POTENTIAL USE OF TOTAL LOGISTICS COST AS A MEASURE OF E-COMMERCE LOGISTICS EFFICIENCY

Michael Machum, Transport Canada[1]

The 27th State of Logistics report from the Council of Supply Chain Management Professionals (CSCMP) identified e-commerce as the main driver of business logistics costs in 2015. Energy prices usually have a significant impact on logistics costs, but in 2015 even with oil prices sharply declining logistics costs went up. The report identified parcel and express and the Less than Truckload (LTL) segment of motor carriers as the main drivers of growth. Both of these are intensely used for e-commerce purposeswhich demonstrates the impact of this relatively new marketplace. Though the report is specific to the US market, e-commerce has not forgotten Canada. Another report on e-commerce from Boston Consulting Group[i] stipulates that though Canada is a laggard in terms of adopting e-commerce, it has now picked up in the Canadian retail scene. eMarketer Retail furthers this point by forecasting that e-commerce will represent 10.0% of total retail sales in 2020, essentially doubling from 2015[ii].

These trends in e-commerce will have a significant impact on Canada's logistics scene as it has had in the US and the UK. They already are. Canada Post reported that e-commerce sales increased by 15% in 2016, compared to the 2% growth in brick-and-mortar sales[iii]. This has led to double digit year-over-year growth in parcel deliveries for this company alone[iv].

Given these trends, it becomes more pressing to analyze the impact that it will have on logistics as a part of the Canadian economy. Logistics costs are a key input to many goods and even services producing industries, and maintaining and improving efficiency helps in increasing the profitability of outputs.
This paper seeks to present a framework for analyzing the impact of e-commerce over time through the creation of a Total Logistics Cost time series that identifies aspects most affected by e-commerce. A recent paper from McMaster University[v] commissioned by Transport Canada identifies the need for performance indices as one step in providing data driven policy options that can help Canada become more competitive in e-commerce. Total Logistics Costs can serve as a benchmark index once specific e-commerce uses have been identified and tracked over time.

Total Logistics Cost

What is TLC?

Logistics is one of many key functions in supply chain management for any firm. It is the movement and maintenance of goods in and out of a firm, and depending on the location and industry of the firm, it can be a significant portion of its input costs. Many firms monitor their logistics costs and decide between alternatives to bring in raw or intermediary inputs or alternatives for distributing their final products. They face time and cost tradeoffs for their choice of mode of transport and for their inventory costs, as well as including administrative costs necessary for these functions. At a macroeconomic level this concept becomes more complex, but no less important. Compiling transportation costs, inventory costs, and administrative costs at a macro level involves some significant challenges, not only because of the data availability for such an exercise but also in grounding such a measure to a concept of efficiency or size.

[1]Presented at the 53rd annual Meetings of the *Canadian Transportation Research Forum*, June 3-6, 2018 at Gatineau, Quebec

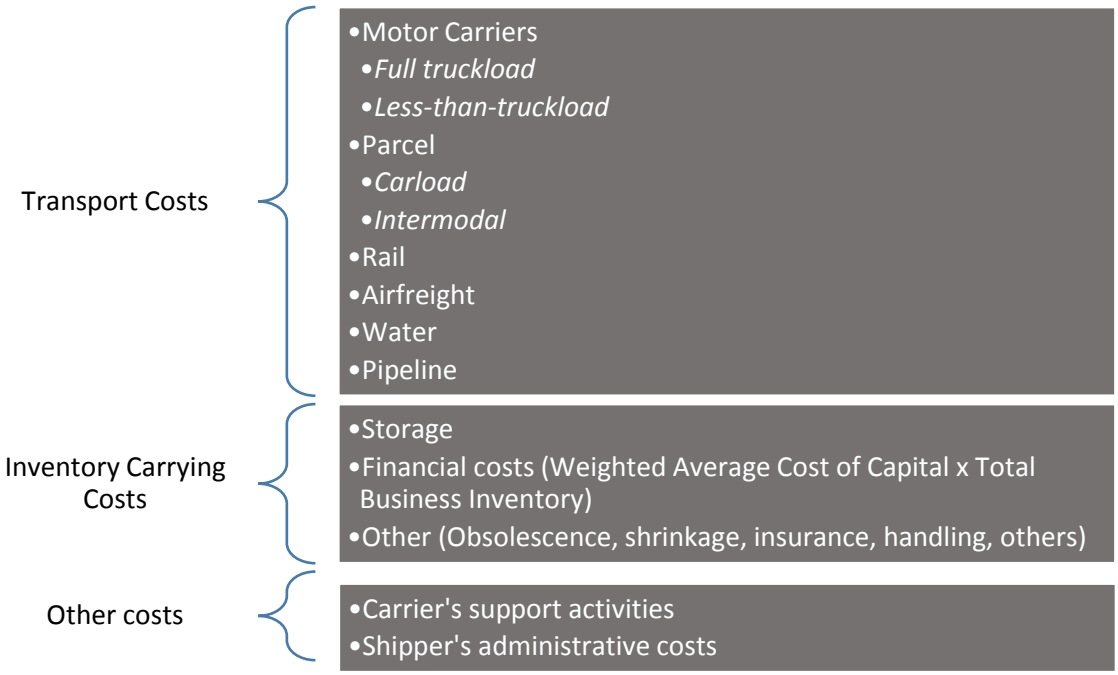
What value does TLC bring?

Firms use TLC measures to identify potential gains in cost reducing measures, and can help streamline the supply chain of the firm. At a national level similar gains can be observed by comparing the changes in cost over time for each of the components of the measure. With this information policies can and have been drafted to improve the state of a country's numerous supply chains. This has an impact on both domestic and international trade for a country. Hoekman and Nicita (2010)[vi]created a gravity model of trade which included the World Bank's Logistics Performance Index. They determined that logistics performance was strongly correlated with trade intensity, and in some ways was a better indicator of trade improvements than even traditional trade barrier reduction measures such as lowering tariffs. Therefore it is important for a country to keep track of its logistics costs to determine how the evolution of various industries affects logistics performance overall.

Existing macro measures of Total Logistics Costs

There are some measures of logistics costs at a national level, and there is even a cross-country comparison index of logistics performance conducted by the World Bank[vii] as previously indicated. In the US, the CSCMP drafts the "Annual State of Logistics Report" which has been published since 1988 and is used by both firms and policy makers in the US[viii]. The estimates of the CSCMP are broken down between 3 main components and various sub-categories within each component as shown in Figure 1

Figure 1: Components of US CSCMP TLC (2016 State of Logistics Report)

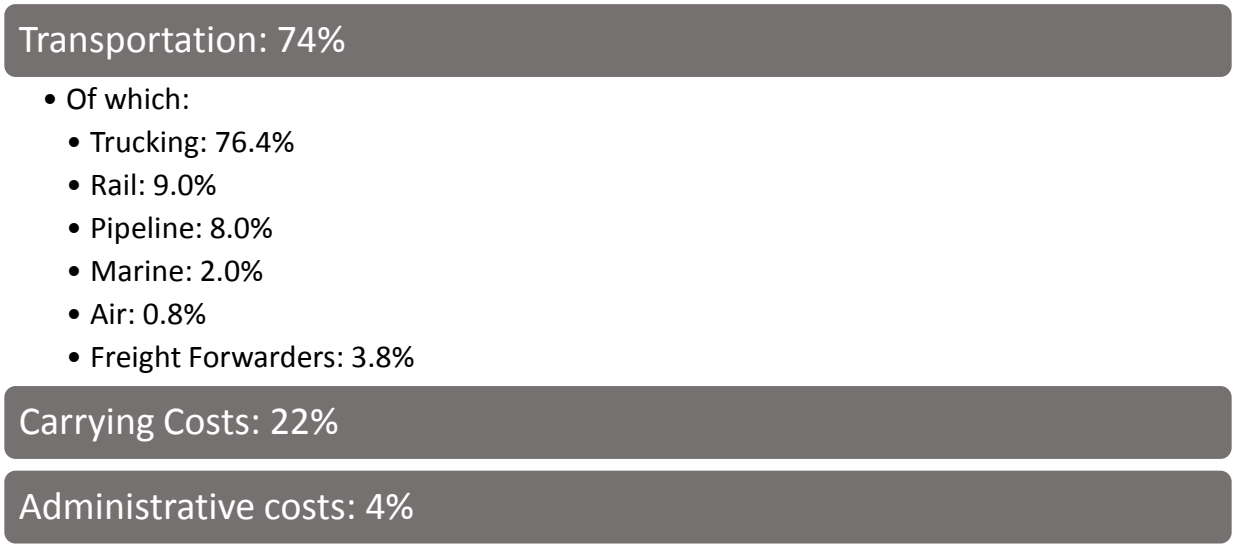


According to Gill (2014)[ix], most TLC measures are similarly broken down in those 3 components, with "Other costs" usually referring to administrative costs. The main changes occur in the different sub-components included, the methodology in estimating these costs, and the measure used for size comparison or efficiency time series. For the CSCMP the methodology involves compiling a variety of government and business data, including national accounts data and then comparing it relative to GDP. The issue with this approach is that it only provides a size estimate of logistics services but not an efficiency estimate because logistics is not a component of GDP but rather of overall output.

Estimates for China by KPMG and the China Federations of Logistics and Purchasing rely mostly on national accounts data, whereas for Korea the Korea Transport Institute is more similar to the US approach of using a variety of public and private data sources. Some estimates are based on surveys, such as the World Bank's Logistics Performance Index, and these performance metrics attempt to quantify cost changes over time. Other methodologies involve comparing costs to total output from Supply-Use tables, though these are challenged by data timeliness. For Canada, Industry Canada developed a study in 2006 as well as in 2008 and the methodology varied from the CSCMP reports mostly on the fact that it was an industry based analysis that could not be used as an overall national level indicator[x].

Using a similar approach to the US CSCMP methodology, we can provide a rough estimate of Total Logistics Costs in Canada through various Statistics Canada surveys and other government sources, as well as assumptions of similarity in US estimates (such as 4% of total transportation costs are freight forwarders, and taxes, obsolescence, and depreciation rate fixed at 19%)

Figure 2: Estimates of TLC proportions in Canada, 2015

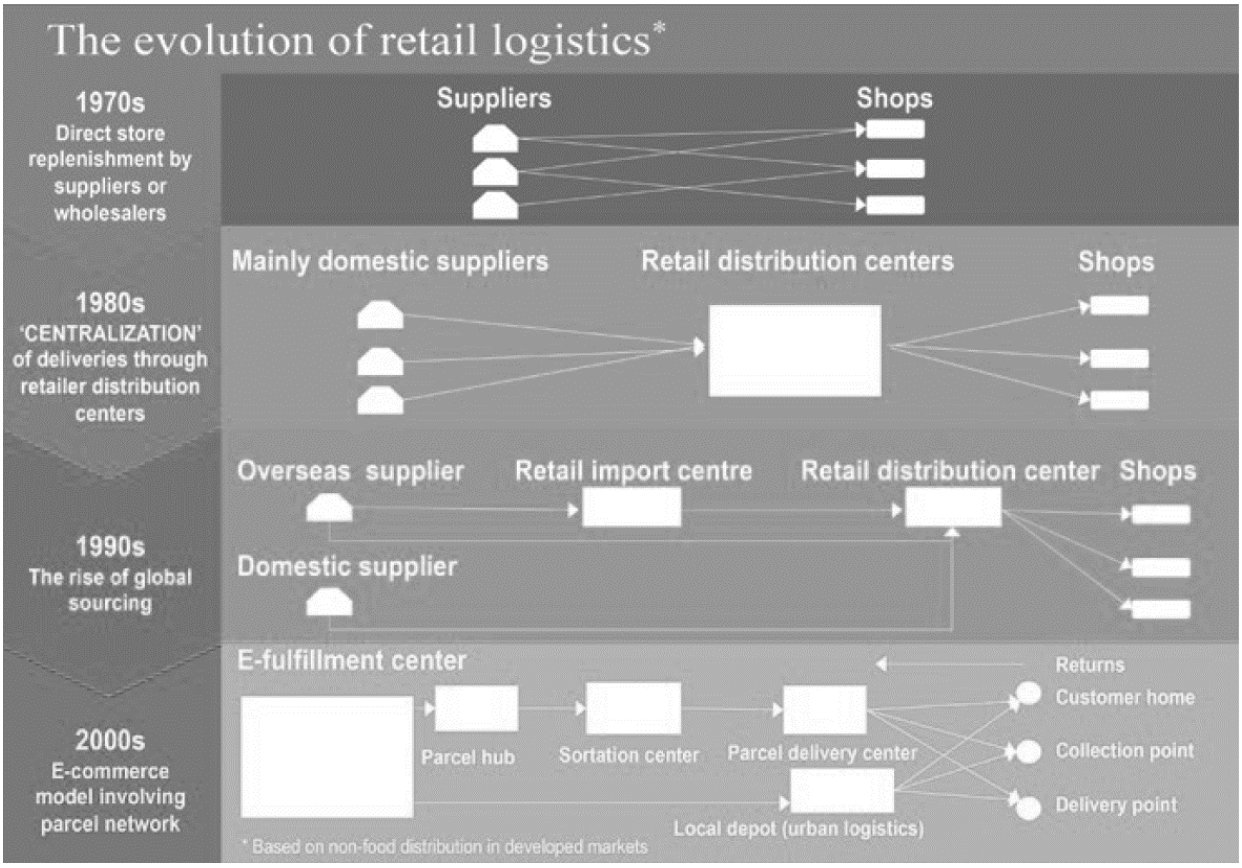


E-commerce

Impact on logistics

As mentioned previously, e-commerce has grown rapidly as a tool for retail and wholesale which is in many ways transforming both those industries, but also transforming their logistics. A white paper by JLL (2013)[xi], an investment management firm, stipulates that e-commerce has significantly altered the logistics of retail firms by increasing the complexity of order management. Whereas the traditional form of retail logistics included a direct shipment from supplier to shop or the use of a number of distribution centers, e-commerce involves a wide number of stages from supplier to customer as shown in Figure 3.

Figure 3: The evolution of retail logistics (JLL, 2013)



The figure demonstrates the increased complexity in retail logistics due to e-commerce, especially when considering that returns are now a key element of the logistics process that was not significant previously. The 27th State of Logistics Report of CSCMP argued that these changes in retail logistics are mostly felt in the trucking and parcel elements of transportation costs. However, Morley (2016)[xii] demonstrates that e-commerce also has a significant impact on the rent of distribution centers, which will be represented as a significant growth on inventory carrying costs. However, it would be necessary to study if there is a decline in brick-and-mortar stores which would decrease inventory carrying costs. The tradeoff between these two components of inventory could then be studied, and it could then be assessed if e-commerce has had an aggregated decrease or increase on inventory carrying costs.

Usage of TLC as a measure of e-commerce efficiency

Amirjamshidi, Abdelkhalek,& Hassini (2018) identified the need for an e-commerce logistics index in their paper for Transport Canada. In this report it is suggest that Total Logistics Costs could determine overall changes in logistics over time which could then be used to determine changes caused by e-commerce. Having identified trucking and inventory as two major elements affected by e-commerce, a time series could be created that would identify whether e-commerce has created a structural shift in these components.

It will be necessary to monitor these changes given that e-commerce is continuously adjusting the retail and wholesale landscape, and if Canada seeks to remain competitive, it will need to determine a variety of measures to understand this phenomenon. Future work could make use of the transportation satellite account created for Statistics Canada's Supply-Use tables in order to create a more accurate depiction of

total logistics costs, and then use the ad-hoc TLC estimates here provided as estimates for the years in which SU Tables are not yet available.

Endnotes

[i]Bodley, D., Dawe, P., Ridesic, S., & Mackenzie, M. (2017). Will Canadian retailers meet demand as E-Commerce takes off? Toronto: Boston Consulting Group.

[ii]eMarketer Editors. (2017, February 20). Ecommerce in Canada: Its time has come. Retrieved from https://retail.emarketer.com/article/ecommerce-canada-its-time-has-come/58acceae9c13e50c186f6f31

[iii]Canada Post. (2016). Growing E-Commerce in Canada. Retrieved from https://www.canadapost.ca/web/assets/pdf/blogs/canada-post-growing-e-commerce-in-canada-2016_en.pdf?ecid=display%7Cpdn%7Ccs%7C104

[iv]Selling to Canadians: Go North. (2018). Retrieved from Canada Post: https://www.canadapost.ca/web/en/pages/gonorth/default.page?LOCALE=en&ecid=murl|pdn|ih|94

[v] Amirjamshidi, G., Abdelkhalek, M., & Hassini, E. (2018). E-commerce logistics in Canada: A review of recent trends and potential impacts. McMaster University, DeGroote School of Business, Hamilton.

[vi]Hoekman, B., &Nicita, A. (2010). Assessing the Doha Round: Market Access, Transaction Costs, and Aid for Trade Facilitation. Journal of International Trade and Economic Development, 19(1), 65-79.

[vii]Logistics Performance Index. (2018). Retrieved from World Bank: https://lpi.worldbank.org/

[viii]Logistics Costs and U.S. Gross Domestic Product. (2005, August 25). Retrieved from U.S. Department of Transportation: https://ops.fhwa.dot.gov/freight/freight_analysis/econ_methods/lcdp_rep/

[ix]Gill, V. (2014). Measuring National Logistics Costs. Conference Board of Canada.

[x]Industry Canada. (2006). Logistics and Supply Chain Management (SCM) Key Performance Indicators (KPI) Analysis. Ottawa.

[xi]JLL. (2013, November). E-commerce Boom triggers transformation in retail logistics.

[xii]Morley, H. R. (2016, July 1). E-commerce drives growth in distribution center rents. Journal of Commerce.