Partnership of

Canada

U.S. Department of Transportation
400 Seventh St., S.W.
Washington, D.C. 20590

Ontario

MDOT
MICHIGAN DEPARTMENT OF TRANSPORTATION

Canada – United States
Ontario – Michigan Border
Transportation Partnership
Planning / Need and
Feasibility Study

Regional and National Economic Impact of Increasing Delay and Delay Related Costs at the Windsor-Detroit Crossings

Final Report

January 2004

HLB

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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 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. Indeed, more than 14 million trucks crossed the Canada-U.S. border in 2002, one truck every 2.5 seconds.

Production depends heavily on the fast and predictable trucking of components, parts and finished products across the border. The components which make up one piston for a newly manufactured automobile engine moves across the bridge 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.

Unless steps are taken to expand infrastructure capacity at the principal border crossings between Michigan and Ontario, this report finds that, by 2020, mounting congestion and delay will cost the United States more than US$2.2 billion and Canada more than CAN$0.3 billion a year in foregone production and output. Exponentially rising congestion over the subsequent decade (2020 to 2030) would lead to further production losses of US$11.4 billion per year to the U.S. and CAN$2.1 billion per year by 2030 (Summary Table 1). Unless capacity at the border expands, these impacts imply cumulative production losses of fully US$40 billion between 2003 and 2020 and *another* US$60 billion by 2030.

SUMMARY TABLE 1: Annual Foregone Production From Impaired Freight Movements and Productivity Losses

Year	Impact on the United States Economy (Values are in millions of 2000 US$)				Impact on the Canadian Economy (Values are in millions of 2000 CAN$)		
	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States	Essex/ Windsor Area	Province of Ontario	Canada
2020	($186)	($630)	($970)	($2,219)	($26)	($220)	($387)
2030	($927)	($3,080)	($4,924)	($11,436)	($144)	($1,184)	($2,127)

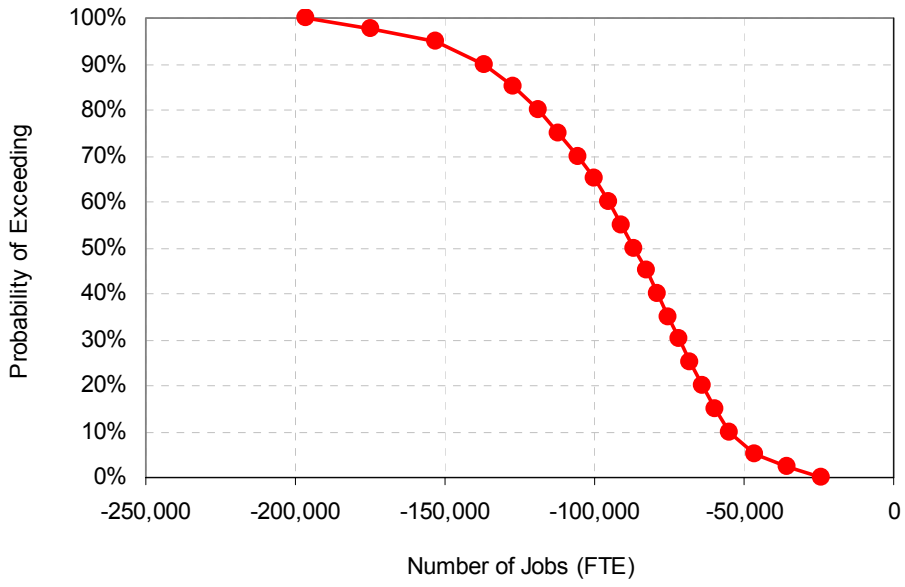
Lost production means fewer jobs. Failure to address the congestion problem, and the production losses arising accordingly, means 17,000 fewer jobs in the U.S. and 6,000 fewer jobs in Canada in 2020, rising to over 120,000 fewer jobs by 2030 in both countries (Summary Table 2). Job losses on this scale 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: Cumulative Foregone Employment From Impaired Freight Movements and Productivity Losses

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
2020	-760	-3,129	-6,406	-17,345	-433	-3,619	-6,206
2030	-4,095	-15,970	-33,977	-91,194	-2,401	-20,088	-34,926

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. Summary Figure 1, below, provides a probability distribution for the *likely* 2030 employment impact in the United States.

SUMMARY FIGURE 1: Cumulative Foregone Employment From Impaired Freight Movements and Productivity Losses By 2030 in the United States -- Probability Distribution



As shown in the figure, cumulative employment impacts may depart quite significantly from the most likely (or mean expected) outcomes shown in Summary Table 2. As shown in the figure, there is a 10 percent probability that cumulative job losses exceed 140,000. There is also a 5 percent chance that there will be less than 50,000 jobs lost overall.

The probability distribution for cumulative employment impact in Canada is shown in Summary Figure 2, below. According to the chart, total job losses are likely to range between 21,000 (lower 10 percent value, or 10th percentile) and 52,000 (upper 10 percent value) over the 30-year horizon.

SUMMARY FIGURE 2: Cumulative Foregone Employment From Impaired Freight Movements and Productivity Losses By 2030 in Canada -- Probability Distribution

Impacts on Cross-Border Recreation, Shopping and Vacation Trips

Over 20 million passenger cars cross the Ontario-Michigan border annually. About 10 million out of these 20 million are shopping or recreational trips. Another 2 million are 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.*

Simulation results, however, indicate that output and employment losses resulting from reduced personal trip making would be concentrated on the Canadian side. The restriction on cross-border movements was found to *increase* economic activity (production and employment) in the United States. Implicit in this conclusion, however, is the assumption that most (if not all) of American household expenditures previously spent in Canada would, to some extent, be spent in the United States instead, on comparable, if not similar, goods and services. Since there are,

overall, more recreational and shopping trips originating from the United States 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 (trade) results in reduced economic activity in Canada (the surplus nation) and in increased activity in the U.S. (the deficit nation). Again, this assumes, from a conservative point of view, a high degree of substitution between home and foreign recreation and tourism services. As shown in Summary Table 3, by 2020, the United States may *gain* up to US$157 million a year in production as a result of foregone cross-border personal trips. Output *losses* in Canada may exceed CAN$450 million a year by 2020. By the end of the following decade (2020-2030), reduced cross-border trip making would lead to further annual production losses of CAN$2.4 billion in Canada; while total output in the United States may rise by $0.8 billion. Note that the two impacts (the gain on the U.S. side and the loss on the Canadian side) do not balance each other, as less than perfect substitution was assumed. This is also explained by differences in indirect and induced economic multipliers.

SUMMARY TABLE 3: Annual Foregone Production From Reduced Personal Trip-Making

Year	Impact on the United States Economy (Values are in millions of 2000 US$)				Impact on the Canadian Economy (Values are in millions of 2000 CAN$)		
	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States	Essex/ Windsor Area	Province of Ontario	Canada
2020	$52	$66	$93	$157	($109)	($329)	($457)
2030	$273	$344	$484	$817	($566)	($1,714)	($2,381)

Expected changes in total employment are shown in Summary Table 4, below. In the Detroit area alone, over 4,700 jobs may be created by year 2030. For the United States as a whole, nearly 12,000 full time equivalent jobs may be created as a result of reduced cross-border trip making (and reduced leakages to the Canadian economy). In the Ontario Province, failure to relieve congestion in the Detroit-Windsor corridor may cost up to 6,000 jobs by year 2020, and over 31,000 by the end of 2030 (nearly half of a percent of total year-2000 Ontario employment). The Canadian economy would lose over 35,000 jobs.

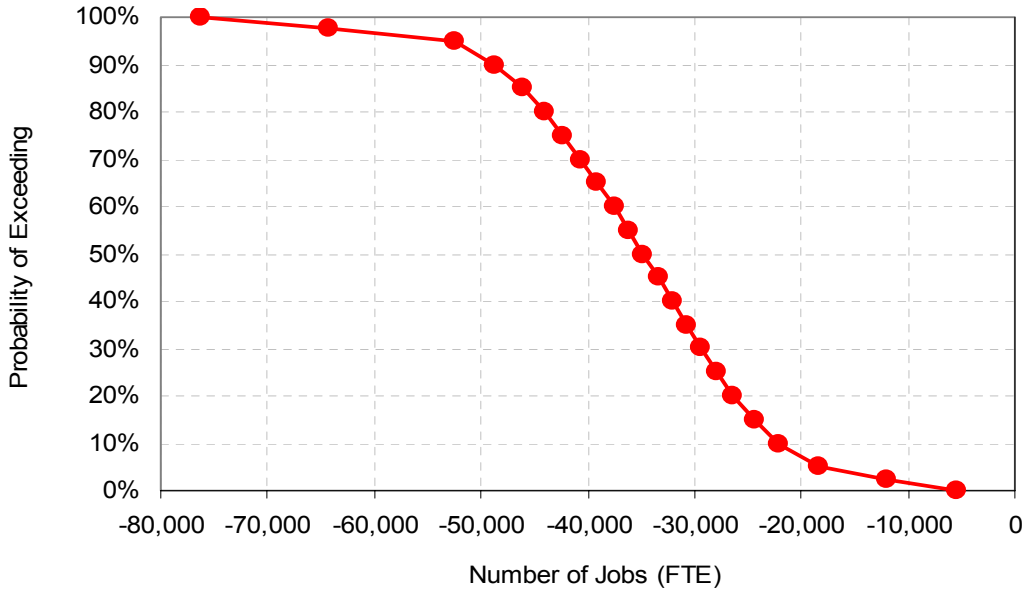
SUMMARY TABLE 4: Cumulative Foregone Employment From Reduced Personal Trip-Making

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
2020	919	1,154	1,762	2,277	-1,892	-6,092	-6,739
2030	4,785	6,013	9,177	11,861	-9,858	-31,732	-35,100

Probability distributions for total cumulative employment impacts in the U.S. and Canada are shown in Summary Figure 3 and Summary Figure 4, respectively.

SUMMARY FIGURE 3: Cumulative Foregone Employment From Reduced Personal Trip-Making By 2030 in the United States -- Probability Distribution

SUMMARY FIGURE 4: Cumulative Foregone Employment From Reduced Personal Trip-Making By 2030 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[1]. By 2030, the failure to address congestion problems at the border would cost the economies of Michigan and Ontario a total of US$6.3 billion (CAN$9.7 billion) in production, annually. Combined output losses in the United

[1] The estimation has been made for 2020 and 2030 to stress the magnitude of the impact in the long term. Note also that by 2010, the impact may be negative but not very significant.

States and Canada would reach US$13.5 billion (CAN$20.8 billion) annually, in 2030 and after. Over a 30-year period (from 2003 through 2030), this would represent cumulative production losses of over US$100 billion.

SUMMARY TABLE 5: Annual Foregone Production if Constrained Capacity, Congestion and Delay at the Ontario-Michigan Border are Not Addressed

Year	Impact on the State of Michigan and the Province of Ontario (Values are in millions of 2000 Dollars)		Impact on the United States and Canada (Values are in millions of 2000 Dollars)	
	US$	CAN$	US$	CAN$
2020	($1,234)	($1,898)	($2,611)	($4,017)
2030	($6,323)	($9,728)	($13,549)	($20,845)

Cumulative employment losses in the State of Michigan and the Province of Ontario would exceed 14,000 by year 2020 and 76,000 by year 2030. Overall, the United States and Canadian economies would lose a total of nearly 150,000 full time equivalent jobs as a result of increasing congestion and delays at the Ontario-Michigan border.

SUMMARY TABLE 6: Cumulative Foregone Employment if Constrained Capacity, Congestion and Delay at the Ontario-Michigan Border are Not Addressed

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)
2020	-14,355	-28,012
2030	-76,621	-149,359

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;

- A smooth and predictable transit time in that corridor is critical to the industries in the region;

- Local economies may be heavily impacted if congestion continue to grow based on the current traffic forecast; and

- There are high stakes at risk in the corridor, which makes major crossing improvements a necessary and urgent action for the decision makers.

1. INTRODUCTION

1.1 Purpose

The purpose of this report is to provide an 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 U.S. have the largest bilateral relationship in the world. In 1998, the U.S. was the destination of 84% of Canada's exports (by value) and the origin of 77% of Canada's imports. With Canada's high ratio of trade to GDP, Canada is highly dependent on the trade with the U.S.

Significantly large proportion of this trade flows through the border crossings between Detroit and Windsor. The auto industry represents the largest volume of trade between these two countries with over 6,200 vehicles daily, or 34% of all commercial vehicle trips. In addition to these, a significant percentage of the almost 1,600 vehicles carrying metal daily would be directly related to the auto industry. The Ambassador Bridge carries 68% of the auto industry-related commercial vehicle volumes. Forest and animal/plant products are also common, each at 1,600 trips daily, followed by machinery/electronics (880 vehicles). Approximately 13% of commercial vehicles move empty during their cross-border trip.

In 2000, Canadian vehicle production reached $71 billion with a trade surplus of $27 billion. Canadians employed 631,000 in all aspects of the auto industry, including manufacturing, parts and sales. The big three auto manufacturers have significant investments in Canada. General Motors has 4 assembly plants and 4 parts-and-other plants located in Oshawa, Ontario and Ste. Ste. Thérèse[2], Quebec. GM produced 916,000 vehicles in 1999. DaimlerChrysler has 3 assembly and 2 parts plants located in Windsor, Ontario and Bramalea, Ontario. DaimlerChrysler produces 797,000 vehicles in 1999. Ford has 3 assembly-plants and 1 parts-plant located in Oakville, Ontario and St. Thomas, Ontario. Ford produced 686,000 vehicles in these plants[3].

Freight transportation continues to play a critical role in the economies of U.S. and Canada. The United States and Canada have the world's largest bilateral trading relationship. In 2002, total merchandise trade between the two countries was US$372 billion, translating into US$1 billion in goods crossing the border every day. When services and investment income are added, the daily total equates to over US$1 billion. In 2002, the U.S. and Canadian economies rebounded from a slump in 2001. The U.S. economy grew by 2.4 percent last year in spite of a weak fourth quarter, but the outlook for 2003 is mixed. Even with the war in Iraq, the U.S. economy is expected to have a 2.6% growth in 2003 and a 3.6% growth in 2004.

[2] This plant was scheduled to close by the end of 2003.
[3] *Industry Canada*

Strong domestic demand resulted in the Canadian economy growing by 3.4% in 2002, up from 1.5% the previous year. Continued strong domestic demand sustained by healthy employment growth, the generous fiscal stimulus package in the February 2003 federal budget, and a relatively optimistic outlook for the U.S. economy, all point to growth of around 3.5% in 2003, rising to over 4 % in 2004. Risks to these projections include rising energy prices dampening consumer spending and global economic and geopolitical uncertainties.

The U.S. and Canadian economies are increasingly integrated. Since the U.S. – Canada Free Trade Agreement (FTA) in 1989, trade between the two countries has grown at an annual rate of 10%. Canada exports 86% of its merchandise to the US, and receives 73% of the goods it imports from the US. On the flip side, 23% of US merchandise exports go to Canada, and 19% of the goods the US imports come from Canada.

U.S. exports to Canada of transportation equipment alone, at US$41 billion in 2002, are larger than total U.S. goods exports to any individual country in the European Union. The economic linkages between Michigan and Ontario are particularly tight. The U.S. traded US$227 billion in goods with the province of Ontario alone in 2002, which was only US$5 billion less than total goods trade with Mexico. For instance, the Canadian automotive industry is almost entirely concentrated within 400 miles of Detroit. Of the U.S. automotive industry, two-thirds of independent supplier plants, 84% of assembler-owned supplier plants, and 58% of assembly plants are located within a day's drive from Detroit[4].

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 Ambassador Bridge is the world's busiest border crossing. In 2000 the Ontario-Michigan state trade was more than $97 billion. Ontario exports to Michigan increased for the fourth consecutive year, reaching almost $67.5 billion. Those exports support nearly 500,000 jobs in Ontario, most of them in the automotive industry. In 2000 also, Ontario hosted 12 million visitors from Michigan[5].

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 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

[4] The Federal Reserve Bank of Chicago, "The Great Lakes Border and Economy", *Chicago Fed Letter*, July 2002, No. 179a

[5] Ernie Eves, Ontario's Premier, "Michigan-Ontario Summit Begins New Era Of Partnership", Michigan-Ontario Economic Summit in Windsor, June 13, 2002.

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 goods and services to support it. These trips have an important role in the economy as they support 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 key role in generating tourism traffic between the two sides of the border. Between 1992 and 1999, U.S. person trips to Canada increased by 38% while trips by Canadian residents to the U.S. have declined by 45% in total, due mostly to the reduction in same-day trips. Even though overall trips to the U.S. dropped over the past few years, passengers in cars entering through Detroit remained relatively stable, except after the 9/11 attack which shows a major drop due to security measures at the border. Recent trend, however, shows that passenger trips are in the rebound.

The growth in passenger trips over the next few years may be hindered by excessive security measures at the border. Currently, congestion is not the main obstacle to recreation, shopping, and vacation trips. However, if the security measures are improved at the border, the growth in passenger car traffic may lead to increased congestion problems.

1.5 Organization of the Paper

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. Chapter 5 concludes the report with a summary of results. Appendices at the end of the report provide supporting data used in the analysis.

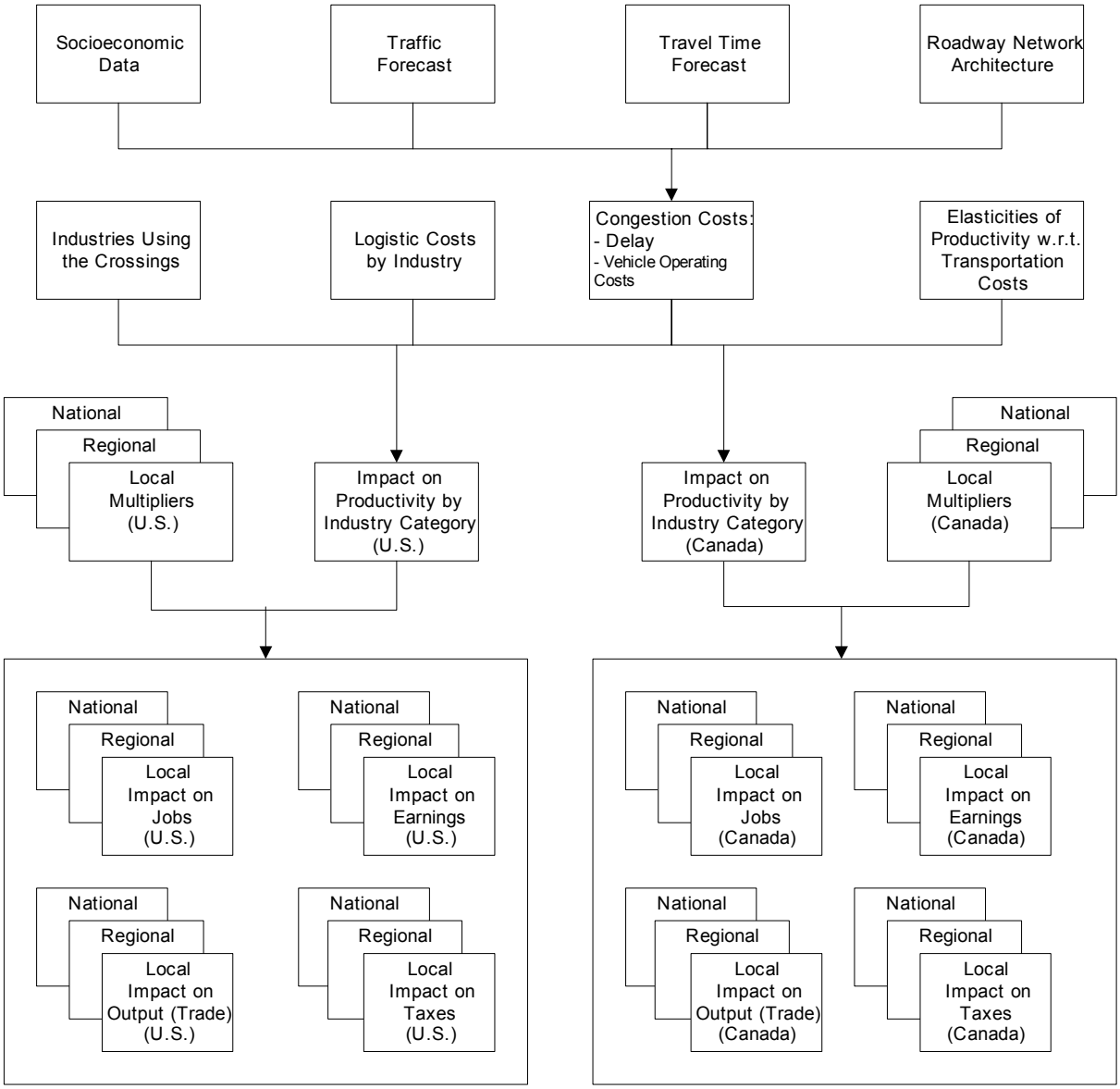
2. METHODOLOGICAL FRAMEWORK

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:

- **Impact of Increasing Delays 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.

- **Impact of Increasing 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.

- **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 Delays 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[6], 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 2000 traffic counts and average annual compound growth rates estimated over 3 periods: between 2000 and 2010, between 2011 and 2020, and between 2021 and 2030. 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 (2000-2030). The 2000 volume-to-capacity ratios (0.67 for the Ambassador Bridge, 0.82 for the Detroit-Windsor Tunnel, and 0.21 for the Blue Water Bridge) were used in conjunction with 2000 traffic levels to derive implicit capacity. Congestion levels between 2000 and 2030 were calculated by dividing projected traffic volumes by those capacity estimates.

[6] 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.

- **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 all three crossings, the type "Urban 2 or 3 Lanes" was selected.

- **Processing Times**: processing times at the 2000 congestion levels were derived from measurements reported by the FHWA for the Ambassador Bridge and the Blue Water Bridge. 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 2000 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 memorandum) 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**: traffic diversion from the Detroit/Windsor crossings to the Blue Water Bridge was assumed in some of the model runs. The percentage of traffic divertible was obtained from a memo prepared by the IBI Group in August 2002 ("Future Travel Demand" - Preliminary Findings).

- **Foregone Freight Traffic**: potential foregone freight traffic (freight traffic at risk) was estimated by considering the number of commercial vehicles above capacity. In other words, it was assumed that freight traffic would continue to grow as long as crossing volumes do not exceed "full capacity" (measured with a V/C ratio of 1.1), *after* accounting for possible diversion.

- **Freight "Impacts:"** potential freight impacts (in billions of dollars of freight "lost") were estimated by multiplying the foregone freight traffic estimated above by an average truckload (derived from FHWA's Highway Economic Requirements System) and an average cargo value (in U.S. dollars per ton). No attempt was made to evaluate the spillover effects of foregone freight traffic, or of increases in truck travel times and costs, on freight shippers and the overall economy.

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 and the Blue Water 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
- The U.S. Department of Transportation, Bureau of Transportation Statistics, for aggregate statistics on cross-border cargo movements, as reported in the "Strategic and Geographic Area Overview Working Paper," dated January 2004.

Detailed data sources and assumptions (assumed values for all key model variables) are provided in the Appendices.

2.3 The Impact of Increasing 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.

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.

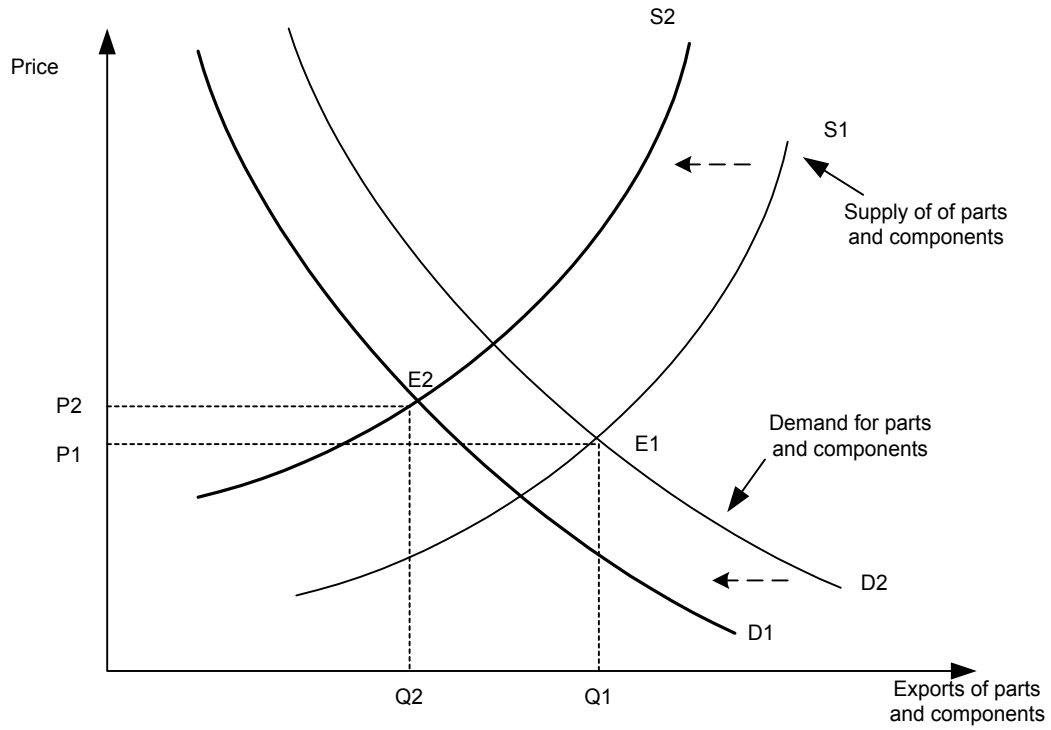
In Part B, the initial equilibrium volume of sales of the finished good and prices is also given by point E1 and the corresponding quantity of sales Q1 and price P1.

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.

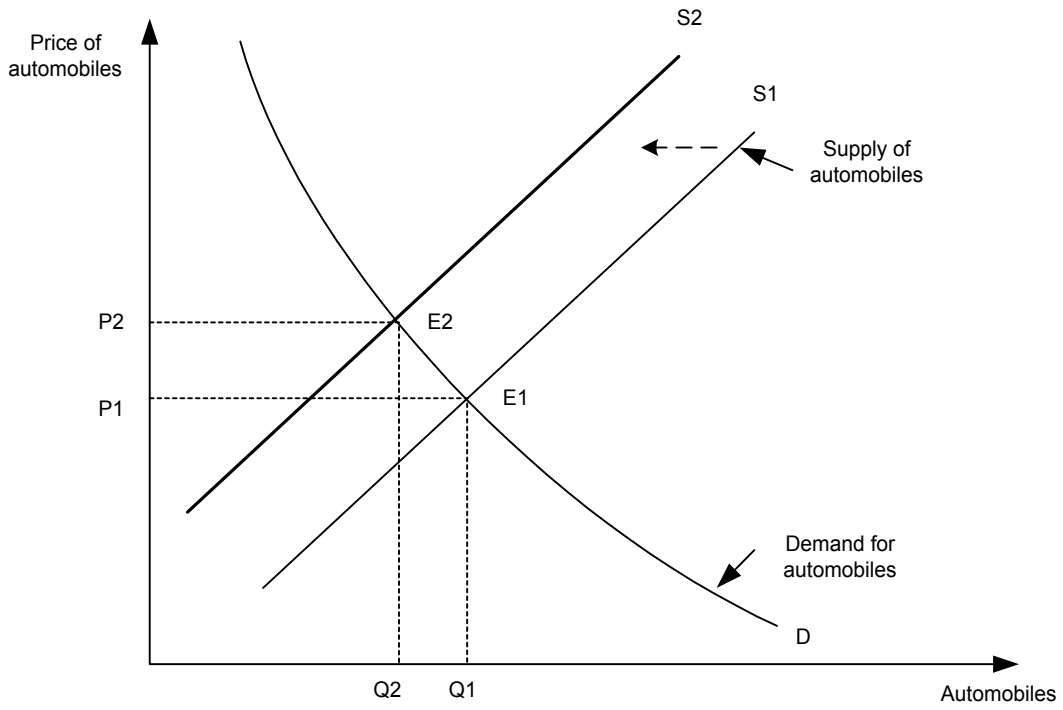
The magnitude of these effects will depend on the extent of the shifts of the supply curves as well as the shape of all supply and demand curves. This in turn will be affected by factors including the following:

- 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

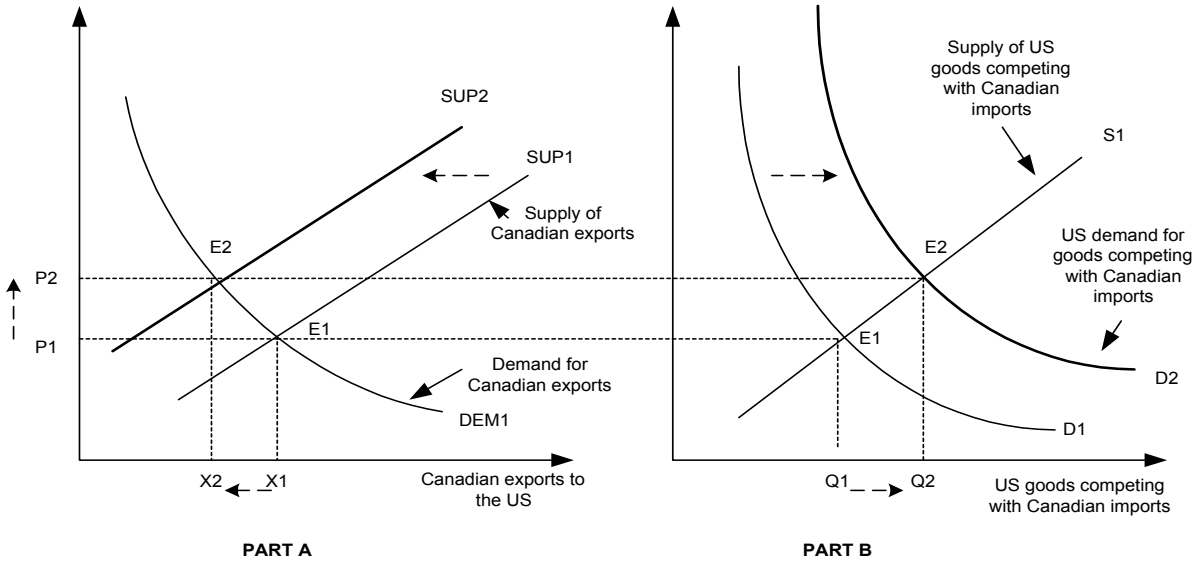


Part B: Assembly and Sales of Final Product

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 US.

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 US goods competing with Canadian exports more competitive, and the demand for US domestic products increases. This is illustrated by a shift in the demand curve for US goods competing with Canadian exports in Panel B of Figure 3. As a result, the output of US goods competing with Canadian goods increases but so does their price. US producers clearly benefit from the reduction in the volume of Canadian exports. However, US 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 US domestic production will depend on the following factors:

- Price elasticity of demand for US goods competing with Canadian goods;

- Price elasticity of US supply of goods competing with Canadian exports.

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

- Animal/Plant Products;
- Automotive;
- Forest Products;
- Machinery/Electronics;
- Metal; and
- Other Products.

The above 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 US. The trade volumes were growing at a relatively stable rate throughout the 1990s. The growth rates are expected to slow down somewhat but overall they accumulate to substantial increase in trade over the study horizon.

Automotive

The dominant direction of trade movements in this industry is from Canada to the US. Trade volumes in the automotive industry experienced a particularly high rate of growth in the early 1990's and late 1990's. The growth rate in this industry is expected to slow down considerably due to slowing down population growth rates and possible relocation of some plants to Latin America as the Auto Pact expires.

Forest Products

Trade in forest products is dominated by Canadian exports to the US. This sector includes pulp and paper, wood pulp, softwood and hardwood lumber and a variety of other products. Canadian exports experienced a fast growth in the early 1990s but declined somewhat and slowed down in the second half of 1990s. The trade volumes are influenced by the Canada-US dispute over the softwood lumber and punitive duties imposed by the US. Another cause for uncertainty in this industry is prospective changes in the environmental legislation that could have an impact on the cost of production. The growth rates in this sector are projected to be quite small.

Machinery and Electronics

The dominant direction of movements is from the US to Canada. This sector showed both a dramatic growth through the 1990s and a dramatic decline with the collapse of the high-tech sector. It is anticipated that growth will be restricted at least until major capacity additions in

telecommunication networks are restored. This, in turn, depends on many factors, including overall performance of the economy. The developed forecasts in general meet or exceed GDP growth projections.

Metal Products

This sector's direction of transport split between Canada and the US is fairly even. The projected trade traffic growth is similar as that for the automotive industry.

Other Products

This category contains the following:

- 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.

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 2020 and 2030 (as reported in the November 2002 Working Paper and reported in Exhibit 5.20);

- HLB Technical Memorandum of March 21, 2003, 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[7] 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:

[7] 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.

Step 1: Further divided the industry groups to smaller industry groups, as shown in the table below.

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[8]

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.

Impacts on the U.S. Economy:

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

- Impact on the economy of the 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; and

- Impact on the economy of the United States.

Impacts 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; and

[8] 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 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[9] model for estimating the economic impact in the US and Statistics Canada model to estimate the economic impact in Canada.

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

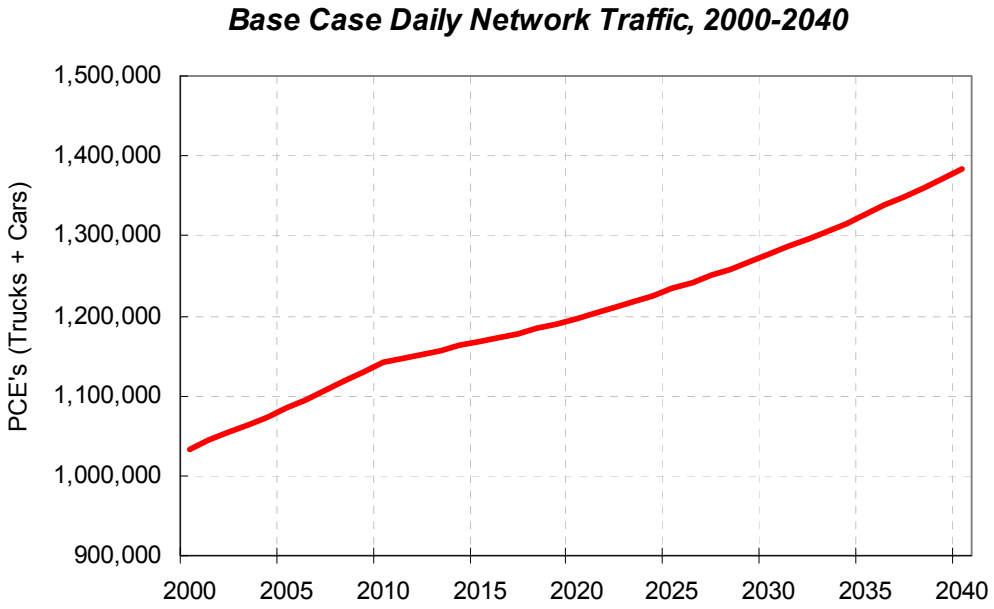
3. ECONOMIC IMPACT ANALYSIS OF FREIGHT TRAFFIC

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 Delays on Transportation Costs in the Detroit-Windsor Crossings

The delay cost was estimated based on the traffic and travel time forecast in the area for the period between 2000 and 2040. Figure 4 and Figure 5 below show the traffic volume[10] and the corresponding travel time forecast for the overall Windsor-Detroit Corridor. This base case forecast doesn't include any major build alternatives but include already planned and funded improvements.

Figure 4: Traffic Volume Forecast for the Windsor-Detroit Area Corridor

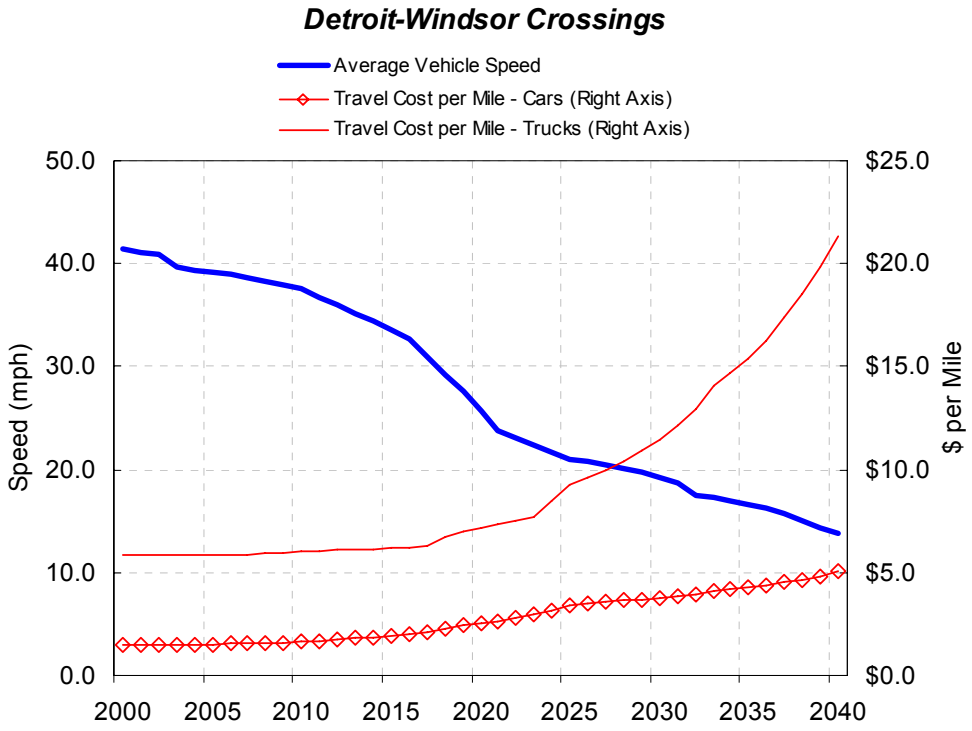


The two figures show that the corridor is expected to experience an increasing congestion and increasing delay. The average speed in the corridor is expected to drop from about 40 mph currently to about 14 mph by 2040. As a result of congestion increase and increase in delay, the users – mainly trucks – will experience a significant increase in cost in terms of travel time and vehicle operating costs. The truck cost per mile is expected to increase from $6 per mile currently to over $20 per mile by 2040.[11]

[10] Traffic growth, Capacity, and Diversion forecast are shown in Appendix 2.

[11] These travel cost projections assume *zero* diversion. The analysis presented in Section 3.3, on the other hand, assumes some diversion to intermodal rail and the Blue Water Bridge according to IBI estimates.

Figure 5: Expected Speed and Corresponding Cost per Mile for Trucks and Passenger Cars in the Windsor-Detroit Area Corridor



Using a maximum volume-to-capacity (V/C) ratio on the Ambassador Bridge and in the Detroit-Windsor Tunnel is of 1.1 (this implies that any projected truck traffic in excess of 110 percent of measured capacity would be lost), and assuming limited diversion from the Detroit-Windsor Tunnel to the Ambassador Bridge (and vice versa), Table 2 shows the simulation findings.

The decumulative probability distribution for potential freight traffic impacts is shown in the figure below. The dotted line crossing the curve at the 90 percent probability level (read along the vertical axis) indicates the 10th percentile (read along the horizontal axis). Similarly, the dotted line crossing the curve at the 10 percent probability level indicates the 90th percentile. The 10th and 90th percentiles define the boundaries of an 80 percent "confidence interval." As can be seen on the chart, there is an 80 percent probability that foregone freight traffic by year 2020 will be somewhere between $0.0 billion (no impact) and $3.5 billion; the median impact being about $0.9 billion.

A similar chart is shown for the total freight impact between 2000 and 2030, in Figure 6, below.

Table 1: Increasing Delays and Transportation Costs, Summary of Findings

	2000-2020	2000-2030
Value of Freight at Risk, $Billions	$1.01	$21.62
Expected Change in Truck Crossing Time, %		
Ambassador Bridge	+15.7%	+111.5%
Detroit-Windsor Tunnel	+127.8%	+127.8%
Blue Water Bridge	+1.9%	+2.8%
Expected Change in Unit Truck Operating Costs, %		
Ambassador Bridge	+28.7%	+134.2%
Detroit-Windsor Tunnel	+140.4%	+140.4%
Blue Water Bridge	+0.4%	+1.5%
Incremental Truck Crossing Time Costs, $Millions		
Ambassador Bridge	$24.9	$76.2
Due to increased traffic	$22.2	$57.0
Due to increased congestion	$2.7	$19.2
Detroit-Windsor Tunnel	$2.8	$3.0
Due to increased traffic	$2.1	$2.3
Due to increased congestion	$0.6	$0.6
Blue Water Bridge	$10.6	$13.4
Due to increased traffic	$10.4	$13.1
Due to increased congestion	$0.2	$0.3
Incremental Truck Operating Costs, $Millions		
Ambassador Bridge	$6.1	$17.1
Due to increased traffic	$4.4	$9.3
Due to increased congestion	$1.7	$7.8
Detroit-Windsor Tunnel	$0.6	$0.6
Due to increased traffic	$0.3	$0.4
Due to increased congestion	$0.2	$0.2
Blue Water Bridge	$0.7	$0.9
Due to increased traffic	$0.7	$0.9
Due to increased congestion	$0.0	$0.0

All dollar estimates in U.S. dollars of 2002, non-discounted
The delay estimates were not provided for 2010 as a planning year because the delay was not found to be very significant for that year

Figure 6: Probability Distribution of Value of Freight Traffic at Risk, through 2020

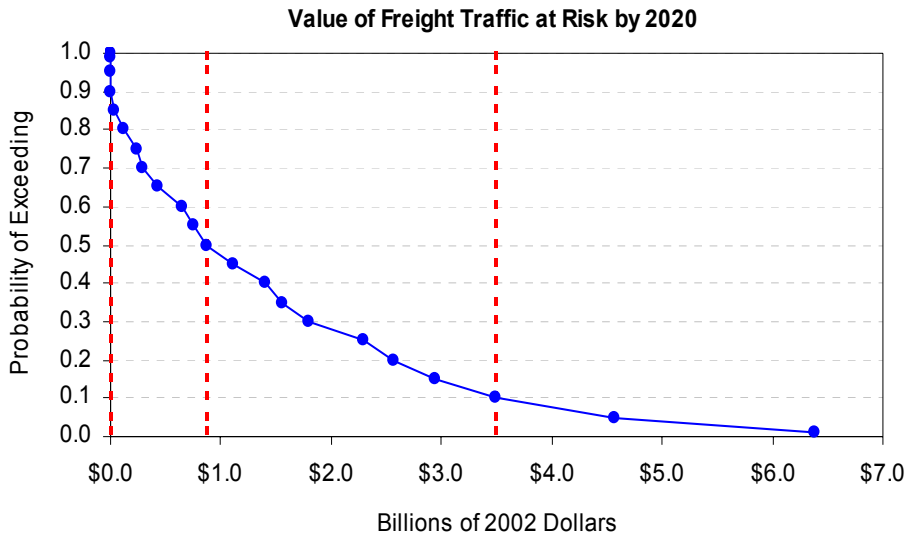
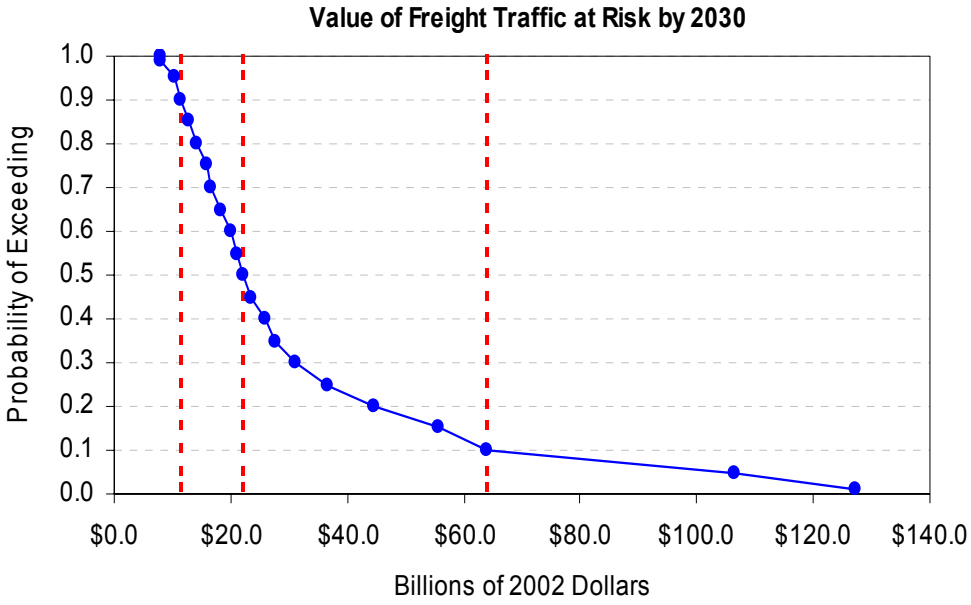


Figure 7: Probability Distribution of Value of Freight Traffic at Risk, through 2030



3.2 The Impact of Increasing 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 8 and Figure 9.

Figure 8: Effects of Border Congestion and Delays in the Automotive Industry (and Other Industries Based on Just-in-Time Logistics and Cross-Border Production)

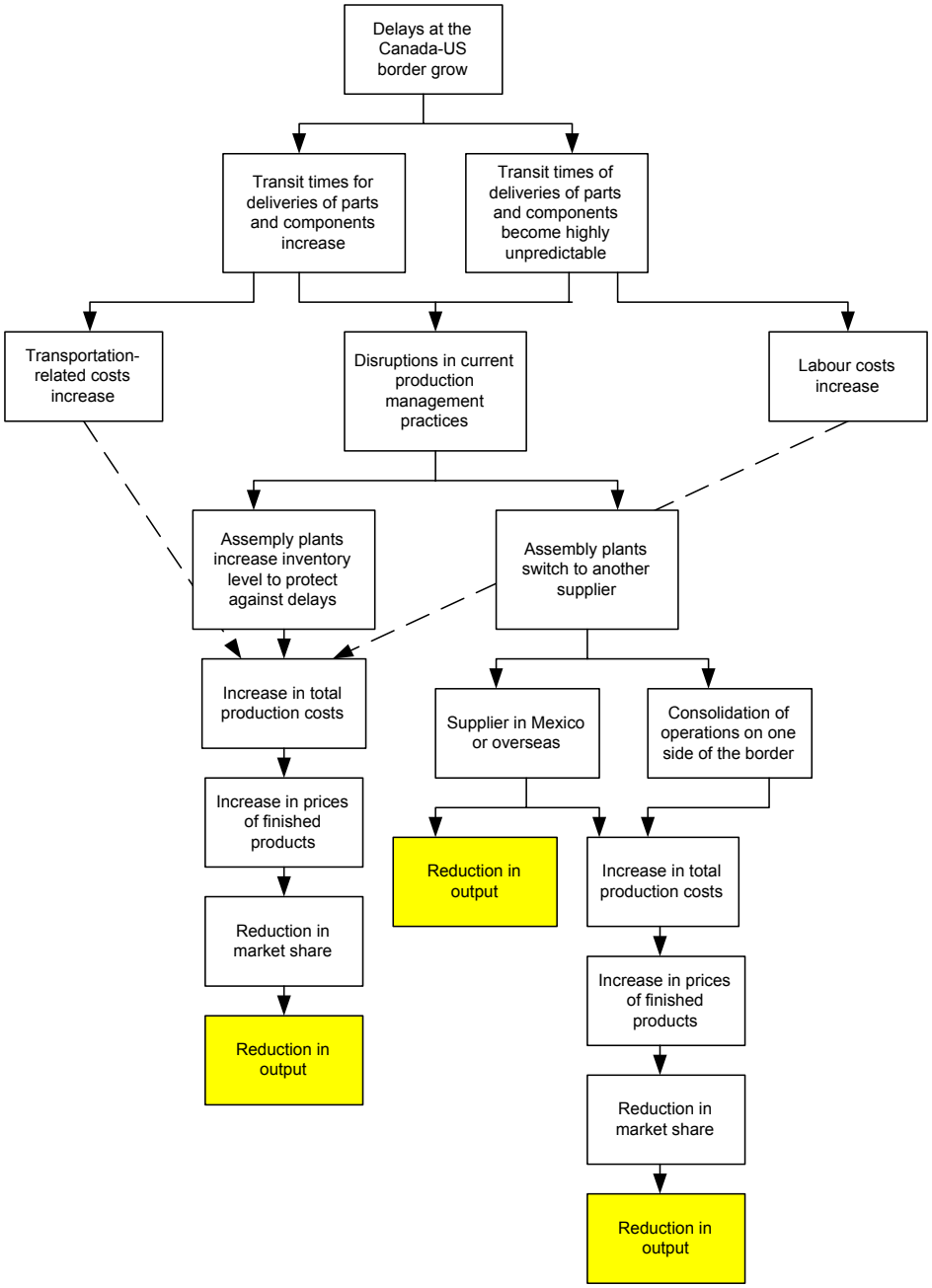
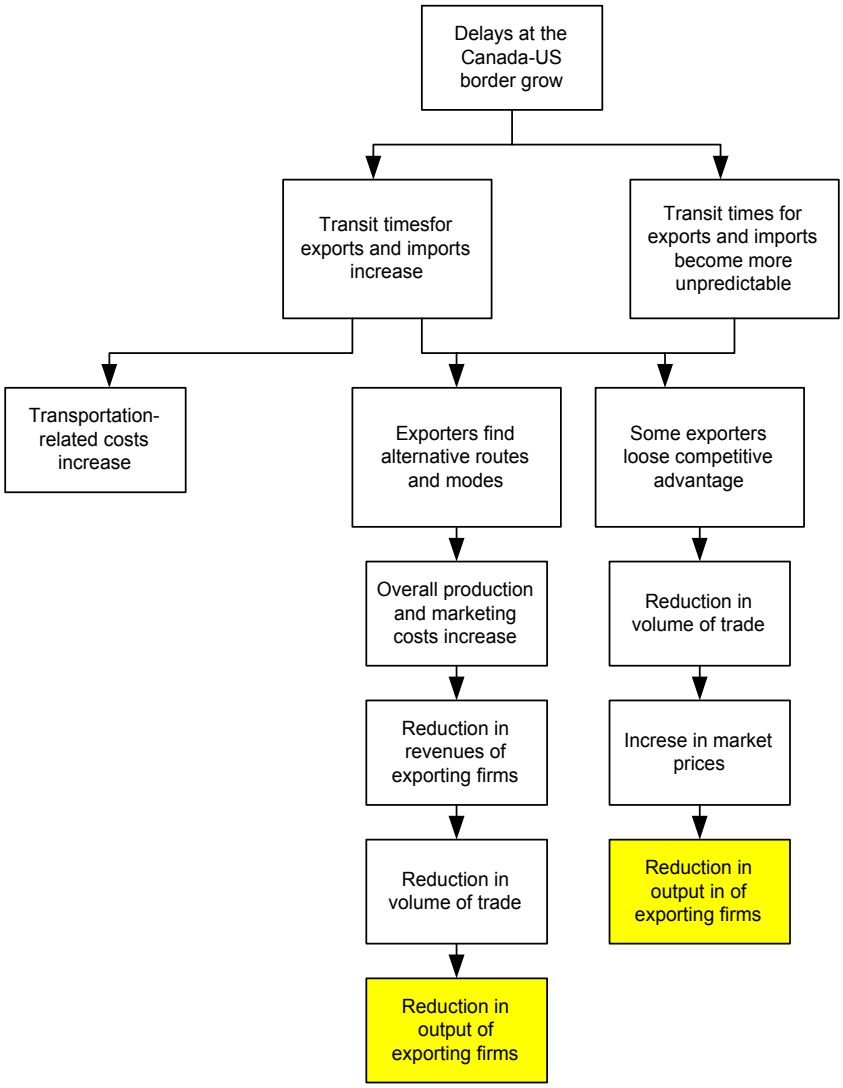


Figure 9: Effects of Border Congestion and Delays in Other Industries (Trading Primarily in Finished Goods)



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

Automotive Industry

Figure 8 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.

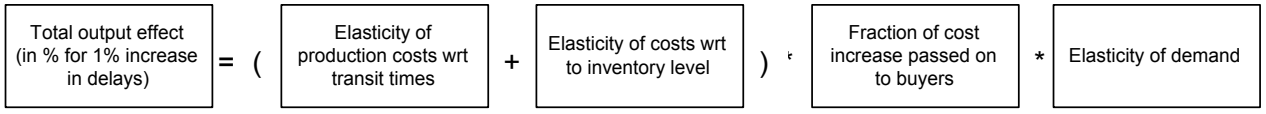
In addition, estimates of cost differentials for alternative suppliers in Mexico, overseas and in Canada and US would be required to assess the operating cost implications of options (2) and (3). Since no such data or any other information were readily available and time constraints prevented detailed 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 border 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 10.

Figure 10: 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.

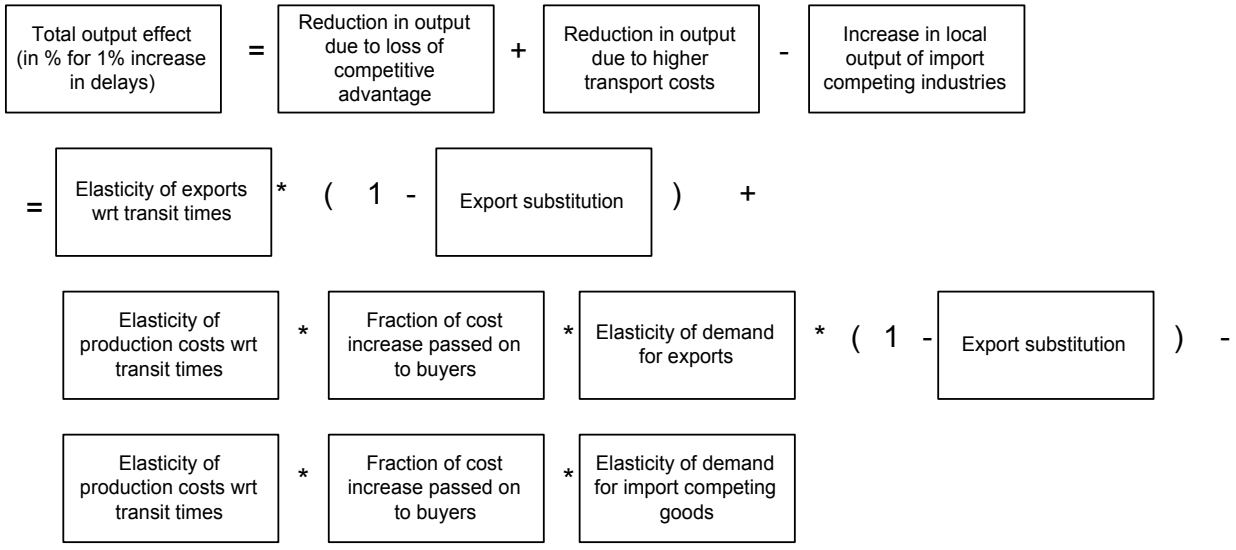
It should also be pointed out that reduction in export demand will be partially offset by domestic sales, or export substitution. In other words, it is recognized and assumed in the methodology that exporters will be able to sell some of the lost exports domestically.

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 11.

Figure 11: 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 2020 and 2030 going through Detroit-Windsor crossings to obtain the output impact of border delays for years 2020 and 2030, respectively. It is worth mentioning here that these effects are annual effects, and not cumulative. The calculation assumptions and the detailed data sources are provided in Appendix 1. The results of the assessment are shown in the table below.

Table 2: Output Impact of Cross-Border Delays, by Industry

Commodity / Industry	Affected volume of trade in 2020 (M of 2000 CAN$)	Affected volume of trade in 2030 (M of 2000 CAN$)	Reduction in output due to increase in border delays in 2020	Reduction in output due to increase in border delays in 2030	Impact on output in 2020 attributable to border delays (M of 2000 CAN$)	Impact on output in 2030 attributable to border delays (M of 2000 CAN$)
Animal/Plant	$8,197	$10,796	-2.92%	-12.17%	($239)	($1,314)
Auto	$62,850	$81,988	-2.57%	-9.12%	($1,615)	($7,476)
Forest	$4,481	$5,443	-0.69%	-2.98%	($31)	($162)
Machinery/Electronics	$53,299	$74,887	-0.69%	-2.98%	($366)	($2,230)
Metal	$11,843	$15,205	-0.69%	-2.98%	($81)	($453)
Other	$34,029	$51,658	-0.69%	-2.98%	($234)	($1,538)
TOTAL	**$174,699**	**$239,977**			**($2,567)**	**($13,173)**

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.

All effects are relatively small in 2020 but increase substantially by 2030 (when border delays also increase substantially).

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 [12] model for estimating the economic impact in the US and Statistics Canada model to estimate the economic impact in Canada.

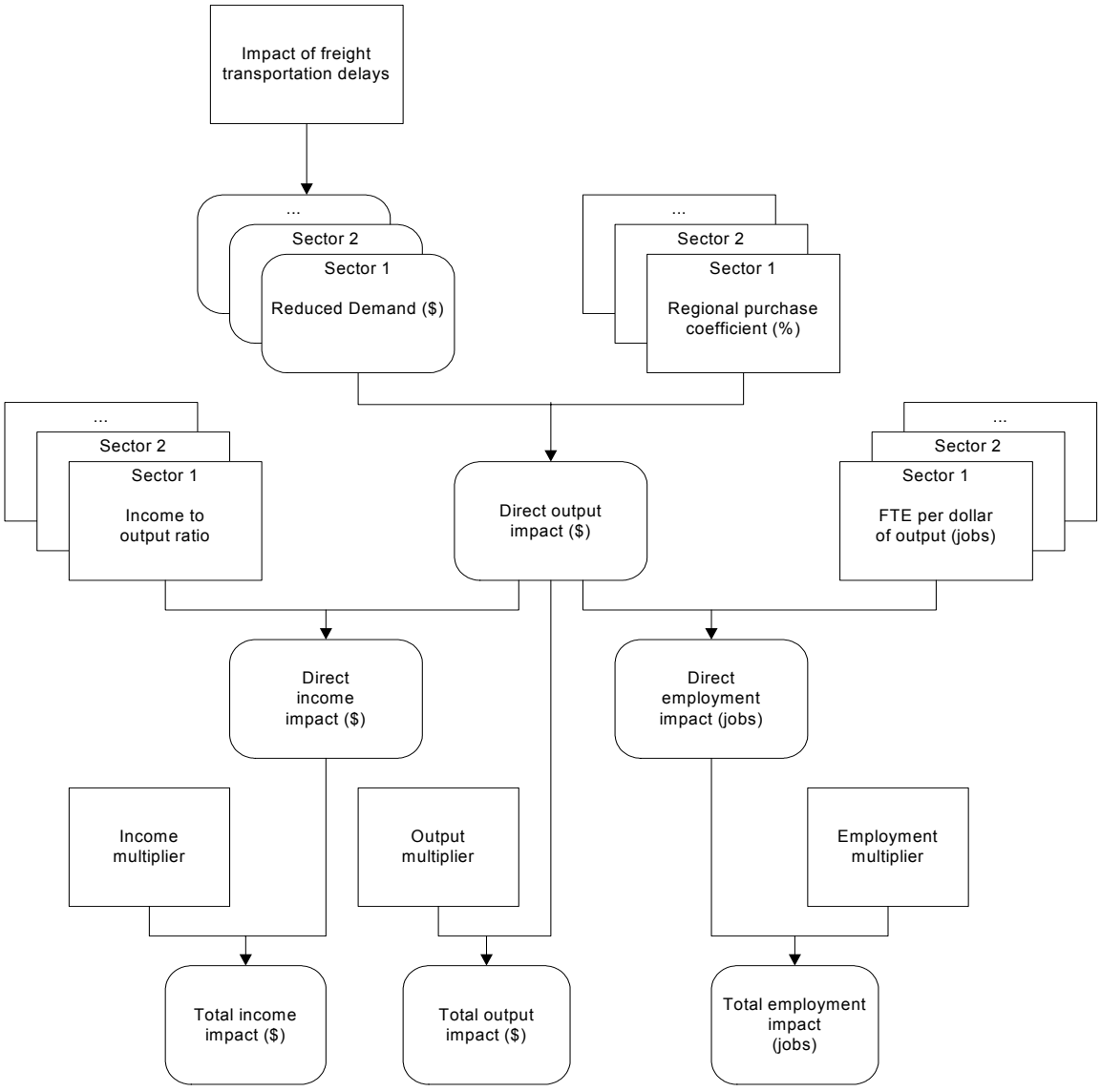
3.3.1 Economic Impacts in the United States

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.

[12] 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 12. 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 12: 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: 2020 and 2030.

3.3.1.1 Impact on the Economy of Wayne County

The simulation results show that congestion may produce 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$186 million per year in 2020, reaching US$927 million by 2030. This would be accompanied by a loss of jobs in the area which is estimated at 760 jobs in 2020 and 4,095 by 2030. The area also risks a loss of tax revenues in the magnitude of US$26 million per year in 2020, which may reach US$108 million by 2030. Tables 3, 4, and 5 show a summary of the economic impact estimates for Wayne County/Detroit Area.

Table 3: Annual Economic Impact in Wayne County

Year	Nature of Impact	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2020	Output	($167)	($12)	($7)	**($186)**
	Earnings	($59)	($6)	($4)	**($69)**
2030	Output	($831)	($60)	($35)	**($927)**
	Earnings	($300)	($29)	($22)	**($352)**

In millions of 2000 US$

Table 4: Cumulative Employment Impact in Wayne County

Year	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2020	-608	-72	-80	**-760**
2030	-3,318	-371	-406	**-4,095**

Table 5: Annual Tax Impact in Wayne County

Year	Employee Compensation	Proprietary Income	Household Expenditure	Enterprises / Corporations	Indirect Business Taxes	Total
2020	($7)	($0)	($9)	($4)	($6)	**($26)**
2030	($32)	($1)	($37)	($15)	($24)	**($108)**

In millions of 2000 US$

3.3.1.2 Impact on the SEMCOG Region Economy

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 Tables 6 and 7, show that the region would lose about 3,129 jobs in 2020. This number is expected to reach a cumulative loss of 15,970 jobs by 2030. Losses in terms of output are expected to reach US$630 million per year by 2020, and US$3.1 billion by 2030.

Table 6: Annual Economic Impact in the SEMCOG Region

Year	Nature of Impact	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2020	Output	($471)	($94)	($64)	**($630)**
	Earnings	($171)	($48)	($41)	**($259)**
2030	Output	($2,346)	($426)	($308)	**($3,080)**
	Earnings	($868)	($218)	($195)	**($1,281)**

In millions of 2000 US$

Table 7: Cumulative Employment Impact in the SEMCOG Region

Year	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2020	-1,763	-615	-751	**-3,129**
2030	-9,534	-2,837	-3,598	**-15,970**

As indicated in Table 8 below, annual tax losses in the region are expected to reach US$81 million in 2020 and nearly US$400 million in 2030.

Table 8: Annual Tax Impact in the SEMCOG Region

Year	Employee Compensation	Proprietary Income	Household Expenditure	Enterprises / Corporations	Indirect Business Taxes	Total
2020	($23)	($1)	($30)	($10)	($17)	**($81)**
2030	($115)	($3)	($148)	($49)	($85)	**($399)**

In millions of 2000 US$

3.3.1.3 Impact on the Michigan Economy

When assessing the impact of cross-border delays on the State of Michigan economy, the analysis shows that the state risks losing a cumulative 6,406 jobs in 2020, which may reach 33,977 jobs in 2030. The annual loss of output may reach US$4.9 billion by 2030. The expected loss in tax revenues could also be significant, reaching US$104 million per year in 2020 and US$536 million per year in 2030.

Table 9: Annual Economic Impact in the State of Michigan

Year	Nature of Impact	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2020	Output	($649)	($185)	($135)	**($970)**
	Earnings	($236)	($93)	($84)	**($413)**
2030	Output	($3,317)	($911)	($696)	**($4,924)**
	Earnings	($1,229)	($463)	($431)	**($2,123)**

In millions of 2000 US$

Table 10: Cumulative Employment Impact in the State of Michigan

Year	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2020	-3,292	-1,415	-1,698	**-6,406**
2030	-18,148	-7,104	-8,725	**-33,977**

Table 11: Annual Tax Impact in the State of Michigan

Year	Employee Compensation	Proprietary Income	Household Expenditure	Enterprises / Corporations	Indirect Business Taxes	Total
2020	($29)	($1)	($38)	($13)	($23)	**($104)**
2030	($149)	($4)	($197)	($65)	($121)	**($536)**

In millions of 2000 US$

3.3.1.4 Impact on the United States Economy

The increasing delay experienced in freight transportation is expected to lead to a reduction in trade of about US$2.2 billion per year at the U.S. national level for 2020. This reduction in output is expected to grow to over US$11.4 billion in 2030 alone.

The employment loss due to the reduction in trade is expected to be significant as well. It is expected that by 2020, the United States economy would lose a cumulative 17,345 jobs. Total job losses may reach 91,194 by 2030. The reduction in income associated with these job losses is estimated at US$1.1 billion and US$5.5 billion per year in 2020 and 2030, 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$823 million per year in 2020 and US$5.76 billion per year in 2030. Tables 12, 13, and 14 below summarize the results of the economic impacts on the U.S. economy.

Table 12: Annual Economic Impact in the United States

Year	Nature of Impact	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2020	Output	($828)	($720)	($672)	**($2,219)**
	Earnings	($307)	($351)	($401)	**($1,058)**
2030	Output	($4,288)	($3,644)	($3,504)	**($11,436)**
	Earnings	($1,626)	($1,790)	($2,089)	**($5,504)**

In millions of 2000 US$

Table 13: Cumulative Employment Impact in the United States

Year	Direct Impacts	Indirect Impacts	Induced Impacts	Total Impacts
2020	-5,166	-5,149	-7,029	**-17,345**
2030	-28,096	-26,456	-36,642	**-91,194**

Table 14: Annual Tax Impact in the United States

Year	Employee Compensation	Proprietary Income	Household Expenditure	Enterprises / Corporations	Indirect Business Taxes	Total
2020	($71)	($4)	($96)	($28)	($73)	**($272)**
2030	($369)	($19)	($500)	($146)	($381)	**($1,415)**

In millions of 2000 US$

3.3.2 Economic Impacts in Canada

On the Canadian side, HLB used Statistics Canada Input Output model. The 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: an input table, an output table, and a 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.

Estimates of economic impacts are summarized in a table showing the output and employment impacts. The estimates are presented at three different geographic levels: the Essex/Windsor Area, the Province of Ontario, and Canada as a whole.

3.3.2.1 Impact on the Essex/Windsor Economy

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 estimates show that the Essex/Windsor area risks losing CAN$26 million in output per year by 2020, and CAN$144 million per year by 2030.

The simulation results also indicate that the Essex/Windsor area may lose a cumulative 433 jobs by 2020, which may reach 2,401 jobs by 2030. Table 15 below shows the summary results of the economic impacts on the Essex/Windsor area.

Table 15: Economic Impact in the Essex/Windsor Area

	2020	2030
OUTPUT (ANNUAL)		
Final Domestic Expenditure	($105)	($541)
Indirect Taxes on Final Demand	($2)	($11)
Direct Foreign Imports	$59	$295
Indirect Foreign Imports	$13	$64
Inventories and Other Leakages	$1	$5
Inter-provincial Imports	$8	$48
Inter-provincial Exports	($1)	($4)
Total	**($26)**	**($144)**
EMPLOYMENT (CUMULATIVE)		
Direct	-288	-1,618
Indirect	-144	-783
Total	**-433**	**-2,401**

Dollar values are in millions of 2000 CAN$
The impact for 2010 was omitted because it has not been found to be significant

3.3.2.2 Impact on the Ontario Economy

When assessing the economic impact on the economy of the Province of Ontario, the analysis found that the net loss of output might be CAN$220 million per year in 2020, reaching CAN$1.2 billion per year by 2030. As a result, the province risks losing about 3,619 jobs by 2020 and over 20,088 by 2030.

Table 16 below shows a breakdown of the impact estimates. The output impact is estimated as the net impact of the Ontario demand, inter-provincial trade, and international trade. The table also shows the employment impact broken down between direct and indirect impacts.

Table 16: Economic Impact in the Province of Ontario

Dollar values are in millions of 2000 CAN$	2020	2030
OUTPUT (ANNUAL)		
Final Domestic Expenditure	($883)	($4,461)
Indirect Taxes on Final Demand	($17)	($91)
Direct Foreign Imports	$501	$2,434
Indirect Foreign Imports	$109	$530
Inventories and Other Leakages	$8	$41
Inter-provincial Imports	$68	$396
Inter-provincial Exports	($6)	($33)
Total	**($220)**	**($1,184)**
EMPLOYMENT (CUMULATIVE)		
Direct	-2,429	-13,634
Indirect	-1,190	-6,454
Total	**-3,619**	**-20,088**

3.3.2.3 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 significant. The impact results show that the net impact on the output of the Canadian economy is over $387 million per year in 2020, and reaches a net impact of $2.1 billion per year by 2030.

Similarly, the impact on employment in Canada is equally significant; the analysis shows that the Canadian economy risks losing a total of 6,206 jobs by 2020. The job loss is expected to increase to nearly 35,000 jobs by 2030.

Table 17, below, provides a summary of results for the economic impacts on the Canadian economy.

Table 17: Economic Impact in Canada

	2020	2030
OUTPUT (ANNUAL)		
Final Domestic Expenditure	($1,293)	($6,576)
Indirect Taxes on Final Demand	($25)	($134)
Direct Foreign Imports	$733	$3,589
Indirect Foreign Imports	$183	$912
Inventories and Other Leakages	$16	$82
Inter-provincial Imports	$115	$671
Inter-provincial Exports	($115)	($671)
Total	**($387)**	**($2,127)**
EMPLOYMENT (CUMULATIVE)		
Direct	-3,870	-22,013
Indirect	-2,336	-12,913
Total	**-6,206**	**-34,926**

Dollar values are in millions of 2000 CAN$

The impact for 2010 was omitted because it has not been found to be significant

3.4 Risk Analysis of the Potential Economic Impact From Impaired Freight Movements And Productivity Losses

Given the uncertainty surrounding the economic impact, a risk analysis simulation was conducted by vibrating the multipliers used in the economic impact estimates. The simulation was conducted for two areas. The first area combined the SEMCOG region with the Essex Region, while the second area encompassed the State of Michigan together with the Province of Ontario. Table 17 and Table 18 below provide the simulation results.

Table 18: Annual Production Potentially Affected (Values are in Millions of 2000 US$)

Year	Potential Impact on the SEMCOG-ESSEX Economy	Potential Impact on the State of Michigan and Province of Ontario Economy
2020	($620) – ($675)	($1,000) – ($1,300)
2030	($3,000) – ($3,300)	($5,500) – ($6,000)

Table 19: Cumulative Employment Potentially Affected (Full Time Equivalent Jobs)

Year	Potential Impact on the SEMCOG-ESSEX Economy	Potential Impact on the State of Michigan and Province of Ontario Economy
2020	(3,000) - (4,000)	(8,000) – (12,000)
2030	(16,000) – (20,000)	(50,000) – (60,000)

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 Methodology and Assumptions

Figure 13, 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;

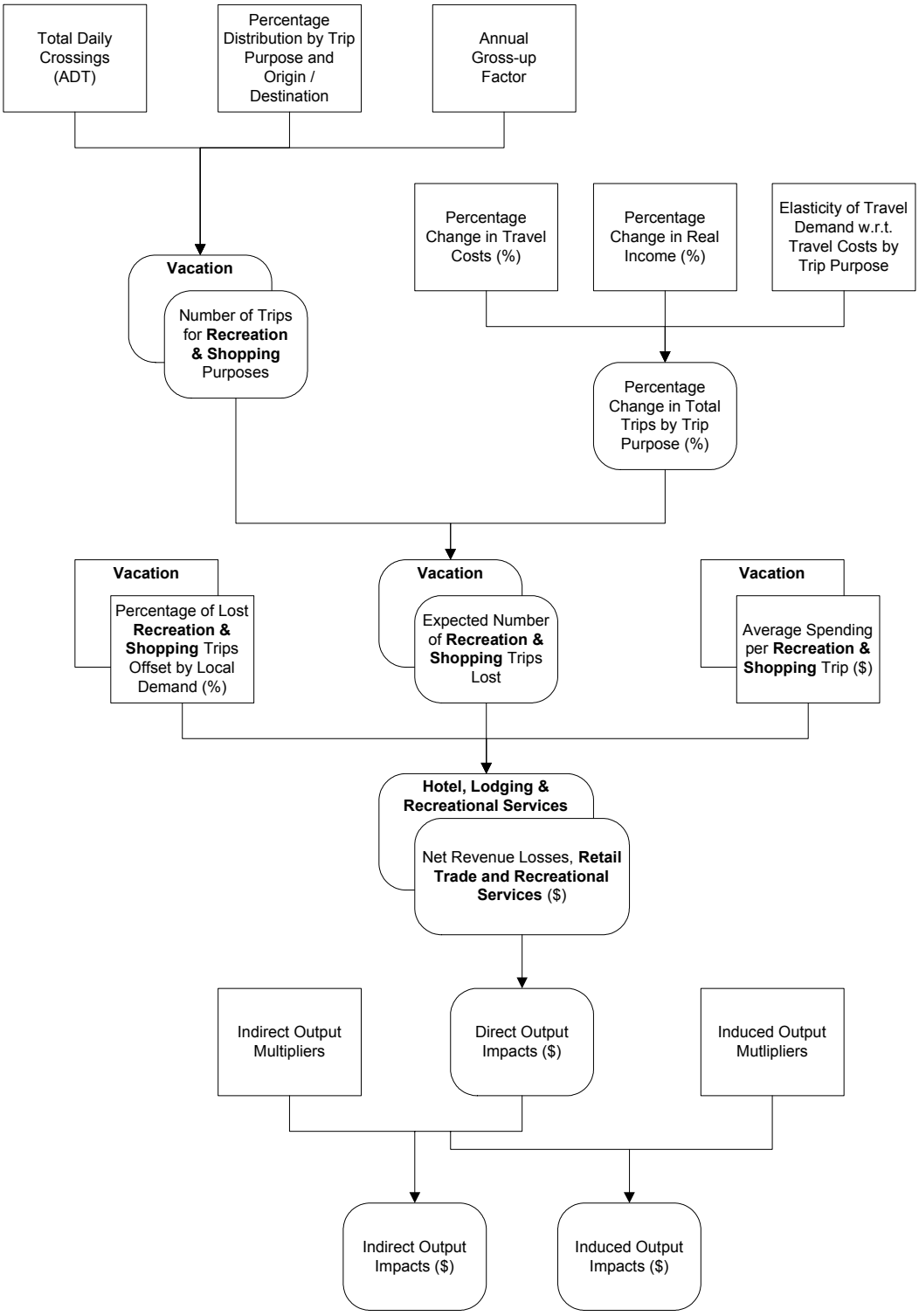
- Adjust for changes in local demand (e.g., shopping or vacation money spent in Canada instead of the U.S., and vice versa);

- 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 13: 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's Existing and Future Demand Study. Other assumptions were derived by HLB on the basis of literature findings and professional opinion.[13]

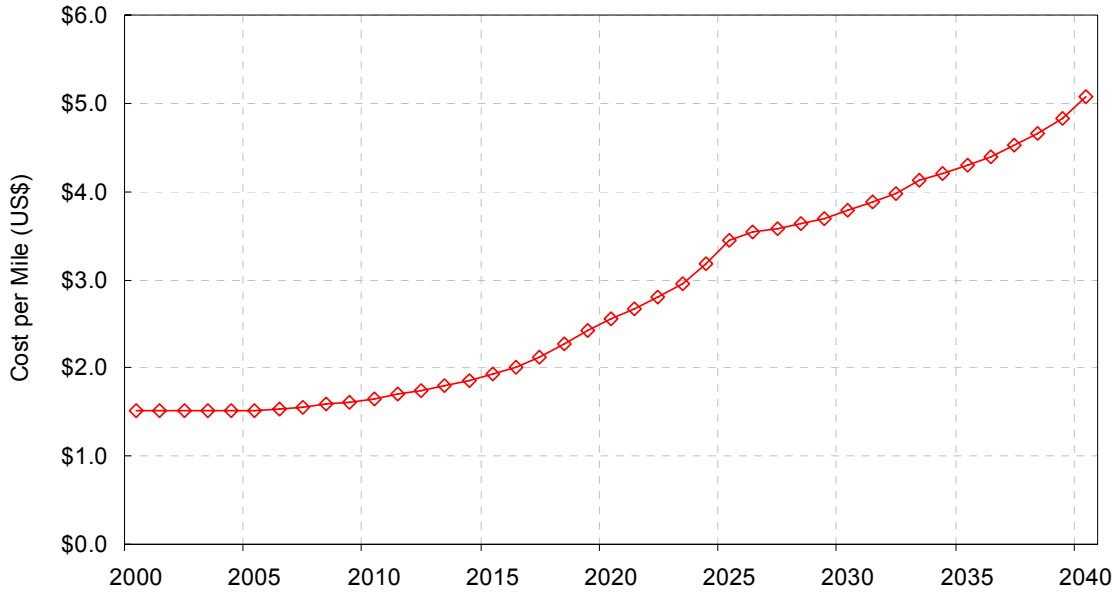
Table 20: Modeling Assumptions

Variable	Value	Sources
Trip Purpose		
Recreation and Shopping	45.98%	IBI – Existing and future demand study – page 14
Vacation	7.36%	IBI – Idem
% of all Crossings FROM Canada TO the U.S.		
Recreation and Shopping	48.67%	IBI – Idem
Vacation	42.04%	IBI – Idem
Average Spending per Trip, in U.S. Dollars		
Recreation and Shopping	$20.0	HLB
Vacation	$100.0	HLB
Elasticity of Travel Demand w.r.t. Travel Costs		
Recreation and Shopping	-0.500	HLB – Derived from BTE elasticities database
Vacation	-0.800	HLB – Derived from BTE elasticities database
% Substitution (by local demand)		
In the U.S. - NATIONAL		
Recreation and Shopping	80.0%	HLB
Vacation	60.0%	HLB
In Canada - NATIONAL		
Recreation and Shopping	80.0%	HLB
Vacation	70.0%	HLB
Trip Destination		
% of RECREATION Trips from Canada to:		
WAYNE COUNTY	80.0%	IBI – Existing and future demand study
SEMCOG REGION	85.0%	HLB
MICHIGAN	90.0%	HLB
U.S.	100.0%	HLB
% of VACATION Trips from Canada to:		
WAYNE COUNTY	10.0%	HLB
SEMCOG REGION	30.0%	HLB
MICHIGAN	80.0%	IBI – Existing and future demand study – page 19
U.S.	100.0%	HLB
% of RECREATION Trips from the U.S. to:		
ESSEX / WINDSOR	75.0%	IBI – Existing and future demand study
ONTARIO	90.0%	HLB
CANADA	100.0%	HLB
% of VACATION Trips from the U.S. to:		
ESSEX / WINDSOR	5.0%	HLB
ONTARIO	80.0%	HLB
CANADA	100.0%	HLB
It is also assumed in the estimation process that the losses occurring prior to 2011, when the border crossings reach capacity; are not significant. It is also assumed that border processing issues are addressed such that these aspects of the crossing are not critical, because the border processing rates are equal to the flow rates.		

Travel cost projections through 2040 can be found in Figure 14, below. Estimated changes in passenger car traffic (crossings) resulting from increased travel costs are shown in Figure 15.

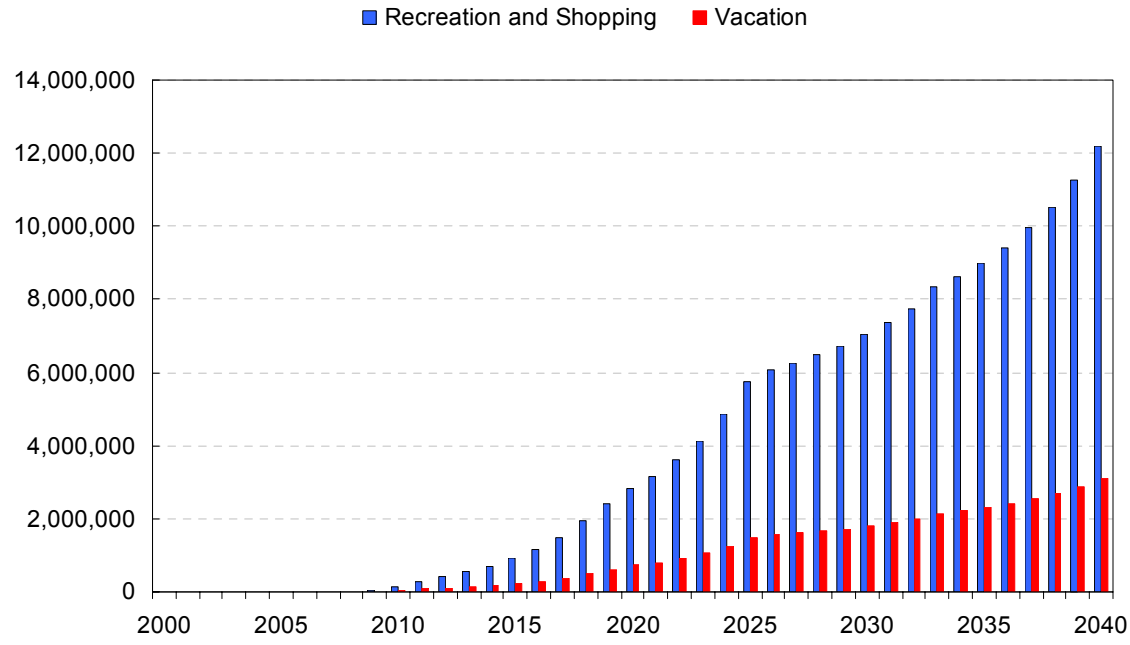
[13] Some of the parameters (the substitution and trip distribution factors) were adjusted in response to comments provided by Jean Pierre Roy, Chief Economist at Transport Canada. The final estimates used in the analysis, however, do not necessarily represent Mr. Roy's views.

Figure 14: Travel Cost per Mile, 2000-2040



Including travel time and vehicle operating costs, excluding tolls.

Figure 15: Expected Loss in Cross-Border Trips, Passenger Cars



The above graph illustrates the fact that the border crossing infrastructure is or near capacity by 2010, and that the loss starts rising significantly by 2012.

4.2 Simulation Results

Simulation results indicate that output and employment losses resulting from reduced personal trip making would be concentrated on the Canadian side. The restriction on cross-border movements was found to *increase* economic activity (production and employment) in the United States. Implicit in this conclusion, however, is the assumption that most (if not all) of American household expenditures previously spent in Canada would be spent in the United States instead, on comparable, if not similar, goods and services. Since there are, overall, more recreational and shopping trips originating from the United States 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 (trade) results in reduced economic activity in Canada (the surplus nation) and in increased activity in the U.S. (the deficit nation). Again, this assumes a high degree of substitution between home and foreign recreation and tourism services.

Simulation results for the U.S. economy, the State of Michigan, 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 2000. Employment impacts are changes in Full Time Equivalent (FTE) jobs. Output and income impacts are annually recurring impacts, estimated in two "snapshot" years (2020 and 2030). Employment impacts, on the other hand, should be viewed as non-recurring changes in total employment (in the "stock" of workers).

Table 21: Economic Impact in the United States

Year	Impact	Lost Trips	Direct	Indirect	Induced	Total
2020	Output	Recreation & Shopping	$37.3	$19.2	$36.6	$93.1
		Vacation	$25.1	$14.4	$24.2	$63.7
		Total	$62.4	$33.5	$60.9	$156.8
	Earnings	Recreation & Shopping	$25.0	$11.2	$21.8	$58.0
		Vacation	$15.7	$8.7	$14.4	$38.8
		Total	$40.6	$19.9	$36.3	$96.8
	Employment	Recreation & Shopping	859	199	383	1,441
		Vacation	440	143	253	836
		Total	1,299	341	636	2,277
2030	Output	Recreation & Shopping	$194.5	$99.8	$190.8	$485.1
		Vacation	$130.7	$74.9	$126.2	$331.7
		Total	$325.2	$174.6	$317.0	$816.8
	Earnings	Recreation & Shopping	$130.0	$58.4	$113.7	$302.2
		Vacation	$81.7	$45.1	$75.2	$202.0
		Total	$211.7	$103.5	$188.9	$504.1
	Employment	Recreation & Shopping	4,476	1,036	1,995	7,507
		Vacation	2,292	743	1,319	4,354
		Total	6,768	1,779	3,315	11,861

Table 22: Economic Impact in the State of Michigan

Year	Impact	Lost Trips	Direct	Indirect	Induced	Total
2020	Output	Recreation & Shopping	$33.6	$9.7	$14.3	$57.6
		Vacation	$20.1	$7.2	$8.1	$35.3
		Total	$53.7	$16.9	$22.4	$93.0
	Earnings	Recreation & Shopping	$22.6	$5.9	$8.9	$37.4
		Vacation	$12.0	$4.4	$5.0	$21.5
		Total	$34.6	$10.4	$13.9	$58.8
	Employment	Recreation & Shopping	832	121	179	1,132
		Vacation	446	82	101	629
		Total	1,277	204	281	1,762
2030	Output	Recreation & Shopping	$175.1	$50.6	$74.5	$300.2
		Vacation	$104.6	$37.4	$42.2	$184.1
		Total	$279.7	$88.0	$116.6	$484.3
	Earnings	Recreation & Shopping	$117.5	$30.9	$46.1	$194.6
		Vacation	$62.7	$23.1	$26.1	$111.9
		Total	$180.2	$54.0	$72.3	$306.5
	Employment	Recreation & Shopping	4,332	633	934	5,898
		Vacation	2,321	429	529	3,278
		Total	6,653	1,061	1,462	9,177

Table 23: Economic Impact in the SEMCOG Region

Year	Impact	Lost Trips	Direct	Indirect	Induced	Total
2020	Output	Recreation & Shopping	$31.7	$8.6	$12.8	$53.1
		Vacation	$7.5	$2.5	$2.9	$12.9
		Total	$39.3	$11.1	$15.7	$66.0
	Earnings	Recreation & Shopping	$21.6	$5.4	$8.1	$35.1
		Vacation	$4.7	$1.6	$1.8	$8.1
		Total	$26.3	$7.0	$9.9	$43.2
	Employment	Recreation & Shopping	698	99	149	947
		Vacation	148	27	34	208
		Total	846	126	183	1,154
2030	Output	Recreation & Shopping	$165.4	$44.7	$66.6	$276.6
		Vacation	$39.2	$13.0	$15.0	$67.2
		Total	$204.6	$57.7	$81.6	$343.8
	Earnings	Recreation & Shopping	$112.6	$28.1	$42.1	$182.8
		Vacation	$24.2	$8.2	$9.5	$41.9
		Total	$136.8	$36.4	$51.6	$224.8
	Employment	Recreation & Shopping	3,637	517	777	4,931
		Vacation	769	139	175	1,082
		Total	4,405	655	952	6,013

Table 24: Economic Impact in Wayne County

Year	Impact	Lost Trips	Direct	Indirect	Induced	Total
2020	Output	Recreation & Shopping	$29.9	$7.6	$10.7	$48.2
		Vacation	$2.5	$0.8	$0.9	$4.1
		Total	$32.4	$8.4	$11.6	$52.3
	Earnings	Recreation & Shopping	$20.3	$4.7	$6.7	$31.6
		Vacation	$1.6	$0.5	$0.5	$2.6
		Total	$21.8	$5.1	$7.2	$34.2
	Employment	Recreation & Shopping	647	84	124	854
		Vacation	47	8	10	64
		Total	693	92	134	919
2030	Output	Recreation & Shopping	$155.6	$39.7	$55.8	$251.1
		Vacation	$13.1	$4.0	$4.4	$21.5
		Total	$168.7	$43.7	$60.2	$272.6
	Earnings	Recreation & Shopping	$105.6	$24.3	$34.8	$164.7
		Vacation	$8.2	$2.5	$2.8	$13.4
		Total	$113.8	$26.8	$37.5	$178.1
	Employment	Recreation & Shopping	3,368	437	645	4,450
		Vacation	243	41	51	335
		Total	3,611	478	696	4,785

National economic impacts are small when compared to the size of the U.S. economy. By 2030, about 11,000 jobs are expected to be created. In 2030 alone, the U.S. economy is expected to gain about $0.8 billion worth of production, while total income (value added) is expected to increase by about $0.5 billion.

Under the do-nothing scenario, output in the SEMCOG region is projected to be about $0.3 billion *larger* than what it would have been in the absence of congestion problems. Over a 30-year period, the cumulative *gain* in output would amount to nearly $6 billion, or 1.5 percent of year-2000 SEMCOG output (total output in the SEMCOG region). About 6,000 jobs (0.2 percent of total regional employment) might be created.

In the Detroit area (Wayne County), over 4,400 jobs may be created by year 2030: less than 1 percent of total year-2000 county employment, but over 2.2 percent of the year-2000 employment in the retail trade, hotel and lodging, and recreation sectors.

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 2000. Employment impacts are expressed as changes in the number of Full Time Equivalent (FTE) jobs.

Table 25: Economic Impact in Canada

Year	Impact	Lost Trips	Direct	Indirect	Total
2020	Output	Recreation & Shopping	($103.0)	($50.2)	($153.2)
		Vacation	($196.8)	($107.1)	($303.8)
		Total	($299.8)	($157.3)	($457.1)
	Earnings	Recreation & Shopping	($68.8)	($27.9)	($96.7)
		Vacation	($123.0)	($61.1)	($184.0)
		Total	($191.8)	($88.9)	($280.7)
	Employment	Recreation & Shopping	-2,134	-494	-2,627
		Vacation	-3,105	-1,006	-4,111
		Total	-5,239	-1,500	-6,739
2030	Output	Recreation & Shopping	($536.7)	($261.4)	($798.1)
		Vacation	($1,024.9)	($557.7)	($1,582.6)
		Total	($1,561.6)	($819.1)	($2,380.8)
	Earnings	Recreation & Shopping	($358.6)	($145.1)	($503.7)
		Vacation	($640.5)	($318.2)	($958.6)
		Total	($999.1)	($463.3)	($1,462.3)
	Employment	Recreation & Shopping	-11,113	-2,573	-13,686
		Vacation	-16,174	-5,240	-21,414
		Total	-27,287	-7,813	-35,100

Table 26: Economic Impact in the Province of Ontario

Year	Impact	Lost Trips	Direct	Indirect	Total
2020	Output	Recreation & Shopping	($92.7)	($25.5)	($118.2)
		Vacation	($157.4)	($53.4)	($210.9)
		Total	($250.1)	($78.9)	($329.1)
	Earnings	Recreation & Shopping	($62.3)	($14.7)	($77.0)
		Vacation	($94.4)	($31.3)	($125.6)
		Total	($156.6)	($46.0)	($202.6)
	Employment	Recreation & Shopping	-2,065	-302	-2,367
		Vacation	-3,145	-581	-3,726
		Total	-5,210	-882	-6,092
2030	Output	Recreation & Shopping	($483.0)	($132.7)	($615.7)
		Vacation	($819.9)	($278.4)	($1,098.3)
		Total	($1,303.0)	($411.1)	($1,714.1)
	Earnings	Recreation & Shopping	($324.3)	($76.8)	($401.1)
		Vacation	($491.5)	($163.0)	($654.5)
		Total	($815.8)	($239.8)	($1,055.5)
	Employment	Recreation & Shopping	-10,756	-1,571	-12,327
		Vacation	-16,381	-3,025	-19,406
		Total	-27,136	-4,596	-31,732

Table 27: Economic Impact in the Essex/Windsor Area

Year	Impact	Lost Trips	Direct	Indirect	Total
2020	Output	Recreation & Shopping	($77.3)	($18.7)	($96.0)
		Vacation	($9.8)	($2.9)	($12.7)
		Total	($87.1)	($21.6)	($108.7)
	Earnings	Recreation & Shopping	($52.4)	($10.9)	($63.3)
		Vacation	($6.1)	($1.7)	($7.8)
		Total	($58.6)	($12.5)	($71.1)
	Employment	Recreation & Shopping	-1,505	-195	-1,700
		Vacation	-164	-28	-192
		Total	-1,669	-223	-1,892
2030	Output	Recreation & Shopping	($402.5)	($97.5)	($500.0)
		Vacation	($51.2)	($14.9)	($66.1)
		Total	($453.8)	($112.4)	($566.2)
	Earnings	Recreation & Shopping	($273.2)	($56.6)	($329.8)
		Vacation	($32.0)	($8.7)	($40.7)
		Total	($305.2)	($65.3)	($370.4)
	Employment	Recreation & Shopping	-7,840	-1,017	-8,856
		Vacation	-856	-145	-1,001
		Total	-8,696	-1,162	-9,858

As shown in Table 23, national economic impacts are relatively small. In 2030, total output is expected to fall by $2.4 billion (about a fifth of a percent of year-2000 Canadian GDP) as a consequence of reduced cross-border trip-making. About 35,000 jobs would be lost.

In the Ontario Province alone, failure to relieve congestion in the Detroit-Windsor corridor may "cost" up to 6,000 jobs by year 2020, and over 31,000 by the end of 2030 (nearly half of a percent of total year-2000 Ontario employment). Over $1.0 billion worth of income may be lost in 2030, or nearly $21 billion over a 30-year period (after adjusting for traffic and cost ramp-up).

Total economic impacts would be relatively larger for the Essex / Windsor area (relative to the size of the local economy). The loss of incoming trips for recreational, shopping, and vacation purposes may result in losses of up to 9,858 jobs by year 2030, and $0.6 billion worth of local output.

4.3 Risk Analysis Potential Economic Impact From Reduced Personal Trip-making

Similar to the economic impact analysis for the freight movement, a risk analysis was conducted to account for the uncertainty surrounding the economic impact from reduced personal trip making. The risk analysis simulation mainly consisted of vibrating the multipliers and the travel cost per mile used in the economic impact estimation. The simulation was conducted for two areas. The first area combined the SEMCOG region with the Essex Region, while the second area encompassed the State of Michigan together with the Province of Ontario. Table 28 and Table 29 below provide the simulation results.

Table 28: Annual Production Potentially Affected (Values are in Millions of 2000 US$)

Year	Potential Impact on the SEMCOG-ESSEX Economy	Potential Impact on the State of Michigan and Province of Ontario Economy
2020	($10) – ($15)	($120 - $165)
2030	($60) – ($70)	($700) – ($800)

Table 29: Cumulative Employment Potentially Affected (Full Time Equivalent Jobs)

Year	Potential Impact on the SEMCOG-ESSEX Economy	Potential Impact on the State of Michigan and Province of Ontario Economy
2020	(700) – (800)	(4,000) – (4,500)
2030	(3,750) – (4,000)	(20,000) – (24,000)

5. SUMMARY OF FINDINGS AND CONCLUSIONS

Although NAFTA bumper stickers pledge that free trade will maximize the well-being of all trading partners, the textbook promise makes a crucial assumption, the assumption of healthy, well maintained and well connected arteries of distribution throughout the trading block, including crossing points. With NAFTA in place, regional and national self-interest in both the U.S. and Canada demand that Michigan and Ontario possess an efficient and balanced cross-border distribution infrastructure.

Unreliable cross-border truck transit times at the border results in missed production schedules at the destination end of time-sensitive shipments and costly contract penalties for the shipper at origin end. The local, regional, and national economies on both sides of the border suffer accordingly, as evidenced by the long queues of vehicles and layoffs of workers immediately after the attacks of September 11.

However, the reverse is also true. Significant reductions in the probability of such delays not only improve production schedules and industry competitiveness, but also enable more firms on both sides of the border to invest in advanced logistics (such as just-in-time manufacturing). Such investments are key to making local and regional economies more efficient and competitive. Consider as well the national perspective. Both Transport Canada and the Federal Highway Administration are required by their respective national policy priorities to serve the interests of national productivity growth. Whereas productivity growth is recognized in both nations as by far the most important source of national economic expansion, improved cross-border transportation infrastructure has been shown to be an important source of improved productivity.

In this report, HLB employed StratBENCOST model, a widely used model for identifying the benefits and costs of local and regional infrastructure opportunities to estimate the delay and it related cost on freight traffic in the Windsor-Detroit corridor. The report then estimated the productivity loss to the industries relying on the corridor as an integral part of their production and delivery system. The report finally considers the economic impacts of distribution inefficiency at the local and regional, and national economic level for two key planning years 2020 and 2030.

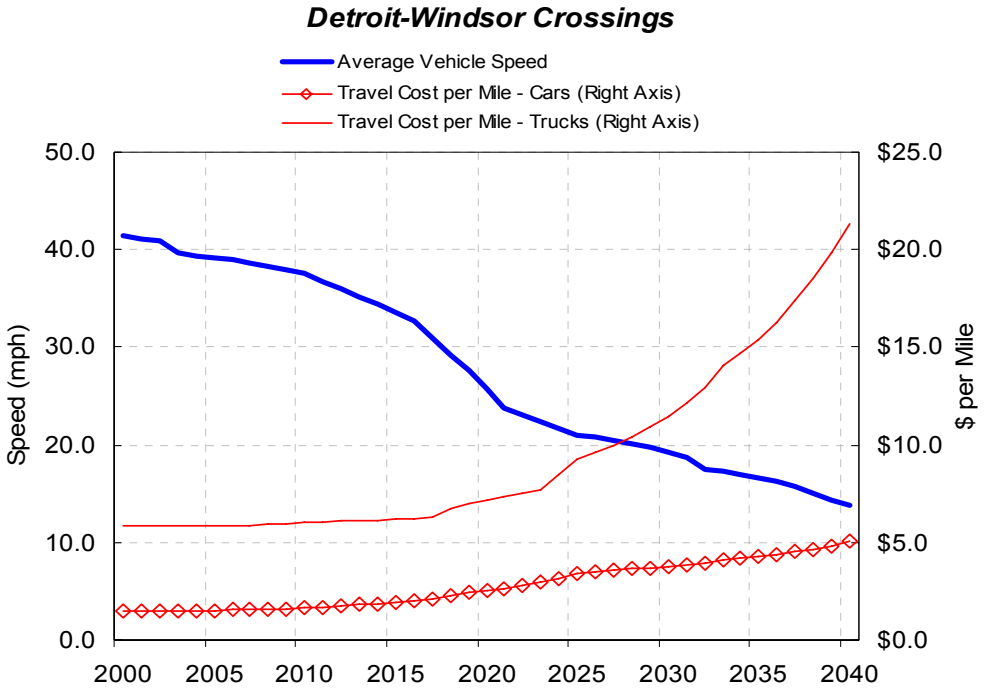
5.1 Delay and Delay-Related Cost Effects on Industry Productivity

The analysis estimated the delay and its related costs around the crossing in the Detroit Windsor area. The analysis found that in the next 25 years, the delay related costs in the area will more than double. Figure 16 shows that the cost per mile, in terms of travel time and vehicle operating cost due to congestion, will reach US$15 per mile by 2035. This expected increase in cost has a significant impact on the industries relying on the crossing for the production and delivery system.

In fact, as logistics and transportation research show, a sharp increase in transportation cost has a significant impact on the industries productivity and competition. While in the short run, the industries will modify their delivery routes or their schedules, they are forced to take drastic

measures such as relocation or changing suppliers in their long run. As a result, their productivity and profitability suffers accordingly.

Figure 16: Expected Speed and Corresponding Cost Per mile for Trucks and Passenger Cars in the Windsor-Detroit Area Corridor



Using models employed by the Federal Highway Administration and employing data on the industries using the corridor and the type of commodities shipped and their value, the report estimated the magnitude of loss that different industries may experience. Table 26 provides a summary of results.

Table 30: Output Impact of Cross-Border Delays, by Industry

Commodity / Industry	Affected volume of trade in 2020 (M of 2000 CAN$)	Affected volume of trade in 2030 (M of 2000 CAN$)	Reduction in output due to increase in border delays in 2020	Reduction in output due to increase in border delays in 2030	Impact on output in 2020 attributable to border delays (M of 2000 CAN$)	Impact on output in 2030 attributable to border delays (M of 2000 CAN$)
Animal/Plant	$8,197	$10,796	-2.92%	-12.17%	($239)	($1,314)
Auto	$62,850	$81,988	-2.57%	-9.12%	($1,615)	($7,476)
Forest	$4,481	$5,443	-0.69%	-2.98%	($31)	($162)
Machinery/Electronics	$53,299	$74,887	-0.69%	-2.98%	($366)	($2,230)
Metal	$11,843	$15,205	-0.69%	-2.98%	($81)	($453)
Other	$34,029	$51,658	-0.69%	-2.98%	($234)	($1,538)
TOTAL	**$174,699**	**$239,977**			**($2,567)**	**($13,173)**

5.2 Local, Regional and National Impact in the United States

While the loss in productivity and profitability relate directly to the industries affected, the impact is very significant at the local, regional, and national level. An assessment of the economic impacts, in terms of output, jobs, and taxes, using an Input-Output model with U.S. data, reveals the impact at Wayne County-Detroit area, SEMCOG region, the State of Michigan, and the U.S. as a whole.

The tables below show that there is a significant economic impact at the local, regional, and national level. The results show that the United States economy risk losing about $11.4 billion worth of output per year in 2030 and that the cumulative job loss could exceed 91,000 by 2030.

Table 31: Annual Economic Impact in the United States, Summary of Findings

Impact on	Year	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States
OUTPUT	2020	($186)	($630)	($970)	($2,219)
	2030	($927)	($3,080)	($4,924)	($11,436)
EARNINGS	2020	($69)	($259)	($413)	($1,058)
	2030	($352)	($1,281)	($2,123)	($5,504)

Values are in millions of 2000 US$
The impact for 2010 was omitted because it has not been found to be significant

Table 32: Cumulative Employment Impact in the United States, Summary of Findings

Year	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States
2020	-760	-3,129	-6,406	-17,345
2030	-4,095	-15,970	-33,977	-91,194

Table 33: Annual Tax Impact in the United States, Summary of Findings

Year	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States
2020	($26)	($81)	($104)	($272)
2030	($108)	($399)	($536)	($1,415)

Values are in millions of 2000 US$

5.3 Local, Regional and National Impact in Canada

Similar to the analysis relating to the economic impact in the U.S., the report estimated the economic impacts to the Canadian economy at the local, regional, and national level. Given the inter-dependency between the U.S. and the Canadian economies, there is a significant impact similar to the U.S. on the Canadian economy. The Canadian economy risks losing CAN$2.1 billion in output per year by 2030. In addition, the economy may shed a cumulative of 34,926 full time equivalent jobs by 2030.

Table 34: Annual Economic Impact in Canada, Summary of Findings

Year	Essex / Windsor Area	Province of Ontario	Canada
2020	($26)	($220)	($387)
2030	($144)	($1,184)	($2,127)

Values are in millions of 2000 CAN$

Table 35: Cumulative Employment Impact in Canada, Summary of Findings

Year	Essex / Windsor Area	Province of Ontario	Canada
2020	-433	-3,619	-6,206
2030	-2,401	-20,088	-34,926

Impacts on Cross-Border Recreation, Shopping and Vacation Trips

By 2020, the United States may *gain* up to US$157 million a year in production as a result of foregone cross-border personal trips. Output *losses* in Canada may exceed CAN$450 million a year by 2020. By the end of the following decade (2020-2030), reduced cross-border trip making would lead to further annual production losses of CAN$2.4 billion in Canada; while total output in the United States may rise by $0.8 billion.[14]

Table 36: Annual Production Impact from Reduced Personal Trip-Making, Summary of Findings

Year	Impact on the United States Economy (Values are in millions of 2000 US$)				Impact on the Canadian Economy (Values are in millions of 2000 CAN$)		
	Wayne County/ Detroit Area	SEMCOG Region	State of Michigan	United States	Essex/ Windsor Area	Province of Ontario	Canada
2020	$52	$66	$93	$157	($109)	($329)	($457)
2030	$273	$344	$484	$817	($566)	($1,714)	($2,381)

[14] Note that the two impacts (the gain on the U.S. side and the loss on the Canadian side) do not balance each other, as less than perfect substitution was assumed. This is also explained by differences in indirect and induced economic multipliers.

Expected changes in total employment are shown in Table 33, below. In the Detroit area alone, over 4,700 jobs may be created by year 2030. For the United States as a whole, nearly 12,000 full time equivalent jobs may be created as a result of reduced cross-border trip making (and reduced leakages to the Canadian economy).

In the Ontario Province, failure to relieve congestion in the Detroit-Windsor corridor may cost up to 6,000 jobs by year 2020, and over 31,000 by the end of 2030 (nearly half of a percent of total year-2000 Ontario employment). The Canadian economy would lose over 35,000 jobs.

Table 37: Cumulative Employment Impact from Reduced Personal Trip-Making, Summary of Findings

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
2020	919	1,154	1,762	2,277	-1,892	-6,092	-6,739
2030	4,785	6,013	9,177	11,861	-9,858	-31,732	-35,100

Combined Economic Impacts

The overall economic impacts[15] of increasing congestion and delays at the Detroit-Windsor border crossing are summarized in Tables 34 and 35 below.

By 2030, failure to address congestion problems at the border would cost the economies of Michigan and Ontario a total of US$6.3 billion (CAN$9.7 billion) in production, annually. Combined output losses in the United States and Canada would reach US$13.5 billion (CAN$20.8 billion) annually, in 2030 and after. Over a 30-year period (from 2003 through 2030), this would represent cumulative production losses of over US$100 billion.

Table 38: Annual Foregone Production if Constrained Capacity, Congestion and Delay at the Ontario-Michigan Border are not Addressed, Summary of Findings

Year	Impact on the State of Michigan and the Province of Ontario (Values are in millions of 2000 Dollars)		Impact on the United States and Canada (Values are in millions of 2000 Dollars)	
	US$	CAN$	US$	CAN$
2020	($1,234)	($1,898)	($2,611)	($4,017)
2030	($6,323)	($9,728)	($13,549)	($20,845)

[15] Detailed Economic Impact Analysis Results are shown in Appendix 3.

Cumulative employment losses in the State of Michigan and the Province of Ontario would exceed 14,000 by year 2020 and 76,000 by year 2030. Overall, the United States and Canadian economies would lose a total of nearly 150,000 full time equivalent jobs as a result of increasing congestion and delays at the Ontario-Michigan border.

Table 39: Cumulative Foregone Employment if Constrained Capacity, Congestion and Delay at the Ontario-Michigan Border are not Addressed, Summary of Findings

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)
2020	-14,355	-28,012
2030	-76,621	-149,359

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;
- A smooth and predictable transit time in that corridor is critical to the industries in the region;
- Local economies may be heavily impacted if congestion continue to grow based on the current traffic forecast; and
- There are high stakes at risk in the corridor, which makes major crossing improvements a necessary and urgent action for the decision makers.

APPENDIX 1: ASSUMPTIONS AND DETAILED DATA SOURCES

Risk Analysis Assumptions for Estimating the Impacts on Cross-Border Freight Movements and Productivity

Variable	Median	Lower 10% Value	Upper 10% Value
Elasticity Coefficients for Automotive and Other JIT Industries			
Logistics cost elasticities w.r.t. reliability / lead time	0.88	0.70	1.06
Elasticity of manufacturing costs with respect to inventory level	0.28	0.22	0.34
% Increase in inventory level to protect against 1% increase in delay	1.00	0.80	1.20
Fraction of cost increase passed on to buyers	0.25	0.20	0.30
Elasticity of demand	-0.80	-0.96	-0.64
Elasticity Coefficients for Agriculture -- Fresh Produce			
Elasticity of freight transportation w.r.t. truck transit time	-0.69	-0.83	-0.55
Export substitution / elasticity of output w.r.t. export orders	0.30	0.24	0.36
Logistics cost elasticities w.r.t. reliability / lead time	0.88	0.70	1.06
Fraction of cost increase passed on to buyers	0.50	0.40	0.60
Elasticity of demand for exports	-0.50	-0.60	-0.40
Elasticity of demand for domestic import competing goods	-0.50	-0.60	-0.40
Adjustment factor to avoid double counting of effects	0.50	0.40	0.60
Elasticity Coefficients for Agriculture -- Other			
Elasticity of freight transportation w.r.t. truck transit time	-0.51	-0.61	-0.41
Export substitution / elasticity of output w.r.t. export orders	0.30	0.24	0.36
Logistics cost elasticities w.r.t. reliability / lead time	0.88	0.70	1.06
Fraction of cost increase passed on to buyers	0.50	0.40	0.60
Elasticity of demand for exports	-0.50	-0.60	-0.40
Elasticity of demand for domestic import competing goods	-0.50	-0.60	-0.40
Adjustment factor to avoid double counting of effects	0.50	0.40	0.60
Elasticity Coefficients for Chemicals			
Elasticity of freight transportation w.r.t. truck transit time	-0.21	-0.25	-0.17
Export substitution / elasticity of output w.r.t. export orders	0.30	0.24	0.36
Logistics cost elasticities w.r.t. reliability / lead time	0.88	0.70	1.06
Fraction of cost increase passed on to buyers	0.50	0.40	0.60
Elasticity of demand for exports	-0.50	-0.60	-0.40
Elasticity of demand for domestic import competing goods	-0.25	-0.30	-0.20
Adjustment factor to avoid double counting of effects	0.50	0.40	0.60
Elasticity Coefficients for Machinery & Electronics			
Elasticity of freight transportation w.r.t. truck transit time	-0.15	-0.18	-0.12
Export substitution / elasticity of output w.r.t. export orders	0.30	0.24	0.36
Logistics cost elasticities w.r.t. reliability / lead time	0.88	0.70	1.06
Fraction of cost increase passed on to buyers	0.50	0.40	0.60
Elasticity of demand for exports	-0.50	-0.60	-0.40
Elasticity of demand for domestic import competing goods	-0.25	-0.30	-0.20
Adjustment factor to avoid double counting of effects	0.50	0.40	0.60
Elasticity Coefficients for Other Industries			
Elasticity of freight transportation w.r.t. truck transit time	-0.15	-0.18	-0.12
Export substitution / elasticity of output w.r.t. export orders	0.30	0.24	0.36
Logistics cost elasticities w.r.t. reliability / lead time	0.88	0.70	1.06
Fraction of cost increase passed on to buyers	0.50	0.40	0.60
Elasticity of demand for exports	-0.50	-0.60	-0.40
Elasticity of demand for domestic import competing goods	-0.25	-0.30	-0.20
Adjustment factor to avoid double counting of effects	0.50	0.40	0.60
Projected Increase in Travel Costs due to Cross Border Delays (Average in Detroit-Windsor Corridor – Net of Diversion Effects)			
2000-2020	+11%	+8%	+15%
2000-2030	+33%	+26%	+65%

Risk Analysis Assumptions for Estimating the Impacts on Cross-Border Recreation, Shopping and Vacation Trips

Variable	Median	Lower 10% Value	Upper 10% Value
Trip Purpose			
Recreation and Shopping	45.98%	45.98%	45.98%
Vacation	7.36%	7.36%	7.36%
% of all Crossings from Canada to the U.S.			
Recreation and Shopping	48.67%	48.67%	48.67%
Vacation	42.04%	42.04%	42.04%
Average Spending per Trip, in U.S. Dollars			
Recreation and Shopping	$20.0	$10.0	$30.0
Vacation	$100.0	$50.0	$150.0
Elasticity of Travel Demand w.r.t. Travel Costs			
Recreation and Shopping	-0.500	-0.600	-0.400
Vacation	-0.800	-0.900	-0.700
% Substitution (by local demand)			
In the U.S. - NATIONAL			
Recreation and Shopping	80.0%	60.0%	100.0%
Vacation	60.0%	40.0%	70.0%
In Canada - NATIONAL			
Recreation and Shopping	80.0%	60.0%	100.0%
Vacation	70.0%	60.0%	80.0%
Trip Destination			
% of RECREATION Trips from Canada to:			
WAYNE COUNTY	80.0%	75.0%	85.0%
SEMCOG REGION	85.0%	80.0%	90.0%
MICHIGAN	90.0%	85.0%	95.0%
U.S.	100.0%	100.0%	100.0%
% of VACATION Trips from Canada to:			
WAYNE COUNTY	10.0%	5.0%	15.0%
SEMCOG REGION	30.0%	25.0%	35.0%
MICHIGAN	80.0%	70.0%	90.0%
U.S.	100.0%	100.0%	100.0%
% of RECREATION Trips from the U.S. to:			
ESSEX / WINDSOR	75.0%	70.0%	80.0%
ONTARIO	90.0%	85.0%	95.0%
CANADA	100.0%	100.0%	100.0%
% of VACATION Trips from the U.S. to:			
ESSEX / WINDSOR	5.0%	5.0%	5.0%
ONTARIO	80.0%	70.0%	90.0%
CANADA	100.0%	100.0%	100.0%

Baseline Traffic Growth, Average Annual Compound Growth Rate

Variable Description	Median	Lower	Upper	Data Sources
2000-2010				
Ambassador Bridge				
Personal Cars	1.3%	1.1%	1.5%	IBI - August and October 2002
Trucks	3.2%	2.9%	3.9%	IBI - August and October 2002
Detroit-Windsor Tunnel				
Personal Cars	1.7%	1.5%	2.0%	IBI - August and October 2002
Trucks	4.0%	3.6%	4.8%	IBI - August and October 2002
Blue Water Bridge				
Personal Cars	2.6%	2.3%	3.1%	IBI - August and October 2002
Trucks	2.8%	2.5%	3.3%	IBI - August and October 2002
2010-2020				
Ambassador Bridge				
Personal Cars	1.7%	1.4%	2.3%	IBI - August and October 2002
Trucks	1.3%	1.0%	1.7%	IBI - August and October 2002
Detroit-Windsor Tunnel				
Personal Cars	1.4%	1.1%	1.9%	IBI - August and October 2002
Trucks	2.2%	1.8%	2.9%	IBI - August and October 2002
Blue Water Bridge				
Personal Cars	1.5%	1.2%	1.9%	IBI - August and October 2002
Trucks	1.4%	1.1%	1.8%	IBI - August and October 2002
2020-2030		70%	150%	
Ambassador Bridge				
Personal Cars	1.5%	1.0%	2.2%	IBI - August and October 2002
Trucks	0.6%	0.4%	0.8%	IBI - August and October 2002
Detroit-Windsor Tunnel				
Personal Cars	1.3%	0.9%	1.9%	IBI - August and October 2002
Trucks	1.8%	1.3%	2.7%	IBI - August and October 2002
Blue Water Bridge				
Personal Cars	1.3%	0.9%	1.9%	IBI - August and October 2002
Trucks	0.7%	0.5%	1.1%	IBI - August and October 2002

Unit Travel Costs, U.S. Dollars of 2002

Variable Description	Median	Lower	Upper	Data Sources
VALUE OF TIME, $ per hour per vehicle				
Personal Cars	$22.0	$15.0	$25.0	Federal Highway Administration, *Highway Economic Requirements System Technical Report*, U.S. Department of Transportation, December 2000; U. S. Department of Transportation, "The Value of Saving Travel Time: Departmental Guidance for Conducting Economic Evaluations," April 1997, Table 4.
Trucks	$35.0	$25.0	$45.0	
VEHICLE OPERATING COSTS - Personal Cars				
Fuel, $ per gallon	$1.4	$1.2	$1.5	AAA, Daily Fuel Gauge Report.
Oil, $ per quart	$4.1	$3.7	$4.6	Federal Highway Administration, Highway Economic Requirements System Technical Report, U.S. Department of Transportation, December 2000; J.P. Zaniewski, et al., Vehicle Operating Costs, Fuel Consumption, and Pavement Type and Condition Factors, Texas Research and Development Foundation, prepared for U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., June 1982, Table 2, p. 7.
Tire, $ per tire	$72.6	$65.4	$79.9	
M&R, $	$118.4	$106.6	$130.3	
Depreciable Value, $	$20,744	$18,670	$22,819	Federal Highway Administration, Highway Economic Requirements System Technical Report, U.S. Department of Transportation, December 2000.
VEHICLE OPERATING COSTS – Trucks / Commercial Vehicles				
Fuel, $ per gallon	$1.4	$1.2	$1.5	AAA, Daily Fuel Gauge Report.
Oil, $ per quart	$1.7	$1.5	$1.8	Federal Highway Administration, Highway Economic Requirements System Technical Report, U.S. Department of Transportation, December 2000; J.P. Zaniewski, et al., Vehicle Operating Costs, Fuel Consumption, and Pavement Type and Condition Factors, Texas Research and Development Foundation, prepared for U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., June 1982, Table 2, p. 7.
Tire, $ per tire	$478.2	$430.4	$526.0	
M&R, $	$412.8	$371.5	$454.0	
Depreciable Value, $	$93,072	$83,764	$102,379	Federal Highway Administration, Highway Economic Requirements System Technical Report, U.S. Department of Transportation, December 2000.

Other Assumptions

Variable Description	Estimate	Data Sources
FREE FLOW TRUCK CROSSING TIME, minutes		
Ambassador Bridge		
From U.S. to Canada	5.7	FHWA - Measurement of Commercial Motor Vehicle Travel Time and Delay at U.S. International Border Stations, 2002
From Canada to U.S.	12.9	
D-W Tunnel		
From U.S. to Canada	3.2	HLB - Ambassador Bridge time prorated by length (AB = 9,200 feet; DWT = 5,160)
From Canada to U.S.	7.2	
Blue Water Bridge		
From U.S. to Canada	5.0	FHWA - Measurement of Commercial Motor Vehicle Travel Time and Delay at U.S. International Border Stations, 2002
From Canada to U.S.	11.0	
AVERAGE 2001 TRUCK CROSSING TIME, minutes		
Ambassador Bridge		
From U.S. to Canada	8.8	FHWA - Measurement of Commercial Motor Vehicle Travel Time and Delay at U.S. International Border Stations, 2002
From Canada to U.S.	20.4	
D-W Tunnel		
From U.S. to Canada	4.9	HLB - Ambassador Bridge time prorated by facility length (AB = 9,200 feet; DWT = 5,160 feet)
From Canada to U.S.	11.4	
Blue Water Bridge		
From U.S. to Canada	6.2	FHWA - Measurement of Commercial Motor Vehicle Travel Time and Delay at U.S. International Border Stations, 2002
From Canada to U.S.	34.2	
PERSONAL CAR PROCESSING TIME		
As % of Truck Processing Time	40%	HLB assumption
SIMULATED TRAFFIC DIVERSION		
From Ambassador Bridge to Blue Water Bridge (and to Intermodal Rail for Commercial Vehicles)		
Personal Cars	3.5%	IBI Report "Existing and Future Travel Demand" dated November 2002
Trucks	22.0%	
From Detroit-Windsor Tunnel to Blue Water Bridge		
Personal Cars	0.0%	IBI Memo "Future Travel Demand" dated August 16, 2002, page 4
Trucks	0.0%	

Other Assumptions, Continued

Variable Description	Estimate	Data Sources
AVERAGE TRUCK LOAD, Pounds		
Detroit-Windsor	35,000	FHWA - Highway Economic Requirements System: average load of a 5-axle combination truck
Sarnia - Port Huron	35,000	
AVERAGE FREIGHT VALUE, $ per Ton		
Detroit-Windsor	$3,251	U.S. D.O.T., Bureau of Transportation Statistics, 2001, estimated for Canada to U.S. cargo movements
Sarnia - Port Huron	$1,774	
CURRENT CONGESTION LEVELS, V/C Ratio		
Ambassador Bridge	0.67	IBI Memo "Future Travel Demand" dated August 16, 2002, page 4
D-W Tunnel	0.82	
Blue Water Bridge	0.21	

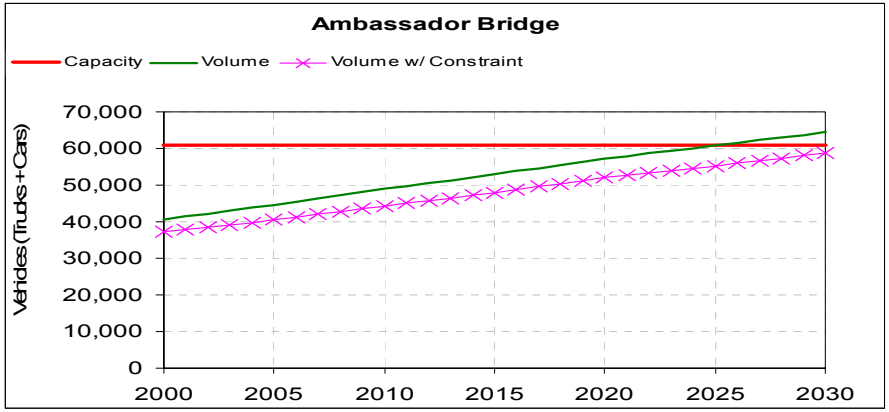
Existing and Projected Traffic Volumes

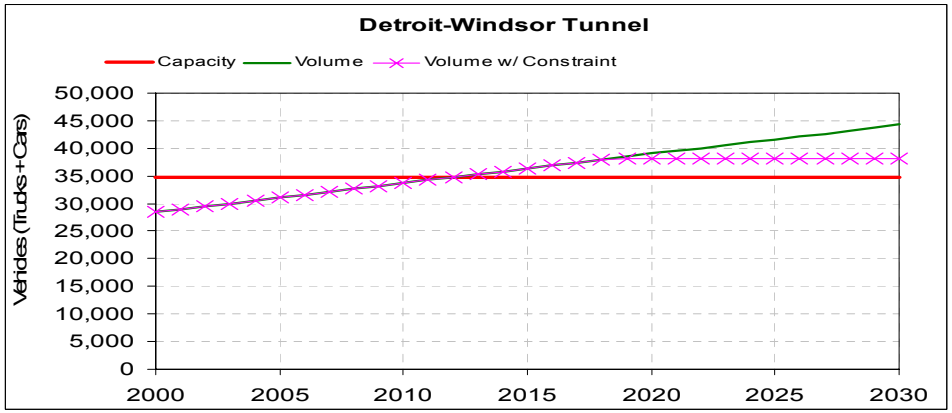
Crossing	2000			2030		
	Cars	Trucks	Access Road LOS	Cars	Trucks	Access Road LOS
Detroit - Windsor	17,102,000	3,668,500	D	23,274,000	7,987,000	F
Sarnia - Port Huron	4,390,000	1,576,800	A	6,130,000	3,496,000	C

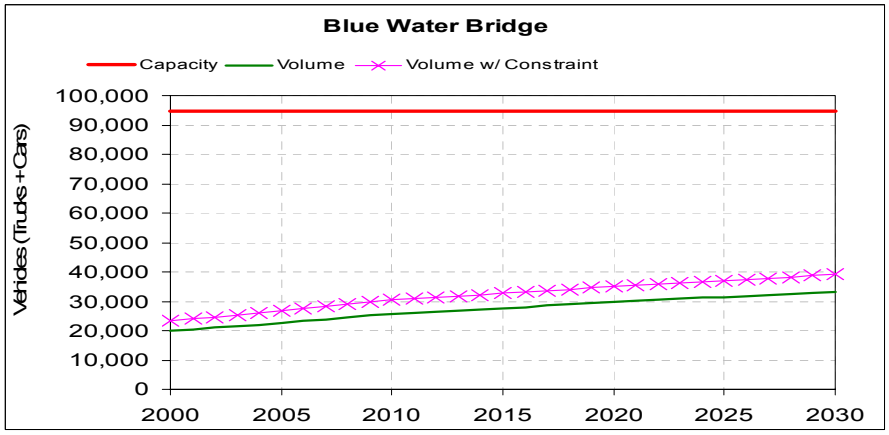
Source: IBI, November 2002

APPENDIX 2: TRAFFIC GROWTH, CAPACITY AND DIVERSION

The graphs below show the traffic projections as compared to capacity. The projected volume is shown under scenario: (1) Unrestricted Volume, which is the potential volume driven by the cross border travel demand and (2) Constrained volume, which accounts for the capacity restrictions, thus providing us with the maximum volume possible.







APPENDIX 3: DETAILED ECONOMIC IMPACT ANALYSIS RESULTS

2020 – United States – Employment Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	-635	-226	-152	-1,014
24	Forestry Products	-69	-4	-2	-75
25	Commercial Fishing	0	0	-1	-1
26	Ag Services	-1,423	-196	-74	-1,692
28	Metal mining	0	-11	-1	-12
37	Coal Mining	0	-5	-2	-7
38	Oil mining	0	-20	-21	-41
40	Non-metal mining	0	-5	-2	-6
48	Construction	0	-91	-72	-163
58	Food processing	0	-18	-102	-120
104	Tobacco mfg	0	0	-2	-2
108	Textiles	0	-27	-22	-49
124	Apparel	0	-24	-39	-63
133	Wood products	0	-31	-12	-42
148	Furniture	0	-62	-17	-79
161	Pulp and paper	0	-37	-25	-63
174	Printing and publishing	0	-65	-76	-142
186	Chemicals and allied	0	-59	-35	-94
210	Petroleum products	0	-5	-5	-10
215	Rubber products	0	-144	-30	-173
221	Leather products	0	0	-3	-4
230	Stone, glass and clay	0	-35	-10	-45
254	Primary metals	-47	-192	-8	-247
273	Fabricated metal	-75	-286	-25	-386
307	Industrial machinery	-337	-159	-16	-512
355	Electrical equipment	-280	-185	-26	-491
384	Transportation equipment	-1,603	-235	-38	-1,876
400	Scientific instruments	0	-39	-10	-49
415	Miscellaneous mfg	-697	-46	-19	-763
433	Railroads and Related Services	0	-14	-6	-20
434	Local, Interurban Passenger Transit	0	-11	-34	-45
435	Motor Freight Transport and Warehousing	0	-183	-83	-266
436	Water Transportation	0	-5	-5	-10
437	Air Transportation	0	-53	-45	-99
438	Pipe Lines, Except Natural Gas	0	0	0	-1
439	Transportation Services	0	-25	-21	-46
441	Communications	0	-54	-74	-128
443	Utilities	0	-24	-34	-58
447	Wholesale Trade	0	-664	-258	-922
448	Retail Trade	0	-89	-1,737	-1,826
456	Banking	0	-69	-112	-181
457	Credit Agencies	0	-94	-142	-236
458	Security and Commodity Brokers	0	-32	-48	-79
459	Insurance Carriers	0	-8	-109	-117
460	Insurance Agents and Brokers	0	-7	-96	-103
461	Real estate	0	-43	-231	-273
463	Hotels and Lodging Places	0	-98	-114	-212
464	Personal services	0	-24	-194	-218
469	Business services	0	-773	-511	-1,283
477	Automotive services	0	-124	-91	-215
480	Repair services	0	-48	-30	-78
483	Motion Pictures	0	-12	-34	-46
484	Recreation services	0	-25	-219	-244
490	Health services	0	-3	-806	-809
494	Legal Services	0	-62	-87	-149
495	Education services	0	-15	-201	-217
498	Social services	0	-20	-201	-221
502	Non-profit organizations	0	-24	-205	-230
506	Professional services	0	-219	-178	-398
510	State & local non-ed government	0	-69	-120	-190
513	Federal non-military	0	-46	-66	-112
516	Special sectors	0	0	0	0
519	Federal Government - Military	0	0	0	0
522	State & Local Government - Education	0	0	0	0
525	Domestic Services	0	0	-89	-89
25001	Foreign Trade	0	0	0	0
28001	Domestic Trade	0	0	0	0
	Total	**-5,166**	**-5,149**	**-7,029**	**-17,345**

2030 – United States – Employment Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	-3,485	-1,315	-793	-5,594
24	Forestry Products	-362	-19	-13	-395
25	Commercial Fishing	0	-1	-5	-6
26	Ag Services	-7,805	-1,126	-384	-9,314
28	Metal mining	0	-57	-3	-60
37	Coal Mining	0	-27	-11	-39
38	Oil mining	0	-105	-109	-215
40	Non-metal mining	0	-24	-9	-33
48	Construction	0	-475	-375	-849
58	Food processing	0	-103	-532	-635
104	Tobacco mfg	0	0	-11	-11
108	Textiles	0	-135	-113	-248
124	Apparel	0	-104	-203	-307
133	Wood products	0	-166	-61	-227
148	Furniture	0	-266	-89	-355
161	Pulp and paper	0	-208	-132	-340
174	Printing and publishing	0	-341	-399	-740
186	Chemicals and allied	0	-315	-183	-498
210	Petroleum products	0	-27	-25	-52
215	Rubber products	0	-717	-155	-872
221	Leather products	0	-2	-17	-19
230	Stone, glass and clay	0	-176	-51	-228
254	Primary metals	-260	-974	-44	-1,279
273	Fabricated metal	-420	-1,348	-130	-1,899
307	Industrial machinery	-2,050	-818	-86	-2,953
355	Electrical equipment	-1,705	-972	-136	-2,813
384	Transportation equipment	-7,422	-995	-200	-8,617
400	Scientific instruments	0	-174	-51	-225
415	Miscellaneous mfg	-4,587	-310	-100	-4,997
433	Railroads and Related Services	0	-74	-31	-105
434	Local, Interurban Passenger Transit	0	-58	-176	-233
435	Motor Freight Transport and Warehousing	0	-937	-432	-1,369
436	Water Transportation	0	-26	-26	-52
437	Air Transportation	0	-269	-236	-505
438	Pipe Lines, Except Natural Gas	0	-2	-2	-5
439	Transportation Services	0	-129	-107	-236
441	Communications	0	-286	-386	-672
443	Utilities	0	-125	-175	-300
447	Wholesale Trade	0	-3,432	-1,345	-4,777
448	Retail Trade	0	-458	-9,057	-9,516
456	Banking	0	-351	-583	-934
457	Credit Agencies	0	-458	-742	-1,200
458	Security and Commodity Brokers	0	-161	-248	-409
459	Insurance Carriers	0	-44	-567	-611
460	Insurance Agents and Brokers	0	-39	-499	-538
461	Real estate	0	-231	-1,202	-1,433
463	Hotels and Lodging Places	0	-500	-592	-1,092
464	Personal services	0	-123	-1,011	-1,134
469	Business services	0	-4,024	-2,661	-6,686
477	Automotive services	0	-588	-475	-1,064
480	Repair services	0	-246	-158	-404
483	Motion Pictures	0	-62	-179	-242
484	Recreation services	0	-130	-1,141	-1,271
490	Health services	0	-17	-4,201	-4,217
494	Legal Services	0	-317	-454	-772
495	Education services	0	-72	-1,049	-1,122
498	Social services	0	-118	-1,048	-1,166
502	Non-profit organizations	0	-125	-1,071	-1,196
506	Professional services	0	-1,145	-930	-2,075
510	State & local non-ed government	0	-364	-627	-991
513	Federal non-military	0	-243	-343	-586
516	Special sectors	0	0	0	0
519	Federal Government - Military	0	0	0	0
522	State & Local Government - Education	0	0	0	0
525	Domestic Services	0	0	-466	-466
25001	Foreign Trade	0	0	0	0
28001	Domestic Trade	0	0	0	0
	Total	**-28,096**	**-26,456**	**-36,642**	**-91,194**

2020 – United States – Total Value Added Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($15,638,358)	($5,574,558)	($3,746,183)	($24,959,097)
24	Forestry Products	($4,225,816)	($221,172)	($151,499)	($4,598,488)
25	Commercial Fishing	$0	($2,739)	($28,658)	($31,397)
26	Ag Services	($27,744,700)	($3,826,315)	($1,435,848)	($33,006,859)
28	Metal mining	$0	($936,420)	($53,449)	($989,869)
37	Coal Mining	$0	($660,322)	($275,882)	($936,204)
38	Oil mining	$0	($3,698,572)	($3,900,399)	($7,598,972)
40	Non-metal mining	$0	($454,521)	($174,268)	($628,789)
48	Construction	$0	($4,186,334)	($3,306,599)	($7,492,933)
58	Food processing	$0	($1,383,887)	($7,921,979)	($9,305,865)
104	Tobacco mfg	$0	($515)	($1,272,388)	($1,272,903)
108	Textiles	$0	($1,239,879)	($983,234)	($2,223,113)
124	Apparel	$0	($804,595)	($1,322,301)	($2,126,896)
133	Wood products	$0	($1,458,513)	($549,516)	($2,008,028)
148	Furniture	$0	($2,756,646)	($756,799)	($3,513,445)
161	Pulp and paper	$0	($3,328,672)	($2,251,720)	($5,580,392)
174	Printing and publishing	$0	($4,128,946)	($4,833,712)	($8,962,658)
186	Chemicals and allied	$0	($10,520,212)	($6,226,038)	($16,746,249)
210	Petroleum products	$0	($1,420,761)	($1,382,511)	($2,803,272)
215	Rubber products	$0	($8,426,486)	($1,738,626)	($10,165,112)
221	Leather products	$0	($21,501)	($167,684)	($189,185)
230	Stone, glass and clay	$0	($2,535,561)	($704,683)	($3,240,244)
254	Primary metals	($3,454,521)	($14,131,500)	($625,009)	($18,211,029)
273	Fabricated metal	($5,227,751)	($19,797,286)	($1,733,295)	($26,758,332)
307	Industrial machinery	($25,422,756)	($12,001,263)	($1,240,054)	($38,664,072)
355	Electrical equipment	($28,628,255)	($18,936,975)	($2,667,296)	($50,232,526)
384	Transportation equipment	($155,671,702)	($22,794,421)	($3,732,417)	($182,198,541)
400	Scientific instruments	$0	($2,952,153)	($747,395)	($3,699,548)
415	Miscellaneous mfg	($40,712,327)	($2,695,811)	($1,122,736)	($44,530,875)
433	Railroads and Related Services	$0	($1,539,076)	($635,196)	($2,174,272)
434	Local, Interurban Passenger Transit	$0	($329,119)	($974,817)	($1,303,936)
435	Motor Freight Transport and Warehousing	$0	($8,903,111)	($4,025,023)	($12,928,134)
436	Water Transportation	$0	($363,401)	($357,719)	($721,120)
437	Air Transportation	$0	($3,766,441)	($3,185,999)	($6,952,440)
438	Pipe Lines, Except Natural Gas	$0	($183,119)	($220,531)	($403,650)
439	Transportation Services	$0	($1,369,302)	($1,115,340)	($2,484,642)
441	Communications	$0	($9,171,507)	($12,452,440)	($21,623,947)
443	Utilities	$0	($7,311,236)	($10,192,305)	($17,503,541)
447	Wholesale Trade	$0	($58,302,421)	($22,640,969)	($80,943,389)
448	Retail Trade	$0	($2,874,462)	($56,243,542)	($59,118,004)
456	Banking	$0	($11,440,930)	($18,627,156)	($30,068,086)
457	Credit Agencies	$0	($3,196,642)	($4,847,739)	($8,044,381)
458	Security and Commodity Brokers	$0	($4,553,134)	($6,813,929)	($11,367,063)
459	Insurance Carriers	$0	($879,354)	($11,289,163)	($12,168,519)
460	Insurance Agents and Brokers	$0	($354,192)	($4,547,122)	($4,901,314)
461	Real estate	$0	($11,800,620)	($63,488,994)	($75,289,616)
463	Hotels and Lodging Places	$0	($3,991,136)	($4,609,599)	($8,600,735)
464	Personal services	$0	($493,443)	($3,929,765)	($4,423,208)
469	Business services	$0	($36,085,127)	($23,842,028)	($59,927,155)
477	Automotive services	$0	($6,418,489)	($4,736,697)	($11,155,187)
480	Repair services	$0	($1,631,119)	($1,033,221)	($2,664,340)
483	Motion Pictures	$0	($589,876)	($1,714,498)	($2,304,373)
484	Recreation services	$0	($641,027)	($5,658,935)	($6,299,963)
490	Health services	$0	($135,573)	($37,583,340)	($37,718,913)
494	Legal Services	$0	($5,188,071)	($7,262,716)	($12,450,787)
495	Education services	$0	($387,387)	($5,118,186)	($5,505,573)
498	Social services	$0	($458,584)	($4,558,255)	($5,016,839)
502	Non-profit organizations	$0	($473,265)	($3,996,902)	($4,470,167)
506	Professional services	$0	($10,530,100)	($8,558,491)	($19,088,591)
510	State & local non-ed government	$0	($3,741,564)	($6,501,008)	($10,242,572)
513	Federal non-military	$0	($2,713,853)	($3,843,413)	($6,557,266)
516	Special sectors	$0	$0	$0	$0
519	Federal Government - Military	$0	$0	$0	$0
522	State & Local Government - Education	$0	$0	$0	$0
525	Domestic Services	$0	$0	($1,009,683)	($1,009,683)
25001	Foreign Trade	$0	$0	$0	$0
28001	Domestic Trade	$0	$0	$0	$0
	Total	**($306,726,186)**	**($350,713,214)**	**($400,666,900)**	**($1,058,106,299)**

2030 – United States – Total Value Added Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($85,801,164)	($32,373,313)	($19,528,887)	($137,703,365)
24	Forestry Products	($22,236,186)	($1,191,304)	($789,767)	($24,217,257)
25	Commercial Fishing	$0	($15,444)	($149,395)	($164,839)
26	Ag Services	($152,223,626)	($21,954,916)	($7,485,085)	($181,663,621)
28	Metal mining	$0	($4,773,283)	($278,631)	($5,051,914)
37	Coal Mining	$0	($3,420,381)	($1,438,176)	($4,858,556)
38	Oil mining	$0	($19,589,780)	($20,332,815)	($39,922,592)
40	Non-metal mining	$0	($2,389,713)	($908,461)	($3,298,173)
48	Construction	$0	($21,838,882)	($17,237,331)	($39,076,213)
58	Food processing	$0	($8,023,125)	($41,297,341)	($49,320,466)
104	Tobacco mfg	$0	($2,762)	($6,632,969)	($6,635,730)
108	Textiles	$0	($6,105,652)	($5,125,609)	($11,231,262)
124	Apparel	$0	($3,548,215)	($6,893,167)	($10,441,382)
133	Wood products	$0	($7,880,801)	($2,864,630)	($10,745,430)
148	Furniture	$0	($11,816,388)	($3,945,202)	($15,761,590)
161	Pulp and paper	$0	($18,517,283)	($11,738,234)	($30,255,516)
174	Printing and publishing	$0	($21,581,997)	($25,198,184)	($46,780,179)
186	Chemicals and allied	$0	($55,868,177)	($32,456,391)	($88,324,566)
210	Petroleum products	$0	($7,572,220)	($7,207,040)	($14,779,261)
215	Rubber products	$0	($42,041,774)	($9,063,470)	($51,105,244)
221	Leather products	$0	($116,805)	($874,139)	($990,944)
230	Stone, glass and clay	$0	($12,606,970)	($3,673,520)	($16,280,489)
254	Primary metals	($19,214,704)	($71,893,797)	($3,258,176)	($94,366,682)
273	Fabricated metal	($29,077,740)	($93,378,902)	($9,035,685)	($131,492,334)
307	Industrial machinery	($154,753,125)	($61,753,799)	($6,464,413)	($222,971,332)
355	Electrical equipment	($174,265,600)	($99,347,711)	($13,904,634)	($287,517,947)
384	Transportation equipment	($720,686,508)	($96,586,869)	($19,457,121)	($836,730,511)
400	Scientific instruments	$0	($13,170,779)	($3,896,175)	($17,066,954)
415	Miscellaneous mfg	($267,761,356)	($18,076,631)	($5,852,830)	($291,690,822)
433	Railroads and Related Services	$0	($7,977,200)	($3,311,281)	($11,288,482)
434	Local, Interurban Passenger Transit	$0	($1,663,281)	($5,081,731)	($6,745,012)
435	Motor Freight Transport and Warehousing	$0	($45,540,361)	($20,982,480)	($66,522,846)
436	Water Transportation	$0	($1,914,763)	($1,864,791)	($3,779,554)
437	Air Transportation	$0	($18,979,742)	($16,608,641)	($35,588,383)
438	Pipe Lines, Except Natural Gas	$0	($969,622)	($1,149,629)	($2,119,251)
439	Transportation Services	$0	($6,973,111)	($5,814,278)	($12,787,390)
441	Communications	$0	($48,202,245)	($64,914,680)	($113,116,917)
443	Utilities	$0	($37,956,582)	($53,132,576)	($91,089,153)
447	Wholesale Trade	$0	($301,269,562)	($118,027,556)	($419,297,141)
448	Retail Trade	$0	($14,831,013)	($293,198,042)	($308,029,059)
456	Banking	$0	($58,460,279)	($97,103,517)	($155,563,798)
457	Credit Agencies	$0	($15,593,007)	($25,271,301)	($40,864,306)
458	Security and Commodity Brokers	$0	($22,954,425)	($35,521,067)	($58,475,492)
459	Insurance Carriers	$0	($4,592,906)	($58,850,508)	($63,443,416)
460	Insurance Agents and Brokers	$0	($1,849,960)	($23,704,186)	($25,554,147)
461	Real estate	$0	($63,549,706)	($330,968,661)	($394,518,352)
463	Hotels and Lodging Places	$0	($20,265,360)	($24,029,882)	($44,295,240)
464	Personal services	$0	($2,497,452)	($20,485,898)	($22,983,351)
469	Business services	$0	($187,938,045)	($124,288,698)	($312,226,754)
477	Automotive services	$0	($30,563,303)	($24,692,446)	($55,255,746)
480	Repair services	$0	($8,401,691)	($5,386,189)	($13,787,880)
483	Motion Pictures	$0	($3,111,539)	($8,937,690)	($12,049,229)
484	Recreation services	$0	($3,351,609)	($29,500,077)	($32,851,687)
490	Health services	$0	($780,406)	($195,922,284)	($196,702,694)
494	Legal Services	$0	($26,440,612)	($37,860,600)	($64,301,211)
495	Education services	$0	($1,833,281)	($26,681,145)	($28,514,425)
498	Social services	$0	($2,675,283)	($23,762,219)	($26,437,502)
502	Non-profit organizations	$0	($2,438,772)	($20,835,884)	($23,274,658)
506	Professional services	$0	($54,949,951)	($44,615,488)	($99,565,439)
510	State & local non-ed government	$0	($19,663,784)	($33,889,809)	($53,553,597)
513	Federal non-military	$0	($14,162,766)	($20,035,745)	($34,198,511)
516	Special sectors	$0	$0	$0	$0
519	Federal Government - Military	$0	$0	$0	$0
522	State & Local Government - Education	$0	$0	$0	$0
525	Domestic Services	$0	$0	($5,263,485)	($5,263,485)
25001	Foreign Trade	$0	$0	$0	$0
28001	Domestic Trade	$0	$0	$0	$0
	Total	**($1,626,020,009)**	**($1,789,789,293)**	**($2,088,679,944)**	**($5,504,489,276)**

2020 – United States – Output Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($44,716,415)	($15,939,923)	($10,711,860)	($71,368,198)
24	Forestry Products	($4,627,080)	($242,173)	($165,885)	($5,035,138)
25	Commercial Fishing		($2,918)	($30,535)	($33,454)
26	Ag Services	($44,716,415)	($6,166,910)	($2,314,170)	($53,197,496)
28	Metal mining		($2,399,159)	($136,940)	($2,536,098)
37	Coal Mining		($1,524,246)	($636,829)	($2,161,075)
38	Oil mining		($7,670,266)	($8,088,825)	($15,759,091)
40	Non-metal mining		($712,364)	($273,128)	($985,492)
48	Construction		($10,711,511)	($8,460,547)	($19,172,058)
58	Food processing		($5,096,017)	($29,171,851)	($34,267,869)
104	Tobacco mfg		($1,140)	($2,815,735)	($2,816,876)
108	Textiles		($3,730,847)	($2,958,594)	($6,689,441)
124	Apparel		($2,745,171)	($4,511,518)	($7,256,689)
133	Wood products		($3,905,256)	($1,471,361)	($5,376,617)
148	Furniture		($7,667,059)	($2,104,886)	($9,771,944)
161	Pulp and paper		($10,036,229)	($6,789,126)	($16,825,355)
174	Printing and publishing		($8,937,289)	($10,462,788)	($19,400,077)
186	Chemicals and allied		($24,488,959)	($14,492,978)	($38,981,936)
210	Petroleum products		($9,555,514)	($9,298,256)	($18,853,770)
215	Rubber products		($25,307,360)	($5,221,634)	($30,528,993)
221	Leather products		($49,163)	($383,421)	($432,584)
230	Stone, glass and clay		($5,727,592)	($1,591,813)	($7,319,406)
254	Primary metals	($12,080,445)	($49,417,790)	($2,185,652)	($63,683,888)
273	Fabricated metal	($12,080,445)	($45,748,170)	($4,005,351)	($61,833,966)
307	Industrial machinery	($68,693,043)	($32,427,768)	($3,350,663)	($104,471,473)
355	Electrical equipment	($68,693,043)	($45,438,970)	($6,400,134)	($120,532,146)
384	Transportation equipment	($492,880,231)	($72,170,590)	($11,817,400)	($576,868,220)
400	Scientific instruments		($7,946,796)	($2,011,885)	($9,958,681)
415	Miscellaneous mfg	($79,138,083)	($5,240,214)	($2,182,414)	($86,560,711)
433	Railroads and Related Services		($2,878,842)	($1,188,134)	($4,066,976)
434	Local, Interurban Passenger Transit		($522,081)	($1,546,352)	($2,068,433)
435	Motor Freight Transport and Warehousing		($20,322,007)	($9,187,413)	($29,509,420)
436	Water Transportation		($1,196,280)	($1,177,575)	($2,373,855)
437	Air Transportation		($6,146,608)	($5,199,362)	($11,345,970)
438	Pipe Lines, Except Natural Gas		($235,872)	($284,061)	($519,933)
439	Transportation Services		($1,863,583)	($1,517,948)	($3,381,532)
441	Communications		($16,431,996)	($22,310,233)	($38,742,229)
443	Utilities		($12,070,032)	($16,826,356)	($28,896,388)
447	Wholesale Trade		($84,202,597)	($32,698,955)	($116,901,552)
448	Retail Trade		($3,942,914)	($77,149,559)	($81,092,473)
456	Banking		($17,276,724)	($28,128,504)	($45,405,228)
457	Credit Agencies		($4,991,685)	($7,569,938)	($12,561,623)
458	Security and Commodity Brokers		($8,043,183)	($12,036,911)	($20,080,093)
459	Insurance Carriers		($1,413,639)	($18,148,317)	($19,561,956)
460	Insurance Agents and Brokers		($450,219)	($5,779,918)	($6,230,137)
461	Real estate		($16,077,587)	($86,499,670)	($102,577,258)
463	Hotels and Lodging Places		($6,327,723)	($7,308,262)	($13,635,985)
464	Personal services		($877,236)	($6,986,280)	($7,863,516)
469	Business services		($52,122,523)	($34,438,197)	($86,560,720)
477	Automotive services		($10,633,981)	($7,847,634)	($18,481,614)
480	Repair services		($3,419,314)	($2,165,940)	($5,585,254)
483	Motion Pictures		($1,254,228)	($3,645,462)	($4,899,690)
484	Recreation services		($1,055,482)	($9,317,710)	($10,373,192)
490	Health services		($205,396)	($56,939,532)	($57,144,928)
494	Legal Services		($6,662,370)	($9,326,569)	($15,988,939)
495	Education services		($592,250)	($7,824,840)	($8,417,090)
498	Social services		($925,462)	($9,198,942)	($10,124,403)
502	Non-profit organizations		($949,852)	($8,021,859)	($8,971,711)
506	Professional services		($17,675,728)	($14,366,205)	($32,041,933)
510	State & local non-ed government		($4,620,973)	($8,028,989)	($12,649,962)
513	Federal non-military		($3,128,455)	($4,430,581)	($7,559,036)
516	Special sectors		$0	$0	$0
519	Federal Government - Military		$0	$0	$0
522	State & Local Government - Education		$0	$0	$0
525	Domestic Services		$0	($1,009,683)	($1,009,683)
25001	Foreign Trade		$0	$0	$0
28001	Domestic Trade		$0	$0	$0
	Total	**($827,625,201)**	**($719,524,185)**	**($672,152,068)**	**($2,219,301,453)**

2030 – United States – Output Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($245,340,359)	($92,568,446)	($55,841,017)	($393,749,822)
24	Forestry Products	($24,347,630)	($1,304,424)	($864,759)	($26,516,814)
25	Commercial Fishing		($16,456)	($159,180)	($175,636)
26	Ag Services	($245,340,359)	($35,384,960)	($12,063,787)	($292,789,106)
28	Metal mining		($12,229,415)	($713,867)	($12,943,281)
37	Coal Mining		($7,895,396)	($3,319,796)	($11,215,192)
38	Oil mining		($40,626,175)	($42,167,115)	($82,793,289)
40	Non-metal mining		($3,745,362)	($1,423,818)	($5,169,180)
48	Construction		($55,878,831)	($44,104,908)	($99,983,739)
58	Food processing		($29,544,311)	($152,073,108)	($181,617,419)
104	Tobacco mfg		($6,112)	($14,678,453)	($14,684,565)
108	Textiles		($18,372,165)	($15,423,174)	($33,795,339)
124	Apparel		($12,106,046)	($23,518,581)	($35,624,626)
133	Wood products		($21,101,317)	($7,670,218)	($28,771,535)
148	Furniture		($32,864,919)	($10,972,789)	($43,837,708)
161	Pulp and paper		($55,831,175)	($35,391,770)	($91,222,945)
174	Printing and publishing		($46,715,207)	($54,542,606)	($101,257,813)
186	Chemicals and allied		($130,049,998)	($75,552,020)	($205,602,018)
210	Petroleum products		($50,927,956)	($48,471,890)	($99,399,846)
215	Rubber products		($126,264,516)	($27,220,421)	($153,484,936)
221	Leather products		($267,083)	($1,998,776)	($2,265,859)
230	Stone, glass and clay		($28,477,958)	($8,298,136)	($36,776,094)
254	Primary metals	($67,193,728)	($251,412,258)	($11,393,825)	($329,999,811)
273	Fabricated metal	($67,193,728)	($215,782,814)	($20,879,935)	($303,856,478)
307	Industrial machinery	($418,147,542)	($166,860,601)	($17,467,037)	($602,475,180)
355	Electrical equipment	($418,147,542)	($238,383,250)	($33,363,949)	($689,894,741)
384	Transportation equipment	($2,281,802,704)	($305,808,669)	($61,604,196)	($2,649,215,569)
400	Scientific instruments		($35,453,953)	($10,487,975)	($45,941,928)
415	Miscellaneous mfg	($520,484,113)	($35,138,004)	($11,376,940)	($566,999,057)
433	Railroads and Related Services		($14,921,353)	($6,193,752)	($21,115,105)
434	Local, Interurban Passenger Transit		($2,638,462)	($8,061,148)	($10,699,610)
435	Motor Freight Transport and Warehousing		($103,949,231)	($47,894,061)	($151,843,291)
436	Water Transportation		($6,303,212)	($6,138,707)	($12,441,919)
437	Air Transportation		($30,973,813)	($27,104,319)	($58,078,132)
438	Pipe Lines, Except Natural Gas		($1,248,949)	($1,480,811)	($2,729,760)
439	Transportation Services		($9,490,219)	($7,913,078)	($17,403,297)
441	Communications		($86,360,846)	($116,303,436)	($202,664,282)
443	Utilities		($62,662,068)	($87,715,935)	($150,378,003)
447	Wholesale Trade		($435,105,051)	($170,459,923)	($605,564,974)
448	Retail Trade		($20,343,776)	($402,181,283)	($422,525,059)
456	Banking		($88,279,728)	($146,634,124)	($234,913,852)
457	Credit Agencies		($24,349,105)	($39,462,150)	($63,811,255)
458	Security and Commodity Brokers		($40,549,346)	($62,748,517)	($103,297,863)
459	Insurance Carriers		($7,383,498)	($94,607,334)	($101,990,832)
460	Insurance Agents and Brokers		($2,351,513)	($30,130,761)	($32,482,274)
461	Real estate		($86,582,387)	($450,923,542)	($537,505,929)
463	Hotels and Lodging Places		($32,129,595)	($38,098,035)	($70,227,630)
464	Personal services		($4,439,935)	($36,419,538)	($40,859,473)
469	Business services		($271,463,792)	($179,526,610)	($450,990,402)
477	Automotive services		($50,636,460)	($40,909,784)	($91,546,243)
480	Repair services		($17,612,456)	($11,291,064)	($28,903,520)
483	Motion Pictures		($6,615,932)	($19,003,827)	($25,619,759)
484	Recreation services		($5,518,585)	($48,573,298)	($54,091,883)
490	Health services		($1,182,331)	($296,826,283)	($298,008,614)
494	Legal Services		($33,954,267)	($48,619,483)	($82,573,750)
495	Education services		($2,802,777)	($40,790,959)	($43,593,736)
498	Social services		($5,398,947)	($47,954,159)	($53,353,106)
502	Non-profit organizations		($4,894,663)	($41,818,017)	($46,712,680)
506	Professional services		($92,238,481)	($74,891,147)	($167,129,628)
510	State & local non-ed government		($24,285,515)	($41,855,189)	($66,140,704)
513	Federal non-military		($16,326,446)	($23,096,655)	($39,423,102)
516	Special sectors		$0	$0	$0
519	Federal Government - Military		$0	$0	$0
522	State & Local Government - Education		$0	$0	$0
525	Domestic Services		$0	($5,263,485)	($5,263,485)
25001	Foreign Trade		$0	$0	$0
28001	Domestic Trade		$0	$0	$0
	Total	**($4,287,997,706)**	**($3,644,010,516)**	**($3,503,934,457)**	**($11,435,942,679)**

2020 – State of Michigan – Employment Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	-458	-53	-14	-525
24	Forestry Products	-80	0	0	-80
25	Commercial Fishing	0	0	0	0
26	Ag Services	-779	-42	-6	-827
28	Metal mining	0	0	0	0
37	Coal Mining	0	0	0	0
38	Oil mining	0	-1	-1	-2
40	Non-metal mining	0	0	0	0
48	Construction	0	-37	-16	-52
58	Food processing	0	-3	-12	-15
104	Tobacco mfg	0	0	0	0
108	Textiles	0	0	0	0
124	Apparel	0	-10	-9	-20
133	Wood products	0	-7	-1	-9
148	Furniture	0	-25	-4	-28
161	Pulp and paper	0	-10	-4	-14
174	Printing and publishing	0	-15	-8	-23
186	Chemicals and allied	0	-15	-7	-22
210	Petroleum products	0	-1	-1	-1
215	Rubber products	0	-1	0	-2
221	Leather products	0	0	-1	-2
230	Stone, glass and clay	0	-7	-1	-8
254	Primary metals	-37	-5	0	-42
273	Fabricated metal	-49	-51	-2	-101
307	Industrial machinery	-296	-106	-4	-407
355	Electrical equipment	-247	-59	-4	-310
384	Transportation equipment	-871	-52	-4	-928
400	Scientific instruments	0	-13	-2	-15
415	Miscellaneous mfg	-475	-3	-1	-478
433	Railroads and Related Services	0	-3	-1	-3
434	Local, Interurban Passenger Transit	0	-2	-4	-6
435	Motor Freight Transport and Warehousing	0	-47	-13	-60
436	Water Transportation	0	-1	0	-1
437	Air Transportation	0	-6	-3	-10
438	Pipe Lines, Except Natural Gas	0	0	0	0
439	Transportation Services	0	-4	-3	-7
441	Communications	0	-12	-12	-24
443	Utilities	0	-9	-11	-20
447	Wholesale Trade	0	-187	-41	-228
448	Retail Trade	0	-37	-589	-626
456	Banking	0	-20	-23	-43
457	Credit Agencies	0	-26	-24	-50
458	Security and Commodity Brokers	0	-6	-5	-11
459	Insurance Carriers	0	-2	-21	-23
460	Insurance Agents and Brokers	0	-1	-10	-11
461	Real estate	0	-12	-52	-64
463	Hotels and Lodging Places	0	-24	-18	-42
464	Personal services	0	-8	-57	-65
469	Business services	0	-284	-100	-384
477	Automotive services	0	-47	-20	-67
480	Repair services	0	-14	-6	-20
483	Motion Pictures	0	-3	-8	-11
484	Recreation services	0	-7	-62	-70
490	Health services	0	-1	-249	-250
494	Legal Services	0	-20	-18	-38
495	Education services	0	-5	-48	-54
498	Social services	0	-7	-62	-68
502	Non-profit organizations	0	-6	-41	-47
506	Professional services	0	-63	-30	-94
510	State & local non-ed government	0	-23	-31	-54
513	Federal non-military	0	-13	-12	-25
516	Special sectors	0	0	0	0
519	Federal Government - Military	0	0	0	0
522	State & Local Government - Education	0	0	0	0
525	Domestic Services	0	0	-21	-21
25001	Foreign Trade	0	0	0	0
28001	Domestic Trade	0	0	0	0
	Total	**-3,292**	**-1,415**	**-1,698**	**-6,406**

2030 – State of Michigan – Employment Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	-2,511	-307	-72	-2,890
24	Forestry Products	-419	0	0	-419
25	Commercial Fishing	0	0	0	0
26	Ag Services	-4,275	-238	-30	-4,543
28	Metal mining	0	0	0	0
37	Coal Mining	0	0	0	0
38	Oil mining	0	-5	-5	-10
40	Non-metal mining	0	-1	0	-2
48	Construction	0	-188	-81	-268
58	Food processing	0	-17	-61	-79
104	Tobacco mfg	0	0	0	0
108	Textiles	0	0	0	-1
124	Apparel	0	-44	-49	-92
133	Wood products	0	-38	-7	-46
148	Furniture	0	-104	-18	-122
161	Pulp and paper	0	-57	-19	-76
174	Printing and publishing	0	-75	-42	-117
186	Chemicals and allied	0	-79	-36	-115
210	Petroleum products	0	-4	-3	-7
215	Rubber products	0	-8	-1	-9
221	Leather products	0	-1	-7	-8
230	Stone, glass and clay	0	-33	-5	-38
254	Primary metals	-207	-24	0	-232
273	Fabricated metal	-271	-234	-9	-513
307	Industrial machinery	-1,805	-532	-22	-2,359
355	Electrical equipment	-1,505	-301	-19	-1,825
384	Transportation equipment	-4,033	-220	-21	-4,275
400	Scientific instruments	0	-57	-9	-66
415	Miscellaneous mfg	-3,123	-18	-4	-3,144
433	Railroads and Related Services	0	-13	-4	-17
434	Local, Interurban Passenger Transit	0	-10	-22	-32
435	Motor Freight Transport and Warehousing	0	-235	-66	-301
436	Water Transportation	0	-3	-2	-5
437	Air Transportation	0	-31	-17	-48
438	Pipe Lines, Except Natural Gas	0	0	0	-1
439	Transportation Services	0	-22	-13	-35
441	Communications	0	-61	-60	-121
443	Utilities	0	-46	-54	-100
447	Wholesale Trade	0	-939	-211	-1,150
448	Retail Trade	0	-186	-3,027	-3,213
456	Banking	0	-100	-118	-218
457	Credit Agencies	0	-123	-121	-244
458	Security and Commodity Brokers	0	-28	-28	-56
459	Insurance Carriers	0	-10	-107	-117
460	Insurance Agents and Brokers	0	-5	-51	-56
461	Real estate	0	-62	-269	-330
463	Hotels and Lodging Places	0	-116	-94	-210
464	Personal services	0	-39	-294	-332
469	Business services	0	-1,445	-515	-1,960
477	Automotive services	0	-213	-103	-316
480	Repair services	0	-72	-30	-101
483	Motion Pictures	0	-14	-42	-57
484	Recreation services	0	-38	-320	-358
490	Health services	0	-7	-1,279	-1,286
494	Legal Services	0	-98	-93	-191
495	Education services	0	-23	-249	-272
498	Social services	0	-41	-316	-357
502	Non-profit organizations	0	-31	-210	-241
506	Professional services	0	-324	-155	-480
510	State & local non-ed government	0	-118	-160	-278
513	Federal non-military	0	-65	-63	-128
516	Special sectors	0	0	0	0
519	Federal Government - Military	0	0	0	0
522	State & Local Government - Education	0	0	0	0
525	Domestic Services	0	0	-108	-108
25001	Foreign Trade	0	0	0	0
28001	Domestic Trade	0	0	0	0
	Total	**-18,148**	**-7,104**	**-8,725**	**-33,977**

2020 – State of Michigan – Total Value Added Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($6,421,419)	($749,759)	($196,727)	($7,367,904)
24	Forestry Products	($3,003,997)	($509)	($390)	($3,004,896)
25	Commercial Fishing	$0	($142)	($1,519)	($1,661)
26	Ag Services	($17,087,872)	($921,477)	($128,736)	($18,138,085)
28	Metal mining	$0	($24)	($7)	($32)
37	Coal Mining	$0	($782)	($352)	($1,134)
38	Oil mining	$0	($86,864)	($79,636)	($166,499)
40	Non-metal mining	$0	($18,341)	($6,516)	($24,857)
48	Construction	$0	($1,864,982)	($794,162)	($2,659,144)
58	Food processing	$0	($266,385)	($1,066,416)	($1,332,801)
104	Tobacco mfg	$0	$0	$0	$0
108	Textiles	$0	($3,656)	($2,306)	($5,962)
124	Apparel	$0	($597,923)	($557,429)	($1,155,352)
133	Wood products	$0	($369,575)	($74,378)	($443,953)
148	Furniture	$0	($1,716,810)	($249,903)	($1,966,713)
161	Pulp and paper	$0	($848,715)	($310,049)	($1,158,765)
174	Printing and publishing	$0	($879,590)	($482,008)	($1,361,598)
186	Chemicals and allied	$0	($3,788,345)	($1,797,147)	($5,585,493)
210	Petroleum products	$0	($119,973)	($87,653)	($207,625)
215	Rubber products	$0	($91,025)	($14,173)	($105,198)
221	Leather products	$0	($13,028)	($85,540)	($98,568)
230	Stone, glass and clay	$0	($646,531)	($88,166)	($734,697)
254	Primary metals	($2,749,568)	($356,779)	($6,988)	($3,113,335)
273	Fabricated metal	($3,458,168)	($3,620,648)	($122,313)	($7,201,129)
307	Industrial machinery	($20,060,395)	($7,165,607)	($294,867)	($27,520,868)
355	Electrical equipment	($18,895,239)	($4,481,727)	($282,318)	($23,659,287)
384	Transportation equipment	($136,759,895)	($8,189,528)	($656,105)	($145,605,530)
400	Scientific instruments	$0	($824,418)	($106,772)	($931,190)
415	Miscellaneous mfg	($27,212,954)	($159,238)	($44,328)	($27,416,522)
433	Railroads and Related Services	$0	($309,674)	($81,776)	($391,450)
434	Local, Interurban Passenger Transit	$0	($56,465)	($123,155)	($179,619)
435	Motor Freight Transport and Warehousing	$0	($2,660,055)	($723,441)	($3,383,496)
436	Water Transportation	$0	($28,876)	($25,499)	($54,375)
437	Air Transportation	$0	($474,049)	($251,023)	($725,072)
438	Pipe Lines, Except Natural Gas	$0	($5,655)	($7,151)	($12,806)
439	Transportation Services	$0	($242,904)	($140,999)	($383,904)
441	Communications	$0	($1,543,422)	($1,543,913)	($3,087,335)
443	Utilities	$0	($2,579,150)	($3,011,516)	($5,590,666)
447	Wholesale Trade	$0	($17,157,229)	($3,771,317)	($20,928,546)
448	Retail Trade	$0	($1,095,907)	($17,481,099)	($18,577,005)
456	Banking	$0	($2,685,224)	($3,045,383)	($5,730,607)
457	Credit Agencies	$0	($745,881)	($663,940)	($1,409,821)
458	Security and Commodity Brokers	$0	($477,360)	($459,807)	($937,167)
459	Insurance Carriers	$0	($196,559)	($2,028,858)	($2,225,417)
460	Insurance Agents and Brokers	$0	($43,737)	($451,449)	($495,186)
461	Real estate	$0	($3,084,145)	($13,999,843)	($17,083,988)
463	Hotels and Lodging Places	$0	($657,589)	($510,541)	($1,168,130)
464	Personal services	$0	($159,398)	($1,146,490)	($1,305,888)
469	Business services	$0	($11,457,482)	($4,040,938)	($15,498,421)
477	Automotive services	$0	($2,399,709)	($1,033,773)	($3,433,483)
480	Repair services	$0	($531,090)	($216,388)	($747,478)
483	Motion Pictures	$0	($79,736)	($241,368)	($321,104)
484	Recreation services	$0	($182,220)	($1,539,134)	($1,721,354)
490	Health services	$0	($56,794)	($11,445,521)	($11,502,315)
494	Legal Services	$0	($1,403,405)	($1,276,504)	($2,679,910)
495	Education services	$0	($105,260)	($993,531)	($1,098,790)
498	Social services	$0	($153,156)	($1,377,067)	($1,530,223)
502	Non-profit organizations	$0	($116,369)	($776,765)	($893,134)
506	Professional services	$0	($2,879,496)	($1,374,800)	($4,254,296)
510	State & local non-ed government	$0	($1,211,544)	($1,664,332)	($2,875,876)
513	Federal non-military	$0	($766,063)	($745,093)	($1,511,155)
516	Special sectors	$0	$0	$0	$0
519	Federal Government - Military	$0	$0	$0	$0
522	State & Local Government - Education	$0	$0	$0	$0
525	Domestic Services	$0	$0	($206,965)	($206,965)
25001	Foreign Trade	$0	$0	$0	$0
28001	Domestic Trade	$0	$0	$0	$0
	Total	**($235,649,507)**	**($93,327,982)**	**($83,936,285)**	**($412,913,780)**

2030 – State of Michigan – Total Value Added Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($35,231,653)	($4,309,810)	($1,010,607)	($40,552,070)
24	Forestry Products	($15,806,990)	($2,835)	($2,005)	($15,811,830)
25	Commercial Fishing	$0	($775)	($7,802)	($8,577)
26	Ag Services	($93,754,043)	($5,222,067)	($661,332)	($99,637,441)
28	Metal mining	$0	($125)	($38)	($163)
37	Coal Mining	$0	($4,040)	($1,808)	($5,848)
38	Oil mining	$0	($451,950)	($409,097)	($861,047)
40	Non-metal mining	$0	($96,638)	($33,476)	($130,114)
48	Construction	$0	($9,508,966)	($4,079,698)	($13,588,663)
58	Food processing	$0	($1,528,347)	($5,478,301)	($7,006,649)
104	Tobacco mfg	$0	$0	$0	$0
108	Textiles	$0	($17,118)	($11,848)	($28,967)
124	Apparel	$0	($2,563,862)	($2,863,578)	($5,427,440)
133	Wood products	$0	($1,965,957)	($382,087)	($2,348,044)
148	Furniture	$0	($7,232,029)	($1,283,780)	($8,515,809)
161	Pulp and paper	$0	($4,786,776)	($1,592,758)	($6,379,534)
174	Printing and publishing	$0	($4,484,307)	($2,476,131)	($6,960,437)
186	Chemicals and allied	$0	($20,257,448)	($9,232,149)	($29,489,596)
210	Petroleum products	$0	($634,147)	($450,282)	($1,084,429)
215	Rubber products	$0	($463,947)	($72,807)	($536,754)
221	Leather products	$0	($69,754)	($439,428)	($509,182)
230	Stone, glass and clay	$0	($3,114,223)	($452,918)	($3,567,141)
254	Primary metals	($15,293,618)	($1,776,497)	($35,899)	($17,106,015)
273	Fabricated metal	($19,234,985)	($16,630,461)	($628,337)	($36,493,785)
307	Industrial machinery	($122,111,412)	($35,996,448)	($1,514,764)	($159,622,632)
355	Electrical equipment	($115,018,890)	($23,029,733)	($1,450,302)	($139,498,921)
384	Transportation equipment	($633,133,761)	($34,562,308)	($3,370,484)	($671,066,528)
400	Scientific instruments	$0	($3,580,551)	($548,498)	($4,129,049)
415	Miscellaneous mfg	($178,977,168)	($1,011,454)	($227,719)	($180,216,335)
433	Railroads and Related Services	$0	($1,575,629)	($420,091)	($1,995,720)
434	Local, Interurban Passenger Transit	$0	($276,247)	($632,659)	($908,906)
435	Motor Freight Transport and Warehousing	$0	($13,243,190)	($3,716,400)	($16,959,590)
436	Water Transportation	$0	($151,698)	($130,993)	($282,692)
437	Air Transportation	$0	($2,309,062)	($1,289,533)	($3,598,595)
438	Pipe Lines, Except Natural Gas	$0	($29,206)	($36,736)	($65,941)
439	Transportation Services	$0	($1,204,199)	($724,330)	($1,928,528)
441	Communications	$0	($7,977,450)	($7,931,257)	($15,908,708)
443	Utilities	$0	($13,153,935)	($15,470,499)	($28,624,434)
447	Wholesale Trade	$0	($86,327,591)	($19,373,691)	($105,701,276)
448	Retail Trade	$0	($5,509,765)	($89,802,446)	($95,312,207)
456	Banking	$0	($13,320,861)	($15,644,485)	($28,965,346)
457	Credit Agencies	$0	($3,468,787)	($3,410,734)	($6,879,522)
458	Security and Commodity Brokers	$0	($2,327,224)	($2,362,082)	($4,689,306)
459	Insurance Carriers	$0	($1,002,091)	($10,422,478)	($11,424,569)
460	Insurance Agents and Brokers	$0	($222,979)	($2,319,147)	($2,542,126)
461	Real estate	$0	($16,457,719)	($71,918,789)	($88,376,506)
463	Hotels and Lodging Places	$0	($3,239,403)	($2,622,708)	($5,862,111)
464	Personal services	$0	($777,798)	($5,889,646)	($6,667,444)
469	Business services	$0	($58,269,002)	($20,758,756)	($79,027,761)
477	Automotive services	$0	($10,940,922)	($5,310,611)	($16,251,533)
480	Repair services	$0	($2,670,194)	($1,111,609)	($3,781,804)
483	Motion Pictures	$0	($414,140)	($1,239,937)	($1,654,076)
484	Recreation services	$0	($926,333)	($7,906,706)	($8,833,039)
490	Health services	$0	($323,690)	($58,796,923)	($59,120,612)
494	Legal Services	$0	($6,930,549)	($6,557,552)	($13,488,101)
495	Education services	$0	($475,397)	($5,103,875)	($5,579,272)
498	Social services	$0	($923,881)	($7,074,141)	($7,998,023)
502	Non-profit organizations	$0	($583,621)	($3,990,328)	($4,573,949)
506	Professional services	$0	($14,736,603)	($7,062,503)	($21,799,106)
510	State & local non-ed government	$0	($6,293,610)	($8,549,864)	($14,843,473)
513	Federal non-military	$0	($3,910,546)	($3,827,624)	($7,738,171)
516	Special sectors	$0	$0	$0	$0
519	Federal Government - Military	$0	$0	$0	$0
522	State & Local Government - Education	$0	$0	$0	$0
525	Domestic Services	$0	$0	($1,063,204)	($1,063,204)
25001	Foreign Trade	$0	$0	$0	$0
28001	Domestic Trade	$0	$0	$0	$0
	Total	**($1,228,562,520)**	**($463,275,893)**	**($431,190,268)**	**($2,123,028,645)**

2020 – State of Michigan – Output Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($27,521,022)	($3,213,327)	($843,134)	($31,577,483)
24	Forestry Products	($3,289,243)	($557)	($427)	($3,290,228)
25	Commercial Fishing		($151)	($1,618)	($1,769)
26	Ag Services	($27,521,022)	($1,484,092)	($207,337)	($29,212,451)
28	Metal mining		($87)	($26)	($113)
37	Coal Mining		($1,033)	($465)	($1,498)
38	Oil mining		($206,566)	($189,377)	($395,942)
40	Non-metal mining		($28,375)	($10,081)	($38,456)
48	Construction		($4,442,830)	($1,891,881)	($6,334,711)
58	Food processing		($999,734)	($4,002,232)	($5,001,966)
104	Tobacco mfg		$0	$0	$0
108	Textiles		($12,740)	($8,037)	($20,777)
124	Apparel		($1,694,552)	($1,579,792)	($3,274,344)
133	Wood products		($978,377)	($196,900)	($1,175,277)
148	Furniture		($4,515,728)	($657,320)	($5,173,048)
161	Pulp and paper		($2,783,342)	($1,016,798)	($3,800,140)
174	Printing and publishing		($1,925,142)	($1,054,963)	($2,980,104)
186	Chemicals and allied		($8,353,802)	($3,962,948)	($12,316,750)
210	Petroleum products		($691,671)	($505,338)	($1,197,008)
215	Rubber products		($269,235)	($41,920)	($311,155)
221	Leather products		($27,047)	($177,591)	($204,639)
230	Stone, glass and clay		($1,322,026)	($180,281)	($1,502,308)
254	Primary metals	($8,611,673)	($1,117,435)	($21,887)	($9,750,995)
273	Fabricated metal	($8,611,673)	($9,016,287)	($304,590)	($17,932,550)
307	Industrial machinery	($49,073,834)	($17,529,255)	($721,334)	($67,324,423)
355	Electrical equipment	($49,073,834)	($11,639,733)	($733,224)	($61,446,791)
384	Transportation equipment	($423,168,708)	($25,340,410)	($2,030,150)	($450,539,268)
400	Scientific instruments		($2,309,870)	($299,155)	($2,609,025)
415	Miscellaneous mfg	($52,545,578)	($307,473)	($85,594)	($52,938,645)
433	Railroads and Related Services		($560,814)	($148,094)	($708,909)
434	Local, Interurban Passenger Transit		($90,045)	($196,398)	($286,443)
435	Motor Freight Transport and Warehousing		($5,682,737)	($1,545,504)	($7,228,242)
436	Water Transportation		($118,031)	($104,230)	($222,261)
437	Air Transportation		($763,999)	($404,560)	($1,168,559)
438	Pipe Lines, Except Natural Gas		($7,284)	($9,211)	($16,495)
439	Transportation Services		($329,083)	($191,024)	($520,107)
441	Communications		($2,875,387)	($2,876,302)	($5,751,689)
443	Utilities		($4,265,562)	($4,980,637)	($9,246,199)
447	Wholesale Trade		($24,751,225)	($5,440,548)	($30,191,773)
448	Retail Trade		($1,518,973)	($24,229,533)	($25,748,507)
456	Banking		($4,054,905)	($4,598,775)	($8,653,680)
457	Credit Agencies		($1,228,724)	($1,093,739)	($2,322,463)
458	Security and Commodity Brokers		($1,101,403)	($1,060,903)	($2,162,307)
459	Insurance Carriers		($319,265)	($3,295,416)	($3,614,682)
460	Insurance Agents and Brokers		($55,595)	($573,844)	($629,439)
461	Real estate		($4,176,148)	($18,956,767)	($23,132,915)
463	Hotels and Lodging Places		($1,110,535)	($862,202)	($1,972,737)
464	Personal services		($289,743)	($2,084,016)	($2,373,758)
469	Business services		($15,777,126)	($5,564,432)	($21,341,558)
477	Automotive services		($4,015,233)	($1,729,726)	($5,744,959)
480	Repair services		($1,069,742)	($435,857)	($1,505,599)
483	Motion Pictures		($223,523)	($676,624)	($900,147)
484	Recreation services		($293,320)	($2,477,554)	($2,770,874)
490	Health services		($87,045)	($17,541,731)	($17,628,775)
494	Legal Services		($1,802,212)	($1,639,250)	($3,441,462)
495	Education services		($173,083)	($1,633,703)	($1,806,785)
498	Social services		($298,191)	($2,681,111)	($2,979,302)
502	Non-profit organizations		($320,290)	($2,137,941)	($2,458,231)
506	Professional services		($5,016,959)	($2,395,321)	($7,412,280)
510	State & local non-ed government		($1,537,633)	($2,112,290)	($3,649,922)
513	Federal non-military		($876,474)	($852,481)	($1,728,955)
516	Special sectors		$0	$0	$0
519	Federal Government - Military		$0	$0	$0
522	State & Local Government - Education		$0	$0	$0
525	Domestic Services		$0	($206,965)	($206,965)
25001	Foreign Trade		$0	$0	$0
28001	Domestic Trade		$0	$0	$0
	Total	**($649,416,586)**	**($185,001,170)**	**($135,461,088)**	**($969,878,844)**

2030 – State of Michigan – Output Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($150,996,391)	($18,471,052)	($4,331,276)	($173,798,719)
24	Forestry Products	($17,307,950)	($3,105)	($2,195)	($17,313,250)
25	Commercial Fishing		($825)	($8,313)	($9,138)
26	Ag Services	($150,996,391)	($8,410,445)	($1,065,114)	($160,471,950)
28	Metal mining		($442)	($135)	($577)
37	Coal Mining		($5,337)	($2,389)	($7,726)
38	Oil mining		($1,074,758)	($972,851)	($2,047,609)
40	Non-metal mining		($149,508)	($51,790)	($201,298)
48	Construction		($22,652,612)	($9,718,809)	($32,371,421)
58	Food processing		($5,735,848)	($20,559,922)	($26,295,770)
104	Tobacco mfg		$0	$0	$0
108	Textiles		($59,654)	($41,289)	($100,943)
124	Apparel		($7,266,155)	($8,115,571)	($15,381,727)
133	Wood products		($5,204,478)	($1,011,499)	($6,215,977)
148	Furniture		($19,022,422)	($3,376,728)	($22,399,150)
161	Pulp and paper		($15,698,116)	($5,223,409)	($20,921,525)
174	Printing and publishing		($9,814,720)	($5,419,462)	($15,234,183)
186	Chemicals and allied		($44,670,348)	($20,358,107)	($65,028,455)
210	Petroleum products		($3,656,006)	($2,595,978)	($6,251,984)
215	Rubber products		($1,372,270)	($215,349)	($1,587,619)
221	Leather products		($144,817)	($912,306)	($1,057,123)
230	Stone, glass and clay		($6,367,961)	($926,126)	($7,294,087)
254	Primary metals	($47,899,759)	($5,564,005)	($112,437)	($53,576,201)
273	Fabricated metal	($47,899,759)	($41,413,863)	($1,564,711)	($90,878,334)
307	Industrial machinery	($298,721,708)	($88,058,275)	($3,705,575)	($390,485,558)
355	Electrical equipment	($298,721,708)	($59,811,750)	($3,766,658)	($362,300,116)
384	Transportation equipment	($1,959,071,276)	($106,944,266)	($10,429,106)	($2,076,444,648)
400	Scientific instruments		($10,032,054)	($1,536,793)	($11,568,847)
415	Miscellaneous mfg	($345,587,577)	($1,953,019)	($439,704)	($347,980,300)
433	Railroads and Related Services		($2,853,438)	($760,777)	($3,614,215)
434	Local, Interurban Passenger Transit		($440,537)	($1,008,916)	($1,449,452)
435	Motor Freight Transport and Warehousing		($28,291,736)	($7,939,432)	($36,231,168)
436	Water Transportation		($620,072)	($535,440)	($1,155,512)
437	Air Transportation		($3,721,391)	($2,078,270)	($5,799,660)
438	Pipe Lines, Except Natural Gas		($37,619)	($47,319)	($84,938)
439	Transportation Services		($1,631,431)	($981,311)	($2,612,742)
441	Communications		($14,861,947)	($14,775,889)	($29,637,836)
443	Utilities		($21,754,814)	($25,586,096)	($47,340,910)
447	Wholesale Trade		($124,537,226)	($27,948,719)	($152,485,945)
448	Retail Trade		($7,636,764)	($124,469,938)	($132,106,703)
456	Banking		($20,115,577)	($23,624,438)	($43,740,015)
457	Credit Agencies		($5,714,294)	($5,618,661)	($11,332,954)
458	Security and Commodity Brokers		($5,369,557)	($5,449,985)	($10,819,542)
459	Insurance Carriers		($1,627,668)	($16,928,938)	($18,556,605)
460	Insurance Agents and Brokers		($283,432)	($2,947,903)	($3,231,335)
461	Real estate		($22,284,903)	($97,383,069)	($119,667,972)
463	Hotels and Lodging Places		($5,470,698)	($4,429,226)	($9,899,924)
464	Personal services		($1,413,832)	($10,705,819)	($12,119,650)
469	Business services		($80,237,299)	($28,585,121)	($108,822,421)
477	Automotive services		($18,306,529)	($8,885,800)	($27,192,329)
480	Repair services		($5,378,408)	($2,239,046)	($7,617,454)
483	Motion Pictures		($1,160,951)	($3,475,895)	($4,636,846)
484	Recreation services		($1,491,125)	($12,727,477)	($14,218,601)
490	Health services		($496,097)	($90,113,833)	($90,609,931)
494	Legal Services		($8,900,010)	($8,421,019)	($17,321,029)
495	Education services		($781,715)	($8,392,508)	($9,174,223)
498	Social services		($1,798,770)	($13,773,155)	($15,571,925)
502	Non-profit organizations		($1,606,337)	($10,982,835)	($12,589,172)
506	Professional services		($25,675,654)	($12,305,033)	($37,980,686)
510	State & local non-ed government		($7,987,543)	($10,851,071)	($18,838,614)
513	Federal non-military		($4,474,164)	($4,379,291)	($8,853,455)
516	Special sectors		$0	$0	$0
519	Federal Government - Military		$0	$0	$0
522	State & Local Government - Education		$0	$0	$0
525	Domestic Services		$0	($1,063,204)	($1,063,204)
25001	Foreign Trade		$0	$0	$0
28001	Domestic Trade		$0	$0	$0
	Total	**($3,317,202,520)**	**($910,519,649)**	**($695,879,031)**	**($4,923,601,199)**

2020 – SEMCOG Region – Employment Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	-217	-3	-1	-221
24	Forestry Products	-44	0	0	-44
25	Commercial Fishing	0	0	0	0
26	Ag Services	-260	-8	-2	-269
28	Metal mining	0	0	0	0
37	Coal Mining	0	0	0	0
38	Oil mining	0	0	0	-1
40	Non-metal mining	0	0	0	0
48	Construction	0	-16	-7	-23
58	Food processing	0	-1	-4	-5
104	Tobacco mfg	0	0	0	0
108	Textiles	0	0	0	0
124	Apparel	0	-5	-4	-9
133	Wood products	0	-1	0	-2
148	Furniture	0	-10	-1	-11
161	Pulp and paper	0	-2	-1	-3
174	Printing and publishing	0	-5	-3	-8
186	Chemicals and allied	0	-5	-3	-8
210	Petroleum products	0	0	0	-1
215	Rubber products	0	-1	0	-1
221	Leather products	0	0	0	0
230	Stone, glass and clay	0	-3	0	-3
254	Primary metals	-17	-5	0	-22
273	Fabricated metal	-28	-29	-1	-57
307	Industrial machinery	-170	-47	-2	-219
355	Electrical equipment	-147	-21	-1	-170
384	Transportation equipment	-658	-39	-3	-700
400	Scientific instruments	0	-6	-1	-6
415	Miscellaneous mfg	-222	-1	0	-223
433	Railroads and Related Services	0	-1	0	-1
434	Local, Interurban Passenger Transit	0	-1	-2	-3
435	Motor Freight Transport and Warehousing	0	-22	-6	-28
436	Water Transportation	0	0	0	0
437	Air Transportation	0	-3	-2	-5
438	Pipe Lines, Except Natural Gas	0	0	0	0
439	Transportation Services	0	-2	-1	-3
441	Communications	0	-5	-5	-10
443	Utilities	0	-4	-5	-9
447	Wholesale Trade	0	-81	-17	-98
448	Retail Trade	0	-17	-261	-278
456	Banking	0	-9	-10	-19
457	Credit Agencies	0	-15	-11	-26
458	Security and Commodity Brokers	0	-3	-3	-6
459	Insurance Carriers	0	-1	-10	-11
460	Insurance Agents and Brokers	0	0	-4	-5
461	Real estate	0	-5	-25	-30
463	Hotels and Lodging Places	0	-7	-5	-13
464	Personal services	0	-4	-26	-30
469	Business services	0	-134	-45	-179
477	Automotive services	0	-19	-8	-27
480	Repair services	0	-6	-3	-9
483	Motion Pictures	0	-1	-5	-6
484	Recreation services	0	-3	-27	-30
490	Health services	0	0	-118	-119
494	Legal Services	0	-11	-10	-21
495	Education services	0	-3	-21	-24
498	Social services	0	-2	-27	-29
502	Non-profit organizations	0	-3	-18	-21
506	Professional services	0	-27	-13	-41
510	State & local non-ed government	0	-9	-13	-21
513	Federal non-military	0	-6	-6	-12
516	Special sectors	0	0	0	0
519	Federal Government - Military	0	0	0	0
522	State & Local Government - Education	0	0	0	0
525	Domestic Services	0	0	-9	-9
25001	Foreign Trade	0	0	0	0
28001	Domestic Trade	0	0	0	0
	Total	**-1,763**	**-615**	**-751**	**-3,129**

2030 – SEMCOG Region – Employment Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	-1,188	-19	-7	-1,214
24	Forestry Products	-232	0	0	-232
25	Commercial Fishing	0	0	0	0
26	Ag Services	-1,426	-42	-8	-1,476
28	Metal mining	0	0	0	0
37	Coal Mining	0	0	0	0
38	Oil mining	0	-2	-2	-3
40	Non-metal mining	0	0	0	-1
48	Construction	0	-76	-34	-110
58	Food processing	0	-3	-21	-24
104	Tobacco mfg	0	0	0	0
108	Textiles	0	0	0	0
124	Apparel	0	-22	-20	-41
133	Wood products	0	-7	-1	-9
148	Furniture	0	-40	-6	-45
161	Pulp and paper	0	-13	-5	-17
174	Printing and publishing	0	-24	-14	-38
186	Chemicals and allied	0	-26	-13	-39
210	Petroleum products	0	-2	-2	-4
215	Rubber products	0	-3	0	-3
221	Leather products	0	0	-2	-2
230	Stone, glass and clay	0	-13	-2	-15
254	Primary metals	-95	-21	0	-117
273	Fabricated metal	-154	-124	-4	-283
307	Industrial machinery	-1,034	-222	-8	-1,264
355	Electrical equipment	-897	-101	-6	-1,005
384	Transportation equipment	-3,047	-159	-12	-3,218
400	Scientific instruments	0	-24	-3	-27
415	Miscellaneous mfg	-1,460	-4	-1	-1,465
433	Railroads and Related Services	0	-4	-1	-4
434	Local, Interurban Passenger Transit	0	-5	-11	-15
435	Motor Freight Transport and Warehousing	0	-101	-27	-128
436	Water Transportation	0	-1	-1	-1
437	Air Transportation	0	-14	-8	-21
438	Pipe Lines, Except Natural Gas	0	0	0	0
439	Transportation Services	0	-9	-6	-15
441	Communications	0	-24	-25	-49
443	Utilities	0	-19	-23	-42
447	Wholesale Trade	0	-380	-81	-461
448	Retail Trade	0	-77	-1,251	-1,328
456	Banking	0	-42	-47	-89
457	Credit Agencies	0	-64	-54	-118
458	Security and Commodity Brokers	0	-15	-14	-29
459	Insurance Carriers	0	-4	-46	-51
460	Insurance Agents and Brokers	0	-2	-21	-23
461	Real estate	0	-23	-122	-145
463	Hotels and Lodging Places	0	-33	-26	-58
464	Personal services	0	-17	-125	-142
469	Business services	0	-632	-216	-848
477	Automotive services	0	-83	-36	-119
480	Repair services	0	-30	-12	-42
483	Motion Pictures	0	-7	-22	-28
484	Recreation services	0	-14	-132	-145
490	Health services	0	-2	-567	-568
494	Legal Services	0	-50	-46	-96
495	Education services	0	-11	-102	-113
498	Social services	0	-13	-127	-141
502	Non-profit organizations	0	-12	-87	-99
506	Professional services	0	-130	-62	-193
510	State & local non-ed government	0	-43	-60	-103
513	Federal non-military	0	-29	-29	-58
516	Special sectors	0	0	0	0
519	Federal Government - Military	0	0	0	0
522	State & Local Government - Education	0	0	0	0
525	Domestic Services	0	0	-42	-42
25001	Foreign Trade	0	0	0	0
28001	Domestic Trade	0	0	0	0
	Total	**-9,534**	**-2,837**	**-3,598**	**-15,970**

2020 – SEMCOG Region – Total Value Added Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($2,841,079)	($45,433)	($19,020)	($2,905,532)
24	Forestry Products	($1,782,178)	($94)	($119)	($1,782,391)
25	Commercial Fishing	$0	($3)	($54)	($57)
26	Ag Services	($6,481,557)	($194,928)	($41,682)	($6,718,166)
28	Metal mining	$0	($32)	($1)	($32)
37	Coal Mining	$0	$0	$0	$0
38	Oil mining	$0	($26,151)	($26,006)	($52,156)
40	Non-metal mining	$0	($7,337)	($2,954)	($10,291)
48	Construction	$0	($922,966)	($399,875)	($1,322,841)
58	Food processing	$0	($53,653)	($414,682)	($468,335)
104	Tobacco mfg	$0	$0	$0	$0
108	Textiles	$0	($1,829)	($949)	($2,778)
124	Apparel	$0	($323,254)	($250,594)	($573,848)
133	Wood products	$0	($79,330)	($16,048)	($95,377)
148	Furniture	$0	($845,731)	($103,092)	($948,823)
161	Pulp and paper	$0	($161,944)	($64,645)	($226,589)
174	Printing and publishing	$0	($346,618)	($194,994)	($541,612)
186	Chemicals and allied	$0	($1,396,996)	($738,774)	($2,135,770)
210	Petroleum products	$0	($68,422)	($57,439)	($125,861)
215	Rubber products	$0	($40,725)	($6,879)	($47,603)
221	Leather products	$0	($2,399)	($17,463)	($19,861)
230	Stone, glass and clay	$0	($331,624)	($39,491)	($371,115)
254	Primary metals	($1,459,185)	($389,197)	($5,374)	($1,853,756)
273	Fabricated metal	($2,180,756)	($2,256,198)	($64,180)	($4,501,134)
307	Industrial machinery	($12,794,632)	($3,560,171)	($132,192)	($16,486,995)
355	Electrical equipment	($12,853,085)	($1,846,862)	($110,350)	($14,810,297)
384	Transportation equipment	($116,514,335)	($6,902,727)	($455,926)	($123,872,995)
400	Scientific instruments	$0	($380,719)	($41,122)	($421,841)
415	Miscellaneous mfg	($13,891,363)	($41,933)	($14,588)	($13,947,884)
433	Railroads and Related Services	$0	($172,394)	($44,523)	($216,917)
434	Local, Interurban Passenger Transit	$0	($31,556)	($65,394)	($96,949)
435	Motor Freight Transport and Warehousing	$0	($1,317,015)	($338,484)	($1,655,499)
436	Water Transportation	$0	($7,902)	($7,575)	($15,477)
437	Air Transportation	$0	($248,445)	($128,217)	($376,661)
438	Pipe Lines, Except Natural Gas	$0	($1,973)	($2,722)	($4,695)
439	Transportation Services	$0	($119,961)	($67,098)	($187,058)
441	Communications	$0	($719,753)	($752,067)	($1,471,820)
443	Utilities	$0	($1,216,187)	($1,406,787)	($2,622,974)
447	Wholesale Trade	$0	($8,572,835)	($1,775,674)	($10,348,509)
448	Retail Trade	$0	($544,658)	($8,572,183)	($9,116,841)
456	Banking	$0	($1,347,095)	($1,453,234)	($2,800,329)
457	Credit Agencies	$0	($476,141)	($361,392)	($837,534)
458	Security and Commodity Brokers	$0	($295,545)	($258,634)	($554,179)
459	Insurance Carriers	$0	($91,295)	($1,025,398)	($1,116,692)
460	Insurance Agents and Brokers	$0	($19,617)	($220,335)	($239,953)
461	Real estate	$0	($1,246,174)	($6,828,351)	($8,074,524)
463	Hotels and Lodging Places	$0	($232,139)	($174,190)	($406,328)
464	Personal services	$0	($78,512)	($560,715)	($639,228)
469	Business services	$0	($6,006,210)	($2,020,092)	($8,026,303)
477	Automotive services	$0	($1,107,815)	($427,059)	($1,534,874)
480	Repair services	$0	($265,238)	($107,606)	($372,844)
483	Motion Pictures	$0	($48,341)	($155,635)	($203,977)
484	Recreation services	$0	($85,669)	($797,824)	($883,493)
490	Health services	$0	($14,129)	($5,731,249)	($5,745,378)
494	Legal Services	$0	($847,535)	($750,453)	($1,597,988)
495	Education services	$0	($58,947)	($500,309)	($559,255)
498	Social services	$0	($62,315)	($693,833)	($756,148)
502	Non-profit organizations	$0	($56,097)	($394,552)	($450,649)
506	Professional services	$0	($1,379,952)	($653,556)	($2,033,508)
510	State & local non-ed government	$0	($522,270)	($729,676)	($1,251,946)
513	Federal non-military	$0	($383,062)	($372,431)	($755,493)
516	Special sectors	$0	$0	$0	$0
519	Federal Government - Military	$0	$0	$0	$0
522	State & Local Government - Education	$0	$0	$0	$0
525	Domestic Services	$0	$0	($99,849)	($99,849)
25001	Foreign Trade	$0	$0	$0	$0
28001	Domestic Trade	$0	$0	$0	$0
	Total	**($170,798,170)**	**($47,804,052)**	**($40,695,587)**	**($259,297,817)**

2030 – SEMCOG Region – Total Value Added Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($15,587,817)	($254,326)	($91,156)	($15,933,299)
24	Forestry Products	($9,377,796)	($503)	($568)	($9,378,868)
25	Commercial Fishing	$0	($17)	($258)	($275)
26	Ag Services	($35,561,605)	($1,056,712)	($199,769)	($36,818,087)
28	Metal mining	$0	($149)	($4)	($153)
37	Coal Mining	$0	$0	$0	$0
38	Oil mining	$0	($125,276)	($124,638)	($249,914)
40	Non-metal mining	$0	($35,680)	($14,158)	($49,838)
48	Construction	$0	($4,345,821)	($1,916,486)	($6,262,306)
58	Food processing	$0	($297,647)	($1,987,442)	($2,285,089)
104	Tobacco mfg	$0	$0	$0	$0
108	Textiles	$0	($8,063)	($4,550)	($12,613)
124	Apparel	$0	($1,329,604)	($1,201,029)	($2,530,633)
133	Wood products	$0	($390,476)	($76,913)	($467,389)
148	Furniture	$0	($3,447,904)	($494,094)	($3,941,997)
161	Pulp and paper	$0	($851,589)	($309,823)	($1,161,411)
174	Printing and publishing	$0	($1,634,843)	($934,549)	($2,569,393)
186	Chemicals and allied	$0	($6,867,675)	($3,540,710)	($10,408,386)
210	Petroleum products	$0	($332,894)	($275,286)	($608,180)
215	Rubber products	$0	($192,805)	($32,968)	($225,772)
221	Leather products	$0	($11,842)	($83,693)	($95,535)
230	Stone, glass and clay	$0	($1,493,403)	($189,271)	($1,682,673)
254	Primary metals	($8,116,264)	($1,816,295)	($25,756)	($9,958,315)
273	Fabricated metal	($12,129,780)	($9,786,443)	($307,596)	($22,223,820)
307	Industrial machinery	($77,883,341)	($16,699,212)	($633,554)	($95,216,105)
355	Electrical equipment	($78,239,154)	($8,839,952)	($528,875)	($87,607,983)
384	Transportation equipment	($539,406,327)	($28,185,059)	($2,185,133)	($569,776,550)
400	Scientific instruments	$0	($1,585,920)	($197,085)	($1,783,005)
415	Miscellaneous mfg	($91,362,258)	($245,799)	($69,917)	($91,677,973)
433	Railroads and Related Services	$0	($808,084)	($213,384)	($1,021,468)
434	Local, Interurban Passenger Transit	$0	($143,631)	($313,413)	($457,044)
435	Motor Freight Transport and Warehousing	$0	($6,064,041)	($1,622,254)	($7,686,294)
436	Water Transportation	$0	($38,349)	($36,306)	($74,655)
437	Air Transportation	$0	($1,122,392)	($614,509)	($1,736,900)
438	Pipe Lines, Except Natural Gas	$0	($9,365)	($13,045)	($22,409)
439	Transportation Services	$0	($549,999)	($321,581)	($871,580)
441	Communications	$0	($3,444,744)	($3,604,428)	($7,049,171)
443	Utilities	$0	($5,746,069)	($6,742,288)	($12,488,356)
447	Wholesale Trade	$0	($39,942,269)	($8,510,274)	($48,452,544)
448	Retail Trade	$0	($2,537,742)	($41,083,944)	($43,621,690)
456	Banking	$0	($6,197,977)	($6,964,895)	($13,162,874)
457	Credit Agencies	$0	($2,058,925)	($1,732,048)	($3,790,973)
458	Security and Commodity Brokers	$0	($1,338,311)	($1,239,550)	($2,577,860)
459	Insurance Carriers	$0	($428,708)	($4,914,463)	($5,343,170)
460	Insurance Agents and Brokers	$0	($92,120)	($1,056,010)	($1,148,130)
461	Real estate	$0	($6,134,767)	($32,726,292)	($38,861,060)
463	Hotels and Lodging Places	$0	($1,063,374)	($834,847)	($1,898,221)
464	Personal services	$0	($355,423)	($2,687,349)	($3,042,773)
469	Business services	$0	($28,257,079)	($9,681,716)	($37,938,795)
477	Automotive services	$0	($4,738,994)	($2,046,777)	($6,785,771)
480	Repair services	$0	($1,233,603)	($515,727)	($1,749,330)
483	Motion Pictures	$0	($231,824)	($745,918)	($977,743)
484	Recreation services	$0	($400,951)	($3,823,757)	($4,224,708)
490	Health services	$0	($77,725)	($27,468,154)	($27,545,880)
494	Legal Services	$0	($3,876,183)	($3,596,698)	($7,472,881)
495	Education services	$0	($251,647)	($2,397,857)	($2,649,504)
498	Social services	$0	($351,018)	($3,325,365)	($3,676,383)
502	Non-profit organizations	$0	($260,205)	($1,890,983)	($2,151,188)
506	Professional services	$0	($6,537,438)	($3,132,303)	($9,669,741)
510	State & local non-ed government	$0	($2,518,362)	($3,497,121)	($6,015,484)
513	Federal non-military	$0	($1,804,002)	($1,784,954)	($3,588,956)
516	Special sectors	$0	$0	$0	$0
519	Federal Government - Military	$0	$0	$0	$0
522	State & Local Government - Education	$0	$0	$0	$0
525	Domestic Services	$0	$0	($478,552)	($478,552)
25001	Foreign Trade	$0	$0	$0	$0
28001	Domestic Trade	$0	$0	$0	$0
	Total	**($867,664,342)**	**($218,451,229)**	**($195,042,040)**	**($1,281,157,654)**

2020 – SEMCOG Region – Output Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($10,325,628)	($165,122)	($69,126)	($10,559,876)
24	Forestry Products	($1,951,406)	($103)	($130)	($1,951,638)
25	Commercial Fishing		($4)	($57)	($61)
26	Ag Services	($10,325,628)	($310,535)	($66,402)	($10,702,565)
28	Metal mining		($134)	($3)	($138)
37	Coal Mining		$0	$0	$0
38	Oil mining		($62,082)	($61,738)	($123,820)
40	Non-metal mining		($11,290)	($4,545)	($15,836)
48	Construction		($2,072,117)	($897,745)	($2,969,861)
58	Food processing		($184,295)	($1,424,417)	($1,608,713)
104	Tobacco mfg		$0	$0	$0
108	Textiles		($5,196)	($2,698)	($7,894)
124	Apparel		($899,463)	($697,285)	($1,596,748)
133	Wood products		($183,514)	($37,124)	($220,637)
148	Furniture		($2,080,262)	($253,577)	($2,333,840)
161	Pulp and paper		($538,550)	($214,977)	($753,527)
174	Printing and publishing		($735,823)	($413,945)	($1,149,768)
186	Chemicals and allied		($3,092,931)	($1,635,637)	($4,728,568)
210	Petroleum products		($353,881)	($297,076)	($650,957)
215	Rubber products		($110,282)	($18,628)	($128,910)
221	Leather products		($3,267)	($23,784)	($27,051)
230	Stone, glass and clay		($645,039)	($76,814)	($721,853)
254	Primary metals	($5,142,901)	($1,371,727)	($18,941)	($6,533,568)
273	Fabricated metal	($5,142,901)	($5,320,816)	($151,356)	($10,615,073)
307	Industrial machinery	($29,454,625)	($8,195,899)	($304,319)	($37,954,844)
355	Electrical equipment	($29,454,625)	($4,232,340)	($252,882)	($33,939,848)
384	Transportation equipment	($353,457,185)	($20,940,069)	($1,383,095)	($375,780,350)
400	Scientific instruments		($1,007,134)	($108,782)	($1,115,915)
415	Miscellaneous mfg	($25,953,072)	($78,342)	($27,255)	($26,058,670)
433	Railroads and Related Services		($258,697)	($66,811)	($325,508)
434	Local, Interurban Passenger Transit		($49,751)	($103,101)	($152,852)
435	Motor Freight Transport and Warehousing		($2,738,891)	($703,917)	($3,442,809)
436	Water Transportation		($33,071)	($31,706)	($64,777)
437	Air Transportation		($392,824)	($202,727)	($595,551)
438	Pipe Lines, Except Natural Gas		($2,542)	($3,506)	($6,048)
439	Transportation Services		($162,314)	($90,787)	($253,101)
441	Communications		($1,305,343)	($1,363,947)	($2,669,290)
443	Utilities		($2,101,346)	($2,430,667)	($4,532,013)
447	Wholesale Trade		($12,312,619)	($2,550,288)	($14,862,907)
448	Retail Trade		($750,899)	($11,818,134)	($12,569,032)
456	Banking		($2,034,223)	($2,194,500)	($4,228,723)
457	Credit Agencies		($751,802)	($570,619)	($1,322,421)
458	Security and Commodity Brokers		($664,045)	($581,110)	($1,245,155)
459	Insurance Carriers		($146,323)	($1,643,470)	($1,789,793)
460	Insurance Agents and Brokers		($24,936)	($280,072)	($305,007)
461	Real estate		($1,690,696)	($9,264,088)	($10,954,783)
463	Hotels and Lodging Places		($379,432)	($284,714)	($664,145)
464	Personal services		($143,256)	($1,023,094)	($1,166,349)
469	Business services		($8,114,098)	($2,729,046)	($10,843,144)
477	Automotive services		($1,812,149)	($698,578)	($2,510,726)
480	Repair services		($514,194)	($208,607)	($722,802)
483	Motion Pictures		($122,828)	($395,448)	($518,276)
484	Recreation services		($134,632)	($1,253,803)	($1,388,434)
490	Health services		($21,416)	($8,687,113)	($8,708,529)
494	Legal Services		($1,088,380)	($963,710)	($2,052,090)
495	Education services		($98,046)	($832,169)	($930,215)
498	Social services		($112,658)	($1,254,359)	($1,367,017)
502	Non-profit organizations		($151,240)	($1,063,730)	($1,214,970)
506	Professional services		($2,403,901)	($1,138,507)	($3,542,408)
510	State & local non-ed government		($655,321)	($915,565)	($1,570,886)
513	Federal non-military		($436,960)	($424,833)	($861,793)
516	Special sectors		$0	$0	$0
519	Federal Government - Military		$0	$0	$0
522	State & Local Government - Education		$0	$0	$0
525	Domestic Services		$0	($99,542)	($99,542)
25001	Foreign Trade		$0	$0	$0
28001	Domestic Trade		$0	$0	$0
	Total	**($471,207,972)**	**($94,209,049)**	**($64,314,605)**	**($629,731,625)**

2030 – SEMCOG Region – Output Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($56,652,423)	($924,323)	($331,297)	($57,908,043)
24	Forestry Products	($10,268,270)	($550)	($622)	($10,269,442)
25	Commercial Fishing		($18)	($275)	($293)
26	Ag Services	($56,652,423)	($1,683,425)	($318,248)	($58,654,095)
28	Metal mining		($631)	($17)	($648)
37	Coal Mining		$0	$0	$0
38	Oil mining		($297,406)	($295,892)	($593,298)
40	Non-metal mining		($54,902)	($21,785)	($76,687)
48	Construction		($9,756,638)	($4,302,630)	($14,059,268)
58	Food processing		($1,022,407)	($6,826,785)	($7,849,192)
104	Tobacco mfg		$0	$0	$0
108	Textiles		($22,911)	($12,929)	($35,840)
124	Apparel		($3,699,663)	($3,341,897)	($7,041,561)
133	Wood products		($903,293)	($177,923)	($1,081,216)
148	Furniture		($8,480,878)	($1,215,332)	($9,696,210)
161	Pulp and paper		($2,831,978)	($1,030,323)	($3,862,301)
174	Printing and publishing		($3,470,548)	($1,983,920)	($5,454,468)
186	Chemicals and allied		($15,204,944)	($7,839,087)	($23,044,031)
210	Petroleum products		($1,721,742)	($1,423,793)	($3,145,535)
215	Rubber products		($522,115)	($89,276)	($611,391)
221	Leather products		($16,128)	($113,990)	($130,118)
230	Stone, glass and clay		($2,904,807)	($368,149)	($3,272,956)
254	Primary metals	($28,605,790)	($6,401,535)	($90,777)	($35,098,101)
273	Fabricated metal	($28,605,790)	($23,079,471)	($725,406)	($52,410,668)
307	Industrial machinery	($179,295,875)	($38,443,391)	($1,458,511)	($219,197,777)
355	Electrical equipment	($179,295,875)	($20,257,976)	($1,211,990)	($200,765,841)
384	Transportation equipment	($1,636,339,848)	($85,502,026)	($6,628,806)	($1,728,470,680)
400	Scientific instruments		($4,195,312)	($521,358)	($4,716,670)
415	Miscellaneous mfg	($170,691,040)	($459,223)	($130,624)	($171,280,887)
433	Railroads and Related Services		($1,212,623)	($320,207)	($1,532,830)
434	Local, Interurban Passenger Transit		($226,450)	($494,132)	($720,582)
435	Motor Freight Transport and Warehousing		($12,610,899)	($3,373,671)	($15,984,570)
436	Water Transportation		($160,504)	($151,956)	($312,460)
437	Air Transportation		($1,774,648)	($971,618)	($2,746,266)
438	Pipe Lines, Except Natural Gas		($12,063)	($16,803)	($28,865)
439	Transportation Services		($744,180)	($435,117)	($1,179,297)
441	Communications		($6,247,380)	($6,536,983)	($12,784,363)
443	Utilities		($9,928,143)	($11,649,424)	($21,577,566)
447	Wholesale Trade		($57,366,546)	($12,222,766)	($69,589,312)
448	Retail Trade		($3,498,686)	($56,640,831)	($60,139,517)
456	Banking		($9,359,445)	($10,517,553)	($19,876,998)
457	Credit Agencies		($3,250,933)	($2,734,811)	($5,985,744)
458	Security and Commodity Brokers		($3,006,978)	($2,785,077)	($5,792,054)
459	Insurance Carriers		($687,117)	($7,876,721)	($8,563,838)
460	Insurance Agents and Brokers		($117,095)	($1,342,310)	($1,459,405)
461	Real estate		($8,323,096)	($44,400,066)	($52,723,163)
463	Hotels and Lodging Places		($1,738,089)	($1,364,561)	($3,102,649)
464	Personal services		($648,513)	($4,903,399)	($5,551,912)
469	Business services		($38,173,940)	($13,079,527)	($51,253,467)
477	Automotive services		($7,751,982)	($3,348,090)	($11,100,072)
480	Repair services		($2,391,485)	($999,798)	($3,391,282)
483	Motion Pictures		($589,033)	($1,895,272)	($2,484,305)
484	Recreation services		($630,106)	($6,009,140)	($6,639,246)
490	Health services		($117,811)	($41,634,723)	($41,752,534)
494	Legal Services		($4,977,683)	($4,618,777)	($9,596,460)
495	Education services		($418,567)	($3,988,380)	($4,406,947)
498	Social services		($634,595)	($6,011,824)	($6,646,419)
502	Non-profit organizations		($701,524)	($5,098,172)	($5,799,697)
506	Professional services		($11,388,337)	($5,456,530)	($16,844,867)
510	State & local non-ed government		($3,159,929)	($4,388,033)	($7,547,962)
513	Federal non-military		($2,057,830)	($2,036,103)	($4,093,933)
516	Special sectors		$0	$0	$0
519	Federal Government - Military		$0	$0	$0
522	State & Local Government - Education		$0	$0	$0
525	Domestic Services		$0	($477,079)	($477,079)
25001	Foreign Trade		$0	$0	$0
28001	Domestic Trade		$0	$0	$0
	Total	**($2,346,407,333)**	**($425,764,454)**	**($308,241,094)**	**($3,080,412,881)**

2020 – Wayne County – Employment Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	-66	0	0	-66
24	Forestry Products	-15	0	0	-15
25	Commercial Fishing	0	0	0	0
26	Ag Services	-93	-1	0	-94
28	Metal mining	0	0	0	0
37	Coal Mining	0	0	0	0
38	Oil mining	0	0	0	0
40	Non-metal mining	0	0	0	0
48	Construction	0	-2	-1	-3
58	Food processing	0	0	-1	-1
104	Tobacco mfg	0	0	0	0
108	Textiles	0	0	0	0
124	Apparel	0	0	0	0
133	Wood products	0	0	0	0
148	Furniture	0	-1	0	-1
161	Pulp and paper	0	0	0	0
174	Printing and publishing	0	-1	0	-1
186	Chemicals and allied	0	-1	0	-1
210	Petroleum products	0	0	0	0
215	Rubber products	0	0	0	0
221	Leather products	0	0	0	0
230	Stone, glass and clay	0	-1	0	-1
254	Primary metals	-6	-1	0	-6
273	Fabricated metal	-10	-3	0	-12
307	Industrial machinery	-49	-4	0	-53
355	Electrical equipment	-62	-1	0	-63
384	Transportation equipment	-213	-5	0	-219
400	Scientific instruments	0	0	0	0
415	Miscellaneous mfg	-95	0	0	-95
433	Railroads and Related Services	0	0	0	0
434	Local, Interurban Passenger Transit	0	0	0	0
435	Motor Freight Transport and Warehousing	0	-4	-1	-4
436	Water Transportation	0	0	0	0
437	Air Transportation	0	0	0	-1
438	Pipe Lines, Except Natural Gas	0	0	0	0
439	Transportation Services	0	0	0	0
441	Communications	0	-1	-1	-1
443	Utilities	0	-1	-1	-1
447	Wholesale Trade	0	-12	-2	-14
448	Retail Trade	0	-2	-27	-29
456	Banking	0	-1	-1	-2
457	Credit Agencies	0	-2	-1	-3
458	Security and Commodity Brokers	0	0	0	-1
459	Insurance Carriers	0	0	-1	-1
460	Insurance Agents and Brokers	0	0	0	0
461	Real estate	0	0	-2	-2
463	Hotels and Lodging Places	0	-1	-1	-2
464	Personal services	0	0	-3	-3
469	Business services	0	-13	-4	-17
477	Automotive services	0	-3	-1	-4
480	Repair services	0	-1	0	-1
483	Motion Pictures	0	0	0	-1
484	Recreation services	0	0	-3	-3
490	Health services	0	0	-13	-14
494	Legal Services	0	-1	-1	-2
495	Education services	0	0	-3	-3
498	Social services	0	0	-4	-4
502	Non-profit organizations	0	0	-2	-3
506	Professional services	0	-4	-1	-5
510	State & local non-ed government	0	-1	-1	-2
513	Federal non-military	0	-1	-1	-1
516	Special sectors	0	0	0	0
519	Federal Government - Military	0	0	0	0
522	State & Local Government - Education	0	0	0	0
525	Domestic Services	0	0	-1	-1
25001	Foreign Trade	0	0	0	0
28001	Domestic Trade	0	0	0	0
	Total	**-608**	**-72**	**-80**	**-760**

2030 – Wayne County – Employment Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	-363	0	0	-363
24	Forestry Products	-80	0	0	-80
25	Commercial Fishing	0	0	0	0
26	Ag Services	-511	-4	-1	-516
28	Metal mining	0	0	0	0
37	Coal Mining	0	0	0	0
38	Oil mining	0	0	0	0
40	Non-metal mining	0	0	0	0
48	Construction	0	-10	-4	-13
58	Food processing	0	0	-3	-3
104	Tobacco mfg	0	0	0	0
108	Textiles	0	0	0	0
124	Apparel	0	-1	-1	-2
133	Wood products	0	-1	0	-1
148	Furniture	0	-6	-1	-7
161	Pulp and paper	0	-1	-1	-2
174	Printing and publishing	0	-4	-2	-5
186	Chemicals and allied	0	-3	-2	-4
210	Petroleum products	0	0	0	-1
215	Rubber products	0	0	0	0
221	Leather products	0	0	0	0
230	Stone, glass and clay	0	-3	0	-4
254	Primary metals	-31	-5	0	-36
273	Fabricated metal	-53	-14	0	-67
307	Industrial machinery	-296	-24	-1	-321
355	Electrical equipment	-377	-7	0	-384
384	Transportation equipment	-986	-27	-2	-1,014
400	Scientific instruments	0	-2	0	-3
415	Miscellaneous mfg	-622	0	0	-622
433	Railroads and Related Services	0	0	0	0
434	Local, Interurban Passenger Transit	0	-1	-1	-2
435	Motor Freight Transport and Warehousing	0	-18	-4	-22
436	Water Transportation	0	0	0	0
437	Air Transportation	0	-2	-1	-3
438	Pipe Lines, Except Natural Gas	0	0	0	0
439	Transportation Services	0	-2	-1	-2
441	Communications	0	-4	-3	-7
443	Utilities	0	-3	-3	-6
447	Wholesale Trade	0	-60	-11	-71
448	Retail Trade	0	-10	-139	-149
456	Banking	0	-6	-5	-11
457	Credit Agencies	0	-10	-6	-16
458	Security and Commodity Brokers	0	-2	-1	-3
459	Insurance Carriers	0	-1	-5	-6
460	Insurance Agents and Brokers	0	0	-2	-2
461	Real estate	0	-2	-9	-11
463	Hotels and Lodging Places	0	-6	-4	-10
464	Personal services	0	-2	-13	-16
469	Business services	0	-68	-19	-87
477	Automotive services	0	-13	-4	-18
480	Repair services	0	-4	-1	-6
483	Motion Pictures	0	-1	-2	-3
484	Recreation services	0	-2	-14	-15
490	Health services	0	0	-68	-68
494	Legal Services	0	-7	-5	-12
495	Education services	0	-2	-14	-15
498	Social services	0	-1	-19	-20
502	Non-profit organizations	0	-2	-11	-13
506	Professional services	0	-18	-7	-26
510	State & local non-ed government	0	-6	-7	-13
513	Federal non-military	0	-4	-3	-7
516	Special sectors	0	0	0	0
519	Federal Government - Military	0	0	0	0
522	State & Local Government - Education	0	0	0	0
525	Domestic Services	0	0	-5	-5
25001	Foreign Trade	0	0	0	0
28001	Domestic Trade	0	0	0	0
	Total	**-3,318**	**-371**	**-406**	**-4,095**

2020 – Wayne County – Total Value Added Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($779,389)	($805)	($290)	($780,485)
24	Forestry Products	($629,647)	($2)	($3)	($629,651)
25	Commercial Fishing	$0	($0)	($2)	($3)
26	Ag Services	($2,302,741)	($16,473)	($2,790)	($2,322,004)
28	Metal mining	$0	($3)	($0)	($3)
37	Coal Mining	$0	$0	$0	$0
38	Oil mining	$0	($820)	($685)	($1,505)
40	Non-metal mining	$0	($847)	($287)	($1,134)
48	Construction	$0	($105,735)	($40,413)	($146,149)
58	Food processing	$0	($8,090)	($52,578)	($60,668)
104	Tobacco mfg	$0	$0	$0	$0
108	Textiles	$0	($109)	($47)	($155)
124	Apparel	$0	($13,513)	($8,938)	($22,451)
133	Wood products	$0	($5,559)	($945)	($6,504)
148	Furniture	$0	($89,394)	($9,225)	($98,619)
161	Pulp and paper	$0	($16,238)	($5,604)	($21,842)
174	Printing and publishing	$0	($49,743)	($22,540)	($72,283)
186	Chemicals and allied	$0	($157,141)	($74,205)	($231,346)
210	Petroleum products	$0	($16,471)	($11,819)	($28,291)
215	Rubber products	$0	($2,884)	($412)	($3,296)
221	Leather products	$0	($25)	($197)	($222)
230	Stone, glass and clay	$0	($82,614)	($8,451)	($91,065)
254	Primary metals	($488,915)	($72,775)	($868)	($562,558)
273	Fabricated metal	($801,493)	($219,583)	($5,573)	($1,026,649)
307	Industrial machinery	($3,824,367)	($334,228)	($10,660)	($4,169,255)
355	Electrical equipment	($4,316,836)	($79,129)	($4,081)	($4,400,046)
384	Transportation equipment	($41,504,605)	($1,037,135)	($59,769)	($42,601,507)
400	Scientific instruments	$0	($31,611)	($3,018)	($34,629)
415	Miscellaneous mfg	($4,751,992)	($1,689)	($492)	($4,754,173)
433	Railroads and Related Services	$0	($25,022)	($5,612)	($30,634)
434	Local, Interurban Passenger Transit	$0	($3,360)	($6,055)	($9,415)
435	Motor Freight Transport and Warehousing	$0	($217,459)	($46,750)	($264,210)
436	Water Transportation	$0	($1,309)	($1,031)	($2,339)
437	Air Transportation	$0	($32,216)	($14,062)	($46,277)
438	Pipe Lines, Except Natural Gas	$0	($504)	($529)	($1,033)
439	Transportation Services	$0	($19,239)	($8,158)	($27,397)
441	Communications	$0	($96,130)	($84,275)	($180,405)
443	Utilities	$0	($147,865)	($148,508)	($296,373)
447	Wholesale Trade	$0	($1,089,118)	($196,113)	($1,285,231)
448	Retail Trade	$0	($60,479)	($838,865)	($899,344)
456	Banking	$0	($171,716)	($163,879)	($335,596)
457	Credit Agencies	$0	($61,788)	($39,698)	($101,486)
458	Security and Commodity Brokers	$0	($26,623)	($20,848)	($47,471)
459	Insurance Carriers	$0	($11,790)	($110,857)	($122,647)
460	Insurance Agents and Brokers	$0	($2,467)	($23,193)	($25,660)
461	Real estate	$0	($158,906)	($755,533)	($914,439)
463	Hotels and Lodging Places	$0	($40,391)	($25,450)	($65,841)
464	Personal services	$0	($9,104)	($55,494)	($64,598)
469	Business services	$0	($527,490)	($151,968)	($679,459)
477	Automotive services	$0	($150,843)	($49,455)	($200,297)
480	Repair services	$0	($34,114)	($11,730)	($45,844)
483	Motion Pictures	$0	($5,884)	($16,114)	($21,998)
484	Recreation services	$0	($11,136)	($88,036)	($99,172)
490	Health services	$0	($2,046)	($640,873)	($642,919)
494	Legal Services	$0	($102,371)	($79,478)	($181,849)
495	Education services	$0	($9,937)	($71,286)	($81,223)
498	Social services	$0	($9,598)	($94,726)	($104,324)
502	Non-profit organizations	$0	($8,160)	($46,959)	($55,119)
506	Professional services	$0	($176,817)	($72,376)	($249,193)
510	State & local non-ed government	$0	($63,226)	($80,358)	($143,584)
513	Federal non-military	$0	($48,644)	($42,223)	($90,867)
516	Special sectors	$0	$0	$0	$0
519	Federal Government - Military	$0	$0	$0	$0
522	State & Local Government - Education	$0	$0	$0	$0
525	Domestic Services	$0	$0	($11,801)	($11,801)
25001	Foreign Trade	$0	$0	$0	$0
28001	Domestic Trade	$0	$0	$0	$0
	Total	**($59,399,986)**	**($5,668,369)**	**($4,326,187)**	**($69,394,538)**

2030 – Wayne County – Total Value Added Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($4,276,185)	($3,991)	($1,469)	($4,281,645)
24	Forestry Products	($3,313,191)	($7)	($13)	($3,313,211)
25	Commercial Fishing	$0	($1)	($12)	($13)
26	Ag Services	($12,634,183)	($106,519)	($14,109)	($12,754,811)
28	Metal mining	$0	($18)	($0)	($19)
37	Coal Mining	$0	$0	$0	$0
38	Oil mining	$0	($4,318)	($3,463)	($7,781)
40	Non-metal mining	$0	($4,238)	($1,452)	($5,690)
48	Construction	$0	($563,325)	($204,372)	($767,697)
58	Food processing	$0	($51,653)	($265,897)	($317,550)
104	Tobacco mfg	$0	$0	$0	$0
108	Textiles	$0	($506)	($236)	($741)
124	Apparel	$0	($66,159)	($45,198)	($111,357)
133	Wood products	$0	($24,665)	($4,780)	($29,445)
148	Furniture	$0	($448,994)	($46,651)	($495,645)
161	Pulp and paper	$0	($74,352)	($28,339)	($102,690)
174	Printing and publishing	$0	($250,647)	($113,986)	($364,632)
186	Chemicals and allied	$0	($728,322)	($375,267)	($1,103,589)
210	Petroleum products	$0	($85,114)	($59,772)	($144,887)
215	Rubber products	$0	($15,096)	($2,084)	($17,180)
221	Leather products	$0	($88)	($998)	($1,086)
230	Stone, glass and clay	$0	($442,152)	($42,739)	($484,891)
254	Primary metals	($2,719,436)	($403,785)	($4,392)	($3,127,612)
273	Fabricated metal	($4,458,056)	($1,154,624)	($28,183)	($5,640,863)
307	Industrial machinery	($23,279,645)	($1,912,853)	($53,909)	($25,246,409)
355	Electrical equipment	($26,277,398)	($459,351)	($20,639)	($26,757,385)
384	Transportation equipment	($192,146,713)	($5,235,032)	($302,252)	($197,684,002)
400	Scientific instruments	$0	($162,325)	($15,260)	($177,584)
415	Miscellaneous mfg	($31,253,430)	($4,901)	($2,486)	($31,260,817)
433	Railroads and Related Services	$0	($133,393)	($28,378)	($161,771)
434	Local, Interurban Passenger Transit	$0	($17,490)	($30,621)	($48,111)
435	Motor Freight Transport and Warehousing	$0	($1,129,195)	($236,420)	($1,365,615)
436	Water Transportation	$0	($7,030)	($5,212)	($12,241)
437	Air Transportation	$0	($160,450)	($71,109)	($231,559)
438	Pipe Lines, Except Natural Gas	$0	($2,582)	($2,675)	($5,256)
439	Transportation Services	$0	($99,954)	($41,256)	($141,210)
441	Communications	$0	($498,404)	($426,187)	($924,591)
443	Utilities	$0	($806,391)	($751,026)	($1,557,418)
447	Wholesale Trade	$0	($5,694,067)	($991,758)	($6,685,825)
448	Retail Trade	$0	($312,230)	($4,242,181)	($4,554,412)
456	Banking	$0	($893,378)	($828,759)	($1,722,137)
457	Credit Agencies	$0	($310,255)	($200,754)	($511,009)
458	Security and Commodity Brokers	$0	($137,272)	($105,432)	($242,703)
459	Insurance Carriers	$0	($61,154)	($560,595)	($621,748)
460	Insurance Agents and Brokers	$0	($12,794)	($117,287)	($130,081)
461	Real estate	$0	($862,097)	($3,820,768)	($4,682,865)
463	Hotels and Lodging Places	$0	($211,535)	($128,699)	($340,233)
464	Personal services	$0	($45,448)	($280,633)	($326,081)
469	Business services	$0	($2,667,824)	($768,511)	($3,436,335)
477	Automotive services	$0	($751,361)	($250,092)	($1,001,453)
480	Repair services	$0	($183,703)	($59,320)	($243,023)
483	Motion Pictures	$0	($29,162)	($81,485)	($110,648)
484	Recreation services	$0	($51,436)	($445,193)	($496,628)
490	Health services	$0	($13,495)	($3,240,954)	($3,254,448)
494	Legal Services	$0	($513,037)	($401,926)	($914,962)
495	Education services	$0	($50,967)	($360,485)	($411,452)
498	Social services	$0	($30,995)	($479,021)	($510,017)
502	Non-profit organizations	$0	($42,196)	($237,472)	($279,668)
506	Professional services	$0	($901,324)	($366,009)	($1,267,333)
510	State & local non-ed government	$0	($331,340)	($406,375)	($737,716)
513	Federal non-military	$0	($237,778)	($213,522)	($451,300)
516	Special sectors	$0	$0	$0	$0
519	Federal Government - Military	$0	$0	$0	$0
522	State & Local Government - Education	$0	$0	$0	$0
525	Domestic Services	$0	$0	($59,674)	($59,674)
25001	Foreign Trade	$0	$0	$0	$0
28001	Domestic Trade	$0	$0	$0	$0
	Total	**($300,358,236)**	**($29,402,775)**	**($21,877,744)**	**($351,638,759)**

2020 – Wayne County – Output Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($3,666,746)	($3,790)	($1,367)	($3,671,902)
24	Forestry Products	($689,435)	($2)	($3)	($689,440)
25	Commercial Fishing		($0)	($3)	($3)
26	Ag Services	($3,666,746)	($26,230)	($4,443)	($3,697,419)
28	Metal mining		($13)	($0)	($14)
37	Coal Mining		$0	$0	$0
38	Oil mining		($1,379)	($1,152)	($2,530)
40	Non-metal mining		($1,293)	($438)	($1,731)
48	Construction		($237,178)	($90,652)	($327,830)
58	Food processing		($26,391)	($171,532)	($197,924)
104	Tobacco mfg		$0	$0	$0
108	Textiles		($221)	($95)	($316)
124	Apparel		($44,473)	($29,415)	($73,889)
133	Wood products		($14,226)	($2,419)	($16,645)
148	Furniture		($241,937)	($24,967)	($266,904)
161	Pulp and paper		($59,407)	($20,501)	($79,907)
174	Printing and publishing		($97,010)	($43,959)	($140,969)
186	Chemicals and allied		($408,676)	($192,984)	($601,659)
210	Petroleum products		($90,976)	($65,283)	($156,259)
215	Rubber products		($7,266)	($1,039)	($8,305)
221	Leather products		($63)	($496)	($559)
230	Stone, glass and clay		($153,109)	($15,663)	($168,772)
254	Primary metals	($1,824,147)	($271,525)	($3,240)	($2,098,913)
273	Fabricated metal	($1,824,147)	($499,757)	($12,684)	($2,336,588)
307	Industrial machinery	($10,441,342)	($912,515)	($29,105)	($11,382,962)
355	Electrical equipment	($10,441,342)	($191,394)	($9,871)	($10,642,607)
384	Transportation equipment	($125,191,579)	($3,128,342)	($180,284)	($128,500,204)
400	Scientific instruments		($82,718)	($7,896)	($90,613)
415	Miscellaneous mfg	($9,180,018)	($3,264)	($950)	($9,184,231)
433	Railroads and Related Services		($34,088)	($7,645)	($41,733)
434	Local, Interurban Passenger Transit		($5,423)	($9,773)	($15,196)
435	Motor Freight Transport and Warehousing		($448,979)	($96,524)	($545,502)
436	Water Transportation		($4,925)	($3,878)	($8,803)
437	Air Transportation		($50,442)	($22,017)	($72,458)
438	Pipe Lines, Except Natural Gas		($649)	($681)	($1,331)
439	Transportation Services		($25,909)	($10,987)	($36,896)
441	Communications		($175,796)	($154,116)	($329,912)
443	Utilities		($283,553)	($284,786)	($568,339)
447	Wholesale Trade		($1,569,880)	($282,682)	($1,852,562)
448	Retail Trade		($84,688)	($1,174,654)	($1,259,342)
456	Banking		($259,305)	($247,471)	($506,777)
457	Credit Agencies		($98,286)	($63,148)	($161,434)
458	Security and Commodity Brokers		($67,292)	($52,696)	($119,989)
459	Insurance Carriers		($18,771)	($176,505)	($195,276)
460	Insurance Agents and Brokers		($3,135)	($29,482)	($32,617)
461	Real estate		($213,368)	($1,014,474)	($1,227,842)
463	Hotels and Lodging Places		($65,376)	($41,194)	($106,570)
464	Personal services		($15,475)	($94,328)	($109,802)
469	Business services		($762,365)	($219,635)	($982,000)
477	Automotive services		($243,965)	($79,985)	($323,950)
480	Repair services		($64,795)	($22,280)	($87,075)
483	Motion Pictures		($14,905)	($40,816)	($55,721)
484	Recreation services		($17,314)	($136,877)	($154,191)
490	Health services		($3,105)	($972,465)	($975,570)
494	Legal Services		($131,462)	($102,063)	($233,526)
495	Education services		($15,730)	($112,842)	($128,572)
498	Social services		($17,521)	($172,923)	($190,444)
502	Non-profit organizations		($19,994)	($115,063)	($135,057)
506	Professional services		($298,524)	($122,194)	($420,718)
510	State & local non-ed government		($84,509)	($107,408)	($191,917)
513	Federal non-military		($55,224)	($47,934)	($103,157)
516	Special sectors		$0	$0	$0
519	Federal Government - Military		$0	$0	$0
522	State & Local Government - Education		$0	$0	$0
525	Domestic Services		$0	($11,789)	($11,789)
25001	Foreign Trade		$0	$0	$0
28001	Domestic Trade		$0	$0	$0
	Total	**($166,925,503)**	**($11,657,907)**	**($6,941,753)**	**($185,525,163)**

2030 – Wayne County – Output Impact

Industry		Direct	Indirect	Induced	Total
1	Farms	($20,117,909)	($18,777)	($6,911)	($20,143,597)
24	Forestry Products	($3,627,797)	($8)	($14)	($3,627,819)
25	Commercial Fishing		($1)	($13)	($14)
26	Ag Services	($20,117,909)	($169,614)	($22,467)	($20,309,991)
28	Metal mining		($77)	($2)	($79)
37	Coal Mining		$0	$0	$0
38	Oil mining		($7,261)	($5,824)	($13,085)
40	Non-metal mining		($6,469)	($2,216)	($8,685)
48	Construction		($1,263,612)	($458,433)	($1,722,044)
58	Food processing		($168,514)	($867,463)	($1,035,977)
104	Tobacco mfg		$0	$0	$0
108	Textiles		($1,028)	($479)	($1,507)
124	Apparel		($217,739)	($148,752)	($366,491)
133	Wood products		($63,118)	($12,233)	($75,351)
148	Furniture		($1,215,160)	($126,255)	($1,341,415)
161	Pulp and paper		($272,009)	($103,674)	($375,684)
174	Printing and publishing		($488,822)	($222,300)	($711,122)
186	Chemicals and allied		($1,894,140)	($975,952)	($2,870,091)
210	Petroleum products		($470,119)	($330,143)	($800,262)
215	Rubber products		($38,037)	($5,252)	($43,289)
221	Leather products		($222)	($2,510)	($2,732)
230	Stone, glass and clay		($819,449)	($79,209)	($898,658)
254	Primary metals	($10,146,253)	($1,506,527)	($16,385)	($11,669,165)
273	Fabricated metal	($10,146,253)	($2,627,851)	($64,142)	($12,838,246)
307	Industrial machinery	($63,558,426)	($5,222,500)	($147,184)	($68,928,111)
355	Electrical equipment	($63,558,426)	($1,111,054)	($49,920)	($64,719,400)
384	Transportation equipment	($579,577,887)	($15,790,583)	($911,692)	($596,280,161)
400	Scientific instruments		($424,758)	($39,930)	($464,688)
415	Miscellaneous mfg	($60,376,157)	($9,468)	($4,802)	($60,390,428)
433	Railroads and Related Services		($181,721)	($38,660)	($220,381)
434	Local, Interurban Passenger Transit		($28,229)	($49,424)	($77,653)
435	Motor Freight Transport and Warehousing		($2,331,399)	($488,125)	($2,819,524)
436	Water Transportation		($26,454)	($19,612)	($46,066)
437	Air Transportation		($251,223)	($111,337)	($362,561)
438	Pipe Lines, Except Natural Gas		($3,325)	($3,445)	($6,771)
439	Transportation Services		($134,611)	($55,561)	($190,173)
441	Communications		($911,446)	($779,380)	($1,690,826)
443	Utilities		($1,546,375)	($1,440,205)	($2,986,580)
447	Wholesale Trade		($8,207,563)	($1,429,544)	($9,637,106)
448	Retail Trade		($437,213)	($5,940,284)	($6,377,496)
456	Banking		($1,349,073)	($1,251,493)	($2,600,566)
457	Credit Agencies		($493,524)	($319,341)	($812,865)
458	Security and Commodity Brokers		($346,972)	($266,492)	($613,464)
459	Insurance Carriers		($97,367)	($892,567)	($989,934)
460	Insurance Agents and Brokers		($16,263)	($149,085)	($165,348)
461	Real estate		($1,157,561)	($5,130,248)	($6,287,809)
463	Hotels and Lodging Places		($342,390)	($208,311)	($550,702)
464	Personal services		($77,252)	($477,017)	($554,268)
469	Business services		($3,855,720)	($1,110,703)	($4,966,423)
477	Automotive services		($1,215,212)	($404,485)	($1,619,697)
480	Repair services		($348,919)	($112,670)	($461,588)
483	Motion Pictures		($73,869)	($206,404)	($280,273)
484	Recreation services		($79,971)	($692,178)	($772,149)
490	Health services		($20,477)	($4,917,847)	($4,938,325)
494	Legal Services		($658,827)	($516,141)	($1,174,968)
495	Education services		($80,678)	($570,628)	($651,306)
498	Social services		($56,582)	($874,457)	($931,038)
502	Non-profit organizations		($103,392)	($581,871)	($685,263)
506	Professional services		($1,521,725)	($617,942)	($2,139,667)
510	State & local non-ed government		($442,876)	($543,170)	($986,046)
513	Federal non-military		($269,939)	($242,402)	($512,342)
516	Special sectors		$0	$0	$0
519	Federal Government - Military		$0	$0	$0
522	State & Local Government - Education		$0	$0	$0
525	Domestic Services		$0	($59,613)	($59,613)
25001	Foreign Trade		$0	$0	$0
28001	Domestic Trade		$0	$0	$0
	Total	**($831,227,018)**	**($60,475,068)**	**($35,104,798)**	**($926,806,884)**

2020 – Canada – Employment Impact

Industry		Direct	Indirect	Total
1A	Crop and Animal Production	-831	-266	-1,097
1B	Forestry and Logging	-128	-29	-157
1C	Fishing, Hunting and Trapping	0	0	0
1D	Support Activities for Agriculture and Forestry	-179	-45	-225
21	Mining and Oil and Gas Extraction	-4	-48	-53
22	Utilities	-2	-32	-34
23	Construction	0	-63	-63
3A	Manufacturing	-1,207	-496	-1,702
41	Wholesale Trade	-275	-204	-479
4A	Retail Trade	-816	-94	-909
4B	Transportation and Warehousing	-3	-251	-254
51	Information and Cultural Industries	-8	-59	-67
5A	Finance, Insurance, Real Estate and Renting and Leasing	-2	-181	-183
54	Professional, Scientific and Technical Services	-386	-239	-625
56	Administrative and Support, Waste Management and Remediation Services	0	-134	-134
61	Education Services	0	-10	-10
62	Health Care and Social Assistance	0	-5	-5
71	Arts, Entertainment and Recreation	-3	-6	-9
72	Accommodation and Food Services	-2	-35	-37
81	Other Services (Except Public Administration)	-21	-101	-123
F1	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0
F2	Travel, Entertainment, Advertising and Promotion	0	0	0
F3	Transportation Margins	0	0	0
NP	Non-Profit Institutions Serving Households	0	-1	-1
GS	Government Sector	-2	-38	-40
Total		**-3,870**	**-2,336**	**-6,206**

2030 – Canada – Employment Impact

Industry		Direct	Indirect	Total
1A	Crop and Animal Production	-4,903	-1,566	-6,468
1B	Forestry and Logging	-718	-167	-885
1C	Fishing, Hunting and Trapping	0	-1	-1
1D	Support Activities for Agriculture and Forestry	-1,059	-263	-1,322
21	Mining and Oil and Gas Extraction	-28	-293	-321
22	Utilities	-11	-180	-191
23	Construction	0	-352	-352
3A	Manufacturing	-6,812	-2,545	-9,357
41	Wholesale Trade	-1,518	-1,139	-2,656
4A	Retail Trade	-4,459	-528	-4,986
4B	Transportation and Warehousing	-19	-1,401	-1,420
51	Information and Cultural Industries	-45	-327	-373
5A	Finance, Insurance, Real Estate and Renting and Leasing	-12	-1,006	-1,018
54	Professional, Scientific and Technical Services	-2,280	-1,299	-3,579
56	Administrative and Support, Waste Management and Remediation Services	0	-739	-739
61	Education Services	0	-54	-54
62	Health Care and Social Assistance	0	-30	-30
71	Arts, Entertainment and Recreation	-15	-35	-50
72	Accommodation and Food Services	-9	-197	-206
81	Other Services (Except Public Administration)	-117	-571	-688
F1	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0
F2	Travel, Entertainment, Advertising and Promotion	0	0	0
F3	Transportation Margins	0	0	0
NP	Non-Profit Institutions Serving Households	0	-4	-4
GS	Government Sector	-9	-217	-225
Total		**-22,013**	**-12,913**	**-34,926**

2020 – Canada – Impact on GDP

Industry		Direct	Indirect	Total
1A	Crop and Animal Production	($23,751,831)	($8,692,186)	($32,444,017)
1B	Forestry and Logging	($9,730,770)	($2,211,931)	($11,942,701)
1C	Fishing, Hunting and Trapping	$0	($9,427)	($9,427)
1D	Support Activities for Agriculture and Forestry	($6,903,210)	($1,667,465)	($8,570,674)
21	Mining and Oil and Gas Extraction	($643,646)	($12,015,228)	($12,658,874)
22	Utilities	($448,154)	($7,294,036)	($7,742,191)
23	Construction	$0	($3,436,083)	($3,436,083)
3A	Manufacturing	($104,746,432)	($40,401,313)	($145,147,745)
41	Wholesale Trade	($18,169,808)	($13,370,523)	($31,540,331)
4A	Retail Trade	($24,153,152)	($2,740,264)	($26,893,416)
4B	Transportation and Warehousing	($217,998)	($13,253,338)	($13,471,336)
51	Information and Cultural Industries	($482,461)	($5,868,578)	($6,351,039)
5A	Finance, Insurance, Real Estate and Renting and Leasing	($164,699)	($19,779,865)	($19,944,564)
54	Professional, Scientific and Technical Services	($16,746,457)	($11,571,663)	($28,318,121)
56	Administrative and Support, Waste Management and Remediation Services	$0	($4,719,632)	($4,719,632)
61	Education Services	$0	($235,235)	($235,2350)
62	Health Care and Social Assistance	$0	($299,483)	($299,483)
71	Arts, Entertainment and Recreation	($84,543)	($185,423)	($269,966)
72	Accommodation and Food Services	($44,791)	($1,006,749)	($1,051,541)
81	Other Services (Except Public Administration)	($708,162)	($2,866,697)	($3,574,859)
F1	Operating, Office, Cafeteria and Laboratory Supplies	$0	$0	$0
F2	Travel, Entertainment, Advertising and Promotion	$0	$0	$0
F3	Transportation Margins	$0	$0	$0
NP	Non-Profit Institutions Serving Households	$0	($21,457)	($21,457)
GS	Government Sector	($79,985)	($2,023,963)	($2,103,949)
Total		**($207,076,100)**	**($153,670,541)**	**($360,746,641)**

2030 – Canada – Impact on GDP

Industry		Direct	Indirect	Total
1A	Crop and Animal Production	($140,018,524)	($51,245,914)	($191,264,438)
1B	Forestry and Logging	($54,560,575)	($12,612,931)	($67,173,506)
1C	Fishing, Hunting and Trapping	$0	($55,212)	($55,212)
1D	Support Activities for Agriculture and Forestry	($40,753,546)	($9,699,450)	($50,452,997)
21	Mining and Oil and Gas Extraction	($4,178,716)	($75,491,021)	($79,669,737)
22	Utilities	($2,463,368)	($41,635,946)	($44,099,314)
23	Construction	$0	($19,362,867)	($19,362,867)
3A	Manufacturing	($557,774,632)	($207,187,617)	($764,962,249)
41	Wholesale Trade	($100,186,654)	($74,750,274)	($174,936,928)
4A	Retail Trade	($132,005,394)	($15,420,051)	($147,425,444)
4B	Transportation and Warehousing	($1,305,938)	($74,065,750)	($75,371,687)
51	Information and Cultural Industries	($2,644,734)	($32,783,019)	($35,427,753)
5A	Finance, Insurance, Real Estate and Renting and Leasing	($902,074)	($110,190,932)	($111,093,006)
54	Professional, Scientific and Technical Services	($98,794,967)	($62,754,515)	($161,549,482)
56	Administrative and Support, Waste Management and Remediation Services	$0	($26,071,671)	($26,071,671)
61	Education Services	$0	($1,291,961)	($1,291,961)
62	Health Care and Social Assistance	$0	($1,714,392)	($1,714,392)
71	Arts, Entertainment and Recreation	($463,051)	($1,017,354)	($1,480,405)
72	Accommodation and Food Services	($245,327)	($5,640,226)	($5,885,553)
81	Other Services (Except Public Administration)	($3,878,673)	($16,125,099)	($20,003,772)
F1	Operating, Office, Cafeteria and Laboratory Supplies	$0	$0	$0
F2	Travel, Entertainment, Advertising and Promotion	$0	$0	$0
F3	Transportation Margins	$0	$0	$0
NP	Non-Profit Institutions Serving Households	$0	($121,264)	($121,264)
GS	Government Sector	($446,705)	($11,408,587)	($11,855,292)
Total		**($1,140,622,878)**	**($850,646,051)**	**($1,991,268,929)**

2020 – Province of Ontario – Employment Impact

Industry		Direct	Indirect	Total
1A	Crop and Animal Production	-535	-143	-677
1B	Forestry and Logging	-81	-16	-97
1C	Fishing, Hunting and Trapping	0	0	0
1D	Support Activities for Agriculture and Forestry	-117	-26	-143
21	Mining and Oil and Gas Extraction	-2	-9	-11
22	Utilities	-1	-17	-18
23	Construction	0	-34	-34
3A	Manufacturing	-678	-249	-927
41	Wholesale Trade	-167	-98	-265
4A	Retail Trade	-557	-50	-607
4B	Transportation and Warehousing	-2	-118	-120
51	Information and Cultural Industries	-6	-30	-35
5A	Finance, Insurance, Real Estate and Renting and Leasing	-1	-95	-96
54	Professional, Scientific and Technical Services	-264	-130	-394
56	Administrative and Support, Waste Management and Remediation Services	0	-71	-71
61	Education Services	0	-6	-6
62	Health Care and Social Assistance	0	-3	-3
71	Arts, Entertainment and Recreation	-2	-3	-5
72	Accommodation and Food Services	-1	-16	-17
81	Other Services (Except Public Administration)	-15	-56	-70
F1	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0
F2	Travel, Entertainment, Advertising and Promotion	0	0	0
F3	Transportation Margins	0	0	0
NP	Non-Profit Institutions Serving Households	0	0	0
GS	Government Sector	-1	-20	-21
Total		**-2,429**	**-1,190**	**-3,619**

2030 – Province of Ontario – Employment Impact

Industry		Direct	Indirect	Total
1A	Crop and Animal Production	-3,133	-837	-3,969
1B	Forestry and Logging	-449	-91	-540
1C	Fishing, Hunting and Trapping	0	0	0
1D	Support Activities for Agriculture and Forestry	-687	-148	-835
21	Mining and Oil and Gas Extraction	-15	-52	-67
22	Utilities	-7	-96	-103
23	Construction	0	-191	-191
3A	Manufacturing	-3,715	-1,236	-4,951
41	Wholesale Trade	-908	-537	-1,445
4A	Retail Trade	-3,024	-276	-3,301
4B	Transportation and Warehousing	-10	-654	-664
51	Information and Cultural Industries	-30	-163	-193
5A	Finance, Insurance, Real Estate and Renting and Leasing	-8	-516	-524
54	Professional, Scientific and Technical Services	-1,546	-693	-2,239
56	Administrative and Support, Waste Management and Remediation Services	0	-385	-385
61	Education Services	0	-32	-32
62	Health Care and Social Assistance	0	-18	-18
71	Arts, Entertainment and Recreation	-10	-17	-27
72	Accommodation and Food Services	-6	-90	-96
81	Other Services (Except Public Administration)	-79	-310	-390
F1	Operating, Office, Cafeteria and Laboratory Supplies	0	0	0
F2	Travel, Entertainment, Advertising and Promotion	0	0	0
F3	Transportation Margins	0	0	0
NP	Non-Profit Institutions Serving Households	0	-2	-2
GS	Government Sector	-6	-111	-117
Total		**-13,634**	**-6,454**	**-20,088**

2020 – Province of Ontario – Impact on GDP

Industry		Direct	Indirect	Total
1A	Crop and Animal Production	($14,789,544)	($4,569,167)	($19,358,711)
1B	Forestry and Logging	($6,124,492)	($1,238,052)	($7,362,544)
1C	Fishing, Hunting and Trapping	$0	($252)	($252)
1D	Support Activities for Agriculture and Forestry	($4,492,174)	($963,044)	($5,455,218)
21	Mining and Oil and Gas Extraction	($251,574)	($1,212,690)	($1,464,264)
22	Utilities	($304,391)	($3,613,068)	($3,917,459)
23	Construction	$0	($1,885,123)	($1,885,123)
3A	Manufacturing	($61,351,212)	($20,156,673)	($81,507,885)
41	Wholesale Trade	($11,121,020)	($6,505,491)	($17,626,512)
4A	Retail Trade	($16,489,746)	($1,481,200)	($17,970,947)
4B	Transportation and Warehousing	($106,834)	($6,102,960)	($6,209,794)
51	Information and Cultural Industries	($327,188)	($2,944,348)	($3,271,536)
5A	Finance, Insurance, Real Estate and Renting and Leasing	($112,446)	($11,089,333)	($11,201,779)
54	Professional, Scientific and Technical Services	($11,427,908)	($6,489,863)	($17,917,771)
56	Administrative and Support, Waste Management and Remediation Services	$0	($2,539,282)	($2,539,282)
61	Education Services	$0	($143,491)	($143,491)
62	Health Care and Social Assistance	$0	($175,521)	($175,521)
71	Arts, Entertainment and Recreation	($57,721)	($92,661)	($150,381)
72	Accommodation and Food Services	($30,581)	($469,511)	($500,092)
81	Other Services (Except Public Administration)	($483,487)	($1,584,338)	($2,067,826)
F1	Operating, Office, Cafeteria and Laboratory Supplies	$0	$0	$0
F2	Travel, Entertainment, Advertising and Promotion	$0	$0	$0
F3	Transportation Margins	$0	$0	$0
NP	Non-Profit Institutions Serving Households	$0	($12,234)	($12,234)
GS	Government Sector	($53,817)	($1,060,417)	($1,114,234)
Total		**($127,524,135)**	**($74,328,719)**	**($201,852,854)**

2030 – Province of Ontario – Impact on GDP

Industry		Direct	Indirect	Total
1A	Crop and Animal Production	($86,635,725)	($26,778,533)	($113,414,258)
1B	Forestry and Logging	($34,121,241)	($6,943,562)	($41,064,803)
1C	Fishing, Hunting and Trapping	$0	($1,332)	($1,332)
1D	Support Activities for Agriculture and Forestry	($26,350,973)	($5,565,813)	($31,916,786)
21	Mining and Oil and Gas Extraction	($1,557,555)	($7,139,245)	($8,696,800)
22	Utilities	($1,662,314)	($20,220,709)	($21,883,024)
23	Construction	$0	($10,478,059)	($10,478,059)
3A	Manufacturing	($317,283,317)	($99,482,309)	($416,765,626)
41	Wholesale Trade	($60,454,695)	($35,777,394)	($96,232,089)
4A	Retail Trade	($89,547,761)	($8,180,421)	($97,728,182)
4B	Transportation and Warehousing	($618,610)	($33,814,781)	($34,433,391)
51	Information and Cultural Industries	($1,781,450)	($16,189,036)	($17,970,486)
5A	Finance, Insurance, Real Estate and Renting and Leasing	($611,956)	($60,801,760)	($61,413,716)
54	Professional, Scientific and Technical Services	($66,988,889)	($34,552,567)	($101,541,455)
56	Administrative and Support, Waste Management and Remediation Services	$0	($13,730,719)	($13,730,719)
61	Education Services	$0	($778,033)	($778,033)
62	Health Care and Social Assistance	$0	($995,813)	($995,813)
71	Arts, Entertainment and Recreation	($314,128)	($499,608)	($813,736)
72	Accommodation and Food Services	($166,427)	($2,581,227)	($2,747,654)
81	Other Services (Except Public Administration)	($2,631,245)	($8,774,176)	($11,405,422)
F1	Operating, Office, Cafeteria and Laboratory Supplies	$0	$0	$0
F2	Travel, Entertainment, Advertising and Promotion	$0	$0	$0
F3	Transportation Margins	$0	$0	$0
NP	Non-Profit Institutions Serving Households	$0	($68,338)	($68,338)
GS	Government Sector	($298,393)	($5,884,663)	($6,183,056)
Total		**($691,024,679)**	**($399,238,098)**	**($1,090,262,777)**