

# **HOW COMPETITIVE IS CANADA'S FREIGHT SYSTEM?**

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## **Introduction**

National competitiveness reports rank Canada's competitiveness against other countries by systematically aggregating multiple factors that underlie the performance of all economic sectors in a country. But Canada's economy is trade based and highly dependent on efficient and effective logistics to move products within, to and from the country (Chow and Gill, 2011). Much of a country's or region's or industry sector's ability to successfully compete will depend upon the strength of its linkages with other countries or regions, its transportation and logistics competitiveness. This paper develops a methodology to examine Canada's logistics and transport performance relative to trading partners and competing peer countries. The methodology is demonstrated through an evaluation of Canada's freight competitiveness with the U.S. The methodology utilizes the Logistics Performance Index (LPI) developed by the World Bank. The LPI is used to identify at a national level, how competitive Canada is with respect to transportation and logistics capabilities. This comparison is made with selected peer countries that compete with Canada in major country markets and best performing countries as benchmarks for potential performance

## **International Competitiveness Benchmarking Studies**

There are many studies that have quantified, ranked, and compared countries based on their level of competitiveness, globalization, economic freedom and other factors. One is the published by World Economic Forum. The International Institute for Management

Development (IMD) has published a similar report referred to as the World Competitiveness Yearbook (WCY).<sup>2</sup> Neither of these benchmarking studies treats the role of freight and logistics capability and capacity explicitly. These comprehensive country-to-country studies bring together multiple components on a broad basis. For example, the IMD rating is based on aggregating four broad factors one of which is Infrastructure, which in turn is decomposed into sub components. The infrastructure sub component entitled “Basic” contains six categories directly related to transportation: Road Network Density, Railroad Network Density, Air transportation passengers carried, Quality of air transportation, Distribution infrastructure, and Water transportation. Each is measured by one quantitative or one qualitative data element.

### **The Logistics Performance Index (LPI)**

Recognizing that improving logistics performance has become an important development policy objective in recent years, the World Bank developed the Logistics Performance Index (LPI) for 2007 and updated the index for 2010 and 2012.<sup>3</sup> This survey-based index is updated every two years to improve the reliability of the indicators and to build a dataset comparable across countries and over time. The survey results and methodology are fully reported in *Connecting to Compete 2012* (World Bank, 2012).

The LPI is a multidimensional assessment of logistics performance, rated on a scale from 1 (worst) to 5 (best). The 2012 ratings are based on 6,000 individual country assessments by nearly 1,000 international freight forwarders, who rated the eight foreign countries their company serves most frequently, resulting in trade logistics profiles of 155 countries (World Bank, 2012). The LPI is based on six indicators:

- Customs – The efficiency of the clearance process (speed, simplicity, and predictability of formalities) by border control agencies, including customs.
- Infrastructure – The quality of trade- and transport-related infrastructure (ports, railroads, roads, information technology).

- International shipments – The ease of arranging competitively priced shipments.
- Logistics Competence – The competence and quality of logistics services (transport operators, customs brokers).
- Tracking & Tracing – The ability to track and trace consignments.
- Timeliness – The frequency with which shipments reach the consignee within the scheduled or expected delivery time.

Connecting to Compete 2012 also includes a more detailed set of Domestic Performance Indicators (DPI) for 143 countries. For this data, survey respondents assess the logistics environments in the countries where they work, providing information on the quality of infrastructure, the performance of core services, the friendliness of trade clearance procedures, and the time, cost, and reliability of import and export supply chains. These domestic indicators help define logistics constraints within countries, not just at the gateways, such as ports or borders but inland transportation cost and time from product source location to the sea, air or land port of exit. The major determinants of overall logistics performance are analyzed, focusing on country performance in: infrastructure, services, border procedures and time, and supply chain reliability.

In summary, the World Bank LPI survey produces two sets of data, the Global LPI based on survey ratings on six components and the more detailed Domestic Performance Indicators. The two sets of data are related in that the same respondents provided the responses for both data sets but differ in that the Global LPI is created from responses of multiple respondents in both the country that is being evaluated and respondents in other countries that have conducted business with that country. In contrast the DPIs were created from responses from only the respondents working in the country. Therefore the latter survey has a much smaller response sample. Both surveys benefit from the extensive knowledge and experience of the respondents in multiple countries.

### **Overall Freight Competitiveness Based on Global LPI**

We first utilize the LPI global ranking and score and component scores to evaluate Canada with its major trade competitors and best in class benchmark countries that are displayed in Table 1. The peer “competitive countries” were selected using 2 criteria: the country is an important competitor in Canada’s top 10 export markets and the country is an important competitor with Canada for the U.S. market. The peer “benchmark countries” were the 2 best in class countries as rated by the LPI. In total, 4 Asian, 4 European and 3 NAFTA countries were selected as peer competitors. The 2 best in class countries, Singapore and Hong Kong, as measured by the LPI global ranking, were not peer competitor countries.

Canada’s global LPI rank and score is seventh among the 13 competitive and benchmark peers and Canada. The 6 competitive peer countries (e.g. excluding Hong Kong and Singapore) that are ranked ahead of Canada are developed countries. These developed country competitors are more likely to be competing with Canada in product markets that are more capital intensive (or less labor intensive). In contrast, Canada has a higher score than the two developing country competitors, China and Mexico, which are significantly behind Canada in LPI performance. However, such countries have successfully competed in global markets because their low labor costs confer a significant manufacturing cost advantage. At the same time, Canada’s performance relative to Newly Developed countries is mixed. Canada has a better LPI than Chinese Taipei or Korea but is worse compared to Singapore or Hong Kong. With Hong Kong and Singapore excluded, the pattern of competitive pattern remains consistent; Canada is very freight-competitive against developing countries, less so with newly developed countries and not as competitive with peer competing countries that are developed. Hong Kong and Singapore are not major competitors with Canada for global trade and both are small (with respect to land mass) island nations where transshipped trade is significant. Hong Kong and Singapore’s LPI performance is valuable as benchmarks for potential improvement rather than as peer competitors.

The global LPI score is the weighted aggregation of each index for each component of logistics performance. The weights, which were developed using principal component analysis, are nearly equal. Given the assumption of nearly equal weighting, we are able to inquire about the source of each country's freight competitiveness.

**Table 1. 2012 LPI Global Ranking and Scores**

Country	LPI Rank	LPI Score	Customs	Infrastructure	International Shipments	Logistics Competence	Tracking & Tracing	Timeliness	Development <sup>*</sup> Classification
Singapore	1	4.13	4.1	4.15	3.99	4.07	4.07	4.39	B
Hong Kong, China	2	4.12	3.97	4.12	4.18	4.08	4.09	4.28	B
Germany	4	4.03	3.87	4.26	3.67	4.09	4.05	4.32	A
Netherlands	5	4.02	3.85	4.15	3.86	4.05	4.12	4.15	A
Japan	8	3.93	3.72	4.11	3.61	3.97	4.03	4.21	A
United States	9	3.93	3.67	4.14	3.56	3.96	4.11	4.21	A
United Kingdom	10	3.9	3.73	3.95	3.63	3.93	4	4.19	A
France	12	3.85	3.64	3.96	3.73	3.82	3.97	4.02	A
Canada	14	3.85	3.58	3.99	3.55	3.85	3.86	4.31	A
Chinese Taipei	19	3.71	3.42	3.77	3.58	3.68	3.72	4.1	B
Republic of Korea	21	3.7	3.42	3.74	3.67	3.65	3.68	4.02	B
China	26	3.52	3.25	3.61	3.46	3.47	3.52	3.8	C
Mexico	47	3.06	2.63	3.03	3.07	3.02	3.15	3.47	C

<sup>\*</sup>A – Developed, B – Newly Developed, C – Developing. Classification from International Monetary Fund (2012).

The rank ordering of the component scores is generally consistent with the rank ordering of the Global LPI except when the Global LPIs are close. This is not unexpected since the Global LPI is the weighted

average of the components. For example, the rank order of Customs performance is identical to the rank order of the Global LPI except for the reversal of the order for the U.S., Japan and United Kingdom which were all closely ranked together. Similarly, Logistics Competence parallels the ordering of the Global LPI except for the reversal of the top 3, Hong Kong, Singapore and Germany, which were also closely ranked together.

Unique strengths of a country can be identified when the component rating is significantly out of line with the Global LPI. Germany is rated higher than the two Global LPI leaders, Singapore and Hong Kong with respect to Infrastructure. Similarly, the U.S. and Netherlands have superior Tracking & Tracing ratings, though their overall LPI is lower than both Singapore and Hong Kong. Canada stands out with highly rated Timeliness that is comparable with the performance of benchmark countries, Singapore and Hong Kong.

The 2012 Global LPIs are a static measure of performance and improvement in the Global LPI and its components are an indication of the dynamic competitiveness of each country. The changes in the Global LPIs' values from 2007 to 2012 were calculated, leading to the following observations.<sup>4</sup>

- Canada, along with peer competing countries Germany, Japan, United Kingdom and Netherlands, saw declining aggregate LPI. The greatest increases in LPI were by Korea, Mexico and China.
- Canada, along with the Netherlands, had the least improvement in the Customs LPI subcomponent while United States, China and Mexico had the greatest improvements.
- Canada had marginal improvement in the infrastructure score but China, Mexico and the Republic of Korea had substantial improvements in infrastructure performance.
- Canada suffered a significant decline in the ease of arranging international shipments while China, Korea, Mexico and China all had significant increases in the rating of this aspect of performance.
- Canada improved its performance with respect to logistics competency, but the improvement by Mexico was far greater.

- Canada had the greatest decline in the Tracking and Tracing dimension of logistics performance while Mexico and China both improved significantly.
- Canada improved the timeliness of international shipping behind larger improvements by Korea and China.

In summary, Canada's logistics performance is far superior to major competitors such as Mexico and China, developing countries that can offset this disadvantage through lower wages. Canada's LPI is marginally superior to competitors such as Korea and Taipei, which have recently gained developed-country status. In contrast, Canada's LPI is lower than the LPI of all of its global competitors, which are developed countries that are unlikely to be competing with lower wages. Canada's greatest strength is in the timeliness (reliability) of freight movements where Canada's component score compares favorably with the best scores of Hong Kong and Singapore.

Unfortunately, Canada's aggregate LPI has declined (albeit marginally) and most of its component LPIs has also declined or increase less than competing countries. The exception is an increase in the timeliness aspect of global logistics performance. As a result, Canada LPI rank dropped from 10th place to 14th between 2007 and 2012 among all of the 155 countries in the LPI rankings while many of the countries directly competing with Canada in global trade gained. Mexico, France, United States, China and Korea made the greatest upward movements in the global LPI ranking.

#### **Freight Competitiveness: Direct Comparison with the U.S.**

The Global LPI data provides competitive performance data at a highly aggregated level. Fortunately the global LPI is supplemented by the domestic LPI database, which provides qualitative and quantitative information about the logistics environment and performance in each country. This provides insight into the factors that underlie the each sub-component of global LPI performance. These additional variables are linked to each other and to higher level Global LPI components so meaningful comparisons and evaluations should examine all of the variables holistically and in related groups rather

than individually. This also permits meaningful comparisons between pairs or groups of competing countries. We demonstrate this approach by evaluating Canada's freight competitiveness with the U.S., which exported \$844.97 billion to the top 10 countries that Canada exports in the amount of \$427.06 billion. A pairwise comparison between the U.S. and Canada provides insights on how well Canada competes with the U.S. to common export markets with respect to freight competitiveness.

The Global LPI ranks the U.S. as number 9 with a LPI score of 3.93, slightly ahead of Canada ranked as 14 with an LPI score of 3.85. Exports can be classified as on shore or offshore. In Table 2 we consolidate the details about competitiveness taken from the domestic LPI survey that are for products exported by ship or air, which are typically exports to offshore markets. The following observations are made:

- The Canadian source of manufactured products is about 13% further from port (sea or air) but costs 5% less to get the product (loaded in containers) to port.
- Service time from source of manufactured product is about the same when measured in days.
- Canada has a higher Global LPI score (4.31) than the U.S. (4.21) with respect to timeliness, "The frequency with which shipments reach the consignee within the scheduled or expected delivery time".
- The U.S. has a marginally higher percent of respondents (93.29%) than Canada (83.39%) meeting the quality criteria for delivery to the consignee.

Products exported by ship or air are most likely to be exports to offshore markets. Thus, in contrast to the overall Global LPI index, Canada compares favorably to the U.S. for offshore exports with respect to cost, speed and reliability and unfavorably with respect to an overall quality evaluation that reflects a myriad of service factors. One possible explanation for this contrast is that the Global LPI is a nearly equally weighted average of the six indicators, only one of which actually measures performance while the majority of the other factors are assessments of the effectiveness of activities such as:



Quality of transportation and information technology infrastructure for logistics, Ease and affordability of arranging international logistics, competence of local logistics industry and ability to track and trace international shipments. When the focus is on the actual performance variables, the picture is different.

This relative cost performance is consistent with the evaluation of the level of fees and charges in different segments of the logistics chain. In Table 3, we observe that a larger percentage of respondents estimate U.S. rates and charges as high or very high than for the respondents in Canada and this is consistent across the every segment of the logistics chain.

High costs are acceptable if the quality of service was also high such as to offset higher direct logistics costs. An indication of this quality is displayed in Table 4 where the respondents to the survey rated the Competence and Quality of Services delivered in the country. For every segment of the global logistics chain, Canada has a higher percent of respondents providing a high or very high rating.

The cost of providing freight and logistics services is in part a function of the infrastructure supporting operations. The quality of the infrastructure of the two countries is reflected in the respondents rating of the quality of infrastructure supporting different segments of the logistics chain displayed in Table 5. The performance metric reflects the percent of respondents rating infrastructure low or very low thus the lower the figure, the better the evaluation. We find that Canada has absolutely no low or very low assessments, though the U.S. percentages are also quite low, except for rail where slightly over 11 percent of the respondents' rated rail infrastructure low or very low. The high rating of Canada's infrastructure would appear to be a direct result of Canada's gateway programs. These programs invested in transport infrastructure, supported the adoption of intelligent transportation systems and encouraged collaboration between the gateway stakeholders.

**Table 2. Export Freight Logistics Performance  
Across NAFTA Countries**

Country	United States	Canada
Performance Metric		
Global LPI Metrics		
LPI Rank	9	14
LPI Score	3.93	3.85
Customs	3.67	3.58
Infrastructure	4.14	3.99
International Shipments	3.56	3.55
Logistics Competence	3.96	3.85
Tracking & Tracing	4.11	3.86
Timeliness	4.21	4.31
Export time and cost / Port or airport supply chain <sup>a</sup>		
Distance (kilometers) <sup>b</sup>	206 km	233 km
Lead time (days)	2 days	2 days
Cost (US\$) <sup>c</sup>	680US\$	646US\$
Export time and cost / Land supply chain <sup>d</sup>		
Distance (kilometers)	346 km	325 km
Lead time (days)	3 days	2 days
Cost (US\$) <sup>e</sup>	745US\$	734US\$
Timeliness	4.21	4.31
Shipments meeting quality criteria (%)	93	83

**Table 3: Logistics Segment Cost Performance**

Country Performance Metric	United States	Canada
Level of Fees and Charges in country operational logistics environment	% answering high or very high	
Port charges	39	13
Airport charges	41	25
Road transport rates	41	13
Rail transport rates	28	14
Warehousing/transloading charges	22	13
Agent fees	22	0

**Table 4: Logistics Segment Competence and Quality**

Country Performance Metric	United States	Canada
Competence and Quality of Services delivered in country	% answering high or very high	
Road	53	88
Rail	35	50
Air transport	75	88
Maritime transport	59	88
Warehousing/transloading and distribution	71	75
Freight forwarders	65	88
Customs agencies	53	63
Quality/standards inspection agencies	35	63
Health/SPS agencies	41	75
Customs brokers	65	88
Trade and transport associations	24	75
Consignees or shippers	12	50

**Table 5: Logistics Segment Infrastructure**

Country Performance Metric	United States	Canada
Quality of Infrastructure	% answering low or very low	
Ports	5.6	0
Airports	5.6	0
Roads	59	0
Rail	11.1	0
Warehousing and transloading facilities	0	0
Telecommunications and IT	0	0

This is consistent with the improvements in the logistics environment indicated by the survey respondents. The survey results reported in Table 6 show that trade and transport infrastructure, telecommunications and IT infrastructure, and private logistics services (that directly benefit from the first two improvements) were perceived to have improved significantly since 2009 relative to the U.S. This is nearly the same period when many of Canada's gateway initiatives were implemented. In contrast, the U.S. substantially improved in customs related factors but this is more likely to impact import movements than export.

**Table 6: Improvement in Logistics Environment Factors**

Country Performance Metric	United States	Canada
Logistics Environment factors improved since 2009	% answering improved or much improved	
Customs clearance procedures	47	38
Other official clearance procedures	40	25
Trade and transport infrastructure	27	38
Telecommunications and IT infrastructure	33	63
Private logistics services	47	75
Regulation related to logistics	7	38

In summary, close examination of the LPI domestic survey data reveals that Canada is highly competitive with the U.S. with respect to freight competitiveness despite the Global LPI ranking the U.S. ahead of Canada. This is true with respect to cost and service and the underlying factors such as competence and infrastructure and consistent with the 3-year trends in improvement for infrastructure and private freight provider services.

### **Limitations and Implications**

The World Bank report warns that the LPI scores should not be overvalued. “The average confidence interval on the 1–5 scale is 0.21, or about 7.4 percent of the average country’s LPI score. On average, this is equivalent to 13 places in the LPI ranking. Caution must be taken when interpreting small differences in LPI scores and rankings” At the very least this indicates that the higher ranking of the Global LPI for the U.S. over Canada is statistically insignificant.

More importantly, the Global LPI may not be an appropriate metric of the current performance of each country (relative to others) as it mixes three service delivery outcomes: timeliness, ease of arranging competitively priced international shipments and tracking and tracing with the underlying determinants of that performance; infrastructure, competence and customs effectiveness. One must look to the LPI’s domestic data survey for data to evaluate freight competitiveness and when that is done Canada, with the exception of one quality measure, is ranked above and evaluated favorably against the U.S. The statistical limitations still apply to the LPI domestic data comparisons, but the consistency in the comparison of the underlying factors leading to this superior performance is amazingly consistent. Charges and fees (Table 3), Competence and Quality (Table 4), Infrastructure (Table 5) and the trends in the logistics environment (Table 6) all favor Canada.

We can firmly conclude that at the very least Canada is competitive if not superior to the U.S. with respect to freight performance at the aggregate level. The comparison similar to that made between Canada and the U.S. could be made with China or with Mexico and the conclusions are very likely to be stronger, if not statistically

significant. Thus, even with the caveat of statistical validity, the LPI is still a useful tool for country-to-country comparisons and for identifying where the direction of government policy might be most fruitful. For example, the LPI domestic performance metrics can be monitored to identify areas where the U.S. freight system is catching up with Canada and where action needs to be taken.

The LPI provides insights valuable to trade policy. The LPI consistently and strongly identifies Canada's timeliness (e.g. reliability) to be above average among its peer competitive countries and comparable to the best in class countries. This means that products that require reliable delivery times are enabled rather than limited by Canada's global logistic chain. However, global customers eventually gravitate to the suppliers in countries that offer the lowest total landed cost. To be competitive, Canadian suppliers must offer a combination of product and delivery price, product quality and delivery service that is superior to that provided by suppliers in other countries. Freight competitiveness measures must be combined with competitiveness in manufacturing or other sectors to reveal the whole picture. For example, the manufacturing competitiveness of Canada can be measured by the Raw Cost Index of Manufacturers in the United States and Its Nine Largest Trading Partners (Manufacturers Alliance/MAPI and The Manufacturing Institute, 2011) or the Deloitte Global Manufacturing Competitiveness index (Deloitte, 2011). In addition, the LPI does not measure countries' connectivity to other countries. Fortunately, there are numerous measures that could be used ranging from simple distance measures to representative ocean or air rates to complex connectivity indices such as the United Nations Liner Shipping Connectivity Index (UNCTAD). Future research can be directed to merging these measures of the performance of each component of the total supply chain from production to delivery at destination. A scorecard or the creation of a single index (comparable to the weighted Global LPI) are alternative approaches.

The measurement of a country's freight performance is valuable for measuring trends and whether the country is moving in the right direction. If the freight performance can be disaggregated, than areas or segments of the logistics chain can be identified for improvement.

But the isolated measurement of a single country's freight performance has unfulfilled potential to measure competitiveness if it cannot be meaningfully compared to other countries. Canada needs to know where it stands in the global marketplace. The LPI is invaluable in that it measures freight performance across multiple countries, including all those competing to export to Canada's major export markets.

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### **Endnotes**

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<sup>2</sup> The Global Competitiveness Report was originally published jointly by the WEF and the IMD, but differences over how to define and measure competitiveness caused these organizations to split and produce separate reports.

<sup>3</sup> Each yearly index is based on surveys conducted one year prior. The complete survey methodology can be found in World Bank (2012).

<sup>4</sup> Computations are available on request from the author.