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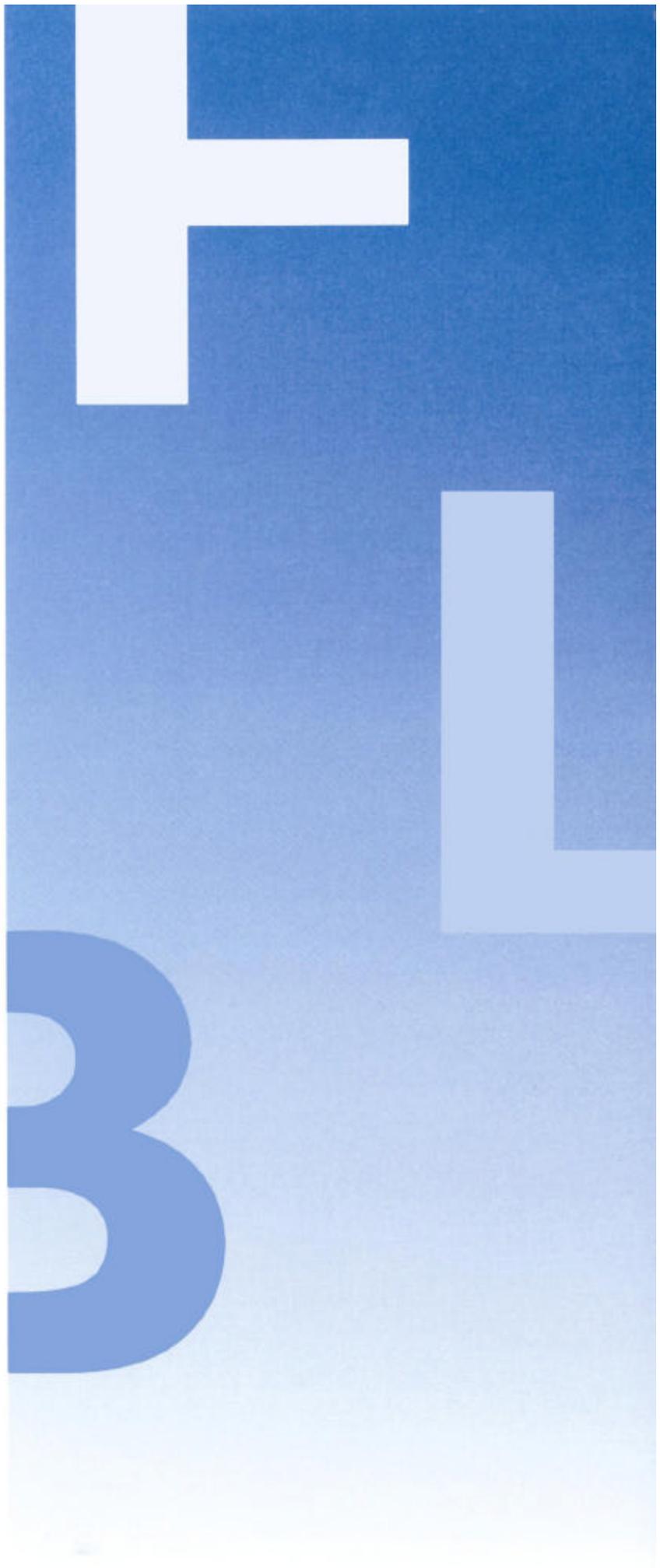
Estimating Economic Impacts of Border Wait Times at the San Diego- Baja California Border Region Framework

Technical Memorandum 1: Literature Review and Proposed Methodology

September 2004

HLB DECISION ECONOMICS INC.

RISK ANALYSIS • INVESTMENT AND FINANCE
• ECONOMICS AND POLICY



SAN DIEGO ASSOCIATION OF GOVERNMENTS

**ESTIMATING THE ECONOMIC IMPACTS OF
BORDER WAIT TIMES AT THE SAN DIEGO-BAJA
CALIFORNIA BORDER REGION FRAMEWORK**

TECHNICAL MEMORANDUM

**LITERATURE REVIEW AND
PROPOSED METHODOLOGY**

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1. INTRODUCTION

1.1 Background

An assessment by the U.S.-Mexico Border States, published by the U.S.-Mexico Border Governors Conference¹ concluded that, following the tragic events of September 11, 2001, the number of personal vehicles crossing the U.S.-Mexico border dropped significantly, while wait times increased. The San Ysidro/Puerta México border crossing has seen vehicle traffic fall about 30%, while border wait times at peak hours have increased to four hours. Vehicle traffic between the bridges connecting Texas and Mexico dropped by as much as 27% after 9/11 attacks. At Nogales, Arizona, personal vehicle crossings dropped by one-third from September to November.

As a result of the traffic congestion, many of those residents who work and shop in the United States are finding themselves looking for other means to quicken their northbound commute. Pedestrian crossings rose by the tens of thousands all along the border, while pedestrian crossing wait times increased to as much as two hours. Many border commuters have taken to riding bicycles. Commercial traffic has seen some slowdowns as well. Trucks must often wait as long as three to five hours to cross the international bridges of El Paso, compared to waits of up to one and a half hours before September 11. In New Mexico, trucks face crossing delays of three to four hours.

The reduction in cross-border traffic caused retail sales to decline in many U.S. border communities that depend on Mexican shoppers. In 2002 it was estimated that Mexican border residents spent up to \$3 billion on products and services annually in Southern California alone. Cross-border movements, in San Diego-Baja California region, generate significant revenues to the retail, hotel and lodging, and recreation sectors on *both* sides of the border. After the tragic events of 9/11, increased security measures have led to higher delays at the border, especially northbound. Increasing delays, however, constrain the growth of cross-border personal trip-making and result in significant economic impact in terms of output and employment losses.

1.2 Objective

The objective of this project is to assess the magnitude of this regional economic impact due to the delays experienced at the San Diego region-Baja California ports of entry. The success of this project, therefore, relies heavily on four factors:

- 1. Data Accuracy:** The results of this study would rely on the accuracy of the data to detect the true behavior of individuals crossing the regional borders on a daily basis. Therefore, the sample has to be statistically reliable and reflective of the volume by time of day, day of the week, and mode of transportation. The data collected, such as the sensitivity of travelers to delays, has to be compared to secondary data (elasticities from the literature) to ensure validity of the data. Other data such as the crossing volumes have to be collected from reliable official sources.
- 2. Methodology Transparency:** The methodology to estimate the economic impact has to be transparent, and theoretically and scientifically acceptable. A review and acceptance

¹ See the proceedings at: http://www.agr.state.tx.us/border/activities/jga_911_border_impact.htm. 2002

by a technical panel within SANDAG or other stakeholders will add credibility to the process.

3. **Model Reliability:** Once developed and validated, the economic impact methodology can be applied over time to assess the impact over time. The methodology can therefore be packaged in an easy to use software model that can be populated with updated data over time to track the economic impact as a result of different changes at the border².
4. **Accounting for uncertainty:** Given the nature of the economic impact estimation, there is an inherent level of uncertainty surrounding the assumptions and the methodology. Risk analysis has to be performed to account for the uncertainty and provide SANDAG with the range of the economic impact within a high level of certainty.

1.3 Project Tasks

To meet the objectives, discussed above, this project is conducted within nine main tasks:

Task 1: Literature Review and Proposed Approach: This task consists of a review of the literature, practice, research findings, and other information (including research in progress) related to economic impacts of border delays.

Task 2: Identification of Data Needs: The data needs task is used to refine the questionnaire to ensure the effective population of the model. In general, border crossing time, trip purposes and Origin/Destination (O/D) information will be obtained from the survey.

Task 3: Survey Instruments and Methodology: This task consists of the questionnaire design as well as the sampling method refinement to ensure that the sample is representative of border crossers within appropriate strata.

Task 4: Survey Pre-test & Modifications: Under this task, the team will conduct a pre-test that will involve an exact simulation of the actual survey procedures for 25 personal vehicles, 25 pedestrians, and 2 buses.

Task 5: Data Collection: Data will be collected in strict adherence to the sample design and the data collection protocol established for the study.

Task 6: Survey Data Entry & Validation: Completed interviews will be individually reviewed for completeness, accuracy and validity, then coded and entered into an electronic database on a daily basis, thereby allowing the team to quickly identify and adjust for any problems that may arise during data collection.

Task 7: Economic Model: Under this task, the model will be developed and refined to comprehensively assess the economic impact on both sides of the border regional economy due to delay at the border crossings.

² US Visit is planning several changes at the border that increase security while improving pedestrian and traffic flow. These changes include electronic visa forms, biometric identification, etc.

Task 8: Economic Model Update: Under this task, the model will be packaged in a spreadsheet format with a user-friendly interface that will allow the user to update the model with new data and re-estimate the impact on a continuous basis.

Task 9: Presentations at Committee Meeting: This task will include presentations to SANDAG and other stakeholders throughout the project schedule.

1.4 Plan of the Report

This report is the first deliverable of this project and it presents the detailed literature review and methodologies used in similar studies, along with a recommendation of the approach for estimating the economic impacts of border wait times on both sides of the San Diego-Baja California border. After this introductory chapter, Chapter 2 presents the literature review. Chapter 3 provides the detailed methodological approach while Chapter 4 presents the schedule for the data collection, the meetings and deliverables.

2. LITERATURE REVIEW

2.1 Overview

There are many studies that have been conducted since the events of September 11, 2001 have caused U.S border authorities to increase the inspection rigor with which both the flow of both persons and goods enter into the United States through its land ports of entry. Delays in the free-flowing passage have downstream impacts of many kinds. These studies cover both the Canadian and Mexican border crossings and have been conducted for a wide variety of purposes such as: estimating economic impact, environmental consequences, and highway safety effects as a result of the admission of Mexican trucks beyond the border area. Studies are not merely concerned with delays and their impacts, but uncertainty in the crossing times as well. As in other areas of transportation research, longer transit times are better tolerated if the *predictability* of the transit time is greater than if significant uncertainty exists as one approaches the border.

Not surprisingly, the bulk of the studies are concerned with effects of freight queue and processing times. The amount of freight moving across the land borders reflects an economic interdependence which, when delayed, disturbed or disrupted, has a significant downward impact on productivity and economic output on each side of the border. At the same time, there have been fewer studies which examine the passenger and pedestrian traffic delays. However, some of the more comprehensive studies whose focus is on freight movements contain a portion which addresses the effects of the impedance of the movement of people as well as goods.

In general, most of the studies were qualitative in nature and didn't rely on primary survey data. Three studies, however, stand as highly relevant to the study in hand. The first is the study by the Federal Highway Administration and Transport Canada to estimate the impact of border delay on tourism and freight movements. This study developed a strong analytical approach but mainly relied on secondary data and elasticities from existing literature. The second relevant study is a study by the Center of Border Economic Studies which used a comprehensive survey to assess the magnitude of expenditures of Mexican visitors on Southern Texas economy. The study was, however, more descriptive than analytical. The third study is a decade old study by San Diego Dialogue which used an extensive survey to provide detailed about the trips characteristics across the San Diego/Tijuana border. While the study provided detailed statistics by trip purpose and stressed the importance of the people flow, it didn't use any analytical framework to assess the magnitude of the economic impact of these trips on the region.

2.2 US-Canada Border Studies

2.2.1 Freight Impacts Study

Taylor and Robideaux and Jackson³ focused on the freight impacts to a large degree. The research methodology can be summarized as follows: In conducting this research a

³ Taylor, Dr. John C., Dr. Douglas R. Robideaux, Dr. George C. Jackson, *The U.S.-Canada Border: Cost Impacts, Causes, and Short to Long Term Management Options* prepared for the Michigan Department of Transportation, the U.S. Department of Transportation and the New York State Department of Transportation, May 21, 2003, <http://www.fhwa.dot.gov/uscanada/studies/taylor/>

combination of secondary source reviews and site visit/personal interviews were used. This information was used to make a variety of findings related to causes and solutions to border issues. The information gathered in these reviews was also used, along with a variety of assumptions, to identify categories of cost impacts at both the macro and detailed levels, and to make cost estimates for each category of potential costs. Examples of specific cost impacts at the detailed level include primary booth transit time (backups), secondary inspection yard processing time, reduced cycles for carriers, lost productivity from reduced trade, higher inventory carrying costs, customs administration costs, brokerage costs, payment of duties, and federal inspection services (FIS) staff costs.

2.2.2 Non-Commercial Traffic at the St. Stephen – Calais Study

A number of studies have been conducted which addressed the issue of non-commercial traffic and the impacts of increased delays and unpredictability. Among them, a series of studies were performed on the subject of the St. Stephen – Calais crossing between Maine and New Brunswick. The major study⁴ focused on the facility and surrounding impacts on local towns. Discussion of freight movements address concerns of increasing shipments of hazardous materials and the threats they pose, especially when mixing with a substantial number of non-commercial vehicles under congested conditions. The importance of the St. Stephen – Calais border crossing has long been recognized as a key link in the international trade corridor between Atlantic Canada and the eastern United States. This border crossing provides the necessary linkage between U.S. Routes 1 and 9 in Maine, and Routes 1 and 3 in New Brunswick, and is the 8th busiest border crossing between Canada and the United States.

The traffic congestion and extensive delay associated with the current border crossing at Ferry Point, along with the growing safety concern with the movement of hazardous goods and materials, has led to the recognition that a new border crossing, removed from the development and restrictive downtown street network in the St. Stephen – Calais communities, is the only viable solution. Much of the current congestion is a result of over 900 trucks per day mixing with over 8,000 local and tourist oriented passenger vehicles, that currently cross the border at either the downtown Ferry Point Bridge or the Milltown Bridge, approximately 3 kilometers upstream. These series of studies thus examine the revamping of the crossing facility to improve throughput and relieve congestion by the construction of a new facility optimized for post-September 11 conditions. A parallel and complementary series of studies were conducted by the Maine Department of Transportation for the same crossing area.

2.2.3 Economic Impacts for Freight and Tourist Traffic at Ontario-Michigan Border Study

HLB conducted a comprehensive study, which is directly applicable to this project, which assessed the economic impacts due to the increasing delay at the border crossing between Ontario and Michigan. The study assessed border crossing bottlenecks with a view toward addressing all congestion impacts: freight as well as non-commercial. While the just-in-time transborder automobile manufacturing supply chain is a key focus of this study, it does contain

⁴ New Brunswick Department of Transportation, *St. Stephen – Calais Border Crossing Study Preliminary Assessment of Options*, January 2002

http://www.nbdot-mdot-bordercross.com/pubs/Border%20Crossing_Jan7_%202002.pdf

a detailed look at non-commercial travelers, their characteristics and the methodologies by which their sensitivities to crossing delays and unpredictability can be assessed.⁵

In particular, the study treated personal trips and tourism as an impact measured and analyzed separately from the freight and good movement issues, although it does not address work trips and the impact of delays on such trips. The study used sound economic theory to develop a methodology to measure the incremental impact on the regional economy both in the U.S. and Canada. The impact was estimated based on the effects of delay on productivity, industry competitiveness, and potential loss revenues to industries using the border. Note that the Ontario-Michigan Border carried about 40% of the trade between the U.S. and Canada. The methodology also assessed the increase in overall travel costs and the increasing loss in recreation and shopping trips. The impact was then estimated in terms of jobs, earning, output, and tax revenues. The impact was then measured for the national level, the regional level, and the local level for both the US and Canada. .

2.2.4 Newspaper Articles on Border Delay Issues

The secondary source review included identification, analysis and categorization of cost impacts from a review of some 750 newspaper articles on border issues. These articles appeared in 25 Canadian and 18 U.S. newspapers that were reviewed. Other secondary sources included 45 border management reports on the overall border crossing environment or on specific border crossings, and several previous studies on the extent of and costs of border transit times. Key reports that were used are summarized in the References. In addition several key secondary sources of data on trade, traffic, tourism, and transit time were used. These key sources included Bureau of Transportation Statistics reports on U.S.-Canada trade by year and month, U.S. Customs Service reports on monthly and annual traffic flows into the U.S., Statistics Canada reports on vehicle traffic entering Canada by year and month, and Canada Customs archives on border primary inspection transit times for commercial and passenger vehicles entering Canada and the U.S.

In addition, in order to gain a better understanding of the nature of various border crossings and to better understand the extent of transit time and uncertainty, a series of site visits to key border crossings were conducted during the summer of 2002 in order to make observations and conduct interviews. The seven key border crossing frontiers at Champlain, NY-Lacolle, Ont (and Vermont crossings); Niagara Falls, Ont.-Niagara Falls, NY (three crossings); Buffalo, NY-Fort Erie, Ont.; Windsor, Ont.-Detroit, MI (two crossings); Port Huron, MI-Sarnia, Ont.; Emerson, MT-Pembina, ND; and Douglas, BC-Blaine, WA (four crossings visited) were visited. Based on these site visits and other sources, a total of 173 personal and/or telephone interviews were conducted in order to assess the impact of border transit time and other border related costs. These interviews were conducted with manufacturer, carrier, broker, trade development, and trade association organizations.

While freight impacts and truck crossing times were the focus of this study, some personal vehicle times were collected. Following are some data of the full summer sample, and specific

⁵ HLB Decision Economics, *Regional and National Economic Impact of Increasing Delay and Delay Related Costs at the Windsor-Detroit Crossings*, prepared for: the Ontario-Michigan Border Transportation Partnership, January 2004.

http://www.partnershipborderstudy.com/pdf/Economic%20Impact%20Report_FINAL_29Jan04WEB.pdf

time of day, average primary inspection transit times (backup times) for selected crossings, for both trucks and personal vehicles.

Border Crossing	Commercial or Personal Vehicle	Average Inspection Transit Time
Detroit Ambassador	Commercial entering U.S.	28.82 minutes
Pacific Highway	Commercial entering U.S.	15.09 minutes
St. Stephen - Calais	Commercial entering U.S.	14.04 minutes
Lacolle - Champlain	Commercial entering U.S.	14.20 minutes
Sarnia Blue Water	Commercial entering U.S.	11.69 minutes
Blaine Peace Arch	Personal entering U.S.	22.79 minutes
Pacific Highway	Personal entering U.S.	16.39 minutes
St. Stephen - Calais	Personal entering U.S.	14.05 minutes
Detroit Ambassador	Personal entering U.S.	10.83 minutes
Blaine Peace Arch	Personal entering Canada	10.39 minutes

The following data from the archive shows average primary inspection transit times (backup times) for selected times of day. Again both trucks and personal vehicle data is shown.

Border Crossing	Commercial or Personal Vehicle at Time of Day	Average Primary Inspection Transit Time
Detroit Ambassador	Commercial to U.S. 9:00PM	40.57 minutes
St. Stephen - Calais	Commercial to U.S. 3:00PM	26.12 minutes
Pacific Highway	Commercial to U.S. 3:00PM	23.01 minutes
Lacolle - Champlain	Commercial to U.S. 9:00PM	21.44 minutes
Blaine Peace Arch	Personal car to U.S. 6:00PM	36.68 minutes
Pacific Highway	Personal car to U.S. 9:00PM	27.78 minutes
St. Stephen - Calais	Personal car to U.S. 3:00PM	26.21 minutes
Detroit Ambassador	Personal car to U.S. 9:00PM	16.65 minutes

One of many useful sources for further data cited in the report was Statistics Canada's Impact of International Visitor Spending on State Economies (Economic Impact) Program. This unit publishes results of an on-going program using Tourism Industries' In-Flight Survey, Bureau of Economic Analysis expenditures and Bureau of Labor Statistics data to develop an annual report showing the international visitor spending garnered by states and the jobs, taxes and pay roll that spending supports. It reports spending and its impacts by purpose of trip, census regions and category of spending, by state, country and census region. Comparable data are available beginning 1990 in an annual report.

2.3 US-Mexico Border Studies

2.3.1 Border Crossing in San Diego/Tijuana Metropolitan Region

In 1994, a report by San Diego Dialogue⁶ provided a comprehensive look at the nature and characteristics of the border trips at the San Diego/Tijuana Metropolitan Area. The study undertook a comprehensive and significant survey of about 6,000 persons crossing the border. The study revealed important information about the characteristics of several trip purpose including work trips, family visits, shopping, and tourism. The study also stressed the importance of the border for the regional development and integration and provided recommendations to ease the border crossing people flow.

2.3.2 Border Economic Impact in Southern Texas Study

In 2003, the Center of Border Economic Studies at the University of Texas-Pan American conducted a study⁷ that profiled Mexican visitors, measured the magnitude of their annual expenditures, and determined the impact of these expenditures on the economy as a whole. It also provided the results of in-depth interviews of Mexican visitors about their experiences entering the U.S. and their perceptions of the US VISIT program. The study used multipliers from IMPLAN Input/Output model to determine the economic impact on retail sales since September 11. The study assessed the impact only on the U.S. side for visitors and shoppers only.

2.3.3 Border Environmental and Energy Effects Study

The Southwest Center for Environmental Research and Policy (SCERP)'s Border Institute published a 2002 monograph⁸ which focused on the *environmental and energy* effects of changes in the U.S. - Mexico border regions. Major sections of the report deal with energy consumption on both sides of the U.S.-Mexico border in general; energy issues in the California-Baja California Region; the interplay of water and energy consumption in the border region; energy and environment issues at the border itself, in particular air pollution; and finally, the impact of the energy inefficiency of electrically-power cooling devices such as refrigerators.

A further environmental assessment of border delays was conducted as a joint project by Texas Transportation Institute and Center for Transportation Research⁹. This study provides the methodology framework to estimate the emission impacts at border crossings. The study also provides a description of earlier studies that estimated the emission impacts at border regions.

⁶ San Diego Dialogue, "Who Crosses the Border: A View of the San Diego/Tijuana Metropolitan Region," April 1994.

⁷ Suad Ghaddar, Chad Richardson, Cynthia J. Brown, Ph.D. "Economic Impact Of Mexican Visitors To The Lower Rio Grande Valley" Center of Border Economic Studies, The University of Texas-Pan American 2003.

⁸ David A. Rohy, Editor, *The U.S.-Mexican Border Environment: Trade, Energy, and the Environment: Challenges and Opportunities for the Border Region, Now and in 2020*, <http://www.scerp.org/pubs/mono7.htm>

⁹ "Sketch Planning Methodology to Quantify Emissions Impacts at Border Crossing: Suggested Approach" which is a part of a series called Criteria for Design of a Model Border Crossing.

. <http://bordercross.tamu.edu/cpoe/shareddocs/environmental.pdf>

2.3.4 Texas Border Infrastructure Investment Study

The Federal Reserve Bank of Dallas published a study targeted toward investment in border infrastructure and its effect on the economy of the border region.¹⁰ This study, conducted before the September 11-related disruptions, addresses freight issues as well, but also emphasizes the border region retail trade that is significant in the Texas-Mexico border. A summary of the effects and approach to this issue are found in the following summaries:

While relative per capita income along the border has stagnated at low levels, job growth has surged, particularly since Mexico entered GATT in 1986. Although some measures, such as earnings per job, have shown relative gains in the 1990s, significant relative income gains are unlikely until educational attainment increases.

The retail trade industry highlights the strong job growth and low income typical of the border. Retail sector growth in the 1990s has created many new jobs well suited for the average education level of border workers. However, because the retail industry generally pays at or near minimum wage, growth in this sector suppresses average wage growth. In general, the retail sector is not perceived as a major economic driver because retail goods are purchased mainly by local citizens. This is not true along the border, however, since Mexican nationals purchase a significant amount of retail goods and services. One way to estimate Mexicans' retail spending in border cities is to estimate, based on border income levels, the part of retail spending that likely comes from local citizens. This local spending can be subtracted from total retail spending to determine retail sales to individuals from outside the local area.

The report also touches upon higher-wage civilian jobs in border regions. The benefits of border retail exports are obvious; the advantages of numerous trucks and trains rumbling through border towns are less clear. One direct benefit from international trade is the federal jobs created in the U.S. Customs Service, the Immigration and Naturalization Service and various federal law enforcement agencies.

Border earnings in transportation services grew strongly in the 1990s. This was especially true in Laredo, TX., where transportation services accounted for 59 percent of total border earnings from this sector in 1998. Growth in border transportation services has lifted average border earnings because this sector pays better-than-average earnings. In 1998, transportation services workers earned an average of \$29,662, versus an average of \$24,427 for all border jobs. Laredo topped all other border cities in earnings growth in the 1990s, most likely on the strength of its transportation services industry.

2.3.5 NAFTA and Trucking Industry Study

A report published by the Center for Transportation Research, the University of Texas at Austin¹¹ primarily deals with the contentious issue of the NAFTA requirement to allow Mexican truckers unrestricted operation in the U.S. Its research effort can be summarized as

¹⁰ Phillips, Keith R. and Carlos Manzanares, *The Border Economy: Transportation Infrastructure and the Border Economy*, prepared for the Federal Reserve Bank of Dallas, June 2001.

¹¹ Jamieson Jr., Jerry L. and Robert Harrison, *Opening The Border To Cross-National Truck Traffic: The Texas Perspective*, Center for Transportation Research, University of Texas at Austin, December 2002
<http://swuttc.tamu.edu/Reports/473700-00067-1.pdf>

follows. Few issues have been as contentious as the opening of the Texas-Mexico border to cross-national truck traffic. This study examines issues surrounding an open border and assesses the possible benefits and costs for the citizens of Texas. The study uses economic data on trade volumes and employment to assess the impacts that an open border will have on Texas. By removing border trucking restrictions, trade and its associated positive economic benefits should increase for Texas and consumer prices should fall.

An open border should lead to reduced congestion, reduced accidents, and less pollution (air and noise) for Texas border communities. To assess the most contentious open border issue, safety, studies used to evaluate Mexican truck safety are scrutinized, the politics of the safety issue are examined, and recommendations are made for properly evaluating Mexican truck safety. After assessing the economic, environmental, social, and safety issues, this study comes to the conclusion that, although an open border produces winners and losers, it will be a net benefit to the state. However, transportation-dependent border economies will suffer in the short-term once open border trucking operations take effect.

2.3.6 SANDAG/CALTRANS Study

Closer to this particular project, SANDAG prepared a qualitative report on the border issues for Caltrans District 11.¹² As a result of traffic conditions along the San Ysidro Port of Entry and anticipated population and economic growth expected at the San Diego-Tijuana metropolitan area, increasing binational coordination and co-operation between transportation and planning agencies have become of paramount importance to the region. Caltrans in collaboration with SANDAG and various transportation and planning agencies from the Republic of Mexico have undertaken several studies over the past years aimed at documenting, and addressing cross-border traffic congestion and improving crossborder wait times. The SANDAG report outlined a framework and methodology to conduct future binational economic impact studies of people crossing the border to shop and work in the San Diego region. Also included is a brief discussion on transporting goods across the border.

To analyze the relationship between retail sales and other variables, the report suggests “multivariate analysis” be conducted where the change in retail sales is explained by several independent variables such as personal income, the number of tourists, and border wait times. To gain insights into individual behavior the report suggests that a survey be conducted at the ports of entry in the San Diego region. The goal of the survey is to understand the economic impacts of extended border wait times on local retail sales, employment and lost work time.

2.4 Other Relevant Studies

Besides the above studies, several articles and studies that are qualitative in nature were found that addresses traffic flow and its impacts on the regional economy. A discussion¹³ by San

¹² Marney Cox, Jeff Tayman, Michael D. Williams, *DRAFT: A Framework For Analyzing the Economic Impacts of Waiting to Cross the San Diego / Baja California International Border*, Prepared for: California Department of Transportation, District 11 by San Diego Association of Governments, http://www.sandag.org/uploads/rfpid/rfpid_59_3286.pdf

¹³ The paper: “Our Ports Of Entry and Homeland Security: A Dialogue with Asa Hutchinson” by Kenn Morris, Director of Crossborder Business Associates can be located at http://www.sandiegodialogue.org/pdfs/Asa_Paper_June_03.pdf.

Diego Dialogue dated June 2003, entitled “Our Ports Of Entry and Homeland Security: A Dialogue with Asa Hutchinson”, provides a qualitative outlook for the regional economy given the population growth, the level of crossings in the region, and the effects of tightened border entry controls.

Similarly, a study by the International Community Forum¹⁴ provided a detailed demographic and socio-economic analysis of the border region. The study also emphasized the importance of the border stressing the proportion of San Diego’s cross-border trade as a total of overall economic activity in the region.

On the Canadian border, some studies stressed the significant economic impact potentials of border crossing infrastructure. A consortium of investors to build Detroit River Tunnel commissioned a study¹⁵ to assess the economic impact of reducing delays at the Detroit – Windsor crossings by building a toll road using existing tunnel.

Similarly, a press release¹⁶ by Washington State’s Governor shortly after September 11, 2001 provided an estimate of the impact of delays at crossings on the regional economy. The Governor’s office stated that heavy traffic congestion and delays at major crossings resulting from tighter security are causing severe financial and other problems in many border communities.”

2.5 Lessons Learned

While the studies, described above, are different in nature and were authored for various reasons, they provide different perspectives on how to deal with the assessment of border issues. All the studies tend to stress, one way or another, the importance of the border traffic and people flow to the regional economy. Most of the studies used descriptive statistics to highlight that local and regional economies on the Canadian and the Mexican border rely heavily on the flow of visitors, workers, and freight. Only few studies used a formal survey to gather new and relevant data and only fewer who used analytical statistics to determine the full economic impact on the regional economy. Furthermore, none of the studies questioned the incrementality of the economic effects on the region. In other words, none of studies both pre and post 9-11 studies questioned if the economic impact loss is purely incremental and not a transfer of loss from one region to another.

¹⁴ International Community Forum, “Blurred Borders: Transboundary Issues and Solutions in the San Diego/Tijuana Border Region”, March 2004. Located at

<http://www.icfdn.org/aboutus/publications/blurrborders/documents/whybrdrmmattersch1.pdf>

¹⁵Michael Belzer, “The Economic Impact of Adequate Border Crossing Infrastructure”, The Jobs Tunnel Detroit River Tunnel Partnership, 2003. Located at <http://www.thejobstunnel.com/pdf/CANbelzerpress.pdf>

¹⁶ The press release can be found at

<http://www.governor.wa.gov/press/press-view.asp?pressRelease=1018&newsType=1>

3. PROPOSED APPROACH

This chapter presents the detailed methodology that will be adopted to estimate the economic impacts due to the border delay on the regional economy. The Chapter presents both the conceptual framework and the approach in non-technical terms.

The proposed methodology is comprehensive and incremental in nature as it accounts for different trip purposes but take into account the impact on both sides of the border. The methodology as stated below is based on solid economic theory and the estimation process will be based on primary data from the formal survey that we intend to conduct. The economic impact will be primarily estimated for the San Diego County and for the Northern Baja California region which include the municipalities of Tijuana and Tecate.

3.1 Conceptual Framework

The economic impact estimation in this project consists of three main categories:

1. Border Crossing Delays Effects on Tourism and Shopping Trips,
2. Border Crossing Delays Effects on Work Trips, and
3. Border Crossing Delays Effects on Regional Productivity.

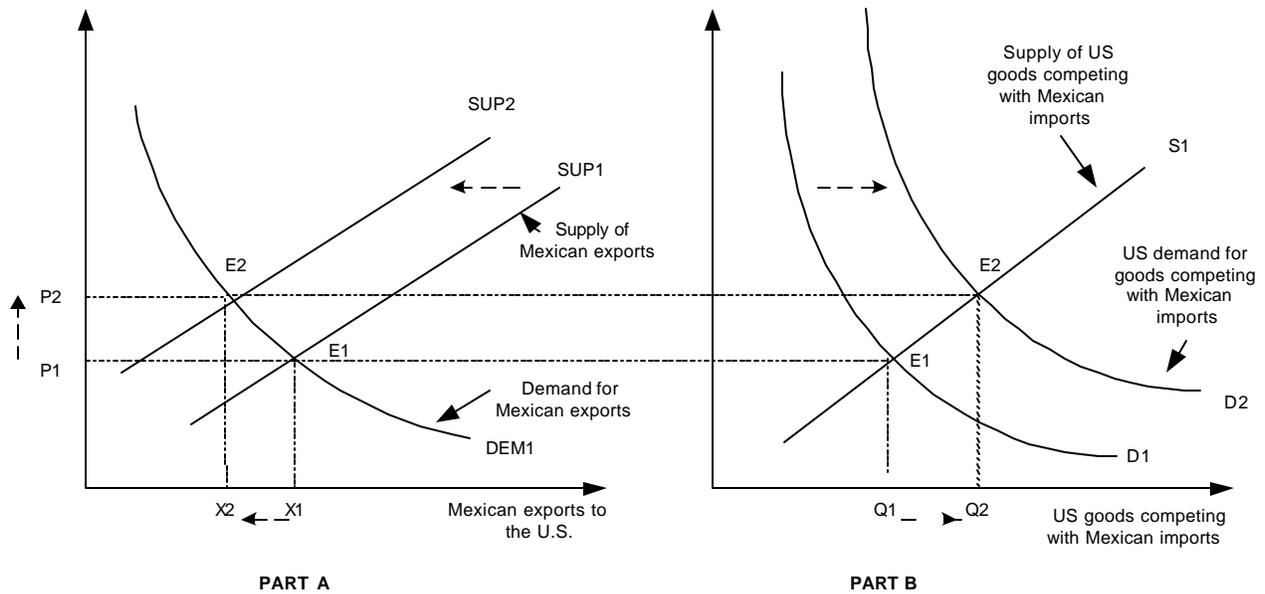
3.1.1 Border Crossing Delays Effects on Tourism and Shopping Trips

Any money spent in the United States (for recreation or shopping purposes) by a visitor from Mexico is a U.S. export to Mexico. Any money spent in Mexico by a visitor from the United States is a U.S. import from Mexico.

Figure 1 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 Mexican company (Mexican goods purchased by US nationals) and the export market is the United States.

Figure 1: Effects of Border Delays on Final Goods Demand



The initial market equilibrium in Figure 1 is shown by point E1. The quantity of Mexican exports is X1, the quantity of domestic output is Q1 and the prevailing market price is P1.

An increase in delays at the border causes the supply curve of Mexican exports to shift to the left as exporters are faced with higher generalized costs, which include delay at the border. The volume of Mexican exports falls to X2 and the price increases to P2. Mexican 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 Mexican exports makes U.S. goods competing with Mexican exports more competitive, and the demand for U.S. domestic products increases. This is illustrated by a shift in the demand curve for U.S. goods competing with Mexican exports in Panel B of Figure 1. As a result, the output of U.S. goods competing with Mexican goods increases but so does their price. U.S. producers clearly benefit from the reduction in the volume of Mexican exports. However, U.S. consumers are hurt by higher market prices and possibly reduced choice.

The reduction in the quantity of Mexican 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 Mexican exports;
- Price elasticity of supply of Mexican exports; and
- Elasticity of Mexican export shipments with respect to border delays.

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

- Price elasticity of demand for U.S. goods competing with Mexican goods; and

- Price elasticity of U.S. supply of goods competing with Mexican exports.

Such mechanism has therefore an impact on the regional economy, both sides of the border, in terms of output, employment, earning, and tax revenues.

3.1.2 Border Crossing Delays Effects on Work Trips

The San Diego region-Baja California ports of entry serve as a major gate to employees especially Mexican workers residing in the Mexican side and working in the San Diego region. Therefore, a delay at these ports of entry has significant implications on the labor market in the region. An increase in delay impacts both the labor market as a result of forgone work trips and impacts the workers who still make the daily trips across the border in terms of increase in trip generalized costs.

An increase in delay at the border may make it harder for some workers to reach their destination within a reasonable time at a reasonable cost, especially low income workers living further south of the border. The impact of the delay that may result into forgone work trips is illustrated in Figure 2, below.

Figure 2: Effects of Border Delays on Labor Market Demand

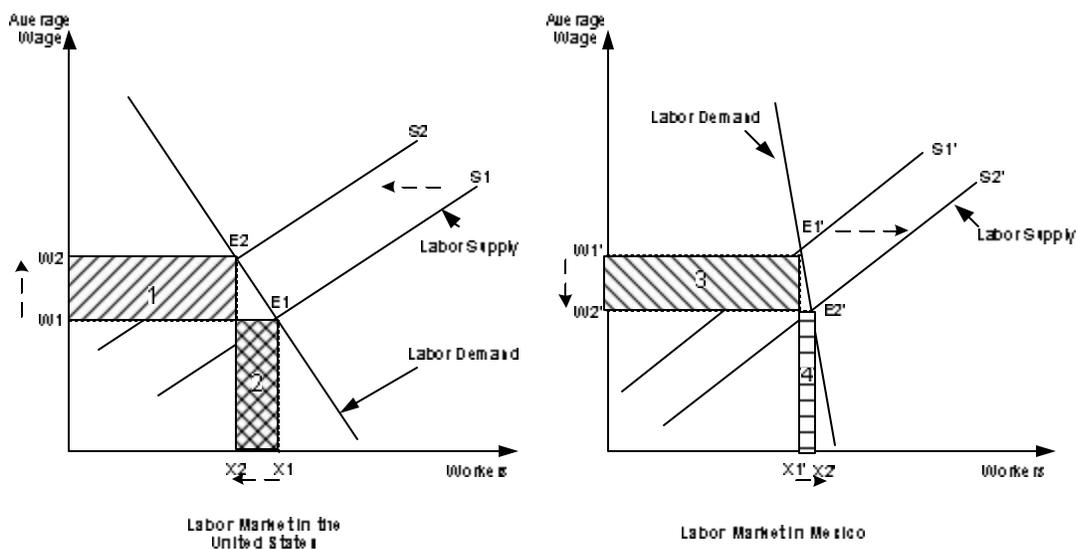


Figure 2 shows that in the base case the labor market in the US side is at equilibrium E1 which corresponds to an X1 number of workers and a W1 average wage. Similarly, on the Mexican side we have an equilibrium at E1' which corresponds to an X1' number of workers and a W1' average wage.

An increase in delay at the border will force some workers to forgo their daily work trips. This results into a reduction in labor force on the US side and an increase in labor force on the Mexican side. In the long run, the labor supply on the US side shift to the left as wages increase and labor force decreases. The new equilibrium on the US side will be equilibrium E2 which corresponds to an X2 number of workers -which is lower than X1- and a W2 average wage -which is higher than W1.

On the Mexican side, the labor supply will shift to the right. However, given the higher unemployment rate, the labor demand curve is relatively inelastic and therefore we end up with lower wages without any significant gains in employment. The new equilibrium on the Mexican side will be equilibrium E2' which corresponds to an X2' number of workers -which is not significantly higher than X1'- and a W2' average wage -which is lower than W1'.

Therefore the area 1 (which is the square: W2,E2,R,W1) can be interpreted as the gain to the number employees (which is X2 on the graph) who earned an additional – unearned income – shown on the graph by the amount of W2 minus W1. Similarly, the area of (R,E1,X1,X2) is the loss in earning to (X2-X1) employees in terms of W1. The area (E2,E1,R) is a deadweight welfare loss.

The economic outcome (loss/gain) can, therefore, be estimated as:

$$\text{Economic Outcome} = (W2,E2,R,W1) - ((R,E1,X1,X2) + (E2,E1,R))$$

The economic outcome will depend on the level of shift in supply curve which in turn depends on the unemployment rate in the region and the elasticity of labor demand.

3.1.3 Border Crossing Delays Effects on Regional Productivity

For workers who make their daily trips across the borders, the delay has a significant impact on their generalized costs in terms of excessive waiting and opportunity cost (lost wages). The impact, however, falls mainly on the worker as they journey to work stretches longer. While the value of time for these workers may be low, given their income level, the aggregate time spent waiting is significant and therefore needs to be monetized and estimated.

3.2 Methodology

3.2.1 Lost Cross-Border Recreation, Shopping and Vacation Trips

To estimate the impact of the border delays on the regional economy, it is critical to breakdown the trips by purpose and destination. Traveler's behavior differs based on its trip purpose, trip time, and trip destination. Under each trip category, it is important to assess the sensitivity of traveler to the delay. Shopping and leisure trips tend to be easier to forgo due to excessive delays than work trips. For instance, a worker will be more willing to wait for two hours at the border to access his or her job. However, a tourist to the San Diego region will be less willing to go to Tijuana if he knows it may take him two hours of delay to get back to the United States.

The methodology therefore should take into account the breakdown of trips by purpose, time, and destination together with the sensitivity of each type of trip to the delay at the border. These two components are a key to estimate the lost trips. Given the characteristics of these trips in terms of destination, length, and average spending; the methodology will derive the direct economic impact. Subsequently, the indirect and induced effects will be estimated using the regional economic multipliers. The economic impacts will be primarily estimated for the economies of the San Diego region and Northern Baja California (municipalities of Tijuana and Tecate). The impact on regional area such as the State of California and Baja California may also be estimated.

In general, the estimation will proceed in seven main steps:

Step 1. Obtain current crossing and projections for passenger cars, broken down by trip purpose and destination (into the U.S. vs. into Mexico) from sources such as the Department of Homeland Security;

Step 2. Estimate the annual percentage change in travel costs (travel time and vehicle operating costs) associated with increased wait times and congestion;

Step 3. 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 wait times and congestion;

Step 4. Estimate the expected loss of revenue (spending from vacationers, shoppers and other travelers) associated with the foregone trips based on the shoppers' sensitivity to waiting time;

Step 5. Adjust for changes in local demand (e.g., vacation money spent in Mexico instead of the U.S., and vice versa)¹⁷;

Step 5. Derive the direct impacts of foregone spending on regional and national output, income (earnings) and employment;

Step 6. Use indirect and induced multipliers to obtain the indirect, induced and total impacts (on output, earnings and employment) of foregone trips.

Step 7. The direct, indirect and induced impact estimates will be derived from coefficients and relationships from an input-output simulation model.

Figure 3, below, provides an overview of the estimation framework proposed for this study. The figure depicts that once we obtain data on trip volume by purpose and the sensitivity of the shoppers and tourist to wait time, from survey and existing volume database on border crossings, we can estimate the number of lost trips due to delay. These estimated lost trips, together with the average spending from the survey, will form the initial impact of lost revenues to the local economy. Using multipliers from Input/Output models, we can then derive the direct, indirect, and induced effects.

¹⁷ Through the survey we will collect data on the sensitivity of shoppers to delay at border and the alternative shopping destination and spending if they forgo their trips to the U.S.

Step 1. Obtain crossing projections for pedestrian and passenger cars, broken down by trip purpose and destination (into the U.S. vs. into Mexico);

Step 2. Estimate the annual percentage change in travel costs (travel time and vehicle operating costs) associated with increased wait times and congestion;

Step 3. 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 for work trips, due to increased wait times and congestion;

Step 4. Estimate the expected loss of revenue (productivity) associated with the foregone trips;

Step 5. Adjust for changes in local demand (e.g., local jobs gains);

Step 5. Derive the direct impacts of economic outcome on regional and national output, income (earnings) and employment;

Step 6. Use indirect and induced multipliers to obtain the indirect, induced and total impacts (on output, earnings and employment) of foregone trips.

Step 7. The direct, indirect and induced impact estimates will be derived from coefficients and relationships from an input-output simulation model.

Figure 4, below, provides an overview of the estimation framework proposed for this study. The figure below depicts similar method as the one used for shopping trips. The difference is that this figure estimates the lost work trips due to the excess delay. This is estimated based on the sensitivity level deducted from the survey (percentage of workers that forgo their trips, given a level of delay). The lost trips are then translated into loss earnings, which, in turn, are translated to loss in productivity in the region.

Figure 4: Structure and Logic Diagram for Estimating the Economic Impacts of Lost Cross-Border Work Trips

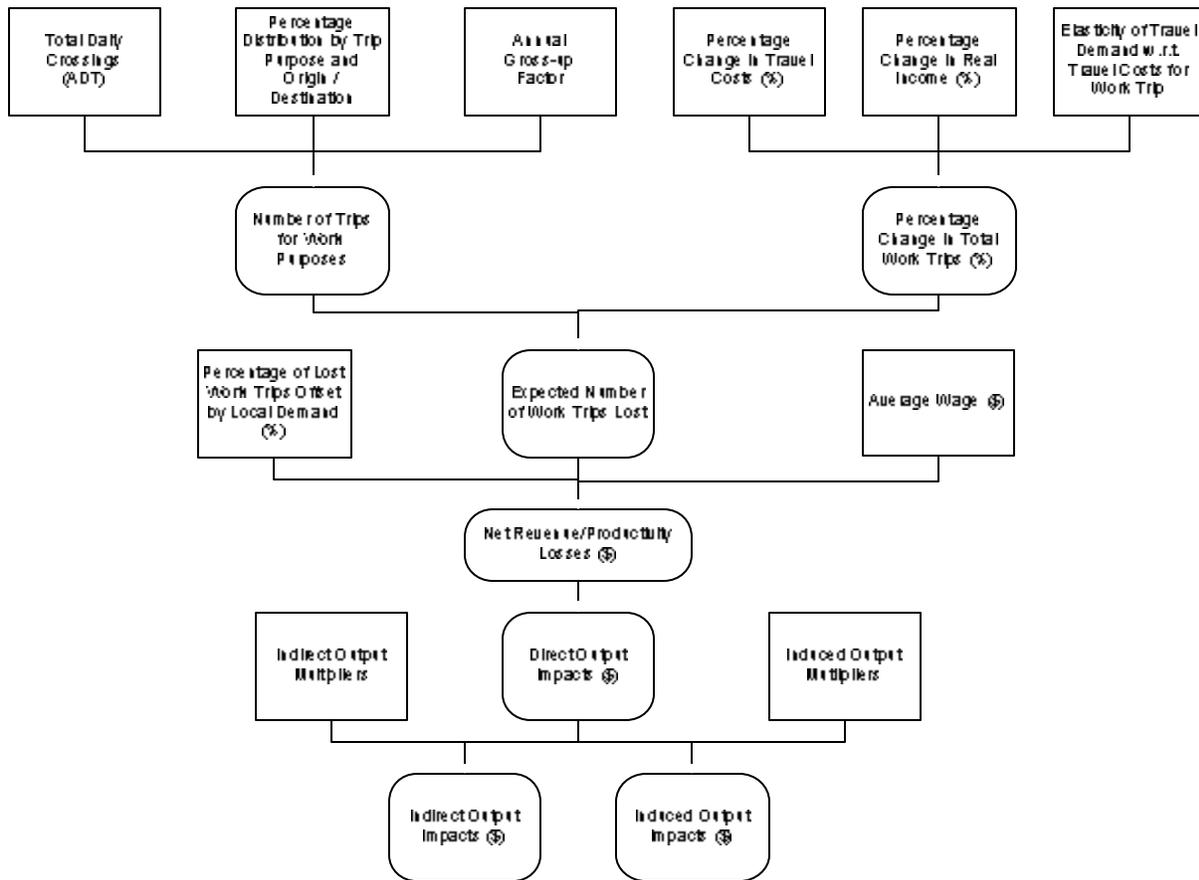
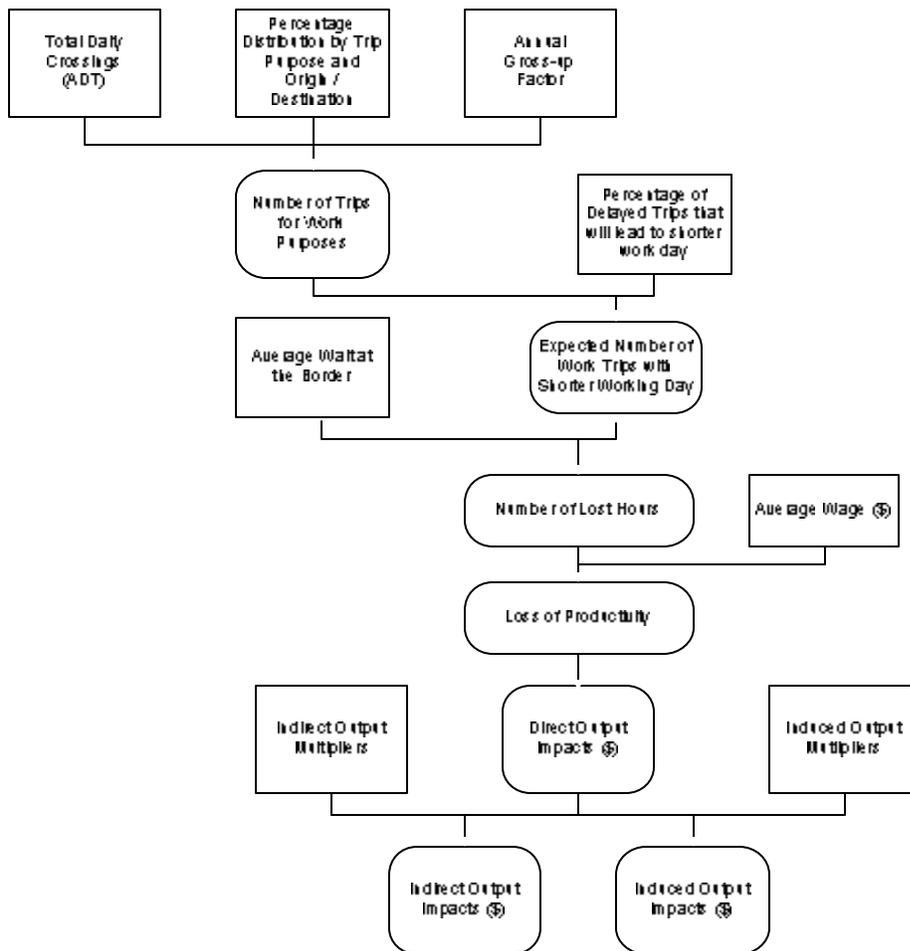


Figure 5: Structure and Logic Diagram for Estimating the Economic Impacts of Productivity Losses due to Impaired Cross-Border Movements



3.3 Input/Output Methodology

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 in 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.”

3.3.1 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.

3.3.2 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.

3.3.3 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.

3.3.4 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.

Input-Output models¹⁹ will be used to estimate the economic impact at local and regional level on both sides of the border. The economic impact will be primarily estimated for the San Diego County and for the Northern Baja California region which include the municipalities of Tijuana and Tecate. 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 will be conducted to assess the direct, indirect and induced effects of lost and delayed trips at the border in terms of trade and jobs at the local and regional levels.

More specifically, the IMPLAN© model – an input-output based economic impact assessment modeling system originally developed by the U.S. Forest Service (and now maintained by the Minnesota IMPLAN Group, Inc.), – will be used to evaluate the above. In conducting the analysis, two series of adjustments will be made to help ensure that all impact estimates would be truly incremental and specific to the region, namely:

- The model is adjusted to reduce the potential impact of spending in sectors with unemployment rates at or below the Non-Accelerating Inflationary Rate of Unemployment (NAIRU). Research has shown that adding employment or output to sectors of the local economy where the unemployment rate lies below the NAIRU benchmark will more likely to cause inflation than spur economic growth.
- Multipliers used for estimating indirect and induced effects are adjusted using Regional Purchase Coefficients (RPCs) in order to ensure that imports would not be counted. RPCs ratios indicate what fraction of total demand for goods and services within a region (both by business and households) is satisfied from within the region. All remaining demand must be satisfied from imports, which provide no direct economic benefit to the region.

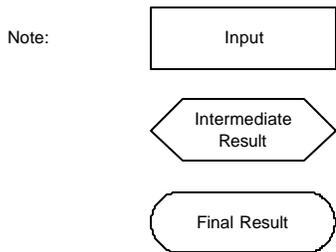
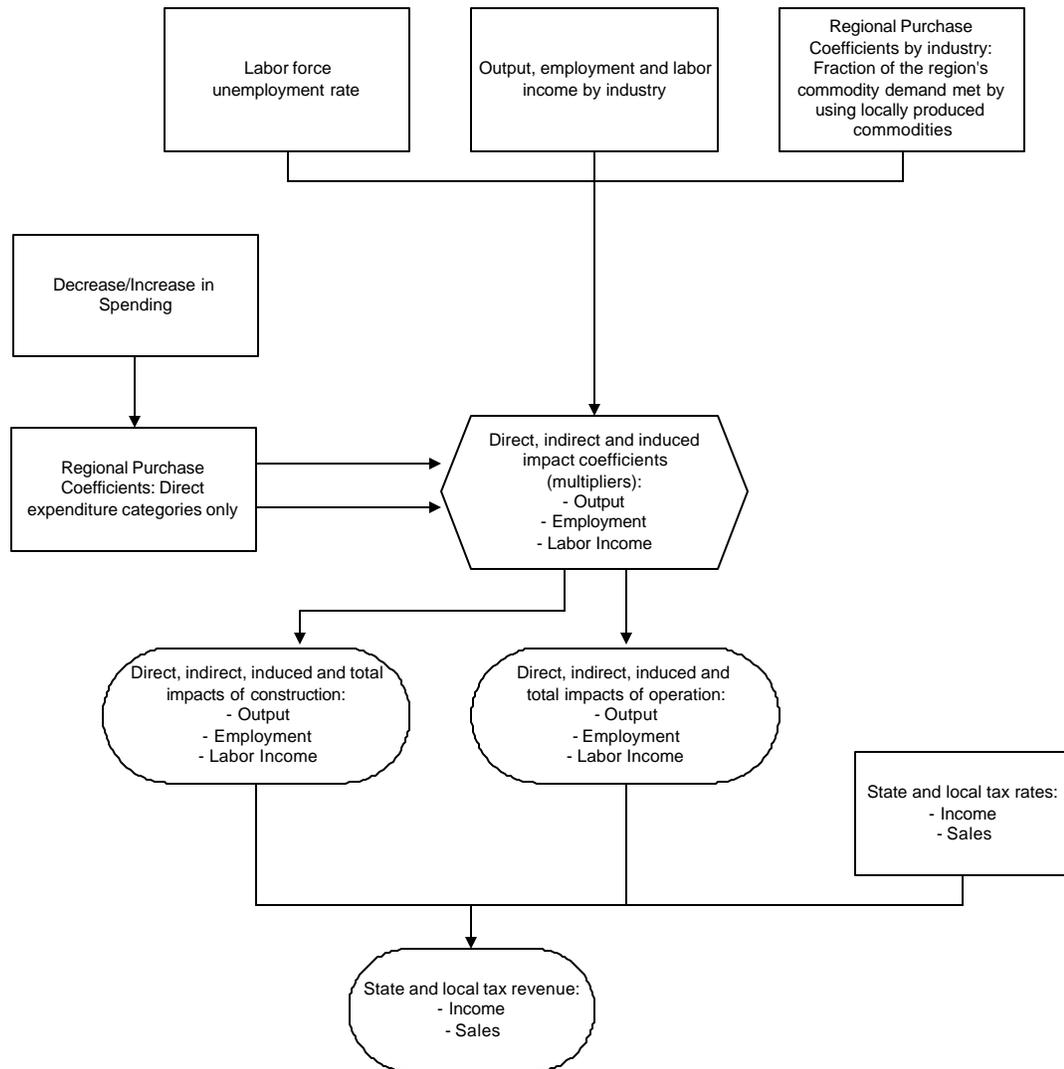
A similar model will be used for the Mexican border. A further evaluation will be conducted to choose between two models: Inforum developed by the University of Maryland and a second model developed by El Colegio de la Frontera Norte (COLEF).

The figure below provides an overview of the economic impact estimation process. It consists of applying the regional purchase coefficient to the loss of gain in spending while taking into account the unemployment rate and the productivity level in the region to estimate the direct,

¹⁹ 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.

indirect, and induced effects in terms of output, employment, and earnings. It then uses the state and local tax rates to estimate the state and local tax impacts.

Figure 6: Input Output Analysis Overview



In Memorandum 2, we will present the data needs and sources to populate the above models, including the data that we will seek from the survey and the ones that we will collect from the Department of Homeland Security and other agencies on crossing volumes.

4. SCHEDULE AND DELIVERABLES

Given the change to the start date for this project, this chapter provides an updated schedule for the proposed deliverable for this project.

Deliverables

As stated in the proposal, the project will involve expert panel reviews and expert panel consensus development. Technical memoranda on sequential aspects of the process would be submitted to the expert panel (by email or hardcopy) for review and comments. The remaining deliverables for this project are as follows:

- **Technical Memorandum 2** would define in detail the data needs for analysis of cross border vehicle travel and pedestrians. (Expected in the last week of September)
- **Technical Memorandum 3** would document the draft survey methodology. A draft survey instrument in English and Spanish would also be delivered at this stage. This memorandum would precede the *Interim Review Meeting* and Technical Memorandum 2 and 3 would form the basis of that meeting. (Expected in Mid-October)
- **Technical Memorandum 4** would present and fully document the results of the pretest, and the final survey instruments in English and Spanish. (Expected by the first week of November)
- During the survey period, the team will issue **biweekly progress reports** to inform SANDAG of the progress, the data collected, surveys completed, and any other relevant issue. (From the beginning of November to Mid-February)
- **A Draft and Final Report** would summarize the previous technical memoranda on literature review, data needs, survey methodology, economic models, assumptions, and estimation process, as well as the detailed findings. The Draft Report would precede the *third meeting*. Note that HLB would facilitate this meeting with the *Economic Impact Model* in-situ. This means that expert panelists would be invited to test alternative probability ranges and alternative values for any and all forecasts, assumptions and variables in the model. The model would be run in real-time, allowing impact on output, sales, jobs, and tax revenues of alternative assumptions, forecasts and probability assessments to be examined and discussed in a smooth, discursive dialogue among the experts and HLB. HLB would use this facilitation process to seek expert panel consensus on inputs during the meeting. (The end of February to the first week of April),
- **Technical Memorandum 5** would include recommendations on future updates of the model, a user manual for the model, and a protocol on how to update the model. (The end of April)

The detailed timeline of tasks and deliverables is shown in the figure below.

Figure 7: Timeline for Tasks and Deliverables

