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The Gordie Howe International Bridge and the Bi-National Great Lakes Economic Region: Assessing Economic Impacts and Realizing Economic Opportunities

Final Report

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Preface and Statement of Purpose

The Windsor Detroit Bridge Authority commissioned a study called *The Gordie Howe International Bridge and the Bi-national Great Lakes Economic Region: Assessing Economic Impacts and Realizing Economic Opportunities*, which has been conducted by the Cross-Border Institute (CBI) at the University of Windsor with the support of researchers at Michigan State Policy Center and Atlas Trade and Logistics Advisory Services, Inc. The purpose of the study is twofold. Its first purpose is to better understand and communicate the economic significance of the Gordie Howe International Bridge¹ for the future of the binational Great Lakes and St. Lawrence (GLSL) region. The second is to identify actions by both private and public sector actors over the coming years that are needed to ensure that the full potential for economic benefits are realized. It is not the goal of this study to provide a cost-benefit assessment of this project, which is already under construction. Neither is it the purpose of this study to estimate the employment impacts of the construction project that will build the bridge – such estimates have been provided in a recent report produced by Workforce Windsor-Essex.² Rather, it was conducted to provide practical information on what to expect after the Bridge is in place and how governments, business and individuals can reap the greatest possible economic benefits from the enhanced transportation services that it will provide.

As the title suggests, we make a distinction between two types of economic effects: impacts and opportunities. This distinction separates those economic effects of the Bridge project that will occur more or less automatically from those that require some policy actions or strategies in order to be fully realized. For example, once the Bridge is in service, all trucks crossing the border will automatically enjoy the positive economic impact of shorter and more reliable crossing times. However, there may be other opportunities to provide superior service to the vast number of trucks that flow through the corridor. For example, the enhanced accessibility provided by the new Bridge may make it economically attractive to develop new logistics facilities on both sides of the border. Government actions, however, such as the rezoning and servicing of land and other policies or incentives may be needed to spur private investment in such facilities. The main point of identifying opportunities is to help define a public – private strategy to expand the economic benefits conferred by the Bridge.

This Final Report summarizes the outcomes of a process of extensive literature review, data collection, quantitative analysis, economic modeling, workshops and one-on-one consultations with numerous experts and stakeholders carried out by an interdisciplinary team of more than a dozen researchers. In the interest of brevity, it does not include much technical detail on the various analyses that were completed as part of the study. Interested readers may consult more focused technical reports that are identified in the end notes.

This Final Report is organized into three sections. The first, Background, provides context on the economic characteristics of the Gordie Howe International Bridge project; the nature of the

¹ In what follows, we use “the Bridge”, “the new Bridge” or “the Bridge project” to refer to the Gordie Howe International Bridge. All other bridges will be identified by name.

² The study *Bridging Our Workforce: A Guide for Jobs Related to the Gordie Howe International Bridge*, may be obtained at <https://www.workforcewindsoressex.com/bridge-jobs-guide/>

Canada-US trade relationship and the importance of border infrastructure; and the special role of the Windsor-Detroit crossing. The second section, Impacts, looks at the reduced crossing times and increased accessibility provided by the new Bridge and how they can be expected to support economic transformation in the future. The third section, Opportunities, identifies new economic activities that can potentially be generated in those areas that enjoy major accessibility benefits from the new Bridge, and actions by public and private actors that are necessary to ensure that the full potentials of these opportunities are realized.



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I Background

Not an Ordinary Bridge

The Gordie Howe International Bridge project has certain characteristics that set it apart from projects of similar design and scope in other places. In other words, it is not an ordinary bridge. The distinct character of this project arises from its role in the Canada-US trade relationship, its function as a facility not only for traffic movement but also for border processing, and its pivotal position in the highway network that is the connective tissue of the binational GLSL economic region.

The trade relationship between Canada and the US is exceptional not only for huge volume, but also for the intensity of integration of production supply chains across the border. In essence, this bilateral trade involves not only trade in goods but the joint production of goods. This type of integration requires frequent cross-border movement of both finished goods and goods in process across the border. While trade between the US and China moves in container ships, the majority of trade between the US and Canada moves in trucks. The Detroit River crossing is the busiest corridor for cross-border truck movement. The new Bridge is therefore expected to serve as the most important piece of infrastructure in support of Canada-US trade.

While there are many bridges in the United States and Canada that carry large volumes of freight, only a small number span the international border. Border bridges must not only provide the capacity to allow truck movement from one side to the other, they must also provide the infrastructure used by US Customs and Border Protection (USCBP) and the Canada Border Services Agency (CBSA) to conduct inspections and processing needed to enforce the customs, immigration, food safety and security laws of both countries. On each side of a border bridge is a Port of Entry (POE) facility through which all trucks and cars, along with their occupants, must pass inspection. Long lines of traffic at borders generally occur not because of inadequate bridge capacity, but because of inadequate capacity or staffing at the POEs. (However, as we will explain below, extra lanes on the bridge can make the POE work more efficiently.) The benefits of the new Bridge will therefore derive not only from its improved highway connection and capacity, but also from the design and capacity of its POEs.

The binational GLSL region, extending from Montreal in the east to Minneapolis in the west, is one of the world's great industrial regions, containing scores of production centres on both sides of the border. Both the US and Canada have developed dense highway networks to connect up their production centres, but the cross-border linkages between the national highway networks are few and widely separated. The most centrally located and heavily used of those linkages occurs at the crossing of the Detroit River, where the new Bridge is under construction. Canada and the United States have made or are currently making massive investments in the highway infrastructure that leads to the Detroit River crossing, including the widening of segments of Highway 401 and the construction of the Herb Gray Parkway in Canada and the widening of Interstate 75 and other major highways in the US. The new Bridge will unlock the benefits of these investments for truck movements in international trade. Furthermore, it is not only Canada-US trade that benefits from



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improved connectivity of highway networks. As we will explain below, the new Bridge will be an important connection to global trade routes for businesses in both countries.

These characteristics are critical to our considerations of the Gordie Howe International Bridge in terms of the benefits it will confer and the opportunities it will make possible. To provide some necessary context, we briefly explain the composition and nature of Canada-US trade and focus in on the Detroit-Windsor crossing in the next two sections.

Canada-US Economic Integration

Canada and the US have the second largest bilateral trade relationship on earth; exceeded only by the trade flows between the US and China.³ While discussions about Canada-US trade often focus on resource commodities like oil, natural gas, softwood lumber and various minerals, manufactured goods account for more than half of the cross-border shipments of both countries. While commodities typically cross the border via pipelines, trains and marine vessels, most manufactured goods cross in trucks. Thus, each cross-border shipment of manufactured goods relies on the highway network of both Canada and the United States and on border infrastructure. The majority of the most important border crossings for truck freight are at bridges over the rivers that mark the boundary between the two countries. Since there are relatively few bridges, each border bridge is a critical conduit for Canada-US trade.

The large volume of trade in manufactured goods reflects not only the sale of finished goods from producers in one country to consumers in the other, but also goods in process shipped between factories on opposite sides of the border. Goods in process, which economists call *intermediate goods*, are partially finished industrial materials and components that are moved through supply chains that ultimately lead to the production of finished goods. In industries such as automotive, aerospace, defence and even agrifood, production of final goods may involve numerous cross-border movements of intermediate goods. In fact, the same intermediate good may cross the border several times.

This integration of US and Canadian production systems in *cross-border supply chains* is one of the essential drivers of Canada – US trade. Cross-border supply chain integration provides an effective strategy whereby a medium sized economy like Canada can trade effectively with a very large economy like the US. If all of Canada's finished goods were produced in exclusively domestic supply chains, Canadian producers could not achieve the scale economies needed to compete effectively with their American counterparts. At the same time, American producers benefit from having access to Canadian markets and suppliers that are often just a few hours or even minutes away by truck.

The level of integration and volume of cross-border supply chain flows between the United States and Canada are dependent on three distinct but interdependent requirements:

³ US total trade (goods and services) with China overtook Canada for the top spot in 2016. In 2017, total trade between US-CA was 679,857M, while trade between US-China was 711,712M. (Both values in US \$).



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- **A strong business case for cross-border integration.** Private industry has to derive significant benefit for linking up production facilities on opposite sides of the Canada-US border. Cross-border supply chains would not exist in the absence of a compelling economic rationale. Recent multi-billion dollar investments in Canadian production facilities by Fiat Chrysler Automobiles (FCA) and Toyota are evidence that this business case is still strong. The recently announced closure of General Motors' Oshawa plant, however, demonstrates that its ongoing strength is vulnerable to trends in market demand and other factors.
- **A high level of cooperation between governments of the United States and Canada.** This takes at least three forms. The first is the elimination of tariff and non-tariff barriers under the North American Free Trade Agreement (NAFTA) and its planned successor agreement.⁴ The second is alignment and improvement of border processes as described in the Beyond the Border Action Plan. The third is the elimination of regulatory inconsistencies that can block cross-border trade, as is currently being addressed by the Canada – US Regulatory Cooperation Council.
- **Adequate and integrated infrastructure capacity to facilitate cross-border freight movement.** The economic benefit of cross-border shipments can easily be negated if there is not appropriate infrastructure to deliver them quickly, reliably and affordably. Construction of the Gordie Howe International Bridge is the most important step in the improvement of this requirement since before the implementation of NAFTA.

These three requirements are interdependent in the sense that failure to meet any one negates the value of the other two. For example, a strong business case for sourcing an input across the border might fall apart if tariff-free trade were eliminated or if transportation infrastructure could not meet the standards of an efficient supply chain. NAFTA has yielded economic benefits because cross-border integration makes good business sense and because adequate infrastructure has been in place to facilitate it.

Over the past year there has been great public interest in the renegotiation of NAFTA and the US imposition of extraordinary tariffs on steel and aluminum, and for good reason. Tariff-free trade has been the foundation of the beneficial Canada-US trade relationship. It is important to understand, however, that excessive costs that are currently incurred by goods crossing the Canada-US border act very much like tariffs – they make Canadian goods more expensive in the US and American goods more expensive in Canada.⁵ The most fundamental benefits of the Gordie Howe

⁴ At the time of this writing (August of 2019), a new agreement called US-Mexico-Canada Agreement (USMCA) has been agreed by the member governments but is still subject to legislative approval in all three countries. Furthermore, US tariffs on Steel and Aluminum, justified on national security grounds, remain in place.

⁵ Brown, W. M. and W. P. Anderson. 2015. How thick is the border: the relative cost of Canadian domestic and cross-border truck-borne trade, 2004-2009. *The Journal of Transport Geography*. 42:10-21.



International Bridge projects will lie in reducing those costs to facilitate cross-border economic integration.

The Detroit-Windsor Crossing

Taking imports and exports combined, 63% of Canada's global trade is with the United States, and about 55% of Canada-US merchandise trade moves by truck. Rail and air account for 25%, while marine transport accounts for less than 4% of trade with the US, with most of the remainder moving through oil and gas pipelines.⁶ The Detroit River crossing between Windsor, Ontario and Detroit, Michigan is by far the most important crossing for Canada-US trade. About 30% of all the truck-borne trade (roughly 19% of total trade) between the US and Canada moves across the Ambassador Bridge.⁷

We can put this into perspective by comparison with major marine ports. According to a recent Brookings Institution study,⁸ the highway, rail and marine crossings at the Detroit and St. Clair Rivers combine to make America's third largest international port by value of imports and exports, behind only the ports of Los Angeles-Long Beach and New York - New Jersey. Based on Brookings data, it is also larger than the Port of Vancouver, again by combined value of imports and exports.⁹ In fact, we estimate the cargo volume of trucks crossing the Ambassador Bridge alone to be roughly twice the volume of all containers passing through the Port of Vancouver in 2014.¹⁰

⁶ Trade data from

<http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/gblec02a-eng.htm>

Modal freight data is from Transport Canada (2016), tables EC5 and EC6. All data for the year 2016.

⁷ Transport Canada (2017) Table R010, 2016 data.

⁸ These crossings are all part of the port of Detroit-Livonia-Warren MI: <https://www.brookings.edu/blog/the-avenue/2015/07/01/the-top-10-metropolitan-port-complexes-in-the-u-s/>

⁹ Total trade through the Port of Vancouver is reported as \$200 billion Canadian dollars in

<http://www.portvancouver.com/about-us/> compared with Brookings estimate of \$206 billion US dollars.

¹⁰ Based on http://www.evergreen-marine.com/tei1/jsp/TEI1_Containers.jsp#Dry_1
interior dimensions (in meters) of containers are:

20 foot Steel Dry Cargo Container: L 5.898m x W 2.352m x H 2.385m = 33.1 cu. mt.

40 foot Steel Dry Cargo Container: L12.032m x W 2.352m x H 2.385m = 67.5 cu. mt.

Based on

<http://www.freightmatchers.com/assets/files/General%20Dry%20Van%20Trailer%20Specifications.pdf>
interior dimensions 53' dry van truck trailer

16, 2.51, 2.79 = 112.0 cu mt. , So volume of a 53' dry van is 3.38 teu. Making a conservative assumption that the average truck captured in the data is 80% of the 53' dry van volume, one truck is equivalent to 2.7 teu.

2014 container traffic for Vancouver (loaded and unloaded combined) 2913 thousand teu (2,913,000) = 1,078,889 truck equivalents. Ambassador bridge in 2014 carried 2,470,199 trucks according to the PBOA spreadsheet: <http://www.publicborderoperators.org/index.php/trafficdata>



The truck volume at the Ambassador Bridge, in both directions combined, was 2,593,403 in 2018.¹¹ This averages about 7,100 trucks per day, or 296 per hour. However, truck flow is extremely variable; daily flows of more than 9000 and hourly flows of over 500 trucks are not unusual.¹²

The sheer volume of truck movement across the Ambassador Bridge attests to its economic importance. This number includes not just regional flow between Southwest Ontario and Southeast Michigan, but also major flows encompassing the entire GLSL region even more dispersed freight markets. Figures 1 and 2¹³ give a geographical perspective on the truck traffic crossing the Ambassador Bridge. Derived from the global positioning system (GPS) data of a sample of over 300,000 trips that crossed the Ambassador Bridge in 2013, they show the Canadian points of origin for trips into the US (Figure 1) and the US point of origin for trips into Canada (Figure 2). In Canada, the trip origins are concentrated in a long corridor from Windsor to Montreal, with the greatest concentration around Toronto. In fact, the GTA and Hamilton account for about one third of all trips. Trips based in and around Montreal are also very well represented.

On the US side (Figure 2), major origin points are more dispersed. Expected concentrations in Detroit and Chicago are evident, but nearly all the principle metropolitan areas in the Great Lakes States and along a corridor descending into Texas are also well represented. Of particular interest are the concentrations in Laredo and Los Angeles. The former identifies the Detroit River crossing as a major gateway for trade between Mexico and Canada. The concentration in Los Angeles is interesting, given the long distance involved. Much of this is the movement of California produce in refrigerated trucks, but another likely component of this flow is Pacific trade entering at the port of Los Angeles – Long Beach before moving in transit to Canada via the Ambassador Bridge. Additional trade from that port moves via rail to Chicago and then by truck into Ontario. As we will explain below, the very large flow southward toward the American mid-South is partly due to the growth of automotive production in states like Kentucky and Tennessee.

¹¹ Data from Public Border Operators Association,
<http://www.publicborderoperators.org/index.php/trafficdata>

¹² Based on the CBI's array of Remote Transportation Microwave Sensors (RTMS) that provide a continuous, real time count of trucks crossing the bridge.

¹³ Data in these figures is produced by CBI using a database of anonymized GPS records for a sample of over 50,000 Canadian registered trucks served by Shaw Tracking. For an explanation of data and methods see Gingerich,K., H. Maoh and W. Anderson (2016a) Characterization of international origin-destination truck movements across two major U.S.-Canadian border crossings, *Transportation Research Record*, 2547: 1-10.



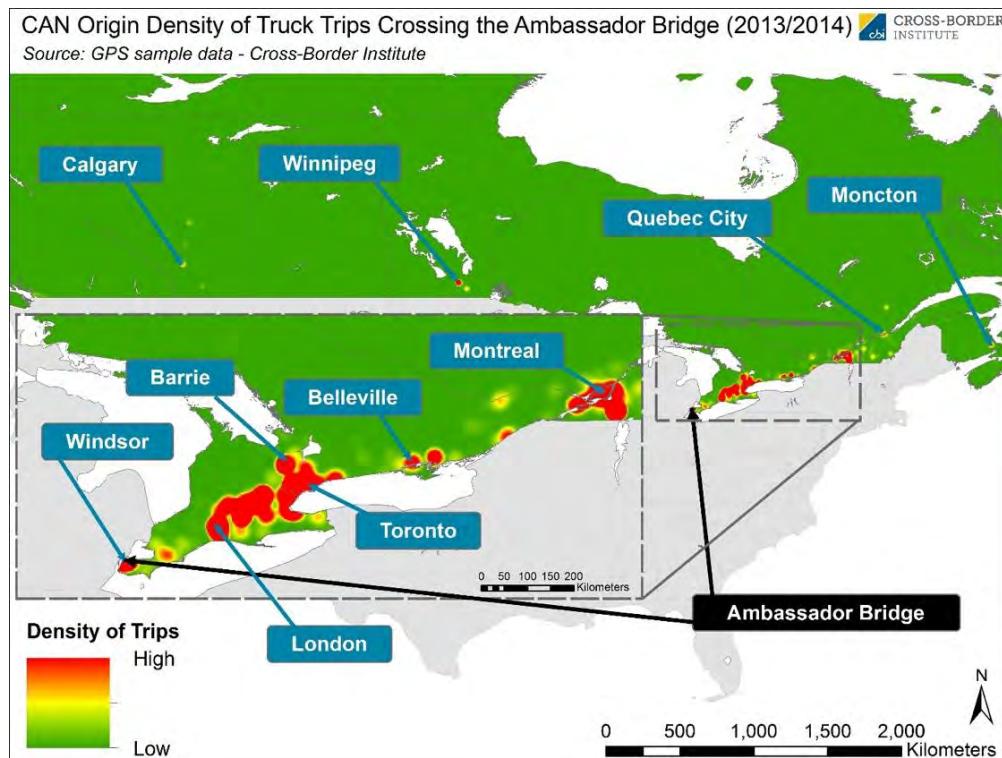


Figure 1: Origin of Trucks Crossing the Ambassador Bridge: US Bound

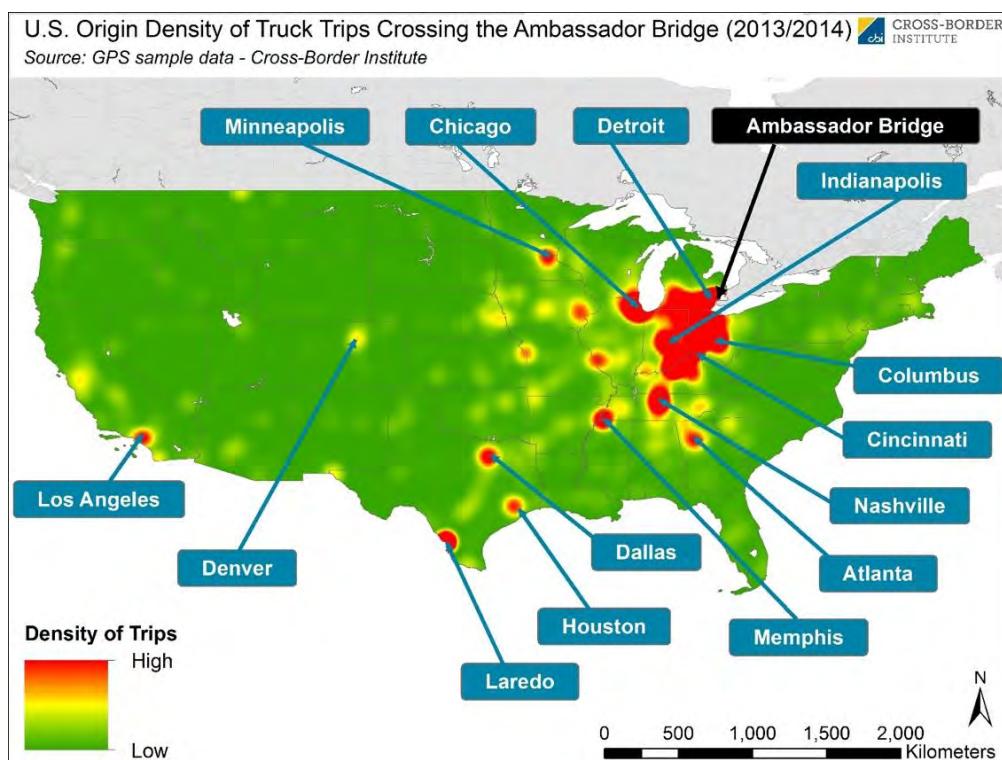


Figure 2: Origin of Trucks Crossing the Ambassador Bridge: Canada Bound



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The US pattern for the Blue Water Bridge and Peace Bridge are shown in Figures 3 and 4 respectively.¹⁴ US origins of trips crossing the Blue Water Bridge are much more concentrated in a corridor running from Sarnia/Port Huron to Chicago, with additional concentrations in Indianapolis and Louisville. This difference relative to the Ambassador Bridge may seem surprising considering how close together the two bridges are, but it demonstrates that the greater centrality of the Detroit River crossing in North American highway network is a major advantage, as there is little reason for trucks coming from the south to bypass the Ambassador Bridge as a point of crossing into Canada. The contrast between the Peace Bridge and the Ambassador Bridge is striking, with a very strong concentration in the US Northeast and the Carolinas. With the exception of central Ohio, there is relatively little overlap between the highest concentrations of US trip origins for the Ambassador Bridge and the Peace Bridge. Thus, the most “substitutable” option for a Detroit River crossing is the Blue Water Bridge.

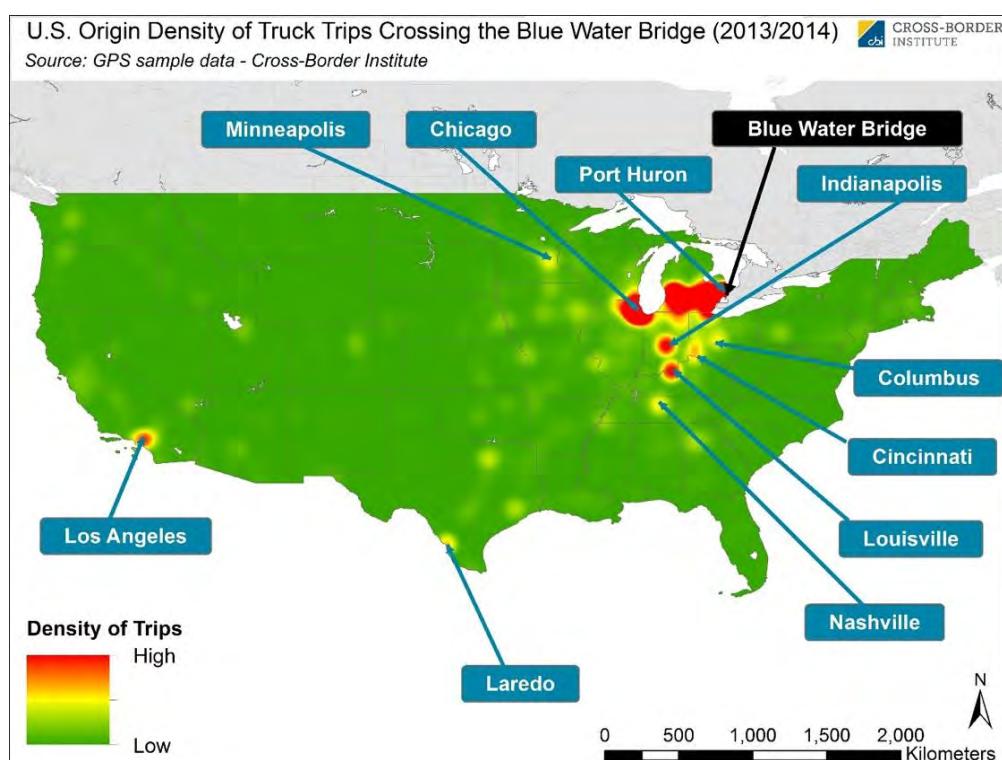


Figure 3: Origin of Trucks Crossing the Blue Water Bridge: Canada Bound

¹⁴ To save space, Canadian origin maps are not shown. The Canadian origin pattern for the Blue Water Bridge is very similar to that of the Ambassador Bridge. For the Peace Bridge, however, Canadian origins are much more tightly clustered around the western end of Lake Ontario, including the Niagara and Hamilton Regions and the Greater Toronto area, with a westward extension along highway 401 as far as London.

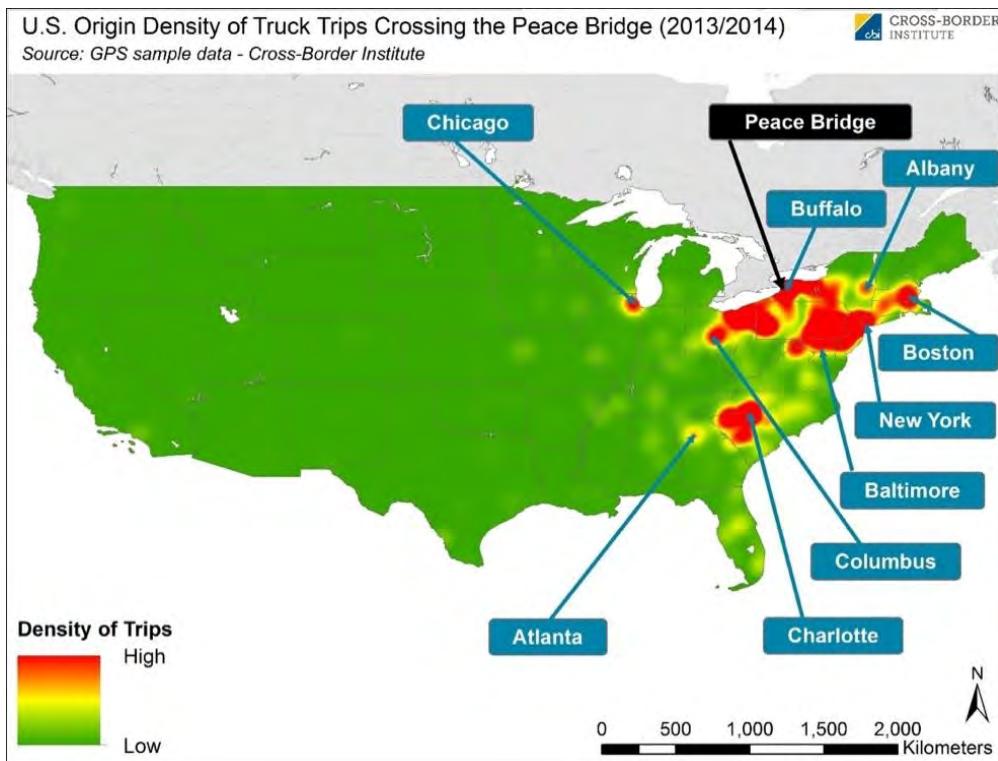


Figure 4: Origin of Trucks Crossing the Peace Bridge: Canada Bound

Figure 5 is a dramatic illustration of how the Ambassador Bridge at the Windsor-Detroit crossing connects an uninterrupted flow of truck freight between the Canadian and US highway networks. The thickness of the lines represents the flows in our sample of over 50,000 Canadian registered trucks for one week in 2014. Its most striking feature is the flow from the GTA to the Detroit River and across the border with its densest concentration along the I-75 corridor (heading south toward Toledo.) This flow is comparable to the flow between Toronto and Montreal and considerably higher than the flow across the Blue Water Bridge.

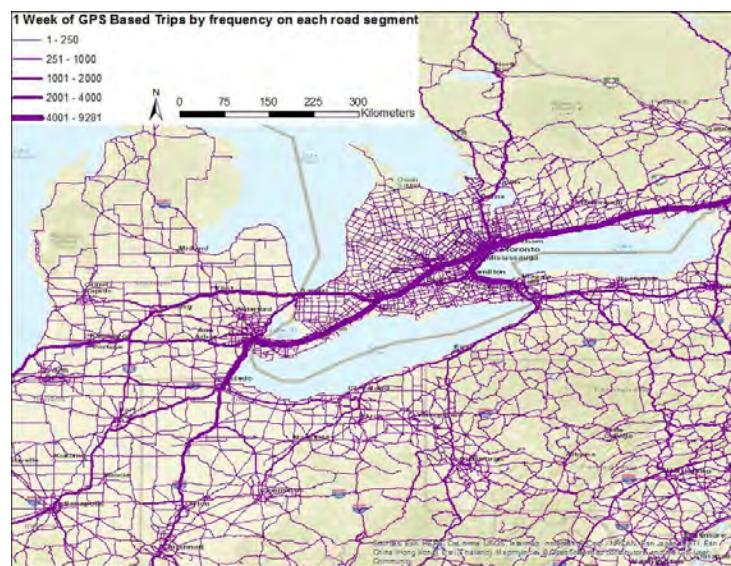


Figure 5: One-week traffic flow from a sample of 50,000+ trucks



Given that the Peace Bridge is closer to the GTA, which is Central Canada's most important market, why is the Ambassador Bridge, located about 370 highways kilometers from Toronto, the most important gateway for cross-border truck traffic? There are two bridges that carry significant numbers of trucks across the Niagara river (Peace Bridge and Lewiston-Queenston Bridge), but the Ambassador Bridge carries 35% more trucks than both of them combined.¹⁵ The answer lies in the fact that the automotive industry accounts for a disproportionate share of Canada-US trade and that the largest flows of automotive products are through the Windsor-Detroit crossing.

The automotive industry and cross-border supply chains

Canada – US trade in automotive products far exceeds trade in all other goods except for oil and gas. For the Province of Ontario, which accounts for about half of all Canada-US trade, automotive products combined with materials such as steel used in the automotive industry and automotive manufacturing machinery account for roughly half of imports and exports. This despite the fact that the automotive industry represents only about 2% of Canada's GDP.

The disproportionate weight of automotive products in Canada-US trade reflects a much longer history of tariff-free trade in that industry than in others. The first agreement to eliminate tariffs on all automotive products moving between the US and Canada – widely known as The Auto Pact of 1965 – came into force 24 years before the broader Canada-US Free Trade and almost 3 decades before the implementation of NAFTA.

The automotive sector provides the best example of the cross-border supply chains described earlier. Canada – US automotive trade is not simply a matter of Canadian cars being traded for American cars. Rather, materials, machinery and parts cross the border to support the various stages of manufacture that lead to the production of a finished vehicle. So, for example, Fiat Chrysler Automobiles builds Pacifica Minivans and three different car models in Ontario, but their engines and hundreds of other components are imported to Canada from factories in the United States. In order to keep Canadian production going, several hundred trucks carrying parts must cross the Ambassador Bridge every day. This kind of cross-border integration leads to very high trade volumes, since the same component may cross the border several times as it passes through stages in the manufacturing process. Because no part of Canada's automotive industry is completely dependent on domestic inputs and markets, its success in the long run depends absolutely on the continued ability to operate efficient cross-border supply chains. This fact alone makes border infrastructure at the Windsor-Detroit crossing a matter of critical strategic importance to the Governments of Canada and Ontario.

The dominance of the Windsor-Detroit corridor results from its location connecting the most intensive clusters of automotive production in Canada with corresponding clusters in the US.

¹⁵ Based on 2018 data provided by Bridge and Tunnel Operators Association, <https://www.bridgeandtunneloperators.org>

Figure 6 is from a report of the McMaster Automotive Policy Research Centre.¹⁶ It illustrates the concentration of automotive assembly and major parts suppliers in Windsor-Essex, the 401 corridors and the GTA. Comparing this map with Figure 1, which shows the Canadian origins of truck trips across the Ambassador Bridge, it is clear that the most intense clusters of trip generation coincide with the geography of automotive production. Turning to Figure 2, the clusters of trip generation coincide with clusters of automotive production in Michigan and in a corridor extending south through Ohio, Kentucky and Tennessee. This corridor contains major assembly facilities such for Jeep in Toledo, Toyota in Indiana and Kentucky, and Nissan in Tennessee, along with hundreds of plants producing automotive components.

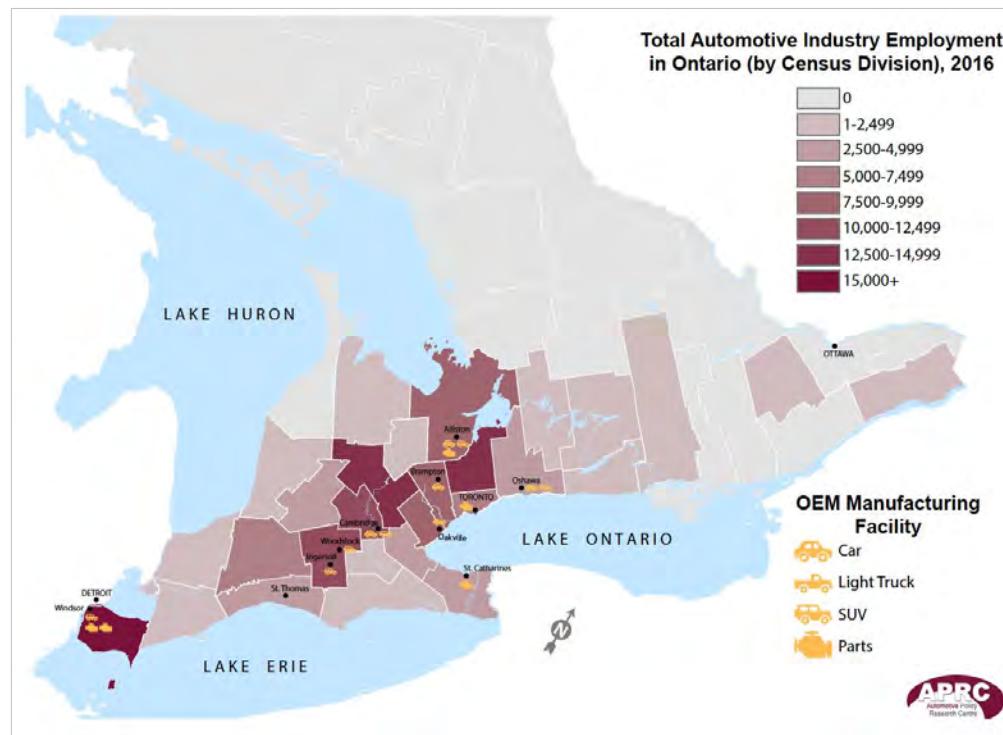


Figure 6: Locations of automotive assembly and major parts production facilities
(source: McMaster University, Automotive Policy Research Centre)

The fact that the Windsor-Detroit crossing is the main connection in automotive and other cross-border supply chains has three implications for border infrastructure. First, because any incremental logistics cost incurred in multiple border crossings detracts from the efficiency and competitiveness of the entire regional production complex, it is important that costs – defined in terms of both money and time – be kept low. Second, because modern supply chains ideally operate on a “just-in-time” (JIT) basis, meaning that inputs and components should arrive at the factory as close as possible to the precise time when they are needed, border crossing times must be reliable. A border delay for goods moving in such a supply chain could lead to the shutdown of a production line, incurring costs running into thousands of dollars per minute. These costs are

¹⁶ Sweeney, Brendan (2017) *A Profile of Automobile Manufacturing in Canada 2012-2016*, McMaster University, Automotive Policy Research Centre, Figure 10.

often passed on as penalties of thousands of dollars per minute to suppliers. Finally, interruption of service for the Ambassador Bridge, which is the sole means of cross-border truck movements at the Detroit River, could have huge economic implication, potentially idling plants on both sides of the border or causing severe extra costs if goods are rerouted across the Blue Water Bridge. This calls for more than one bridge to provide redundancy – taking such a scenario out of the picture. In other words, providing additional and separate crossing capacity will make cross-border supply chains resilient to extreme, unpredictable events such as an infrastructure failure, catastrophic accident, extreme weather or seismic event, or even a terrorist attack.

To summarize, Canada has a highly trade dependent economy. The Windsor-Detroit crossing is the most important gateway to Canada's number one trade partner and also an important connection to the rest of the world. The dominance of this crossing owes much to the high level of supply chain integration between Canada and the US in the automotive industry. The long - term viability of automotive production in Canada depends on efficient, affordable, reliable and resilient infrastructure at the Windsor-Detroit crossings, as does the potential for increased cross-border integration in other industries. Recognizing these facts, governments and businesses on both sides of the border have long called for additional infrastructure investment at the Windsor-Detroit crossing.



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II Impacts

The Gordie Howe International Bridge: a better crossing

The need for new infrastructure at the Windsor-Detroit crossing has been recognized for decades. The process that led directly to the Gordie Howe International Bridge Project began in 2002 with the Detroit River International Crossing (DRIC) process involving the US and Canadian federal governments along with state and provincial transportation agencies. Their initial study identified not only the limited capacity and advanced age of the Ambassador Bridge, but also the lack of a freeway to freeway connection. After considering numerous alternatives, they determined that the best alternative would be a new bridge downriver from the Ambassador Bridge and a new access road on the Canadian side that would provide a direct freeway connection from the end of the Highway 401 to the new bridge. The Gordie Howe International Bridge project must therefore be viewed in conjunction with the recently completed Herb Gray Parkway project (see Figure 7), which provides the rapid access called for in the DRIC process. The Herb Gray Parkway was completed in 2015. “Early works” including construction of access roads, site preparation, utilities relocations etc. for the Bridge began late in that same year. After overcoming a number of political barriers and completing a complex public-private-partnership contracting process, construction on the full Gordie Howe International Bridge – including the bridge span, ports of entries and connections to existing highways - got underway on October 5, 2018.

These two projects combined provide a once in a lifetime opportunity to transform one of the most economically consequential transportation infrastructure systems in the world. This transformation involves not only expanding the infrastructure, but also getting the connections right from the 401, to the Parkway, through the inspection plazas and their connections to the Bridge, and on to the interchange with the I-75, which is itself in the process of massive reconstruction and expansion.

The new Bridge will be a superior Detroit River crossing option to the current Ambassador Bridge for three reasons:

- First, when combined with the Herb Gray Parkway it will provide a freeway-to-freeway connection between Ontario’s Highway 401 and US Interstate I-75, avoiding the signalized intersections and urban traffic that border-bound vehicles encounter now.
- Second, it will have additional lane capacity and much larger inspection plazas on both sides of the border, when compared to the Ambassador Bridge and its Port of Entry facilities.
- Third, it will deploy the most sophisticated intelligent transportation systems (ITS) and border logistics and security technology currently available throughout the entire highway - plaza - bridge system, and it will be designed to easily accommodate new technologies that may emerge in the future.



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Figure 7: Herb Gray Parkway and Gordie Howe International Bridge with inspection plazas

These three key characteristics of the Bridge will make crossing times both shorter and more reliable. Shorter crossing times will be due to the rapid traffic flow between the end of the 401 and the entrance to the Bridge along the Herb Grey Parkway; the availability of more travel lanes across the bridge; and the fact that the inspection and toll plazas will not only be larger but will also deploy the latest technology for rapid clearance and non-stop “open road” tolling. Naturally, better crossing times will depend in large part on the commitments by US CBP and CBSA to make investments in the latest technology and provide adequate staffing.

More reliable crossing times will arise because incidents that cause unpredictable delays on the current crossing will be circumvented or mitigated. Delays due to accidents and breakdowns that often occur at intersections involving urban traffic will be completely bypassed. Where accidents and breakdowns occur on the Parkway, the Bridge, or an inspection Plaza, more lanes will be available so that delay time due to a lane closure will be much lower. The extra lanes will also make it possible for the Plazas and the Bridge to more effectively absorb demand spikes.

The availability of more lanes on the approaches and across the Bridge will also unlock the potential of “trusted trader” programs. At present, program members are often stuck in the same queues with non-members, greatly limiting the returns to investments made to attain “trusted” status. Additional lanes will make it possible to assign dedicated lanes or otherwise give advantages to members. As benefits increase, membership is also likely to increase leading potentially to a situation where the great majority of trucks approaching the border are from pre-screened carriers and shippers.

There will be great potential to develop and implement advanced information systems to further enhance the performance benefit of the expanded parkway - plaza - bridge infrastructure system.



ITS systems that take advantage of new wireless technologies such as Vehicle to Infrastructure (V2I) communications will help route vehicles to appropriate lanes for better traffic flow; give the bridge operator and border agencies advanced notice of demand spikes so that they can make staffing and other adjustments before delays develop; and reduce delays at primary inspection lines by flagging and directing vehicles to secondary inspection before they join primary queues.

While a large share of the traffic that currently uses the Ambassador Bridge will divert to the Gordie Howe International Bridge, the former bridge is expected to stay in place. This will provide needed redundancy. Not only will the highway network function better under emergency scenarios involving the temporary loss of one bridge, but the reduced risk may encourage the expansion of cross-border supply chain linkages.

For personal vehicles, the Gordie Howe International Bridge will be a key part of a new, user-friendly and welcoming gateway to help expand Canadian tourism - a sector that has been especially hard hit by the post 9/11 border security environment. It will also provide a more reliable route for the more than 5,000 people who commute to work through the Detroit River crossing every day. Many trips in personal vehicles are for business purposes such as marketing, maintenance, repair, consultation, training and others. Improved accessibility for such work-related personal trips will further enhance the productivity of cross-border supply chains in the GLSL economic region.

The Gordie Howe International Bridge will also help increase the integration of the local economies in Windsor-Essex and the Metro Detroit Area. It will provide a freeway – to – freeway complement to the Detroit Windsor Tunnel's downtown-to-downtown link. For both communities, easier crossing for short trips will provide access to more shops, restaurants, sporting events, cultural facilities, airports and rail connections.

Economic Impacts

In assessing economic impacts, it is not our purpose to arrive at a bottom line value for net benefits. The project is already committed and well underway, so our purpose here is not to justify expenditures. Furthermore, we believe that the complexities involved in cross-border supply chains and the uncertainties surrounding the long-term impacts of a project of this magnitude would make such an exercise speculative and imprecise. History teaches that the long-term impacts of major infrastructure projects are often quite different in both their magnitude and their basic character than what was anticipated prior to construction. For example, did anyone anticipate at the time of its planning that the Ambassador Bridge would be the key to creating a multi-billion-dollar international system of production in the automotive industry?

Furthermore, it is not our purpose to assess the economic impact of the bridge as a construction project. Political arguments for the economic benefit of building any major piece of infrastructure tend to emphasize the creation of construction jobs and the indirect and induced jobs that spin off from them.¹⁷ While the economic stimulus provided by such employment generation is valuable,

¹⁷ "Indirect" refers to jobs generated by the purchased inputs of the bridge project (steel, concrete, lighting, etc.) while "induced" refers to jobs that are created when the new income that is generated by direct(construction) and



especially during a period of recession, the jobs created are transitory. Once the project is complete, those jobs and the income they generate are no longer present in the economy. The main benefit of building the new Bridge lies in the improved transportation service that it provides once the construction phase is over. The improved transportation service permanently improves the performance of all firms that use it, leading to increased employment, productivity and economic output. Since these benefits spread throughout the entire economy and endure for many decades (as has been the case for the Ambassador Bridge) they are much larger than the benefits that arise from the initial construction activity.

Our purpose is to explore all the mechanisms by which addition of the Gordie Howe International Bridge will improve the efficiency of cross-border movements of freight over the North American highway networks. There are two reasons for doing this. The first is to anticipate how improved transportation service, reliability and accessibility will affect the economic development of the GLSL region. The second is to guide policies that seek to realize new economic opportunities that the Bridge project unlocks. (The second reason is addressed in Part III below.) While in some cases quantitative indicators can be provided, we will not limit our discussion to mechanisms that are easily quantified.

At the outset, we can define some broad mechanisms by which completion of the Gordie Howe International Bridge will affect the economy.

- The new bridge will provide significant improvement in both the duration and the reliability of crossing times.
- It will serve the market that is currently served by a bridge that is nearly 90 years old and therefore is nearing the end of its service lifetime. Its economic contribution therefore includes its value as a guarantee that there will be at least one functioning bridge across the Detroit River for more than 100 years
- In order to have a resilient crossing, however, the preferred situation should be for the Ambassador Bridge and its eventual replacement to provide redundancy.
- While the flow of trucks through the Windsor-Detroit corridor is currently below its historical peak, it is to be expected that the availability of the new bridge will induce more trips in the future. (We explain this argument later.)
- The new Bridge has a sufficiently significant impact on the patterns of accessibility in the GLSL region to alter spatial patterns of economic activity.
- Border crossing costs, like tariffs, are barriers to trade. It is well known that tariff reduction under trade agreements like NAFTA promotes trade. Border cost reduction that will come about after completion of the new Bridge will have a similar trade promotion effect.

indirect employment is recirculated in the economy and spent on consumer goods and services. The study *Bridging Our Workforce: A Guide for Jobs Related to the Gordie Howe International Bridge*, conducted by Workforce WindsorEssex includes such estimates and may be obtained at <https://www.workforcewindsoressex.com/bridge-jobs-guide/>



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- Over the next century, the Gordie Howe International Bridge is likely to enable types of economic integration and interaction across the Canada-US border that are hard to predict, but potentially transformational.

As a way of organizing our explanation, we start by recognizing that these mechanisms operate at different time scales. We consider economic effects as falling into static and dynamic categories:

- **Static:** These mechanisms act on the existing traffic flows at the Detroit-Windsor crossing. Estimates of static impacts do not take account that the introduction of the new Bridge will change the structure of existing flows. They comprise cost savings that become available as soon as the new Bridge opens and remain in place over its service lifetime.
- **Dynamic:** These are mechanisms that reflect ways that the current structure of cross-border traffic flows and supply chains will change as a result of the superior service offered by the new Bridge. The new Bridge will significantly change the geographic accessibility patterns in the binational GLSL region. In the longer term the locations of factories, warehouses, demand centres and other generators of cross-border traffic may shift in response to the shifting patterns of accessibility.

Note that we do not specify time horizons, rather we define static and dynamic effects according to what is variable and what is fixed. Static effects would occur even if the structure of cross-border flows were to remain fixed. Dynamic effects are driven by long term changes in the spatial structure of flows and of the economic activities that generate them.

Static Impacts

Static impacts affect the current cross-border traffic flow. Any border crossing creates traffic delays both because it is a traffic bottleneck and because it is the site of time-consuming border processes. These delays may vary over time from a few minutes when traffic is light and all border systems function efficiently to a few hours when traffic spikes; infrastructure is impeded by an accident or repairs; border systems slow down due to factors ranging from a software failure to a homeland security emergency; or from some combination of these reasons. How do these delays affect the cost and efficiency of firms trading across the border? Bearing in mind that many of the goods movements at the Detroit-Windsor are in highly synchronized industrial supply chains, the cost and efficiency of trading are affected in the following 5 ways:

1. **Total value of time:** Many of the costs involved in providing trucking services are a function of the length of time it takes to make a delivery. If a truck and driver are stuck in traffic or in a border queue, they are not moving the goods, so they are not productive. This implies a cost that may be borne by the shipper, the carrier and possibly the driver.
2. **Number of “turns.”** In automotive, agrifood and other supply chains, the same truck often makes the same delivery (the same goods and the same origin-destination pairs) several times per day. How many “turns” it can make depends on the trip time. For example, if 16 deliveries of the same good are made within an 8-hour period, and the round-trip time is reliably 2 hours, then 4 trucks with drivers are needed to provide the service. However, if



the time is unreliable – for example if times of 3 hours occasionally occur – then it might be necessary to assign 5 trucks and drivers to ensure that the 16 deliveries are made within 8 hours. Thus, variability in crossing time can increase a carrier's capital and labour cost.

3. **Hours of Service (HOS) regulations:** In both Canada and the US truck drivers are required to keep a log to make sure that they do not drive for more than a stipulated number of hours before they are required to take an extended break. These regulations are strictly enforced using electronic logging devices that are now mandatory in the US and will soon be in Canada. Border delays can create a major problem here, as a driver who is able to make a particular delivery within their HOS limitations may not be able to make it if there is a delay of an hour or more at the border. Because a driver who runs out of hours before reaching their destination must stop and rest for 10 or more hours, a one hour delay at the border may translate into a 10-hour delay in delivery time. Again, this is a problem that derives from the variability of the crossing time.
4. **Delivery time windows:** In the automotive industry and in other complex manufacturing industries, shipments need to arrive within narrowly defined time windows, not only to keep inventories lean but also to synchronize production schedules. Such a high level of synchronization, however, creates the risk that a production line may be forced to shut down if critical inputs are not delivered on time.
5. **Detours:** Border crossings such as the Ambassador Bridge are examples of *critical infrastructure* links. In the context of a highway network, a critical link is one whose loss results in very large increases in trip times and costs. The loss may occur due to a catastrophic structural failure, an extreme weather event or a terrorist attack. It may also occur temporarily for more mundane reasons such as a necessary repair, a failed inspection or a major accident. In any case, for as long as the critical link is out of service, cars and trucks need to make long detours in order to use the closest alternative route. Providing redundancy at key parts of the network is the surest way to reduce that risk.

Some economic assessments of infrastructure projects rely almost exclusively on measures that only relate to point 1. They calculate the total hours of savings by summing the average time savings across the number of vehicles crossing the bridge and multiply that value by a per hour value of truck operating costs. While this may be a good place to start, it ignores the other four points, all of which arise from the supply chain and regulatory requirements that apply to cross-border truck movements. Such a superficial approach misses one of the main points of building the Gordie Howe International Bridge, which is to preserve and expand the cross-border integration of Canadian and American production systems. It also relies on the average crossing time, despite the fact that points 2 through 5 are predominantly driven by the variability of crossing times, rather than the average value. Current supply chain practices imply that most firms base decisions on a Total Cost Analysis (TCA) that takes into account all factors, rather than just average time savings.

Value of time savings: In order to make a conventional estimate of the value of time savings, we can incorporate variability into our estimate of time savings by adding a moderate buffer time to the average time savings for the new Bridge. Based on our consultation with industry, we know that carriers typically address the problem of unreliable crossing times by building time buffers into their schedules for all trucks that cross the border. Based on analysis of GPS data, we have estimated both the average crossing time at the Ambassador Bridge and the variability around it.



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Our analysis indicates that both of these values will be lower for the Gordie Howe International Bridge. On the very conservative assumption that carriers set their buffers based on the 90th percentile crossing times, we conclude that there is a time savings of about 20 minutes for each truck using the new Bridge. (We consider this a very conservative estimate. More details on how we arrived at the estimate are found in Appendix 1.)

Based on the current flow of about 2.5 million truck crossings per year, the time savings amounts to almost 850,000 hours per year in aggregate. Within a range of conservative assumptions about the value of truck delays and the discounting of future benefits, if the current flow were to remain constant over the lifetime of the Bridge, the present value of these time savings lies in a range of \$1.1 To \$2.3 billion dollars. (Adding time savings for cars, again with conservative assumptions, raises the range from \$1.4 to \$3.0 billion dollars.) This is a low estimate for a couple of reasons. First, it does not apply to point 5: the long detour that would be required if service on the Ambassador Bridge were interrupted. Because trucks would have to make a long detour to the Blue Water Bridge, our estimates of the impacts of a one year interruption of Ambassador Bridge service is almost one half billion dollars. (As discussed below, the cost to the regional economy would be much greater if production facilities were idled because of such an interruption.) Second the value of time in this estimate is based on the cost of operating a truck, amounting to less than \$90 per hour. In the case of point 4 above, we know both from anecdotal information and from published sources¹⁸ that if a delivery of auto parts arrives sufficiently late to require the shutdown of an automotive assembly line, fines imposed on the shipper are defined in thousands of dollars *per minute*. As this example illustrates, valuation of time savings based on truck operating costs does not capture the value of time in synchronized, JIT supply chains.

The estimates so far assume that the Gordie Howe International Bridge is one of two bridges across the Detroit River. Time savings are therefore defined as the difference in crossing times between those two bridges. The picture is different, however, if the new Bridge is viewed as providing a guarantee that there will always be at least one bridge across the Detroit River. In this case it is relevant to measure the value of the having the option to cross at the Detroit River instead of at the closest alternative crossing, which is the Blue Water Bridge across the St. Clair river at Sarnia-Port Huron. Our analysis indicates that the value of time savings due to having the option to cross at the Detroit River rather than just at the St. Clair River is \$8.4 billion over 40 years. (Again, details are provided in Appendix 1.)

Naturally the GLSL economic region is best served by the presence of both Detroit River bridges, because each bridge provides redundancy for the other. The importance of redundancy is highlighted, however, by the enormous cost of having no bridge at the Windsor-Detroit crossing.

Dynamic Impacts

Dynamic impacts arise because the addition of the new Bridge to the existing network has an impact on a variety of business decisions involving, routing, sourcing and location, which in turn

¹⁸ InterVISTAS Consulting. 2009. *Cross-Border Flow Analysis Report 5: Case Study for Company 5 (Automotive Parts Manufacturer)* prepared for Industry Canada.



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affect the levels of cross-border commercial traffic flows. To understand why this happens, first consider some important characteristics of transportation infrastructure. Using the example of a road:

1. **Transportation infrastructure depreciates:** A road may be built to serve traffic moving between two places. Even if that traffic remains constant, the road will wear out over time. Infrastructure investment that replicates the design and capacity of the original road does not reduce travel time, but it still yields a benefit by extending the useful lifetime of the road into the future.
2. **Transportation Infrastructure induces traffic:** When a new road is improved or expanded, making it easier to move between two places, the potential for economic interaction increases. If there is some economic or social rationale for interaction between the two places, that potential translates into increased traffic. So, the benefit of the new road accrues not only to users of the original infrastructure, but also to the new users
3. **Infrastructure alters the spatial pattern of economic development:** When a place is connected by new roads to more potential markets for the goods or services it produces, its economic potential increases and it may experience economic growth that would otherwise not have occurred. At the same time, the new roads expose local producers to more competition. So, some businesses may grow while others contract.
4. **Infrastructure is long lived:** While infrastructure depreciates, its useful lifetime is much longer than that of most capital in the economy. This lifetime varies across types of infrastructure – ranging from 20 years or so in the case of a local road to 50, 100 or more years in the case of major elements such as bridges and tunnels.

While these characteristics are defined with reference to roads, their importance is magnified in the case of bridges. One reason is that bridges tend to be traffic bottlenecks. Because a kilometre of bridge is far more expensive than a kilometre of normal roadway, there is a relatively small number of bridges in any network. For example, if a river divides two urban areas, we would not expect to find a bridge at the end of each road that leads to the river. Rather, there would be one or a few bridges onto which traffic is funneled from many roads. This is why bridges within cities are often points of traffic congestion and the closure of a single bridge can lead to massive traffic congestion. Even in a remote area, failure of a bridge with little or no redundancy can cripple freight systems, as demonstrated by the 2016 failure of the Nipigon River Bridge in Northern Ontario. Failure of a major border bridge would have a much worse disruptive effect.

The cost of building and operating border bridges is even higher than domestic bridges because they have the added expense and land requirements of POE facilities and require significant staffing. This, in part, explains why there has been little addition to cross-border infrastructure and therefore little redundancy in the Canada-US highway freight system, despite increased Canada-US integration since the implementation of NAFTA.

The fact that bridges and other infrastructure depreciate means that investment may be intended either to provide replacement for depreciating infrastructure or to supplement the services provided by existing infrastructure. As our discussion of static benefits illustrates, the new Bridge project addresses both of these needs. It also means that the provision of new infrastructure reduces



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uncertainty about the quality and availability of transportation services in the future. Economic development involves private firms making long term investment in immobile assets such as buildings and machinery. Private investment may be curtailed if there is uncertainty about the long-term availability of necessary infrastructure. Projects such as the Gordie Howe International Bridge are therefore signals to private industry that that transportation needs of their business will be supported.

The argument that transportation infrastructure induces traffic is not based by a simplistic notion that “supply creates its own demand.” If there is not a social or economic rationale for increased spatial interaction between places, no supply of new infrastructure will generate traffic. In a corridor such as the Detroit-Windsor crossing, where history has shown a compelling rationale for interaction, and where there is already a very large flow of traffic, it is likely that infrastructure that reduces costs will induce traffic. For example, if a firm in Ontario finds that it can source an input to its production process more cheaply from a supplier in Michigan than from any domestic supplier, it must balance the savings against the incremental cost of bringing that input across the border. If the border cost is reduced, the likelihood that the Ontario firm will source across the border increases, which generates more cross-border trade and traffic. Or as mentioned above, firms in trade-dependent industries may respond to the long-term assurance of connectivity by making new capital investments. New investments lead to expanded production, which in turn leads to increased cross-border traffic.

More traffic may be induced within a given geographic pattern of economic activity. Characteristic 3 above goes a step further by saying that the presence of new infrastructure can alter that geographical pattern. Transportation infrastructure increases the accessibility of places to one another, making them more interdependent. The result is that each place experiences growth in industries where it is able to sell into external markets, but decline in those industries that lose out to external competition. By this process, a set of relatively self-sufficient and diversified communities becomes more interdependent and specialized. From an economic perspective, this is good for two reasons. First, each place will specialize in those lines of business in which it is competitive due to advantages in terms of natural resources, labour resources, entrepreneurial skills, etc. Second, each line of business will operate in fewer places, but at larger scale, resulting in scale economies.

This is in fact precisely the argument that is made in favor of free trade. Eliminating tariffs has a positive impact on a country’s most productive industries and a negative impact on its least productive industries. Since each country becomes specialized in what it does best, all countries have higher average productivity, leading to a higher standard of living. But since spatial connectivity is necessary for all economic transactions, the productivity effect of infrastructure applies at all geographical scales, rather than just the national scale. Overall, it leads to a more efficient and dynamic multi-regional economy.

The benefits of geographical specialization don’t even depend on each place having an inherent advantage in a particular type of production. For example, two cities might have identical labour resources and other productive assets. They might both be excellent places to locate an automotive component plant. If one city has a large engine plant while the other has large



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transmission plant, their plant-level scale of operation will be larger than if both cities had both types of plants. (This is true both because of the limited size of the market and the limited labour resources in each city.) So by specializing, more efficient production is achieved via scale economies. This type of spatial separation can be observed throughout the North American automotive production complex. Because of this specialization, each vehicle is assembled from components that come from facilities in dozens of different locations, which is only possible because of the dense network of highways that connect them. In this way, transportation infrastructure enables spatial specialization that leads to greater aggregate efficiency. The Ambassador Bridge and other border bridges have made it possible to extend that process across the Canada-US border. The Gordie Howe International Bridge will enhance and reinforce the process, and provide assurance that the spatial production complex will be supported long into the future.

The fact that transportation infrastructure is long lived has a number of implications. For one thing, it emphasizes the need to make good decisions about the location, design, functionality and capacity of major infrastructure elements, because once those decisions are made, we are committed to them for a very long time. A less obvious implication is that, especially for those elements that last for 50 years or more, the economic circumstances in which the infrastructure operates near the end of its service lifetime is likely to be completely different from the circumstances in which it was planned and built. As a result, the ultimate economic function and contribution of such major infrastructure investments are hard to predict.

The case of the Ambassador Bridge provides an illustration. That single piece of infrastructure has played a pivotal role in the economic history of Canada because it enabled the development cross-border supply chains in the North American automotive industry and other industries. Without the ability to “plug in” to the US industrial system in this way, it is questionable whether Ontario would have become one of North America’s most important manufacturing regions. It is unlikely, however, that the proponents of the Ambassador Bridge even envisioned this type of intense economic integration at the time of its construction in 1929.

What lesson are we to take from this? Certainly not “build it and they will come.” There are numerous examples of major infrastructure investments that did not meet expectations in terms of traffic and economic benefit. A more prudent conclusion is that where there are compelling economic and political reasons to expect intense interaction between two places, infrastructure that significantly improves the connection between those places is likely to enable new and unanticipated economic interaction over the course of its service lifetime. It may not be possible to predict the nature or value of such interactions. If we assume, however, that anything we cannot predict has a value of zero, we may systematically underestimate the economic contribution of infrastructure investments. Because of its pivotal location where there is already intense cross-border interaction, and where there are highly dynamic economies on both sides of the Canada-US border, the new Bridge will be well-placed to help unlock the potential for new forms of interaction over the next century.



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Modelling Impacts on Trade and Growth

The proposition that the new Bridge can be expected to increase the total volume of trade and thereby accelerate economic growth may seem hypothetical, but we are able to illustrate the process by means of a data-driven, quantitative framework called a Computable General Equilibrium (CGE) model that was developed specifically to illustrate the broad economic effects of improvements in transportation infrastructure.¹⁹ An overview of the model is provided in Appendix 2, but a simple explanation of its projections are as follows:

The CGE represents the linkages among major economic activities in the economy, including industrial production, labour markets, consumption, investment and government taxes and expenditure. It also accounts for cross border trade between a large number of Canadian and foreign region. The volume of trade depends, in part, on the ease of crossing borders. Thus, it can incorporate the effect of the Gordie Howe International Bridge by reducing the time cost of border crossing in the Windsor-Detroit corridor.

Consistent with the measurement of time savings described above, our model simulation decreases the crossing time in the corridor by 20 minutes. This reduction leads to three fundamental change processes in the model:

- The lower cost of trading via the highway mode at the Windsor-Detroit crossing shifts some trade flows from other modes to the highway mode and from other crossings to the Windsor-Detroit crossing.
- The generally lower cost of cross-border freight movements leads to increases in both exports and imports.
- Benefits from increased trade leads to growth in macroeconomic aggregates such as GDP and wage income.

This simulated change to the macroeconomic aggregates from this simulation are shown in Figure 8. (Simulated changes in trade flows are shown in Appendix 2.) Note than most of the benefits accrue to the Province of Ontario, although there are also significant benefits to Quebec. This reflects the significant trips over the Ambassador Bridge that connect to the Montreal regions, as shown in Figure 2.

¹⁹ The model was developed by Dr Shunsuke Segi of Kyoto University in Japan while he was a postdoctoral fellow at the Cross-Border Institute. An implementation framework for the model was developed by Dr. Hanna Maoh with the assistance of Haibin Dong and Maureen Campbell led the development of data for the model at CBI.

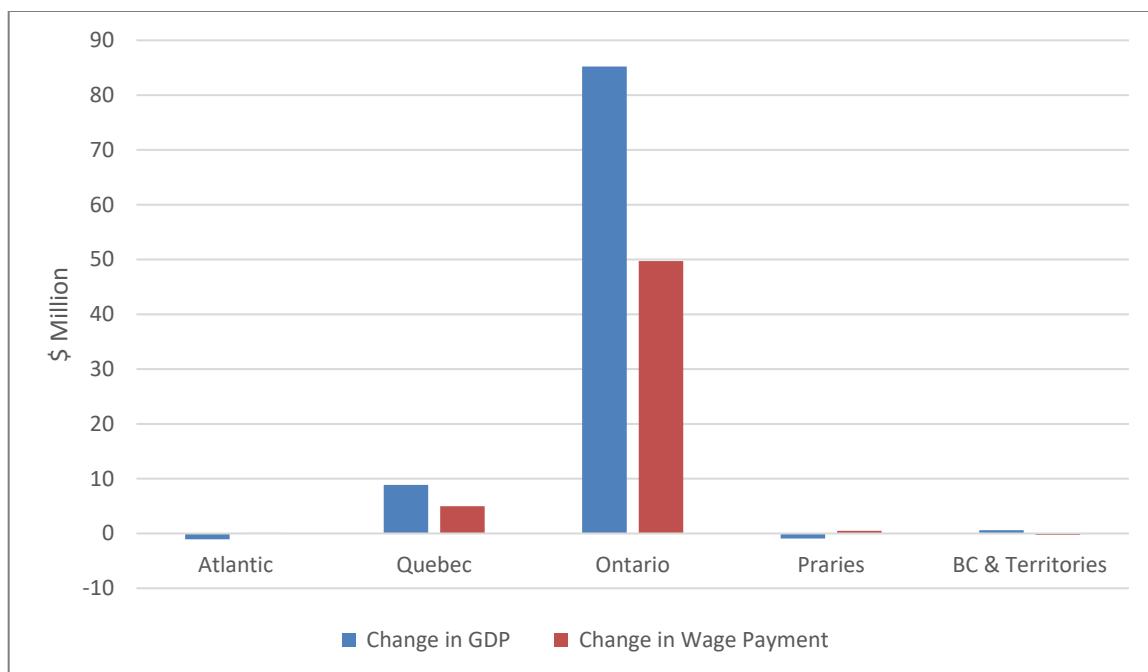


Figure 8: Change in GDP and Wage Payment with Improved Windsor-Detroit Crossing

While the magnitudes of growth in economic aggregates are small relative to their base values, it is important to keep two things in mind. First, these are permanent, annual increases. At a discount rate of 5%, the magnitude of the increase in GDP alone over the 100 year lifetime of the Bridge is about \$1.9 billion. Second, the model's mathematical structure is too simple to capture some important benefits from trade. Most notably, it does not incorporate scale economies, which we have identified as a crucial benefit of cross-border integration in the automotive and other industries. Overall, the model's estimates are very conservative. The main point from this analysis is that the long term macroeconomic benefits of a major project such as the Gordie Howe International Bridge are significant.

Measuring Accessibility

We have explained above that the Gordie Howe International Bridge will confer economic benefits to businesses by making them more accessible to places across the border where they can sell goods or purchase inputs. In this sense, the benefits are in the form of improved *cross-border accessibility*, defined for any location as the ease of reaching locations on the other side of the border where there are firms or households with which you can do business. The value of an accessibility improvement may be different for different firms located in the same location, depending upon their line of business. For example, access to the production of auto parts is important to an automotive assembly plant, but not to farmers engaged in crop and animal production. To the latter, access to producers of seed, fertilizer, feed, farm equipment and other agricultural inputs is more important.

To address the importance of cross-border supply chains in the Great Lakes Region, and to capture the fact that the new Bridge may confer different accessibility benefits to different industries and in different places, we have devised a measure called the *weighted average cross-border travel time*



(WACBT). For each industry in each location of a given country, the WACBT is an inverse measure of the ease of access to the potential sources of its intermediate inputs (materials, parts, etc.) from the other country. The new Bridge will lead to reductions in some (although not all) place-to-place travel times. The reduction in WACBT is therefore our measure of increased accessibility due to improved infrastructure. Figures 8 and 9 are maps of this measure for Motor Vehicle Manufacturing (assembly) and Crop and Animal Production (farming) respectively.

The technical details of this calculation are provided in Appendix 3. Interpretation of the results, however, is possible by keeping in mind that the reduction in WACBT will be high in a particular zone if:

- Most of the activity of industries that provide inputs to the industry in question are located across the border, so they must use the Gordie Howe International Bridge or some other crossing – i.e., if most of the inputs are in the US, accessibility improvements will be greatest in Canada; and
- Most of the zones' cross-border activity is efficiently accessed across Detroit-Windsor rather than any other border crossing.

Putting it into words, a reduction in WACBT of 10 minutes means that producers in a particular zone will be on average 10 minutes closer to their inputs after the new Bridge is available than they are at present. (While 10 minutes may not seem like a long time, for a truck travelling at 100 KPH it is equivalent to moving the average input supplier 17 km closer.)

Looking at the patterns in Figures 9 and 10, the following conclusions apply to both Motor Vehicle Manufacturing and Crop and Animal Production:

- Cross-border accessibility improvements conferred by the opening of the new Bridge are greater in Canada, owing to the greater number of supplier locations on the US side of the border – which means that Canadian producers are more dependent on cross-border suppliers.
- Improvements in Canada are greatest in Southwest Ontario but are significant throughout Southern Ontario to the GTA and extend well into Quebec.
- Improvements in Northern Michigan and along the Lake Huron shores in Southwest Ontario are low because firms in those areas are more likely to use the Blue Water Bridge.
- The pattern of greatest accessibility improvements in the US is principally to the south and west, following major highways including the I-75 inter-state highway.

The reduction in Figure 10 are more heavily skewed to the Canadian side because production of agricultural inputs is highly concentrated on the US side of the border, while auto parts production is somewhat more balanced between Canada and the US.

While it may seem that more benefits accrue to Canada, in fact firms in those Canadian places that have the greatest improvement in cross-border accessibility are the most likely to increase their



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importation of auto parts or agricultural inputs from the United States. (This is an example of Characteristic 2 above – transportation infrastructure induces traffic and trade.) At the same time, the cost savings by having better access to cross-border inputs means that automotive plants and farm production have a greater potential to locate or expand in those places. Thus, the benefits of enhanced accessibility should not be viewed through the lens of a zero-sum competition for business. Rather, accessibility increases the growth prospects and productivity of businesses on both sides of the border, thus improving the long term prospects of the binational GLS economic region.

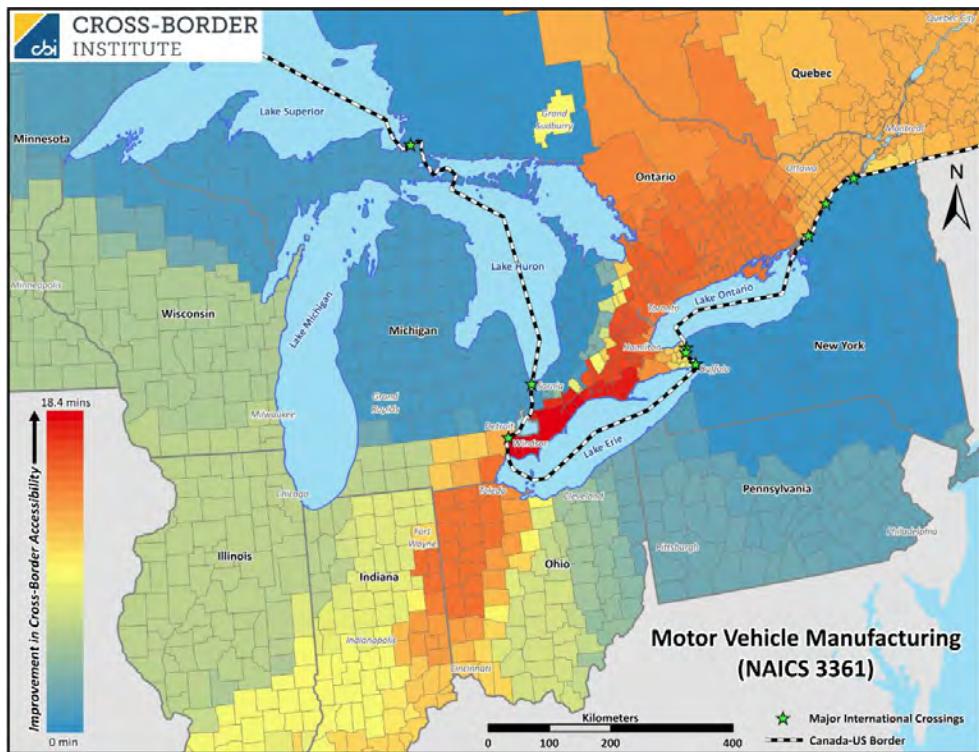


Figure 9: Improvement in Cross-Border Accessibility: Motor Vehicle Manufacturing



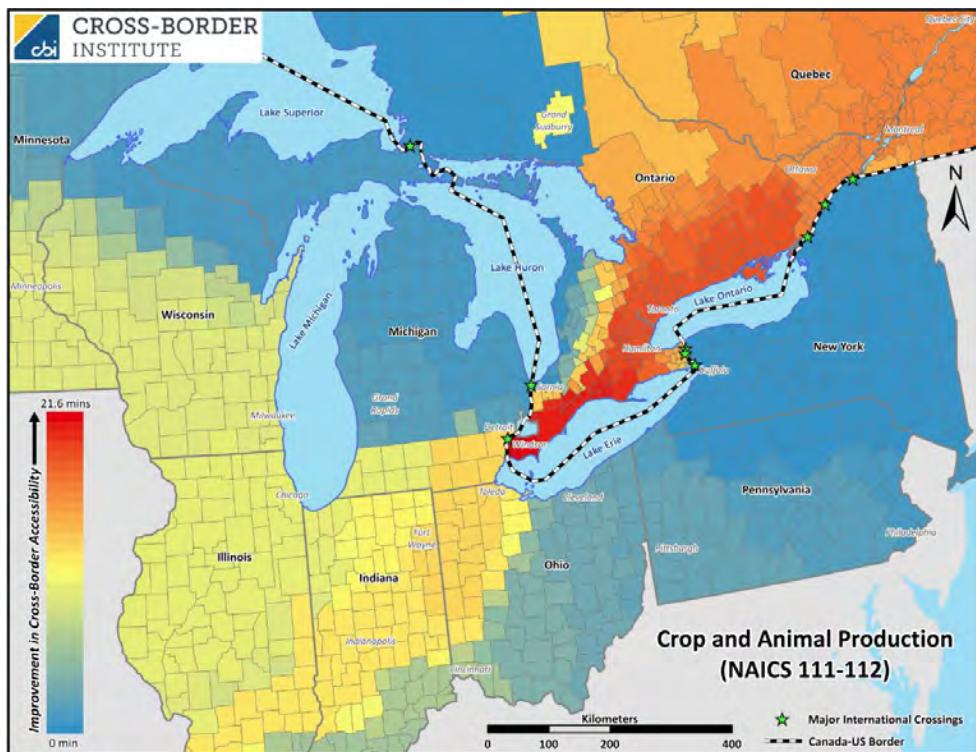


Figure 10: Improvement in Cross-Border Accessibility: Crop and Animal Production

III Opportunities

As we have noted, the distinction between impacts and opportunities is that impacts occur more or less automatically once the new Bridge is open, while opportunities typically require some additional actions by public sector players in order to be fully realized. Based on our background research on industry priorities and trends, our quantitative feasibility analyses and consultations with numerous industry players, we have concluded that the transportation, distribution and logistics (TDL) sector is uniquely well placed to benefit from the combined Parkway/Bridge configuration. TDL therefore presents the most significant and attainable opportunities for the development of new activities or expansion of existing activities stimulated by the Gordie Howe International Bridge project.

We have argued throughout our impact analysis that the improved accessibility provided by the Gordie Howe International Bridge will benefit all goods production industries that trade between Canada and the US. Why, then, in identifying opportunities are we placing a strong focus on TDL, which is a service industry? In brief, our focus arises from the following three factors:

- Geographical Focus:** The economic benefits to goods producers who use the new bridge are geographically dispersed. For example, a manufacturer who ships goods into the US via the new Bridge will have the same per-truckload saving whether it is located in Windsor-Essex, in the Greater Toronto Area or even in Quebec. This is a good thing – one reason that the economic impacts are so large and pervasive is that they extend far from the Detroit



River crossing. However, economic initiatives – especially those related to the production and movement of goods – are more easily organized and implemented on a regional basis. For reasons discussed under factor 2, the addition of the New Bridge creates a relatively compact region of enhanced potential for TDL development.

2. *Traffic Flow as a Market Asset:* Because there are relatively few border crossings in the bi-national GLSL Region, each crossing funnels a huge volume of trucks and cars through a narrow corridor. While pejorative terms such as *bottleneck* and *choke-point* are often used, such a concentration creates a valuable market asset for communities adjacent to the crossing. The strategy of the TDL cluster development we are proposing views the flow of trucks as a rolling market, to which a variety of services can be provided by regional businesses. While TDL industries based in most regions are dependent on local demand, such industries located in SE Michigan and SW Ontario can serve a much larger North American demand. (We expand on this point below.)
3. *Significance of the new crossing configuration.* Since there is already a very large flow of trucks through the Detroit River crossing, why does the addition of the New Bridge substantially enhance the potential for TDL development? For one thing, we anticipate that the improved crossing performance will have a positive effect on the flow. But more importantly, the realignment of access routes to the border, especially on the Canadian side (see figure 1), will make more sites available with direct access to major highways. This will provide opportunities for TDL development that are commercially attractive but also have minimal impact on local traffic and are sensitive to potential land use conflicts including environmental concerns.

Factor 2 is especially important because it defines the economic rationale for TDL development. We can illustrate how the cross-border flow of trucks represents a market asset through the example of a common logistics facility called a *cross-dock*. A cross-dock facility receives and redirects goods without putting them into storage. For example, a truck from Indianapolis carrying goods bound for all destinations in Ontario may arrive at the cross-dock, where its freight is broken up and transferred to separate trucks bound for London, Toronto, St. Catherines etc. Each destination-specific truck will take on freight from several trucks arriving from different points of origin: e.g. Indianapolis, Cincinnati, Grand Rapids, etc. There may not be enough freight to fill a truck between many origin-destination pairs. However, by consolidating all the Ontario-bound freight from each US destination into a single truck and bringing it to a cross-dock facility where it is temporarily unloaded and then reconsolidated into trucks bound for specific Ontario destinations, it is often possible to fill trucks, making delivery cheaper and more environment-friendly. (Note that this is similar to the function of a hub airport, where flying people in from a number of different origins and transferring them to planes to various destinations serves the purpose of filling planes.)

A successful cross-dock must be located where it can serve trucks from many different origins carrying freight bound for many different destinations. Therefore, it should be located at a point in the highway network where a wide variety of truck routes come together. Because the border crossing funnels diverse truck movements through a narrow corridor, it creates such a point.

Even in such an ideal location, the potential to locate a major cross-dock facility depends on rather demanding site requirements. Because it must accommodate a large number of trucks without too



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much congestion, and because it must have sufficient interior space to efficiently move freight between trucks, it requires a large site. Also, because the cross-dock attracts many trucks it should be located directly adjacent to one or more major highways. Not only are such locations preferred by truck operators, they also avoid land use conflicts by eliminating the need for trucks to access the facility via municipal roads. Since emissions from trucks are much higher when they are moving in stop-and-go city traffic, keeping cross-dock facilities within highway corridors also minimized the negative environmental and health impacts from truck-related activities. When compared with the current route for border access, the new crossing configuration for the Gordie Howe International Bridge makes many more such appropriate sites available. While our cross-dock example is for a specific type of facility, it is generalizable because other logistics facilities (e.g. cold storage, bulk load facilities, distribution centres, etc.) have similar location priorities.

On the basis of the three factors above, we conclude that the construction of the Gordie Howe International Bridge greatly enhances the business case for the establishment of a TDL intensive cluster on both sides of the border at the Detroit-Windsor crossing. A number of additional factors reinforce this conclusion:

- the new Bridge is reasonably close to road/rail intermodal facilities in Michigan and Ohio that can be linked to the logistics cluster via transporting containers on a truck trailer (a process known as drayage), thus providing local access to major rail and shipping lanes;
- the regional experience in automotive and other logistics-intensive industries provides a base of facilities and skills to build on, and;
- Locations close to the Bridge will provide opportunities for border-related services, such as on-site inspection and services to help address the shortage of cross-border drivers.

Another reason for our focus on TDL activities for the “opportunities” aspect of this study is that concerted and coordinated effort by public and private sector actors is necessary to spur economic growth in this sector. Economic growth in goods producing industries may be expected to arise principally through the action of economic mechanisms. As cross-border transportation costs are reduced, producers become more competitive and may be expected to grow. Reducing the economic impediment of the border helps the most efficient firms capture a larger share of the bi-national market, leading to scale economies and productivity growth. Supportive public policy and recruitment by regional development agencies can accelerate this process, but new institutional arrangements are not necessary to trigger this type of economic benefit.

A similar argument applies with respect to retail and tourism activities. Much as the new Bridge creates a concentrated flow of trucks through the corridor, it also provides a concentrated flow of people in passenger vehicles who constitute a mobile market for these activities. Restaurants, outlet malls, and all tourist attractions can benefit from this increased supply of potential customers. Retail developers, with the support of necessary planning permissions, can be expected to take advantage of these improving market conditions by investing in retail space. Major hospitality operators (hotel and restaurant chains) may be expected to take advantage of enhanced demand with new investments in the highway corridors leading to the new Bridge. Tourism boards and agencies can be expected to advertise major regional attractions along the same corridors. The



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public and private mechanisms needed to take advantage of the new opportunities created are already in place.

On the other hand, as we explain below, the creation of a TDL cluster will require the establishment of a new coordinating institution on each side of the Detroit River, with an international board or committee to ensure that the TDL cluster activities in the US and Canada develop in a consistent and complementary fashion. These new institutions must have responsibilities and authority with respect to land conversion and servicing, environmental assessments, community consultation and other processes that need public sector input. They will also require private sector partnerships and coordination to achieve a critical mass of investment and expertise. Until such new private-public institutional arrangements take place, the TDL opportunity cannot be transformed into substantial economic benefit. Thus, our focus on TDL development does not suggest that economic growth in other sectors is somehow less important but rather, consistent with our definition of the distinction between impacts and opportunities, that a new public-private strategy and supporting institutional structure is necessary to exploit the full potential for growth in TDL activities.

Experts in logistics and distribution site selection have said that in the current economic environment, local workforce resources have emerged as the decisive factor in many development choices. The ability to marshal workforce resources and demonstrate their availability to potential investors will therefore be a key for the success of any logistics cluster.

The fact that there is good potential for development in a particular economic sector does not, in itself, justify setting such development as a regional economic development priority. It must also be the case that activity in that sector will yield substantial economic benefit to the people in the region. We conclude that the establishment of such a TDL cluster will provide great economic benefits to the region on both sides of the border because:

- TDL activities provide employment opportunities that can be filled by workers from both countries who may be displaced from manufacturing;
- growth in TDL services will enhance the competitiveness of other industries in the region, including manufacturing, agrifood and e-commerce, and;
- Logistics facilities, combined with the improved cross-border flow via the new bridge, will more effectively connect the Detroit-Windsor region not only to North American road and rail networks, but also to global shipping lanes.
- Negative environmental impacts from TDL or any other economic activity can offset the value of economic benefits. However, because of the opportunity to limit facilities development to sites within the highway corridors, emission can be kept to a minimum and provision of buffer spaces can minimize land use conflicts.
- TDL supports a full range of jobs from routine tasks to highly advanced jobs in information and communications technology. Its benefits are therefore available to a wide cross section of the local population.

The last point is especially important. There is a popular, but erroneous, perception that TDL industries are “low tech.” In fact, this economic sector is currently experiencing a technological



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transformation. Not only are industry giants such as Amazon, Maersk, UPS and FedEx making major investments in technology to speed goods movement, reduce costs and preserve information on the chain of possession for regulatory enforcement, a new wave of start-ups employing artificial intelligence, blockchain, geomatics and other technologies plays an increasing role in the TDL sector. Technological innovation by these firms is highly complementary to the tasks of border agencies, who must collect, process and manage huge volumes of data on the goods and people passing through their ports of entries. The juxtaposition of a cluster of innovative TDL facilities with one of the most important land border crossings on earth provides the ideal environment for a technological revolution in border operations, nurturing the development of a specialized technology cluster on both sides of the border.

In what follows we discuss the rationale for our conclusions based on analysis conducted in this study and on consultation we conducted in various ways with informed stakeholders. We then propose a series of steps that will be necessary to take advantage of the stimulus provided by the Bridge project to create TDL cluster on both sides of the Detroit-Windsor crossing.

Transportation, Distribution and Logistics (TDL)

TDL activities include all physical movement and storage of goods, along with the associated communication and information processing, involved in producing goods and services and delivering them to their final purchasers. In other words, TDL gets things where they need to be, when they need to be there. It is a somewhat narrower term than “supply-chain,” which encompasses every aspect of the transformation of natural resources in the ground to a final good in the hands of an end user, but references to supply chain activities and TDL activities tend to overlap. It is a common misconception that TDL applies only to goods-producing industries like agriculture and manufacturing, as service activities such as restaurants and health care facilities are highly dependent on TDL as well.

The business functions of firms in the TDL sector are diverse but integrated. *Carriers* move goods between shippers and receivers in trucks, trains, marine vessels and aircraft. *Integrators* provide transportation over more than one mode. For example, FedEx integrates air and road freight. There are specialized facilities where goods are shifted from one vehicle to another, such as an *intermodal facility* where goods in standardized containers can be shifted from trains to trucks. *Crossdock* facilities allow goods to be unloaded from trucks, sorted by destination, and reloaded on other trucks within a few minutes. Some industry actors serve coordinating functions. For example, *freight forwarders* are intermediaries who consolidate loads from different shippers and reduce costs by contracting full vehicles rather than partial loads. *Customs brokers* help importers prepare all the necessary legal documents and payments needed to move goods across an international border. *Third party logistics (3PL)* firms assume a firm’s logistics functions such as shipping and receiving, warehousing, order fulfilment, on a contract basis, and some also provide transportation services.

There are a number of TDL facilities in which goods are held in inventory for some time as they move between their producers and ultimate consumers. A basic *warehouse* allows goods to be stored until they are needed. Warehouses may also provide *value-added services* such as labeling,



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packaging, sequencing of parts and even customs brokerage. *Bulk transload facilities* are used to store commodities such as grain or fuels. A *customs bonded warehouse* allows importers to store goods that have crossed a border without paying duties until the goods are actually sold or transferred to a third country. Massive *distribution centres*, which hold thousands of distinct items that will eventually appear in supermarkets and other retail outlets, use advanced information technology to manage and replenish inventory and ensure that retail shelves remain stocked. Where fresh or frozen foods, flowers, pharmaceuticals and other temperature-sensitive goods are involved, *cold-chain facilities* with carefully climate-controlled zones are required. The rapid growth of e-commerce has led to the growth of *fulfillment centres*, where goods are picked from complex inventories and packed for shipping.

The large number of vehicles and workers involved in TDL operations creates a demand for *service centres*. The classic example of this category is the “truck stop” where truck fuel and repairs are offered along with food, showers, and other amenities for drivers. These facilities also play the important role of providing parking space for drivers who have exhausted their hours of service (HOS) limits.

In addition to carriers, warehouse operators, and other firms dedicated to one link in the supply chains, there are a number of actors who combine functions.

Given the variety of actors and facilities in the TDL sector and the interrelationships among them, there is a tendency for these activities to locate close together in zones known as *logistics intensive clusters* or *integrated logistics centres*. In what follows we will refer to such developments as “TDL clusters.” Sometimes these clusters arise spontaneously through complementary location decisions, but increasingly they are planned developments.²⁰

There is some confusion about the word *hub* as it applies to logistics facilities – not every TDL cluster is a logistics hub. A hub, in the context of TDL activities, refers to a place where goods are shipped in, subjected to some sort of logistics function, and then shipped out, often by a different mode. As an example, logistics facilities in the Chicago region, where all North American class I railroads converge, have been providing this hub function for over a century.

From an economic development perspective, this type of cluster has a particular significance. Regional economists generally regard logistics activities as providing services for local firms and households. However, when goods come in from Los Angeles to a hub in Chicago, receive some form of logistic services, and then are shipped out again to Toronto, the logistics industry in Chicago has provided services for firms in Los Angeles and Toronto – which is to say they have exported logistics services. This is significant because regional economic theory suggests that a region’s growth is driven by the goods and services it provides to demand outside its boundaries. In the

²⁰ For extensive discussion see Higgins, C.D. and M. R. Ferguson (2011) *An Exploration of the Freight Village Concept and its Applicability to Ontario*, McMaster Institute for Transportation and Logistics, and

Sheffi, Yossi (2012) *Logistics Clusters*, Cambridge MA: MIT Press.



same sense that Windsor and Detroit produce cars for the North American market, Chicago produces logistics services for the North American market.

For reasons we discuss below, the completion of the Gordie Howe International Bridge may create the right set of economic conditions for the establishment of a TDL hub cluster at the Detroit-Windsor crossing.

TDL site selection factors

In order to assess the potential of the Bridge project to create opportunities for TDL activities in Southwest Ontario and Southeast Michigan, it is first important to understand the drivers behind TDL site selection.

Transportation costs: Logistics is one of the few industries where transportation costs are the most important component of total costs. (Inventory costs are generally the second most important.) So, it is critical to choose a location that provides low transportation costs. This has two implications. First, site selectors will favour locations that have good network accessibility to relevant markets and second, for truck-based facilities, site selectors look for 5 / 55 locations – which means locations where the truck can get into a 55 MPH stream of traffic within 5 minutes of leaving the facility gates. This favours location close to freeway interchanges. In addition, access to intermodal facilities where goods can be transferred across road, rail, air and water modes are preferred. Site selectors will also favour points of centrality on a transportation infrastructure network. Much as the convergence of rail networks made, and continues to make, Chicago a unique location for TDL activities involving rail, the convergence of the Canadian and American highway networks at the Detroit River crossing make it a unique location for TDL activities associated with Canada-US trade, especially trade via the truck mode.

Availability and cost of land: Nearly all TDL activities are land intensive, owing to need for large paved aprons around buildings that are generally of only one story. It is therefore not realistic for logistics facilities to compete for land with facilities such as high-rise office buildings that generate a lot of revenue per area of footprint. This implies an advantage for areas with available land at low cost and in large parcels – generally over 10 acres but preferably over 50 acres for some types of facilities, and much more for logistics intensive clusters.

Economic scale: For some types of logistics facilities, the minimum efficient scale of operation rules out many locations. The intermodal centre is an extreme example: because a modern facility requires a very large site and a number of expensive cranes used to lift and relocate containers, operations that achieve fewer than 200,000 lifts per year may not be feasible, and more than 500,000 lifts is more typical of contemporary locations. This means that many urban areas cannot generate a sufficient number of container movements to support such a facility. This is important, because the intermodal facilities are often catalysts for the formation of a major logistics hub, such as inland ports where shipping containers are delivered by rail, processed in TDL facilities and goods are transferred to trucks.

Labour force: Despite a rapid move toward automation, logistics facilities are still quite labour intensive. Work in such facilities can be physically demanding, however, and may not be well suited



to an aging workforce. Also, as new technologies are adopted, the need for people with specialized skills in programming and supply chain management and the need for general computer literacy of the workforce is increasing.

Public Consultations

Over the course of this study, the research team consulted with shippers and TDL industry experts to gain a better sense of how they viewed the benefits of the new Bridge and the potential for expanded TDL development on lands with good access to the POEs of the new Bridge. Since land development and planning will be integral to the development of a TDL cluster, we also consulted with relevant government officials and economic development specialists. The consultations took three basic forms:

- Members of the research team met one-on-one with well over 100 stakeholders, mostly representing the logistics industry – including carriers, 3PLs and 4PLs²¹ – but with significant representation from international shippers and representatives of public sector agencies.
- Survey instruments were sent to people with interest and experience in cross-border business.
- A series of workshops were held on both sides of the border, where participants were asked to comment on the viability and need for a binational logistics cluster around the Gordie Howe International Bridge and the actions by private and public players that would be necessary to bring such an idea to fruition.

Details of these public consultation are provided in a separate report.²² The most important information that we drew from these consultation activities are summarized in *Appendix 4: Outcomes from Public Consultations*. This information is critical to the analysis and recommendations that follow.

Regional SWOT

With the results of our consultation and TDL site selection factors in mind, we set the context through a SWOT (Strengths, Weakness, Opportunities, Threats) analysis of the Southwest Ontario / Southeast Michigan, cross-border region.

Table 1: SWOT Analysis for Logistics Intensive Cluster

²¹ 3PL stands for third party logistics service operations who provide, on a contract basis, a firm's logistics functions such as shipping and receiving, warehousing, order fulfilment, and others and may also provide transportation services. 3PLs that do not directly own or operate logistics or transportation assets are sometimes called 4PLs.

²² *The Gordie Howe International Bridge and the Great Lakes Economic Region: Assessing Economic Impacts and Opportunities, Comprehensive Assessment of Economic Benefits, Final Report on Public Consultation*, submitted January 31, 2019.

Strengths	Weaknesses
<ul style="list-style-type: none"> • Central location / accessibility • Access to freight flow in the corridor • Pivot point for rest and repack • Logistics expertise • Availability of Land: sites and price • Industrial labour forces • FTZ designation 	<ul style="list-style-type: none"> • Small local market (Canadian Side) • Lack of intermodal facility (Canadian Side) • Location “on a peninsula” (Detroit) • Reputation as a “flow through” town (Windsor)
Opportunities	Threats
<ul style="list-style-type: none"> • Cross border ecommerce • Logistics services to agriculture • Cross-border access to containers • Integration in retail and other sectors • Effective use of backhaul capacity • Truck driver shortage • Emerging Technology 	<ul style="list-style-type: none"> • Trade restriction • Slow growth labour force • Land use conflicts • Truck driver shortage

Strengths: The first two strengths identified for the region are connected to transportation. The location at the center of the highway network presents a high accessibility location, which translates into low transport costs to a large number of urban markets on both sides of the border. But it is not only access to other places, but also access to the flow-through traffic that presents opportunities, especially for services to the logistics industries such as truck stops. While most flows through without stopping, the border is seen by some operators as a “pivot point” that is well suited for things like cross docking and rest at a truck stop. In particular, the channeling of so much freight through the border corridor is advantageous to TDL activities such as cross-docks, distribution centres, and others that require trucks with diverse origins and destinations to meet at a single point.

Another strength is the very high local level of logistics expertise. Even though neither Windsor nor Detroit functions as a logistics hub, there has for decades been a very high level of logistics activity associated with the automotive industry, which is very logistics intensive because of the transfer of parts in complex supply chains. Declining manufacturing employment on both sides of the border provides a pool of reliable labour with general skills to draw on for work in logistics facilities.

Compared with other cities in the Great Lakes, such as the Chicago and Toronto metropolitan areas, there are ample land resources. On the US side the city of Detroit is in the process of re-tasking abandoned or underutilized industrial or residential land. While on the Canadian side the supply is more limited, there are some areas available for development that are well placed relative to the main freeway (401) and border crossings. It is important to recognize that the utility of land ultimately depends on complementary infrastructure that makes it accessible and developable; principally access roads and water and sewage services. Our analysis of available land parcels on the Canadian side identified many sites that were well located and accessible but did not have services in place. Thus, land availability as a strength is highly contingent on the ability and



willingness of municipalities, perhaps with the support of higher orders of government, to make investments in services.

Finally, both Windsor-Essex and Greater Detroit have designation under flexible Free Trade Zones (FTZ) programs that allow importers to easily establish facilities that function as customs bonded warehouses.

Weaknesses: On the Canadian side, the major weakness is the small size of the local market. This in turn leads to the second weakness, which is the lack of an intermodal facility. This is not the case on the Detroit side, where there are several intermodal facilities.

A fundamental weakness faced on both sides of the border is the (perceived or real) location “on a peninsula.” If you imagine the Detroit River as an impenetrable border, Windsor would be a remote location, 2 hours down the 401 from next large urban market, London, Ontario. In a similar way, Detroit would also be located on the edge, rather than in the centre of the urban network of the Great Lakes States. Windsor, in particular, has a reputation as a “flow though” town for carriers, an image that may be difficult to erase.

The automotive industry has demonstrated that in an integrated sector, the peninsula effect does not exist. Not all industries, however, are as well integrated across the border as automotive. In particular, retail supply chains – which normally account for a very large share of TDL activity – are not well integrated across the Canada-US border. Reasons for this include a general lack of harmonization on things like labeling, container size regulations, etc., as well as the complexity of moving retail goods through the Canada-US border.

Opportunities: The opportunities we have identified will be expanded upon below, so we review them only briefly at this point. The first is the rapid growth of ecommerce. Most major fulfillment centres are located on the US side. Logistics operations that provide services to facilitate cross-border ecommerce sales for American ecommerce firms are already located in Windsor, and there is potential for expansion.

The second is the need for better logistics services to agriculture, which is an important part of the economy on both side of the border.

While there is very limited access to containers in Southwest Ontario, there is the potential for Canadian business to take advantage of intermodal facilities on the US side by draying containers across the border. This could open up new opportunities for international trade, such as the export of high value agricultural commodities in refrigerated containers.

The automotive sector has demonstrated that with a sufficient economic and regulatory incentive, most of the problems of cross-border supply chain integration can be overcome. With increased cooperation on regulations under the Canada-US Regulatory Cooperation Council (RCC) some of the complexities that limit integration in retail and other sectors may be overcome, eliminating the peninsula effect and expanding opportunities for logistics activities.



The structure of logistics in the automotive industry creates an imbalance between inbound and outbound freight. Trucks arrive delivering parts to assembly plants but leave empty. Finding new opportunities to fill empty backhauls may create new logistics activities as well.

The truck driver shortage is also listed as a threat. Opportunities may arise from the establishment of facilities that address the shortage by facilitating transfers between American and Canadian drivers.

The TDL sector has been ripe for technological development as legacy systems have fallen far behind the state-of-the-art for IT in most other industries. There is currently a surge of start-ups developing fully digital logistics solutions using distributed ledger and other new technologies. These systems also feed into border processing. A new logistics cluster that embraces these technologies may have an advantage over others that are burdened by legacy systems.

Threats: The greatest threat to logistics activity in the region under study would be increased limitation on Canada-US trade arising from an abandonment or restrictive renegotiation of NAFTA or a new environment of protectionism. This risk has been reduced by the agreement on the USMCA, but that agreement is yet to be ratified and the US has used the claim of national security to impose high tariffs on steel and aluminum. While these tariffs have been eliminated and provisions in USMCA restrict such imposition of tariffs on cars and trucks, the threat of further tariff imposition has sown uncertainty in the minds of industrial investors. In a worse case (and unlikely) scenario even the automotive industry could become less integrated and reduce the logistical advantage of operating close to the Detroit River crossing.

Slow workforce growth is another threat. Demographic trends dictate that growth due to natural increase will be slow but labour force growth on both sides of the border is in a position to benefit from immigration. This is especially true for Windsor, which unlike other smaller metro areas enjoys a high rate of immigration, especially from the Middle East. The Detroit area also enjoys substantial immigration from the Middle East, which could be threatened by restrictive immigration policy.

The truck driver shortage is a threat because it is especially difficult to find drivers for cross-border work – both because many drivers are disqualified from border crossing due to past convictions and because those who are qualified to do cross-border work often reject it to avoid being stuck in long queues. This problem is exacerbated by the recent imposition of more stringent hours of service (HOS) regulations and the requirement for electronic logging devices (ELD). As noted above, this threat can be an opportunity if logistics facilities are established to help carriers address the problem.

Finally, land use conflicts are always a problem for logistics development. The Canadian side of the border has some rare and precious environmental resources located close to potential logistics sites. A concerted effort to accommodate legitimate environmental concerns in new developments is needed. On the Detroit side, land transformation that could create economic opportunity and jobs might also threaten the viability of economically challenged residential communities.



How does the new Bridge change things?

The Gordie Howe International Bridge project – in combination with the Herb Gray Parkway project on the Canadian side – enhances the suitability of the Detroit / Windsor region as the location of a logistics hub serving cross-border goods movement in four ways: 1) it improves the accessibility of the region to other places that are sources and destinations of cross-border shipments; 2) it eliminates the risks associated with the absence of redundant infrastructure, 3) it increases the flow of trucks through the cross-border highway corridor; and 4) it opens up opportunity to develop land that meets the requirements of logistics facilities.

Figure 7 above shows the Bridge and Parkway projects and how they connect to the major highways on either side: Ontario Highway 401 on the Canadian side and Interstate I-75 on the US side. Note the current route is via Huron Church Road in Windsor, which has numerous signalized intersections leading to the Ambassador Bridge. Also, prior to completion of the Parkway, trucks took a route that included signalized intersections and was often heavily congested starting around Howard Avenue. In essence, the improvement in cross-border traffic flow for trucks is coming in two phases. In the first, starting from the opening of the Parkway in 2015, the flow of traffic from the end of the 401 to the intersection of the E.C. Row Expressway and Huron Church Road is carried by a limited access highway instead of a signalized arterial road, eliminating delays. In the second phase, which will be realized when the new Bridge opens, it will be possible to cover the entire distance from their 401 to the border on a limited access highway.

Accessibility improvement is demonstrated in Figures 9 and 10 above. Using the weighted average cross-border travel time to production facilities in a number of different industries as an indicator, we demonstrate that accessibility is significantly enhanced in both the Windsor-Essex and Detroit areas. This means that if we think of the GLSL as a bi-national, integrated production region, the locational advantage for serving hub functions in the regions around the Detroit-Windsor crossing will be reinforced by the Bridge project.

The absence of redundancy for most truck movements across the Detroit River crossing discourages cross-border supply-chain integration. From our consultations, we believe that some potential investors are reluctant to risk having supply chain assets stranded on opposite sides of the border in case of a catastrophic failure or other problem that causes the Ambassador Bridge to shut down for an extended period. (The Windsor-Detroit Tunnel cannot accommodate most full-sized trucks and the ferry services may be too expensive and slow to serve as a long-term alternative.) With the addition of a second bridge, this concern will be alleviated, paving the way for increased integration of supply chains, even in retail.

Some hub functions depend not so much on a location's accessibility to the origins and destinations of trips as on the magnitude of through traffic. For example, a truck stop can be successfully located where there is a sufficient density of long-haul trucks passing, irrespective of their origins and destinations. As we noted above, cross-docks and several other types of TDL facilities benefit from



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locations at which trucks moving between spatially dispersed origins and destinations in the US and Canada intersect one another. While no quantitative estimate is made as part of this study, it is reasonable to expect that the opening of the new Bridge will increase the flow of trucks through the corridor first because a faster, more reliable crossing will compete some trucks away from the Blue Water Bridge and second because the reductions in border costs will have a trade enhancing effect, leading to more trucks overall.

There are two types of sites that would be most appropriate for facilities related to a cross-border logistics hub. The first includes sites that are close enough to the POEs to be very convenient for access by CBSA and CBP employees and to possibly accommodate ideas that are described below involving driver exchanges and the temporary storage of as yet uncleared goods. The second includes a broader class of sites that have fast access to the Bridge, unimpeded by signalized intersections and with very little travel on local roads. When we talk about a TDL “cluster” we do not necessarily mean a single, large contiguous site. A cluster can occupy a number of sites, each well suited to a different logistics function, as long as they are sufficiently concentrated and well connected to act as an integrated service centre.

There are several niche markets for cross-border supply chain integration that may be feasible as soon as the new Bridge opens:

Canada-US Cross-docking: A fundamental rule in supply-chain logistics is that it is cheaper to ship goods in a full truckload between a single origin and a single destination than to combine shipments from several origins and bound to several destinations on the same truck. In the jargon, truckload (TL) shipping is less costly than less-than-truckload (LTL) shipping. The difference in costs is magnified when goods must cross the border, as certain trusted trader programs are available only to TL service. Also, if a single shipment on an LTL truck is targeted as suspicious, the whole truck is sent to secondary inspection. For shippers, this means that even if they have a very clean record in cross-border trade, their goods may be held up because they are sharing a truck with a shipper who does not.

As we have already explained above, cross-docking is a logistics procedure that helps to fill trucks. Locations on either side of the new Bridge will be very favourable for cross-docking, first because of the advantage of using TL service to cross the border and second, because the very large volume of trucks in the Highway 401 – Gordie Howe – I75 corridor improves the probability of matching trucks to quickly move shipment through the facility. (Representatives of two very large cross-border service providers mentioned cross-docking as the most obvious and likely function for a logistics cluster adjacent to the new Bridge.)

E-commerce: Both Canadian and American consumers are making an ever-increasing share of their purchases online. Because Canadians purchase a lot from US e-retailers, a kind of implicit cross-border integration of retail is taking place. This has already led to novel logistics activities, some of which are located close to POEs. For example, a model has developed whereby orders



taken by US e-retailers from hundreds of Canadian online customers are consolidated and shipped across the border as a single consignment addressed to a Canadian logistics partner. The advantage is that it is easier to clear a truck with a single consignment than a truck with goods addressed to several hundred customers. The Canadian partner firm then deconsolidates the load and ships the orders to the Canadian customers. The logic of this service is similar to crossdocking, but it requires a more complex and labour-intensive facility in which orders can be picked and packed. (Farrow Logistics, located in Windsor Ontario is already an industry leader in this service.)

In apparel and some other lines, a third or more of e-commerce orders are returned. This creates a challenge of “reverse logistics,” which is even more challenging when goods have crossed the border and had duties paid. When such goods are returned, they must either be redirected to other customers in the country of import or sent back across the border, with the added administrative task of recovering duties (a process known as drawback.) A large central facility for processing international returns might find its best location in a cross-border logistics cluster.

Global Trade: A substantial proportion of Canada’s trade with Asia arrives by truck. A typical route for consumer goods from China, for example, is to cross the Pacific by container ship, arrive at LA / Long Beach or other US port, and then be moved in the original container by rail to a logistics hub in Chicago. From there it is moved by truck into southern Ontario. As those goods cross the border, they require the service of customs brokers and other intermediaries and may be delivered to warehouses from which they will finally be distributed to the retail point of sale. A warehouse that provides single window services might conveniently be located in Windsor-Essex, which is designated under Canada’s FTZ Point program as an area that can provide favourable customs treatment. A similar import service might be established in Detroit for goods passing from third countries through the Port of Montreal for delivery into the US. Also, drayage services might be instituted to move containers from nearby intermodal facilities in Southeast Michigan and Northwest Ohio across the new Bridge to logistics facilities in Windsor.

Industry experts indicated that such a logistics function could be viable, but only if it reduces cost per container while reducing or at least matching delivery times through existing routes. This suggests that a large facility employing advanced technology would be most competitive.

Climate controlled facilities with inspection capabilities: Cold storage warehouses are important logistics facilities that handle goods that must be kept at specific temperatures that vary by good, but in general are below ambient temperatures. The concept of the “cold chain” applies to supply chains where it must be verified that the goods have been kept within a specific temperature range throughout the cycle of production, storage and distribution. This implies that even the loading dock in a logistics facility must be kept a specified temperature. The two major categories of goods that pass through these facilities are food and pharmaceuticals. The food category includes produce, meat, dairy products, seafood, frozen and a variety of processed foods. In order to accommodate all these categories, the facility must have several zones that maintain different temperatures. These stringent requirements mean that climate control facilities have much



higher development costs than other warehouses or distribution centres, and that they have very high energy costs once they are operational. The presence of pharmaceuticals also implies that these facilities must have high level security systems. Our analysis indicates that the revenue per square foot necessary for a climate-controlled warehouse to be profitable is about 2.5 times that of a crossdock.

The food and pharmaceuticals categories are also subject to more stringent inspections than most goods as they cross the border. Food inspections may be relatively frequent and involve opening a truck and physically inspecting the contents. This creates a potential for the cold chain to be broken, possibly devaluing the goods in the truck. In some cases, Canadian and US food inspection agencies can examine the goods on private premises. A cold storage facility directly adjacent to the POE creates the opportunity for inspections to be done without endangering the goods. For example, a cold storage facility located on the Detroit side could serve the large flow of produce that is grown in greenhouses in Leamington (Essex County) and shipped to US markets. This option appeals to food industry shippers we consulted, for whom border inspections are major irritant.

There are also opportunities for logistics facilities that are not so much related to specific supply chains as to the presence of a very large flow of trucks and the labour market issues of the North American trucking industry:

Truck stops: Since most off-road services cannot provide parking for large trucks, there are a limited number of options for drivers to stop for food, fuel, access to washrooms, etc. Hours of service regulations, which have recently become stricter in the US with mandatory of electronic logging devices (ELDs), require the driver to stop and rest at prescribed intervals for 10 hours or more, so they need locations where they stop to sleep in their cabs, preferably with access to showers and other amenities. Since the Windsor-Detroit crossing is essentially a funnel that aggregates a huge volume of trucks into a single corridor, it presents a very large market for truck stop services. The border itself magnifies the demand because occasional delays that can tie up a truck and driver for several hours can require drivers to make unscheduled rest stops as they exhaust their hours of service. Our consultation indicates, however, that truck stop services are in very short supply in the corridors leading to the crossing on both the US and Canadian sides.²³

Looking to the future, a truck stop at the Windsor-Detroit crossing may be well placed to serve vehicles with advance technologies. For example, alternatively fuel trucks requiring electric charging or fueling with compressed natural gas or hydrogen may need to ensure that they are fueled to achieve their full range before they cross the border.

Addressing the truck driver shortage: A shortage of qualified drivers is one of the greatest challenges currently faced by the North American trucking industry. The current population of

²³ In 1999 a study was conducted making a business case for a major truck-stop facility at the intersection of the 401 and Manning Road in Tecumseh, ON. The facility was never developed, however.



drivers is aging, and young people are not easily attracted into a line of work that can result in being away from home for 200 days per year. Carriers are constantly recruiting drivers and often experience turnover rates of 100% per year. Based on our consultation, it is much easier to get within-region drivers, who can work regular hours and sleep at home, than over-the-road drivers, who may be away most of the year and sleep many nights in their cabs. Of the latter category, cross-border drivers are even harder to find. Border delays are a disincentive and many potential drivers are not able to get the credentials required for cross-border work. In particular, drivers with FAST cards, required for trucks to take advantage of faster clearance in trusted trader programs, are often in short supply.

Based on our consultation, we know that there are considerations for services that address the cross-border driver shortage. One possible model would be for a kind of cross-border driver exchange. For example, a Canadian driver may bring the truck as far as a facility near the border, where a FAST-qualified driver takes it across the border and then passes it to an American driver. While this would not involve any additional logistic function, it would provide jobs for a crew of local drivers specializing in shunting trucks across the border. Another possibility is to establish a secure area adjacent to the POE where, for example, an American driver could pass off a truck to a Canadian driver without being formally cleared into Canada. That American driver could then wait for a US bound truck to take back across the border and on to its final destination.

Information technology for an advanced TDL cluster: TDL activities are data intensive. While they were among the earliest industries to make extensive use of computers, in many cases TDL firms have fallen behind, in part because they are tied down to legacy systems. This also applies to the data transfers that are necessary for border compliance on customs, inspections, immigration, etc. As we noted above, the global TDL industry is undergoing a technological transformation. If incumbent firms and new SMEs are to compete, they must upgrade their systems. We believe a new, technologically advanced TDL cluster around the Detroit River crossing can help individual firms meet that challenge. It will also create new areas of expertise and lines of business for the communication and information technology community on both side of the border.

While IT systems are normally acquired and owned by individual firms, an advanced IT architecture that serves the entire cluster might be provided to TDL facility operators in the cluster and to their customers, providing a competitive advantage over firms located outside the cluster. Some specific aspects of such a system might include the following:

- Advanced customs programs such as CBSA's Customs Self-Assessment (CSA) require establishment of a direct data link between an importer's IT system and CBSA. A central IT provider in the cluster could work with CBSA to develop a software system through which all cluster members could meet the data qualifications for CSA and other border compliance systems.



- Traders in e-commerce and other fields with a large number of stock keeping units (SKUs) could benefit from advanced systems to minimize the duties.
- Large retailers such as Walmart are requiring produce suppliers to participate in an advanced traceability system. Amazon Transparency is a program to eliminate counterfeit goods through **traceability** technology. Small producers who are unable to meet the IT requirements of such programs, may be cut off from important markets. The central IT provider could develop a compliant system that smaller users of TDL facilities could access.
- Crossdocking and similar load matching facilities could use an artificial intelligence (AI) based platform to match loads with trucks as they move through the highway network.
- All of the IT systems in the cluster can collect and distribute data (with appropriate permission and security) with great commercial value – creating a profit centre that can subsidize logistics costs for all cluster participants and users. The location on the border is ideal for aggregating diverse and valuable data.

Environmental Priorities: While all economic sectors have environmental and social impacts, there are a few concerns that are specific to the TDL sector and must be addressed in the planning stages of a cluster. Three classes of environmental problems are of particular concern:

- First, freight transportation is a major contributor to both greenhouse gas emissions and urban air pollution. While passenger vehicles account for slightly more greenhouse gas emissions than freight vehicles, trucking is the largest single category of emissions.²⁴ While personal vehicles (cars and light trucks) are the largest sources of precursor pollutants that cause smog²⁵, diesel powered trucks make a disproportionate contribution to particulate emissions²⁶.
- Second, TDL facilities generally require large areas of impermeable paved surface. This can lead to problems with both the volume and the quality of stormwater runoff. Especially in areas with combined sewers and insufficient capacity to treat the total volume of water after major rain events, the extra stormwater contributes to discharges of polluted water.
- Third, the fact that TDL facilities attract large numbers of trucks can lead to conflicts with surrounding residents and other land users who want to avoid traffic congestion, noise and the local concentration of emissions.

In addressing the first class of concerns, emissions from trucks can be reduced by two general approaches. The first is to reduce the overall level of freight transportation via trucks. The second is to reduce the emissions of truck transportation on a per truck-mile basis. Appropriate development of a TDL cluster on both sides of the border, close to the Gordie Howe International Bridge, can contribute to both of these approaches.

²⁴ Government of Canada, *Greenhouse Gas Emissions*, <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html>.

²⁵ Government of Canada, *Air Pollution from Cars, Trucks, Vans and SUVs*, <https://www.canada.ca/en/environment-climate-change/services/air-pollution/sources/transportation/cars-trucks-vans-suvs.html>

²⁶ *Science Daily*, September 10, 2018, “Large trucks are the biggest culprits of near-road air pollution, <https://www.sciencedaily.com/releases/2018/09/180910111237.htm>



Since Canada's economy is so highly dependent on trade with the United States, the objectives of achieving economic growth and reducing emissions from freight transportation can appear to be in conflict. There are practical strategies that contribute to both goals, however, and the TDL cluster can play a major role. One strategy is to move the same amount of freight – or perhaps even more freight – in fewer trucks. While estimates vary, anywhere from 20% to 33% of over-the-road trucks run empty²⁷ and a much higher proportion run at significantly below capacity. These values are probably much higher for cross-border trucking, because cabotage restrictions make it difficult to find backhaul loads. As we have already noted, one of the main outcomes of cross-dock and other TDL facilities is to reduce the cost of freight transportation by filling unused space in trucks. Thus, activities in a TDL cluster can promote economic growth by simultaneously reducing costs and reducing emissions. At the same time, filling trucks help alleviate the perennial shortage of qualified truck drivers.

Another strategy is to shift freight from trucks to a less emissions-intensive mode, notably rail. Our consultations with industry indicate a perception of limited scope for shifting loads onto rail, especially for goods moving in manufacturing supply chain. The main reason given is the slower and less dependable delivery schedules. However, services offered in a TDL cluster providing better connectivity to major rail corridors and container facilities in both the US and Canada may help offset such disadvantages. Furthermore, better integration with container rail systems will improve access of businesses in Southwest Ontario and Southeast Michigan to global shipping lanes, another example of how environmental and economic goals may be complementary.

As we noted earlier, the construction of the Gordie Howe International Bridge with access via the Herb Gray Parkway contributes to the goal of reducing truck emissions per mile by providing a smoother driving cycle relative to the stop and go driving conditions through the current Huron Church / Ambassador Bridge corridor. Another important way to reduce emissions per mile is via increased market penetration for alternatively fueled trucks. Technology to power heavy trucks via compressed natural gas (CNG) has been available for many years both as new equipment and retrofits to existing power units. More recently the potential of trucks powered by electric engines has drawn even more attention. As is the case for alternatively fueled personal vehicles, the issue of “range anxiety” (the fear that fuel or a charging station will not be available where and when they are needed) is a major impediment to adoption. If the TDL cluster includes major CNG fuelling facilities on both sides of the border, and if every facility in the cluster provides several charging stations for electric trucks, range anxiety can be alleviated. Since the Detroit River Crossing has one of the densest truck flows anywhere in the world, establishing a zone of high availability for alternative fuels and for charging can make a significant contribution to increasing the overall market penetration of alternative trucks with lower emissions.

Automated truck technology also holds great promise for reducing the emissions per mile of heavy trucks. By optimizing driving cycles and combining trucks into “platoons” that reduce wind drag, automated truck technology can reduce energy use by 5-10% or more, with corresponding

²⁷ *Supplychaindive.com*, “Analysis: One third of class 8 truck miles are driven empty,” August 1, 2019, <https://www.supplychaindive.com/news/convoy-empty-miles-trucking/559972/>

reductions in emissions²⁸. Moving automated trucks through border ports of entry (POE), however, presents a number of challenges, as discussed in a recent review prepared by the Cross-Border Institute for Transport Canada.²⁹ For example, it must be possible to disassemble platoons temporarily and, in some cases, a human driver may be needed to accompany the truck through the POE. Services to facilitate cross-border movement of automated trucks may be provided in the TDL cluster.

Issues around the creation of impermeable surfaces at TDL facilities and other localized environmental impacts can only be addressed by application of best practices in land use planning, landscape architecture and environmental management. Technological innovations such as the use of permeable pavement³⁰, which allows water to drain from paved surfaces into a stone reservoir where it is detained or allowed to infiltrate into the soil, may be used (although the weight of trucks may limit this application.) Other methods such as rainwater collection, green roofs, and the use of vegetative filters, grass swales and perforated pipe system can be used to create a slower and more natural runoff. Stormwater and other environmental issues such as species preservation have been extensively addressed by both the Herb Gray Parkway project and the Gordie Howe International Bridge project. It is important that development of any TDL sites draw on the experience of these projects, in consultation with local municipalities and conservation authorities. The TDL cluster may also follow the lead of the Gordie Howe International Bridge project by requiring all developments to meet ISO 14000 standards for environmental development.

Development of large scale TDL clusters or even individual facilities often lead to land use conflicts as local communities bear the burden of increased truck traffic.³¹ While a full public consultation will be required, and municipalities will have the opportunity to reject any development proposals, we believe that the “hub” nature of the TDL cluster will reduce the impacts that often lead to such conflict. To recap, the TDL cluster will provide services to the flow of truck traffic through the Windsor-Detroit corridor. Especially on the Canadian side, the great majority of this traffic will be non-local, which means it will comprise trucks with neither origin nor destination in the Detroit-Windsor region. If all facilities in the TDL cluster are located within or adjacent to the Highway 401/Gordie Howe International Bridge/ Interstate I-75 corridor, there will be no reason for nonlocal trucks to travel over municipal roads and interact with local traffic or come close to residential neighborhoods. Locally based trucks that wish to access these facilities should be routed so as to

²⁸ A discussion of the environmental effects of both alternative fueled and autonomous trucks is found in Conference Board of Canada, *Greening Freight: pathways to reducing GHG emissions from trucks*, May 2018, https://www.conferenceboard.ca/temp/2ce71152-00a5-46ba-bf0c-a78188ad4467/9596_Greening-Freight_RPT.pdf

²⁹ Bill Anderson, Marta Leardi-Anderson and Laurie Tannous, *Automated Trucking and Border Crossings*, Cross-Border Institute, March 31, 2018. A copy may be requested by email: CROSSBORDER@uwindsor.ca.

³⁰ Credit Valley Conservation Authority / Toronto and Region Conservation Authority, *Low Impact Development Stormwater Management Planning and Design Guide, version 1.0*, 2011, available at https://cvc.ca/wp-content/uploads/2014/04/LID-SWM-Guide-v1.0_2010_1_no-appendices.pdf

³¹ A planned CN Logistics Hub in Milton Ontario provides evidence of such a debate. Many local residents are objecting on the basis of negative environmental impacts as well as increased traffic and noise:

<https://www.thestar.com/business/2019/07/24/proposed-cn-rail-truck-hub-in-milton-sparks-debate.html>



bypass areas of concentrated population – including, but not limited to, Sandwich Town. The goal for such areas should be no net increase in truck traffic.

Developing an action plan for establishing Logistics Intensive Hub Cluster

Will development of a logistics cluster at the Detroit-Windsor crossing with a strong orientation to the Gordie Howe International Bridge require a plan, or will market forces be sufficient to produce such a cluster if it is economically viable? We define a plan as a coordinated effort by public and private players to direct economic resources in a way that promotes development of the cluster. An “action plan” translates that effort into a set of specific actions to be taken by the players involved. There are standard economic arguments against such a plan. By directing resources in a specific way, we may be short-circuiting economic processes that weed out inefficient proposals and direct resources to where they can create the greatest value. Players in such plans may be motivated by private interest and therefore attempt to use the planning process to direct resources in ways that are inefficient in the aggregate sense, but privately beneficial to them. Politicians may use the plan to reward specific constituencies or popular goals at the expense of more economically beneficial projects. These arguments call for a “hands off” approach to regional economic development.

The counter argument is that the kind of economic development we have in mind here may never come about as the result of individual, uncoordinated decisions, even if it is economically efficient and brings net benefits to the region. To explain this, Figure 11 defines three processes that are mutually determined.

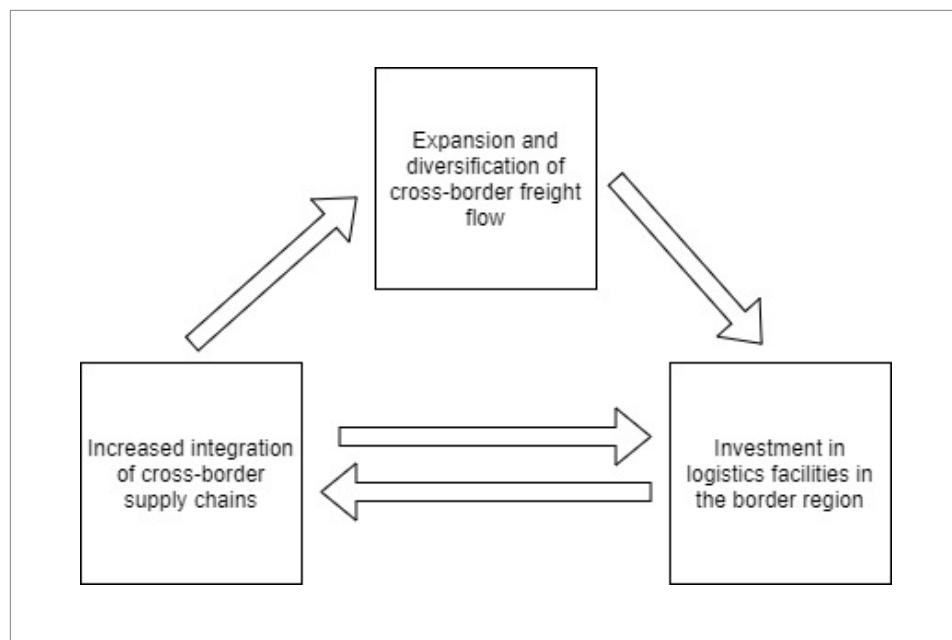


Figure 11: Simultaneous Causation in Cross-border Logistics



As we noted earlier, there is a chicken-and-egg relationship between investment in logistics facilities and cross-border supply chain integration. Supply chain operators will be more likely to integrate across the border if there are logistics services in place that mitigate the costs of dealing with border processes. If those logistics services are not already in place, however, developers and logistics operators may not be willing to make the necessary investments until they are sure that cross-border supply chain integration will happen.

There is a third process at work also. Greater integration of supply chains in sectors other than automotive will drive an increase in cross-border freight, and consequently an increase in the revenue of border infrastructure operators. That increase in traffic will also constitute the principal signal to investors in logistics facilities. But that won't happen until supply chain operators increase their cross-border integration, which in turn may not happen until they see that supporting logistics services are in place. The process of simultaneous causation constitutes a "virtuous circle" in which three classes of economic actors all benefit. Yet there is no clear mechanism by which one actor can move independently and be confident of a positive return. A very large scale private supply chain operator might resolve this by building proprietary logistics facilities – thereby acting in two mutually supportive roles. Otherwise some sort of plan of cooperation among the interested parties is needed.

Development Models

The need for an action plan raises the question: who takes the lead? What sort of private operator, public authority, or public-private partnership can be most effective in coordinating all the stakeholders, formulating a plan and putting it into action? But we can draw some valuable insights from a review of other logistics cluster initiatives in North America. Strengths and weaknesses of the three models are summarized in Table 2.

Private Sector Models: Most logistics intensive cluster initiatives have some participation by public sector entities but some, like the Alliance Global Logistics Hub, are predominantly private entities. The Hillwood Group, a real estate development company, owns and manages Alliance, including the entire 18,000-acre site on which it is situated. Two class I railroad intermodal facilities and a freight-only airport are located on or adjacent to the property. Another example of a logistics initiative owned and managed by a private land developer is the Centerpoint Logistics Park outside Chicago³², where 41 logistics tenants are on a 6,400-acre site encompassing two class I intermodal facilities. CN Rail has also established a private logistics park around one of its major intermodal centers, the CN Calgary Logistics Park on 170 acres in Conrich Alberta.³³

The success of these projects shows that predominantly private initiatives are viable. The very large number of tenants attracted by Alliance and Centrepoint may reflect the development of rigorous business models based on extensive experience and market discipline. But as noted, larger projects generally require some public-sector help. Alliance was started as a joint effort with the Federal Aviation Administration and the Texas Department of Transportation. The Centerpoint project was made possible on land that was provided after the decommissioning of US Department

³² <https://centerpoint.com/parks/centerpoint-intermodal-center-jolietelwood/>

³³ <http://cn-calgarylogisticspark.com/>



of Defence armaments plant. There is also the concern that private developments might stress profitability over the public interest. Centerpoint has struggled with local land use and infrastructure conflicts. Despite many jobs provided, local residents object to high volumes of truck traffic.

Public Sector Models: Nearly all logistics cluster initiatives have private-sector stakeholders, but in some cases the initial expenditures are exclusively or predominantly public. This is especially the case when the initiative is viewed as a way to stimulate growth or promote diversification in a slow growth region. The CentrePort initiative to create a major inland port outside Winnipeg Manitoba is an example. While it was created as a for-profit enterprise, initial funding of \$460 million was provided by the Manitoba and Federal Governments. While this project is still actively developing, it appears that the speed of development within the CentrePort property has been disappointing. A much more modest public-sector initiative in Western Canada, the Global Transportation Hub in Regina, Saskatchewan has made steady progress and now employs almost 900 people. GTH has an interesting history of governance, having started as a project within the provincial ministry and eventually established as the Global Transportation Hub Authority, with autonomous powers to make decisions and make investments.

Cornwall Business Park in Cornwall Ontario is an interesting example of a small (1600 acres developed) but successful logistics cluster under the management of a local public-sector organization, Cornwall Economic Development. This development has attracted major distribution centres to serve the Montreal market from a more economical location in Eastern Ontario. Having attracted a 1.4 million square foot Walmart distribution centre early in its development no doubt provided a signal for other warehouses and related activities located there.

While more modest public sector led logistics initiatives have had some success, the slow development of CentrePort provides a cautionary tale. There is no comprehensive analysis available on that project, but major private investments at the inception of the project would have provided a positive market signal, and the board of CentrePort is currently focussed on finding private development partners for a new intermodal rail park.³⁴

Private-Public Partnership: We use this term not in the very focused context of an alternative model of procurement for infrastructure projects, such as the Gordie Howe International Bridge, but in the more general context of initiatives in which private and public sectors entities act as a joint venture with both sides making risky investments. This excludes initiatives where the participation of private “stakeholders” is in an advisory capacity only or the participation of public agencies is simply to facilitate the permitting process or steer the project toward public policy objectives.

One of the defining characteristics of a logistics cluster is that it has substantial land requirements. Land assembly can therefore be a challenge. This is one of the most important reasons that large coordinated development projects in both Canada and the US frequently include public sector agencies. In particular, public authorities such as port authorities may have it within their mandate to acquire land. Furthermore, expropriation (Canada) or eminent domain (US) generally cannot be justified on the basis of creating private commercial benefit – there has to be a strong public

³⁴ <https://globalnews.ca/news/4259416/centreport-expects-to-build-100m-rail-terminal/>



purpose. Private-public partnerships ideally combine the powers and responsibilities of government with the market discipline of private commerce.

There are several examples of private-public logistics cluster initiative in the US. The Rickenbacker Logistics Park in Columbus Ohio, which has built a cluster of logistics activities around a major intermodal facility and a freight-only airport, is a partnership of two private commercial real estate companies and a public airport authority. It has attracted several large distribution and internet fulfilment centres and smaller facilities. Logistics Park Kansas City is a partnership of a Class I railroad, two commercial real estate developers and a site selection firm on the private side and representatives from three orders of government (municipality, county, state) on the public side. Substantial public infrastructure funds and exemptions from regulations were helpful in getting the project on track. KC SmartPort, a non-profit organization that attracts business to the greater Kansas City Area (covering parts of two states) is also in the partnership.

CargoM is a Canadian private-public institution that promotes logistics and transportation activities in the Montreal region. It is closely allied with the Port of Montreal and funded by the Quebec and Montreal governments as well as about 50 private sector members. While CargoM does not appear to have operational control over facilities at this time, its mandate includes initiating developmental projects, to promote Montreal's position as a hub for transportation of goods.

Finally, some initiatives comprise a combination of coordinated private and public facilities. The Savannah Logistics Cluster in Georgia includes development areas that are managed by the Georgia Port Authority, a Business Park run as a non-profit and a completely private industrial park. Several private-public entities work to develop and promote the cluster, which is experiencing rapid growth due to the growth of intermodal traffic through the Port of Savannah.

The private-public model appears to be the most common model for a coordinating institution. Most of the examples include commercial real estate interests, who have realistic market knowledge. Some private partners serve as anchor tenants, while others own the infrastructure (ports, intermodal facility) that generates the flow of goods. Public participation makes it possible to receive various development funds and navigate the complexity of permitting, zoning adjustments and regulatory compliance. A possible downside is that a dominant private partner may be able to capture most of the benefit to the detriment of other partners and the community, but good governance should reduce this risk.

Table 2: Models for Coordinating Institution

Type of institution	Advantage	Disadvantage
Private Developer	Less public funds required Experienced operators Market discipline Track record of success	Still dependent on public help No incentive to act in the public interest Greater potential for land use and other community conflicts



Public Initiative	Response to economic development priorities Access to infrastructure funds Faster permitting, rezoning	Large initial public risk Lack of market signal from private investments
Private/Public	Anchor tenants or facilities Market information Help with financing Permitting, rezoning, compliance	Private capture

Public Sector Entity: If there is to be public sector participation in the coordinating institution, a natural question is what public entities can play the most constructive role? Different entities can bring different proficiencies and powers to the table. Proficiency refers to expertise that it has based on its experience and the people it has on staff. Powers refers to legal or constitutional authorities it has that can help the partnership succeed. The advantages and disadvantages of different public entities are summarized in Table 3.

Economic development agencies will tend to have the most expertise, especially in terms of the factors that influence logistics service providers to locate in the cluster. They are also well connected to agencies at higher orders of government that can provide funding. They generally have regional mandates, encompassing more than one municipality. Since they have a responsibility and the expertise to recruit new firms and retain and nurture existing firms, they can play a highly constructive role both to attract TDL operators to locate within the cluster and to find constructive ways for existing local firms to contribute to the cluster's development. Once the cluster is established, they can help explain to new and existing firms in all industries how they can reduce their costs and expand their markets by taking advantages of the services it offers. They do not, however, generally have experience building or operating facilities or acting as a landlord, and they are vested with very limited legal powers.

Municipalities have extensive powers of land use. They can decide which sites to provide services to, change zoning, and regulate truck routes and other local transportation issues. As the recipient of property taxes and development charges they are in a position to waive them as incentive. Since they have ultimate discretion over many aspects of land development and tax policy, they must be directly involved in the planning and development of the cluster as well as in its governance and operation. A potential problem with municipalities is that they are naturally biased in terms location, favouring locations within their boundaries. This may be a problem in Detroit-Windsor region, since the potential development sites are scattered over several municipalities on both sides of the river. Municipalities are also led by elected officials, who may seek to use the development project to reward specific constituencies, rather than making the best commercial decisions.

Port authorities and airport authorities figure prominently in some of the public-private cases we examined. This is not surprising since they control the infrastructure that creates the region's location advantage for logistics, are experienced in acting as a landlord and have significant



powers. While there is no precedent, it is reasonable to consider the WDBA as having similar advantages. The main disadvantage of such authorities may be that development not specific to the infrastructure they control may lay outside their legal mandate. Port authorities in the US, however, appear to have rather broad discretion to participate in non-marine developments. State and provincial governments have the greatest taxing authority of the public entities considered here, so they have the best access to funds. They also have authority over highway infrastructure and the power to assemble land through processes of expropriation (Ontario) and condemnation (Michigan). One problem is that as political entities, they may have considerations other than the most efficient and productive use of resources.

Table 3: Participation of Public Entities in the Coordinating Institution

Type of Public Entity	Advantage	Disadvantage
Economic Development Agency	Already in place, site selection, interface with higher levels of government, regional focus	No experience in operations or acting as landlord Limited Powers
Municipality	Powers over land use, servicing, transportation	Limited experience, potential location bias, political interference
Port Authority, Airport Authority	US authorities have powers Experience as landlord Incentive to drive business	Maybe outside mandate
State / provincial	Powers of land assembly Access to funds	Political interference

There are a number of other civic organization who can play important support roles in the development of the cluster, including but not limited to the following:

- *Regional conservation authorities* should be involved at an early stage to ensure that plans are consistent with the implementation of best practice environmental management. Their staff may be supplemented with environmental scientists from local universities, colleges and consultancies.
- *Workforce development boards / agencies* play a critical role in assessing the ability of to meet the workforce requirements of the cluster locally. Where there are capability gaps, training programs can be provided with the support of local educational institutions.
- *Regional Chambers of Commerce* often play the pivotal role of communication between governments and business community. They can be especially effective in encouraging their members to participate in public consultation activities and in some cases make investments in the cluster.



An international institution?

The most unique and challenging aspect of creating an institution to coordinate development of a logistics cluster near the Gordie Howe International Bridge is the cluster would straddle the Canada-US border. If there is to be a single institution, therefore, it would need to operate in both countries. Given this challenge, the simplest solution is to create separate institutions in the US and Canada with some sort of informal cooperative relationship. While this would accommodate some aspects of cluster development, there are several impediments to cross-border supply chain integration that can only be addressed with a binational approach. Examples include:

- *Addressing the truck driver shortage.* The general problem of finding long haul truck drivers is much worse for cross-border shipments because many potential drivers are unable to get the needed documentation to cross the border and others may refuse cross-border work because of delays. In our business consultations, we heard ideas to address this problem through driver exchange mechanisms at the border or even a “conveyor belt border” whereby autonomous trucks pull trailers across the border as a service. This type of service requires a single operator with facilities on both sides of the border.
- *Serving two markets from one distribution centre.* Changes in technology, legislation and regulatory harmonization could create new opportunities to serve both the US and Canadian markets from a single facility. This would create an opportunity to attract large distribution centres to the border region, which would help grow the binational cluster. It would be better to have a common institution that recruits such business and helps it find the most advantageous site, rather than have two separate institutions competing for these facilities.
- *Road / rail intermodal.* The lack of an intermodal facility is currently a disadvantage for the growth of the logistics sector on the Canadian side of the border. We believe there is great potential for global containers to move to and from Southwest Ontario via intermodal facilities in Michigan and even Ohio with container drayage across the Gordie Howe International Bridge. This would expand business at existing intermodal facilities, generate new trips and revenue across the Bridge and give businesses in Southwest Ontario access to global supply chains without first trucking their goods all the way to the GTA. Such a cross-border service could give new life to the Detroit International Freight Terminal (DIFT) proposal, which has been inactive for some time.³⁵ Developing the necessary facilities and overcoming institutional barriers, however, would be the work of a truly binational coordinating institution.

Unfortunately, a single, binational institution is probably not a realistic goal. The reason is that there would be severe limits on the powers that could be given to such an institution under the laws of the US, Canada, Michigan and Ontario. If the coordinating institution is to be more than just a forum, some legal status would need to be established separately on each side of the border. The

³⁵ Public documents related to the DIFT can be downloaded at https://www.michigan.gov/mdot/0,4616,7-151-9621_11058_26215---.00.html



challenge will then be to create mechanisms that ensure that the two institutions act in a way that is mutually supportive of a common vision.

Conclusions on Logistics Development

Our conclusions regarding the development of a TDL cluster as a means of exploiting opportunities created by the new Gordie Howe International Bridge may be summarized as follows.

- Our analysis and consultations indicate that a strong business case can be made for the development of a binational transportation, distribution and logistics (TDL) cluster on lands with good access to both POEs of the Gordie Howe International Bridge. Since this business case depends in part on “flow-through” traffic, the cluster must be developed around the provision of logistics services that facilitate cross-border movement, rather than facilities that serve only local supply and demand.
- Development of the cluster should be on a private-public model. It is critical to avoid creating facilities that will not attract enough business to cover their full costs. The best way to ensure against such an outcome is to support only the development of facilities and activities in which private logistics service providers commit to making substantial investment. (In other words, avoid building “on spec.”)
- Since it unlikely that any single entity will provide all the services in the cluster, some type of private-public coordinating institution will be needed. While the logistics cluster should be designed as an integrated whole spanning the border, a single binational coordinating institution is unlikely to have the necessary powers to implement land development. Therefore, a hybrid structure with a binational institution that serves to coordinate the activities of two national institutions is the most practical option.
- Cluster development on both sides of the border should be guided by both the potential for commercial success and the social objectives of environmental preservation, the creation of high-quality employment opportunities and conferring significant net benefits (economic, social and environmental) on adjacent neighbourhoods.
- TDL sites should be limited to locations in or adjacent to the corridor comprising the Ontario Highway 401, The Gordie Howe International Bridge and its POEs, The US Interstate Highway I-75 and perhaps other significant highways. Movement of flow-through truck traffic over municipal roads to access cluster facilities should be minimized, and local trucks accessing these facilities should be routed around residential and environmentally sensitive areas.
- Drawing on the experience of the Gordie Howe International Bridge POEs, all TDL cluster facilities should adopt best environmental practices, with the goal of meeting or exceeding ISO 14000 standards for environmental management. Full services should be made available for alternative fuel, electric and automated trucks.



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- Common hardware and software assets for rapid compliance and clearance at the border; advanced tracking and traceability; load matching and similar platforms for marketing and collaboration in logistics services; and the collection and management of marketable data should be a distinguishing characteristic of the cluster.
- Prior to establishment of the bi-national and national coordinating institutions, an *ad hoc* committee should be struck to develop an action plan. (The mandate of the committee is described below).

The *ad hoc* committee should be binational and composed of representatives of interested groups such as community groups; broadly defined business groups (such as Chambers of Commerce) and representatives of key industries such as supply chain, automotive and agriculture; regional economic development agencies and municipalities; infrastructure authorities (ports, airports, bridges, tunnels); and state, provincial and federal agencies. Member of the committee will serve as volunteers.

The committee's mandate will include defining the scope and geographical extent of the logistics cluster initiative; defining the mandates and governance of coordinating institutions for the development and operation of the cluster; initiating the development of land use, capital and common service plans; and establishing timelines for the work of the coordinating institutions and the progress toward an operational logistics intensive cluster.

As noted earlier, the coordinating institutions will most likely include some binational entity with separate entities endowed with development powers on either side of the border. (However, this will be up to the *ad hoc* committee to determine.) The common service plans will address special facilities available to cluster members such as advanced IT systems.



General Conclusions

By significantly improving connectivity at the most important corridor for goods movement in the huge Canada-US bilateral trade relationship, the Gordie Howe International Bridge projects represents one of the most important initiatives for trade facilitation in the world today. It will not only save billions of dollars for the trade movements that currently pass through the Windsor-Detroit corridor, it will improve cross-border accessibility throughout the Great Lakes and St. Lawrence region, facilitating growth in mutually beneficial cross-border trade. By creating a more reliable and resilient border, it will provide the level of certainty necessary to induce investments in productive assets in both Canada and the United States. It will also create a zone of high cross-border accessibility and freight flow, providing the opportunity to build a cluster of transportation, distribution and logistics activities that can expand the economic base and employment level in Southeastern Michigan and Southwestern Ontario.



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Appendix 1: Measuring the Value of Time Savings³⁶

The standard approach to estimating the value of time savings arising from a highway infrastructure improvement is to estimate the value of time savings in each year of the infrastructure's expected lifetime and sum up the discounted values of those annual savings.³⁷ First, how do you estimate the value of time savings that will occur in any year? And second, how do you discount savings that are expected to occur in the future?

Estimating the time savings in a given year involves multiplying three things:

$$\text{value of time} \times \text{time savings per vehicle} \times \text{number of vehicles}$$

The value of time for trucks is based on a comprehensive estimate of operating costs per hour for US trucking is provided by the American Transportation Research Institute, which is supported by the American Trucking Association.³⁸ In its 2017 update, ATRI's estimate of average marginal operating costs per hour is US\$63.66. This is actually lower than it was in 2013 and 2014 because of relatively low fuel costs. At the current exchange rate³⁹ this translates to \$82.75. Given the higher costs of fuel and some other factors in Canada, we round that up to \$85.00⁴⁰

Time savings per vehicle is defined as the difference between time to travel over the new infrastructure and the time to travel over the infrastructure that was previously available. For this study, the new infrastructure is the Gordie Howe International Bridge and the previously available infrastructure is the Ambassador Bridge. Earlier estimates of travel times savings are quite small, but they are based on average times over the network.⁴¹ However, the average crossing time is not the only, or even the most relevant indicator from a scheduling perspective, because many of the carrier's costs (number of turns, hours of service, narrow time windows) depend on the variability of crossing times. Our industry consultations indicate that the conventional approach to addressing variability is to build substantial time buffers into truck schedules. Such buffers lead to many cases where the truck arrives at its destination early. The cost of being early, however, consists only in the truck and driver standing idle until the scheduled delivery time, while the cost of being late could be a large fine or even the loss of a contract.

³⁶ Full technical details are available in *The Gordie Howe International Bridge and the Great Lakes Economic Region: Assessing Economic Impacts and Opportunities, Comprehensive Assessment of Economic Benefits, Part 1 Time Savings*, submitted January 30, 2018.

³⁷ The discounted value is used because just as a payment of money that you expect to receive at some point in the future is worth less to you than the same payment received today, time savings that occur in the future are worth progressively less, the further into the future they are realized.

³⁸ Alan Hooper and Dan Murray (2017) *An Analysis of the Operating Cost of Trucking: 2017 Update*, Arlington, VA: American Transportation Research Institute

³⁹ .77 on August 5, 2018.

⁴⁰ ATRI uses a similar approach to estimating the total cost of congestion for trucks in the US by multiplying its operating cost per hour by its estimate of total delay. W. Ford Torrey IV (2017) *Cost of Congestion to the Trucking Industry: 2017 Update*, Arlington, VA: American Transportation Research Institute.

⁴¹ Wilbur Smith Associates (2010) *Preliminary Results of the Comprehensive Traffic and Toll Revenue Study for the Detroit River International Crossing Project Forecasts Refresh and Update: Traffic Only Summary*, submitted to Michigan Department of Transportation.



We assume that carriers address crossing time uncertainty by adding schedule time buffers based on the 90th percentile crossing time, which means the time you can achieve 9 times out of 10. We consider this a conservative estimate; based on our consultations, we know that some carriers schedule much longer buffers. As we note in the text, the cost of being late can be thousands of dollars per minute, so long buffers are justified. Since these buffers are built into schedules, they should be included in the effective crossing time, even though on many occasions the truck will cross more quickly.

Based on our analysis of GPS data we can estimate the 90th percentile crossing time for the Ambassador Bridge.⁴² For reasons discussed, we expect the Gordie Howe International Bridge to have a much lower variance in crossing times, so the 90th percentile will be about ½ that of the Ambassador Bridge.⁴³ This makes the difference between the two bridges just under 15 minutes. There is also the advantage of the highway-to-highway connection because the route from the end of the 401 to the new Bridge via the Herb Gray Parkway is shorter than the route to the Ambassador Bridge, which is still partially along Huron Church Road. So, a time savings (including schedule buffers) of about 20 minutes seems reasonable.

Our estimate of the number of vehicles is based on data provided by the Bridge and Tunnel Operators Association (BTOA).⁴⁴ These estimates of about 2.5 million trucks crossings in recent years are significantly lower than in the early 2000's.⁴⁵ This is partially due to long term trends, but may also reflect the failure of the Detroit River Crossing to recover as rapidly as other crossings after the 2008 recession. On the basis of 2.5 million trucks, each saving an average of 20 minutes, and assuming \$85.00 as the value of time, the annual undiscounted value of time savings for trucks is about \$71 million.

The choice of discount rate has a significant impact on the estimate of the value of time saved. Given the current very low interest rates, a number of recent studies related to infrastructure projects use discount rates of less than 3%.⁴⁶ However, given the long-term nature of the Gordie Howe International Bridge Project and likelihood that interest rates will return to higher levels in the future, the estimates below are provided at three discount rates 3%, 5% and 7%. Another key factor is the time horizon over which the present value of time savings is estimated. The Bridge is designed to last 100 years, but estimates that far into the future are highly speculative so estimates

⁴² GPS records are used to measure the time it takes to pass from the entry to the bridge through the inspection plaza on the opposite side for a large sample of trucks, making it possible to generate a probability distribution of crossing times.

⁴³ As a conservative assumption, we also assume that with most truck traffic redirected to the new Bridge, the distribution of crossing times on the Ambassador Bridge shifts back by 20%.

⁴⁴ <https://www.bridgeandtunneloperators.org>

⁴⁵ It might be argued that the number of trucks should be scaled down because some trucks will still use the Ambassador Bridge. However, it would only be rational to do so if a) reduced traffic on the Ambassador Bridge reduced crossing times to the same level as the new Bridge, or b) a toll discount sufficient to offset the time difference were offered at the Ambassador Bridge. In either case all trucks would receive the same benefit, irrespective of which bridge they use. In other words, the benefits accrue to 100% of trucks crossing at the Detroit River.

⁴⁶ Government of Canada (2015) *Value of Money Report: New Champlain Bridge Corridor Project*; Centre for Spatial Economics (2017) *The Economic Benefits of Infrastructure Spending in Ontario*, prepared for the Ontario Ministry of Economic Development and Growth.



are provided over time horizons of 30, 40, and 50 years. Figure A1.1 illustrates how different assumptions about the discount rate and time horizons affects the estimate of the discounted time savings for trucks.

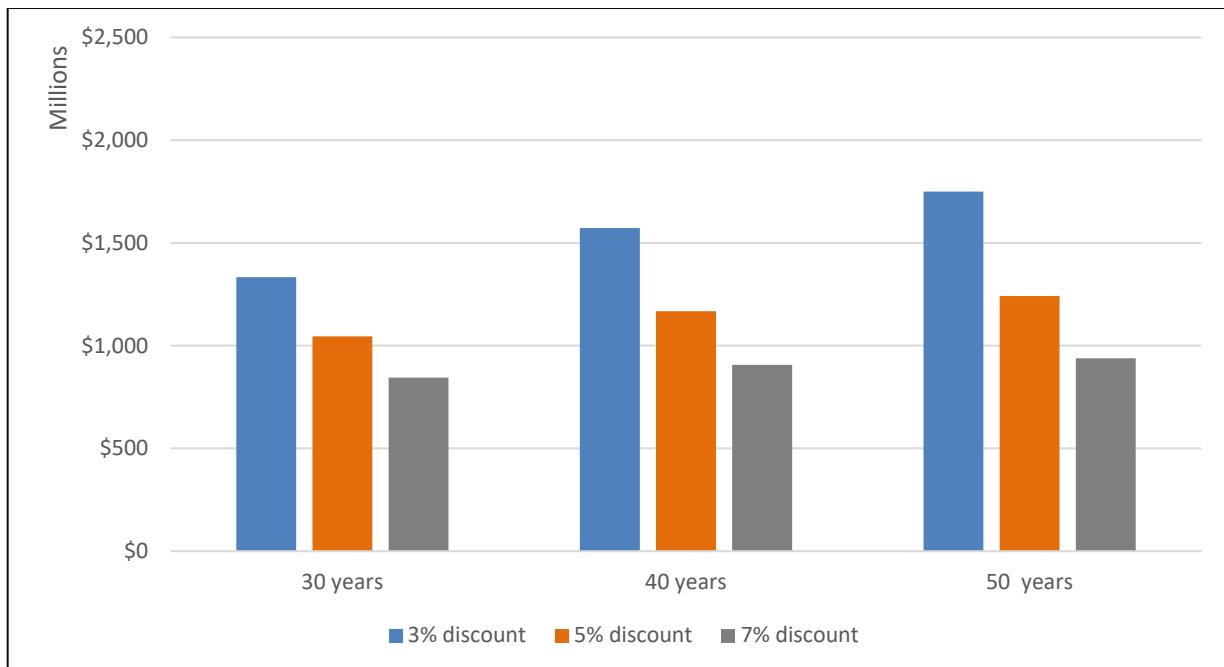


Figure A1.1: Discounted Value of Time Savings for Trucks: 20 Minutes, Constant Traffic

Estimating time savings for passenger cars is more straightforward than for trucks. Again, we adopt the BTOA figure for the Ambassador Bridge in 2016, which is 4,203,114. Since time savings is a benefit that accrues to individual people, we assume a load factor of 1.5 to translate the number of vehicles to 6,304,671 people. We use a common convention in value of time studies setting the dollar value of time saved at $\frac{1}{2}$ of hourly earnings. Also given the lower likelihood of individual drivers to add time buffers to their cross-border schedules we focused on a lower time savings of 15 minutes. Based on the Ontario average of 26.82⁴⁷ we set the value of time for personal vehicle occupants at 13.41. Overall, we believe these are conservative assumptions.

⁴⁷ <https://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/labr69g-eng.htm>

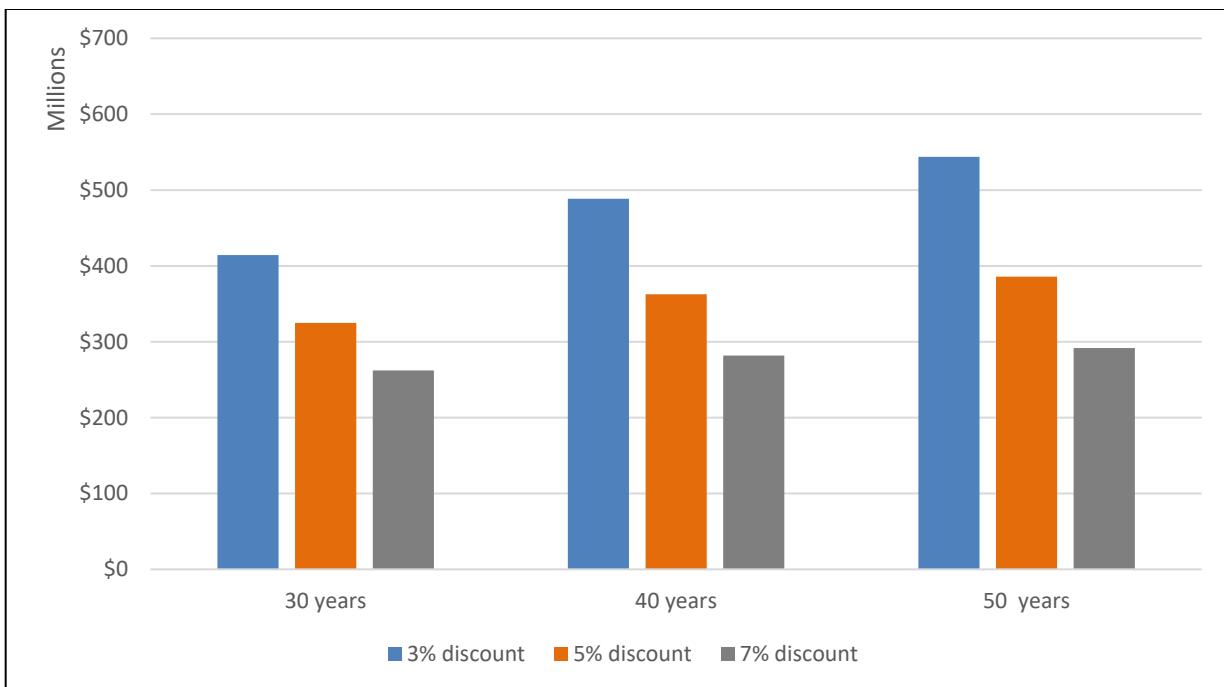


Figure A1.2: Discounted Value of Time Savings for Autos: 15 Minutes, Constant Traffic

Estimation of time savings provided by the Detroit River crossing option.

The purpose of this exercise is to illustrate the potential value of providing redundancy at the Detroit River crossing. In this case, redundancy implies an assurance that there will always be an option to cross at the Detroit River rather than use the closest option, which is the Blue Water Bridge at Sarnia-Port Huron.

Our estimate of the time cost of using the Blue Water Bridge rather than any Bridge available at the Detroit River is about \$424 million per year. This contrasts with the cost differential of \$71 million between the Ambassador Bridge and the new Bridge.

The discounted cost savings over 40 years of trucks using a Detroit River Crossing in preference to the Blue Water Bridge is calculated as the present value of annual savings of \$424 million at a discount rate of 5%, which is \$8.4 billion.



Appendix 2: CGE Model for Assessing the Impacts on Trade and GDP

Overview of the Model

All Computable General Equilibrium (CGE) models seek to represent the circular flow of funds⁴⁸ in the economy as illustrated in Figure 6. In this diagram, industries produce output of goods and services, some of which is sold to households as a final good from industry to households, the government or as an investment in fixed assets, while some of it is sold as an “intermediate good” from one industrial process to another. For example, in the automotive industry the sale of a finished vehicle satisfies final demand, while the sale of an auto part satisfies intermediate demand.

The idea of “circular flow” can be illustrated by the fact that industries pay wages to households for their labour, and then households use those wage payments to buy goods and services from industry. Households also save part of their wage income with financial institutions that channel it into investment and pay part of their income to the government as taxes.

Everything to the left of the vertical line in Figure 6 represents the domestic economy. However, in this cross-border economy goods and services can flow in and out as imports and exports. For example, domestic industrial firms can purchase intermediate goods from other domestic firms or from foreign sources. Their choice depends on the relative prices and qualities of foreign and domestic goods. It also depends on border crossing costs, including tariffs and cross border costs which are defined in terms of both the monetary costs of freight transportation and time. Other things being equal, the volume of exports from and imports to the domestic economy will increase if the border costs decrease. Thus, the addition of new border infrastructure should have a positive impact on the volume of trade.

Like all CGE models, ours translates the relationships in Figure 6 into a set of interrelated mathematical equations. We define the production and expenditures of the industry sector for each of 27 goods producing sectors (listed in Figure A2.2) and 38 service producing sectors. Intermediate demand consists of the flows that occur between all pairs of production sectors.

The unique ability to assess the impact of individual border bridges or other major transportation infrastructure derives from the spatial detail at which the model is developed.

⁴⁸ The direction of the arrows in the diagram represents the flow of funds. So, for example, consumption is represented by an arrow pointing from households to industry. For each flow of funds, however, there is a flow of some good or service (including labour service) in the opposite direction.

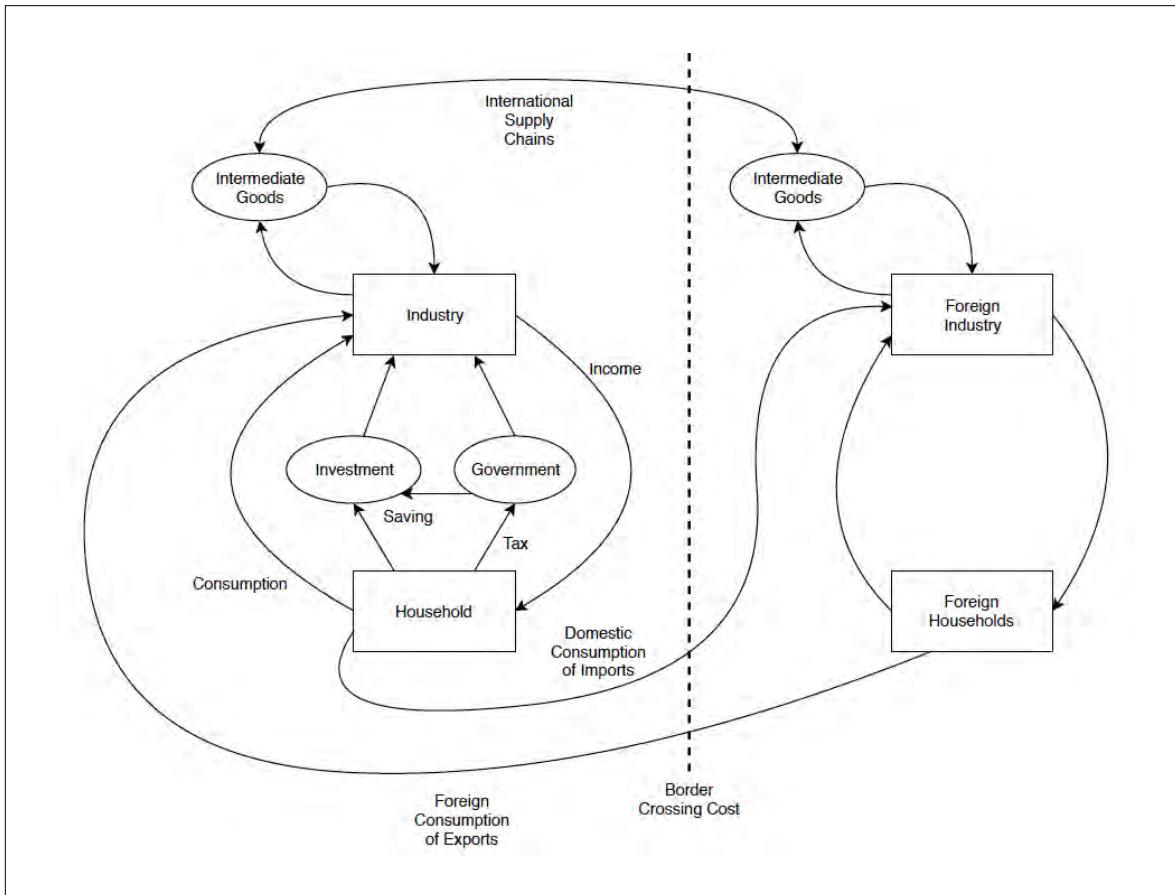


Figure A2.1: The Circular Flow of Income and Spending in Cross-Border Economy

Rather than defining aggregate imports and exports at the level of trading nations or the rest of the world, trade flows are defined for 61 foreign regions – including all 50 US States – as listed in Figure 8. Canadian provinces are divided into a number of subregions. For example, there are 25 subregions in Ontario. Trade flows are defined as occurring between the major city in each Canadian subregion and each of the foreign region. For each regional pair, a set of potential freight modes (truck, rail, marine, air, pipeline) and a set of feasible border crossings (major highway bridges, rail bridges etc.) are designated. The model assigns the flow of each goods producing industry between a Canadian subregion and a foreign region to a mode and a border crossing based on relative costs defined in terms of money and time.

Figures A2.2 and A2.3 present the model's quantitative simulation of changes in trade that can be expected as a result of the reduced crossing time at the Windsor-Detroit crossing. Figure 7A2.2 indicates that both imports and exports increase in response to reduced travel times for all but one of the 27 good producing industries. Not surprisingly the largest changes are in goods that already have large trade flows between Ontario and the US, including chemicals, food, primary metals and the automotive sector. The difference between goods category 24, which includes finished vehicles and category 25, which includes auto parts is interesting. In the first case Ontario's exports increase more than imports and in the second case the reverse is true. This is consistent with long-established automotive trade relationships where the Canadian industry exports mostly vehicles



and the US industry exports mostly parts. Some of these changes reflect the indirect relationships that are captured in the model. For example, the increased imports of mineral fuels reflect not just the cost of importing those goods, but the general increase in demand arising from growth in most sectors of the Ontario economy.

Figure A2.3 breaks out aggregate changes in imports and exports for Ontario to the 61 foreign regions. Here the greatest increases are in Michigan (23) and other nearby states of Illinois (14) and Indiana (15). There are also increases from more distant regions that we know from our research connect to Canada primarily through the Windsor-Detroit crossing, including California (5), Texas (44) and Mexico (54).

While the model's results suggesting that reduction in crossing time stimulates growth in trade are interesting, they do not in themselves indicate a positive influence on the economy. Trade is only valuable in that it increases economic growth and wellbeing. The model represents this effect in terms of the increase in GDP and wage income, which are shown in Figure 8 in the main text.



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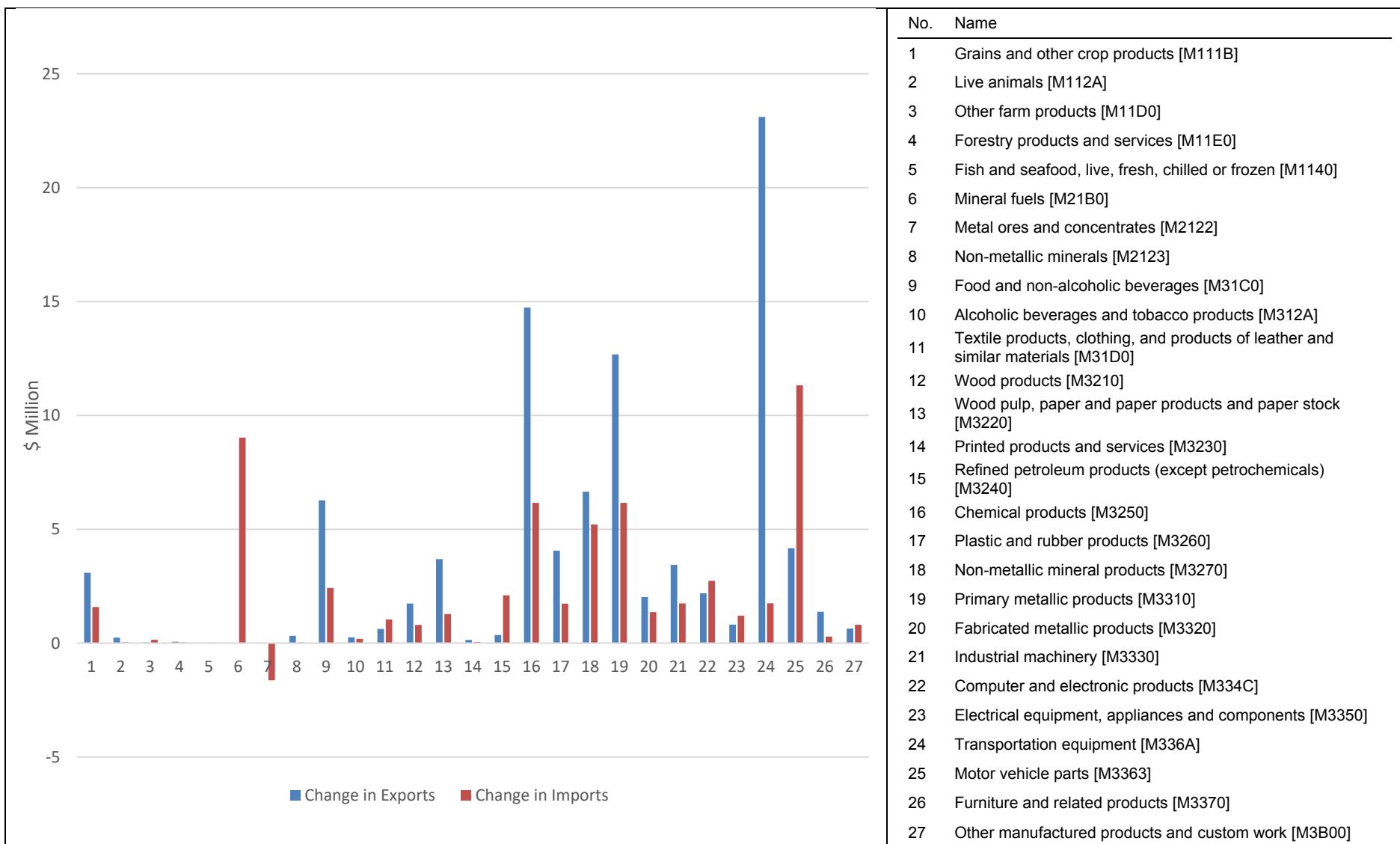


Figure A2.2: Change in Ontario's Foreign Trade with Improved Windsor-Detroit Crossing by Category of Good

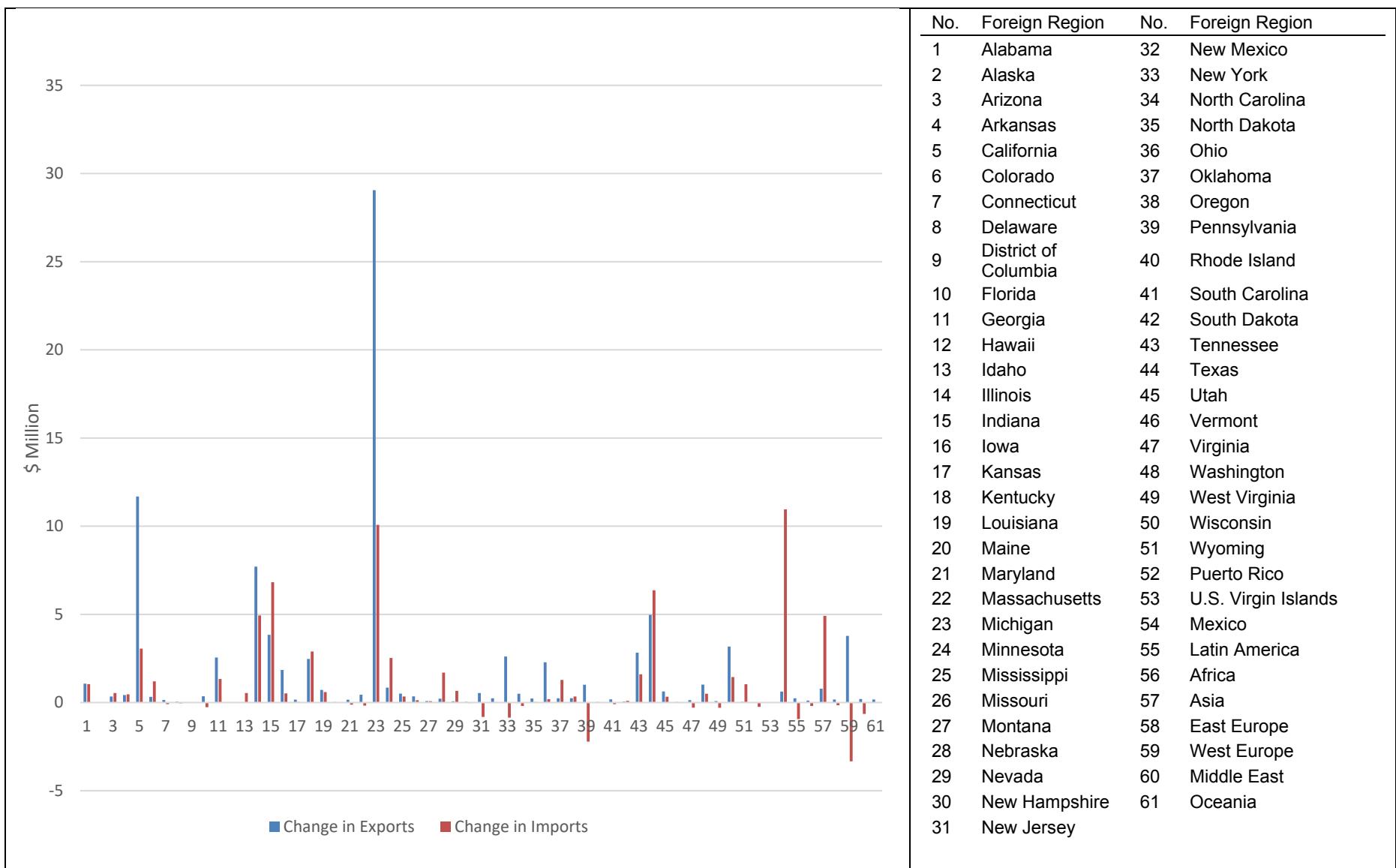


Figure A2.3: Change in Ontario's Exports to and Imports from Foreign Regions with Improved Windsor-Detroit Crossing

Appendix 3: Estimating Weighted Average Cross-Border Time⁴⁹

The maps in Figures 9 and 10 shows the reduction in WACBT calculated for each of 998 zones in the GLSL region.⁵⁰ Using the digital transportation network data and GIS software of the CBI Traffic Lab, highway travel times for the fastest route between each pair of zones are calculated— a total of almost 500,000 distinct distances. WACBT for any zone is calculated as the weighted average of the travel times to the other 997 zones. The weights used depend on the industry in question, for example the weights for motor vehicle manufacturing would depend on the level of activity in auto parts and other industries that provide inputs to automotive assembly plants. (The weights are derived by the intensity of interindustry purchases and the level of employment by industry in each zone. Data were acquired from official Canadian and US government sources.) Therefore, a rural zone with no industrial production will be weighted much lower than an industrial district specializing in automotive inputs. In words, the WACBT is the average time it would take parts or other inputs from anywhere in the region to arrive by truck to the zone we are measuring accessibility for.

The reduction in WACBT is measured by first calculating a base case WACBT for each zone using the digital transportation network that includes only the Ambassador Bridge as a Detroit River crossing for trucks. The exercise is then repeated with a modified digital network to which the Gordie Howe International Bridge, with its connection to the Herb Gray Parkway, are included. The Ambassador Bridge crossing time is based on our GPS-based estimates. We use the same time savings assumptions as in Appendix 1.

⁴⁹ Technical details (including a mathematical specification), data sources and additional accessibility maps are available in *The Gordie Howe International Bridge and the Great Lakes Economic Region: Assessing Economic Impacts and Opportunities, Comprehensive Assessment of Economic Benefits, Report on Accessibility Improvements Due to the Gordie Howe International Bridge*, submitted August 15, 2017.

⁵⁰ There are 653 zones on the US side, all of which are counties. On the other hand, there are 345 zones on the Canadian side. Those along the 401 corridor in Southern Ontario are census subdivisions, while the remainder are census divisions.



Appendix 4: Outcomes from Public Consultations

Awareness and Interest

All of consultation activities reinforced the fact that there is limited knowledge about the Gordie Howe International Bridge project, even among people who may be significantly affected by it. Knowledge is much greater in Canada than in the US, but even in Canada it was evident that potential users see the availability of the Bridge as too far into the future to affect any current planning or expenditures. Survey results and round table discussion indicate that people in transportation intensive industries are better informed, although many of them have not yet done much planning with the Bridge in mind.

Those who are familiar with the project, however, tend to be quite positive about the long term benefits in terms of more reliable crossing times, the highway-to-highway connection and providing redundancy. While there was little opposition to the project among round table participants, there was the assertion that the new Bridge was given an unfair advantage relative to existing bridges.

Feasibility of a logistics cluster in the vicinity of the Bridge

Many people we consulted were optimistic about the potential for logistics services near the Bridge. A simple reason is that revenue for all logistics activities depends upon the volume of cargo traffic, and Windsor sees one of the largest truck based freight flows in the world. To the extent that improved crossing times via the new Parkway and Bridge attracts more cargo to use the corridor, the potential for revenue will increase. Specifically, the importance of reliability was stressed as a reason to attract more commercial traffic and also to improve the performance of cross-border supply chains. This is not just true for the automotive industry, but also other manufacturing as well as agriculture and retail supply chains. However, some questioned whether more flow will translate into more demand for logistics services.

The general problem of hiring truck drivers came up quite often in the discussions. While the problem affects the entire industry, it is most severe in the market for cross-border drivers. This is because many drivers are unable to cross the border because of minor criminal records. Of those who can, since jobs are plentiful many choose to avoid delays by refusing to work cross-border lanes. To the extent that this makes cross-border trucking more expensive and less reliable (because carriers sometimes have to turn down loads) it has a negative effect on commercial flows and therefore the prospects for a cross-border logistics cluster. On the other hand, some people suggested that it provides opportunities for services such as cross-border drayage of over-the-road truck by local drivers.

The introduction of more stringent hours of service (HOS) regulations and of electronic logging devices (ELD) that more strictly enforce those regulations could provide opportunities. As one major cross-border logistics provider indicated, Windsor is now being used as a pivot point for “rest



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and repack" operations. (This is reinforced by recent media reports.⁵¹) We spoke to a representative of a carrier whose investment in a Windsor crossdock facility was largely motivated by new regulations. Another person we consulted was considering specific investments near the border for driver exchange operations.

In general, Canadian service providers noted that the major advantage of Windsor as a location for logistics operations was rapid access to US markets, and not the local market. Niche operations that take advantage of that advantage have good prospects for success. (The drayage of containers from US intermodal facilities noted below is an example.)

Several people noted that CETA, the new trade agreement between Canada and the European Union, could also provide an incentive for US firms to set up operations in Canada.

There were, however, some skeptics among the people we consulted. There was some mention of the by-pass issue. This is the notion that the new infrastructure will provide a by-pass around Detroit and Windsor and that much of the economic impact will be directed toward Toledo and Toronto, not Detroit/Windsor. Several people pointed out that logistics development does not necessarily (and maybe should not) take place near the base of the bridge. Land near the base of the bridge will be more expensive and congestion will be greater. It is more difficult to locate worker housing there. With pre-clearance technologies and policies, cross-doc facilities and fulfillment distribution centers can be located several miles from the base of the bridge. One representative of a prominent logistics provider made a comparison with Laredo, Texas where there is a major logistics cluster mainly because of high border frictions. Many of the services provided there become unnecessary when traffic flows smoothly through the border.

There was also the suggestion that decline in truck crossings over the past decade represent a secular trend that reflects technological change and the shift to a service economy. It was also noted that contrary to the popular impression, qualified labour is not plentiful in either the Windsor or Detroit markets.

Some of the most valuable comments relate to specific issues and specific types of facilities⁵²:

- **Intermodal.** It was suggested that the increased traffic and improved level of service due to the new Bridge may not in itself be sufficient to ensure the success of a logistics cluster, but greater connections with other modes may provide the necessary extra stimulus. The links between rail and highway transportations were stressed, with possibilities such as the drayage of containers from intermodal facilities in Southeast Michigan and even Ohio into Canada via the new Bridge. The success of such a model depends on the simple test of whether containers can be delivered more cheaply, quickly and reliably than by current options, which in this case would be the intermodal facilities in the Greater Toronto Area

⁵¹ <https://www.cbc.ca/news/canada/windsor/truckers-moving-to-windsor-due-to-electronic-logging-1.4990261>

⁵² Definitions of the logistics terms used below can be found in our earlier report *The Gordie Howe International Bridge and the Bi-National Great Lakes Economic Region: Report on Development Opportunities Arising from the Gordie Howe International Bridge, Appendix 1: Logistics functions, facilities, players and clusters*. submitted to WDBA March 2018.

(GTA). There was also the suggestion by several people that with the movement of more general cargo via the St. Lawrence Seaway, Windsor would become an excellent transfer location.

- **Agriculture.** It was striking how often the topic of logistics service to agriculture came up. This is both because there is a significant potential and a significant need for such services. It was pointed out that Port of Hamilton, which lost much of coal and ore business because of the shutdown of steel facilities, was successful in shifting resources to agriculture. It was noted that changes in food supply chains and technology, such as the hyper-freezing of produce, are pushing processing and logistics back toward the farm. Essex county is one of the most productive agricultural regions in Canada, but has very little processing activity. A logistics cluster specializing services for agriculture might change that. This leads into the next special issue...
- **Cold and cool facilities.** The maintenance of cold chains, whereby food, pharmaceuticals and other temperature sensitive goods must remain in a controlled environment even during logistic transfers and inspections, provides an opportunity to connect the logistics cluster to border activities. One major shipper expressed interest in facility located close to the POE at the new Bridge where inspections by the Canadian Food Inspection Agency (CFIA) and the US Food and Drug Administration (FDA) could occur on site, within the controlled environment.
- **Crossdock.** At a crossdock, goods are exchanged from one truck to another directly, without storage. Because of the high density of trucks, the border corridor provides an ideal location for a crossdock where goods destined for export are consolidated and where imported goods on a single truck are broken out into trucks bound for specific markets within the country of import. We were advised that the most successful model would be open to numerous carriers and shippers rather than a proprietary facility. It was suggested that a public entity such as a port authority would be well placed to operate such a facility.
- **Fulfilment.** The rise of e-commerce has increased the demand for fulfilment centres, many of which operate across borders. The presence of Foreign Trade Zones (FTZs)⁵³ on either side of the border make the region advantageous for such facilities located in either country. The border creates significant challenges for e-commerce, especially in the reverse logistics which is necessary because of a large proportion of goods bought online are returned. An advanced facility dedicated to reverse logistics was suggested as a niche opportunity for the logistics cluster.

The importance of technology was another pervasive topic through all of our consultation activities. Technology comes into play in several ways.

- It is expected the new Bridge will be the most technologically advanced crossing along the Canada-US border, further competing freight away from other crossings. New border technologies employing wireless communication, tracking and pre-clearance are especially important, as the ability to accommodate automated trucks.

⁵³ FTZs in Canada and the US function somewhat differently, as explained in the report mentioned in the previous footnote.



- The data generated by the flow of traffic over the bridge will be an extremely valuable commodity in itself.
- Technology to assist traders with returns, traceability and to take full advantage of mechanisms to reduce duty.
- The logistics industry is undergoing a revolution based on information technology. A largely new logistics cluster that can adopt this technology and is largely free of the legacy system problem will have a competitive advantage.
- The logistics cluster can serve the needs of alternative fuel vehicles, including electric charging and CNG and hydrogen fueling.

Regional Economic Benefits

Most of the people we consulted saw economic benefits from the development of a logistics cluster in terms of creation of jobs and tax revenue. They also noted that superior logistics service will give a competitive edge to the region, improving the productivity of existing firms and increasing attractiveness to new firms. This is especially the case for producers with special logistics needs. For example, manufacturers of large equipment need locations from which such goods can be transported efficiently.

There were words of caution, however, about possible negative effects. Logistics clusters can lead to increased congestion and emissions, reducing the attractiveness of a region for other activities and enlarging its carbon footprint. Few people thought development of a logistics cluster would be bad for the local economy, quite a few emphasized the need for careful land use planning, environmental assessment and seamless integration into transportation networks.

Coordinating Institution

The question about the need for and characteristics of a coordinating institution generated relatively little response. Those who commented on it generally thought such an institution was needed to avoid fragmentation and ensure some level of integration across different logistics functions.

Those who commented were largely supportive cross-border cooperation. It was noted, however, that an institution with authority over things like land assembly would have a better chance of success, and it is not feasible for a binational organization to have such authority in both countries. Thus, a hybrid organization with an overarching, binational committee but individual authorities with significant powers in each country seemed to be the most attractive option.

