Partnership of

Detroit River International Crossing Study

Regional and National Economic Impact of Increasing Delay and Delay-Related Costs at the Detroit River crossings

Draft Report

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HLB

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EXECUTIVE SUMMARY

This report examines the economic impacts of constrained capacity and increasing congestion and delays at the Ontario-Michigan border. Two broad categories of impacts are explored: 1) the impact on cross-border freight movements and industry productivity; and 2) the impact on cross-border personal trips for vacation, shopping or recreation purposes.

Impacts on Cross-Border Freight Movements and Productivity

Canada buys more goods from the United States than it buys from all 15 European Union nations combined. Every year the Canadian and U.S. economies generate bilateral transactions that are double the value of U.S. transactions with Japan and five times greater than transactions with the United Kingdom. The province of Ontario alone shipped exports valued at $138 billion to the U.S. while receiving imports worth $117 billion in 2004. The value of trade between Ontario and the U.S. represented over 60 percent of total bilateral trade. The value of trade between Michigan and Canada totaled approximately $71 billion in 2004.

The Canada-U.S. trade relationship is deeply rooted in integrated, cross-border supply chains and production processes. Over $1 billion in trade crosses the U.S.-Canada border every day. Fully 70 percent of this trade moves by truck. Production depends heavily on the fast and predictable trucking of components, parts and finished products across the border. For example, the components which make up one piston for a newly manufactured automobile engine moves across bridges between Detroit and Windsor an average of four times in four hours under the cross-border, just-in-time supply chain and production processes of Ford, General Motors, Chrysler and others.

Travel demand forecasts of passenger car and commercial vehicle volumes at the Detroit river crossings suggest that additional border crossing system capacity will be required to accommodate traffic growth over the next several years[1]. Unless steps are taken to expand infrastructure capacity, this report finds that, by 2025, mounting congestion and delay will cost the United States more that US$1.4 billion and Canada more than CAN$206 million a year in foregone production and output. Exponentially rising congestion over the subsequent ten years (2025 to 2035) would lead to further production losses of US$9.3 billion per year to the U.S. and CAN$ 1.5 billion per year by 2035 (Summary Table 1).

SUMMARY TABLE 1: PROJECTED ANNUAL FOREGONE PRODUCTION FROM IMPAIRED FREIGHT MOVEMENTS AND PRODUCTIVITY LOSSES, SUMMARY RESULTS

Year	Impact on the United States Economy (Values are in millions of 2004 US$)				Impact on the Canadian Economy (Values are in millions of 2004 CAN$)		
	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States	Essex/ Windsor Area	Province of Ontario	Canada
2025	($127)	($431)	($633)	($1,410)	($14)	($119)	($206)
2035	($834)	($2,773)	($4,179)	($9,384)	($101)	($833)	($1,475)

[1] See IBI Travel Demand Forecasts

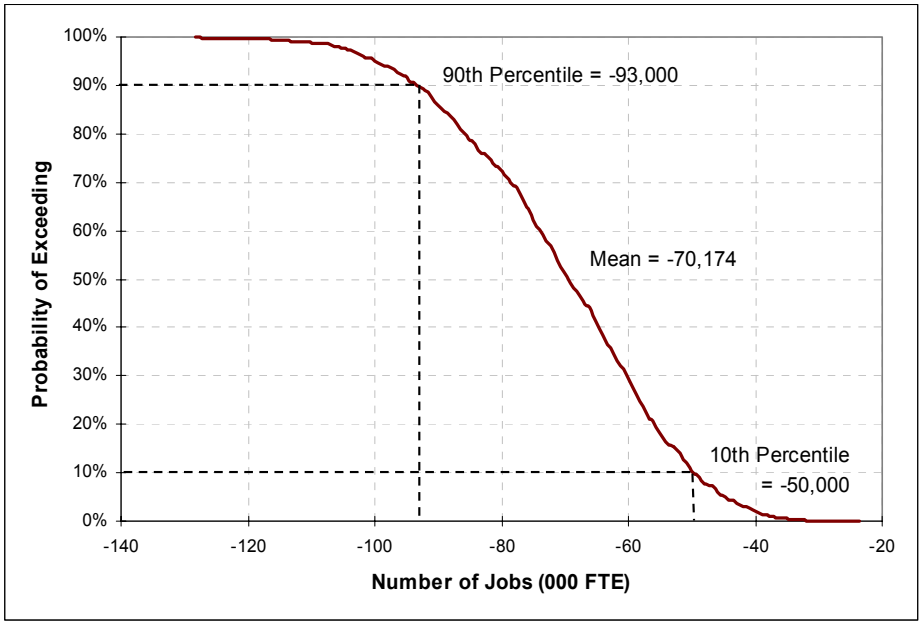
Lost production means fewer jobs. Failure to address the congestion problem, and the production losses arising accordingly, means 10,000 fewer jobs in the U.S. and 3,000 fewer jobs in 2025, rising to over 94,000 fewer jobs by 2035 in both countries (Summary Table 2). Job losses on this scale imply sharp reductions in personal incomes and living standards, and lost tax revenues for the provision of public services, particularly in the local jurisdictions of Michigan and Ontario.

SUMMARY TABLE 2: PROJECTED CUMULATIVE FOREGONE EMPLOYMENT FROM IMPAIRED FREIGHT MOVEMENTS AND PRODUCTIVTY LOSSES, SUMMARY RESULTS

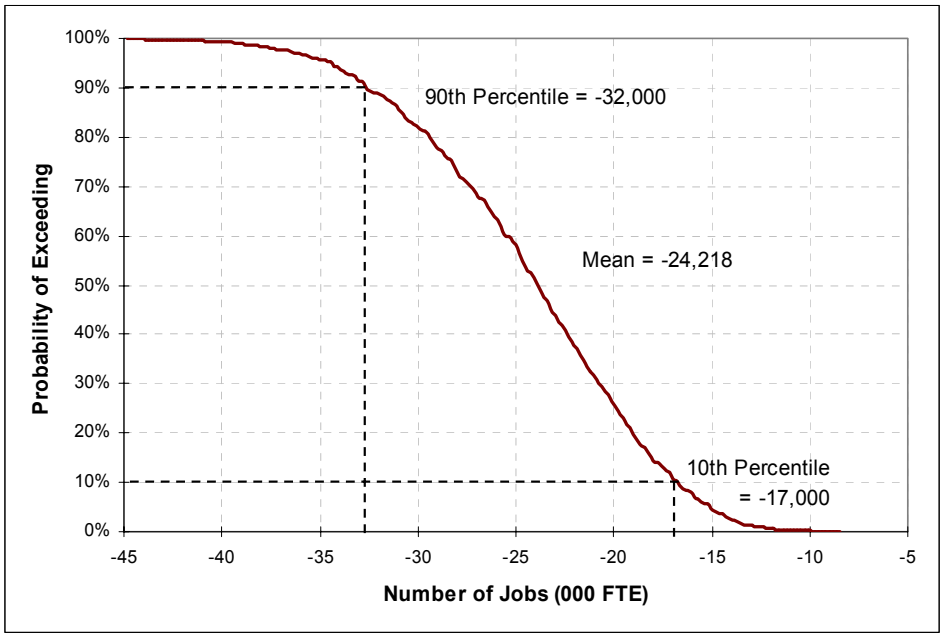
Year	Impact on the United States Economy (Full Time Equivalent Jobs)				Impact on the Canadian Economy (Full Time Equivalent Jobs)		
	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States	Essex/ Windsor Area	Province of Ontario	Canada
2025	(435)	(1,907)	(3,701)	(10,387)	(233)	(1,953)	(3,310)
2035	(2,992)	(12,508)	(25,141)	(70,174)	(1,689)	(14,131)	(24,218)

There is, however, considerable uncertainty regarding the magnitude of these economic impacts. In particular, over a 30-year period, manufacturers and truckers may adjust to increasing congestion in ways not fully accounted for in the above analysis. While the values above represent mean projected losses, uncertainty inherent in the economic variables driving the overall impact suggest the possibility that actual impacts may veer from the mean values shown above. The full probability distribution of the projected 2035 employment impact in the United States is provided in Summary Figure 1. The figure shows the mean foregone employment projection to be around 70,000; however, there exists a 10 percent probability that cumulative job losses may exceed 93,000 as well as a 10 percent probability that they are less than 50,000. The probability distribution for cumulative 2035 employment impact in Canada is shown in Summary Figure 2. According to the chart, expected job losses are around 24,000 but the 80 percent confidence interval is between 17,000 (lower 10 percent value) and 32,000 (upper 10 percent value).

SUMMARY FIGURE 1: Projected Cumulative Foregone Employment from Impaired Freight Movements and Productivity Losses by 2035 in the United States – Probability Distribution



SUMMARY FIGURE 2: Projected Cumulative Foregone Employment from Impaired Freight Movements and Productivity Losses by 2035 in Canada – Probability Distribution



Impacts on Cross-Border Recreation, Shopping and Vacation Trips

Approximately twelve million passenger cars crossed the Detroit-Windsor border in 2004. Over one-third of these were shopping or recreational trips. Another five percent were trips made for vacation purposes. These cross-border movements generate significant revenues to the retail, hotel and lodging, and recreation sectors on both sides of the border. Increasing congestion and delays, however, may constrain the growth of cross-border personal trip-making and result in output and employment losses, *relative to a situation where steps would be taken to alleviate congestion.*

The restriction on cross-border movements was found to reduce economic activity (production and employment) in both Canada and the United States. As shown in Summary Table 3, by 2035, the United States may lose up to US $50 million a year in production as a result of foregone cross-border personal trips. Output losses in Canada may exceed CAN $172 million a year by 2035. Since there are, overall, more recreation, shopping and vacation trips originating in the U.S. and ending in Canada than vice versa, and since increasing congestion is expected to affect the residents of both nations equally, a restriction on cross-border movements results in reducing economic activity in Canada by a greater degree than in the U.S. It should be noted that these losses are adjusted to reflect the partial substitution of trips that would occur under the reasonable assumption that most of American household expenditures previously spent in Canada would, to some extent, be spent in the U.S. instead, on comparable, if not similar goods and services and vice-versa.

SUMMARY TABLE 3: PROJECTED ANNUAL FOREGONE PRODUCTION FROM REDUCED PERSONAL TRIP-MAKING, SUMMARY RESULTS

Year	Impact on the United States Economy (Values are in millions of 2004 US$)				Impact on the Canadian Economy (Values are in millions of 2004 CAN$)		
	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States	Essex/ Windsor Area	Province of Ontario	Canada
2025	($2)	($4)	($4)	($8)	($13)	($20)	($26)
2035	($13)	($25)	($28)	($50)	($82)	($129)	($172)

Expected employment losses are shown in Summary Table 4, below. For the United States as a whole, around 700 full time equivalent jobs may be lost by 2035 as a result of foregone cross-border trip making. In Ontario, failure to relieve congestion in the Detroit-Windsor corridor may cost 358 jobs by 2025, and over 2,300 by the end of 2035. The Canadian economy would lose over 2,400 jobs.

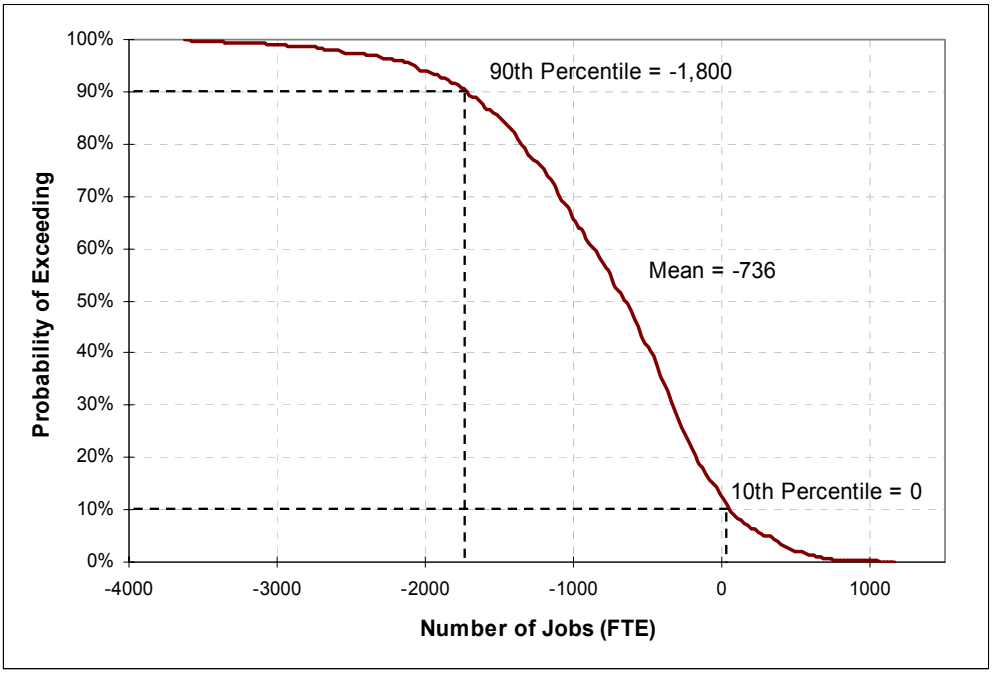
SUMMARY TABLE 4: PROJECTED CUMULATIVE FOREGONE EMPLOYMENT FROM REDUCED PERSONAL TRIP-MAKING, SUMMARY RESULTS

Year	Impact on the United States Economy (Full Time Equivalent Jobs)				Impact on the Canadian Economy (Full Time Equivalent Jobs)		
	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States	Essex/ Windsor Area	Province of Ontario	Canada
2025	(35)	(66)	(83)	(112)	(198)	(358)	(373)
2035	(231)	(430)	(544)	(736)	(1,295)	(2,342)	(2,439)

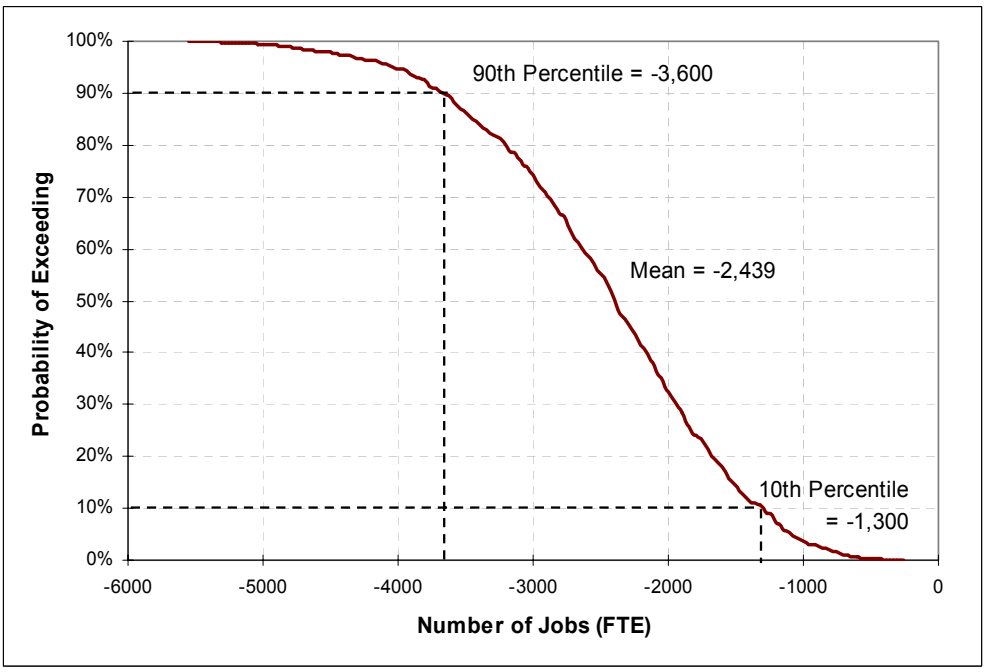
As before, the above values represent the mean projected impacts. However, the degree of uncertainty in the outcomes is characterized by the probability distributions for total cumulative employment impacts in the U.S. and Canada shown in Summary Figure 3 and Summary Figure 4, respectively.

In the U.S., while there is 10 percent probability that cumulative job losses may exceed 1,800, there is an equal likelihood (10 percent) of no adverse impact. Implicit in this finding is the assumption that a large proportion of U.S. household expenditures previously spent in Canada would, to some extent, be spent in the U.S. as some of the travelers foregoing trips to Canada would instead choose to travel within the U.S. Since there are, overall, more recreational and vacation trips originating in the U.S. and ending in Canada than vice versa, and since increasing congestion is expected to affect the residents of both nations equally, there exists a chance that a restriction on cross-border movements may result in reduced economic activity in Canada and in increased activity in the U.S. as exhibited by the probability distribution in Summary Figure 3. Again, this assumes, from a conservative point of view, a high degree of substitutability between domestic and foreign recreation and tourism services. In Canada, there is a 10 percent probability that job losses will exceed 3,600 and a 10 percent chance they will be less than 1,300, as shown in Summary Figure 4.

SUMMARY FIGURE 3: Projected Cumulative Foregone Employment from Reduced Personal Trip-Making by 2035 in the United States – Probability Distribution



SUMMARY FIGURE 4: Projected Cumulative Foregone Employment from Reduced Personal Trip-Making by 2035 in Canada – Probability Distribution



Combined Economic Impacts

The overall economic impacts of increasing congestion and delay at the Ontario-Michigan border are summarized in Summary Tables 5 and 6 below.

By 2035, the failure to address congestion problems at the border would cost the economies of Michigan and Ontario a total of US$748 million (CAN$939 million) in production and output, annually. Combined output losses in the United States and Canada would reach US$5.0 billion (CAN$6.2 billion) annually, in 2035 and after.

SUMMARY TABLE 5: PROJECTED ANNUAL FOREGONE PRODUCTION IF CONSTRAINED CAPACITY, CONGESTION AND DELAY AT THE ONTARIO-MICHIGAN BORDER ARE NOT ADDRESSED, SUMMARY RESULTS

Year	Impact on the State of Michigan and the Province of Ontario (Values are in millions of 2004 Dollars)		Impact on the United States and Canada (Values are in millions of 2004 Dollars)	
	US$	CAN$	US$	CAN$
2025	($748)	($939)	($1,603)	($2,004)
2035	($4,977)	($6,221)	($10,752)	($13,440)

Cumulative employment losses in the state of Michigan and the province of Ontario would exceed 6,000 by 2025 and 42,000 by 2035. Overall, the United States and Canadian economies would lose a total of 97,000 full time equivalent jobs as a result of increasing congestion and delays at the Ontario-Michigan border.

SUMMARY TABLE 6: PROJECTED CUMULATIVE FOREGONE EMPLOYMENT IF CONSTRAINED CAPACITY, CONGESTION AND DELAY AT THE ONTARIO-MICHIGAN BORDER ARE NOT ADDRESSED, SUMMARY RESULTS

Year	Impact on the State of Michigan and the Province of Ontario (Full Time Equivalent Jobs)	Impact on the United States and Canada (Full Time Equivalent Jobs)
2025	-6,095	-14,182
2035	-42,158	-97,566

In summary, the analysis in this report stresses the following:

- Importance of the Detroit-Windsor corridor for the vitality of the U.S. and Canadian economies;
- Continuous and free flowing movement of people and goods in that corridor is critical to the industries in the region;
- The potential impacts of increased delay on the local, regional and national economies are significant in terms of lost production and full-time employment, which makes major crossing improvements a necessary and urgent action.

1. INTRODUCTION

1.1 Purpose

The purpose of this report is to provide an update to the economic assessment of the impact of the increasing traffic congestion in the Windsor-Detroit crossings on the industrial productivity in the area, the economic activity, and tourism traffic at the regional and the national level. Therefore, this paper aims to identify the opportunity cost and the potential economic impacts (at the national, regional, and local levels) in the case of *not* undertaking any solution to ease the congestion on the existing border crossings between Detroit and Windsor.

1.2 Overview of Current Trends and Structure of Trade Flows

Canada and the United States are the largest bilateral trade partners in the world with the total value of goods traded between them reaching US$428 billion in 2004. The North American Free Trade Agreement has had significant impact on trade between the two nations, solidifying and reinforcing access to both markets. In 2004, 85 percent of total Canadian exports were destined for the United States while 59 percent of imports were sourced from the U.S. The Detroit river crossings, especially the Ambassador Bridge, represent key gateways for cross-border trade between Canada and the United States and hold great importance to the economies of both countries. Total cross-border trade in the Detroit-Windsor corridor was estimated at US$113 billion in 2004[2] representing approximately one-quarter of total bilateral trade.

The most significant component of this bilateral trade is related to the automotive industry. The Autopact, the 1965 agreement between Canada and the U.S. that opened the way for Canadian auto plants to produce automobiles for sale in the U.S., followed by the North American Free Trade Act (NAFTA), has propelled Canada into an ongoing trade surplus situation with the United States. Exports to the United States were negligible prior to the pact but now cars and trucks are Canada's largest items of export. With the "Big Three" original automakers located next door in Detroit, Ontario has become a leader in automotive manufacturing exports to the United States. Similarly, Michigan has become a major importer of Canadian products. That the economic linkages between Michigan and Ontario are particularly strong can be exhibited by the fact that the U.S. traded US$255 billion in goods with the province of Ontario alone in 2004, of which over 25 percent represented trade with Michigan.

The U.S. auto industry and a significant portion of Canada's economy depend on a smoothly functioning border crossing between Windsor and Detroit. The following section highlights how increasing congestion and delay at the border may adversely affect trade flows between the two countries.

1.3 Transportation Effects on Trade

Congestion and delays at border crossings increase the overall transit time for transportation services on the particular route and increase the probability of occasional or unscheduled delays (i.e. delays that exceed substantially the average delay). As a result, transit time costs associated with the affected route increase. Transit time costs refer to the value of time spend in transportation. They

[2] Estimate of Detroit river crossing trade provided by IBI Group.

include costs to businesses of time of their employees, vehicles and goods. Transit time costs savings and the resulting productivity improvements are now routinely recognized as important benefits of highway transportation improvement projects and taken into account in cost-benefit analysis of investment proposals.

By a reverse argument, an increase in transit time costs will reduce some of the existing benefits and force the users of transportation services, exporters and importers, to modify their production, purchasing and transportation decisions. The specific effects will depend on the nature of the industry and product. They will be higher for perishable products, just-in-time deliveries, and other time-sensitive deliveries. For example, if there are delays, perishable products may arrive in a bad condition with a very short remaining shelf life. In plants based on just-in-time logistics, a delay may cause disruptions in the production process, leaving crews of un-packers idle and perhaps even stopping the assembly line. In order to deal with this situation, the firm may find it necessary to abandon just-in-time practices or increase the level of inventories as a way of protection against delays. This, however, will increase production costs.

In addition, an increase in transit time may also lead to an overall increase in (monetary) transport costs. This is so because long waiting times and delays cause increased wear and tear of trucks. Moreover, regulatory restrictions on the number of hours a trucker can spend behind the wheel imply that in case of substantial delays and longer transit times more truckers may be required for a given delivery.

1.4 Transportation Effects on Personal Trips and Tourism

Tourism, which may include recreation, shopping and vacation trips, is a broad service sector requiring a wide range of simple and complex goods and services to support it. These trips have an important and vital role in the economy as it supports other services such as tour operators, travel agencies, lodging, banks, insurance companies, transportation, food, culture and other technical services and material products (machinery, equipment, instruments) required to support travel activities and tourism attractions.

Availability and affordability of transportation in the Windsor-Detroit corridor plays a big role in generating tourism traffic between the two sides of the border. Between 1992 and 2003, U.S. person trips to Canada increased by 10% while trips by Canadian residents to the U.S. have declined by 55% in total, due mostly to the post-2000 reduction in same-day trips resulting from factors such as 9/11, SARS, heightened security, border delays etc. Over the 1995-2003 period, passengers in cars entering the U.S. through Detroit have decreased at an annual average rate of 8.1 percent, although much of this decline has been witnessed after 2000. The growth of the passenger trips in the next few years may be hindered by excessive security measures (for example, the U.S. Visit program led by the Department of Homeland Security) at the border. Currently congestion is not the main obstacle to recreation, shopping, and vacation traffic. However, if the security measures are improved at the border, a growth in passenger cars may lead to congestion at the border.

1.5 Organization of the Report

After this introductory chapter, Chapter 2 presents the methodological framework for estimating the economic impact for freight at the local, regional, and national levels. This chapter also shows the theoretical framework for estimating the impacts at the three different levels and provides the data sources used in the estimation. Chapter 3 presents the results of the economic impact analysis of freight. Chapter 4 addresses the economic impact analysis of recreation, shopping, and vacation traffic.

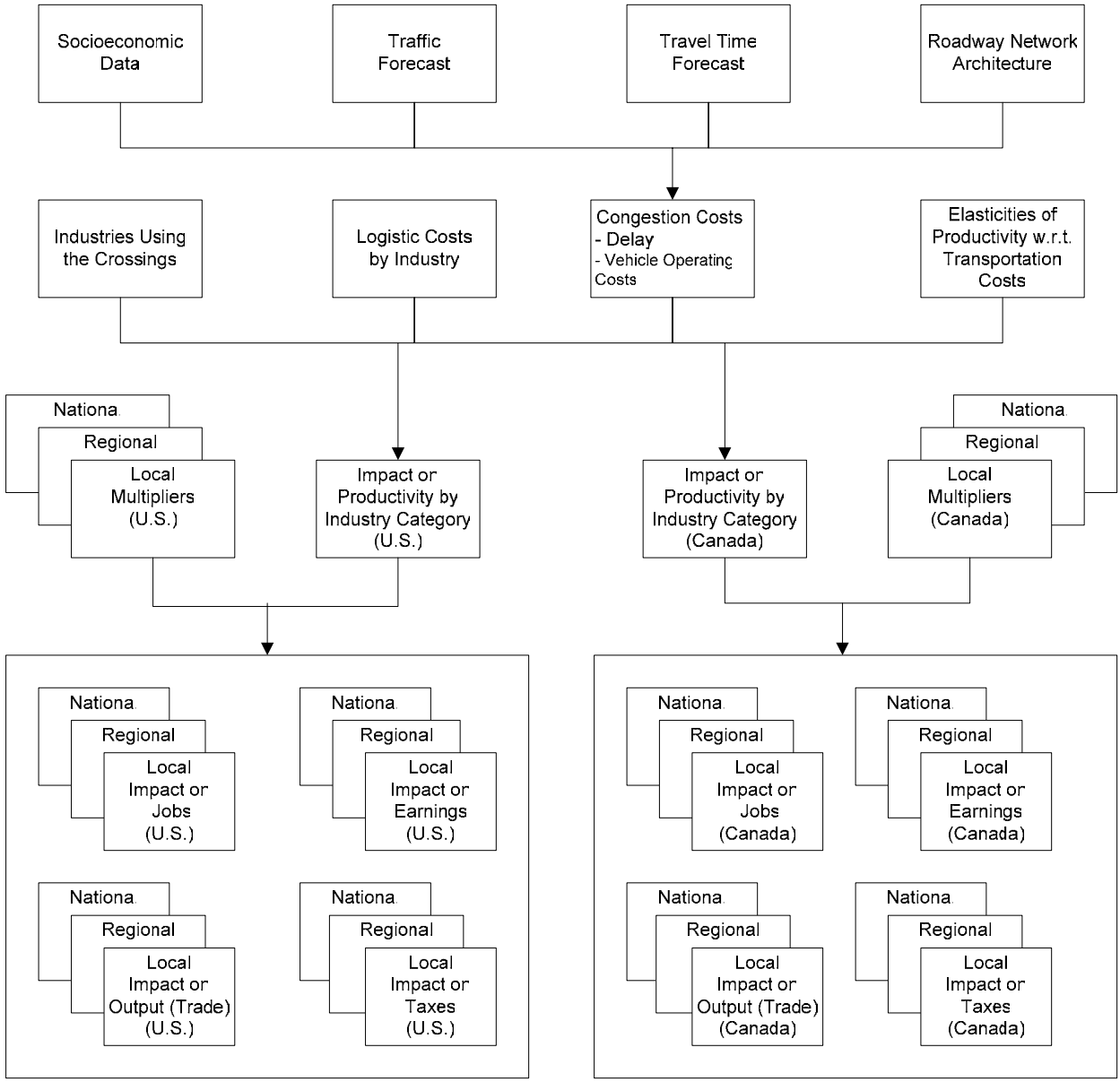
2. METHODOLOGICAL FRAMEWORK

The goal of this chapter is to provide an overview of the methodological framework that is pursued in this paper to estimate the economic impact at local, regional and national level.

2.1 Conceptual Framework

The conceptual framework for estimating the economic impact of delay on the economy consists on three components. Figure 1 shows an illustration of the conceptual methodology and the flow of the impact estimation process.

Figure 1: Conceptual Framework to Estimate the Economic Impacts



The figure shows the economic impact estimation process broken down into three steps:

1. **The Impact of Increasing Delay on Transportation Costs in the Detroit-Windsor Crossings:** This impact is estimated based on the direct congestion costs experienced by the crossings' users. The costs are expressed in terms on travel delays and vehicle operating costs.

2. **The Impact of Increase in Transportation Costs on Canadian and U.S. Industrial Output:** This impact estimation employs the fundamental concepts of the theory of trade between two countries to investigate the impact of transportation cost increase on the industries productivity in the economies of the trading countries.

3. **The Economic Impact of Industry Productivity Loss on the Local, Regional, and National Economies:** This impact applies multipliers at local, regional, and national level from the U.S. and Canada to assess the impact in terms of output, jobs, earnings, and taxes.

2.2 The Impact of Increasing Delay on Transportation Costs in the Detroit-Windsor Crossings

2.2.1 Methodology

A traffic-growth and travel-cost spreadsheet model, using parameters and relationships from StratBENCOST[3], was developed by the study team. The model allows for risk analysis and produces probability distributions for all (selected) output variables.

Key steps and methodological assumptions used in the model development are as follows:

- **Traffic Volumes**: annual traffic volumes for personal cars and trucks were derived from 2004 traffic counts and average annual compound growth rates estimated over 3 periods: between 2004 and 2015, between 2015 and 2025, and between 2025 and 2035. These traffic estimates correspond to non-constrained, baseline, traffic volumes (that ignore, in particular, the impacts of increasing congestion levels and travel costs on traffic demand).

- **Capacity and Congestion Levels**: road capacity is assumed to remain constant over the study period (2004-2035). The 2004 volume-to-capacity ratios were derived based on 2004 daily traffic estimates and road capacity and grow at the rate of forecast traffic growth. Congestion levels between 2004 and 2035 were calculated by dividing projected traffic volumes by fixed capacity estimates.

- **Travel Speed and Crossing Times**: travel speed and crossing times (assuming no processing) were estimated from speed-flow relationships from the StratBENCOST model. These relationships indicate the average speed of a vehicle at various congestion levels (V/C ratio) and for various facility types. For both crossings, the type "Urban 2 or 3 Lanes" was selected.

[3] The *StratBENCOST* model was developed for the National Cooperative Highway Research Program (NCHRP) by HLB to evaluate highway projects. The model incorporates an analysis of the network of highways and surrounding roads. The objective of the StratBENCOST model is to present a methodology that allows strategic level planners to integrate highway user costs and benefit-cost analysis into a broad-based highway investment evaluation tool.

- **Processing Times**: processing times at the 2004 congestion levels were derived from measurements reported by the FHWA for the Ambassador Bridge[4]. Processing times for the Detroit-Windsor Tunnel were derived by pro-rating the Ambassador Bridge time estimates with facility length. As a simplifying assumption, total crossing time (including processing time) after 2004 was assumed to grow with congestion, *at the same rate* as travel time grows with congestion along a standard highway facility. *No* other attempt was made to model the impacts of increased queuing on crossing times.

- **Travel Costs**: travel costs (vehicle operating costs, accident costs, and emission costs - the later two cost categories are not reported in this report) were estimated using relationships from StratBENCOST. Truck vehicle operating costs (including fuel, oil, tires, maintenance and repair, and vehicle depreciation) were derived with consumption lookup tables providing consumption rates (gallons of fuel, quarts of oil, tire usage, etc.) at various vehicle speeds and volume-to-capacity ratios. These tables account for changes in vehicle operating costs associated with changes in both average speed and speed cycling.

- **Traffic Diversion**: truck traffic diversion from the Detroit River crossings to intermodal rail was assumed in some of the model runs. The percentage of traffic divertible was obtained from IBI.

2.2.2 Data Sources

Key data sources for this analysis included:

- The IBI Group, for existing traffic volumes and projected traffic growth;

- Research sponsored by the U.S. Federal Highway Administration (FHWA), Office of Freight Management, for current border crossing times and congestion level at processing booths, at the Ambassador Bridge;

- The StratBENCOST highway investment evaluation software and database, developed by HLB Decision Economics for the U.S. National Cooperative Highway Research Program (NCHRP); and

2.3 The Impact of Increase in Transportation Costs on Canadian and U.S. Industrial Output and Productivity

2.3.1 Economics of International Trade and Impact of Border Delays

This section uses the fundamental concepts of the theory of trade between two countries to investigate the impact of border delays on the economies of the trading countries.

[4] No updates to the 2002 FHWA study of border crossing times have been published to date.

2.3.1.1 Automotive Industry

Figure 2 illustrates the effects of border delays on the industries based on just-in-time practices and cross-border production. Part A shows the impact on trade volumes of parts and components used as inputs and Part B shows the corresponding impact on output of assembled products.

In Part A, the initial equilibrium volume of trade and prices is given by point E1 and the corresponding quantity of shipments Q1 and price P1.

An increase in border congestion and delays causes both the supply curve and the demand curve to shift to the left. The export supply curve shifts to the right as the increase in congestion and delays imply an increase in transport and transport-related costs of exports. Economic theory predicts that when production costs increase, the quantity supplied at the given price falls. This effect is illustrated as a shift to the left. The demand curve also may shifts to the left. This is so because border delays and less efficient transportation network make the production in general more expensive. As a result, input demand may be reduced at any price.

In Part B, the initial equilibrium volume of sales of the finished good and prices is also given by point E1 and the corresponding quantity of sales Q1 and price P1.

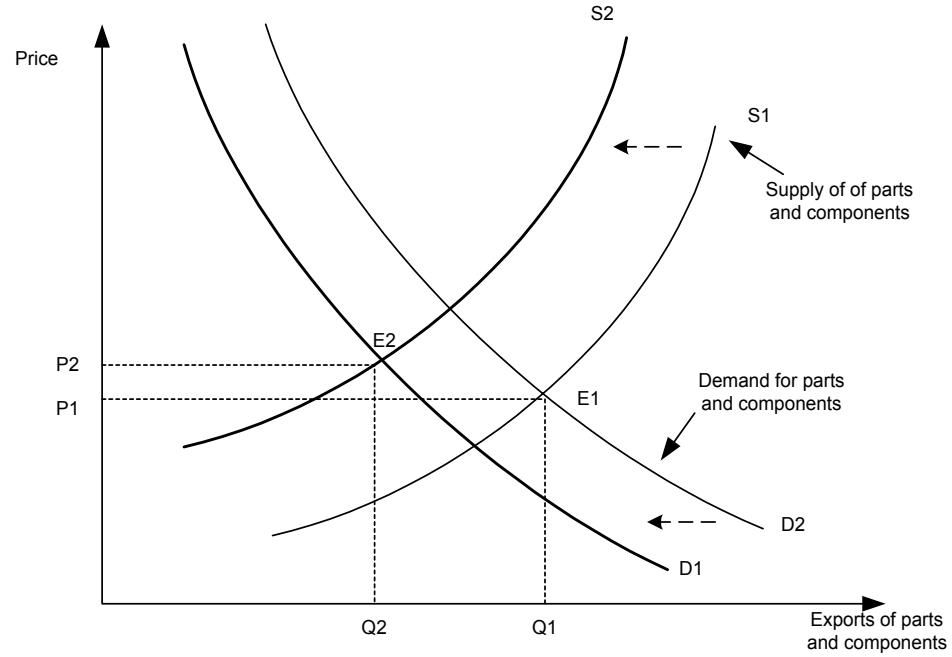
The supply curve of automobiles shifts to the right as a result of an increase in the costs of inputs and an overall increase in production costs. This then in turn results in a reduction in the quantity of output and an increase in price.

The magnitude of these effects will depend on the extent of the shifts of the supply curves as well as the shape of all supply and demand curves. This in turn will be affected by factors including the following:

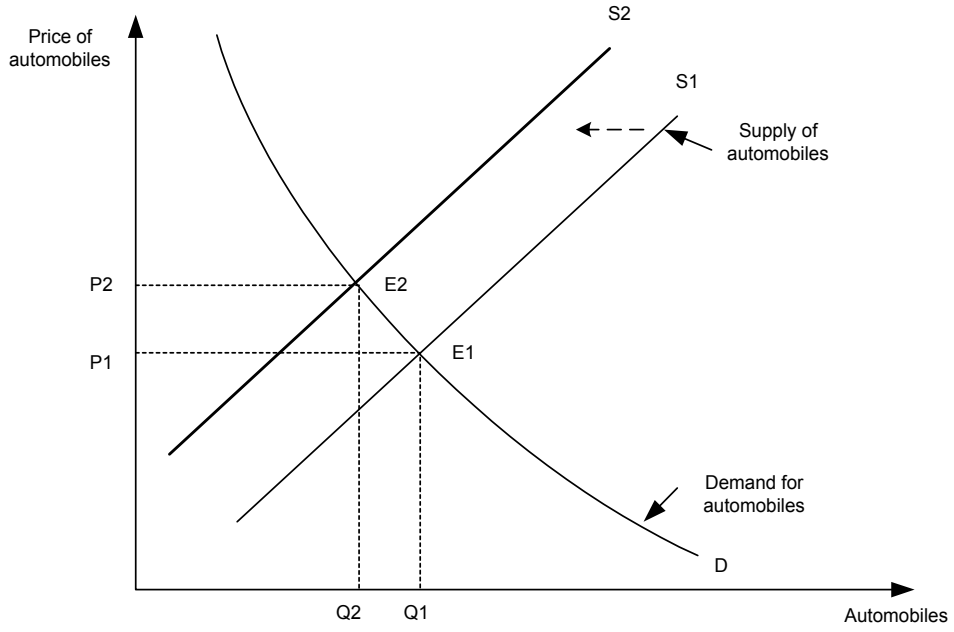
- Output elasticity with respect to costs (just-in-time versus traditional production practices);
- Price elasticity of supply of finished products, and
- Price elasticity of demand of finished products.

Figure 2: Effects of Border Delays on Industries Based on Just-In-Time Logistics and Cross-Border Manufacturing

Part A: Production and Volume of Trade of Parts and Components



Part B: Assembly and Sales of Final Product

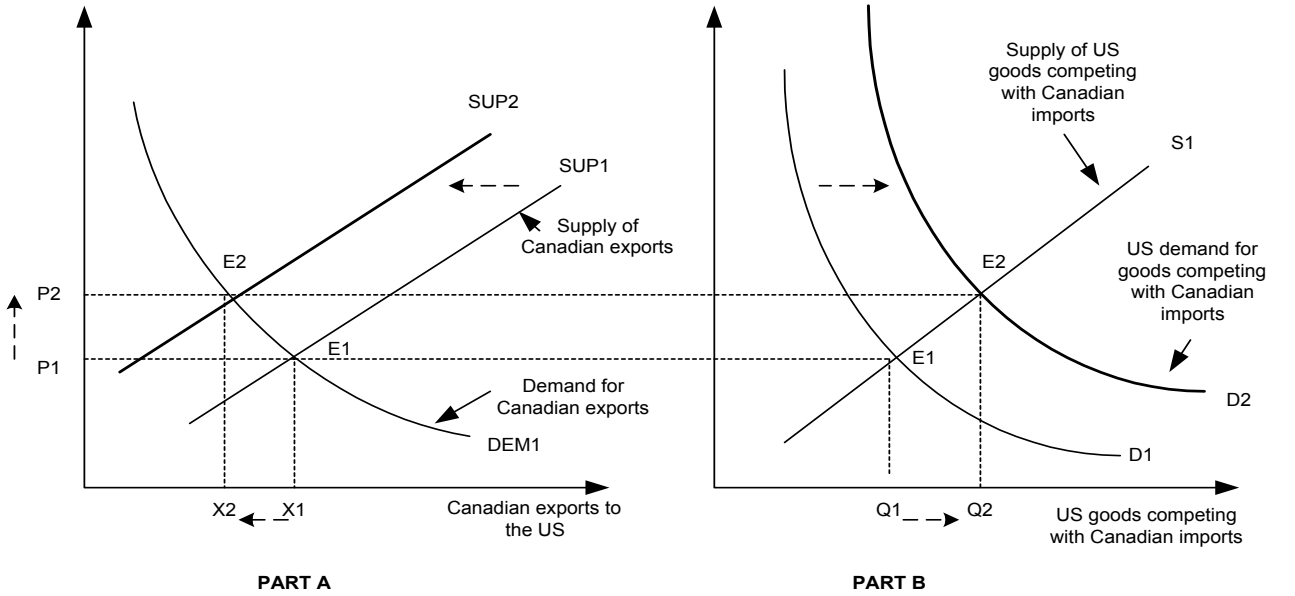


2.3.1.2 Other Industries

Figure 3 shows the effects of congestion and border delays on other industries, i.e. those where final products are traded. There are two parts in this figure. Part A shows the effect on the exporter, and

Part B shows the corresponding effect in the export market producers and the impact on consumers and producers of competing products. To facilitate the analysis, it is assumed in this figure that the exporter firm is a Canadian company and the export market is the U.S.

Figure 3: Effects of Border Congestion and Delays on Industries Trading Final Goods



The initial market equilibrium in Figure 3 is shown by point E1. The quantity of Canadian exports is X1, the quantity of domestic output is Q1 and the prevailing market price is P1.

An increase in congestion and border delays causes the supply curve of Canadian exports to shift to the left as exporters are faced with higher transportation costs. The volume of Canadian exports falls to X2 and the price increases to P2. Canadian exporters are worse off in terms of the reduced volume of shipments. Their revenues will also fall if the increase in price does not compensate for the reduction in volume, i.e. if the percentage increase in price is smaller than the percentage reduction in shipments.

The increase in price of Canadian exports makes U.S. goods competing with Canadian exports more competitive, and the demand for U.S. domestic products increases. This is illustrated by a shift in the demand curve for U.S. goods competing with Canadian exports in Panel B of Figure 3. As a result, the output of U.S. goods competing with Canadian goods increases but so does their price. U.S. producers clearly benefit from the reduction in the volume of Canadian exports. However, U.S. consumers are hurt by higher market prices and possibly reduced choice.

The reduction in the quantity of Canadian exports (and increase in the price) will depend on the shapes of the demand and supply curves, that is on the following factors:

- Price elasticity of demand for Canadian exports;
- Price elasticity of supply of Canadian exports, and
- Elasticity of Canadian export shipments with respect to border delays.

The increase in the volume of the U.S. domestic production will depend on the following factors:

- Price elasticity of demand for U.S. goods competing with Canadian goods;
- Price elasticity of U.S. supply of goods competing with Canadian exports.

IBI developed the forecasts of trade volumes for the years of interest. Separate forecasts were provided for five commodity/industry groups:

1. Animal/Plant Products;
2. Automotive/Metal;
3. Forest Products;
4. Machinery/Electronics; and
5. Other Products.

These industries are discussed briefly below:

Animal and Plant Products

This sector is characterized by a fairly even directional split of the trade volumes between Canada and the U.S. and trade volumes have grown at a relatively stable rate over the last thirteen years. Despite on-going disputes in beef, pork and chicken, demand remains strong and long-term prospects call for steady growth over the study horizon.

Automotive/Metal

Automotive/metal sector trade between Canada and the U.S. has shown steady growth over the past few decades as a consequence of the Auto Pact and more recently, NAFTA. A slowdown in the industry was predicted in the early 2000s, but did not fully materialize due to a combination of factors that helped sustain strong auto sales in North America. The future outlook for auto industry trade between Ontario and Michigan calls for continued long-term growth likely at lower than historical growth rates, although with particularly stronger growth projected in the near term.

Forest Products

Trade in forest products is dominated by Canadian exports to the U.S. This sector includes pulp and paper, wood pulp, softwood and hardwood lumber and a variety of other products. Canadian exports experienced a fast growth for a good part of the 1990s but have shown low (and sometimes negative) growth in recent years, in part due to the on-going Canada-US dispute over softwood lumber and punitive duties imposed by the U.S. Despite this and other uncertainties affecting the industry, near-term growth is expected to be remain positive as demand remains strong.

Machinery and Electronics

The dominant direction of movements is from the U.S. to Canada. This sector showed dramatic growth through the 1990s followed by a period of negative growth corresponding with the collapse of the high-tech sector. Despite the difficulties experienced in recent years, this sector is poised to be the fastest growth sector with impetus expected from low interest rates, aging capital equipment

and strong demand for IT products. Trade in both directions is expected to grow at high rates over the entire study horizon.

Other Products

This category contains the following:

- Various Raw Minerals
- Fuels
- Chemicals And Related Products
- Cement
- Non-Metal Manufactured Goods
- Furnishings
- Clothing & Footwear
- Sporting Goods

2.3.2 Data Sources

Key data sources for this analysis will include:

- The IBI Group, for projected trade volumes by commodity/industry in years 2025 and 2035;
- HLB model for the projection of border delays;
- Database of transportation elasticities compiled by the Australian Bureau of Transport Economics (http://dynamic.dotrs.gov.au/bte/tedb/index.cfm);
- Transport Canada policy analysis paper "Highways and Logistics and Production Performance", Paper TP12791E; and
- Internal HLB analysis.

2.4 The Economic Impact of Industry Productivity Loss on the Local, Regional, and National Economies

This section presents the methodology to estimate the impact of productivity and trade loss on output and employment in different industries. The methodology shows how the American and Canadian labor force will be affected by a possible deterioration in US-Canada trade. We base our methodology on the measurement of "incremental" effects of reduced international trade for the local, regional, and national economies.

2.4.1 Economic Impact Modeling

Economic impact analysis is the study of the effect of a change in demand (spending) for goods and services on the level of economic activity in a given area, as measured by business output (sales), employment (jobs), personal income, and tax revenue. This change in demand for goods and services can be the result of decisions made by private enterprise, government, or households. Reduction in trade due to delays on the border crossings will impact the export manufacturing industries and hence reduce the requirements for inputs (purchases) of labor, materials, equipment, and services, which must be supplied by local (and non-local) producers. To the extent that reduction in these purchases result reduced productivity and/or reduced levels of labor force

utilization (employment), they will cause real decline in the local (regional) economy with attendant costs of lower employment, personal income, business profits, and local tax revenue.

Economic impact analysis involves the estimation of three types of expenditure/production activity within a regional economy, commonly referred to as "direct effects," "indirect effects," and "induced effects."

2.4.1.1 Direct Effects

Direct effects are the result of direct spending as a consequence of industrial, commercial, warehousing and office development. Direct spending results in the employment of workers, sales of locally produced goods and services, and generation of local tax revenue. The distinguishing feature of a direct effect is that it is an immediate consequence of the activities and expenditures of firms and agencies setting up operations in the newly developed areas.

2.4.1.2 Indirect Effects

Indirect effects are the result of purchases by local firms who are the direct suppliers to the firms and agencies in the areas developed. The spending by these supplier firms for labor, goods and services necessary for the production of their product or service creates output from other firms further down the production chain, thus bringing about additional employment, income and tax activity. Output, employment, income, and tax revenue resulting from spending by supplier firms (but not households) are considered to be indirect effects.

2.4.1.3 Induced Effects

Induced effects are changes in regional business output, employment, income, and tax revenue that are the result of personal (household) spending for goods and services – including employees of the firms in the developed areas**,** employees of direct supplier firms (direct effect), and employees of all other firms comprising the indirect effect. As with business purchasing, personal consumption creates additional economic output, leading to still more employment, income and tax flows.

2.4.1.4 Total Economic Impact and "Multiplier Effect"

Total impact is the sum of the direct, indirect and induced economic effects of the project or policy change being evaluated. The total change in economic output, employment, personal income, and local tax revenue are generated by successive rounds of spending by businesses and households.

The term "multiplier effect" describes the phenomenon whereby the change in total economic activity resulting from a change in direct spending is greater than the direct spending alone – that is, it is a measure of all indirect and induced effects. The ratio of total effect (e.g., total business output) to the direct effect is termed an "impact multiplier," and is the most direct measure of a regional economy's ability to meet new demand with local (as opposed to imported) resources. The higher the multiplier the greater is the total economic response to the initial direct effect. Multipliers

can also be expressed in terms of employment and income. An employment multiplier is the total overall increase in employment for all industries per new job created.

2.4.2 Economic Impact Approach

Input-Output models[5] were used to estimate the economic impact at various levels in the U.S. and Canada. One of the most common uses of the I-O model is to simulate the impact of a demand shock on the economy. Shock here means any change or departure from the status quo, in this case any change in demand for goods and services. Any decrease in consumption of goods and services will generate both direct and indirect economic production, the latter resulting from the purchase of inputs. The simulations were conducted to assess the direct, indirect and induced effects of a reduction in the total output of industries in the corridor in terms of trade and jobs at the local, regional, and national levels. The direct output effect derived from the transportation delay impact model was used as input for the economic impact estimations. The following steps were followed to estimate the economic impact:

Step 1: Further divided the industry groups to smaller industry groups.

Auto	Transportation Equipment
Forest	Forestry Products
Animal/Plant	Agricultural Services
	Farms
Metal	Fabricated Metal
	Primary Metal
Machinery/Electronics	Electric equipment
	Industrial Machinery
Other	Miscellaneous Manufacturing[6]

Step 2: Split the direct impact of the transportation delays between the U.S. and Canada according to the relative sizes of exports.

Step 3: Broke down the national economies into smaller state/province and county level geographical regions. We estimated that transportation delays would have different levels of impact at the local, regional and national levels. We used the following geographic breakdown of economies to highlight the impacts at appropriate levels.

The Impact on the U.S. economy:

[5] An input-output ("I/O") approach was followed in this study, drawing on an extensive body of research and experience with successful applications to transportation project analysis. An I/O model calculates impact multipliers, which are then used to compute direct, indirect, and induced effects – output, employment, personal income, and local tax revenue generated per dollar of direct spending for labor, goods, and services.

[6] The category of "Other" goods (Miscellaneous Manufacturing) include various raw minerals, fuels, chemicals and related products, cement, non-metal manufactured goods (e.g. glass products, textile products, small household and kitchen articles, toys, video games and other entertainment articles), furnishings, clothing & footwear, and sporting goods.

- Impact on the economy of Wayne County which includes the immediate communities around the crossings in Detroit.

- Impact on the economy of SEMCOG region: the Southeast Michigan Council of Governments. The region encompasses Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties.

- Impact on the Economy of the state of Michigan

- Impact on the Economy of the United States

The Impact on the Canadian economy:

- Impact on the economy of Essex and Kent Counties including the immediate communities around the crossings in Windsor.

- Impact on the economy of the province of Ontario

- Impact on the economy of Canada.

Step 4: Allocated the direct impact of transportation delays at various geographic levels for the industry groups. We based our division on the basis of traffic generated for each industry groups from the local areas on the both sides of the border.

Step 5: Conduct the simulation using the IMPLAN[7] model for estimating the economic impact in the US and Statistics Canada model to estimate the economic impact in Canada.

[7] IMPLAN is a regional input-output model developed and marketed by Minnesota IMPLAN Group, Inc. For more information, see www.implan.com

3. ECONOMIC IMPACT ANALYSIS OF FREIGHT TRAFFIC

This chapter presents the economic impact analysis and findings based on the methodology presented in Chapter 2 and the economic and trade data from U.S. and Canadian sources.

3.1 The Impact of Increasing Delay on Transportation Costs for the Detroit River Crossings

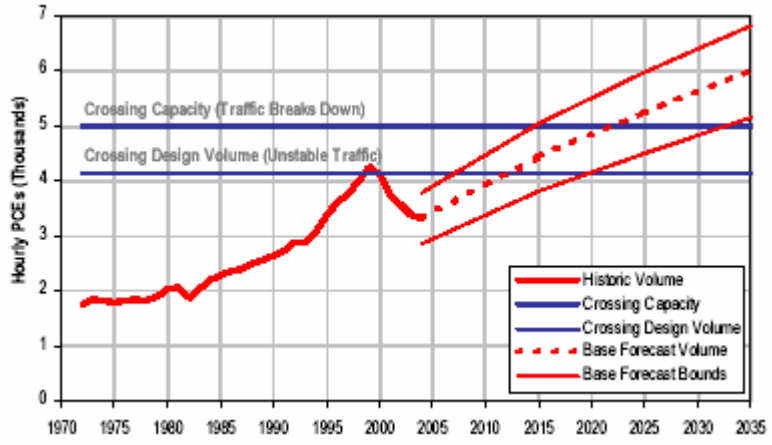
The forecasted traffic growth in the Detroit-Windsor corridor is a key input in the economic impact analysis. Table 1 below provides the projected annual passenger car and commercial vehicle traffic volumes for the base year (2004) and 2015, 2025 and 2035 developed by IBI Group. Annual car traffic on the Detroit River crossings is expected to exceed 18.7 million vehicles by 2035 while truck traffic is projected to reach 7.4 million. This base case forecast does not include any major build alternatives but include already planned and funded improvements.

Table 1: Summary of Annual Vehicle Base Forecast by Major Crossing

Crossing	Vehicle Type	Volume by Horizon Year			
		2004	2015	2025	2035
Ambassador Bridge	Passenger Cars	6,170,000	8,180,000	8,820,000	9,380,000
	Commercial Vehicles	3,370,000	4,950,000	6,320,000	7,680,000
	Total	9,540,000	13,130,000	15,140,000	17,060,000
Detroit-Windsor Tunnel	Passenger Cars	5,780,000	8,100,000	8,750,000	9,360,000
	Commercial Vehicles	160,000	230,000	310,000	380,000
	Total	5,940,000	8,330,000	9,060,000	9,740,000
Detroit River Crossings	Passenger Cars	11,950,000	16,280,000	17,570,000	18,740,000
	Commercial Vehicles	1,800,000	2,450,000	3,360,000	4,290,000
	Total	15,490,000	21,460,000	24,200,000	26,800,000

Source: IBI Group.

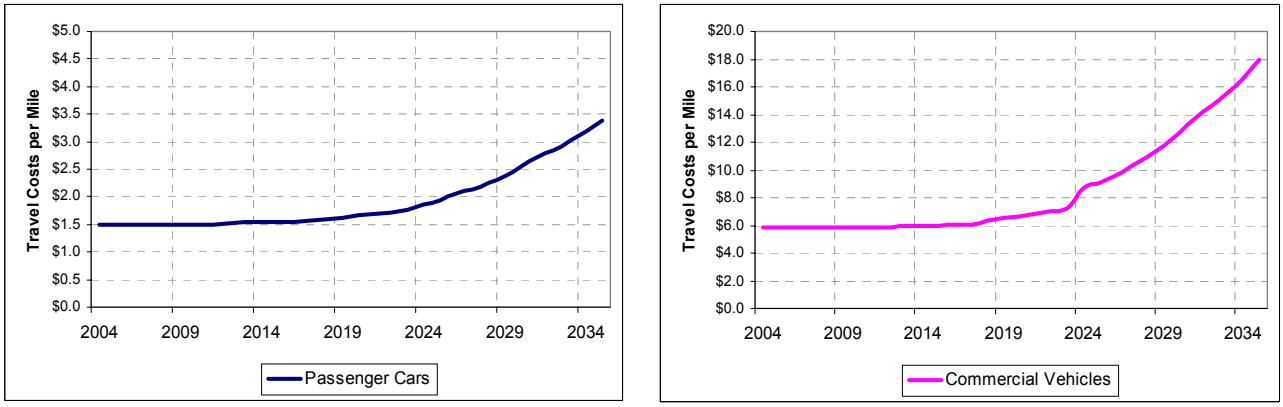
Figure 4: Base Forecast Year Detroit River Crossings Capacity Reached



Source: IBI Group.

Figure 4 above shows the projected IBI peak hour, peak direction passenger car equivalent (PCE) volumes and the year in which crossing design and capacity is reached for both Detroit river crossings. As a result of increasing congestion and delay, the crossing users will experience a significant increase in cost in terms of travel time and vehicle operating costs. As congestion worsens with the growth in vehicle traffic at the crossings (characterized by a rising Volume-to-Capacity (V/C) ratio), average vehicle speeds will fall, in turn leading to higher per trip travel times and unit vehicle operating costs. The monetization of the travel time estimates together with vehicle costs are combined with the total number of cross-border trips to derive the total travel costs on a per mile basis. The passenger car and commercial vehicle costs per mile are shown in Figure 5.

Figure 5: Expected Travel Cost Per Mile for Passenger Cars and Commercial Vehicles in the Detroit River Crossings



3.2 The Impact of Increase in Transportation Costs on Canadian and U.S. Industrial Output

Transformation of insights of economics of international trade into measurable implications and development of the empirical methodology involved three steps:

Step 1: Development of structure and logic models for production and managements decisions of firms facing border delays and identification of key effects

Step 2: Development of an empirical estimation model by identification of key elasticities required to compute the key effects identified in Step 1 and calculation of the effects in relative terms (i.e. in percentage terms)

Step 3: Calculation of the absolute value of the impacts by applying the results from Step 2 to forecasted trade volumes.

Two sets of structure and logic models and empirical estimation models were developed. One of them considers the automotive industry and other industries based on just-in-time logistics, cross-border production and extensive trading in parts and components. The other model examines the other industries that trade primarily in finished goods. All impact consider Canadian and US industries combined.

The three steps are discussed in more detail below.

3.2.1 Step 1: Effects on Production and Management

The developed structure and logic models for production and management decisions in situation of increasing border delays are shown in Figure 6 and Figure 7.

Figure 6: Assumed Effects of Border Congestion and Delays in the Automotive Industry (and Other Industries Based on Just-in-Time Logistics and Cross-Border Production)

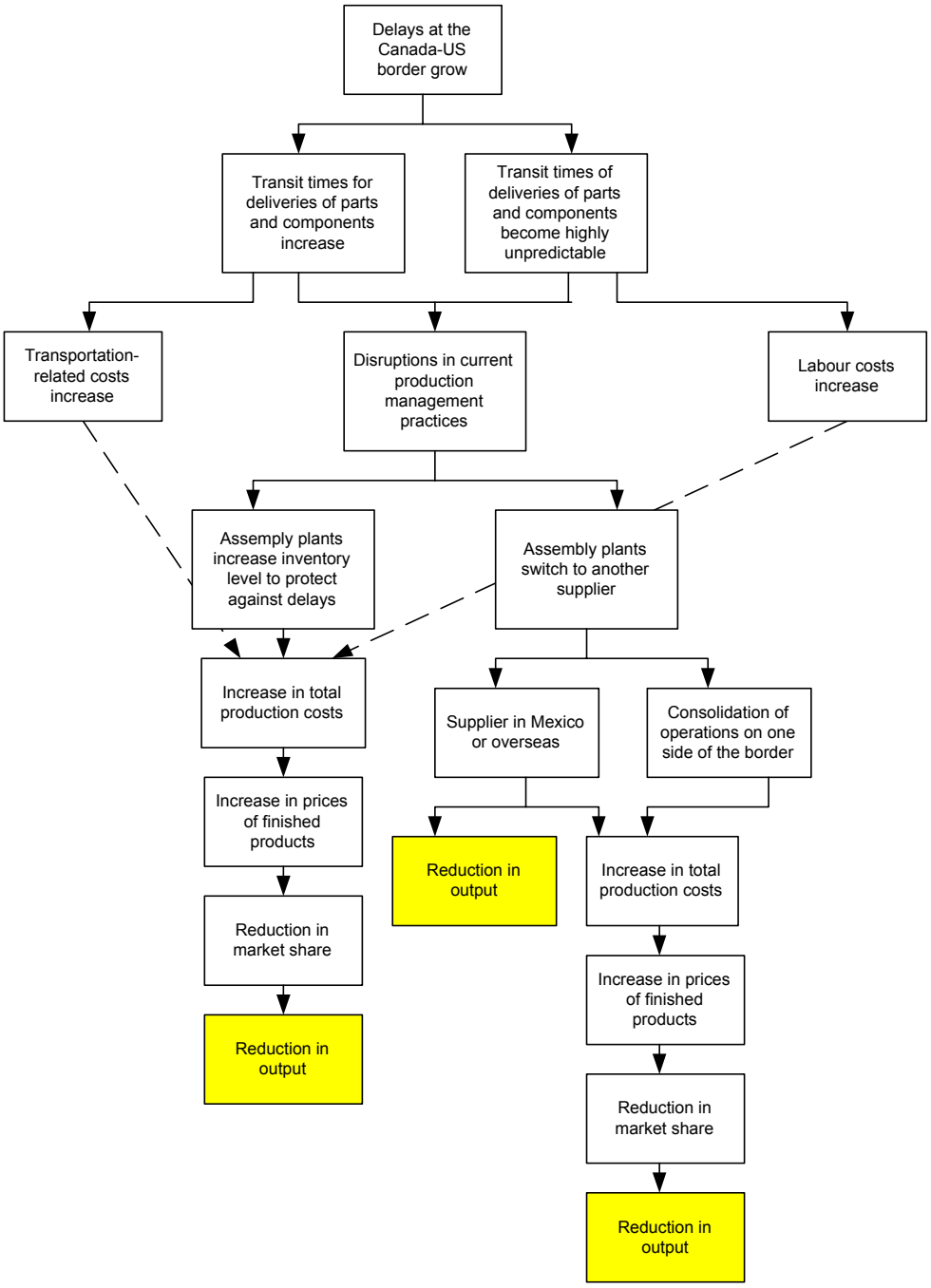
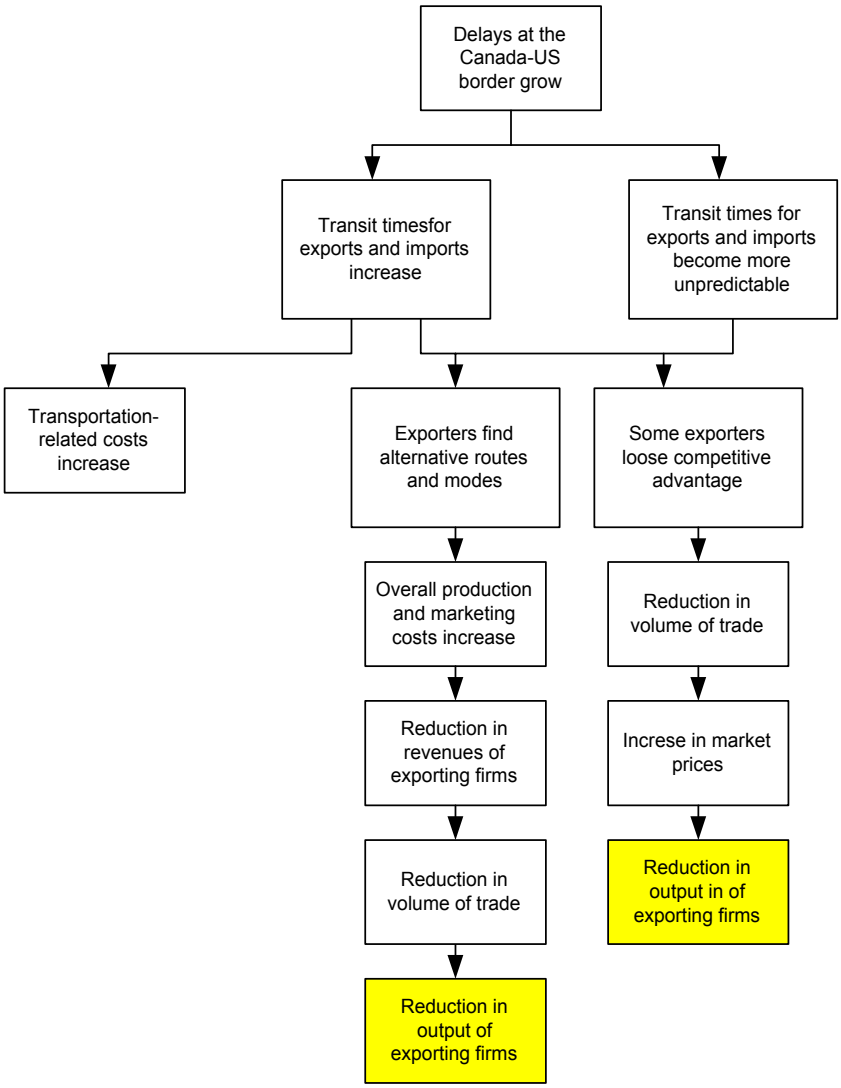


Figure 7: Assumed Effects of Border Congestion and Delays in Other Industries (Trading Primarily in Finished Goods)



3.2.2 Step 2: Estimation of the effects on Productivity using Key Elasticities

Automotive Industry

Figure 6 implies that a precise estimation of the output effects would require an assessment of the probability of assembly plants faced with border delays choosing the various options illustrated, i.e.:

(1) Probability of simply increasing the inventory level (but maintaining the current locations of production facilities);

(2) Probability of switching to a supplier in Mexico or overseas, and

(3) Probability of consolidating all operations on one side of the border.

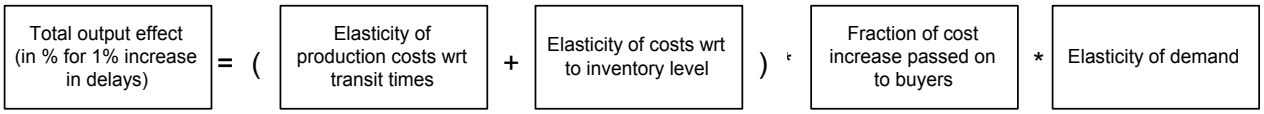
In addition, estimates of cost differentials for alternative suppliers in Mexico, overseas and in Canada and U.S. would be required to assess the operating cost implications of options (2) and (3). Since no such data or any other information were readily available and time constraints prevented detailed research, it was assumed that the entire industry would choose option (1), i.e. simply increase the inventory level to protect against border delays, but maintain the current locations of production plants.

This assumption implies that the following data are required to estimate the relative impact of border delays on output:

- Elasticity of production costs with respect to transit times;
- Elasticity of production cots with respect to inventory level;
- Percentage increase in inventory level required, for each 1% increase in trip delays, to protect the production line against delays;
- Fraction of cost increase passed on to buyers, and
- Elasticity of demand for final product.

The total output effect would then be calculated as shown in Figure 8.

Figure 8: Calculation of Output Impact in the Automotive Industry



Other Industries

The border delays have an output reducing impact through two related effects:

1. Reduction in output due to a loss of competitive advantage in export markets related to transportation times, and
2. Reduction in output due to higher transportation costs.

Since "Other Industries" trade mainly in finished goods, there will be an offsetting effect to the reduction in output pointed out above. The offsetting effect is an increase in output of local or domestic producers competing with imports; since imported goods became more expensive and less attractive, local producers experience a higher demand.

It should also be pointed out that reduction in export demand will be partially offset by domestic sales, or export substitution. In other words, it is recognized and assumed in the methodology that exporters will be able to sell some of the lost exports domestically.

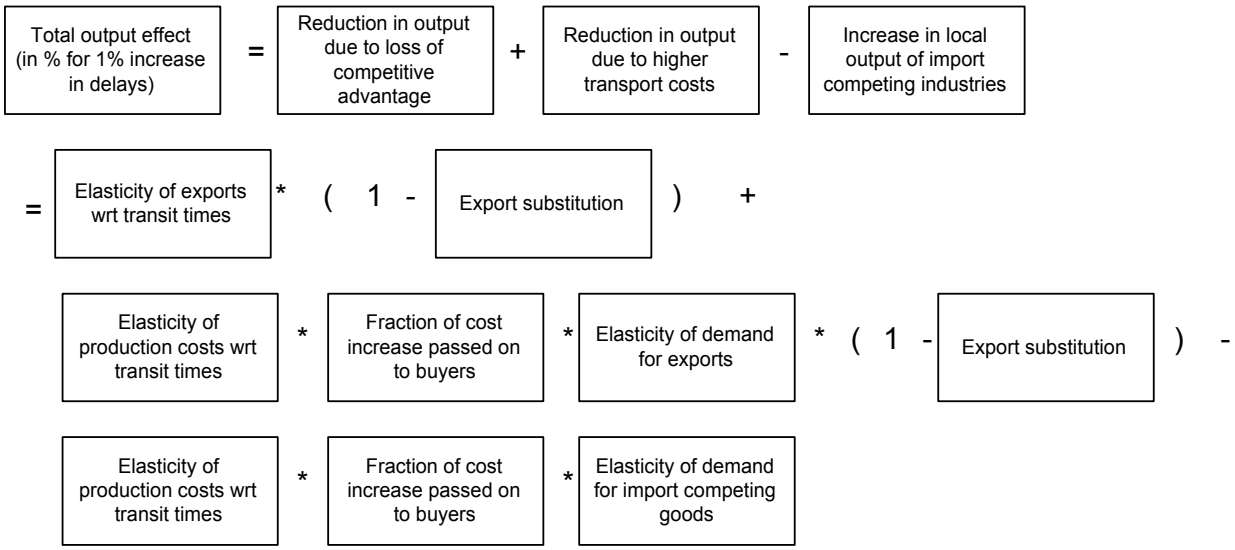
The following data would be required to estimate the output impact:

- Elasticity of exports with respect to transit times;
- Export substitution with domestic sales;

- Elasticity of production costs with respect to transit times;
- Fraction of cost increase passed on to buyers;
- Elasticity of demand for exports, and
- Elasticity of demand for domestic import competing goods.

The output effect for 1% delay would then be calculated as shown in Figure 9.

Figure 9: Calculation of Output Impact for Other Industries



3.2.3 Step 3: Calculation of the absolute value of the impacts

In Step 3, the relative output effects, or percentage changes in output calculated in Step 2 were multiplied by forecasts of trade volume in years 2025 and 2035 going through Detroit-Windsor crossings to obtain the output impact of border delays for years 2025 and 2035, respectively. It is worth mentioning here that these effects are annual effects, and not cumulative.

The results of the assessment are shown in Table 2 below.

Table 2: Results of the Assessment

Commodity/Industry	Affected volume of trade in 2025 (M of 2004 CAN$)	Affected volume of trade in 2035 (M of 2004 CAN$)	Reduction in output due to increase in border delays in 2025	Reduction in output due to increase in border delays in 2035	Impact on output in 2025 attributable to border delays (M of 2004 CAN$)	Impact on output in 2035 attributable to border delays (M of 2004 CAN$)
Animal/Plant	$6,502	$8,234	-1.04%	-6.06%	-$68	-$499
Auto	$103,002	$123,974	-0.95%	-5.01%	-$982	-$6,215
Forest	$5,129	$5,740	-0.24%	-1.45%	-$12	-$83
Machinery/Electronics	$66,093	$86,899	-0.24%	-1.45%	-$160	-$1,259
Metal	$19,619	$23,614	-0.24%	-1.45%	-$47	-$342
Other	$31,862	$38,674	-0.24%	-1.45%	-$77	-$560
TOTAL	**$232,207**	**$287,135**			**-$1,347**	**-$8,958**

The largest impacts are on the agribusiness industry (i.e. animal/plant commodities) and the auto industry. The reason is a particular sensitivity of trade in these industries to delays in transportation. In the agribusiness industry, the sensitivity arises because of requirements to transport fast fresh produce and perishable food products. On the other hand, the auto industry is sensitive to delays because of its organization and production management that entail just-in-time logistics and plants located on both sides of the border.

3.3 The Economic Impact of Industry Productivity Loss on the Local, Regional, and National Economies

As explained in Chapter 2, HLB relied on two models to estimate the economic impacts at the local, regional, and national levels. HLB conducted the simulation using the IMPLAN[8] model for estimating the economic impact in the US and Statistics Canada model to estimate the economic impact in Canada.

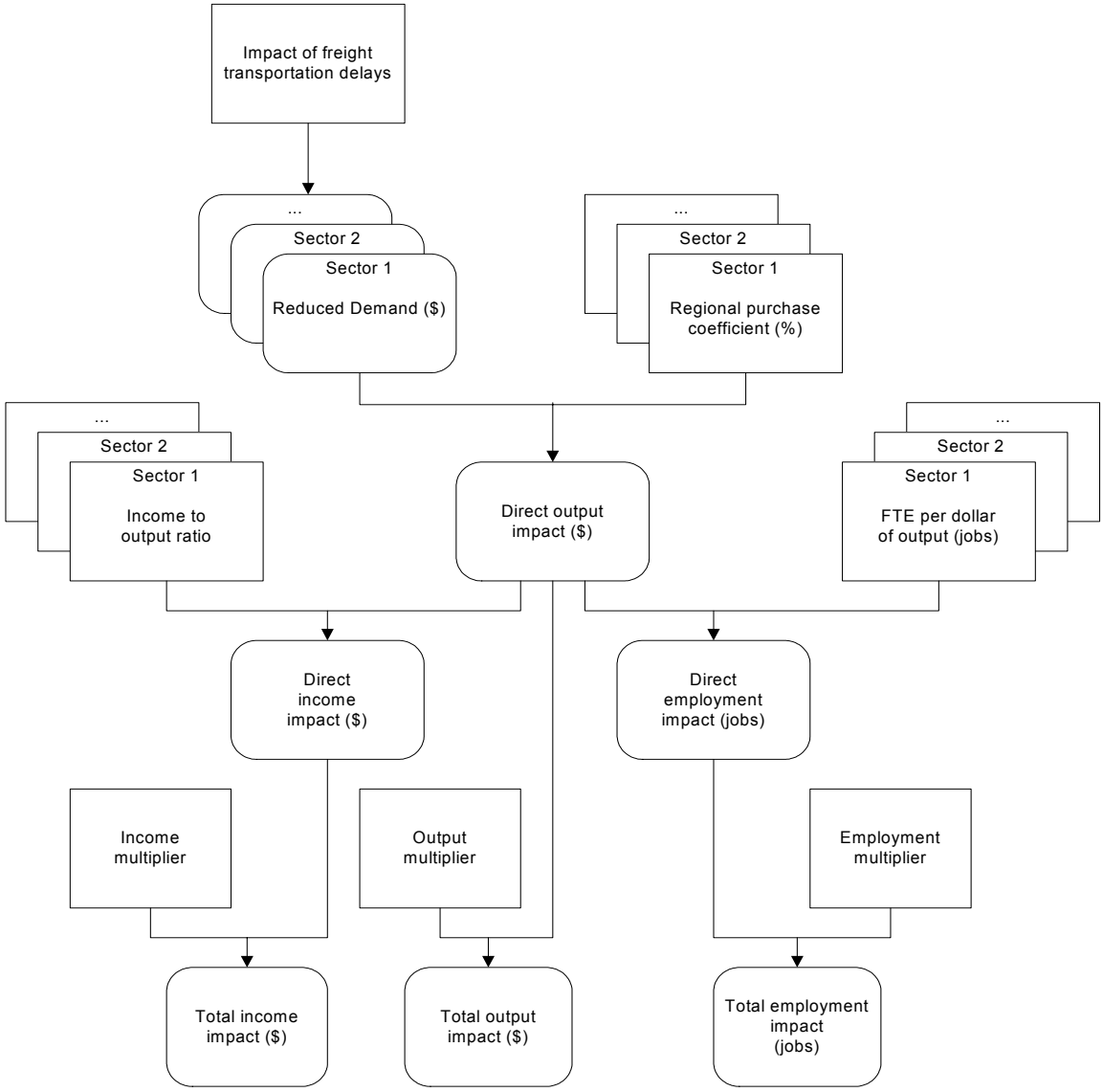
3.3.1 Economic Impacts in the United States

To measure impact of capacity constrained international trade, for the U.S. side, HLB used the IMPLAN© model which is an economic impact assessment modeling system (structured as an input-output model) originally developed by the U.S. Forest Service (and now maintained by the Minnesota IMPLAN© Group, Inc.). The model data files include transaction information (intra-regional and import/export) for 528 different industrial sectors (generally 3 or 4-digit Standard Industrial Classification code breakdown), and data on 21 different economic variables, including employment, output, and employee compensation.

[8] IMPLAN is a regional input-output model developed and marketed by Minnesota IMPLAN Group, Inc. For more information, see www.implan.com

The structure and logic diagram for estimating the total long-term economic impacts of the project is shown in Figure 10. The direct output effect derived from the transportation delay impact model, presented in Chapter 2, was used as input to IMPLAN model runs shown in the upper part of the diagram.

Figure 10: Structure and Logic Diagram for Estimating Total Economic Impacts



Note that this methodology was applied at four different economy levels: Wayne County-Detroit area, SEMCOG region, the State of Michigan, and the U.S. as whole. The impacts were estimated for two key planning years 2025 and 2035.

3.3.1.1 Economic Impact on Wayne County

The simulation results show that congestion may impact a significant loss in trade which in turn has a significant impact on the local, regional, and the national economies. An estimation of the economic impacts on the Wayne County-Detroit area reveals that the area risks a trade loss of about

US$127 million per year in 2025 which reaches US$834 million by 2035. This will be accompanied by a loss in jobs in the area which is estimated at 435 jobs in 2025 and 2,992 by 2035. The area also risks a loss of tax revenues in the magnitude of US$16 million per year in 2025 which may reach US$87 million by 2035. Tables 3, 4 and 5 show a summary the economic impacts results for Wayne County/Detroit Area.

Table 3: Annual Economic Impact on Wayne County/Detroit Area

Year	Impact	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2025	Output	($114)	($8)	($5)	**($127)**
	Earnings	($40)	($4)	($3)	**($47)**
2035	Output	($748)	($54)	($32)	**($834)**
	Earnings	($262)	($26)	($20)	**($308)**

Table 4: Cumulative Employment Impact on Wayne County/Detroit Area

Year	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2025	(331)	(49)	(55)	**(435)**
2035	(2,292)	(334)	(366)	**(2,992)**

Table 5: Annual Tax Impact on Wayne County/Detroit Area

Year	Employee Compensation	Proprietary Income	Household Expenditure	Enterprises (Corporations)	Indirect Business Taxes	Total
2025	($5)	($0)	($6)	($2)	($4)	**($16)**
2035	($25)	($1)	($30)	($12)	($19)	**($87)**

3.3.1.2 Economic Impact on SEMCOG Region

SEMCOG, the Southeast Michigan Council of Governments, region encompasses Livingston, Macomb, Monroe, Oakland, St. Clair, Washtenaw, and Wayne counties. This region is home to several manufacturing and service corporations that are heavily dependent on the border. The simulation results shown in Table 7, shows that the region will lose about 1,907 jobs in 2025. This number is expected to reach a cumulative loss of 12,508 jobs by 2035. The loss in terms of trade (output) in the region is expected to reach US$431 million per year by 2025 and US$2.8 billion by 2035. Table 8 below shows that the corresponding tax loss for the region is expected to reach US$50 million per year in 2025 and US$321 billion in 2035.

Table 6: Annual Economic Impact on SEMCOG Region

Year	Impact	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2025	Output	($322)	($64)	($44)	**($431)**
	Earnings	($113)	($33)	($28)	**($174)**
2035	Output	($2,113)	($383)	($278)	**($2,773)**
	Earnings	($750)	($197)	($176)	**($1,122)**

Table 7: Cumulative Employment Impact on SEMCOG Region

Year	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2025	(973)	(421)	(514)	**(1,907)**
2035	(6,714)	(2,555)	(3,240)	**(12,508)**

Table 8: Annual Tax Impact on SEMCOG Region

	Employee Compensation	Proprietary Income	Household Expenditure	Enterprises (Corporations)	Indirect Business Taxes	Total
2025	($14)	($0)	($19)	($6)	($11)	**($50)**
2035	($92)	($2)	($119)	($40)	($68)	**($321)**

3.3.1.3 Economic Impact on the State of Michigan

When assessing the impact of delay at the border on the Michigan economy, the analysis shows that the state will risk losing about a cumulative 3,701 jobs in 2025 which can reach 25,141 jobs in 2035. The loss of trade can reach US$4.2 billion per year in 2035. The expected tax loss to the state can reach US$66 million per year in 2025 and US$443 million per year in 2035. Table 9, 10 and 11 show the economic summary results.

Table 9: Annual Economic Impact on the State of Michigan

Year	Impact	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2025	Output	($424)	($121)	($88)	**($633)**
	Earnings	($148)	($61)	($55)	**($264)**
2035	Output	($2,816)	($773)	($591)	**($4,179)**
	Earnings	($995)	($393)	($366)	**($1,754)**

Table 10: Cumulative Employment Impact on the State of Michigan

Year	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2025	(1,668)	(924)	(1,109)	**(3,701)**
2035	(11,706)	(6,030)	(7,406)	**(25,141)**

Table 11: Annual Tax Impact on the State of Michigan

	Employee Compensation	Proprietary Income	Household Expenditure	Enterprises (Corporations)	Indirect Business Taxes	Total
2025	($19)	($1)	($24)	($8)	($15)	**($66)**
2035	($123)	($4)	($163)	($54)	($100)	**($443)**

3.3.1.4 Economic Impact on the United States Economy

The increasing delay experienced in freight transportation is expected to lead to a reduction in trade of about U.S. $1.4 billion per year at the U.S. national level for 2025. This reduction in output is expected to grow to over US$9.4 billion in trade loss in 2035 alone.

The employment loss due to the reduction in trade is expected to be very significant as well. It is expected that by 2025, the United States economy will lose a cumulative 10,387 jobs and will reach a cumulative 70,174 jobs by 2035. The earnings corresponding to these job losses are estimated at US$663 million and US$4.4 billion per year in 2025 and 2035, respectively.

Tax impacts which include loss in corporate profits tax, indirect business taxes, personal taxes (income tax, mainly) and social insurance taxes will reach US$170 million per year in 2025 and US$1.1 billion per year in 2035. Tables 12, 13 and 14 below summarize the results of the economic impacts on the U.S. economy.

Table 12: Annual Economic Impacts on the United States

Year	Impact	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2025	Output	($526)	($457)	($427)	**($1,410)**
	Earnings	($186)	($223)	($254)	**($663)**
2035	Output	($3,519)	($2,990)	($2,875)	**($9,384)**
	Earnings	($1,256)	($1,469)	($1,714)	**($4,439)**

Table 13: Cumulative Employment Impact in the United States

Year	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2025	(2,652)	(3,270)	(4,464)	**(10,387)**
2035	(18,396)	(21,710)	(30,069)	**(70,174)**

Table 14: Annual Tax Impact on the United States

	Employee Compensation	Proprietary Income	Household Expenditure	Enterprises (Corporations)	Indirect Business Taxes	Total
2025	($45)	($2)	($60)	($17)	($46)	**($170)**
2035	($298)	($15)	($403)	($118)	($307)	**($1,141)**

3.3.2 Economic Impacts in Canada

For the Canadian side, HLB used Statistics Canada Input Output model. The Input-Output (I-O) model uses the Canadian Input-Output (I-O) tables to track and quantify the economic activity generated by changes in consumption or production. The Canadian I-O tables present one of the most complete and detailed accounting framework of the Canadian economy available. As such the model has the greatest potential of all major economic models for capturing the flows of goods and services between industries and consumers at relatively detailed levels.

There are three types of I-O tables, input table, output table, and final demand table. The Canadian Input and Output tables are rectangular. At the most detailed level, they consist of 243 industries by 679 commodities (including primary inputs, and various margins). Each cell of information in the Input table contains the dollar value of the parts, services, raw materials or labour used up in the production process of the associated industry. The Input table provides a detailed decomposition of the total production costs. The Output table works in a similar manner, but provides a detailed breakdown of the individual goods and services comprising the industry total output.

The Final Demand table gives detailed information on goods and services that are bought by many categories of buyers (consumers, industries and government) for both consumption and investment purposes. For convenience, the Final Demand table includes imports, exports and non-tax government revenues. The tables are available in various levels of aggregation from 243 industries by 679 commodities at the most detailed level to only 21 industries by 57 commodities at the least detailed level. Generally, an I-O model simulation will report the results at three different levels of aggregation in order to facilitate data treatment and analysis.

The impact estimation results are summarized into a table showing the trade and employment impact. The impact results are presented at three different levels: Essex/Windsor Area, the Province of Ontario, and Canada as a whole.

3.3.2.1 Economic Impact on Essex/Windsor Area

Many industries in the Essex/Windsor area rely on the crossing to ship and/or receive supplies and products. Therefore, an increasing delay has a significant effect on their productivity which is translated into a devastating impact on the area's economy. The economic impact results show that the Essex/Windsor area will risk losing CAN$14 million per year by 2025 and CAN$101 million per year by 2035.

The analysis results also show that the Essex/Windsor area is expected to lose a cumulative 233 jobs by 2025 which will reach 1,689 jobs by 2035. Table 15 below shows the summary results of the economic impacts on the Essex/Windsor area.

Table 15: Economic Impact on Essex/Windsor Area

	2025	2035
OUTPUT (ANNUAL)		
Final Domestic Expenditure	($57)	($381)
Indirect Taxes On Final Demand	($1)	($8)
Direct Foreign Imports	$32	$208
Indirect Foreign Imports	$7	$45
Inventories And Other Leakages	$1	$3
Interprovincial Imports	$4	$34
Interprovincial Exports	($0)	($3)
Total	**($14)**	**($101)**
EMPLOYMENT (CUMULATIVE)		
Direct	(155)	(1,138)
Indirect	(78)	(551)
Total	**(233)**	**(1,689)**

3.3.2.2 Economic Impact on the Province of Ontario Economy

When assessing the economic impact on the economy of the Province of Ontario, the analysis found that the net loss in trade by 2025 will be CAN$119 million per year and will reach CAN$833 million per year in 2035. As a result, the province will risk losing about 1,953 cumulative jobs by 2025 and losing a total of 14,131 by 2035. Table 16 below shows a breakdown of the impact on the output. The economic impact is estimated as the net impact of the Ontario demand, interprovincial trade, and international trade. The table also shows the employment impact breakdown at the direct and indirect levels.

Table 16: Economic Impact on the Province of Ontario

	2025	2035
OUTPUT (ANNUAL)		
Final Domestic Expenditure	($476)	($3,138)
Indirect Taxes On Final Demand	($9)	($64)

Direct Foreign Imports	$270	$1,712
Indirect Foreign Imports	$59	$373
Inventories And Other Leakages	$4	$29
Interprovincial Imports	$37	$278
Interprovincial Exports	($3)	($23)
Total	**($119)**	**($833)**
EMPLOYMENT (CUMULATIVE)		
Direct	(1,311)	(9,591)
Indirect	(642)	(4,540)
Total	**(1,953)**	**(14,131)**

3.3.2.3 Economic Impact on the Canadian Economy

Given the importance and the level of trade in the Windsor–Detroit corridor for the Canadian economy as a whole, the economic impact on the national economy is very significant. The impact results show that the net impact on the output of the Canadian economy is over $206 million per year in 2025 and reaches a net impact of $1.5 billion per year by 2035. Similarly, the impact on employment in Canada is equally significant; the analysis shows that the Canadian economy risks losing a total of 3,310 jobs by 2025. The job loss is expected to increase to over 24,000 jobs by 2035. Table 17 provides the results summary of the economic impacts analysis on the Canadian economy for 2025 and 2035.

Table 17: Economic Impact in Canada

	2025	**2035**
OUTPUT (ANNUAL)		
Final Domestic Expenditure	($690)	($4,560)
Indirect Taxes On Final Demand	($14)	($93)
Direct Foreign Imports	$391	$2,488
Indirect Foreign Imports	$98	$632
Inventories And Other Leakages	$8	$57
Interprovincial Imports	$61	$465
Interprovincial Exports	($61)	($465)
Total	**($206)**	**($1,475)**
EMPLOYMENT (CUMULATIVE)		
Direct	(2,064)	(15,264)
Indirect	(1,246)	(8,954)
Total	**(3,310)**	**(24,218)**

4. ECONOMIC IMPACT ANALYSIS OF RECREATION, SHOPPING AND VACATION TRAFFIC

The purpose of this chapter is to estimate the economic impacts of lost passenger car crossings in the Detroit-Windsor corridor, due to increased congestion under the no-build (do-nothing) alternative. The trips considered in this assessment are restricted to recreation and shopping trips, and vacation trips.

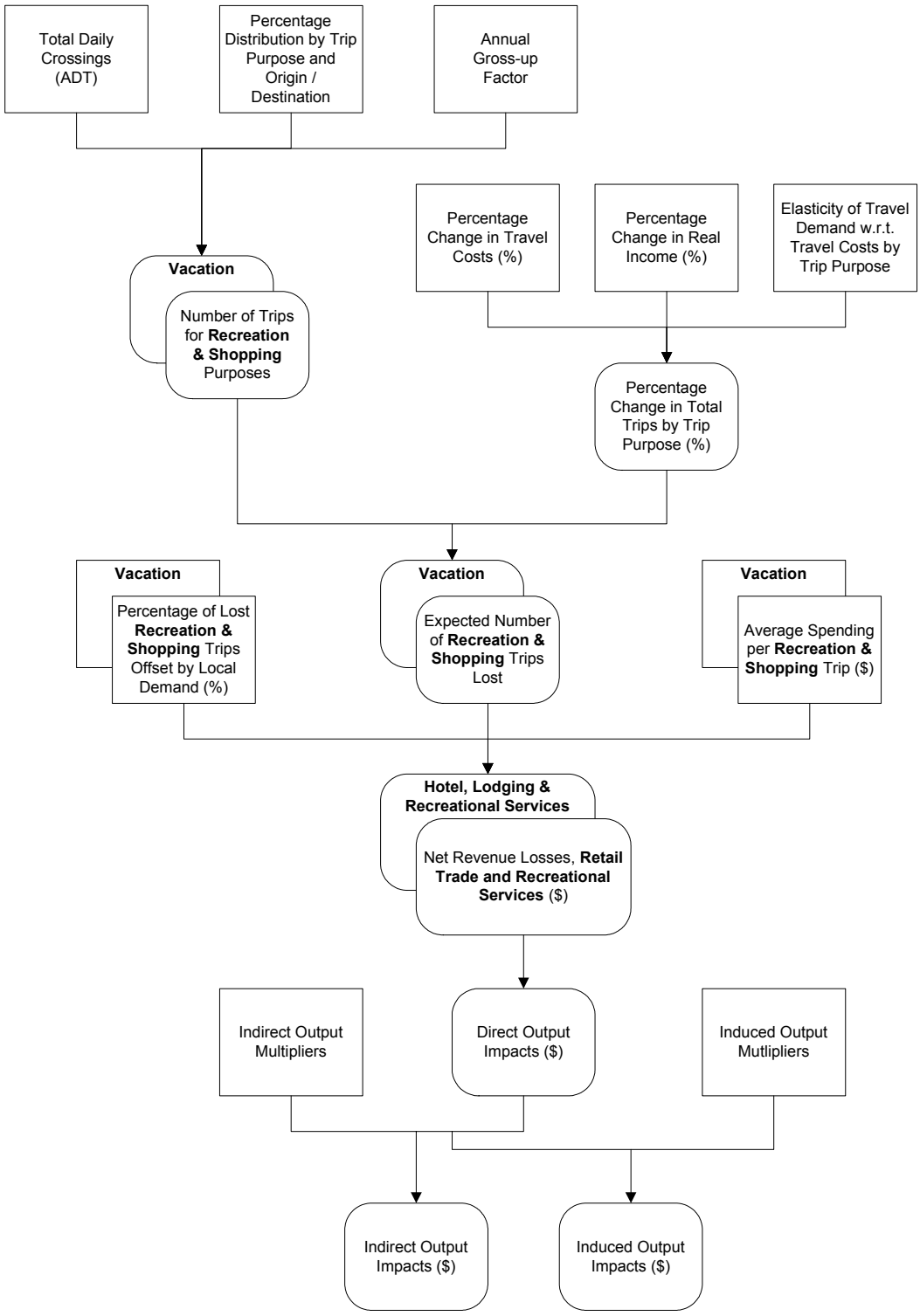
4.1 Framework

Figure 11, below, provides an overview of the estimation framework developed for this study. The estimation proceeded in seven steps:

- Obtain crossing projections for passenger cars, broken down by trip purpose and destination (into the U.S. vs. into Canada);
- Estimate the annual percentage change in travel costs (travel time and vehicle operating costs) associated with increased congestion;
- Apply demand elasticity coefficients to the estimated changes in travel costs (after adjusting for growth in real personal income) and derive the potential annual loss of crossings, by trip purpose, due to increased congestion;
- Estimate the expected loss of revenue (spending from vacationers, shoppers and other travelers) associated with the foregone trips;
- Adjust for changes in local demand (e.g., vacation money spent in Canada instead of the U.S., and vice versa);
- Derive the direct impacts of foregone spending on national, regional, and local output, income (earnings) and employment;
- Use indirect and induced multipliers to obtain the indirect, induced and total impacts (on output, earnings and employment) of foregone trips.

The direct, indirect and induced impact estimates on the U.S. side were derived from coefficients and relationships from IMPLAN, an input-output simulation model. On the Canadian side, those coefficients and relationships were adjusted based on data and simulations provided by Statistics Canada.

Figure 11: Structure and Logic Diagram for Estimating the Economic Impacts of Lost Cross-Border Recreation, Shopping and Vacation Trips



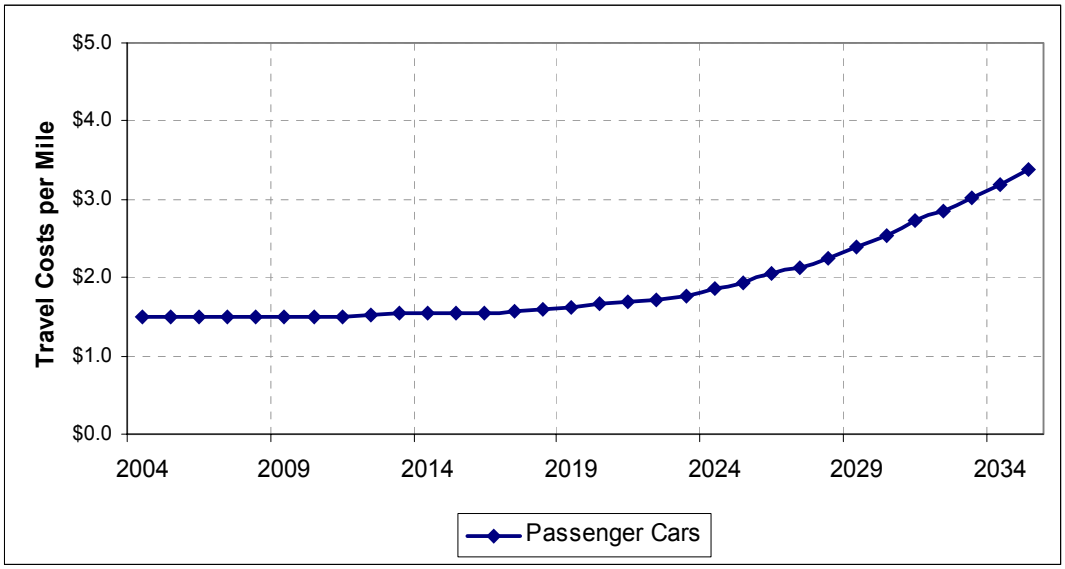
The principal modeling assumptions used in the analysis are shown in Table 18, below. Traffic projections, trip purposes and O/D information were obtained from IBI. Other assumptions were derived by HLB on the basis of literature findings and professional opinion.

Table 18: Modeling Assumptions

Variable	Value	Sources
Trip Purpose		
Recreation and Shopping	35.9%	IBI Group
Vacation	5.6%	IBI Group
Percent of All Crossings INTO the U.S.		
Recreation and Shopping	49.7%	IBI Group
Vacation	37.5%	IBI Group
Average Spending per Trip, in U.S. Dollars		
Recreation and Shopping	$50.0	HLB
Vacation	$275.0	HLB
Elasticity of Travel Demand w.r.t. Travel Costs		
Recreation and Shopping	-0.500	HLB - From BTE elasticities database
Vacation	-0.800	HLB - From BTE elasticities database
Percent Substitution (by Local Demand)		
In the U.S.		
Recreation and Shopping	80.0%	HLB
Vacation	60.0%	HLB
In Canada		
Recreation and Shopping	80.0%	HLB
Vacation	70.0%	HLB
Trip Destination		
% of Recreation trips from Canada to:		
WAYNE COUNTY	46.5%	Derived from IBI data
SEMCOG REGION	82.6%	Derived from IBI data
MICHIGAN	91.2%	Derived from IBI data
U.S.	100.0%	Derived from IBI data
% of Vacation trips from Canada to:		
WAYNE COUNTY	29.3%	Derived from IBI data
SEMCOG REGION	51.2%	Derived from IBI data
MICHIGAN	60.7%	Derived from IBI data
U.S.	100.0%	Derived from IBI data
% of Recreation trips from U.S. to:		
ESSEX / WINDSOR	90.0%	Derived from IBI data
ONTARIO	95.0%	Derived from IBI data
CANADA	100.0%	Derived from IBI data
% of Vacation trips from U.S. to:		
ESSEX / WINDSOR	50.0%	Derived from IBI data
ONTARIO	85.0%	Derived from IBI data
CANADA	100.0%	Derived from IBI data

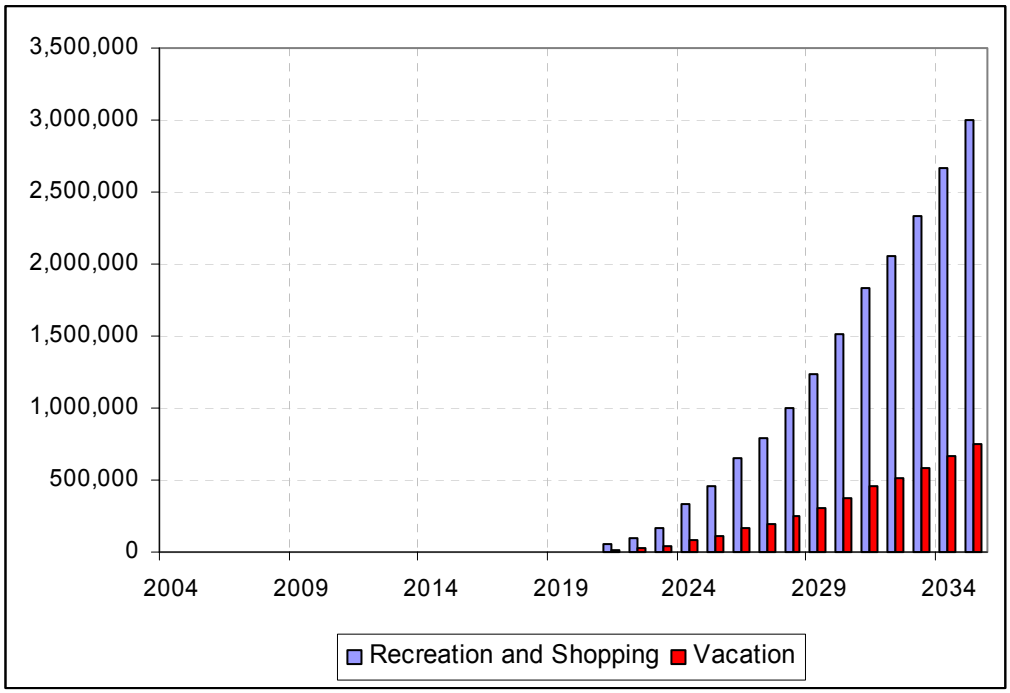
Travel cost projections through 2035 can be found in Figure 12, below. Estimated changes in traffic (crossings) resulting from increased travel costs are shown in Figure 13.

Figure 12: Travel Cost per Mile, 2004-2035 [1]



1. Including travel time and vehicle operating costs, excluding tolls.

Figure 13: Expected Loss in Cross-Border Trips, Passenger Cars



4.2 Simulation Results

Simulation results for the U.S. economy, the SEMCOG region and Wayne County are provided in Tables 19, 20, 21 and 22 below. Output and income impacts are expressed in millions of U.S. dollars of year 2004. Employment impacts are changes in Full Time Equivalent (FTE) jobs. Output and income impacts are annually recurring impacts, estimated in two "snapshot" years (2025 and 2035). Employment impacts, on the other hand, should be viewed as non-recurring changes in total employment (in the "stock" of workers).

Table 19: Economic Impact in the United States

Year	Impact	Lost Trips	Direct	Indirect	Induced	Total
2025	Output	Recreation & Shopping	($2.2)	($1.1)	($2.1)	($5.4)
		Vacation	($0.9)	($0.5)	($0.8)	($2.2)
		Total	($3.0)	($1.6)	($3.0)	**($7.6)**
	Earnings	Recreation & Shopping	($1.5)	($0.7)	($1.3)	($3.4)
		Vacation	($0.5)	($0.3)	($0.5)	($1.3)
		Total	($2.0)	($0.9)	($1.8)	($4.7)
	Employment	Recreation & Shopping	-50	-12	-22	-84
		Vacation	-15	-5	-9	-28
		Total	-65	-16	-31	**-112**
2035	Output	Recreation & Shopping	($14.2)	($7.3)	($14.0)	($35.5)
		Vacation	($5.6)	($3.2)	($5.4)	($14.2)
		Total	($19.8)	($10.5)	($19.4)	**($49.7)**
	Earnings	Recreation & Shopping	($9.5)	($4.3)	($8.3)	($22.1)
		Vacation	($3.5)	($1.9)	($3.2)	($8.6)
		Total	($13.0)	($6.2)	($11.5)	($30.7)
	Employment	Recreation & Shopping	-328	-76	-146	-550
		Vacation	-98	-32	-56	-186
		Total	-426	-108	-202	**-736**

Table 20: Economic Impact in the State of Michigan

Year	Impact	Lost Trips	Direct	Indirect	Induced	Total
2025	Output	Recreation & Shopping	($2.0)	($0.6)	($0.8)	($3.4)
		Vacation	($0.5)	($0.2)	($0.2)	($0.9)
		Total	($2.5)	($0.8)	($1.1)	**($4.3)**
	Earnings	Recreation & Shopping	($1.3)	($0.4)	($0.5)	($2.2)
		Vacation	($0.3)	($0.1)	($0.1)	($0.6)
		Total	($1.6)	($0.5)	($0.7)	($2.8)
	Employment	Recreation & Shopping	-49	-7	-11	-67
		Vacation	-11	-2	-3	-16
		Total	-61	-9	-13	**-83**
2035	Output	Recreation & Shopping	($13.0)	($3.8)	($5.5)	($22.3)
		Vacation	($3.4)	($1.2)	($1.4)	($6.0)
		Total	($16.4)	($5.0)	($6.9)	**($28.2)**
	Earnings	Recreation & Shopping	($8.7)	($2.3)	($3.4)	($14.4)
		Vacation	($2.0)	($0.7)	($0.8)	($3.6)
		Total	($10.8)	($3.0)	($4.3)	($18.1)
	Employment	Recreation & Shopping	-321	-47	-69	-438
		Vacation	-75	-14	-17	-106
		Total	-397	-61	-86	**-544**

Table 21: Economic Impact in the SEMCOG Region

Year	Impact	Lost Trips	Direct	Indirect	Induced	Total
2025	Output	Recreation & Shopping	($1.8)	($0.5)	($0.7)	($3.0)
		Vacation	($0.4)	($0.1)	($0.2)	($0.7)
		Total	($2.2)	($0.6)	($0.9)	**($3.8)**
	Earnings	Recreation & Shopping	($1.2)	($0.3)	($0.5)	($2.0)
		Vacation	($0.3)	($0.1)	($0.1)	($0.5)
		Total	($1.5)	($0.4)	($0.6)	($2.5)
	Employment	Recreation & Shopping	-40	-6	-8	-54
		Vacation	-9	-2	-2	-12
		Total	-48	-7	-10	**-66**
2035	Output	Recreation & Shopping	($11.8)	($3.2)	($4.7)	($19.7)
		Vacation	($2.9)	($1.0)	($1.1)	($4.9)
		Total	($14.6)	($4.1)	($5.8)	**($24.6)**
	Earnings	Recreation & Shopping	($8.0)	($2.0)	($3.0)	($13.0)
		Vacation	($1.8)	($0.6)	($0.7)	($3.1)
		Total	($9.8)	($2.6)	($3.7)	($16.1)
	Employment	Recreation & Shopping	-259	-37	-55	-351
		Vacation	-56	-10	-13	-79
		Total	-315	-47	-68	**-430**

Table 22: Economic Impact in Wayne County

Year	Impact	Lost Trips	Direct	Indirect	Induced	Total
2025	Output	Recreation & Shopping	($1.0)	($0.3)	($0.4)	($1.6)
		Vacation	($0.2)	($0.1)	($0.1)	($0.4)
		Total	($1.3)	($0.3)	($0.4)	**($2.0)**
	Earnings	Recreation & Shopping	($0.7)	($0.2)	($0.2)	($1.1)
		Vacation	($0.2)	($0.0)	($0.1)	($0.3)
		Total	($0.8)	($0.2)	($0.3)	($1.3)
	Employment	Recreation & Shopping	-22	-3	-4	-29
		Vacation	-5	-1	-1	-6
		Total	-27	-4	-5	**-35**
2035	Output	Recreation & Shopping	($6.6)	($1.7)	($2.4)	($10.7)
		Vacation	($1.6)	($0.5)	($0.6)	($2.7)
		Total	($8.3)	($2.2)	($2.9)	**($13.4)**
	Earnings	Recreation & Shopping	($4.5)	($1.0)	($1.5)	($7.0)
		Vacation	($1.0)	($0.3)	($0.3)	($1.7)
		Total	($5.5)	($1.3)	($1.8)	($8.7)
	Employment	Recreation & Shopping	-143	-19	-27	-189
		Vacation	-30	-5	-6	-42
		Total	-174	-24	-34	**-231**

National economic impacts are very small when compared to the size of the U.S. economy. By 2035, about 700 jobs are expected to be lost. In 2035, the U.S. economy is expected to lose about $50 million worth of production, while total income (value added) is expected to fall by about $31 million. Under the do-nothing scenario, output in the SEMCOG region is projected to be about $25 million smaller than what it would have been in the absence of congestion problems. About 400 jobs may be lost.

Simulation results for the Canadian economy, the province of Ontario and the Windsor area are shown in Tables 23, 24 and 25. Output and income impacts are expressed in millions of Canadian dollars of year 2004. Employment impacts are expressed as changes in the number of Full Time Equivalent (FTE) jobs.

Table 23: Economic Impact in Canada

Year	Impact	Lost Trips	Direct	Indirect	Total
2025	Output	Recreation & Shopping	($3.0)	($1.5)	($4.5)
		Vacation	($14.2)	($7.7)	($21.9)
		Total	($17.2)	($9.2)	**($26.4)**
	Earnings	Recreation & Shopping	($2.0)	($0.8)	($2.8)
		Vacation	($8.9)	($4.4)	($13.3)
		Total	($10.9)	($5.2)	($16.1)
	Employment	Recreation & Shopping	-62	-14	-77
		Vacation	-224	-72	-296
		Total	-286	-87	**-373**
2035	Output	Recreation & Shopping	($19.7)	($9.6)	($29.2)
		Vacation	($92.7)	($50.5)	($143.2)
		Total	($112.4)	($60.0)	**($172.5)**
	Earnings	Recreation & Shopping	($13.1)	($5.3)	($18.5)
		Vacation	($58.0)	($28.8)	($86.8)
		Total	($71.1)	($34.1)	($105.2)
	Employment	Recreation & Shopping	-407	-94	-501
		Vacation	-1,464	-474	-1,938
		Total	-1,871	-568	**-2,439**

Table 24: Economic Impact in the Province of Ontario

Year	Impact	Lost Trips	Direct	Indirect	Total
2025	Output	Recreation & Shopping	($2.9)	($0.8)	($3.6)
		Vacation	($12.1)	($4.1)	($16.1)
		Total	($14.9)	($4.9)	**($19.8)**
	Earnings	Recreation & Shopping	($1.9)	($0.5)	($2.4)
		Vacation	($7.2)	($2.4)	($9.6)
		Total	($9.1)	($2.8)	($12.0)
	Employment	Recreation & Shopping	-64	-9	-73
		Vacation	-241	-44	-285
		Total	-304	-54	**-358**
2035	Output	Recreation & Shopping	($18.7)	($5.1)	($23.8)
		Vacation	($78.8)	($26.8)	($105.6)
		Total	($97.5)	($31.9)	**($129.4)**
	Earnings	Recreation & Shopping	($12.5)	($3.0)	($15.5)
		Vacation	($47.3)	($15.7)	($62.9)
		Total	($59.8)	($18.6)	($78.4)
	Employment	Recreation & Shopping	-416	-61	-477
		Vacation	-1,575	-291	-1,866
		Total	-1,991	-352	**-2,342**

Table 25: Economic Impact in the Windsor Area

Year	Impact	Lost Trips	Direct	Indirect	Total
2025	Output	Recreation & Shopping	($2.7)	($0.7)	($3.4)
		Vacation	($7.1)	($2.1)	($9.2)
		Total	($9.8)	($2.7)	**($12.5)**
	Earnings	Recreation & Shopping	($1.8)	($0.4)	($2.2)
		Vacation	($4.4)	($1.2)	($5.6)
		Total	($6.3)	($1.6)	($7.8)
	Employment	Recreation & Shopping	-53	-7	-60
		Vacation	-118	-20	-139
		Total	-171	-27	**-198**
2035	Output	Recreation & Shopping	($17.7)	($4.3)	($22.0)
		Vacation	($46.4)	($13.5)	($59.9)
		Total	($64.1)	($17.8)	**($81.8)**
	Earnings	Recreation & Shopping	($12.0)	($2.5)	($14.5)
		Vacation	($28.9)	($7.9)	($36.8)
		Total	($41.0)	($10.3)	($51.3)
	Employment	Recreation & Shopping	-345	-45	-389
		Vacation	-775	-131	-906
		Total	-1,120	-176	**-1,295**

As shown in Table 23, national economic impacts are relatively small. In 2035, total income is expected to fall by $173 million as a consequence of reduced cross-border trip-making. About 2,400 jobs would be lost. In Ontario alone, failure to relieve congestion in the Detroit-Windsor corridor may "cost" around 350 jobs by year 2025, and over 2,000 by the end of 2035. Over $129 million worth of income may be lost in 2035. In the Windsor area, the loss of incoming trips for recreational, shopping, and vacation purposes may result in losses of up to 1,295 jobs by year 2035, and $82 million worth of local output.