	3.563 6	FUEL	Yes
2) Road Expenditure (Per Capita of Population aged 15 and over -in 1986 $)	130	3.3674	1.0249	1.618 6	6.450 8	HIGHEX P	Yes

J) Education							
1) No. of secondary school graduates per 100,000 of population aged between 15 to 19	130	1321.6	128.34	1020.9	1655.1	SECP	Yes
2) No. of post secondary graduates per 100,000 of population aged between 20 to 24	130	678.42	240.99	357	1755.1	POSTP	Yes
K) Medical							
1) Real Per Capita Hospital Revenue - 1986 $	130	5.6127	1.126	3.3184	8.2616	HOSP	Yes
L)Insurance							
1) Comp. Minimum Third Party Liability(in 1986 $)	130	1479.8	505.13	413.22	2570.7	COMP	Yes
2) Weekly Disability Benefits(in 1986 $)	130	1.5527	1.2424	0	8.1833	DISABILITY	Yes
M) Enforcement							
1) No. of Police (Per 100 000 of population)	130	193.12	24.229	149.33	292.67	POLICE	Yes
N) Instruments							

Table 4:Impact of Highway Traffic Laws on the Driver Fatality Rate (OLS Estimates)[21]

Explanatory Variables	(1) Control Variables	(2) Auto Insurance	(3) Liquor Laws	(4) Highway Traffic
1) Mandatory Seatbelt Legislation (SEATBELT)	**-0.1477**	**-0.1503**	**-0.1441**	**-0.1274**
	(-2.1322)**	**(-2.4387)****	**(-2.2546)****	**(-2.0817)****
2) Speed Limit (SPEED)	**-1.5763**	**-1.5606**	**-1.1257**	-0.8062
	(-2.9605)***	**(-2.898)*****	**(-1.8437)***	(-1.3669)
3) Graduated Speed Fines (SPFINE)				**-0.1637**
				(-1.9842)**
4) Failure to Drive with Due Care (Maximum Fine-1986 $)-(DMONMAX)				0.1233
				(1.4920)
5) Failure to Drive with Due Care (Maximum Jail Term-In Days)-(DJAILMAX)				-0.0927
				(-1.2977)
6) Failure to Stop & Assist (License Suspensions)-(FSTOP)				0.0541
				(0.6062)
7) Failure to Stop & Assist (Minimum Fine-1986 $)-((FMONMIN)				**-0.2317**
				(-2.3153)**
8) Failure to Stop & Assist (Maximum Jail Term-In Days)-(FJAILMAX)				-0.0048
				(-0.5826)
9) License Suspensions (Implied Consent and Illegal Per Se Laws) - (LICENSE)				0.0681
				(0.8112)
10) Administrative License Suspensions-(SUSPECT)			**-0.1873**	**-0.2091**
			(-1.6318)	**(-1.9578)****

11) Open Container Laws - (OPCONT)			-1.0893	-1.2973
			(-2.3919)**	(-2.7089)***
12) Minimum Legal Drinking Age - (MINAGE)			-2.6745	-2.6632
			(-1.0991)	(-1.1187)
13) Mandatory Third Party Liability Insurance - (COMP) - 1986 $		-0.0639	-0.1467	-0.13672
		(-0.9038)	(-2.3486)**	(-2.0136)**
14) First Party Accident Benefits - (DISABILITY) - 1986 $		-0.0043	-0.0019	0.0045
		(-0.6527)	(-0.2402)	(0.5642)
15) Per Capita Police - (POLICE)	-0.3703	-0.373	-0.4334	-0.308
	(-1.3105)	(-1.3548)	(-1.4309)	(-0.9585)
16) Fuel Consumption Per Registered Vehicle - (FUEL)	0.5907	0.5901	0.6297	0.7723
	(2.5829)**	(2.6508)**	(2.8212)***	(3.1349)***
17) Per Capita Real Highway Expenditure - (HIGHEXP) - 1986 $	0.2034	0.1776	0.1322	0.1083
	(1.7142)*	(1.4845)	(1.1733)	(0.9402)
18) Per Capita High School Graduates - (SEC)	-0.3711	-0.2767	-0.3586	-0.3911
	(-0.8513)	(-0.6069)	(-0.8681)	(-0.7650)
19) Per Capita Secondary School Graduates - (POSTSEC)	0.134	0.1969	1.0581	1.2338
	(0.7825)	(1.0268)	(2.4756)**	(2.6837)***
20) Percentage of Population over 65 years - (P65)	2.4265	2.4827	3.1586	3.1366
	(2.6674)***	(2.4614)**	(3.0419)***	(3.0570)***
21) Percentage of Young Males - (PM1524)	1.8654	2.1384	3.7374	4.0824
	(2.1351)**	(2.6294)**	(4.0593)***	(3.2937)***
22) Real Per Capita Hospital Revenue - (HOSP) - 1986 $	0.8689	0.7926	0.591	0.6458
	(3.2907)***	(2.9734)***	(2.4677)**	(2.8799)***
23) Percentage of Urban Population - (URBANP)	2.204	2.0369	1.5491	4.1628
	(2.6257)**	(2.429)**	(1.8873)*	(3.1787)***
24) Real Per Capita Income - (PCI) - 1986 $	-0.0144	0.0943	0.3971	0.9274
	(-0.0469)	(0.2637)	(1.0853)	(2.3748)**
25) Unemployment Rate - (UNEMP)	-0.0156	-0.003	-0.0279	0.1138
	(-0.0796)	(-0.0155)	(-0.1455)	(0.573)
26) Per Capita Liquor Stores - (ACCESS)	-0.7047	-0.7109	-1.1887	-1.2134
	(-3.0453)***	(-2.7592)***	(-3.2128)***	(-3.0621)***
27) Alcohol Price Index - (ALINDEX)	-0.5614	-0.5126	-0.2509	-0.1309
	(-1.3363)	(-1.1857)	(-0.5934)	(-0.2797)
Province Fixed Effects (*P* - Values)	.00253***	.00212***	.00065***	.00135***
Year Fixed Effects (*P*- Values)	.01482**	.01043**	.00638***	.00290***
R-SQUARE	.8224	.8241	.8389	0.8546

Table 5: Impact of Highway Traffic Laws on different Fatality Rates (OLS Estimates)[23]

Explanatory Variables	(1) Total Fatality Rate	(2) Driver Fatality Rate	(3) Vehicle Occupant	(4) Pedestrian Fatality
1) Mandatory Seatbelt Legislation (SEATBELT)	-0.1217	-0.1274	-0.1079	-0.0354
	(-2.1836)**	(-2.0817)**	(-1.8737)*	(-0.3209)
2) Speed Limit (SPEED)	-0.4175	-0.8062	-0.7929	1.5640
	(-0.694)	(-1.3669)	(-1.3000)	(1.3688)
3) Graduated Speed Fines (SPFINE)	-0.1525	-0.1637	-0.1796	-0.1169
	(-2.1397)**	(-1.9842)**	(-2.4184)**	(-0.9692)
4) Failure to Drive with Due Care (Maximum Fine-1986 $)-(DMONMAX)	0.1279	0.1233	0.1118	0.446
	(1.7407)*	(1.4920)	(1.2573)	(1.9836)**
5) Failure to Drive with Due Care (Maximum Jail Term-In Days)-(DJAILMAX)	-0.102	-0.0927	-0.0873	-0.3803
	(-1.5976)	(-1.2977)	(-1.1266)	(-1.9384)*
6) Failure to Stop & Assist (License Suspension)-(FSTOP)	0.0534	0.0541	0.0328	0.3183
	(0.5898)	(0.6062)	(0.3571)	(1.8415) *
7) Failure to Stop & Assist (Minimum Fine-1986 $)-((FMONMIN)	-0.2435	-0.2317	-0.20948	-0.5132
	(-2.4676)**	(-2.3153)**	(-2.1154)**	(-2.8012)**

8) Failure to Stop & Assist (Maximum Jail Term-In Days)-(FJAILMAX)	-0.0101 (-1.4789)	-0.0048 (-0.5826)	-0.0077 (-1.0927)	**-0.0353** **(-2.6380)****
9) License Suspensions (Implied Consent and Illegal Per Se Laws) - (LICENSE)	0.1054 (1.1768)	0.0681 (0.8112)	0.1302 (1.3920)	-0.0469 (-0.3550)
10) Administrative License Suspensions-(SUSPECT)	-0.0902 (-1.0193)	**-0.2091** **(-1.9578)****	-0.1554 (-1.6136)	0.11984 (0.7889)
11) Open Container Laws - (OPCONT)	**-0.8694** **(-2.0174)****	**-1.2973** **(-2.7089)*****	**-1.2733** **(-2.7939)*****	-0.14181 (-0.1723)
12) Minimum Legal Drinking Age - (MINAGE)	**-4.3870** **(-1.8597)***	-2.6632 (-1.1187)	**-4.8422** **(-2.2282)****	-0.4382 (-0.0978)
13) Mandatory Third Party Liability Insurance - (COMP) - 1986 $	-0.0803 (-1.3286)	**-0.13672** **(-2.0136)****	-0.1009 (-1.5554)	-0.1202 (-1.0074)
14) First Party Accident Benefits - (DISABILITY) - 1986 $	0.0038 (0.5682)	0.0045 (0.5642)	0.0066 (0.9880)	-0.0060 (-0.5113)
15) Per Capita Police - (POLICE)	-0.5484 (-1.6349)	-0.308 (-0.9585)	-0.4595 (-1.4219)	-0.7823 (-1.3833)
16) Fuel Consumption Per Registered Vehicle - (FUEL)	**0.7247** **(3.1664)*****	**0.7723** **(3.1349)*****	**0.6881** **(2.6946)*****	0.5715 (1.4940)
17) Per Capita Real Highway Expenditure - (HIGHEXP) - 1986 $	0.1550 (1.2949)	0.1083 (0.9402)	0.1495 (1.3488)	0.1294 (0.5157)
18) Per Capita High School Graduates - (SEC)	0.0217 (1.2949)	-0.3911 (-0.7650)	-0.3358 (-0.6739)	0.3856 (0.4016)
19) Per Capita Secondary School Graduates - (POSTSEC)	**0.8610** **(2.0520)****	**1.2338** **(2.6837)*****	**1.2205** **(2.7924)*****	0.3051 (0.3862)
20) Percentage of Population over 65 years - (P65)	**2.9395** **(2.8931)*****	**3.1366** **(3.0570)*****	**3.0496** **(2.7799)*****	1.1742 (0.7074)
21) Percentage of Young Males - (PM1524)	**3.6509** **(2.7698)*****	**4.0824** **(3.2937)*****	**4.1328** **(3.0828)*****	0.1161 (0.04395)
22) Real Per Capita Hospital Revenue - (HOSP) - 1986 $	**0.6556** **(2.6282)****	**0.6458** **(2.8799)*****	**0.6876** **(2.9192)*****	0.5456 (1.1779)
23) Percentage of Urban Population - (URBANP)	**3.8341** **(3.0081)*****	**4.1628** **(3.1787)*****	**3.6425** **(3.2696)*****	**4.8445** **(1.9073)***
24) Real Per Capita Income - (PCI) - 1986 $	0.3264 (1.0018)	**0.9274** **(2.3748)****	**0.6483** **(1.8576)***	-0.5474 (-0.8356)
25) Unemployment Rate - (UNEMP)	0.0442 (0.2542)	0.1138 (0.573)	0.1257 (0.669)	-0.3598 (-1.1412)
26) Per Capita Liquor Stores - (ACCESS)	**-0.9753** **(-2.9202)*****	**-1.2134** **(-3.0621)*****	**-1.1438** **(-3.1520)*****	**-1.2879** **(-2.1494)*****
27) Alcohol Price Index - (ALINDEX)	-0.3139 (-0.6350)	-0.1309 (-0.2797)	-0.0705 (-0.1385)	-0.9431 (-1.4066)
Province Fixed Effects (*P* - Values)	**.0006*****	**.00135*****	**.00006*****	.24815
Year Fixed Effects (*P*- Values)	**.01586****	**.00290*****	**.01546****	**.00001*****
R-SQUARE	.8752	.8546	.8695	.7561

Endnotes

1. The views expressed are those of the author and not necessarily those of the Competition Bureau.

2. Prince Edward Island and Alberta have separate maximum speed limits for day and night time driving. Quebec is the only province with a minimum speed limit (60 km/hr) on its highways.

3. Also, I only elaborate on minimum monetary fines and maximum jail terms as few provinces actually had legislation on maximum monetary fines and minimum jail terms.

4. I discuss maximum monetary fines and maximum jail terms as few provinces actually had legislation on minimum monetary fines and minimum jail terms.

5. This is third party insurance as the injured party is compensated by the injurer's insurance company.

6. This is because Quebec had implemented an exclusively first party or no fault system of automobile insurance by 1978.

7. This is precisely why accident benefits under no-fault schemes are termed "first party".

8. Thresholds can either be in monetary terms (above a specified dollar amount of insured medical expenses) or verbal (a description of injuries).

9. Most provinces have always had some form of no-fault insurance in place. In 1946, Saskatchewan was the first province in Canada to introduce a form of no-fault insurance. Other provinces followed suit in the nineteen-sixties and early nineteen-seventies. Ontario introduced a modified system of no-fault insurance in 1990, which was further modified in 1994.

10. Research on the effect of automobile insurance laws on traffic fatalities has been mixed. Landes (1982) found that no-fault increases highway traffic fatalities while Kochanowski and Young (1985), Zador and Lund (1986), and Wilkinson (1987) found the opposite. However, Devlin (1990) and Gaudry (1988) found that no-fault led to more accidents in Quebec.

11. Sen (1998) provides an in-depth discussion of the previous literature.

12. Descriptions of sources of data for independent variables are in Section B of the Data Appendix: Compilation of Other Variables and Empirical Construction.

13. Empirical constructs of variables are represented by acronyms.

14. Adapting a log linear model facilitates the interpretation of estimated coefficients as elasticities.

15. All statements concerning significance are based on two tailed t-tests done at the 1%, 5% and 10 % significance levels.

16. Standard errors of the estimates are White corrected for heteroskedasticity.

17. The direction of the bias depends on the correlation between the excluded and included variables.

18. Information on laws in these provinces are not included in this year, since I only have data on fatality rates for these particular provinces from the mid 1980s onward. Specifically, from 1987 for Quebec, from 1985 for New Brunswick and from 1986 for Newfoundland.

19. Acronyms for provinces are BC=British Columbia, ALB=Alberta, SASK= Saskatchewan, MAN=Manitoba, ON= Ontario, PQ= Quebec, NB= New Brunswick, NS= Nova Scotia, PEI= Prince Edward Island, and NF=Newfoundland.

20. The last column indicates whether the variable was converted into natural logarithms for empirical analysis.

21. The dependent variable is the natural logarithm of total driver fatalities per 100,000 licensed drivers. This means all fatally injured drivers; t-statistics are included in parenthesis. All independent variables, (excepting binary) are in natural logarithms. The data set is comprised of annual provincial data from 1975 to 1992 for British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, and Prince Edward Island, from 1987 onwards for Quebec, from 1986 for New Brunswick, and from 1985 for Newfoundland, giving us 147 observations. Year and provincial dummies are included in all specifications. Standard errors of the estimates are White corrected for heteroskedasticity.

22. * denotes significance at 10%, ** denotes significance at 5% and *** denotes significance at 1%.

23. All fatalities are per 100,000 licensed drivers; t-statistics are included in parenthesis. All independent variables, (excepting binary) are in natural logarithms. The data set is comprised of annual provincial data from 1975 to 1992 for British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, and Prince Edward Island, from 1987 onwards for Quebec, from 1986 for New Brunswick, and from 1985 for Newfoundland, giving us 147 observations. Year and provincial dummies are included in all specifications. Standard errors of the estimates are White corrected for heteroskedasticity .

24. * denotes significance at 10%, ** denotes significance at 5% and *** denotes significance at 1%.

INTRODUCING ROAD SAFETY AUDITS TO BRITISH COLUMBIA

BY

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One of the key functions of a road transportation facility is to promote the safe movement of goods and people. The application of road safety audits provides the basis of an effective pro-active road safety strategy that aims to prevent collisions from occurring through the sound application of road safety engineering principles to road design. The main objective of a road safety audit is to ensure that all newly designed road projects operate as safely as practicable.

The systematic application of road safety audits is expected to result in reduced life-cycle costs of new roadways by pro-actively identifying and eliminating potential safety hazards at the design stage. By pro-actively addressing potential safety issues, the highest quality is built into a new facility, thereby promoting a safety-conscious planning, design and engineering environment.

The use of road safety audits has been adopted in many European and Australasian countries. A road safety audit provides a formal, independent, and safety-focussed review of the design as input to the design team at specified milestones. The audit recommendations aim to prevent the occurrence of collisions or reduce their severity should they occur.

Recognizing the value of a pro-active safety strategy, the Insurance Corporation of British Columbia, in association with the BC Ministry of Transportation and Highways, is currently piloting road safety audits in the province.

The purpose of this paper is to promote the knowledge of road safety audits and share the British Columbia experience. This paper is based on extensive research conducted on current road safety audits practice in the United Kingdom, Australia, and New Zealand, as well as extensive local applications to highway design.

Definition

A road safety audit is defined as a formal and independent review of a proposed road design by an expert safety team to assess the multi-modal safety performance of the design. An audit concentrates solely on the safety implications of a project and aims to:

- consider the safety of all road users;
- ensure that preventable collision-producing elements are absent;
- ensure that injury reducing elements are provided at suitable locations;
- ensure that suitable collision-reducing elements are included; and
- ensure that the project does not impact safety on adjacent roads.

The outcome of the audit is a report identifying any safety concerns with the design, quantifying the safety implications of the relevant design decisions, and suggesting safer alternatives for consideration.

An audit is *formal* since it requires documented recommendations from the safety team, and a documented response from the design team outlining how the safety recommendations are being addressed.

An audit is *independent* since the safety team has no other association with the project, and the safety team is not part of the design team.

Finally, an audit requires that safety be addressed from a *multi-modal* perspective, so that the safety performance for all road users is considered and optimized.

The Need for Safety Audits

The need for safety audits primarily stems from two key issues which currently challenge road designers. The first issue is the pressure faced by the design team to balance various competing needs in a project. The second issue is more fundamental in nature: Are design standards adequate in addressing safety? The following sections provide a discussion on these issues.

Design Pressures

With limited resources to improve road and traffic conditions, design engineers are under pressure to provide a cost-effective design. The various factors which need to be addressed include a variety of issues.

These issues include capacity requirements, right-of-way availability, geotechnical conditions, archaeological constraints, environmental considerations, socio-economical impacts and budget constraints. These various issues are often in conflict, and the design team needs to balance the project characteristics to optimize project value.

In recent years, the need for specialists to address the different issues involved in road design projects has become apparent. Experts are typically called upon to provide specialist input to address various project issues. The role of the design team is to receive the specialists' inputs, and accommodate as many of the competing demands as possible while still meeting the core project objectives. The design team therefore has a significant responsibility to balance the competing pressures. Compromises are almost always necessary to achieve as many project objectives as possible.

Road safety audits are needed to ensure that road safety is *explicitly* addressed and given the same prominence as the other issues being considered in a project.

Design Standards

Traditionally, road safety has been incorporated into the design process by following design standards, while safety is implicitly considered. However, there are a number of safety concerns in strict adherence to design standards:

- *Desirable versus minimum standards*: Design standards are typically limit standards, where a minimum value must be met by the design team. Meeting a minimum standard may not be the optimal or most desirable standard for the safety aspect of a particular design. Good design practice requires the design team to exceed the minimum standards wherever it is cost effective to do so. The safety audit examines the implication of using various design criteria, and whenever possible, quantifies the safety impacts of deviating from desirable standards, to facilitate informed decision making.

- *Combination of standards*: Individual design standards may appear to provide an adequate design. However, combinations of standards may introduce safety concerns. This is especially true when minimum standards are combined in a design. The safety audit examines the inter-relationship between the combined standards to assess the safety performance of the design.

- *Age of the standards*: Over time, road design standards evolve as newer research and design principles will surface and new relationships between various road design elements are established. Driver and vehicle characteristics, road geometry and design principles may change. It is quite common for design standards to lag behind the latest research which relates safety performance to design features. The safety audit ensures that the latest available safety knowledge is incorporated in the design.

Road safety audits can effectively identify potential safety concerns before any construction has taken place. These tools are pro-active and represent an effective means to optimize safety in design.

Safety Audit Process

A typical design process involves the review of various competing issues. The design team often needs to balance and optimize the design to address these issues. Experts are utilized by the design team to address these specialized areas, and often tradeoffs are made. The design is finished once the plans are checked for errors.

Thus, the road safety component is currently missing as an explicit issue in the design process. A road safety audit process explicitly and independently addresses the safety of the finished design (or at specified design milestones). Upon receiving the recommendations of the audit report, the design team may elect to revise the design to address the safety issues identified in the audit. This process is generally adopted in countries where road safety audits are compulsory. The typical design process and the safety audit process are shown in FIGURE 1.

Audit Applications

Road safety audits can be applied to all types of projects. The types of projects can be categorized as follows:

- existing road improvement (rehabilitation and retrofit) projects;
- new road construction projects;
- development-driven projects; and
- traffic calming projects.

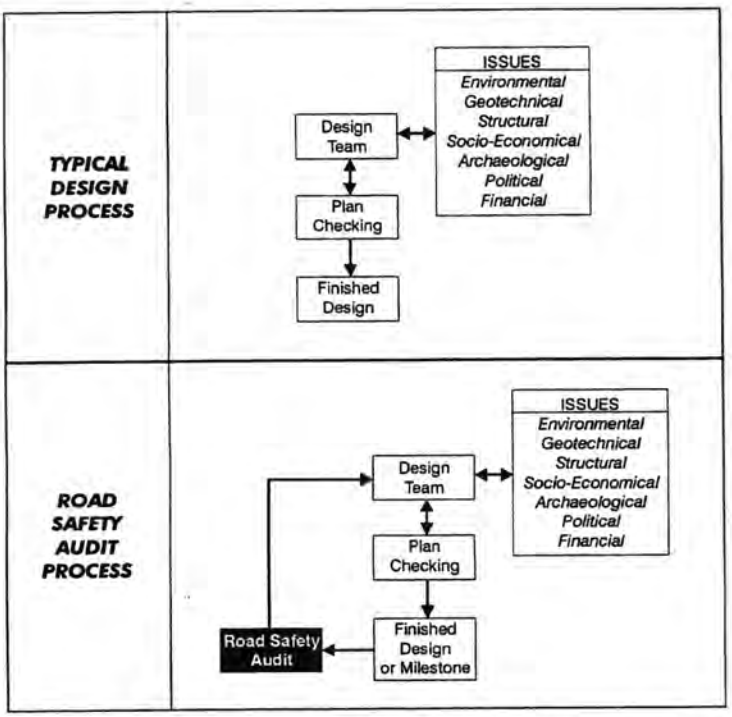


FIGURE 1 DESIGN AND SAFETY AUDIT PROCESS

A road agency needs to decide which projects to audit and at what stage. Some agencies require that all major road projects be audited, while others may require that only a percentage of projects be audited. TABLE 1 summarizes a range of project types and the corresponding recommended stages of audits. TABLE 1 represents a recommended practice and should be viewed as a guide only. Each road agency may decide to devise its own system in road safety programming, which should be flexible and cost effective to respond to the needs of individual projects.

TABLE 1 RECOMMENDED STAGES FOR VARIOUS PROJECTS

PROJECT	AUDIT STAGE			
	Planning/ Feasibility	Preliminary Design	Detailed Design	Pre-opening
Major New Highway	✓	✓	✓	✓
Minor New Highway	-	✓	✓	✓
Major Rehabilitation/Retrofit	-	✓	✓	✓
Minor Rehabilitation/Retrofit	-	✓	✓	-
Major Development	✓	✓	✓	✓
Minor Development	-	✓	✓	-
Traffic Calming	-	-	✓	✓

Note: ✓ denotes recommended

Roles and Responsibilities

The scope of the safety audit needs to be well defined at the onset of the project. The terms of reference should clearly specify the roles and responsibilities of each party involved in the process. A well structured and organized safety audit will expedite the process. Communication protocols between each party involved in the process should be established from the start, and will result in a well-managed and cost-effective project. The roles and responsibilities of the project owner, design team and safety team may vary from one agency to another, depending on the available resources. The typical roles and responsibilities of each party in a safety audit are described as below.

Project Owner

The project owner needs to express a commitment to road safety as a critical element of the highway commissioning and design process. Funding and resources within the organization to conduct safety audits should be incorporated as an integral service. This commitment to safety will lead the owner organization to:

- accept safety audits as an essential quality control requirement;
- commission safety audits at appropriate stages in their projects;
- select the safety team;
- attend the start-up meeting; and
- facilitate the response to the recommendations of the audits.

Design Team

The design team should facilitate the audit process by constructively cooperating with the safety team. At the start-up meeting, the design team should provide the relevant drawings, background reports and information affecting the design. A vital role of the design team is the assessment of the safety audit report and recommendations. The design team will then make the necessary decisions to address the concerns raised by the safety team. The reasons for any proposed corrective actions or non-actions must be documented by the design team to ensure that a proper response is formulated for every safety recommendation. Some decisions may need to involve the project owner.

Safety Team

The main role of the safety team is to identify any potential safety concerns in the proposed design. The safety team should also make constructive recommendations based on safety engineering principles to address their concerns. The safety concerns and recommendations should be documented in a formal audit report, and submitted to the design team. A completion meeting should be held by the safety team with the design team and the project owner.

Road Safety Audit Procedure and Management

The typical procedure involved in conducting road safety audits are shown in FIGURE 2. The audit is initiated by the project owner selecting an independent safety team from a qualified pool of safety experts. The design team then provides all relevant documents to the safety team, and a start-up meeting is held among all parties. The safety team then reviews all documents, conducts a site inspection and safety analysis, and prepares the audit report. A completion meeting among all parties is then held to present and discuss the audit recommendations. The design team then responds to the audit report by adopting selected audit recommendations and by providing written responses for excluding the remaining recommendations. All actions in response to every audit recommendation should be documented in a written report by the design team.

In managing a safety audit, a variety of methods provide satisfactory results. There is no single "right" method of managing an audit A number of key factors described below can ensure the successful management of a safety audit:

- The audit scope should be clearly specified in the terms of reference.
- The roles and responsibilities of each stakeholder (owner, design team and safety team) should be clearly understood by all parties.
- The safety team must be independent of the design team.
- The safety team must have up-to-date knowledge of safety engineering.
- The recommendations of the audit must be formally documented and reported.
- The reasons for various actions resulting from the audit recommendations should be formally documented.

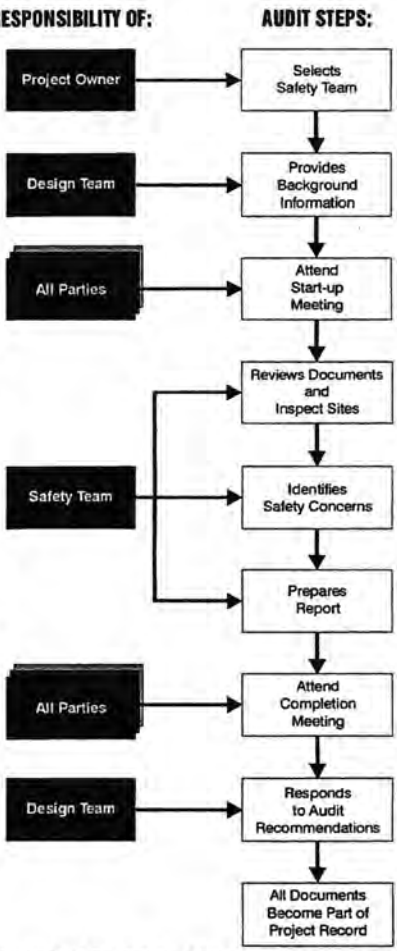


FIGURE 2 SAFETY AUDIT PROCEDURE

Audit Stages

There are several stages of a project at which a road safety audit can be performed. The four stages currently used in British Columbia are the Planning/Feasibility, Functional/Preliminary Design, Detailed Design and Pre-opening stages. Different safety issues can be addressed at each stage, as described below:

Stage 1. Planning/Feasibility

At this stage, a safety audit can make recommendations relating to route choice, layout options, treatment alternatives, road design standards, and project scope. Safety is viewed on a "macro" scale and is primarily focussed on the project impact on a network level with respect to the adjacent communities and surrounding land use. During this stage, changes or improvements to enhance and promote safety are highly cost effective and relatively inexpensive.

Stage 2. Functional/Preliminary Design

At this stage of the project, the specific design standards applied to the following elements should be addressed by the audit:

- horizontal and vertical alignment;
- cross section;
- sight distances;
- intersection and interchange layouts and traffic control;
- integration of pedestrian and cyclists; and
- parking movements.

Major changes to the project after this stage are limited since right-of-way requirements may already be determined.

Stage 3. Detailed Design

At the detailed design stage, before the preparation of contract documents, the detailed geometric design elements should be addressed, including:

- road, intersection, and interchange design details;
- signing plan and pavement markings;
- channelization;
- lighting;

- road side features and clear zones;
- guard rails and barriers; and
- landscaping and street furniture.

Stage 4. *Pre-opening Stage*

Before opening, a site inspection should be conducted by the safety team. The inspection should be conducted preferably under a variety of conditions (night and day, wet and dry) to evaluate the safety performance of the facility. The inspection should be carried out from the perspective of all road users, including pedestrians and cyclists.

This stage is essential to ensure that the safety implications of changes to the final design which were implemented during construction are addressed. While physical changes to the facility may be difficult at this stage, mitigation measures such as the addition of roadside barriers and warning signs, and the relocation of hazards (trees, utility poles) can still be implemented in response to the inspection.

The cost effectiveness of the audit decreases for the latter stages of audits and reviews as changes become more difficult to implement. The resources and details required also increase for each audit or review stage. However, the early audit stages typically are more conceptual in nature, and are more difficult to conduct, requiring higher skill levels.

Safety Team

The project owner typically appoints or selects the safety team, or delegates this responsibility to the design team. The safety team must be independent and appropriately skilled. The size and type of project typically dictates the size of the safety team. The selection of a safety team for various audit stages also varies. TABLE 3.1 summarizes the recommended composition of a safety team for each audit stage for a medium size project.

The safety team may consist of qualified personnel in the areas of road safety audits and engineering, highway design, enforcement and traffic management, road maintenance and other special areas as required. Some of the special areas include expert knowledge such as traffic control systems, human factors, traffic calming, and street lighting.

TABLE 3.1 AUDIT TEAM TYPICAL REQUIREMENTS MEDIUM SIZE PROJECT

EXPERTISE	AUDIT STAGE			
	Stage 1 Planning/ Feasibility	Stage 2 Functional/ Preliminary Design	Stage 3 Detailed Design	Stage 4 Pre-opening Stage
Safety Expert	✓	✓	✓	✓
Design Engineer	✗	✓	✓	✓
Other Experts	O	O	O	O
Police	✗	✗	O	✓
Maintenance Engineer/ Technician	✗	O	O	✓

Note: ✓ denotes required, O denotes optional, and ✗ denotes not required.

Audit Information Requirements

All the relevant information should be provided to the safety team. It is the responsibility of the design team to collect all the necessary and relevant reports, data, drawings and contract documents for the safety team. This step should be initiated well before the commencement of the audit to avoid delays. Typically, the background information includes:

General Information

- project scope, goals and objectives;
- methodology, standards, and design criteria used;
- any deficiencies which need to be reviewed;
- prior community input and consultation;
- relevant background reports; and
- any proposals for relaxations or departures from design standards.

Site Data

- collision data;
- traffic volumes including pedestrians and cyclists;
- known safety issues; and
- key environmental, geotechnical, right-of-way and socio-economic issues and constraints.

Plans and Drawings

- drawings showing vertical and horizontal alignment and cross-sectional elements;
- other relevant design items with respect to the audit stage; and
- other plans showing adjacent roads and land that may be affected by the project.

The Audit Process

Before undertaking the audit, it is necessary for the design team to familiarize the safety team with the project background. A start-up meeting will provide this opportunity to discuss the project background and any safety issues, exchange information, assign responsibilities, and establish communication channels. The terms of reference to define the scope of the audit, as specified by the project owner should be finalized at this meeting. Details such as project schedules and any special requirements should be included at this stage.

After the start-up meeting, the audit process of assessing the documents and site inspections will commence. The following steps describe typical procedures for the planning, preliminary design and detailed design stage audits:

STEP 1 The safety team examines in detail all the background and design information provided. Typically the project is audited in a section by section basis to fully consider the impact on different road users. A preliminary list of potential safety issues should be identified at the end of this step. Any preliminary recommendations likely to improve safety should also be generated at this point.

STEP 2 The team should conduct a site visit for both existing roads and "green field" projects. The site inspection is essential, and provides an overall picture of the conditions. During the site visit, the team should pay particular attention to the transition of the project to the existing road network to ensure consistency from the perception of road users, to visualize the proposed design and impacts, and prevailing climatic and geographic conditions. The inspection should be conducted from the perspective of all potential road users.

STEP 3 The document assessments and field work are analysed, reviewed and integrated, using checklists as appropriate, to ensure all relevant aspects have been covered. The safety team should conduct the audit from the road users' perspective, by visualizing road conditions and analysing the multitude of factors which can affect safety in combination. Any potential safety issues should be identified at this stage.

STEP 4 The audit report should be prepared. The audit report should clearly and succinctly identify participants, process, issues and recommendations. The recommendations are usually conceptual in nature, rather than specifying the details of a solution. The report documents the safety concerns as a basis for corrective decisions or justification by the design team.

For Stage 4 audits (pre-opening), the main task is to conduct a site inspection, and the procedure is described as follows:

STEP 1 Review all previous audit reports and other relevant information.

STEP 2 Review the physical characteristics of the project site to identify potential problems through a site inspection. The inspection should include driving and walking through the project from different directions, and considering requirements for various road users. If possible, the inspection should also be conducted at night and for adverse weather conditions. The most likely safety issues to be identified at this stage include the positioning of street furniture, signs and pavement markings that may adversely affect the road users' perception of the road or restrict sight lines. This step should be undertaken as close as possible to opening and allowing time for any necessary changes to be implemented.

STEP 3 A preliminary report of the pre-opening audit should be submitted to the design team as soon as possible to overcome any time constraints to implement corrective measures. At the same time, a final report should be prepared documenting the findings of the audit.

Audit Recommendations and Response

Responding to the audit report should be the responsibility of the design team. A meeting involving the safety team and the design team, preferably in the presence of the owner, should be held at the completion of the audit. The objective of this meeting is to address the audit recommendations in a constructive manner. It is important that this meeting commence with a reiteration of the dedication of all parties to enhance safety, and to proceed with the meeting in a cooperative and constructive spirit. The discussion should be concentrated on the recommendations for any corrective measures or actions. Each recommendation of the audit report can either be accepted or rejected.

For each accepted recommendation, feasible corrective measures should be identified and adopted by the design team. The redesign should then proceed to overcome or reduce the safety hazard. Once the redesign is complete, the redesign may be submitted for a further audit. For each rejected recommendation, the reasons for rejection (whether physical, economic, or social) should be provided and documented in writing. The design team should document in a written report the action for every recommendation in the audit report. Both the audit report and the design team's response become part of the project record.

Legal Perspective

In the United Kingdom, no claims have been made against a road authority due to deficient safety audit. In Australia, the issues of public authority liability for acts of negligence is still evolving and the courts are still searching for definitive answers. However, the current level of legal liability was not expected to be raised by adopting road safety audits as a safety enhancement process by a road authority.

An introductory assessment of the potential legal impact upon the participants in the audits process was undertaken in British Columbia. The legal issues concerning safety audits generally fall into the areas of duty of care, qualified immunity for public authorities, reasonable care, and principles of negligence. It is recommended that road agencies seeking to formally introduce road safety audits obtain the advice of their own legal counsel.

Design/Build Projects

When undertaking a design/build project, the road authority can address road safety explicitly by stating the requirements for a road safety audit in the contract documents or terms of reference. As part of the requirement for the design/build project, the proponent should commit to conducting an independent safety audit on the proposed design. The audit procedures as outlined in this paper may be followed. Design/Build projects typically streamline the design process. It is therefore essential that the safety team be involved with the private sector design team very early in the project, preferably at the project proposal stage.

Addressing Safety in Value Engineering

Assessing the safety implications of value engineering recommendations should be an integral part of projects subjected to value engineering. Ideally, the safety assessment needs to be conducted *after* the value engineering exercise. Road safety audits should be used to assess fully and explicitly the safety implications of the value engineering recommendations. As a minimum, a safety specialist should be included as part of the value engineering team to assess the safety implications of the modified design due to the value engineering proposal. Experience in both Ontario and British Columbia has indicated that value engineering decisions frequently jeopardize safety, and that a safety audit of these decisions is desirable.

Conclusion

In conclusion, road safety audits can be incorporated as part of an overall quality assurance program in a road agency. The systematic application of safety audits can ensure that good road safety practice is achieved in roadway construction projects. The systematic application can also foster a principle of safety conscious design among owners and designers. As such, safety audits are positive processes towards building a "quality-oriented" corporate culture. By providing a high quality product, the potential for liability and the need for future remedial work may be reduced, thus reducing the overall risk and life-cycle costs undertaken by the road agency and significant benefits are expected to be realized.

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External Challenges Facing Canadian Ports
The Case for Reform

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Introduction

Since the end of World War II, the global economy has shifted from "import substitution" and public sector involvement in economic development (Keynesian fiscal policy) to contemporary neo-liberalism focusing on freer markets, increased competition, and relatively open borders for trade expansion. Transportation technology improvements coupled with increased competition led to lower shipping costs that in turn encouraged greater international trade. These shifts in the global marketplace generate turmoil, rapid change and increased uncertainty. Such shifts in the international economic system create turbulence in the operating environments of Canadian ports by creating more complicated markets and competitive situations, generating uncertainty about the future, encouraging the use of rapidly changing technology, enabling shifts in customer preferences (reflecting the "foot loose" nature of shipping lines and shippers and their lack of port loyalty), creating extensive capital investment requirements (mechanizing port operations for productivity gains), and diminishing the time available for decision-making (just-in-time inventory systems demanding rapid port response).

Constant and unpredictable change is pervasive in turbulent times. Trying to protect or preserve a traditional transportation system (such as Canada's federal port system) is a public policy fraught with difficulty. Traditional protective steps such as limiting the incursion of foreign carriers, establishing non-standard regulations, and creating other non-tariff barriers were designed to support domestic firms. But these same protective measures prevented Canadian firms from the benefits of the economic rigours imposed by external competition. Currently Canada is shifting from its past protectionist policies to supporting a free-market economy, developing and maintaining free trade (by reducing tariffs and other non-tariff barriers), and enhancing competitiveness in the transportation sector.

Within Canada's federal system, constitutional authority and responsibilities are divided between provincial and federal governments. Under the

Constitution Act of 1982 (formerly the *British North America Act* of 1867), ports and harbours are federal responsibilities. Despite this concentration of port authority at the national level, current Canadian ports administration is anything but homogeneous. Canada's 369 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.

Canada's national public ports system is divided into three separate systems: Canada Ports Corporation (CPC) comprised of 7 semi-autonomous Local Port Corporations (LPCs), and 7 smaller Divisional Ports, Harbour Commissions - 9 semi-autonomous federal ports administered under their own Act of Parliament, and Transport Canada's Harbours and Ports Directorate - some 356 smaller commercial ports administered by the Canadian Coast Guard.

This paper focuses on the significant forces within the external environment in which Canadian ports operate. Four major forces are considered: international trade and economic globalization, North American continentalism (including the growth of inter-port competition), changing transportation technology, and transportation deregulation and reform. These economic and technological forces affect Canadian ports and partly drive contemporary port reform.

International Trade

International trade has been supported by the General Agreement on Tariffs and Trade (GATT). The GATT was signed by 23 nations in 1947 following three years of international trade discussions. It encouraged the growth of international trade on the basis of reciprocity and non-discrimination. The GATT's central tenet is the "most favoured nation" principle through which trade concessions negotiated between two countries applied to others within the GATT system. GATT's objectives were to: create international cooperation in trade policy, develop an open and non-discriminatory world trade system, observe a common set of trade rules, and provide a conciliatory settlement process for trade disputes. These objectives were achieved through tariff reductions, prohibiting certain non-tariff barriers, and eliminating most trade discrimination.

Since the postwar reconstruction era in the early 1950s, the world's economic activity has become more "internationalised" and significantly, more "globalized." These two terms are not synonymous. "Internationalisation" refers to the geographical spread of economic activities across national boundaries. The

more recent phenomenon of economic "globalization" refers to the enhanced functional integration among internationally dispersed economic activities.

Operating on a world scale, multinational corporations (MNC) took advantage of the new global division of labour. Instead of worker specialization in different parts of the production process within one plant, the production process spread over many countries to achieve economies from various types of labour and resource inputs from each location with the final product being assembled in yet another country. In turn, such economic globalization generates increased international trade as raw materials, parts and products are shipped among the MNC plants in various regions of the world. Improvements in transportation technology, particularly containerisation and intermodalism, contributed to the growth of international trade by ensuring faster service, reduced freight costs and improved reliability. The net result is increased world trade, primarily by sea, as resources, parts and finished products are shipped to meet the demands of a vibrant international economy.

North America and Global Trade

During the 1980s, total world seaborne trade in tonnage terms increased by only 10 percent, down considerably from the 42 percent increase in the previous decade (see Table 1). Increasingly commodities were being containerised (including some bulks) to achieve economies of scope from handling unit loads. As further shown in Table 1, both Canada and the U.S. had similar shipping growth rates as reflected by their respective market shares of world trade. Table 1 also shows that the growth of Canadian and U.S. trade in tonnage terms exceeded the increase in world trade in the two earlier decades. But in the 1990s, seaborne trade in Canada declined relative to the world. This decrease in seaborne shipping may reflect the growth of trans-border surface trade from the North American Free Trade Agreement (NAFTA).

The changing nature of the sea-borne commodities during the past two decades is outlined in Table 2. In the 1980s and 1990s, dry cargo tonnage trade grew by 50 percent while bulk tanker cargo increased by only 18 percent.

Reinforcing the global trend of transporting less dense but more valuable containerised commodities, Table 3 outlines the world, Canadian and U.S. growth of containers handled. In part, the phenomenal growth shown in Table 3 includes a change in cargo handling methods for many commodities (from break-bulk to containers) rather than a total increase in the goods traded. Canadian container ports had an increase in containers handled of 230 percent in the 1970s, 50 percent in the 1980s and 11 percent to 1994 (reflecting, in part, the effects of economic recessions). U.S. ports recorded similar increases of 247 percent, 78 percent and 25 percent respectively. Although Canadian container throughput parallels U.S.

throughput, the Canadian growth rate is slightly lower. In part, this may be the result of a change in the balance of transborder diverted Canadian containers in favour of U.S. West Coast ports.

Table 1 Seaborne Shipping (loaded/unloaded in mil tonnes)

Year	World Trade	Canada (mil tonnes)	Canada (%)	U.S. (mil tonnes)	U.S. (%)
1970	5,220	133	2.5%	523	10.0%
1980	7,386	203	2.7%	804	10.9%
1990	8,096	232	2.9%	784	9.7%
1995	9,200	260	2.8%	978	10.6%
% change (70-80)	42%	53%	----	54%	----
% change (80-90)	10%	14%	----	10%	----
% change (90-95)	14%	12%	----	25%	----

Sources: *Statistical Abstract of the United States*, Bureau of Census, Washington DC, 1991-97, *Shipping in Canada*, Statistics Canada, Ottawa, 1989- 97, and *Review of Maritime Transport*, United Nations, Geneva, 1988-97.

Table 2 Changing World Seaborne Trade (loaded/unloaded in mil tonnes)

Year	Dry Cargo	Tanker Commodities
1980	3,684	3,702
1990	4,506	3,510
1996	5,528	4,354
% change (1980-96)	50%	18%

Source: *Review of Maritime Transport*, United Nations, Geneva, 1997.

Table 3 Container Throughput (mil TEU)

Year	World (mil TEU)	Canada (mil TEU)	Canada (% share)	U.S. (mil TEU)	U.S. (%)
1971	7.21	0.23	3.2%	2.47	34.3%
1980	37.16	0.76	2.0%	8.57	23.1%
1990	85.60	1.51	1.8%	15.24	17.8%
1994	125.0	1.68	1.3%	19.02	15.2%
% (71-80)	415%	230%	—	247%	—
% (80-90)	130%	51%	—	78%	—
% (90-94)	46%	11%	—	25%	—

Source: Klaus H. Beplat, *Megatrends II: Localisation of Potentials in Container Trade - Analysis 1971-1990, Forecast 1991-1996*, Hamburg, 1992, and *Containerisation International Yearbook 1982-96*, Emap Business Communications, London.

North American Economic Continentalism

Economic continentalism directly effects Canada's ports by encouraging a shift from the country's traditional east-west commerce to a north-south trade. Since most of this north-south trade is by surface mode (road and rail), this has resulted in a relative reduction in overseas trade and cargo throughput in Canadian ports. In 1997, the U.S. accounted for 75 percent of Canada's total trade (exports, 82 percent and imports, 68 percent). Although Canada maintains both a multilateral (supporting GATT and seeking other trade partners abroad) and a bilateral trade policy (FTA and, subsequently NAFTA), Canada's primary international economic success has come from its bilateral trade with the U.S.

Free Trade Agreements

A 1983 Royal Commission on the Economic Union and Development Prospects for Canada recommended bilateral free trade with the U.S. The 1984 election of the Progressive Conservative Government which supported trade expansion with the U.S. added momentum to the free trade debate. In the U.S., the feasibility of developing free trade with Canada arose from their disappointment of the failure of

the 1982 GATT Ministerial meeting in Montreal to solve pressing problems of agriculture and the growing trade in services and investments. At the time, the U.S. believed bilateral trade talks might produce more progress than the GATT's multilateral approach (11).

Exploratory discussions on sectoral free trade were initiated in Washington in December 1983 with the two nation's leaders signing the FTA in January 1988 for implementation a year later. Canadian support for the FTA came from a number of factors including: securing access to the larger U.S. market by tariff reductions and removal of non-tariff barriers, exposing Canadian industry to increased competition to generate domestic innovation and productivity, and achieving economies of scale and industrial rationalization in both countries (4). The U.S. sought new rules to govern trade in services and investments and a resolution to nagging bilateral trade problems in energy and automobile production (10).

Although the FTA opened U.S. markets over time, it was primarily a tariff elimination agreement. Some tariffs were eliminated immediately, other reductions phased in over five or ten years. Several other trade issues were encompassed in the FTA including: a dispute settlement mechanism, regularizing energy shipments, and establishing continuing bi-national committees to consider trade standardization and harmonization.

The FTA did not deal with several trade-related elements, in particular transportation. During the FTA negotiations, transportation was a matter of considerable discussion. Canadian negotiators undertook various studies to determine the nature of transportation competitiveness under the FTA (12). In the marine mode, the U.S. cabotage restrictions under the *Jones Act* limits the domestic coasting trade, including shipping to offshore states and protectorates such as Alaska, Hawaii and Puerto Rico, to U.S. flag vessels operated by American companies, crewed by Americans, and built in U.S. shipyards. Canada has more liberal cabotage restrictions in which foreign flag vessels may be used if no suitable Canadian flag vessels are available (such vessels must conform to Canadian standards and pay a 25 percent import duty), Canadian flag vessels can be built in off-shore shipyards to Canadian standards, and there are no ownership provisions on the domestic trades thus permitting U.S. firms to own and operate a Canadian fleet. Several transportation alternatives were discussed during the FTA negotiations including: the provision of full cabotage rights in the other country's coastal trade, cabotage rights limited to specified ports-of-call, and opening up ownership/investment opportunities in each country (3). With full cabotage rights, Canadian and U.S. vessels would have been able to carry cargo between any two ports in each other's country. Full cabotage rights would have helped Canadian carriers to secure U.S. coastal traffic to improve their operating performance and generate additional commodity throughput in Canadian ports. The U.S. shipping

industry feared further inroads from the Canadian fleet in transborder shipping. Despite the benefits for both nations in modifying the *Jones Act* and other cabotage restrictions, transportation was deliberately excluded from the FTA. In fact, the final negotiations were put in jeopardy by the extensive lobbying of the U.S. maritime industry (2).

The FTA was subsequently approved without a transportation section, leaving cabotage restrictions in place. These restrictions continue to stifle the development of continental coastal trade limiting cargo throughput in Canadian and U.S. ports.

Transportation Technology

Containerisation improved cargo handling efficiency and raised port productivity. During the 1980s, further productivity improvements were achieved with the introduction of larger container ships coupled with improvements in land-side transportation. Larger ships require greater amounts of cargo consolidated in one terminal for rapid loading and unloading. Given the high cost of larger vessels (in 1996, a 6,000 TEU capacity container ship cost more than $100 million), their owners can ill-afford to spend time travelling from port-to-port along a coastal range. Today, modern and efficient sea feeder services and land-based intermodal systems (road and rail) encourage the development of load-centre ports serving these larger container ships. Similar to the airline industry, the container trade is increasingly moving towards a "hub and spoke" distribution system. Directing container traffic through strategically located load centre ports on each coast means the choice of port for discharging and loading containers is increasingly being made by the ocean carrier (through their selection of a limited number of ports to serve) rather than by the shipper. In addition, larger ships with higher throughput volumes per vessel call led to improvements in container handling equipment and the need for enhanced productivity in container terminals. Consolidating large scale container handling systems at specialized facilities results in lower cargo-handling costs through economies of scope and scale, improved efficiency, and the enhanced bargaining powers (volume discounts) of shippers and shipping lines. Ports have had to adapt to the changing needs of this competitive market.

Economic Deregulation, Competition and Port Reform

The increasing re-orientation of Canadian trade to a north-south direction is not only the result of the FTA/NAFTA. U.S. transportation industry deregulation and Canada's subsequent regulatory reform also contributed to north-south shifts in surface transportation routings.

U.S. Transportation Deregulation

U.S. transportation systems are better positioned than Canadian firms to compete in a free-market continental economy because they adapted earlier to open market competition created by economic deregulation. Transportation deregulation resulted in railway rationalisation including: consolidated firms, reduced labour, increased productivity, trackage reductions, introduction of new technology, and a subsequent decrease in freight rates. From 1981 to 1991, there was a 50 percent reduction in the number of employees of U.S. Class I railways; today, employment compensation represents only 28 percent of their operating expenses, compared to almost 40 percent in Canadian railways (8).

The U.S. trucking industry reported similar results. The major effect of the *Motor Carrier Act* of 1980 was to ease entry and exit conditions for trucking firms. In a deregulated environment, existing and new firms had only to demonstrate that they were "fit, willing and able" to obtain licenses to operate commercial services. Changes in entry requirements permitted Canadian trucking firms to more easily access U.S. markets (although initially the reverse was not true). Despite initial problems, there has been significant consolidation of smaller trucking firms into larger, more efficient "mega-carriers" and the development of extensive "hub and spoke" distribution systems (for less-than-truck load commodities).

Deregulation forced the U.S. trucking industry to rationalize fleet size, improve management, achieve greater economies of scale, and enhance productivity. Increased operating revenues and a lower debt to equity ratio (U.S. trucking firms had about half the debt of Canadian firms) enabled the U.S. trucking industry to weather the 1990s recession better than Canadian firms (7).

Canadian Regulatory Reform

Continental competitive pressures forced the Canada to follow the U.S. lead in transportation deregulation. Canada modified its domestic and international air services in 1984, and adopted reformed regulations in 1987 with the passage of the *National Transportation Act* (NTA), the *Motor Vehicle Transportation Act*, and the *Shipping Conference Exemption Act* (SCEA). Unlike U.S.'s rapid shift to a deregulated environment, Canada took a more moderate step - one of regulatory reform. Regulatory reform followed a slower, more incremental process leading to full deregulation allowing the Canadian transportation industry to adapt over time.

Significant changes were made to Canadian railways to enable them to compete with other modes including those in the U.S. In addition, entry limitations in the trucking industry were initially eased and fully removed after a five year period (allowing U.S. trucking firms to readily enter Canadian markets). The SCEA enabled shippers to negotiate contracts directly with conference shipping lines.

The 1987 NTA was designed to introduce a market responsive environment for the Canadian transportation industry, particularly the railway sector. The NTA included mechanisms to encourage both intermodal and intra-model competition. Government sanctioned collective rate making (published tariffs) was eliminated, confidential contract and competitive access provisions introduced and rail rationalization (abandonment of excess trackage) facilitated. The majority of rail freight now travels under confidential contract relating both to price and level of service being provided.

In the 16 year period from 1980 to 1995, north-south rail tonnage grew by 59 percent compared to a mere 15 percent increase in total Canadian railway tonnage (9). The importance of north-south rail movements continued in the FTA and NAFTA period (1990 to 1995) when north-south rail tonnage grew by more than 31 percent while overall Canadian tonnage increased at a slower rate (13 percent).

The significance of north-south trade has been reflected in the investment decisions of the two Canadian national railways. CN consolidated its U.S. subsidiaries (the Grand Trunk Western, the Duluth, Winnipeg and Pacific Railway and the Central Vermont Railway) into a fully integrated continental CN North America and recently acquired the Illinois Central. Similarly, CP consolidated its U.S. subsidiaries (the Soo Line and the Delaware and Hudson Railway) into its CP Rail Systems. In addition, CP Rail Systems established a joint service with Conrail to move containers between Montreal and Toronto and the Port of New York and New Jersey, entered into a seven year agreement with Norfolk Southern to service a Buffalo to Chicago route, and established a joint container service with Burlington Northern Railroad between Montreal and Toronto and markets in the U.S. Midwest and South. CN also established alliances with U.S. and Mexican railways. Focusing on north-south trade could mean less cargo throughput in Canadian ports as Canadian railways promote continental trade rather than traditional east-west traffic, including overseas export/import throughput.

Canadian Container Ports

Collectively, Canada's three major ports (Halifax, Montreal and Vancouver) handle 93 percent of all Canadian container throughput, with the remainder being handled in Saint John, St. John's, Newfoundland and Toronto (primarily domestic moves in the latter two ports). The four Local Port Corporations (Halifax, Saint John, Montreal and Vancouver) have the capacity to handle some 1.85 million TEU per year. The distribution of this capacity is shown in Table 4. Although total container port utilization is high at 89 percent, it is not uniformly distributed among the four LPCs. It does not help Montreal and Vancouver, operating at full capacity, that Saint John and Halifax are under-utilized. To maintain quality service to

shipping lines and shippers, Montreal and Vancouver both need additional terminal capacity (thus the recent development of Vancouver's Deltaport).

Table 4 Canadian Port Container Capacity and Utilization

Port	Current Capacity ('000 TEU)	1994 Throughput ('000 TEU)	% Utilization
Halifax	573	311	54%
Saint John	200	28	14%
Montreal	575	729	127%
Vancouver	500	499	100%
Canada Ports Corp	1,848	1,643	89%

Source: *Transportation Trends & Issues - 1994 Review*, National Transportation Agency, Ottawa.

Canadian - U.S. Port Competition

The relatively open border between Canada and the U.S. permits the ready diversion of commodities in bond through each other's ports. This is particularly true for containerised general cargo commodities. Typically, U.S. West Coast ports are used by Canadian shippers (or their agents) to handle Canadian-Far East imports and exports to the detriment of the Vancouver Port Corporation. On the East Coast, the opposite occurs with U.S. commodities from the Mid-west states normally being shipped through Montreal to Europe. Over the years, diverted containerised trade between the two nations has been almost balanced. For example, in 1994 Canada exported more than 142,000 TEUs through U.S. ports and imported over 174,000 TEUs via the U.S. This diversion represents some 16 percent of Canada's total TEU throughput. The significance of container diversion in terms of the percentage of total national traffic is considerably greater for Canadians than Americans. With the potential of long-term growth of Far East markets and the relative decline of the North Atlantic trade, diverted Canadian traffic may grow to a point where the balance shifts in favour of U.S. ports over Canadian facilities.

The competition for retaining or capturing diverted traffic has increased over the past decade as improved intermodal systems (particularly in the U.S.) enhanced the efficiencies of moving containers throughout the continent. The loss of a significant portion of Far East trade through U.S. and Canadian East Coast ports to U.S. West Coast ports, partly caused by the development of efficient

double-stack container trains traversing the continent, led U.S. East Coast ports to seek additional throughput to offset their Far East losses. Both the ports of New York-New Jersey and Baltimore provide rebates to U.S. Mid-west shippers for using their ports for their container shipments - a direct challenge to the lower costs of their primary competitor, Montreal.

Canadian ports compete with U.S. facilities as a result of an integrated, efficient and well-developed continental transportation system. The FTA and NAFTA reinforced continentalism and led to increased north-south trade. The FTA/NAFTA does not significantly contribute to marine traffic between Canada and the U.S. In 1993, 86 percent of transborder goods movements by value were by surface mode while a mere two percent was transported by water (1). The marine trade that does exist between Canada and the U.S. tends to be heavy bulks (petroleum products, aggregates, coal and iron ore) and exported forest products.

The Case for Canadian Port Reform

Canadian ports face many challenges and opportunities, including:

- shifts in international trade and routes (with the trans-Pacific gaining dominance over the trans-Atlantic trades),
- continued growth of North American economic continentalism resulting in increased inter-port competition (reflected in container trade diversions),
- improved transportation technology, and
- economic deregulation creating a free market in the continental transportation system.

These external forces require flexible Canadian ports placing themselves in competitive positions to ensure continued survival and growth. Canadian ports can only deal with these challenges and opportunities if they are led by port managers and Boards of Directors who can accurately perceive the effect of these external forces, quickly adapt and take appropriate responses. The question is whether or not Canada's federally dominated and centralised ports system has developed managers and directors capable of detecting significant changes in their operating environments and can rapidly adjust to emerging realities?

Current Port Reform

Canadian ports as public enterprises were centrally controlled, subjected to constraining bureaucratic regulations, and relatively slow to adjust to emerging competitive forces. Political appointments to the boards of Canada's major ports

led, at times, to decisions favouring political expediency over commercial needs. Canada has taken steps to liberalise the transportation sector. Port reform is needed to increase overall efficiency, productivity and competitiveness.

Table 5 outlines international port reform options by listing selected national port systems (Australia, Britain, Canada, New Zealand and U.S.) by their operating systems ranging from comprehensive (where the port authority undertakes all cargo-handling activities) to landlord (where the private sector provides service) with the degree of public sector intervention varying from the port as a government department to a fully privatised operation. As shown, contemporary port reform is shifting public ports upwards from comprehensive to landlord and to the right towards commercialisation, corporatisation and privatisation.

Port reform is needed to enable Canadian ports to improve their efficiency, focus on purely commercial objectives, rationalize port labour, and enhance their overall competitiveness. The commercialised, corporatised and privatised port reforms in Australia, New Zealand and Britain offer lessons for Canada (6).

Table 5 Government Intervention in Port Systems

Port Operating System	Level of Public Sector Intervention			
	Department	Commercialised	Corporatised	Privatised
Landlord (private terminals)	*Transport Canada HPD*, and *U.S. municipal ports*	*CPC (1983), LPCs (1983), Harbour Commissions, U.S. Port Authorities*, and *Australia (1993)*	*New Zealand (1988)*	*Britain: ABP (1983)* and *Trust Ports (1991)*
Compre-hensive (public terminals)	Nationalized British ports, West/South Australia, Queensland	British Trust Ports, Australia Port Authorities, New Zealand Harbour Boards		

Note: 1998 port institutional structures shown in *italics*.

Source: M.C. Ircha, "Canadian Port Reform: Commercialisation to Corporatisation", PhD dissertation, Department of Maritime Studies and International Transport, University of Wales Cardiff, 1997.

In 1993, the Liberal Government instituted in-depth reviews of all federal departments and programs including the marine sector. In parallel with Transport Canada's internal review, in 1995 the Parliamentary Standing Committee on

Transport (SCOT) undertook extensive cross-country hearings to generate recommendations for a national marine policy. The SCOT report led to a series of Transport Canada sponsored regional shippers workshops reviewing its recommendations. Both of these participative processes assisted the Minister of Transport in developing a national marine policy.

In August 1995, the Minister's proposed marine policy was presented to the Canadian Port and Harbour Association. The proposed port reform sought to shift major ports towards enhanced "commercialism" in which designated Canada Port Authorities (major ports) are incorporated as not-for-profit corporations, directed by a Board with user representatives, expected to raise capital funds from commercial banks (with no liability being transferred to the federal government), and provided with higher spending authority.

In June 1996, the new Minister introduced the *Canada Marine Act* (Bill C-44) to Parliament for first reading. The *Act* passed third reading in the House of Commons in April 1997 but failed to be adopted by Senate before Parliament was prorogued for the 1997 federal election. The *Act* was re-introduced to the new Parliament as Bill C-9 and adopted in June 1998. The *Act* comes into effect in January 1999, but the actual implementation date for specific CPAs depends upon the issuance of their negotiated letters patent from the federal government.

Canadian ports operate within the global economy, hence reform and change occurring internationally impacts on the Canadian ports system. As shown in Table 5, Canadian ports are currently situated in either the departmental component (Transport Canada's Harbours and Ports Directorate facilities) or in the commercialised section (CPC [Divisional Ports and LPCs] and Harbour Commissions). Contemporary port reform, reflected in the *Canada Marine Act*, will move CPAs towards corporatisation.

Is the shift to a corporate structure sufficient? By adopting the type of not-for-profit corporate model proposed, the government will not likely create the competitive, business-like commercial ports it is seeking. Canadian port managers and their directors support continuing the current system with minor modifications (5). This resistance to radical change will likely continue throughout the reform process. If the changes proposed do not go far enough in the direction of corporatisation and eventually privatisation, there could be further erosion of the port reform achievements and a reversion to the more comfortable current model of a federally dominated ports system.

What is required is a move to port privatisation similar to New Zealand's port reform. Full incorporation leading to privatisation ensures there is no question about the port's mandate and objectives (to maximize profits for the shareholder). The suggested "cost-minimisation" goal of the not-for-profit CPAs reflects a typical Canadian compromise, a hybrid model designed to offend no one, yet create

confusion over what business orientation is expected from the country's major commercial ports.

Unlike island nations in which economic development is dependent upon ports as key nodes for commodity transfer, Canadian ports are part of an integrated continental transportation network where shippers have competing options for the overseas shipment of goods (both in Canada and in the United States). Canadian ports have lost the competitive advantages they may have had in the past in terms of captured hinterlands. Today's efficient and relatively low cost integrated intermodal transportation system provides shippers considerable freedom to chose alternative routings for logistics movements. Thus Canadian ports must be efficient and competitive to survive and develop. To achieve such efficiency, Canadian ports must be freed from federal constraints to operate locally as a business enterprises in a commercial manner.

Conclusion

Canadian ports face many challenges and opportunities in this period of turbulent change. The key concern for the reform of Canadian ports is to liberalize them to enable them to function in a business-like manner in the increasingly competitive continental environment. Although the *Canada Marine Act* is a step in the right direction, further commercial freedoms are needed to limit the federal government's role in major Canadian ports.

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"Adrift ! – Subsidies, Economic Benefits and the Impasse in Policy Reform for B.C. Ferries

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There is a long history of ferry subsidies for island and coastal communities on both coasts of Canada (as well as in other countries). In British Columbia, the years have brought substantial population and economic growth, and with this has come substantial increases in ferry traffic. High volume routes are at least potentially viable financially, but not so for smaller or "minor" routes. The B.C. Government is running a budget deficit hence would like to cut subsidies. But increasing ferry fares and/or cutting service provokes vocal and effective opposition by user groups. Many questions arise including: (1) do the economic benefits justify the costs incurred in providing the service? (2) How large are the subsidies and how do they affect the net benefits of ferry service? (3) Is it possible for such ferry services to be financially viable? (4) What is the distribution of the ferry benefits among groups in society? and (5) what are the prospects for possible policy changes in the future?

This paper explores these questions for B.C. Ferry (BCF) minor routes including a specific route case study. A brief background on BCF operations is followed by an illustration of calculating the net economic benefits of BCF operations for a specific route. Because prices are artificially low, the benefits to users are larger than the overall benefits to society. But the benefits to users tend to be capitalized into land values, making it all the more difficult for government to modify current policies.

1.0 SETTING THE SCENE

BCF serves a number of coastal ferry routes in British Columbia, using a fleet of 40 vessels to serve 42 communities over 24 routes. These include a couple high volume runs which appear to be financially viable, but the majority of services have little or no prospect of viability (Waters, Evans and Caravan, 1996a, 1996b). Nonetheless, these services have been provided for many years, even decades.

There is an escalating federal subsidy which the federal government would like to eliminate, and the Province of B.C. has been reducing explicit subsidies in recent years. But revenues are not sufficient to sustain BCF services, and debts are mounting as the fleet must be replaced. Many ships are over 30 years old, and the current cash flows will not support the investments. In recent months, there is considerable controversy over rapidly mounting debt associated with high-cost fast ferries which are under construction. The fast ferries add to the problems facing BCF (and thereby the government and taxpayers of B.C.), but the financial problems facing BCF were well advanced before the recent fast-ferry controversy.

BCF exhibits a classic "crown corporation syndrome:" it is a government-owned corporation which often must make commercial considerations subservient to public policy goals. Users and stakeholders are well aware of the situation and are effective at preventing commercial decisions from coming into effect by bringing political pressure on the government. The result is an ad hoc policy of prices below costs, with little or no explicit rationale, and political paralysis in confronting these problems. Mounting crown corporation debt appears to be less "visible" than are price increases or service reductions.

The long-established implicit subsidies on most BCF services have become entrenched in the communities, and now are regarded as entitlements by ferry users. And because of the workings of land markets, the value of ferry subsidies has become embodied in property values, which are vulnerable to any change in government policy. This makes it even more difficult for governments to contemplate pricing and subsidy reform. And in the meantime, traffic grows, losses mount and the growth of BCF corporate debt is unsustainable.

The next section illustrates the economics in assessing the overall and net economic benefits of ferry operations, how subsidies distort the benefits, and how this affects the prospects for policy reform.

2.0 MEASURING THE ECONOMIC BENEFITS OF SUBSIDIZED FERRY SERVICES

Measuring economic benefits first requires a review of some basic economics concepts; then empirical implementation can be discussed.

2.1 Economic value

The private market measures the value of something in terms of the revenue it generates, that is, the price paid times the quantity supplied. By

consuming a particular service instead of something else, people reveal that they value this service as worth more than whatever else they could have purchased. The amount paid is *not* a complete measure of value. People may be willing to pay more than the market price. The objective in economics, from a consumer point of view or that of society as a whole, is to maximize the value we can derive from the resources available, that is to maximize the net benefit or "surplus" which we can gain from economic activity.

Demand curves show the amount the consumers will purchase at various prices. Turning this around, demand shows that some consumers value some consumption very highly as indicated by their willingness to pay (WTP) a high price, while other consumers place a lower value on consumption. The price in the market place indicates the value people are placing on a bit more or less of that good or service, a *marginal* value. The *total* value is what people actually pay *plus* the additional amount they would have been willing to pay but did not have to. The latter is known as "consumers' surplus."[1]

This economic concept of value is based on consumer preferences and their incomes. There is an important caveat: this measure of value is constrained by people's income. It is a measure of value based on existing circumstances of wealth distribution, location and people's preferences.

2.2 Opportunity costs

The real measure of the costs of producing anything are the "opportunity costs," i.e. whatever else could have been produced by the same resources. In a competitive market economy, the working assumption is that the price one must pay to attract resources from alternate employment is also a measure of the value of the incremental output those resources could have produced. If there is unemployment or other market distortions, then what is paid to inputs may not be a measure of the true opportunity costs and the costs would need to be adjusted ("shadow priced").

2.3 Prices, costs and consumers' surplus

Commercial markets will supply goods and services as long as price covers the costs of production, illustrated in Figure 1. The price P1 exactly covers the full per unit costs of production, C1. Total revenues cover total costs, the market is viable. The total value derived from the service is greater than what consumers actually pay by the amount of consumer surplus (area abg in Figure 1). The total value can be measured as the area beneath the demand curve up to quantity Q1.

2.4 Demand, benefits and subsidy

Suppose the service is supplied at a price below costs as illustrated by price P2 in Figure 1. The lower price results in higher quantities produced and consumed. The benefits derived by consumers are larger than before (by area gbdf in Figure 1). Some consumers are now served whose valuation of the service is below the costs of production. The portion of demand between Q1 and Q_2 realize a value of the service below the value that could be produced elsewhere in the economy, i.e., the value of the additional output to consumers is area Q_1bdQ_2 but the costs are Q_1bcQ_2. The area bcd is a loss to the economy because the incremental benefit is less than the incremental costs of the expansion due to the subsidized price. Note that this measure is different from (and smaller than) the additional financial cost or subsidy (area gcdf).

To assess the overall net economic benefit, we compare the total value derived from the service (area beneath demand up to Q_2) with the total costs of serving Q_2. The total benefit is area $oadQ_2$. Total costs for this quantity supplied is the rectangle $ogcQ_2$ in Figure 1, leaving a net benefit of (abg - bcd). (Note that an even larger net benefit would result if prices were raised to reduce the subsidy and reduce the quantity supplied).

To measure net benefits requires some estimate of demand and costs, and the difference between price and unit costs (subsidy). This is the basic framework for evaluating the subsidized BCF operations. But additional measurements are necessary: (1) establishing whether or not the observed costs of production are minimized, and (2) differences in the quality of service may also be valuable to consumers.

2.5 Reassessing the costs and quality of ferry operations

Critics of BCF operations question the efficiency and cost of various components of the operations. In terms net benefit calculations, excessively high costs mean the net benefits could be higher if the inefficiency could be eliminated.

Another extension is to recognize improved quality of service. BCF service quality is higher than what would have emerged in the market place. Higher quality is valued by customers. Quality could refer to many things including on-board amenities, waiting rooms, etc., but the most important quality variable for ferry service is frequency of sailings. An increase in quality (frequency) will shift the demand curve outwards in Figure 1, indicating that the quantity of trips demanded will increase for a given price, or, users would be willing to pay higher prices for the more frequent service. Increased frequency also

increases the costs of supplying ferry service. The net benefits of enhanced quality depend on the demand response relative to the increased costs of service.

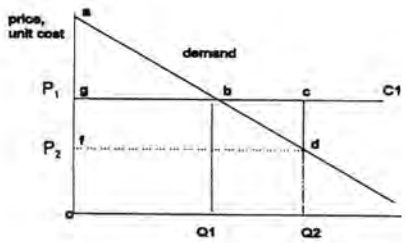


Figure 1: Demand, prices, costs and net benefits

2.6 The incremental benefits of BCF operations

Next, it is necessary to distinguish between the overall value of service provided to ferry users and the incremental value of BCF services relative to what service which would exist in the absence of BCF. The market place would supply some type of ferry service but it would be of much smaller scale and have to charge prices which covered its costs.

The approach adopted here is to calculate what lower level of service could be sustained in the market place based on BCF cost experience. That is, suppose BCF or a privatized corporation were free to maximize the profits it could charge for service. Given estimates of the market demand, what price and service level would exist under these conditions? The costs would be higher than at present because a lower scale of operations would face higher per-unit costs. The cost savings and increased consumer surplus associated with the current subsidized rates are benefits of the current BCF service. This is shown in the summary framework.

2.7 Summary framework for evaluating BCF service

Figure 2 pulls together components required for calculating the net benefits of a subsidized service which provides higher quality service at lower price than what would be supplied in a private market. It assumes that the higher volumes of service attracted by the subsidized service enable some cost savings associated with larger scale of operations. The net benefits depend on the demand or response of

users to the enhanced service, the costs of the two types of service, and the level of price charged. More specifically, we need:

1) information on the costs/price and quality which would exist in the market if there were no subsidy (cost C4 equal to price charged P4 in Figure 2);
2) the demand for service based on the lower quality unsubsidized service (the interior demand curve in Figure 2);
3) the increase in demand (willingness to pay and quantity demanded) for the higher quality service; and
4) the costs of supplying the (current) high quality of service (C5 in Figure 2).

The net benefits of the service are total benefits realized by consumers (area oakQ_5 in Figure 2), less benefits consumers would have realized in the absence of the subsidized service (area nbc), and less the costs of providing the subsidized service (area omgQ_5).

Figure 2 assumes that the current costs of production C5 are fully justified. If these costs are an overstatement of the true opportunity costs, then Figure 2 can be modified to incorporate adjustments to the cost measure.

2.8 Who realizes the benefits?

The discussion thus far focuses on measuring the net benefits. Another issue is the distribution of these benefits. Typically the group realizing the largest share of net economic benefits are the consumers who value the service at more than they are required to pay. However, there is more to the story. This is the prospect, even likelihood, that the potential consumer benefits may be captured in higher land values.

Transportation is a "derived" demand, that is, not something demanded for its own sake, but because it is something need to satisfy other demands. The vast majority of trips are a necessary step in satisfying some other demand, such as traveling to work, to shop, to visit some place or friends, relatives or some other trip purpose. Because travel is a cost, we try to minimize it in carrying out activities. This gives rise to an intimate relationship between the costs of travel and the value of land at various locations. There is a link between the accessibility of a location and the price we are willing to pay to be at that location.[2] . Land values embody the capitalized value of the perceived savings in transportation costs because it is a more convenient location.

The implication is that the potential consumers' surplus for travel on ferries, at least in part, will be captured in higher land values. If service has improved over the years, and a person owns the land, they will realize an appreciation in their property values. However, for a recent purchaser, the value

of the ferry service at current price and quality will be embodied in the purchase price of the property. Expressed still another way, the value of ferry service is 'paid for' via higher land prices, but it is paid to the land owner, not to the ferry corporation.

Another important point to note is that the total consumer surplus which drives the willingness to pay for land is larger than the net benefits of the BCF operations. Returning to Figure 2 where the ferry price was P4', the total consumer surplus is the entire area P4'ak. The entire consumer surplus could conceivably be captured in higher land prices, i.e., the land value impact would be much larger than the net benefits of BCF services.

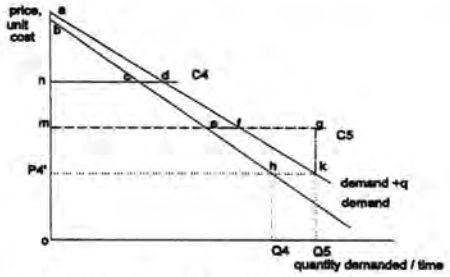


Figure 2: Summary Framework: demand, costs and benefits of BCF Operations

3.0 ILLUSTRATIVE APPLICATION: ECONOMIC VALUATION OF BC FERRY MINOR ROUTES

This paper carries out the net benefit calculation for one specific route in B.C., Route 8 (Bowen Island). A similar analysis must be conducted for each route to assess the respective benefits, costs and subsidy. The Bowen service sails between Bowen Island and Horseshoe Bay (West Vancouver), a distance of six kilometres, with a crossing time of 20 minutes. An 85 AEQ (automobile equivalent measure) vessel is employed at present. Total annual vehicle traffic is approximately 450,000, as well as 1,102,000 passengers (one-way trips). BCF serves different traffic types: commercial vehicles of various types, passenger cars, and foot passengers. To simplify the analysis, we group the various services together. We define a "trip" as a vehicle accompanied by the average number of passengers per vehicle. There were 450,000 such "trips" in 1997 (1997 British Columbia Ferry Corporation Route Report).

3.1 Economic evaluation of BCF Bowen Island service

Calculating the total economic benefit requires extensive knowledge about demand. However, typically we have very limited information about demand, primarily only the quantity consumed at the current price. It is essential to know how the quantity demanded will change if price (or quality) is changed, that is, the slope of the demand curve or its elasticity, preferably over a wide range of price-quantity combinations. Fortunately, in addition to current traffic volume and price data, BCF has sponsored a number of studies into the demands for BCF service on various routes (IBI Study, 1998).

Dividing 1997 total revenues on this route by the established number of trips will yield the current price:[3]

$3.932 M / 450,000 Trips = $8.74

This provides the current point on the demand curve. IBI (1997) estimated the price elasticity of demand on Route 8 to be –0.19, i.e., a 10 percent increase in price would give rise to a 1.9 percent reduction in trips. Figure 3 plots two versions of a demand curve based on this elasticity and the current price and quantity. It also shows the current variable costs of BCF service on Route 8 (along with average total costs, with and excluding terminal costs) . Dividing total direct operating expenses by the current number of "trips" implies an average cost of:

$6.392 M / 450,000 Trips = $14.20 per trip

The price of $8.74 relative to the direct operating cost of $14.20 is an implied subsidy of $5.54 per "trip," or a total annual subsidy of about $2.46 million per year to cover operating costs only. This subsidy may be financed directly by cash transfers from the Province, or cross-subsidy from other users, or from forgone earnings of the company at the expense of taxpayers.

There are also the capital costs of terminal facilities and the ship itself. While these may be fixed for a period of time, it is unlikely that they truly are sunk costs with no need to ever incur them again. Certainly ships have opportunity costs and need eventual replacement; some terminal costs may be more debatable. A "full cost" approach is to include all the capital costs valued in current dollars.

Figure 3 shows the full replacement cost (average costs) of Bowen service to be $21.95 per "trip", substantially above the current price of $8.74 and well above the average operating cost ($14.20) cited earlier. If one argued that terminal costs were a sunk cost and could be ignored, this would lower the average total cost to $18.76 for the current 450,000 annual trips.

Figure 3 shows the two versions of the demand for ferry service on Route 8. If the curvelinear demand is correct, BCF could break-even at a price equal full

average cost of about $28 and a traffic volume of approximately 361,000 trips per year. However, a property of the curvelinear demand is that there is virtually no limit to the prices some would be willing to pay for ferry trips. This would imply implausibly high measures of the benefits of BCF services. Instead we use the linear demand curve. However, there is no price on the linear version of the demand curve which will recover the current full costs of Route 8 services. It would require lower-volume lower-cost operations.

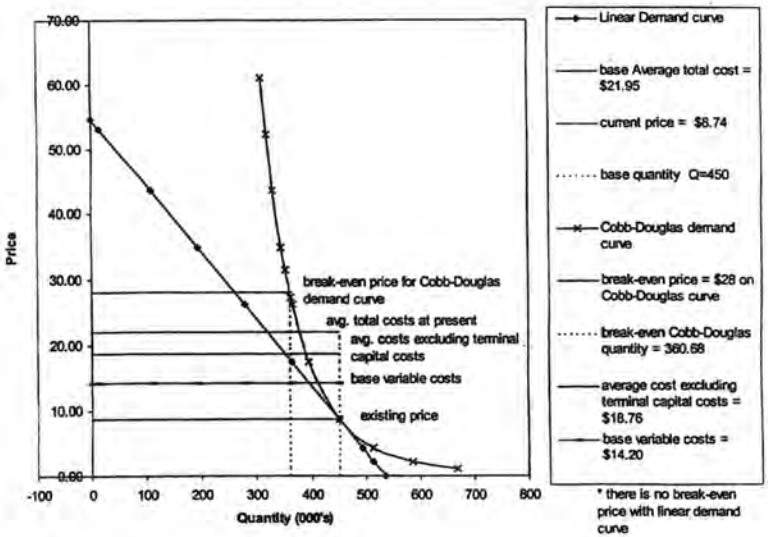


Figure 3: Two Demand Curves with Current Costs (Route 8-Bowen Island)

We need to estimate the feasible price and service that could exist in the absence of BCF service. This would require a substantial study. For this paper, we speculate on the outcome if BCF were to be replaced by a private operator, with

price unregulated, yet facing similar capital and operating costs as BCF. Calculations indicate that the profit maximizing strategy would be to employ a smaller vessel (50 AEQ instead of the current 85 AEQ) with service frequency reduced by 20 percent. This is shown in Figure 4. Using the linear demand curve (shifted to the left because of the lower service frequency), the profit-maximizing outcome is a price of $27 with a full average cost of $26.52. This price results in approximately 256 thousand trips per year compared to the current 450 thousand, with a per unit profit of $0.48 per trip or an annual profit of approximately $123,000. One might expect that if services were truly left to the free market, this profit level – and indeed, the cost levels of BCF – might be driven down by competition. However, the Route 8 market may not be large enough to sustain much competition, hence some monopoly power is plausible.

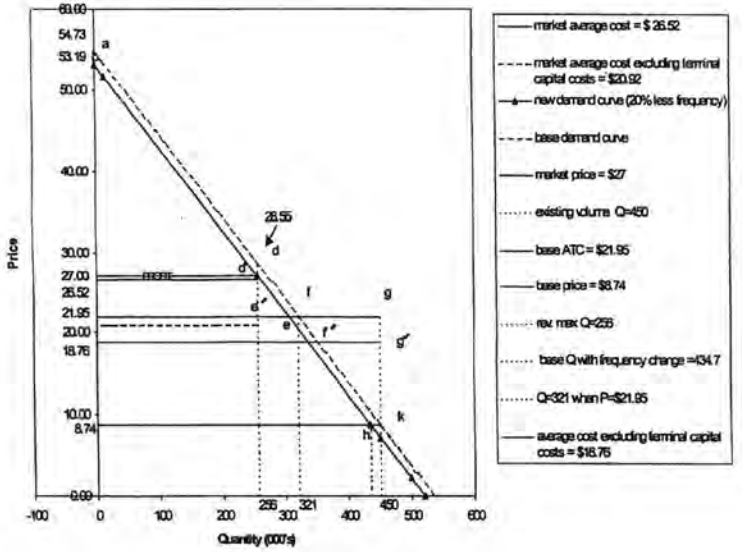


Figure 4: Net Benefit of BCF Bowen Island Route Relative to Private Market

3.2 The net economic benefits of Route 8 Bowen Island service

With Figure 4, it is possible to calculate the net benefit of BCF operations in contrast to an assumed private monopoly service. The calculations are summarized in Table 1. The current price and volume served ($8.74 and 450,000 trips) enables a larger vessel to be employed compared to the private monopoly supply, producing some savings. This is indicated in Figure 1 by the lower costs of serving the 256,000 trips which would exist in the profit-maximizing case ($26.52-$21.95 times 256,000 trips equals $1,169,920, per year). BCF currently supplies more frequent service, which is valued by users as indicated by the outward shift in demand. The IBI Study (1998) estimated the frequency elasticity of 0.17 for the Bowen route, e.g., doubling service frequency would increase annual traffic by 17 percent. Applied to this case of a 20 percent increase in frequency, this works out to a vertical shift in the demand curve of $1.55 per trip, or $396.8 thousand per year (area abd'd in Figure 4). The lower cost and larger scale operation enables additional users to be served relative to the monopoly solution; this is measured by the area of the triangle beneath demand and above base average full cost and between quantities 256,000 and 321,000 (area de'f, $164,125).

These economic benefits are partly offset by pricing well below the costs of providing the service. This attracts many users (450,000 minus 321,000) for whom the value they place on the service is less than the costs of providing the service. This is the area of the triangle below average full costs ($21.95) and above the demand curve, for the traffic quantities between 321,000 and 450,000, area fgk; this is a negative $852 thousand.

The net benefit of BCF Route 8 operations is estimated at approximately $879 thousand per year (Table 1). If terminal costs were treated as sunk and excluded from consideration, this would reduce the net benefit to $571.3 thousand per year. In either case, the net benefits of the area beneath demand is larger than the total costs, confirming the overall value of BCF services to society is positive despite the fact that it is operating at a financial loss. Similar calculations must be carried out for other routes to assess their overall net benefit.

3.3 Benefits to users compared to net benefits

It is important to note that the total economic benefit enjoyed by users is substantially greater than the overall net benefits to society. This is because the service is supplied at a price well below the full costs of service. In Figure 4, the total benefit or economic value realized by users is indicated by the area beneath the demand curve up to the current price and quantity of trips ($8.74 and 450,000, respectively). This total value is $14.28 million per year, consisting of the amount they actually pay for the service (total revenue, $8.74 times 450,000 equals $3.9

million) plus consumers surplus. The latter is the triangle for hypotenuse ak above the price line $8.74 in Figure 4 (calculated as ½ times $54.73-$8.74 times 450,000 trips). This equals $10.35 million per year, about two and one-half times the amount paid in fares. Of this $10.35 million, approximately $3.35 million consumer surplus would exist even with the monopoly market, meaning BCF added about $7 million annually to the consumer surplus of Route 8 ferry users.

Summing up, using the linear approximation to the Route 8 demand curve and accepting BCF's costs including replacement costs for the year 1997, the total value of the Route 8 ferry service to users is approximately $14.3 million per year, achieved at a cost of approximately $9.9 million ($21.95 times 450,000 trips). The users actually pay about $3.9 million in ferry revenues. The implied subsidy of about $6 million per year is borne partly by direct subsidies from

Table 1
Calculation of Net Economic Benefits (Route 8, Bowen Island)

Net benefits including all capital costs	(Thousands, 1997$)
Increased value due to greater frequency	
$28.55-$27.00 = $1.55 value per trip, x 256 trips	$396.8
WTP> costs of traffic not carried in market solution	
.5 x ($27.00-$21.95) x (321K-256K)	$164.125
Cost saving on traffic carried previously	
($26.52-$21.95) x 256 K	$1,169.92
Less: WTP < costs due to subsidized price	
.5 x ($21.95-$8.74) x (450K-321K)	<$852.05>
Net benefit including all capital costs	$878.80
Annual Benefits to Users (approximate)	
Total benefit to users	
(Area beneath demand to price $8.74)	$14,280.
(Cf. Total cost, ~ $9.9 million)	
Less: amount paid	<$3,930.>
Consumers surplus	$10,350.
Less: Consumer surplus from market solution	<$3,350.>
Additional consumer surplus due to BCF	$7,000.
Capitalized as land value (@ 8%), approx:	$87,500.
Cf.: Bowen assessed land values (1997)	$293,500.

the federal and provincial governments, partly by cross-subsidy from other profitable routes, but primarily from the foregone earnings on assets invested in BCF by the owners, i.e., the tax payers of the province represented by the government.

3.4 User benefits and land values

The foregoing paragraphs suggest that the major beneficiaries of the surplus of value over cost accrue to the ferry users. However, this implicitly assumes that the consumers' surplus benefits are retained by the ferry users. But, there is every prospect that this becomes capitalized into land values.

An annual consumers' surplus of $10.35 million per year would be capitalized at about $129.35 million using a discount rate of eight percent. Some of this consumers' surplus would exist in the absence of BCF operations. BCF's low-priced operations still adds about $7 million per year to consumers' surplus, or a potential capitalized land value of $87.5 million net increase in land values on B\owen attributed to BCF relative to a market-supplied service facing their same cost structure. The total assessed valuation of single family residences on Bowen is $293.5 million (from B.C. Assessment Authority). Large margins of error are implicit in these consumers' surplus calculations, but the imputed enhanced land value from BCF operations to Bowen of $100 million or so is a plausible figure relative to the total property valuation (including improvements) on Bowen.

Insofar as ferry users are also long time property owners on Bowen Island, they realize the calculated consumers' surplus benefit in the form of enhanced land values rather than as consumers' surplus per se. There are taxes on land values so at least some of the consumer surplus qua land value is subsequently captured by government. However, for more recent purchasers of property on Bowen Island, the picture is more complicated. The consumers' surplus calculated with Figure 4 is not a "surplus" but may be an actual monetary payment by the recent land purchasers. The land price they paid would include the capitalized value of the benefits of the ferry service. Expressed another way, recent property purchasers may have paid fully for the BCF service, but they paid it to the previous land owner rather than to BCF.

These calculations were for one BCF route. Similar calculations need to be carried out for other routes to estimate the net economic benefits and their distribution. In any case, note that benefits recognized by users will be larger than the overall net benefits because the services are subsidized. And correspondingly, this means that the property value effects are likely to be larger than the overall net benefits. This generates substantial political complications for governments contemplating reductions in subsidies and/or service.

4.0 PROSPECTS FOR POLICY REFORM

The Government of British Columbia, like those in most other provinces and countries, has been seeking to reduce subsidies. The federal subsidy has been increasing as it is indexed to inflation; it is likely that the Canadian government would like to reduce this subsidy but it is locked in an historical contractual agreement. The explicit subsidy to BCF from the B.C. Government has declined over several years. However there is the hidden subsidy of forgone earnings on capital invested in BCF. No estimates are available but as a rough guide, the full replacement capital costs of minor route ferry operations typically are close to the size of operating costs. Since revenues do not cover all operating costs, this implies a substantial shortfall on the capital side.

There are allegations that BCF costs are excessive. Because BCF is a monopoly service, it is hard to establish benchmarks. It is a unionized operation, and unionized public enterprises are rarely paragons of efficiency.

The governance structure is not conducive to cost-minimization. First, there is the "disconnect" between pricing and performance assessment. Prices are not set to maximize profits, but are a complex outcome of balancing financial and public policy concerns. If transportation firms are not focussed on profits, they tend to become operations oriented, concentrating on service delivery and smooth operations. Investments are made to facilitate operations and relieve congestion, and not judged by return on investment.

Since the WTP of many ferry users is above what they are required to pay, there would be the prospect for fare increases. But major fare increases would be necessary, and quite possibly fares could not increase enough to make some runs financially viable. Radical changes in prices and service would be required, but the prospects for such bold reform are dim. This is because of the governance structure of the crown corporation.

The governance structure of BCF makes it very vulnerable to political pressures by organized stakeholders. BCF management answers to a Board of Directors appointed by the Government. They are not chosen for their financial acumen in running a business, although overseeing BCF management decisions is part of their mandate, but it is also to oversee that the crown corporation policies are consistent with those of the Government. Further, some appointees represent user constituencies. Still further, major BCF decisions, including pricing, must be approved by Cabinet, so there is direct government influence on corporate decisions. Taxpayers and broad public interests in efficiency tend to be less organized, less aware of and less vocal than more immediate stakeholders.

There is the further political conundrum that historical policies of low-priced ferry service have come to be regarded as an entitlement, and the expectation that this will continue now is embodied in property values. Recent purchasers have "paid for" the value of ferry service in land prices, and a change in government policy will have direct, predictable consequences for them. And as mentioned, such stakeholder groups are well-organized and effective in making their concerns known to government.

As a result, government ferry subsidy policy is "adrift,"unable to take tough unpopular decisions, and possibly even inequitable in that some users have in effect "paid for" the subsidized ferry service via land prices. The corporation's debts mount and are not sustainable. The current controversy over the construction of expensive, fast ferries (all debt-financed) is accelerating an already-building financial crisis. Taking a lesson from the "crow rates" and Western Grain Transportation Act (WGTA) experience, the eventual outcome will probably have to be a formal Government commitment of a certain subsidy which becomes capped, and then turning the operation over to a private or at least completely "arms-length" entity to provide ferry service and thus distance the government from further political lobbying. This would be a major shift in policy and probably will not happen until the debt levels reach some yet undefined crisis point.

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Endnotes

1 I abstract from numerous theoretical technicalities in the precise interpretation and validity for consumers' surplus in measuring economic welfare.

2. There are a great many other factors which determine the value of land at particular locations, lot size, view, nearness to various amenities, municipal services, etc. The influence of transportation costs must be separated from these other influences on land prices.

3. This is for a one-way trip. In practice, BCF charges round-trip fares by selling tickets only on the Mainland side of the voyage.

A Risk-Adjustment Model for Capital Budgeting in Transportation: The Capital Asset Pricing Model Approach to Port Investment Projects

Numerous firms and even entire industries engage in capacity planning endeavors at ports and harbors throughout the world. International trading companies and public port authorities routinely modify and/or expand their seaport facilities. These installations include both general cargo docks and specialized berths, such as bulk and commodity terminals. Petroleum, grain, iron ore, and coal are commodities that normally require specialized bulk handling and storage equipment.

Permanent adjustments to facility capacity represent substantial capital expenditures. The capacity-planning framework usually includes the identification of viable capacity modifications and their evaluation. Quantitative techniques such as simulation and mathematical programming, provide estimates of the cash flows which would likely result from the possible changes in capacity. Furthermore, most corporations currently evaluate the risk of investment decisions involving capacity modifications or expansions.

Previous studies have established the differential cash flows that would be expected to occur under various capacity combinations of port facilities and equipment. However, prior research efforts have failed to address the problem of discounting those cash flows on a risk-adjusted basis. Among the methods available to deal explicitly with risk are: (1) the certainty equivalent approach, which assigns subjective probabilities to the possible cash flows; and, (2) the risk-adjusted-discount rate, which can provide a market influenced measure of risk. The purpose of this paper is to construct a risk-adjusted discount rate for port investment projects.

The Capital Asset Pricing Model (CAPM) approach to evaluating risky investments assumes that the required rate of return for the project does not depend on the company considering the investment. In other words, the required rate of return for the port project is the same for any firm that might invest in it. Although the project's required return is the same for all potential investors, the project may not be equally valuable to all firms. This may result from differences in expertise and management. Nevertheless, the acceptance standard (i.e., hurdle rate) will be the same for all firms considering similar port projects.

The Capital Asset Pricing Model and Systematic Risk

The Capital Asset Pricing Model (CAPM) has been widely adopted in evaluating "risky" securities. The CAPM is one of the building blocks of modern portfolio theory. In spite of its popularity in securities analysis, there is some controversy whether the CAPM can be used to evaluate non-security types of capital investments because there is no efficient market for such assets.

Although it has been widely applied in investment management, the CAPM's extension to corporate financial management is a relatively recent development. Consequently, its use is not widespread in industry at the present time for this purpose. Although some of the model's assumptions are clearly unrealistic, the shortcomings of the CAPM appear no more severe than alternative methods of estimating the cost of equity capital.

The cost of equity capital is inherently difficult to measure. Though imperfect, the CAPM represents a new and different approach to this difficult task. Thus, corporate financial managers can employ this technique to develop realistic and useful estimates of the firm's cost of equity capital. The current financial literature seems to favor the CAPM for non-security risk analysis, if the researcher remains aware of the model's limitations. The main objective of this paper is to demonstrate the adaptability of the CAPM to capital-budgeting problems in transportation.

The widespread appeal of the CAPM partially results from the model's assumption that the required rate of return on an investment project's systematic risk. A project's total risk can be divided into two components: (1) unsystematic risk, which is peculiar to a specific firm and can be diversified away; and, (2) systematic risk, which is market related and non-diversifiable. Thus,

$$\text{Total Risk} = \text{Unsystematic Risk} + \text{Systematic Risk}$$

The model further assumes that rational investors diversify and eliminate unsystematic risk. Therefore, the only risk that is relevant in capital expenditure analysis is systematic risk.

The CAPM provides a convenient measure of systematic risk. This measure, known as beta (β), estimates the tendency of a security's return (or a project's return) to move in parallel with the overall market's return (i.e., the return on the Standard & Poors 500). In other words, beta gauges a security's volatility (or a project's volatility) relative to the market's volatility. A stock with a beta of 1.0 varies the same as the market. Thus, β of 1.0 indicates and average level of

systematic risk. Stocks with a beta greater that 1.0 rise and fall by a greater percentage than the market. They have a high level of systematic risk and are very sensitive to market changes. Similarly, stocks with a beta less than 1.0 have a low level of systematic risk and are less sensitive to market swings.

The following factors determine the risk/expected return trade-off under the CAPM. In general,

$$R_s = R_f + \text{Risk Premium}$$

If the CAPM correctly describes market behavior, then

$$R_s = R_f + \beta_s (R_m - R_f)$$

The expected return on a security or project (R_s) is equal to the risk-free rate plus a risk premium. With the CAPM, the risk premium is beta times the return on the market (R_m) minus the risk-free rate. Thus, the risk premium on a stock or project varies with the level of systematic risk, β.

A Risk-Adjusted Discount Rate for Port Elevator Projects

The major difficulty in using the CAPM is that its theory relates entirely to the future, and the values used for R_f, β, and R_m are future values. The first practical problem in the application of this model is to estimate future values for these variables.

It has been customary to use the rate on 90 day Treasury Bills as a proxy for the risk-free rate of return. Long-term rates are more consistent with this model than short-term rates. The risk-free rate chosen for this application of the CAPM is the rate on U.S. government bonds bearing an 8.5 percent coupon.

The second future variable that must be determined is R_m, the rate of return that investors expect to earn on the average security in the market. Problems exist with using ex-post data to estimate ex-ante variables. For example, the rate of inflation and the expectations of investors can affect R_m, but these phenomena are not indicated by ex-post data. A possible method for deriving estimates for R_m is to use the dividend yield plus expected growth approach. In this method, the estimated value for R_m is given by the following equation:

$$R_m = (D_1 \div P_0) + g$$

where:

D_1 = the expected dividend on the Standard & Poors 500 Stock Index;
P_0 = the average price of the 500 Stock Index; and
g = the expected growth rate of the S&P Index.

$$R_m = (4.33 \div 93.82) + .0644 = 93.82$$

The third variable needed is beta (β), the covariance of the return on the average security in the market divided by the variance of the expected return on the market. Historical data does not always provide a good indication of future beta values. Moreover, the risk on new project undertaken by a firm is often greater than the risk associated with existing projects.

To demonstrate a model capable of evaluating capital expenditures on port grain handling facilities, the value for beta should reflect the systematic risk associated with firms in a capital intensive and bulk commodity handling industry. In the case of large projects, firms can be identified which routinely undertake similar port investments. These firms would have systematic risk characteristics similar to port grain elevator projects, and the average beta for those firms can be used as a surrogate for deriving a particular firm's required rate of return on a new project.

For this model, the beta coefficient was obtained by computing the mean beta for five publicity-traded firms that frequently undertake projects of this type. These firms are Archer-Daniels-Midland, Central Soya, ConAgra, Peavey Company, and Pillsbury. All are merchandisers of grains and feed ingredients, both domestic and foreign. Their mean beta value is .99.

The surrogate betas are stock betas, which include measures of both business and financial risk. the appropriate beta for use in evaluating projects is the project beta (i.e., the beta that would include only business risk). When used in the model, the project beta provides the required rate of return to equity capital for that project. However, when the degree of financial leverage for the surrogate firms does not significantly differ from a firm using the model, then the mean stock beta of the surrogate firms is appropriate. This is equivalent to using a marginal-weighted average cost of capital for discounting.

If there is a significant difference in the degree of financial leverage between the surrogate firms and the firm employing the model, it is necessary to remove the effects of financial leverage from the mean stock beta of the surrogate firms. Then substitute the effects of the degree of financial leverage for the using firm into the model. This is also equivalent to using the marginal-weighted average cost of capital to discount the project, and appropriate when the business risk of the surrogate firms and the using firm is the same and the only difference is in financial risk.

In this study, the degree of financial leverage for the surrogate firms and the firm employing the model would be essentially the same. The mean stock beta is therefore appropriate. In order for a firm that employs a different degree of financial leverage to use the model, the effects of financial leverage would have to be removed from the mean surrogate stock beta and the degree of financial leverage from the using firm substituted.

The appropriated risk-adjusted discount rate for port grain elevator investment projects is the required rate of return obtained by substituting the estimated future values from the aforementioned sources in to the CAPM equation.

$$R_s = .085 + .99\,(.1106 - .085)$$

$$R_s = 11.03\ \%$$

The required rate of return for port elevator projects is 11.03 percent, which includes a risk-free rate of return plus a risk premium. The required rate of return for port elevator projects is the same for any firm that might invest in such capital equipment. In other words, the systematic risk of a port elevator project is the same for all firms.

Summary and Conclusion

The incorporation of risk in capital expenditure analysis is essential to evaluate alternative investment and capacity strategies under conditions of uncertainty in port related industry. Rather than rely on subjective probability distributions of estimated cash flows expected to result from a project, the CAPM provides a mechanism to measure directly the contribution of a project to the firm's overall risk. Although some controversy exists in the current financial literature over whether the CAPM can be used to evaluate non-security types of capital investments, this analysis demonstrates the usefulness of the CAPM for this purpose.

For the CAPM, a simple equation expresses the positive relationship between risk and return. The risk-free rate (the return on a risk-less investment such as T-bill) anchors the risk/expected return relationship. The expected return on a risky investment can be thought of as the risk-free rate plus a premium for systematic risk.

To demonstrate a CAPM capable of evaluating expenditures on port grain handling facilities, the value for beta should reflect the systematic risk associated with firms in a bulk commodity handling industry. Firms can be identified which normally undertake similar port investments. These firms would have systematic risk characteristics similar to port grain elevator investment projects, and the average beta for those firms can be used as a surrogate for deriving a particular firm's required rate of return on a new project at the port.

The widespread appeal of the CAPM results from the model's assumption that the required rate of return on an investment project depends only on that project's systematic risk. This component of total risk cannot be diversified away. The CAPM further assumes that rational investors diversify and consequently eliminate unsystematic risk. Therefore, the only risk that is relevant in capital budgeting analysis is systematic risk.

For this particular application, the beta coefficient (measures of systematic risk) was obtained by computing the mean beta for five publicly traded firms that usually consider similar projects. All of these firms are merchandisers and traders of grains and animal feeds in both domestic and foreign markets. The same approach with the CAPM could be readily transferred to other industries that routinely construct and/or modify capacity at port terminals, such as coal, iron ore, and petroleum.

The surrogate betas are stock betas, which include measures of both business and financial risk. The appropriate beta for use in evaluating projects is the project beta (the beta that would include only business risk). When used in the model, the project beta provides the required rate of return to equity capital for that project. When the degree of financial leverage for the surrogate firms does not differ significantly from a firm using the model, the mean stock beta of the surrogate firms is appropriate, since the business risk of the surrogate firms and the using firm is the same. The employment of the surrogate firms' stock beta is not unrealistic in this instance, since the debt-equity ratios in the grain trading industry appear to be consistent.

The CAPM approach to evaluating risk investments assumes that the required rate of return for the project does not depend on the company considering the investment. Given the project's systematic risk, the market expects a single return. The required rate of return for the port elevator project is the same for any firm that might invest in it. In other words, the systematic risk of a port elevator project is the same for all firms; and therefore, the project's required return may not be equally valuable to all firms, due to differences in expertise and management. Nevertheless, the acceptance standard will be the same for all firms considering port elevator projects.



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