Transportation and Logistics International Competitiveness: How does Canada Fare?

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Introduction

Canada's economy is a trade based and highly dependent on efficient and effective logistics to move products within, to and from the country. This paper examines Canada's logistics and transport performance relative to trading partners and competing peer countries. The paper utilizes several international benchmarking studies including the World Bank's Logistics Performance Index, The World Economic Forum Global Competitiveness Report, the IMD World Competitiveness rankings and the Deloitte Global Manufacturing Competitiveness Index. Areas explored include:

- Linkages between transportation infrastructure and overall logistical performance.
- Logistical competitiveness of Canada versus competing countries and with trading partners.
- The impact of logistical competitiveness on total landed cost of domestically manufactured products that are exported.

In addition, a brief evaluation of some of the shortcomings with respect to transportation and logistics competitiveness of the

international benchmarking studies are considered. It is suggested that an alternative approach be explored in order to address some of these shortcomings.

Defining Competitiveness

Michael Porter defines national competitiveness as being based on, "the productivity with which it produces goods and services."[1] While sound macroeconomic conditions and a stable political regime are necessary conditions to competitiveness, they alone are not sufficient to ensure prosperity. Instead, company operations and strategies, and the business environment in which they compete are fundamental to national competitiveness. In other words, when evaluating national competitiveness and understanding the drivers of competitiveness, it is necessary to view the environment through the lens of businesses, and understand what drives their decisions and success.

With respect to transportation and logistics competitiveness, much of a country's or region's ability to successfully compete and make best use of its own resources will depend upon the strength of its linkages with other countries or regions. Assessing competitiveness on these terms requires a methodology that goes beyond only the domestic factors.

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. These international comparisons can be classified on two dimensions; aggregation and comprehensiveness. National competitive studies are a systematic aggregation of variables to assess aggregate factors that underlie the performance of all economic sectors in a country rather than one industry sector or firm. Comprehensive studies examine multiple

[1] Institute for Strategy and Competitiveness, "Competition and Economic Development." http://www.isc.hbs.edu/econ-natlcomp.htm

factors affecting competitiveness and less comprehensive examine a smaller set of factors, or even just one.

Comprehensive Country to Country Studies

Two organizations publish annual competitiveness reports. The World Economic Forum (WEF) has published the Global Competitiveness Report (GCR) since 1979. The International Institute for Management Development (IMD) has published a similar report referred to as the World Competitiveness Yearbook (WCY) since 1989.[2] The WEF defines competitiveness as "the ability of a country to achieve sustained high rates of growth in gross domestic product (GDP) per capita." The GCR measures the set of institutions, policies, and factors that set the sustainable current and medium-term levels of economic prosperity.[3] The IMD defines competitiveness as "the ability of a country to create added value and thus increase national wealth by managing assets and processes, attractiveness and aggressiveness, globality and proximity, and by integrating these relationships into an economic and social model." The two indexes also differ on which factors to include in the competitiveness index and how to weight these factors.

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; Economic Efficiency, Government Efficiency, Business Efficiency and Infrastructure. These in turn are decomposed into sub components. The infrastructure factor is composed of Basic, Technological, Scientific, Health and Environment, and Education sub components. Within Basic infrastructure there are six categories directly related to transportation; Road Network Density, Railroad Network Density, Air transportation passengers carried, Quality of air transportation,

[2] 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.

[3] http://www.weforum.org/issues/global-competitiveness

Distribution infrastructure, and Water transportation. Each one is measured by one quantitative or one qualitative data element. Comprehensive country to country benchmark studies are inherently less detailed than studies that focus on a specific area of competitiveness across countries.

Component Factor Country to Country Studies

A number of international benchmarking studies focus on a specific component of competitiveness. The World Bank's Ease of Doing Business report focuses specifically on a range of indicators related to the barriers to conducting business, such as taxes, permits, registration, investor protection and others. Similarly there are nation to nation comparisons of technology performance (World Economic Forum: Global Information Technology Report), e-commerce readiness (Economist Intelligence Unit: E-readiness), sustainability (The National Roundtable on Energy and Environment: Low Carbon Performance Index) and quality of life (The Conference Board of Canada: How Canada Performs). Any comparison of the cost of living, tax rates or labour costs across countries fall in this category.

Numerous benchmarking studies have compared transport performance or proxy variables across countries. The World Bank's Trade Costs and Facilitation web site contains a compendium of selected data sets and indicators on trade costs and facilitation including Customs and Border Crossing Time, Port Performance Indicators and Transport Infrastructure Indicators. Trade costs that impact private firms have most often been proxied by a single indicator and include the international transport costs, or the productivity of a particular transportation mode (air, maritime, road). A direct measurement (e.g. non proxy) of comparative transport costs at the national level is implemented by Golub and Tomaski (2008). They estimate country-specific international transport costs for 21 OECD countries over the period 1973-2005. The methodology is based on direct measures of air, maritime, and road transport costs. Transport costs are calculated as costs per kilogram for each mode of transport at a bilateral level and then aggregated.

On a broader scale, attempts to measure national logistics performance often focused on the percent of GDP that logistics costs accounted. For example the Boston Logistics Group compiled this statistic for 28 countries (Cambridge Systematics, 2008) but there are both measurement and comparative difficulties with this approach (OECD). 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.[4] The underlying survey is conducted every two years to improve the reliability of the indicators and to build a dataset comparable across countries and over time.

The LPI is a multidimensional assessment of logistics performance, rated on a scale from one (worst) to five (best). It uses more than 5,000 individual country assessments made by nearly 1,000 international freight forwarders to compare the trade logistics profiles of 155 countries. The LPI is based on seven indicators:

- Efficiency of clearance in customs and border processes - Customs
- Quality of transportation and information technology infrastructure for logistics - Infrastructure
- Ease and afford ability of arranging international logistics - International shipments
- Competence of local logistics industry - Logistics Competence
- Ability to track and trace international shipments - Tracking & Tracing
- Domestic logistics costs
- Timeliness of shipments reaching destination – Timeliness

[4] Evidence from the 2007 and 2010 LPIs indicates that, for countries at the same level of per capita income, those with the best logistics performance experience additional growth: 1 percent in gross domestic product and 2 percent in trade (Arvis et al, World Bank 2010).

World trade is moved between countries by a network of increasingly global logistics operators. But the ease with which traders can use this network to connect with international markets depends in large part on country-specific factors such as trade procedures, transport and telecommunications infrastructure, and the domestic market for support services. The LPI and its component indicators are thus focused on the logistics of getting products to and from and across borders.[5]

Another logistics related competitive benchmark that is narrower than the LPI but more precise, is the UNCTAD Liner Shipping Connectivity Index (LSCI). Similar to the LPI, the LSCI measures a country's level of integration into the existing liner shipping network or access to global trade by measuring liner shipping connectivity. The index is calculated based on four major components:

- Containership deployment
- Container carrying capacity
- Number of shipping companies, liner services and vessels per company.
- Average and maximum vessel size.

The LSCI considers fewer dimensions of trade facilitation then the LPI but focuses on liner shipping connectivity and therefore can be more precise and quantifiable.

In contrast to the LSCI, the Supply Chain Strength (SCS) component of the Access Index developed by SRI International for Fedex is designed to capture business efficiencies made possible through increased access. They are mostly proxy measurements because supply chain efficiency is typically measured on a company level, not on a national level. These proxy indicators examine the prevalence of

[5] The 2010 LPI also provides a snapshot of selected performance indicators in nearly 130 countries, including expanded information on the time, cost, and reliability of import and export supply chains, infrastructure quality, performance of core services, and the friendliness of trade clearance procedures.

B2B and B2C e-commerce, the extent to which businesses have adopted the most efficient technologies in their production processes, and whether businesses are adding value along the entire "value chain" (from extraction to logistics, from product design to after-sales services). In addition, indicators on air freight usage and growth are included to measure the extent to which businesses have taken advantage of increased access through air transport. The calculation of this Supply Chain Strength metric along with the computation of the whole Access Index utilizes data and variables collected from other international benchmarking studies. For example, the Production Process Sophistication and Value Chain Presence subcomponents of the SCS are taken directly from the World Economic Forum's Global Competitiveness Report.

Comprehensive Country-Sector Studies

These studies compare a specific industry sector across countries. Exemplary of this class is the Deloitte Global Manufacturing Competitiveness index. This index uses qualitative data derived from surveys with senior manufacturing executives around the world. It ranks 26 countries on both current manufacturing competitiveness, as well as a forecast of competitiveness in five years. Among the key competitiveness drivers identified are: quality of physical infrastructure, cost of labor, energy costs and factors related to innovation.

Other comprehensive country-sector studies include the manufacturing Institute and Manufacturers Alliances: MAPI Structural Cost Study, the World Economic Forum: Travel & Tourism Competitiveness Report and the International Comparison of Production Costs: Spinning, Texturing, Weaving and Knitting.

Comprehensive Country-product Studies

These studies focus on a specific product and compare the competitiveness of producing and delivering the product to specified markets. These are often referred to as Total Landed Cost comparisons which are calculated by individual firms to identify the

competitive advantage of sourcing (or selling) from specific countries or suppliers in those countries relative competing sellers. Alix Partners (2010) provide an evaluation of market basket products which included fabricated parts such as machined parts or molded plastic parts, assemblies including electromechanical and auto-welded assemblies and custom packing. The total landed costs were estimated for producing the product in 12 low cost manufacturing countries as well as the U.S. and delivering them to the U.S. market. Cost drivers included prevailing wage costs, raw material cost, exchange rates, duties, in transit inventory and overhead. However, as the purpose was to compare total landed costs of these products produced in the U.S. relative to low cost alternatives, Canada was not included in this analysis.

Discussion

International benchmarking studies are useful in highlighting and identifying the strengths and weaknesses of a country's assets and resources. The rankings of Canada and selected peer countries were collected for many of the benchmarking studies described above. These rankings are shown in Table 1.[6]

The two comprehensive benchmarking studies conducted by IMD and WEF both show Canada to be in the top rung of competitive countries. In fact, Canada's ranking either did not change (WEF) or marginally improved (IMD) from 2006 to 2010. However Canada's relatively high ranking may not hold for specific industry sectors as indicated the Deloitte Global Manufacturing Index, which places Canada exactly in the middle of the evaluated nations. All of these benchmark measures accounted for transportation infrastructure as part of larger, more encompassing constructs. In addition, the WEF accounted for "goods market efficiency" which includes regulatory and other barriers to goods markets. Obviously the higher the performance evaluation of these transportation and logistics related

[6] These countries were selected to represent a mix of both trading partners and competitors to Canada as well as developed and developing countries in the Pacific Rim.

subcomponents, the higher the overall competiveness ranking. It was observed however, that nearly all of the subcomponents are proxy indicators which are combined through an informed but still judgment based weighting scheme.

Table 1: Country to Country Competitive Benchmarking

Study (# of countries)	Selected Pacific Rim Countries					
	Canada	China	U.S.	Japan	Korea	Mexico
IMD (58)	7	9	3	27	23	47
WEF (133)	10	27	4	6	22	66
OECD (21)	1	N/A	2	19	N/A	N/A
WB LPI (154)	14	27	15	7	23	50
UNCTAD (China 2004 = 100)	42.39	143.57	83.8	67.43	82.61	36.39
BL (%)	22	27	13	16	N/A	N/A
SRI (28)	24	21	1	6	7	34
Deloitte (26)	13	1	4	6	3	7
Alix (12)	N/A	6	8	N/A	7	1

Note:
IMD – The IMD World Competitiveness Yearbook 2010
WEF – World Economic Forum: Global Competitveness Report (2010 – 2011)
OECD – OECD Real Total Average Transport Cost for Exports 2005
WB LPI – World Bank Logistics Performance Index 2010
UNCTAD – UNCTAD Liner Shipping Connectivity Index 2010
BL – Boston Logistics Transportation and Logistics Cost Percentage 2005
SRI – SRI International Supply Chain Strength
Deloitte – Deloitte Global Manufacturing Competitiveness Index 2010
Alix – Alix Partners Manufacturing Outsourcing Cost index 2010

The transport and logistics benchmarks were mixed for Canada. While Canada ranked first (just barely ahead of the U.S.) with respect to the estimate to total average transport cost for exports and in the top 10 percent of the LPI, its ranking and performance on the Liner Shipping Connectivity Index, Transportation and Logistics cost percentage and Supply Chain Strength were all weak compared to

other developed countries. These indexes, however, measured many different aspects of transportation and logistics competitiveness. The LPI and Supply Chain Strength metrics are focused on the country's ability to move export products to and import products from and across it borders. The OCED total transport costs for exports addresses the cost of moving goods between countries, while the UNCTAD connectivity index is one, albeit important, factor in the cost of shipping between countries. The OECD total transport cost metric, UNCTAD connectivity index and LPI all rely on unique and consistent data elements. However, the breadth of the Supply Chain Strength metric results in that metric relying on proxies, most of which are also used by the comprehensive country benchmarks. Therefore while commendable, the Supply Chain Strength index also relies on informed judgment to ultimately create the metric.

Competitiveness must account for logistics and transportation costs that connect countries, not just those logistics and transportation costs that move products to borders within country. Location does confer inherent advantage and it is not realistic to claim that a country is competitive based on site specific advantages alone. The comprehensive country to country benchmarks fail in this dimension. In actual business transactions, total landed costs determine the competitiveness of alternative sourcing locations for specific domestic markets. A country is competitive if it can both produce and deliver the goods to a specific geographic market in an efficient and cost effective manner. In addition, being able to import goods efficiently from specific markets is also a determinant of national competitiveness. Thus, an evaluation of competiveness can be augmented by a form of total landed cost index that accounts for country specific and trade lane specific factors. An approach based on the total landed cost concept for country pair trade lanes can be used to account for trade lane specific factors.

Filling the Gap with a Total Landed Cost Approach

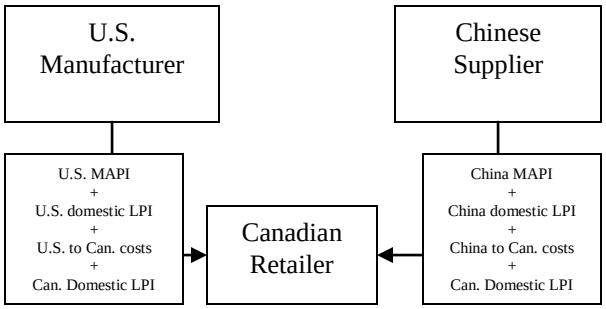
As noted above, most of the indicators with respect to transportation and logistics within the above studies were proxy indicators. In other words, they attempted to represent performance with an indicator that

is expected to be correlated with actual performance, but isn't necessarily so. For example, the IMD study uses, among others, density of the road and railroad networks (km per km^2) as a proxy for basic infrastructure performance. However, these indicators have limited value for assessing actual performance.

An approach based on the total landed cost concept can help to address this gap. One option would be to approximate this approach to the greatest extent possible using data from the readily-available studies.

Consider a scenario where a Canadian retailer faced with the choice between importing goods from the U.S. versus importing the same or similar goods from China (see exhibit 1).

Exhibit 1 – Example of Sourcing Costs



In this case, an indicator such as the MAPI effective cost index could provide the domestic U.S. and Chinese manufacturing costs. Furthermore, an indicator such as the LPI (domestic LPI sub-component) can provide an estimate of the typical logistics costs within each country. Finally, these data could be augmented with international logistics costs specific to each country pair, in order to complete the evaluation of the two alternatives. Freight costs, vessel transit times and vessel frequencies for specific shipping lanes are

required in order to adequately compare the alternatives. The based data behind the UNCTAD LSCI is a potential source for the vessel data by shipping lane. While this indicator would speak directly to the competitiveness of U.S. exports relative to Chinese exports, it would also speak to the extent to which Canadian retailers (and all businesses with similar sourcing decisions) are able to be competitive in their own domestic markets, which ultimately impacts the prosperity of Canadians in general.

Examples are not limited to sourcing decisions by domestic businesses. For example, consider the evaluation of Canadian final goods manufacturers' ability to compete with US manufacturers. The MAPI effective cost index could be used in order to provide a picture of the domestic costs differences that Canadian manufacturers face, relative to those in the U.S. Furthermore, the effective costs in China provide an indication of a portion of the costs that manufacturers either in Canada or the U.S. would absorb if they were to source intermediate parts from China. The LPI can provide an indication of the domestic logistics costs in each country. However, although the LPI provides rankings on international shipments, what is missing is the cost of shipping from one specific country to another, or in this case, China to Canada and China to the U.S.

New Data Sources are Required for a More Rigorous Approach

As stated at the outset, understanding firm level strategies and the business environment in which they operate is key to understanding competitiveness. A total landed cost approach would attempt to do this by measuring the impact of connectivity and reliability on the costs faced by firms with making sourcing decisions.

Some of the above-mentioned studies can be harvested for the purpose of populating a systematic model that would approximate a total landed cost approach. However, in order to develop a true estimation of transportation and logistics based on a total landed cost approach, better information with respect to transit times and reliability at each link and node along the supply chain is required. One example of this approach is Transport Canada's recent efforts

geared towards collecting transit time data at various links and nodes of the freight transportation network.[7]

Total landed costs are location and trade lane specific. However, aggregation methods can be applied in order to arrive at an overall assessment of a specific country's performance. This would not be unlike the aggregation methods that UNCTAD employs in order to aggregate vessel frequency and capacity information by origin-destination pair up to a national level index.

A total landed cost approach requires greater quantification of costs and performance, while explicitly recognizing the benefits of reliability through the quantification of its impact on inventory and other costs. Furthermore, the benefits of efficient transportation networks in terms of both imports and exports can be quantified through a total landed cost approach. Finally, it would provide a framework for examining the impact of policy on transportation and logistics performance.

Conclusion

This paper has reviewed international benchmarking studies that identify the competitiveness of countries, industry sectors and specific components of the economy of different countries. The review suggests that none of these fully measure competitiveness of a country or an industry sector. Observing the total landed costs faced by firms may be one way to evaluate the competitiveness while considering the impact of linkages with other regions. Ultimately, the total landed cost of goods is what firms evaluate when making global sourcing decisions. These costs depend not only on domestic factors, but factors external to the domestic market as well. These observations have led us to conclude that a total landed cost framework should be used to augment existing measures competitiveness.

[7] Transport Canada, *Gateways and Corridors Performance Measurement.*

A total landed cost calculation will explicitly recognize transportation costs and transportation service as well the related non-transport logistics components. A total landed cost approach would inherently recognize specific transportation corridors and trade lanes by which good would move. In such trade lanes, hubs and gateways are key enablers of inter-country transportation and logistics competitiveness. These nodes in the transportation and trade corridor network help create dense traffic lanes, economies of density and scope that reduce transport and logistics costs. Thus the logistics and transportation sector that develops at these hubs and gateways become industry clusters that are key enablers for goods producing and resource sectors, as well as other transport and logistics intensive industries. By measuring competiveness with total landed costs, the benefits of improvements to the gateway to the nation's competiveness can be explicitly and more accurately recognized.

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