Final Report Appendices

Impacts of Border Delays at California-Baja California Land Ports of Entry

Volume 2: Economic Impact Analysis Report

San Diego, CA
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In Coordination with T. Kear Transportation Planning and Management, Inc.

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Economic Model Methodology

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San Diego, CA
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Introduction

The California – Baja California border region is one of the most important and dynamic economic zones in North America. While border crossings have become a critical element of the binational region's economic integration and competitiveness, growing trip demand has led to increased congestion at land ports of entry (POEs) and generated delays and unreliable crossing times for cars, trucks, and pedestrians. These delays and travel time unreliability at the border have the potential to reduce the region's economic competitiveness and attractiveness to businesses, which can translate into lower levels of economic activity and growth.

In 2006, SANDAG and Caltrans completed a study that showed how border delays cause significant reductions in economic output and employment. The study highlighted the need for improving border crossings and helped make the case for developing a third crossing between San Diego and Tijuana (the planned Otay Mesa East-Mesa de Otay II POE). Similarly, in 2007, the former Imperial Valley Association of Governments (IVAG) and Caltrans conducted an economic delay study for Imperial County POEs. Much has changed since these earlier studies: the regional economy has rebounded from the Great Recession and there are new emerging industry clusters that depend on crossborder trade. As a result, SANDAG has commissioned the HDR team (led by HDR Inc., and supported by T. Kear Transportation Planning and Management, Inc., Crossborder Group, and Sutra Research) to conduct the study on Economic and Air Quality/Emissions Impacts of Delays at the California-Baja California Border.

This memorandum presents the proposed methodology to estimate the economic impacts of delays at land POEs along the California – Baja California border. It builds upon the methodology implemented for the original studies commissioned by SANDAG and IVAG. The memorandum includes a review of the most recent and relevant literature on the topic. The methodological framework distinguishes the impacts of border delays for personal trips (i.e., personal vehicles and pedestrians) and those for freight movements (i.e., commercial trucks).

Literature Review

In developing the proposed methodology, HDR conducted a brief literature review that updates earlier reviews conducted as part of the study on the *Economic Impacts of Wait Times at the San Diego–Baja California Border* for SANDAG (2006) and the *Imperial Valley – Mexicali Economic Delay Study* for IVAG (2007). The review focused on the economic impacts of delays on personal trips and freight movements at the U.S. borders with Mexico and Canada. Five directly relevant studies published since 2010 were identified:

- Avetisyan, M., Heatwole, N., Rose, A., and Roberts, B., (2015) "Competitiveness and Macroeconomic Impacts of Reduced Wait Times at U.S. Land Freight Border Crossings". *Transportation Research Part A, 78*, 84-101.
- Brown, W. M., (2015) *How Much Thicker is the Canada-U.S. Border? The Cost of Crossing the Border by Truck in the Pre- and Post 9/11 Eras*. Statistics Canada, Economic Analysis Research Paper Series, 11F0027M No. 99.
- Koopman, R., Powers, W., Wang, Z., and Wei, S., (2010) *Give Credit Where Credit is Due: Tracing Value Added in Global Production Chains*. National Bureau of Economic Research, Working Paper 16426.

- Rajbhandari, R., Saman, S., Vadali, S., and Kang, D., (2012) "Dashboard Tool to Communicate Delays and Economic Cost of Delays at International Border Crossings". *Transportation Research Record: Journal of the Transportation Research Board, 2285*, 135-144.
- Roberts, B., Rose, A., Heatwole, N., Wei, D., Avetisyan, M., Chan, O., and Maya, I., (2014) "The Impact on the U.S. Economy of Changes in Wait Times at Ports of Entry". *Transport Policy,* 35, 162-175.

These studies are summarized in the sections that follow. It is surprising that so few papers have been published in freight and border issues over this period, but the topic may have become less popular in the research community as a result of the Great Recession.

Roberts, B., Rose, A., Heatwole, N., Wei, D., Avetisyan, M., Chan, O., and Maya, I. (2014)
Roberts et al. (2014) measure the economic impact of reduced wait times during border crossings due to increases in U.S. Customs and Border Protection (CBP) staffing. The study covers 17 land POEs at the U.S.-Canada and U.S.-Mexico borders (including Calexico West, Calexico East, and San Ysidro) and four U.S. airports. The authors quantify the reduction in wait time for passenger vehicle traffic at land POEs, passenger flows at international airports, and commercial vehicle traffic at land POEs. They then monetize the reduced wait times and estimate the impact of reduced wait times on the U.S. economy. Overall, their analysis shows that adding one customs officer to each crossing would result in an annual increase in GDP of $64.8 million and 1,084 jobs.

To determine the monetary value of reductions in wait times during border crossings, the authors multiply estimated wait time reductions by the value of (wait) time for passenger vehicle traffic and passenger flows at international airports following the U.S. Department of Transportation methodology for valuing travel time.[1] Additionally, they use separate values of time for business and leisure travelers, and set higher values of time for air travel than for ground travel. For commercial vehicles, they use the findings of a 1999 study sponsored by the National Cooperative Highway Research Program (NCHRP).[2]

The authors also determine the economic impact of reductions in wait times on GDP and employment levels for passenger and commercial vehicle traffic at land POEs. For passenger vehicle traffic, they estimate the expenditures arising from additional tourist visits for various consumption categories (food, retail, banking, etc.). They also use the elasticity of crossborder trips with respect to wait time measured during an experiment conducted at the San Ysidro POE to determine the impact of wait time reductions on the number of crossings. Then they use an input-output model to determine the net increase in GDP and employment levels due to increased consumption, taking into account the decrease in domestic spending resulting from the increased number of tourists travelling to Mexico and Canada.

[1] Belenky, P., (2011) *Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis*. U.S. Department of Transportation, Office of Economic and Strategic Analysis.
[2] Small, K., Noland, R., Xuehao, C., and Lewis, D., (1999) *Valuation of Travel-Time Savings and Predictability in Congested Conditions for Highway User-Cost Estimation*. Transportation Research Board, National Cooperative Highway Research Program Report 431.

For commercial vehicle traffic, the authors assume that a reduction in wait times does not lead to an increase in the number of trips. Instead they evaluate the economic impacts of reductions in transportation costs from reduced wait times. The authors use a statistical model to estimate transportation cost reductions and an economic model to determine changes in net export values, GDP, and employment.[3]

Avetisyan, M., Heatwole, N., Rose, A., and Roberts, B. (2015)
A similar study was conducted by Avetisyan et al. in 2015. The authors analyze the impacts of reducing wait times by adding one customs officer at each of the twelve major land freight crossings of the U.S. (including Calexico East and Otay Mesa). The change in wait time stemming from staffing changes is first estimated on the basis of primary data and then translated into changes in freight costs through a logistical model. The transportation cost changes are then fed into a multi-country computable general equilibrium model. The authors find that adding one customs officer at each land border crossing would, on average per crossing, generate an increase in U.S. GDP of $350 thousand and 3.58 additional jobs.

Rajbhandari, R., Saman, S., Vadali, S., and Kang, D. (2012)
Rajbhandari et al. (2012) discuss the development of a dashboard that presents information on delays at the land border crossing in El Paso, Texas and the related economic cost to commercial vehicles. The authors focus on the contents of the dashboard, in particular the user interface, and also provide a summary of other transportation dashboards in use in the U.S.

The target audience of the dashboard includes freight companies operating in border regions and policy makers. Freight companies can use the dashboard to make planning decisions. For example, they can obtain information on average delays for a time period and determine how much buffer time to schedule. Policy makers can use the dashboard to assess policy decisions related to delay times and evaluate results of past decisions. The dashboard presents trends in multiple timeframes (annual, monthly, weekly, as well as user-specified time periods). This functionality allows users to customize the information to their needs.

The dashboard presents the following information:

- Performance measures that convey information on delays such as the buffer index, which captures uncertainty of crossing times and is a top concern to freight companies. The dashboard calculates delay times in three ways:
    - Additional time over average crossing time;
    - Additional time over median crossing time; and
    - Additional time over the 95th percentile crossing time.

  It uses data captured from radio frequency identification (RFID) transponders installed in commercial vehicles that cross the border. However, there are limitations to this data: failure to identify responders before and after crossing the border means that crossing times cannot be calculated. Furthermore, the data is not broken down by lane or by Free and Secure Trade (FAST) or non-FAST status.

[3] HDR will refer to Roberts et al. (2014) to validate some of the inputs used in the economic impact model (such as crossborder wait time elasticity, average spending levels, and truck operating costs).

- Direct costs to shippers related to delays include inventory costs, such as damage costs for perishable goods. Direct costs also include the operating costs of commercial vehicles, such as fuel and maintenance costs and driver wages. The dashboard does not include indirect economic costs such as the costs of vehicle emissions issued during delays and wider effects to the regional and national economies of higher freight costs due to delays.
- Volumes of commercial vehicles presented on a monthly basis for individual POEs. Sources of data include the Bureau of Transportation Statistics and the Texas Department of Transportation.
- Economic information includes data on volumes and monetary values of trade broken down by commodity and trading partner. The dashboard also presents information on daily exchange rates. Sources of information include the Bureau of Transportation Statistics and the Center for Border Enterprise and Economic Development.

The dashboard can serve as a source of information to estimate truck operating costs and to calculate the impact of higher wait times on transportation costs. One can also calculate performance measures included in the dashboard, such as the buffer index, to convey complementary information on the impact of delays at the California-Baja California border.[4]

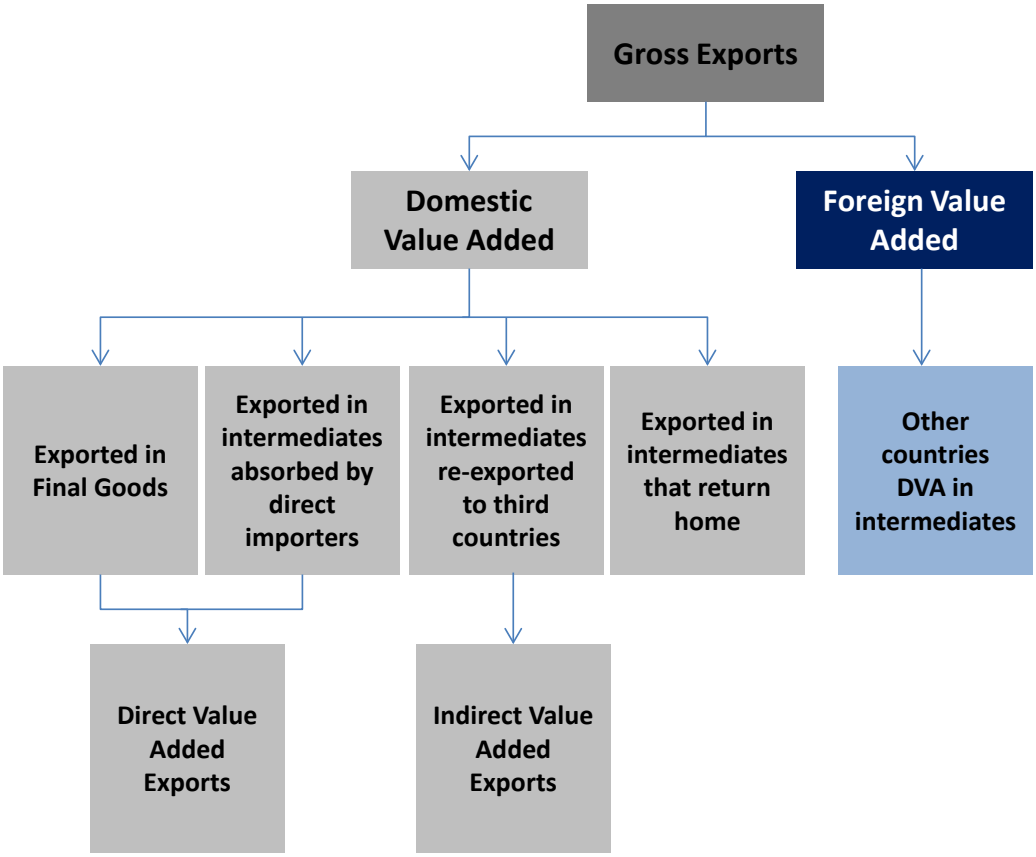
Koopman, R., Powers, W., Wang, Z., and Wei, S. (2010)
Official trade statistics do not present an accurate representation of the value that countries contribute to goods produced through international supply chains. They are measured in gross terms – that is, a country's official trade statistics include the value of the intermediate goods imported to the country and the value the country adds. As such, official trade statistics double count the value of intermediate goods that cross international borders more than once.

Koopman et al. (2010) address this problem by tracing the value each country adds in international trade (i.e., the domestic value added). Specifically, they break down the value of gross exports into its underlying components, foreign value added and domestic value added (DVA). Figure 1 below provides a representation of the components that make up gross exports. It also shows the conceptual framework used to carry out this exercise and explains how the results of the analysis can be used to illuminate issues in international trade.[5]

[4] The dashboard can be accessed on the Texas A&M Transportation Institute website at: http://bcis.tamu.edu/Commercial/en-US/index.aspx

[5] Though our proposed methodology to estimate the economic impacts of border delays on freight movements does not look into the origin of the value added of goods, it includes an adjustment factor to avoid double-counting of effects (percentage of export volume that is affected by a loss in competitive advantage and higher transportation costs caused by delays).

Figure 1: Breakdown of Gross Exports



Source: Koopman, 2010

To carry out the analysis, the authors develop an inter-country input-output (ICIO) table covering 26 countries and 41 sectors. Determining the value added by each country across sectors is accomplished in two steps. First, they separate intermediate goods from final goods in the imports of different countries. Specifically, they apply United Nations Broad Economic Categories (BEC) to detailed trade data to identify intermediate goods in each bilateral trade flow. Second, they allocate intermediate goods from a particular country to the sectors where they are used within all destination countries. The ICIO table uses data from the 2007 Global Trade Analysis Project (GTAP) database, the United Nations Comtrade database, and two input-output tables for major emerging economies that have large amounts of intermediate exports.

The results the analysis have wide-ranging applications. The authors provide examples of these applications and some are summarized below:

- Identify a country's position in the value chain of a sector. Determine whether the country is positioned in the upstream or downstream of the value chain. A country in the upstream of the value chain exports intermediate goods to firms operating in the downstream. The authors find that Japan, Western Europe, and the U.S. (among others) operate at the upstream end of the electronics value chain, whereas Singapore, some

EU member countries, Indonesia, and Thailand (among others) operate at the downstream end.

- Determine revealed comparative advantages. Using value added to calculate revealed comparative advantages removes the distortion produced by double counting intermediate goods in gross export data calculations. As such, using value added presents a more accurate identification of comparative advantages. For example, the study finds that when comparative advantages are assessed with value added data, India has a comparative disadvantage in the finished metal products sector whereas it has a comparative advantage when gross export data is used.
- Calculate bilateral trade imbalances. The authors find that Mexico's trade surplus with the U.S. calculated with value added data is 30 percent lower than when it is calculated with gross export data. This is because Mexico is positioned at the downstream end of a large number of global value chains and it uses parts and components from the U.S. and other countries.

Brown, W. M. (2015)

Brown (2015) assesses the impact of additional regulations on the costs of shipping goods across the Canada-U.S. border. Specifically, the study answers three questions:

1. Did costs for moving goods across the border increase with the new regulations implemented in 2004?[6]
2. If costs did increase, what was the magnitude of the increase?
3. Has the cost increase persisted through time?

The study assesses revenues of trucking firms for the period from 1994 to 2009 to measure increases in shipping costs borne by shipping companies transporting goods across the border. It includes a statistical analysis that identifies temporal differences in variable and fixed costs between crossborder shipments and domestic shipments. Since costs for complying with border regulations are included in fixed costs, this disaggregated analysis shows cost increases incurred due to complying with tougher border regulations. The study also determines the premium on crossborder *ad valorem* rates (i.e., the additional cost of moving goods across the Canada-U.S. border over moving goods across the same distance domestically) and assesses how they have changed over time. It uses the Trucking Commodity Origin and Destination Survey which measures output of the trucking sector and the volume of commodities moved by truck.

The study finds that the premium on cross border *ad valorem* rates increased significantly after new regulations were introduced. From 1994 to 2000 it cost 16.2 percent more to ship goods across the border than to ship the same goods over the same distance domestically. However, the premium rose steadily to 25.1 percent from 2000 to 2005. The study also finds that the premium on cross border *ad valorem* rates remained high thereafter. Although the magnitude is

[6] As a result of 9/11, new security regulations were imposed on the movement of goods across the Canada-U.S. border that went into effect in November 2004.

low, higher premiums on cross border *ad valorem* rates can have significant impacts on goods that cross the border at various points during the production process.

Methodological Framework

Our proposed methodological framework to estimate the economic impacts of border delays is split between personal trips and freight movements.

Personal Trips

The economic impact of delays at the border on personal trips can be broken down into three categories: 1) impacts of foregone recreation, shopping, and vacation trips; 2) impacts of foregone work trips; and, 3) productivity losses from impaired crossborder movements. The description of the methodology to estimate each one of these impact categories is presented below.

LOST CROSSBORDER RECREATION, SHOPPING AND VACATION TRIPS

Traveler behavior differs based on trip purpose (e.g., business vs. leisure), trip time (e.g., peak vs. off-peak), and trip destination (e.g., Mexico vs. U.S.). In particular, the sensitivity to border delay varies under each trip category. Shopping and leisure trips tend to be easier to forego than work trips. For instance, a worker residing in Mexico will be more willing to wait for two hours at the border to commute to his or her job in San Diego. On the other hand, a U.S. resident on a short leisure trip to Baja California will be less willing to cross the border if they know they will have to wait two hours at the border to get back home later in the day.

The methodology therefore takes into account the sensitivity of each type of trip to border delay, thereby allowing us to estimate the number of trips foregone. Based on the trip destination, trip duration, and average spending per trip, we can then derive the direct economic impact. The indirect and induced effects are then estimated by means of input-output analysis. The economic impacts are estimated separately on both sides of the border using economic multipliers specific to the region of interest (for instance, San Diego County, Imperial County, or the State of California on the U.S. side).

The estimation of the economic impact of lost recreation, shopping, and vacation trips consists of seven (7) steps:

1. Obtain recent estimates and projections on border crossings by port of entry, trip purpose (shopping, recreation, and vacation) and destination (U.S. and Mexico);
2. Calculate the annual percentage change in future travel time associated with increased wait times and congestion – with respect to baseline conditions;[7]
3. Apply demand elasticity coefficients to the estimated changes in travel time to derive the annual reduction in recreation, shopping, and vacation trips due to increased wait times and congestion;
4. Estimate the expected revenue loss (spending from vacationers, shoppers, and other travelers) associated with the foregone trips based on the average spending per trip;

[7] Border wait time projections for each POE will be jointly developed by HDR and SANDAG using the Binational Traffic Model (BTM).

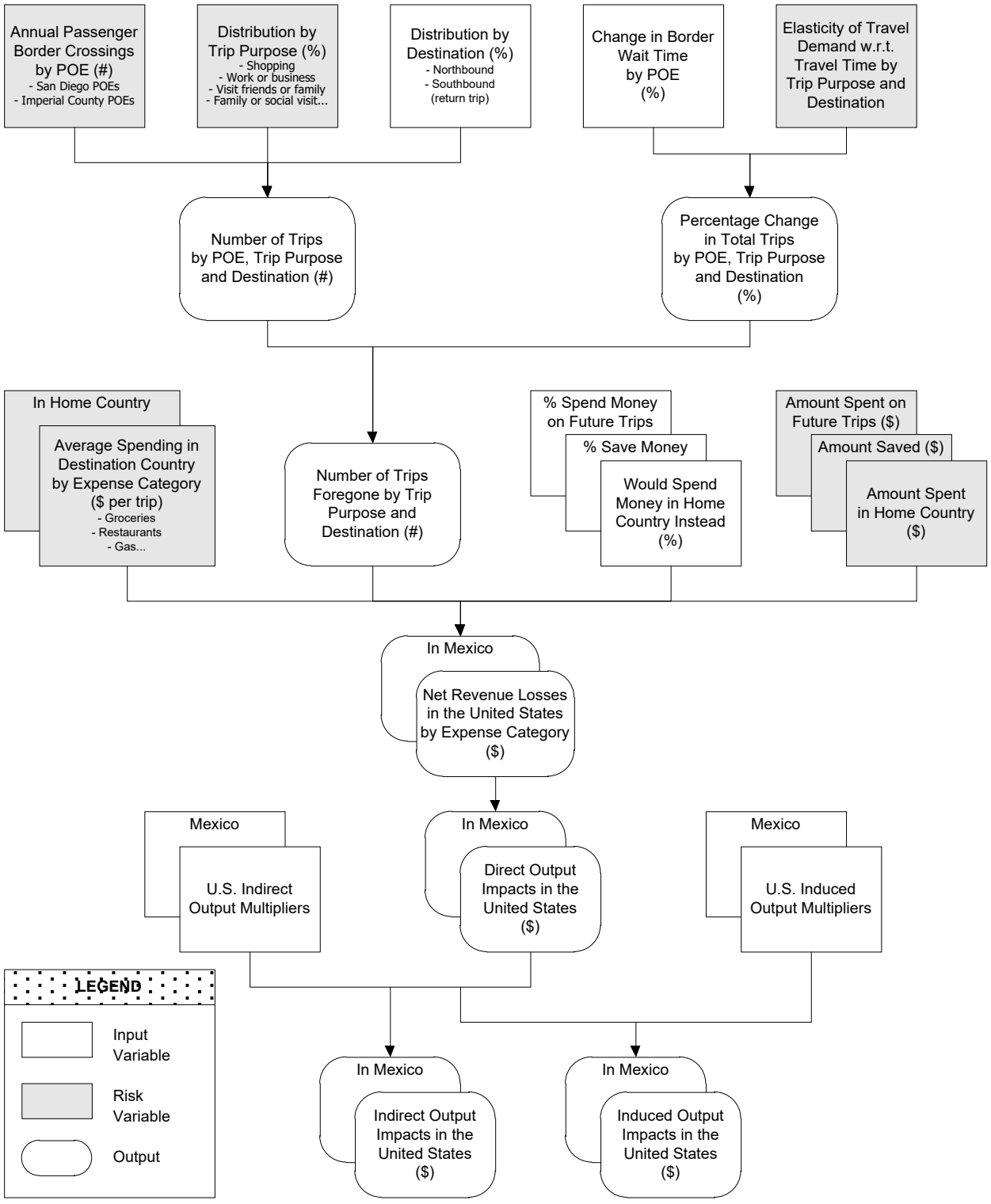
5. Adjust for changes in local demand using the survey data (e.g., vacation money spent in Mexico instead of the U.S. and vice versa);
6. Derive the direct impact of foregone spending on the region's business output, labor income, and employment;
7. Estimate the indirect and induced impacts (on output, income, and jobs) of foregone trips by means of input-output analysis.

Figure 2 on the next page provides an overview of the estimation process. The diagram identifies the different inputs (e.g., annual passenger border crossings), intermediate outputs (e.g., number of trips foregone by trip purpose and destination), and final outputs (e.g., indirect economic impacts in the U.S.) as well as the dependency relationships between them.

Note that the estimation of the economic impacts is conducted within a risk analysis framework to account for uncertainty surrounding some input variables (e.g., percentage of trips for work or business purposes): model inputs are provided as a range of estimates (with lower and upper bounds) instead of single point estimates. These ranges are transformed into probability distributions and combined using a simulation technique (Monte Carlo analysis) that allows each variable to vary simultaneously. Several risk variables will be discussed in detail with a panel of experts during a workshop; these variables are shaded in grey in Figure 2.

An extensive survey of crossborder travelers was conducted for this study at land POEs located along the California – Baja California border in the summer and fall of 2016. The survey responses provide key inputs to the economic impact model, such as trip origin and destination, trip purpose, expected wait time at the border, sensitivity to increased wait times, average spending per trip, and alternative local spending if the trip were not made.

Figure 2: Estimation of the Economic Impacts of Lost Crossborder Recreation, Shopping, and Vacation Trips



LOST CROSSBORDER WORK TRIPS

Even though crossborder work trips are anticipated to be harder to forego compared to recreation, shopping or vacation trips, delays at the border can still create a situation where commuters decide not to go to work due to high border-crossing times.

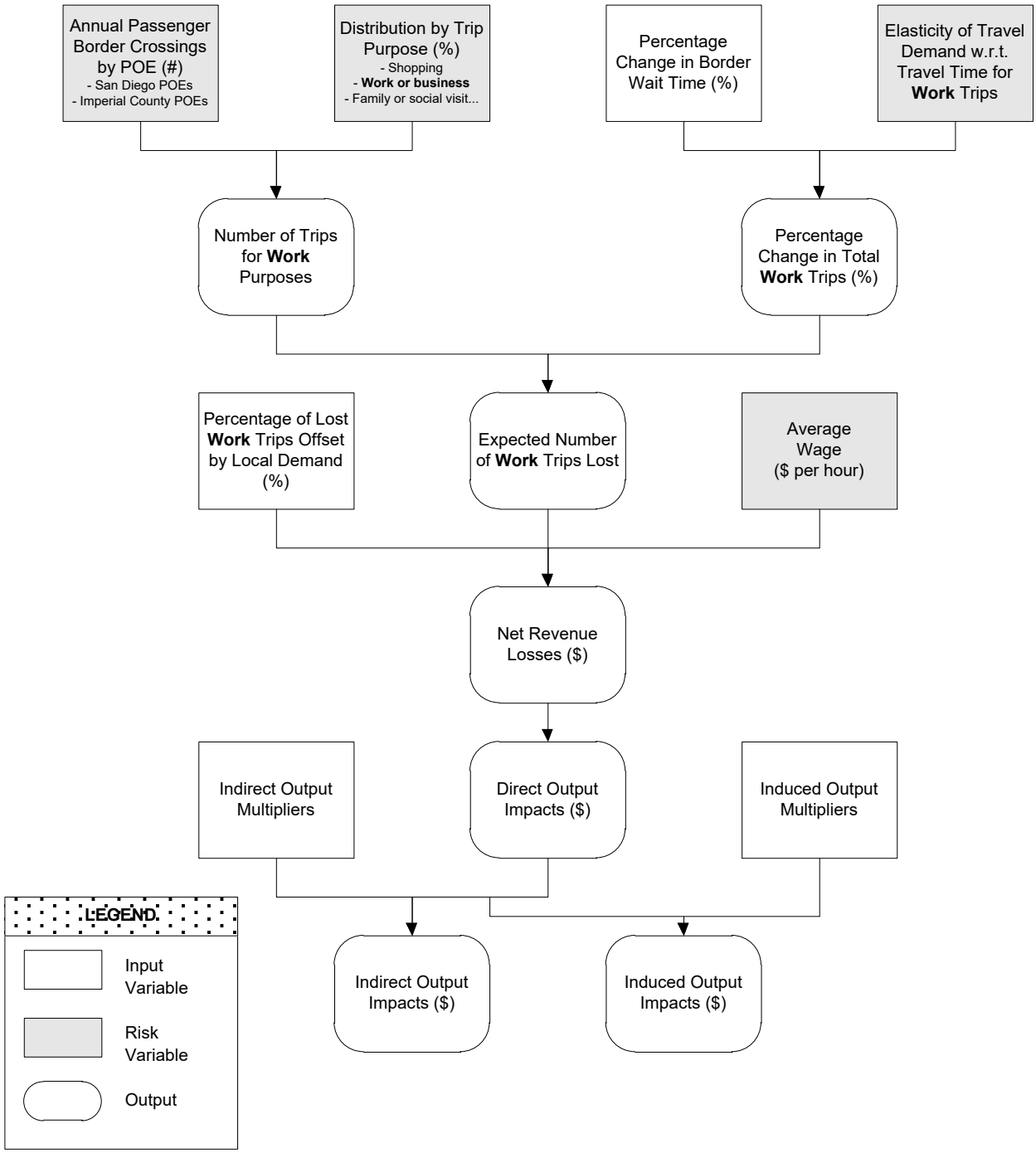
Estimating the economic impact of lost crossborder work trips is similar in concept to the estimation of the economic impact of lost recreation, shopping and vacation trips and follows seven (7) steps:

1. Obtain current data and projections on passenger crossings by port of entry, trip purpose (work) and destination (U.S. and Mexico);
2. Calculate the annual percentage change in future travel time associated with increased wait times and congestion;
3. Apply demand elasticity coefficients to the estimated changes in travel time to derive the annual number of work trips foregone due to increased wait times and congestion;
4. Estimate the expected revenue (productivity) loss associated with the foregone work trips using average wage estimates;
5. Adjust for changes in local demand (i.e., local job gains);
6. Derive the direct impact of foregone work trips on the region's business output, labor income and employment;
7. Estimate the indirect and induced impacts (on output, income, and jobs) of foregone work trips by means of input-output analysis.

Figure 3 on the next page provides an overview of the estimation process (risk variables to be discussed with the panel are shaded in grey). The figure depicts a method similar to the one used for recreation, shopping, and vacation trips. The number of lost work trips due to border delays is estimated based on the number of crossings for work purposes and the sensitivity of workers to wait times. Lost work trips are then converted to lost earnings. Using multipliers from an input-output model, we can then derive the direct, indirect, and induced economic impacts.

As in the case of foregone recreation, shopping and vacation trips, the survey results are also used to estimate the economic impacts of forgone work trips.

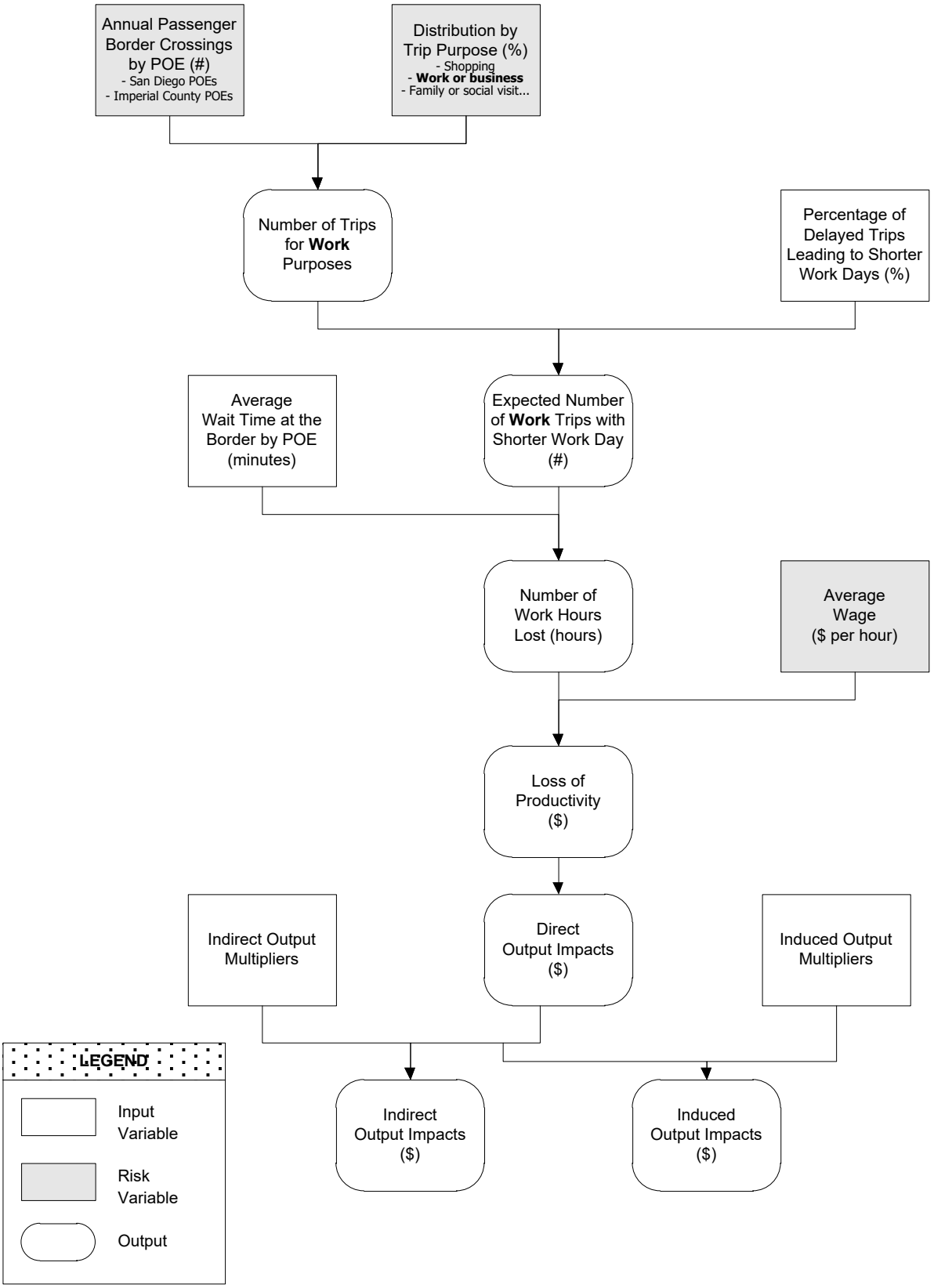
Figure 3: Estimation of the Economic Impacts of Lost Crossborder Work Trips



PRODUCTIVITY LOSSES DUE TO IMPAIRED CROSSBORDER WORK TRIPS

In addition to lost work trips, border delays have a significant impact on productivity in the crossborder region. They cause workers to be late at work, spend less time with their family, and make trips at less desirable times. While some of this effect is not directly related to the macro-economic impact, reduced working time has a direct effect on productivity and therefore should be included in the economic impact analysis. If, as a result of a border delay, a person works six hours instead of eight hours, the two hours lost should be accounted for in the economic impact calculation. On the other hand, if that person is delayed at the border but still manages to work eight hours, the delay is part of the user cost and is not estimated at the macro-economic level. Figure 4 on the next page provides an overview of the estimation process (risk variables to be discussed with the panel are shaded in grey).

Figure 4: Estimation of the Economic Impacts of Productivity Losses due to Impaired Crossborder Work Trips



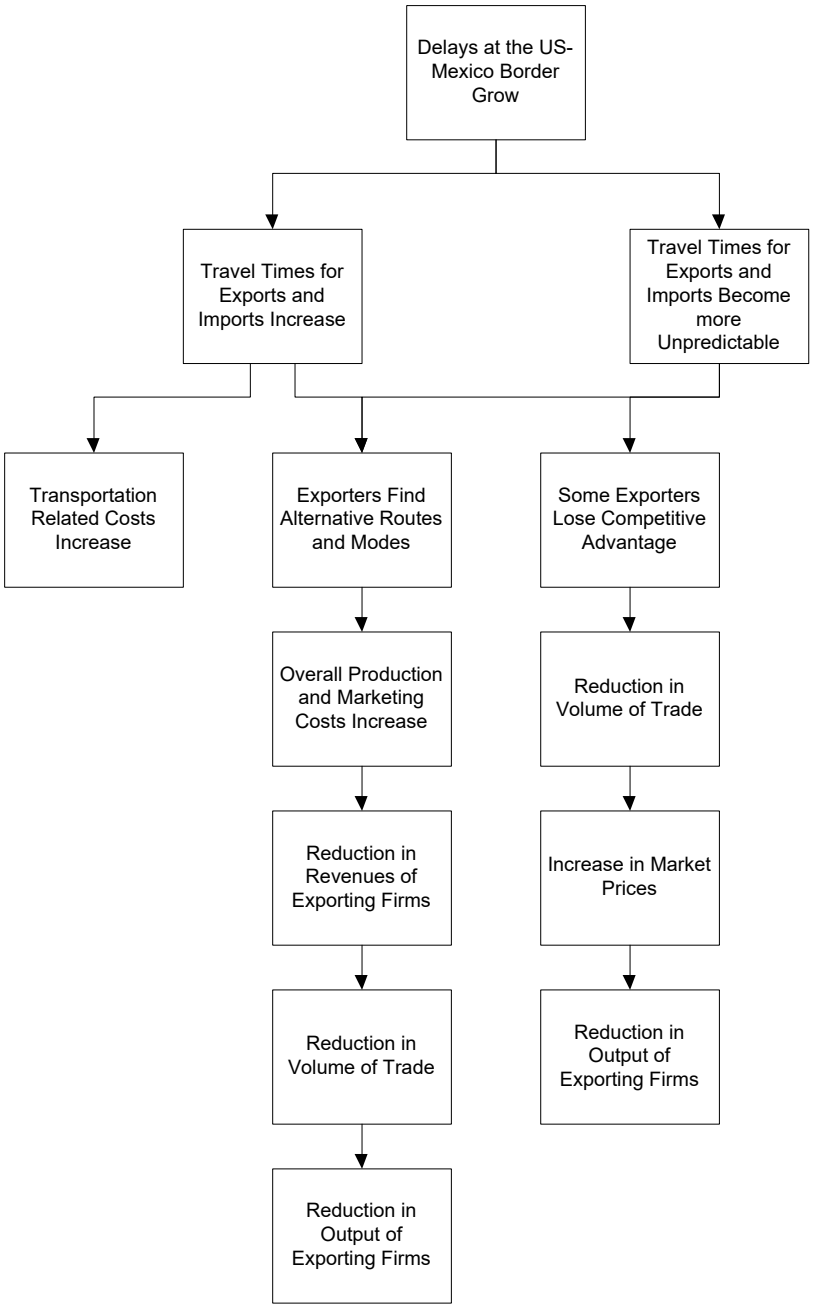
Freight Flows

The methodology to estimate the economic impacts of border delays on freight movements relies on the fundamental principles of the theory of trade between two countries. The following explains how border delays affect prices and production in each trading country and presents the process and key inputs used to estimate the impact on trade and the economy at large.

EFFECTS OF BORDER DELAYS ON PRICES AND PRODUCTION

Figure 5 depicts the general process for production and management decisions in a situation of increasing delays at the U.S.-Mexico border and identifies the main effects of border delays.

Figure 5: Effects of Border Delays on the Production Process of Firms Engaged in Crossborder Activity



As shown in the diagram, the effects of increasing wait times are estimated separately from the effects of wait time uncertainty. However, in both cases, the final result is an estimation of the change in output of exporting firms. The methodology to estimate the impact on output from increasing wait times is presented below. Multipliers from input-output models are subsequently used to derive the direct, indirect, and induced effects of border delays (see page 23).

ESTIMATION OF OUTPUT IMPACT

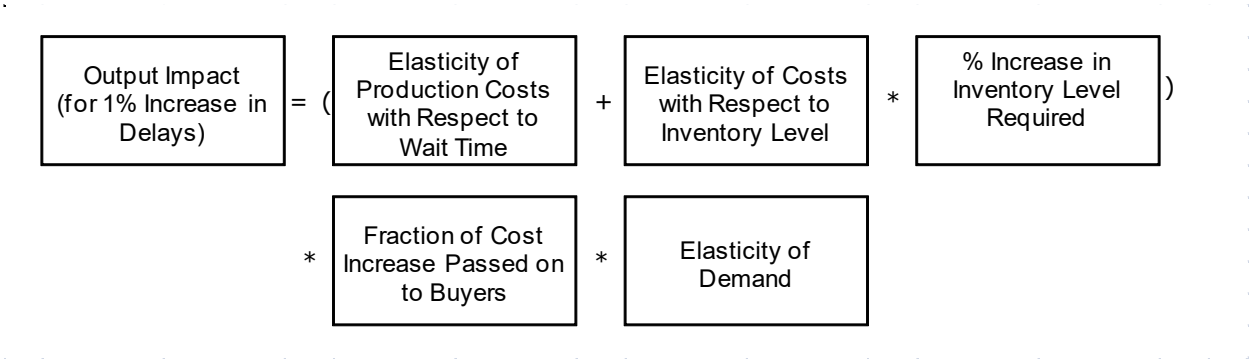
Due to the effects of increasing wait times described in the previous section, the estimation of output impacts is broken down into industries for which timing of their inputs is important for their production processes (i.e., just-in-time industries) and other industries that trade primarily finished goods. Various elasticities, derived from the literature (see Blanchard, 1996), are used to estimate the economic impacts on just-in-time (JIT) industries (e.g., Machinery and Equipment, and Manufactured Goods) and the economic impacts on other industries that trade primarily finished goods (e.g., Agricultural and Food Products, Mining and Mineral Products) separately.

The following data is used to estimate the impact of border delays on the output of just-in-time industries:

- Elasticity of production costs with respect to wait time;
- Elasticity of manufacturing costs with respect to inventory level;
- Percentage increase in inventory level required, for each one percent 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 percentage change in total output is calculated as shown in Figure 6 below.

Figure 6: Calculation of Output Impact in Just-in-Time Industries



For other industries, border delays result in a reduction in output 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.

There is an offsetting effect to the reduction in output mentioned above. The offsetting effect is an increase in output of local or domestic producers competing with imports: since imported goods become more expensive and less attractive, local producers experience a stronger demand.

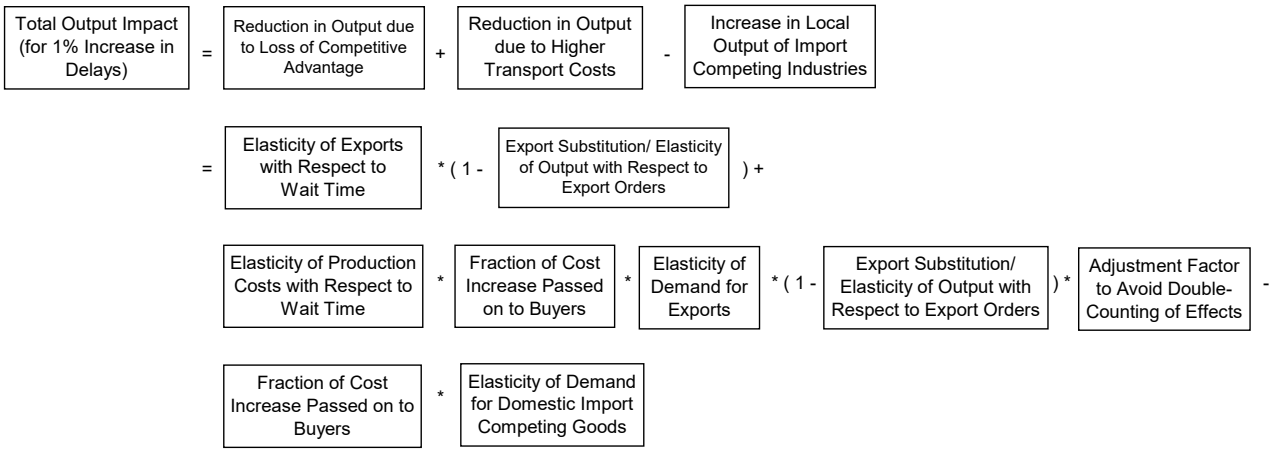
It should also be pointed out that the reduction in export demand is partially offset by domestic sales, or export substitution. In other words, it is assumed in the methodology that exporters are able to sell some of the lost exports to the domestic market.

The following data is used to estimate the impact of border delays on the output of other industries:

- Elasticity of exports with respect to border wait times;
- Export substitution with domestic sales;
- Elasticity of production costs with respect to border wait times;
- Fraction of cost increase passed on to buyers;
- Elasticity of demand for exports;
- Adjustment factor to avoid double-counting of effects (percentage of export volume that is affected by a loss in competitive advantage and higher transportation costs caused by delays); and
- Elasticity of demand for domestic import competing goods.

Ideally, those estimates are provided by industry or main commodity grouping to account for the fact that not all firms are equally vulnerable to border delays. The (percentage) reduction in output of exporting firms is calculated as shown in Figure 7 below.

Figure 7: Calculation of Output Impact in Other Industries



Once the percentage change in output is known for each type of industries, it is multiplied by the projected freight value at each port of entry to obtain the total output impact.

KEY INPUT VARIABLES

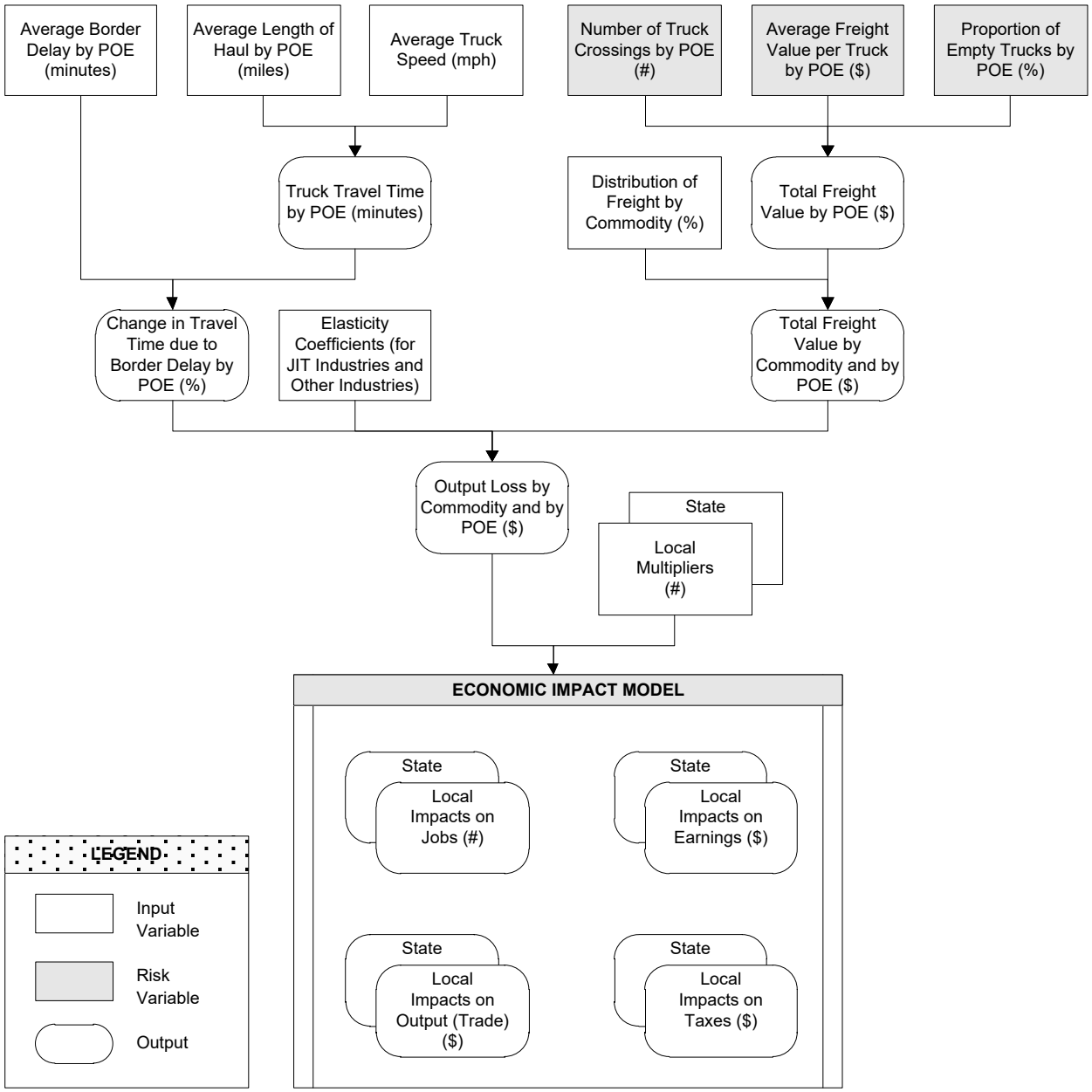
The calculation of the output impact relies on the following key input variables:

- Traffic Volumes – Annual truck traffic volumes at each POE are obtained from the Bureau of Transportation Statistics (Transborder Surface Freight Data); the average annual growth rate for truck traffic over the forecasting period is derived from socio-economic variables and U.S.-Mexico trade forecasts and refined through the use of the Binational Traffic Model (BTM).[8]
- Border Wait Times – Current border wait times are based on data collected for this study for trucks and personal vehicles at each POE. Projections are derived from SANDAG's BTM.
- Average Freight Value – The average freight value per truck is obtained by dividing the total freight value (from the BTS North American Transborder Freight Database) by the number of trucks in both directions at each POE. It is used to estimate the total value of freight at risk.
- Average Length of Haul – The average length of haul (derived from the literature) is used in conjunction with the average truck speed to determine travel time.
- Average Speed – The average truck speed (derived from the BTM) for the entire trip is used in conjunction with the average length of haul to determine travel time. It does not reflect the wait at the border, and is assumed to be the same in both directions.
- Trucks Origin and Destination – Percentage of trucks bound to/from San Diego County, Imperial County, California and Baja California derived from the survey data and the BTM.

Figure 8 on the next page summarizes the methodological framework along with the input variables (described above) to assess the economic impacts of reduced freight movements. Note again that the impacts are separately estimated on both sides of the border.

[8] The BTM is an offshoot of SANDAG's Regional Travel Demand model. It includes the entire San Diego regional highway network plus the network south of the U.S. border covering the roadway system in Tijuana, Playas de Rosarito, and Tecate. The model is designed to assign private auto and commercial vehicle trips originating from Mexico and destined to U.S. (and vice versa) to the roadway system through all the available land POEs. The POEs are coded in the model as a collection of links representing SENTRI, Ready and Regular lanes for auto traffic and Regular and FAST lanes for processing commercial vehicle traffic. For more information, see HDR's memorandum on Border Crossing Wait Time Estimation Methodology.

Figure 8: Estimation of the Economic Impacts of Reduced Freight Movements



Input-Output Analysis

Economic impact analysis helps quantify the effects of a change in the demand for goods and services on the level of economic activity in a given area. The initial change in demand can be the result of decisions made by governments, firms, or households.

The reduction in trade due to border delays affects the export manufacturing industries, thereby reducing the need for inputs (purchases) of labor, materials, equipment, and services, which are supplied by local (and non-local) producers. To the extent that the reduction in these purchases results in reduced productivity and/or reduced levels of labor force utilization (employment), it will cause a decline in the local economy with attendant costs of lower employment, personal income, business profits, and tax revenue.

TYPES OF EFFECT

Traditionally, economic impact analysis involves the estimation of three types of effect, commonly referred to as direct effects, indirect effects, and induced effects. The total economic impact is the sum of these direct, indirect, and induced effects.

- Direct effects – Refer to the economic activity occurring as a result of direct spending by businesses (e.g., import/export companies) or agencies located in the study area. For instance, the direct effect of foregone shopping trips (due to border delays) is the incremental revenue loss to the crossborder retail industry.
- Indirect effects – Refer to the economic activity resulting from purchases by local firms who are the suppliers (e.g., electrical equipment manufacturers) to the directly affected businesses or agencies. The spending by these supplier firms for labor, goods, and services necessary for the production of their own goods or services generates additional economic activity further down the production chain.
- Induced effects – Represent the increase in economic activity – over and above the direct and indirect effects – associated with increased labor income that accrue to workers (of directly and indirectly affected businesses) and is spent on household goods and services purchased from businesses within the study area. As with business purchases, household consumption generates additional economic activity.

The indirect and induced effects are sometimes referred to as “multiplier effects” since they can make the total economic impact substantially larger than the direct effect alone: in theory, the larger the multiplier, the larger the overall response (total economic impact) to the initial shock (direct effect). In reality though, while indirect and induced impacts do always occur, the net impact on the total level of economic activity in an area may or may not be increased by multiplier effects. That outcome depends on the definition of the study area and its ability to provide additional workers and capital resources, or attract them from elsewhere.

An employment multiplier measures the total increase in the number of jobs in the economy per new job created in a specific industry. Consider a drayage company that hires 10 new truck drivers. Let’s assume that the employment multiplier for the trucking industry is 1.5. In this example, 5 additional jobs would be created in the economy as a result of the 10 positions created at the drayage company, for a total of 15 new jobs.

IMPACT METRICS

Typically, economic impacts are measured in terms of business output, value added, employment, and tax revenue.

While business output is the broadest measure of economic activity and refers to the total volume of sales (i.e., intermediate and final demand), value added refers to the value a company adds to a product or service. It is measured by the difference between the amount a company spends to acquire it and its value at the time it is sold to other users. The total value added within a region is equivalent to the gross domestic product (GDP) for that region and consists of employee compensation, taxes on production and imports less subsidies, and gross operating surplus.

Employment impacts measure the number of jobs created for a full year. These impacts should not be interpreted as full-time equivalents (FTEs) as they reflect the mix of full and part-time jobs that is typical for each sector. And, strictly speaking, they should not be interpreted as permanent jobs either, but rather as job-years. A job-year can be defined as one person employed for one year, whether part-time or full-time.

Tax impacts comprise local, state, and federal taxes. They can be broken down by institution (households, corporations, etc.) and by type of tax (personal income tax, corporate profits tax, etc.).

INPUT-OUTPUT MODELS

Input-output (IO) models[9] are often used to simulate the impact of a change in the demand for goods and services. They are used to estimate the direct, indirect, and induced effects of border delays on both personal crossings and freight movements.

To measure the economic impacts in the U.S. we will use IMPLAN Pro, which is an input-output based regional economic assessment modeling system. It consists of a software package and data files that are updated every year. The IMPLAN data files include transaction information (intra-regional and import/export) on 536 industrial sectors (corresponding to four- and five-digit North American Industry Classification System [NAICS] codes) and data on more than 20 different economic variables, including business output and value added. For this study, the IMPLAN system is populated with the most recent data available (2015) for San Diego County, Imperial County, and the rest of California.[10]

In the course of the analysis, several adjustments will be made to help ensure that all impact estimates are truly incremental and specific to the study area:

[9] An input-output approach is followed in this study, drawing on an extensive body of research and experience with successful applications to transportation projects. An IO model calculates impact multipliers, which are then used to compute direct, indirect, and induced effects – output, employment, income, and local tax revenue generated per dollar of direct spending for labor, goods, and services.
[10] The analysis may also be conducted at the city or subregional levels for specific areas within San Diego County and Imperial County.

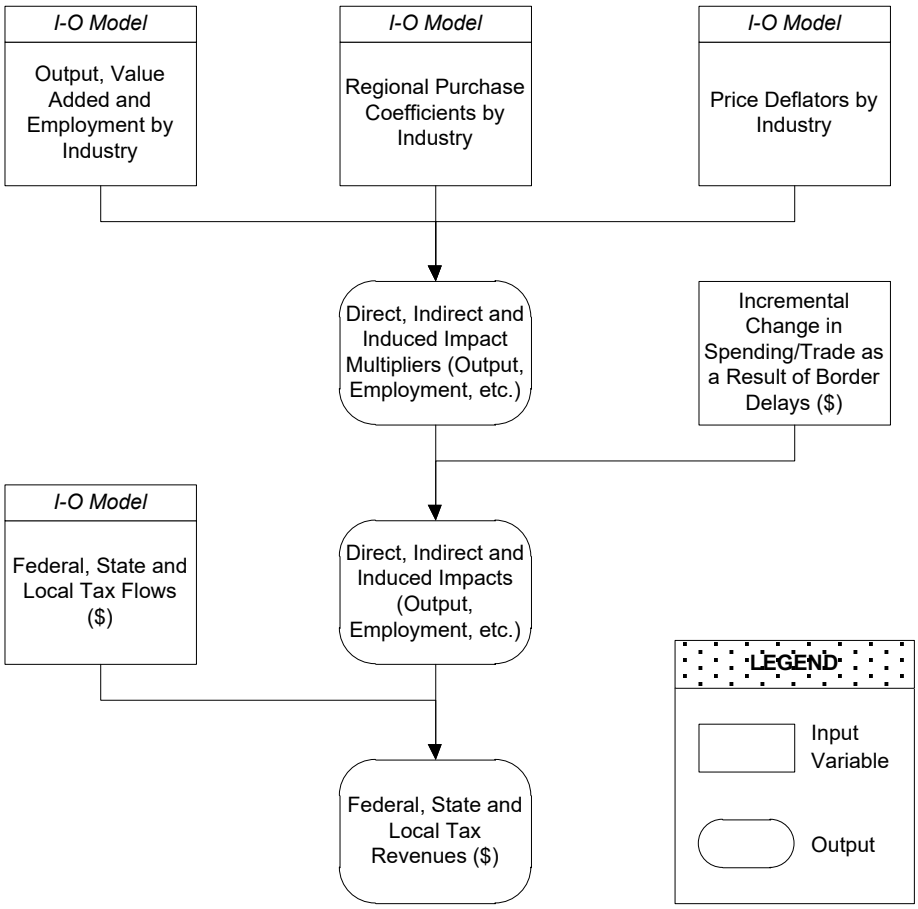
- Since the original IMPLAN data are for 2015, the analysis results are adjusted for inflation;[11]
- Social Accounting Matrix (SAM)[12] multipliers used for estimating indirect and induced effects are modified with regional purchase coefficients (RPCs)[13] derived from the IMPLAN National Trade Flows Model to ensure that any spending "leaking" out of the study area is not counted; and
- Households are the only institutions considered when building type SAM multipliers. As a result, induced effects are based on the income of residents of the study area solely.[14]

To estimate the economic impacts on the Mexican side of the border we use an input-output model for the State of Baja California developed by the Colegio de la Frontera Norte (COLEF). The model includes 2013 economic data on 261 sectors from Instituto Nacional de Estadística Geografía e Informática (INEGI), Secretaria de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA), and the U.S. Bureau of Transportation Statistics (BTS).

Figure 9 on the next page provides an overview of the economic impact estimation process with an IO model. The key input to the IO model is the incremental change in spending or trade (i.e., direct effect) resulting from border delays. Multipliers are applied to this initial change in demand to calculate the direct, indirect, and induced effects, in terms of output, value added, and employment. Local, state, and federal tax impacts are subsequently estimated.

[11] Deflators derived from the most current Bureau of Labor Statistics (BLS) growth model are used in IMPLAN to account for relative price changes over time. These deflators are available through year 2030 and applied at the commodity level.
[12] Type SAM (Social Accounting Matrix) multipliers are the direct, indirect and induced effects where the induced effect is based on information from the social accounting matrix. Type SAM multipliers capture inter-institutional transfers (such as transfers between households and the Federal government) in addition to all commodity flows (purchases of goods).
[13] RPCs are ratios indicating what fraction of total demand for goods and services within a region (both by business and household) is satisfied from within the region; all remaining demand is satisfied by imports, which provide no direct economic benefit to the region. In other words, they filter out economic leakages from the region.
[14] It is commonly accepted that only households should be internalized when building type SAM multipliers. Internalizing households relies on the assumption that local workers will spend a portion of their labor income.

Figure 9: Overview of Input-Output Analysis



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Appendix B: Brief Description of Baja California I-O Model

(Provided by Dr. Alejandro Brugués)

Methodological Elements of Input-Output Matrices

From the standpoint of economics, one of the methodologies designed to provide the data needed for the analysis of economic impacts is the *Input-Output Model* (I-O model). In fact, the initial proposal by the methodology's creator, Wassily Leontief (Leontief, 1936), was oriented toward understanding the structure of interdependency between different branches of the U.S. economy. Leontief's subsequent development of the methodology and its application in the analysis of economic impacts led him to being awarded the Nobel Prize in Economics in 1973. In its current form, the I-O model is an analytical tool useful in describing the economic relationships between sectors, and based on these, measuring the impact that changes in demand have on sectorial production levels, employment and other relevant measures for economic analyses.

The I-O model provides a framework for the organization of disaggregated data by economic sector in relation to how production in the economy is generated and distributed. In addition, the I-O model has the capacity to render disaggregated data compatible with its synthetic performance indicators, such as Gross Output, Gross Domestic Product, Household Consumption, Exports, among others. As producers—represented in columns—the economic measures contained in the matrix account for: good and services purchased from all other economic sectors, payment for factors of production, net taxes for subsidies, and imports of goods and services that become aggregated into the Gross Domestic Product of the economy. Purchases of goods and services from all other economic sectors are referred to as *Intermediate Consumption*, since when these become integrated into the production of a new product or service they continue to be a part of the flow of intersectoral goods, only now incorporated into a new product.

As consumers—represented in rows—the economic measures contained in the matrix account for sales of products between the sector represented by row and all other sectors in the economy, represented in the columns. In this case, the measures contained in the intersectoral section are also considered as intermediate values, and in analyzing the destination for production this is referred to as Intermediate Demand—as it was previously explained, it is destined to satisfy the productive requirements of all other economic sectors. The destinations for production are complemented with the sectors that consume the goods in the end, among which we have: Household Consumption, Government Consumption, Changes in Inventory, Gross Fixed Capital Formation, and Exports. The label *Final Demand* is used here since the consumption of goods in these sectors supposes their destruction or their incorporation into a "product" of sectors that are relatively independent from the flow of goods in the economy.

Once these conditions are established, we can suppose then that the sum of what is produced by each sector of the economy coincides with the total availability of goods to be distributed within it by sector. If there were an imbalance, the new amounts to be produced by each sector must simultaneously meet the needs of Intermediate Demand and Final Demand. In principle, this is the basic question that the Impact Analysis seeks to answer*: when facing an increase in Final Demand*, *what production amounts are needed to simultaneously meet the needs of Final Demand and Intermediate Demand for each and every one of the sectors?*

The main assumptions of the Input-Output Model are:

- *Sectoral Homogeneity*: Each input is provided by a single sector. This implies that each one of the sectors has a primary production or characteristic, but not a secondary one.
- *Hypothesis of Relative Price Invariance:* Inputs or similar products have the same value prices for all producers.
- *Hypothesis of Proportionality:* The input amount varies in the same proportion as production. This implies that factors and inputs are not determined by relative prices.
- *Hypothesis of Additivity:* The total effect over the production of various sectors is equal to the sum of the effects on the production of each sector.
- *Hypothesis of Exceeding Capacity:* The economy operates with certain excess capacity that does not generate bottlenecks in short-term production.

In terms of its graphic presentation, the I-O model for a single region can be represented as a cross-tabulation table where the columns display the form in which production is generated and rows the form in which it is distributed. As Figure 1 shows, if we follow the columns we can observe how the production of each sector is composed by the intermediate consumption of goods coming from other sectors of the economy; we can also observe the amount of net taxes by subsidies paid—charged—by each sector, and payments for primary factors of production—labor and capital; the former in terms of wages and salaries and the latter as gross operating surplus.

In Figure 1, if we look at the Primary Sector Column we may observe how the consumption of intermediate goods of all sectors adds up to 221,000 million pesos, of which 58,000 million pesos are self-inputs to the primary sector, and 120,000 million and 43,000 million pesos of the secondary and tertiary sectors respectively. Additionally, they receive 3.8 Billion pesos in net subsidies. The payment to primary factors of production in the sector, in the table represented as Aggregate Value, reaches 393,000 million pesos. Finally, this is the composition of production in this sector of the economy, that reaches 610,000 million pesos.

Figure 1. 2008 National Input-Output Matrix by Activity Sector (In Millions of Pesos)

NO.	NAICS	SECTOR / SECTOR	TOTAL USE OF DOMESTIC PRODUCTION AT BASIC PRICES	INTERMEDIATE DEMAND				FINAL DEMAND					NO.
				TOTAL INTERMEDIATE DEMAND	Primary Activities	Secondary Activities	Tertiary Activities	TOTAL FINAL DEMAND	HOUSEHOLD CONSUMPTION	GOVERNMENT EXPENDITURE	GROSS FIXED CAPITAL FORMATION	FOREIGN TRADE AND MISC.	
					1	2	3	4	5	6	7	9	
1	11	Primary Activities	610,193	431,217	58,031	373,140	47	178,975	139,396	0	89,679	-50,100	1
2	21,22,23,31-33	Secondary Activities	10,585,818	5,757,350	119,790	4,644,164	993,396	4,828,468	2,714,534	1,969	2,676,151	-564,186	2
3	43,46,48-49,51-56,61-62,71-72,81,93	Tertiary Activities	9,486,556	2,712,877	43,184	1,245,851	1,423,841	6,773,679	4,760,647	1,330,536	410,845	271,651	3
4	Use of the total economy of domestic and imported origin		20,682,566	8,901,444	221,005	6,263,156	2,417,284	11,781,122	7,614,576	1,332,505	3,176,676	-342,635	4
5	NET PURCHASES BY RESIDENTS AND NON-RESIDENTS		0					0	-52,061	1,302	0	50,759	5
6	Total uses of domestic-origin and imports		20,682,566	8,901,444	221,005	6,263,156	2,417,284	11,781,122	7,562,515	1,333,807	3,176,676	-291,876	6
7	Taxes of goods and services net of subsidies		315,664	-160,077	-3,796	-42,545	-113,736	475,741	455,898	0	19,843	1	7
8	Total uses of domestic-origin and imports at buyer prices		20,998,230	8,741,367	217,209	6,220,611	2,303,547	12,256,864	8,018,413	1,333,807	3,196,519	-291,875	8
9	Gross Aggregate Value for Total Economy		11,941,199	11,941,199	392,984	4,365,207	7,183,008						9
10	Total Economic Output at basic prices		20,682,566	20,682,566	610,193	10,585,818	9,486,556						10

Source: INEGI, SCNM. Matriz de Insumo-Producto Nacional (INEGI, 2012).

Looking at the contents of Figure 1 by row reveals the destinations to which available products are sent. As it was previously mentioned, the table is divided into Intermediate Demand for the products distributed to the rest of the productive sectors, and Final Demand for the products distributed for Household Consumption, Government Spending, Gross Capital Formation and the Foreign Sector; its label as *Final* is derived from the assumption that consumption in these sectors withdraws goods and services away from circulation among economic sectors.

In this case, if we pay close attention to the production of the secondary sector we can see that it amounts to 10,585.6 Billion pesos of which 5,757.3 Billion pesos are destined to meet the demand of all other productive sectors, and are grouped as Intermediate Demand since upon their consumption they become part of, or transfer their characteristics to, the product of the sector that consumes them. Additionally, we may identify that 4,828.5 Billion pesos are sent to Final Demand where the main consumer is the Household sector. Finally, we must highlight how there is a balance between the amounts produced and those distributed, which constitutes an equilibrium in the economy that allows for the verification of consistency of the instrument.

Input-Output Regional Matrices

Although initially the development of input-output models was proposed for economies at the national level, by the 1950s various models emerged to be applied to economies at the regional level. In principle, these considered regions as isolated spaces and the matrices were derived from national matrices, “adjusting” national coefficients to the values of regional economies. The development related to regional models subsequently led to the expansion of their application taking into consideration the possibility of generating models for various regions, including the interactions produced between them.

The uni-regional I-O model can be converted into a bi-regional I-O model, if the country were divided into “two regions” only. In this manner, we would obtain a model of practical dimensions for an empirical analysis. In the previous table, it would be possible to maintain the fundamental structure of the uni-regional I-O model, with the exception that in it each element would be identified with a pair of subscript indices for sectors (i, j), and a pair of superscript indices for regions (Baja California, Rest of Mexico).

A challenge faced when building input-output models is that they require highly detailed data regarding commercial transactions at the sectoral level and between sectors, and the rest of the agents that participate as consumers taking part in the economic activity. Moreover, the construction of regional-level models must consider two elements in relation to the data—the first, related to lack of available recorded regional transactions or interregional trade flows; and the second, the restriction to the assignation to regions of activity or superregional businesses.

These restrictions have prompted the creation of a set of methods which, based on national matrices and supported by regional data sets, can estimate regional models between them. In the literature, they are referenced as:

- Location Quotient Family
- Regional Purchase Coefficients

- Supply-Demand Adjustments

The Location Quotient Family in a two-region context would analyze for each sector if these have the capacity of meeting local demand and of exporting production surpluses. To achieve this, it compares the value of the location quotient with the unit; if the value is greater it establishes that the corresponding sector possesses the elements to support the local economy and export surpluses, and this is represented with a location quotient greater than 1 and would not suppose any adjustment in the magnitude of technical coefficients.

The Regional Purchase Coefficients stem from the fine-tuning of an econometric model which correlates flows in trade with the size of an economy and regional output. In the case of the Mexican economy, there are no interregional trade flows available, rendering the use of these methods impossible.

Finally, Supply-Demand Adjustments are focused on utilizing the values of regional indicators to estimate values of supply and demand by sector for the regional economy, and in turn being able to estimate the flows of trade necessary to balance the supply and demand of goods and services in the economy. In our case, this is the method that will be used and will be detailed below.

Estimation of the 2013 Baja California Matrix

The foundation for the Baja California Input-Output Model 2013 (BC I-O model 2013) is provided by data from the 2008 National Input-Output Matrix (Matriz Nacional de Insumo-Producto 2008) published by the National Institute of Statistics, Geography and Information (INEGI in Spanish). As it may be noticed, due to the gap in years between them, it will be necessary to update the national base first and engage with the regional estimation afterward. Initially, an estimation was conducted of national gross output values by economic sector for the year 2013 based on data from national accounts.

To perform this estimation, in national accounts, we only have the values for Gross Output at aggregate levels in two-digits, so applying growth rates for disaggregate sectors would imply that all subsectors be increased by a similar value on average. Alternatively, we decided to utilize the growth of the indicators contained in the Economic Census at the desired level of disaggregation and use the variations in relation to the aggregate average of that sector to achieve a growth rate unique for each disaggregate sector, in addition to reproducing the behavior of the aggregate growth reported in national accounts. Formally, the values for Gross Output (GP) for 2013 by sector would be expressed in accordance to the following formula:

$$GP_{4d}^{2013} = GP_{4d}^{2008} * rna_{2d}^{\frac{2013}{2008}} * \left[\frac{rec_{4d}^{\frac{2013}{2008}}}{rec_{2d}^{\frac{2013}{2008}}}\right]$$

Where GP has been expressed as the values of gross production, and *rna* and *rec* as the growth rates from national accounts and economic census respectively. The superscripted indices refer to the year in reference of the data, and the subscripted indices to their level of aggregation—referred as 2d for two-digit and 4d for four-digit.

Once the national values for GP for each sector had been estimated, we proceeded to divide said values by the measurements corresponding to Baja California and the Rest of Mexico, using as base the value shown by these aggregates in the Economic Census of 2013.

Having obtained the value of GP for Baja California and the Rest of Mexico we derived the measurements for Aggregate Value (AV) corresponding to these values, for which we utilized the proportion of AV to GP of Baja California. Once these values are determined for the Rest of Mexico, they were determined as complement to the values obtained, since the regionalization framework is one of a balanced bi-regional matrix.

Finally, the rest of the aggregates were obtained as complement to the values calculated for the indicators previously described.

With this data and the aggregates for Baja California for the concepts of Final Demand, we complemented the need for information to develop an initial estimation adjusted to the aggregates of the Baja California economy. Based on it, total initial demand was contrasted against the values for production registered, from which the necessary trade volumes needed for the model to reach equilibrium were obtained.

These calculated trade volumes are incorporated into the general model, disaggregated starting from patterns of interregional trade and lastly, the model was balanced with a technique of bi-proportional adjustment known as RAS.

Appendix C: Comments from and Responses to Economic Peer-Review Panel

A FRESH LOOK AT IMPACTS OF BORDER DELAYS AT CALIFORNIA-BAJA CALIFORNIA PORTS-OF-ENTRY ECONOMIC PEER REVIEW PANEL

Thursday, April 20, 2017

Subject	Source	Questions/Comments	Answers/Responses
Methodology (General)	Written question	This study appears to be using a similar methodology to the previous study, but has done an updated literature review. How has the previous methodology been altered based on this new research?	A similar approach to the previous study is proposed because the literature review did not yield ground breaking findings or significant improvements that could be implemented for this update. Also, our approach needs to comply with a number of study requirements, in particular: risk analysis; estimation of impacts on both sides of the border; estimation of impacts at different geographical levels (including sub-county level) with the IMPLAN system; and estimation of economic impacts for personal trips (pedestrians and POVs) and freight movements separately. With that said, certain results from the literature will be accounted for in our methodology. For instance, we will refer to Roberts et al. (2014) to validate some of the inputs used in the economic impact model (such as crossborder wait time elasticity, average spending levels, truck operating costs, and elasticity of vehicle trips with respect to border wait times)
Methodology (General)	Written question	The study will estimate the impacts separately both sides of the border. It is not obvious from the methodology how this will be done. For example, was the 2016 survey conducted for both north and southbound travelers? If not, where does the information come from to estimate the effects of personal trips to Mexico?	The economic impacts of border delays will be estimated on both sides of the U.S.-Mexico border separately. Though only northbound travelers were surveyed [CBP does not keep track of travelers crossing into Mexico and U.S. immigration laws do not impact travelers crossing into Mexico], the questionnaire included separate questions for crossers living in Mexico (visiting the U.S.) and crossers living in the U.S.(returning to their principal residence)
Methodology for Personal Trips	Written question	It appears that the elasticities to estimate the effects on wait times on personal trips will come from the cross border survey conducted in 2016. Using a survey of people at the border may introduce a potential bias into these elasticities because it does not include people who decided not the make the trip because of border congestion. What if any are the biases in the	The survey results will be complemented with elasticity estimates from the literature (e.g., Roberts et al. (2014)) and feedback from the RAP panel. Also, as part of risk analysis, elasticities will be defined as a range of estimates (with lower and upper bounds) in lieu of single point estimates to account for uncertainty

Subject	Source	Questions/Comments	Answers/Responses
		survey and how might they affect the impact estimates?	
Methodology for Personal Trips	Written question	To estimate the impacts of productivity losses the method uses the percent of delayed trips leading to a shorter work day. Does that information come from the 2016 survey?	Yes, we specifically asked people traveling for work purposes whether they would be able to make up the time or whether they would have a shorter work day (questions BW-15 and BUW-15).
Methodology (General)	Written question	As we all know some crossborder travelers do not want to reveal the true purpose of the trip. Please explain how you take into account this factor to estimate the true trip purpose.	We can only assume that respondents accurately and truthfully answered that question. Note that respondents have the option to decline answering that question (or any question for that matter) if they choose to. Note also that the survey results will be compared with the results from other surveys for validation purposes.
Methodology for Freight Movements	Written question	Figure 5 depicts the Production Process for Firms Engaged in crossborder activity. Please elaborate the sources of information to estimate variables use in this diagram. For example, "exporters find alternative routes". This is difficult to estimate as there are few alternatives in the region. Same comment for Figure 7. Can you expand where are you planning to obtain the information to estimate these variables, and if it is disaggregated to the level of detail that is required.	Figure 5 depicts the process followed by firms engaged in crossborder activity in response to border delays, not the methodology we propose to estimate the impacts of these delays on freight movements and industrial output. Some assumptions (elasticity estimates in particular) will come from the literature (Database of transportation elasticities, Bureau of Transport Economics, Australia; Highways and Logistics and Production performance, Paper TP 12791E, Transport Canada), others will be based on the panel inputs, and a few will be based on the professional judgment of HDR. To the extent possible, and where applicable, we will use estimates specific to the following aggregate sectors: Agricultural and Food Products; Mining and Mineral Products; Machinery and Equipment; Manufactured Goods; and Others.
Methodology for Freight Movements	Written question	*RE: Length of haul.* Is it the total trip length from origin to destination, or just at the border? It is important to map the complete supply chain and not only the border crossing section of the trip.	This is the length of haul for the trip being made when the driver was interviewed. Note however that our methodology accounts for the impact of border delays on manufacturers (production) not just shippers.

Subject	Source	Questions/Comments	Answers/Responses
Methodology (General)	Panel discussion	Are “shocks” assumed to be permanent or temporary?	Yes. The shocks in the economic model are permanent.
Methodology (General)	Panel discussion	How long is the shelf life for an analysis like this and how often should it be updated?	Every 7 to 10 years would be advisable given the changing dynamics of the economy.
Methodology (General)	Panel discussion	Will the double-counting identified by Koopman be adjusted? Are there any risks of similar double-counting within this study that may have been identified in the literature review?	Our analysis will try to avoid any double-counting scenarios.
Methodology for Freight Movements	Panel discussion	Will adjustments on crossborder trade flows be conducted? Perhaps the adjustment method used in previous studies is still relevant for our study?	Dr. Pickrell offered to think about possible methodology. HDR and SANDAG will coordinate on this issue separately.
Methodology (General)	Panel discussion	Will there be a guiding principle in the methodology that accounts for the value of time? Also, will the value of time be available as an output of the analysis?	It depends on the intent of the study’s analysis. In some ways, the data collection component (surveys) has already integrated the value of time in the survey responses, but it will not necessarily be an output of the study.
Methodology (General)	Panel discussion	After the model is structured, how conservative will the ranges be for outputs?	How to display the ranges will be a discussion to have with the project study team.
Methodology (General)	Panel discussion	Is there any industry standard for where to initially place range percentages?	Normally the 80 percent range is the one used (i.e., 10th to 90th percentile of a distribution), but this can be adjusted.
Methodology (General)	Panel discussion	Are we considering specific industry elasticities or market substitutions in the analysis?	We are considering these factors, but it should be noted that changes to the model itself cannot be done within the IMPLAN system. Risk analysis cannot be done in the I-O model. It would be possible to do multiple model runs for this purpose.
Methodology for Personal Trips	Panel discussion	Are differences in lane types being considered as a type of sensitivity variable?	The lane type variable is aggregated within the model, the weighted average of crossing time by lane is being accounted for.
Methodology for Personal Trips	Panel discussion	Base year estimates for trip purpose are fine, but what is accounting for forecasted trip purpose estimates and how do you derive this “rate” by purpose type?	Because of the variability in forecasts, a range will be developed.
Methodology (General)	Panel discussion	Are the models accounting for the often “spontaneous” nature of queue length variability and the impacts on wait times?	The equations used to input into the model were configured to address this and to match, as closely as possible, the observed wait times in the field.

Subject	Source	Questions/Comments	Answers/Responses
Methodology (General)	Panel discussion	Regarding estimating net losses; Will the data be reported at the regional level and how small will the geographies get?	The model will produce estimates for several geographical levels as well as specific industries.
Methodology for Personal Trips	Panel discussion	What is the procedure for considering foregone trips that simply become future trips? Is the assumption that the trip will occur in the near-term future, shortly after it is forgone?	Yes, this is the assumption. It also has a lot to do with the trip purpose type as well.
Methodology (General)	Panel discussion	Where is INEGI data being accounted for?	The Baja California I-O model integrates INEGI data.
Methodology for Personal Trips	Panel discussion	Does the survey data account for industry-specific impacts due to lost work hours?	Yes. The model gets down to the industry level for estimated losses. However, the model does not account for the industry where the lost work hours occur, since that is a different type of analysis, based on changes to household income.
Methodology (General)	Panel discussion	We have data for processing times at the existing Otay Mesa POE. It would be good to use as comparison. Also, can you explain the assumptions being made for the future Otay Mesa East POE?	We will rely on the model developed for previous studies (namely the Binational Traffic Model created as part of previous SANDAG/Caltrans work)
Methodology for Freight Movements	Panel discussion	Are JIT industries being accounted for in the survey data?	The surveys did ask truck drivers certain questions, but we will rely on the Bureau of Transportation Statistics data for JIT industry components.
Methodology for Freight Movements	Panel discussion	Is the freight flow in the Binational Traffic Model separated from POV flows?	Yes, they are separate.
Methodology (General)	Panel discussion	How are wait time estimates being derived for Otay Mesa East?	The planning level assumption for wait times at Otay Mesa East is 20 minutes, which is an operational target for that POE. The study will use that assumption as an average wait time at that POE.
Methodology for Personal Trips	Panel discussion	Is there consideration for over-estimation of wait times on behalf of the survey respondents?	We do acknowledge that the survey responses may reflect over-estimates (perceived) of wait times, but the study has multiple measures to validate actual vs. perceived wait times, including actual measures in the field of border crossing times.
Methodology (General)	Panel discussion	Can you clarify the differences between assumed direct effects on wait times vs indirect effects on wait times due to variability?	We are trying to separate the impacts of travel time uncertainty versus the impacts of travel time delay.

Subject	Source	Questions/Comments	Answers/Responses
Methodology (General)	Panel discussion	Have interviews been done that help us derive elasticities for wait times?	Elasticities are being derived mainly from literature and survey data. This data will then be validated with observed wait times.
Methodology (General)	Panel discussion	How are the estimation formulas being developed? Are they somewhat theoretical?	Yes, in a sense they are theoretical and based on the theory of international trade, but the development of the study equations take into account the availability of data.
Methodology for Freight Movements	Panel discussion	How does the estimation account for output losses due to variable transportation costs? Inventory levels? Is the model accounting for all aspects of transportation cost as well as value of time elements?	We will follow up with you directly for more clarification. However, there are some concepts like out-of-pocket expenditures that are so small that we're not taking them into consideration (the net difference is close to zero due to change in place of expenditure, but the expenditure still occurs)
Methodology for Freight Movements	Panel discussion	Are payment structures for truck drivers being somehow accounted for? These often have an impact on elasticities.	Not directly, but the formula does account for "passed-on" reductions in revenue, etc. However, our analysis does not attempt to estimate the impact of trucker wage losses
Baja California Input-Output Model	Panel discussion	Can you clarify the data assumption used to update the BC I-O Model from the original base year to the current estimates (recent update)?	The 2013 I-O model builds from the previous version, but accounts for updated data by industry. The model formulas carry some coefficients from the original (2008) model structure.

A FRESH LOOK AT IMPACTS OF BORDER DELAYS AT CALIFORNIA-BAJA CALIFORNIA PORTS-OF-ENTRY
ECONOMIC PEER REVIEW PANEL & REGIONAL STAKEHOLDERS
RISK ANALYSIS WORKSHOP
Thursday, April 27, 2017

Subject		Source	Questions/Comments	Answers/Responses
RAP Variable	Mode or Location			
Preliminary Forecast	Commercial Vehicles	Data sheet comment	The CBP count data indicate the 2016 annual NB truck crossings at Otay Mesa to be about 859,740. The HDR preliminary forecast is 935,000 for 2017, an increase of 8.75%. Unless there is a large seasonal bump in the average (monthly) number of trucks crossing during August-December, it's likely the 935,000 value would be high.	We would like the forecasts to be consisted with transportation planning documents from both SANDAG and ICTC, so we're happy to review our growth projections.
		Data sheet comment	Do we plan to have the [Otay Mesa East] truck open before the [personal vehicles]? The table P says assumed operations in 2020 but 1st value is 2021 vs trucks show values in 2020.	There was an error copying the forecasted volumes for personal vehicles into the RAP Workbook table (placed copied numbers into wrong year). For this study Otay Mesa East is assumed to open in 2020 and the revised POV forecasts are presented in a separate tab in this file (called "POV Forecast Numbers").
		Data sheet comment	The split of trucks going from Otay Mesa to Otay Mesa East seems to be fairly high, relative to my understanding of current assumptions re the percent of trucks that would divert to Otay Mesa East once its open. I'd thought that the split would be closer to 50/50.	The split of trucks presented in the Workbook corresponds to the results from the SR-11/OME Traffic and Revenue Study developed in 2014. Our understanding is that these numbers may be revised in the future, but currently they are the only official numbers we are aware of.
		Data sheet comment	Otay Mesa East outperforms Otay Mesa [in preliminary forecast]?	

Subject		Source	Questions/Comments	Answers/Responses
RAP Variable	Mode or Location			
Annual average growth rate of border-crossing traffic	Passenger Vehicles	Data sheet comment	[The sheet] states probability ranges but only shows a single value?	Probability ranges were not produced or requested for growth rates because it would be too cumbersome to include risk into the economic model in this way. We are considering including variations on the growth rates for border crossing traffic as part of the scenarios that will be analyzed in this study.
		Data sheet comment	Need to know the embedded correlations in model	We looked at more than 30 variables to develop the econometric model used to generate these projections. We chose a model specification that reduced the chance of multicollinearity and included relevant variables from the theoretical standpoint. The methodology is described in the SR-11 Traffic & Revenue Report.
		Data sheet comment	Why is SD county growth 50% higher than Imperial County's?	Economic activity is a big driver of these projections, so this reflects the strength of the San Diego economy.
	Commercial Vehicles	Panel and data sheet	It would be important to develop scenarios with and without NAFTA and also do it at the commodity level as some commodities will be impacted more than others	These scenarios will be discussed with the PST.
Loaded vs. Empty Truck Crossings	Commercial Vehicles	Panel discussion	Is Aduanas data being utilized?	No, but if there is data available we'll be happy to include it either as a source or to validate our data.
Average Freight Value per Loaded Truck	Commercial Vehicles	Data sheet comment	I thought [the SD import value] would be higher than export. Unless this is because of the mix and we are looking at the average. Actually, says average in title but says median in table?	We assume a symmetric distribution for freight value, so the average and median values are the same. The estimated median values were calculated based on import and export values published by BTS by port of entry, so it does incorporate the mix of goods that actually cross the border in any given year.
	POVs/ Pedestrians	Panel discussion	Seems like there may be missing elements not reflected in the average	The survey asked interviewees to report expenditures incurred/to be incurred during the specific border-

Subject		Source	Questions/Comments	Answers/Responses
RAP Variable	Mode or Location			
Average spending per trip			spending variable, for instance, frequency of crossing per person. The combination of both factors would influence the total estimated impacts differently than average spending alone.	crossing trip taken when interviewed. Therefore, when this information is combined with the number of border-crossing trips at each POE, we get an accurate picture of the expenditures related to border-crossers. Furthermore, since the sample is large, from a statistical standpoint the spending patterns of people who cross frequently are well represented in the sample, and are thus included in the distribution and average for per person spending.
		Data sheet comment	Comment: When surveys where done, average vehicle occupancy wasn't a factor. I gathered that the responses came only from drivers and didn't consider the expenditures of passengers.	Respondents are assumed to speak for all persons in the vehicle when listing expenditure amounts. Note also that interviewers recorded the number of adults and children per vehicle (questions O-6 and O-7).
		IMBA Presentation	IMBA Meeting - Comment/comparison between recent Imperial County survey effort (also conducted by CrossBorder Group) that looked at similar data including average spending. Noted that the data compiled for that effort (about 1,000 surveys) is similar to Border Delay Study survey effort findings.	This is a good cross-validation of our results.
Trip purpose	POVs, Imperial County	Data sheet comment	What is the health care share?	The health care share for POVs crossing through Imperial County is 9% for people living in the U.S. and 2% for people living in Mexico.
	Pedestrians, Imperial County	Data sheet comment	The ‘other’ piece is 70% of breakdown, so it is very important what this looks like. Medical, for instance, should be a large category	The "other" piece for pedestrians living in the U.S. crossing through Imperial County is comprised of family or social visits (51%), medical or health purposes (16%), school (3%), and other (2%), where "other" allowed space for individual responses. The "other" piece for pedestrians living in Mexico crossing through Imperial County is comprised of

Subject		Source	Questions/Comments	Answers/Responses
RAP Variable	Mode or Location			
		Data sheet comment	please show all purposes. Clarify: all else [is] too large	family or social visits (14%), medical or health purposes (3%), school (3%), and other (4%).
	Pedestrians, San Diego County	Data sheet comment	detail “all else”	The "other" piece for pedestrians living in the U.S. crossing through San Diego County is comprised of family or social visits (56%), medical or health purposes (9%), school (2%), and other (1%), where "other" allowed space for individual responses. The "other" piece for pedestrians living in Mexico crossing through San Diego County is comprised of family or social visits (20%), medical or health purposes (2%), school (6%), and other (2%).
Average Wage	POVs	Panel discussion	Is it possible that there are limitations with only being able to conduct surveys at certain times of the day?	It is certainly possible that some groups of workers cross through the hours that were not covered in the survey (like the case of early-crossing agricultural workers in Imperial County discussed during the Workshop). However, the hours when surveys were conducted covered the main time slots for border-crossing (between 7:30 am and 6:00 pm). The current results make this variable comparable to the one used in the 2006 study since at that time the average expenditure was also collected through a survey applied only during certain times of the day. We are open to revisions on this variable; however, it is very difficult to quantify what that impact would be in the average wage indicator.
	Pedestrians	Data sheet comment	Would people routinely cross the border to make only $100 or $200/ month?	While we recognize that some of the data we gathered on monthly wages may be low, we can only assume that respondents accurately and truthfully listed their wage when asked, and thus our estimates are, on average, an adequate representation of the spread of wages for the population. A possible explanation for these low wages could be that some people may have part-time jobs across the border.

Subject		Source	Questions/Comments	Answers/Responses
RAP Variable	Mode or Location			
	POVs and Pedestrians	Data sheet comment	[These] should be broken out by country of residence. Not sure why Peds and PVs don't show same trend for Imp vs SD. Something may be masking these values, I would dive deeper to understand it.	Our first set of average wage estimates were separated by country of residence. However, based on additional qualitative assessments, the HDR team came to the conclusion that populations living in one country and crossing the border to work in the other are sufficiently similar in terms of wages that we can treat them as one group.
Elasticity of travel demand with respect to border delay	POVs & Pedestrians	Data sheet comment	Elasticity is positive?	Positive elasticities are shown in the workbook because elasticities are usually thought of in an absolute value sense. We recognize that the relationship between wait time and border crossings is negative and therefore the elasticity should be listed with a negative sign (as commented during the Workshop).
		Panel discussion	Is this the elasticity for northbound traffic only or both directions? I would imagine that 80% of the time a 1% increase in border delay is meaningless.	The elasticities listed for Pedestrians and POVs represent crossers living in the U.S. and Mexico (i.e. southbound and northbound crossers). It is a standard practice to have the elasticities normalized to a unit percent for display purposes; however more significant border delays (a number of minutes or hours) will be provided by the travel demand model to use with the elasticities in the estimation of the economic impacts.
		Panel discussion	How were 'inelastic' crossers included in the distribution for elasticity ranges?	The elasticity was calculated using survey responses that ran the gamut from highly inelastic to highly elastic crossers. Therefore, crossers that are inelastic to increases in border wait time are included in the estimate presented in the Workbook.
		Panel discussion	How are elasticities for truck trips being derived?	Elasticities for truck trips are taken from the literature. Previous experience in this area indicates that the decision of whether to cross the border or cancel the trip doesn't usually lie with the truck driver and

Subject		Source	Questions/Comments	Answers/Responses
RAP Variable	Mode or Location			
				therefore surveying them on this topic was not considered appropriate.
		Data sheet comment	"survey questions and elasticity study use are a good combination for these numbers, but which elasticity studies did you use?"	The elasticities listed for Pedestrians and POVs were calculated from survey questions on respondents' threshold for additional border wait time. Elasticities from the literature are used to validate our findings and were included in the Appendix in the Risk Analysis Workbook (Section K) and in the Power Point presentation used during the Workshop.
Alternate Average Spending	POVs	Panel discussion	What are the percentage differences of deferred spending by those living in the U.S. vs. those living in Mexico?	Spending patterns for people living in Mexico and the U.S. are similar (though proportions of deferred spending differ depending on which county and travel mode is used to cross). The largest difference is for people crossing in vehicles through San Diego County, in which 50% of crossers living in the U.S. defer spending for canceled trips, whereas about 35% of crossers living in Mexico stated they would defer spending from trips not taken (i.e., a difference of 15 percentage points).
Appendix: Scaling Proportions	Workers	Data sheet comment	Proportions for scaling the survey responses are from the survey? Are they referring to a different survey (the one used to estimate the SANDAG model)?	Proportions for scaling the survey to persons crossing the border for work are from the SANDAG Border Survey (the survey conducted for this study). These proportions were applied to data collected by the BTS for 2016 border crossing traffic to scale the survey responses, like monthly wage, that only refer to persons who crossed the border for work.

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Appendix D: Economic Impact Tables for San Diego County's MSAs

The following tables present the economic impacts of delays for the San Diego County MSAs in the Base Year (2016) by mode of crossing. Notice that totals for the 7 MSAs by crossing mode may differ from the aggregate impacts at the county level due to how IO models account for "leakages" across geographical boundaries.

Economic Impacts from Delays to Passenger Vehicle Trips

Table 1. Economic Impacts from Delays in San Diego County's Central MSA, Passenger Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$68
	Recreation & Entertainment	-$8
	Hotels	-$2
	Miscellaneous	-$2
	Total	**-$79**
Labor Income (millions of U.S. dollars)	Retail	-$29
	Recreation & Entertainment	-$3
	Hotels	-$1
	Miscellaneous	-$1
	Total	**-$34**
Employment	Retail	-707
	Recreation & Entertainment	-89
	Hotels	-13
	Miscellaneous	-12
	Total	**-822**

Table 2. Economic Impacts from Delays in San Diego County's North City MSA, Passenger Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$46
	Recreation & Entertainment	-$5
	Hotels	-$1
	Miscellaneous	-$1
	Total	**-$54**
Labor Income (millions of U.S. dollars)	Retail	-$19
	Recreation & Entertainment	-$2
	Hotels	$0
	Miscellaneous	-$1
	Total	**-$22**
Employment	Retail	-452
	Recreation & Entertainment	-65
	Hotels	-9
	Miscellaneous	-9
	Total	**-534**

Table 3. Economic Impacts from Delays in San Diego County's East Suburban MSA, Passenger Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$23
	Recreation & Entertainment	-$3
	Hotels	-$1
	Miscellaneous	-$1
	Total	**-$26**
Labor Income (millions of U.S. dollars)	Retail	-$10
	Recreation & Entertainment	-$1
	Hotels	$0
	Miscellaneous	$0
	Total	**-$11**
Employment	Retail	-235
	Recreation & Entertainment	-27
	Hotels	-5
	Miscellaneous	-4
	Total	**-271**

Table 4. Economic Impacts from Delays in San Diego County's South Suburban MSA, Passenger Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$286
	Recreation & Entertainment	-$32
	Hotels	-$7
	Miscellaneous	-$7
	Total	**-$332**
Labor Income (millions of U.S. dollars)	Retail	-$119
	Recreation & Entertainment	-$11
	Hotels	-$3
	Miscellaneous	-$4
	Total	**-$137**
Employment	Retail	-2,901
	Recreation & Entertainment	-366
	Hotels	-66
	Miscellaneous	-52
	Total	**-3,384**

Table 5. Economic Impacts from Delays in San Diego County's North County East MSA, Passenger Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$6
	Recreation & Entertainment	-$1
	Hotels	$0
	Miscellaneous	$0
	Total	**-$6**
Labor Income (millions of U.S. dollars)	Retail	-$2
	Recreation & Entertainment	$0
	Hotels	$0
	Miscellaneous	$0
	Total	**-$3**
Employment	Retail	-54
	Recreation & Entertainment	-7
	Hotels	-1
	Miscellaneous	-1
	Total	**-63**

Table 6. Economic Impacts from Delays in San Diego County's North County West MSA, Passenger Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$7
	Recreation & Entertainment	-$1
	Hotels	$0
	Miscellaneous	$0
	Total	**-$8**
Labor Income (millions of U.S. dollars)	Retail	-$3
	Recreation & Entertainment	$0
	Hotels	$0
	Miscellaneous	$0
	Total	**-$3**
Employment	Retail	-70
	Recreation & Entertainment	-10
	Hotels	-1
	Miscellaneous	-1
	Total	**-83**

Table 7. Economic Impacts from Delays in San Diego County's East County MSA, Passenger Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$2
	Recreation & Entertainment	$0
	Hotels	$0
	Miscellaneous	$0
	Total	**-$2**
Labor Income (millions of U.S. dollars)	Retail	-$1
	Recreation & Entertainment	$0
	Hotels	$0
	Miscellaneous	$0
	Total	**-$1**
Employment	Retail	-17
	Recreation & Entertainment	-2
	Hotels	-1
	Miscellaneous	0
	Total	**-21**

Economic Impacts from Delays to Pedestrian Trips

Table 8. Economic Impacts from Delays in San Diego County's Central MSA, Pedestrian Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$60
	Recreation & Entertainment	-$10
	Hotels	-$4
	Miscellaneous	-$7
	Total	**-$81**
Labor Income (millions of U.S. dollars)	Retail	-$24
	Recreation & Entertainment	-$4
	Hotels	-$1
	Miscellaneous	-$4
	Total	**-$34**
Employment	Retail	-627
	Recreation & Entertainment	-124
	Hotels	-31
	Miscellaneous	-69
	Total	**-851**

Table 9. Economic Impacts from Delays in San Diego County's North City MSA, Pedestrian Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$40
	Recreation & Entertainment	-$7
	Hotels	-$3
	Miscellaneous	-$5
	Total	**-$55**
Labor Income (millions of U.S. dollars)	Retail	-$16
	Recreation & Entertainment	-$3
	Hotels	-$1
	Miscellaneous	-$3
	Total	**-$23**
Employment	Retail	-399
	Recreation & Entertainment	-86
	Hotels	-21
	Miscellaneous	-53
	Total	**-560**

Table 10. Economic Impacts from Delays in San Diego County's East Suburban MSA, Pedestrian Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$20
	Recreation & Entertainment	-$3
	Hotels	-$1
	Miscellaneous	-$2
	Total	**-$27**
Labor Income (millions of U.S. dollars)	Retail	-$8
	Recreation & Entertainment	-$1
	Hotels	$0
	Miscellaneous	-$1
	Total	**-$11**
Employment	Retail	-208
	Recreation & Entertainment	-37
	Hotels	-11
	Miscellaneous	-22
	Total	**-279**

Table 11. Economic Impacts from Delays in San Diego County's South Suburban MSA, Pedestrian Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$250
	Recreation & Entertainment	-$42
	Hotels	-$15
	Miscellaneous	-$30
	Total	**-$337**
Labor Income (millions of U.S. dollars)	Retail	-$100
	Recreation & Entertainment	-$15
	Hotels	-$6
	Miscellaneous	-$15
	Total	**-$137**
Employment	Retail	-2,568
	Recreation & Entertainment	-487
	Hotels	-152
	Miscellaneous	-273
	Total	**-3,481**

Table 12. Economic Impacts from Delays in San Diego County's North County East MSA, Pedestrian Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$5
	Recreation & Entertainment	-$1
	Hotels	$0
	Miscellaneous	-$1
	Total	**-$7**
Labor Income (millions of U.S. dollars)	Retail	-$2
	Recreation & Entertainment	$0
	Hotels	$0
	Miscellaneous	$0
	Total	**-$3**
Employment	Retail	-48
	Recreation & Entertainment	-9
	Hotels	-3
	Miscellaneous	-7
	Total	**-66**

Table 13. Economic Impacts from Delays in San Diego County's North County West MSA, Pedestrian Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$6
	Recreation & Entertainment	-$1
	Hotels	$0
	Miscellaneous	-$1
	Total	**-$8**
Labor Income (millions of U.S. dollars)	Retail	-$2
	Recreation & Entertainment	$0
	Hotels	$0
	Miscellaneous	$0
	Total	**-$3**
Employment	Retail	-62
	Recreation & Entertainment	-13
	Hotels	-3
	Miscellaneous	-7
	Total	**-85**

Table 14. Economic Impacts from Delays in San Diego County's East County MSA, Pedestrian Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Retail	-$1
	Recreation & Entertainment	$0
	Hotels	$0
	Miscellaneous	$0
	Total	**-$2**
Labor Income (millions of U.S. dollars)	Retail	-$1
	Recreation & Entertainment	$0
	Hotels	$0
	Miscellaneous	$0
	Total	**-$1**
Employment	Retail	-15
	Recreation & Entertainment	-4
	Hotels	-1
	Miscellaneous	-4
	Total	**-24**

Economic Impacts from Delays to Commercial Vehicle Trips

Table 15. Economic Impacts from Delays in San Diego County's Central MSA, Commercial Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Food and Agriculture	-$4
	Mining	-$2
	Machinery and Equipment	-$5
	Misc. Manufactured Goods	-$3
	Total	**-$13**
Labor Income (millions of U.S. dollars)	Food and Agriculture	-$2
	Mining	$0
	Machinery and Equipment	-$2
	Misc. Manufactured Goods	$0
	Total	**-$4**
Employment	Food and Agriculture	-99
	Mining	-5
	Machinery and Equipment	-20
	Misc. Manufactured Goods	-8
	Total	**-130**

Table 16. Economic Impacts from Delays in San Diego County's North City MSA, Commercial Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Food and Agriculture	-$3
	Mining	-$2
	Machinery and Equipment	-$4
	Misc. Manufactured Goods	-$2
	Total	**-$10**
Labor Income (millions of U.S. dollars)	Food and Agriculture	-$1
	Mining	$0
	Machinery and Equipment	-$1
	Misc. Manufactured Goods	-$1
	Total	**-$3**
Employment	Food and Agriculture	-27
	Mining	-12
	Machinery and Equipment	-12
	Misc. Manufactured Goods	-7
	Total	**-58**

Table 17. Economic Impacts from Delays in San Diego County's East Suburban MSA, Commercial Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Food and Agriculture	-$1
	Mining	-$1
	Machinery and Equipment	-$2
	Misc. Manufactured Goods	-$1
	Total	**-$5**
Labor Income (millions of U.S. dollars)	Food and Agriculture	-$1
	Mining	$0
	Machinery and Equipment	$0
	Misc. Manufactured Goods	$0
	Total	**-$1**
Employment	Food and Agriculture	-13
	Mining	-3
	Machinery and Equipment	-6
	Misc. Manufactured Goods	-3
	Total	**-25**

Table 18. Economic Impacts from Delays in San Diego County's South Suburban MSA, Commercial Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Food and Agriculture	-$17
	Mining	-$9
	Machinery and Equipment	-$26
	Misc. Manufactured Goods	-$14
	Total	**-$66**
Labor Income (millions of U.S. dollars)	Food and Agriculture	-$7
	Mining	-$2
	Machinery and Equipment	-$8
	Misc. Manufactured Goods	-$3
	Total	**-$20**
Employment	Food and Agriculture	-165
	Mining	-41
	Machinery and Equipment	-98
	Misc. Manufactured Goods	-60
	Total	**-363**

Table 19. Economic Impacts from Delays in San Diego County's North County East MSA, Commercial Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Food and Agriculture	$0
	Mining	$0
	Machinery and Equipment	-$1
	Misc. Manufactured Goods	$0
	Total	**-$1**
Labor Income (millions of U.S. dollars)	Food and Agriculture	$0
	Mining	$0
	Machinery and Equipment	$0
	Misc. Manufactured Goods	$0
	Total	**$0**
Employment	Food and Agriculture	-3
	Mining	-1
	Machinery and Equipment	-2
	Misc. Manufactured Goods	-1
	Total	**-7**

Table 20. Economic Impacts from Delays in San Diego County's North County West MSA, Commercial Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in...	Total Impact
Output (millions of U.S. dollars)	Food and Agriculture	$0
	Mining	$0
	Machinery and Equipment	-$1
	Misc. Manufactured Goods	$0
	Total	**-$2**
Labor Income (millions of U.S. dollars)	Food and Agriculture	$0
	Mining	$0
	Machinery and Equipment	$0
	Misc. Manufactured Goods	$0
	Total	**$0**
Employment	Food and Agriculture	-4
	Mining	-1
	Machinery and Equipment	-2
	Misc. Manufactured Goods	-1
	Total	**-9**

Table 21. Economic Impacts from Delays in San Diego County's East County MSA, Commercial Vehicle Trips, Base Year (2016)

Impact Category	From Reduced Spending in…	Total Impact
Output (millions of U.S. dollars)	Food and Agriculture	$0
	Mining	$0
	Machinery and Equipment	$0
	Misc. Manufactured Goods	$0
	Total	**$0**
Labor Income (millions of U.S. dollars)	Food and Agriculture	$0
	Mining	$0
	Machinery and Equipment	$0
	Misc. Manufactured Goods	$0
	Total	**$0**
Employment	Food and Agriculture	-1
	Mining	0
	Machinery and Equipment	-1
	Misc. Manufactured Goods	0
	Total	**-2**

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Appendix E: Breakdown of Economic Impacts by County

The following tables present the disaggregated economic impacts from delays and foregone trips at different geographies (including the state-wide and national level), by mode for San Diego and Imperial Counties separately. These results correspond to the Base Year (2016).

Table 22. Economic Impacts from Delays for Trips through San Diego County at the California – Baja California Border, 2016

Type of Traffic	Areas	Output, $M	Labor Income, $M	Employment, jobs
Passenger Vehicle Trips	California	-$662	-$265	-5,547
	Baja California	-$222	-$36	-11,010
	California & Baja California	-$884	-$301	-16,557
	United States	-$662	-$265	-5,547
	Mexico	-$231	-$39	-11,658
	United States & Mexico	-$893	-$303	-17,205
Pedestrian Trips	California	-$719	-$286	-6,233
	Baja California	$13	$2	474
	California & Baja California	-$706	-$284	-5,759
	United States	-$719	-$286	-6,233
	Mexico	$20	$4	817
	United States & Mexico	-$699	-$283	-5,417
Freight Movements	California	-$192	-$61	-857
	Baja California	-$461	-$80	-25,994
	California & Baja California	-$654	-$141	-26,851
	United States	-$192	-$61	-857
	Mexico	-$725	-$127	-40,854
	United States & Mexico	-$917	-$187	-41,711
Combined Personal Trips and Freight Movements	California	-$1,573	-$612	-12,638
	Baja California	-$670	-$115	-36,530
	California & Baja California	-$2,243	-$726	-49,167
	United States	-$1,573	-$612	-12,638
	Mexico	-$936	-$161	-51,695
Combined Personal Trips and Freight Movements	Combined Mexico and United States	-$2,509	-$773	-64,333

Table 23. Economic Impacts from Delays for Trips through Imperial County at the California – Baja California Border, 2016

Type of Traffic	Areas	Output, $M	Labor Income, $M	Employment, jobs
Passenger Vehicle Trips	California	-$407	-$162	-3,426
	Baja California	-$123	-$20	-6,030
	California & Baja California	-$531	-$183	-9,456
	United States	-$407	-$162	-3,426
	Mexico	-$111	-$17	-5,434
	United States & Mexico	-$518	-$180	-8,860
Pedestrian Trips	California	-$18	-$6	-164
	Baja California	-$32	-$5	-1,600
	California & Baja California	-$50	-$11	-1,765
	United States	-$18	-$6	-164
	Mexico	-$31	-$5	-1,513
	United States & Mexico	-$49	-$11	-1,678
Freight Movements	California	-$92	-$29	-394
	Baja California	-$147	-$26	-8,265
	California & Baja California	-$239	-$54	-8,659
	United States	-$92	-$29	-394
	Mexico	-$231	-$40	-12,990
	United States & Mexico	-$323	-$69	-13,384
Combined Personal Trips and Freight Movements	California	-$518	-$197	-3,984
	Baja California	-$302	-$51	-15,896
	California & Baja California	-$820	-$248	-19,880
	United States	-$518	-$197	-3,984
	Mexico	-$372	-$63	-19,937
Combined Personal Trips and Freight Movements	Combined Mexico and United States	-$890	-$260	-23,921

These results correspond to the Baseline Scenario in 2025.

Table 24. Economic Impacts from Delays for Trips through San Diego County at the California – Baja California Border, Baseline Scenario, 2025

Type of Traffic	Areas	Output, $M	Labor Income, $M	Employment, jobs
Passenger Vehicle Trips	California	-$678	-$271	-5,685
	Baja California	-$380	-$63	-18,878
	California & Baja California	-$1,059	-$334	-24,563
	United States	-$678	-$271	-5,685
	Mexico	-$403	-$67	-20,349
	United States & Mexico	-$1,082	-$339	-26,034
Pedestrian Trips	California	-$647	-$258	-5,610
	Baja California	-$11	-$2	-418
	California & Baja California	-$658	-$260	-6,028
	United States	-$647	-$258	-5,610
	Mexico	-$8	-$1	-322
	United States & Mexico	-$655	-$259	-5,932
Freight Movements	California	-$871	-$276	-3,884
	Baja California	-$374	-$65	-21,050
	California & Baja California	-$1,245	-$341	-24,934
	United States	-$1,634	-$444	-7,148
	Mexico	-$587	-$102	-33,083
	United States & Mexico	-$2,221	-$547	-40,231
Combined Personal Trips and Freight Movements	California	-$2,197	-$805	-15,199
	Baja California	-$769	-$130	-40,987
	California & Baja California	-$2,966	-$934	-56,187
	United States	-$2,960	-$974	-18,463
	Mexico	-$1,001	-$171	-54,340
Combined Personal Trips and Freight Movements	Combined Mexico and United States	-$3,960	-$1,145	-72,803

Table 25. Economic Impacts from Delays for Trips through Imperial County at the California – Baja California Border, Baseline Scenario, 2025

Type of Traffic	Areas	Output, $M	Labor Income, $M	Employment, jobs
Passenger Vehicle Trips	California	-$509	-$203	-4,284
	Baja California	-$53	-$9	-2,603
	California & Baja California	-$563	-$212	-6,887
	United States	-$509	-$203	-4,284
	Mexico	-$27	-$4	-1,316
	United States & Mexico	-$536	-$207	-5,600
Pedestrian Trips	California	-$28	-$10	-258
	Baja California	-$16	-$3	-779
	California & Baja California	-$44	-$12	-1,037
	United States	-$28	-$10	-258
	Mexico	-$13	-$2	-622
	United States & Mexico	-$41	-$12	-880
Freight Movements	California	-$122	-$38	-519
	Baja California	-$191	-$33	-10,740
	California & Baja California	-$312	-$71	-11,259
	United States	-$228	-$62	-997
	Mexico	-$300	-$52	-16,879
	United States & Mexico	-$528	-$115	-17,877
Combined Personal Trips and Freight Movements	California	-$659	-$251	-5,059
	Baja California	-$260	-$45	-14,122
	California & Baja California	-$919	-$296	-19,180
	United States	-$766	-$276	-5,537
	Mexico	-$339	-$59	-18,819
Combined Personal Trips and Freight Movements	Combined Mexico and United States	-$1,105	-$334	-24,356

These results correspond to the Baseline Scenario plus Capacity Enhancements in 2025.

Table 26. Economic Impacts from Delays for Trips through San Diego County at the California – Baja California Border, Baseline plus Capacity Enhancements Scenario, 2025

Type of Traffic	Areas	Output, $M	Labor Income, $M	Employment, jobs
Passenger Vehicle Trips	California	-$512	-$203	-4,270
	Baja California	-$393	-$66	-19,979
	California & Baja California	-$905	-$269	-24,249
	United States	-$512	-$203	-4,270
	Mexico	-$426	-$72	-21,596
	United States & Mexico	-$938	-$275	-25,866
Pedestrian Trips	California	-$754	-$301	-6,491
	Baja California	$2	$0	42
	California & Baja California	-$752	-$301	-6,449
	United States	-$754	-$301	-6,491
	Mexico	$7	$1	235
	United States & Mexico	-$747	-$300	-6,256
Freight Movements	California	-$223	-$71	-992
	Baja California	-$267	-$47	-15,106
	California & Baja California	-$490	-$118	-16,098
	United States	-$420	-$114	-1,844
	Mexico	-$416	-$73	-23,584
	United States & Mexico	-$836	-$188	-25,428
Combined Personal Trips and Freight Movements	California	-$1,489	-$575	-11,739
	Baja California	-$659	-$113	-35,317
	California & Baja California	-$2,148	-$688	-47,056
	United States	-$1,685	-$618	-12,590
	Mexico	-$837	-$144	-45,215
Combined Personal Trips and Freight Movements	Combined Mexico and United States	-$2,522	-$762	-57,805

Table 27. Economic Impacts from Delays for Trips through Imperial County at the California – Baja California Border, Baseline plus Capacity Enhancements Scenario, 2025

Type of Traffic	Areas	Output, $M	Labor Income, $M	Employment, jobs
Passenger Vehicle Trips	California	-$107	-$41	-913
	Baja California	-$285	-$47	-14,326
	California & Baja California	-$392	-$88	-15,239
	United States	-$107	-$41	-913
	Mexico	-$300	-$50	-15,013
	United States & Mexico	-$406	-$90	-15,926
Pedestrian Trips	California	-$27	-$10	-246
	Baja California	-$18	-$3	-897
	California & Baja California	-$45	-$13	-1,142
	United States	-$27	-$10	-246
	Mexico	-$16	-$2	-781
	United States & Mexico	-$43	-$13	-1,026
Freight Movements	California	-$129	-$39	-538
	Baja California	-$57	-$10	-3,206
	California & Baja California	-$186	-$49	-3,745
	United States	-$243	-$66	-1,061
	Mexico	-$90	-$16	-5,039
	United States & Mexico	-$333	-$81	-6,100
Combined Personal Trips and Freight Movements	California	-$263	-$90	-1,698
	Baja California	-$361	-$60	-18,430
	California & Baja California	-$623	-$150	-20,128
	United States	-$377	-$117	-2,221
	Mexico	-$406	-$68	-20,838
Combined Personal Trips and Freight Movements	Combined Mexico and United States	-$782	-$184	-23,059