

## **Border Crossing for Trucks Twenty Three Years after NAFTA**

Alan K. Fox<sup>1</sup>  
U.S. International Trade Commission

Pilar Londoño-Kent  
Londoño-Kent Associates  
DRAFT—March 30, 2016

### ABSTRACT

Despite the liberalization achieved by the North American Free Trade Agreement (NAFTA), and substantial investments in infrastructure, technology, and equipment, significant barriers to efficient truck transport remain between the United States and Mexico. We present the practical and economic implications of changes to the NAFTA border crossing system put in place after the terrorist events of September 11, 2001. Security measures have “thickened” NAFTA’s borders, increasing costs and delays associated with border crossings. These measures have a global impact on the logistics chain, since they are applied to all countries that source goods to the United States. We review literature on costs and impacts of border delays due to enhanced security and build on our earlier research on these institutional peculiarities and their impacts of the US-Canada- Mexico border crossing system.<sup>2</sup>

We discuss procedures used today and note changes to border processing since our earlier work. Based on interviews and review of the literature, we present the institutional context in which barriers exist and border authorities’ rationale for establishing new barriers or continuing of pre-existing ones. Based on this information and the time and costs associated with cross-border freight movements, we estimate the welfare effect of these measures on the NAFTA economies in a CGE framework. Our counterfactual assumes the implementation of a “seamless freight flow” system similar to Europe’s Transport International Routier (TIR) system, and calculates the time and cost differentials between such a system and the status quo.

We estimate net annual welfare gains for the NAFTA countries accruing from the streamlining of the U.S.-Mexican brokerage system and find that NAFTA-wide annual welfare could rise by \$7.5 billion. Extending the simulation to include streamlining intra-NAFTA security-related delays could add an additional \$14.7–28.6 billion to annual welfare across the region.

---

<sup>1</sup> This paper is solely the opinion and work of the authors and does not represent the views or opinions of the U.S. International Trade Commission or its Commissioners.

<sup>2</sup> See Fox, Alan, Francois, Joseph, and Londoño-Kent, Maria del Pilar, “Measuring Border Crossing Costs and their Impact on Trade Flows: The United States-Mexican Trucking Case”, April 2003.

## I. Introduction

This paper presents the economics of border crossing of manufactures transported by truck in NAFTA countries. The security measures put in place after the terrorist events of September 11, 2001 have “thickened” the Canada-United States-Mexico borders, thereby increasing the costs and delays associated with border crossing of goods, services and travelers. These security measures have a global impact in the logistics chain since they are applied to all countries, industrialized and less developed that source goods to the United States.

We consider border crossings an important component of the global logistic chain. A logistic system is as efficient as its most inefficient link. Border crossings are the equivalent of a dam in the river: it stops the flow, and this research is like taking the water out of the river, examine the terrain and look at the stones and through the stones. Border crossings cause, among other things, excessive stops, interrupting transport flow and making the cargo more susceptible to damage, loss, and tampering; in addition, pollution is generated from diesel engines, accelerating stopping, idling and starting under heavy loads<sup>3</sup>; and security risks are greater in congested environments. The fact that manufactures often cross the border several times as they are being produced creates a multiplier effect for gains and losses in border efficiency.

The North America Free Trade Agreement (NAFTA) assumes seamless border crossing without detailing however how this would be achieved particularly in the case of trucking, the most important mode of transportation. Trucking is one of the most disputed elements of the agreement. NAFTA did not specify how trade should be administered by the Government agencies of the NAFTA countries. The implicit assumption was that it would take only one truck and minimum time to go from point A in the United States to point B in Mexico and vice-versa. In reality, however, it takes twenty to twenty eight hours to go from Chicago to Laredo, a 1400 mile trip, while to cross the border from Laredo, Texas, to

---

<sup>3</sup> A single truck idling for an hour could burn up to 4 liters of fuel and release 11.2 kg of greenhouse gases, 1-5 g of particulate matter, and 140 g of nitrogen oxide into the atmosphere. The environmental impact could become significant, given the large number of commercial vehicles idling daily at the border (Nguyen, T. and Wigle, R. 2011).

Nuevo Laredo just across the Rio Grande in Mexico, it takes from three to five days and at least four pieces of equipment and three or four drivers, to cross the river with a loaded truck. Obviously, there is a large gap between NAFTA underlying assumption and reality.

This paper shows that in spite of NAFTA, a complex border crossing system continues to prevail, introducing uncertainty, creating delays and extra costs that have effectively become non-tariff barriers to trade. Uncertainty is the enemy of trust, investment, job creation, economic prosperity, and supply chain security. An efficient supply chain is a necessary condition for economic cooperation and mutual prosperity, and it contributes to NAFTA countries' competitive advantage.

The system entails inefficiencies that have proliferated since the 1980s. In essence, such inefficiencies have been the result of long standing practices of governments, transportation interests, customs brokers, and others that NAFTA has failed to eliminate. The events of 9/11 introduced security arrangements that have complicated the border crossing operations. Governments and industry struggle to maintain a balance between security and safe trade, eliminating the risk while maintaining prosperity. New technology and efficient transit systems offer an opportunity for overcoming these barriers.

The paper is organized as follows. Section II presents the context of the research by outlining the previous work on border crossings in Europe and North America. This section also analyses the environment of 20 years of NAFTA, describing its elements, such as the geographical region, the trade flows, the border crossing systems: U.S.-Canada and U.S.-Mexico; the key factors at the core of these developments and the security programs introduced after the 9/11 are identified, and the evidence of the re-emergence of border delays and the economic costs of enhanced security in Canada and Europe is presented.

Section III presents in more detail the Laredo border crossing, the prominent one between United States and Mexico in trade volume and value, describing its elements, such as the geographical region, the trade flows. The objectives of NAFTA and the reality of the trade flow process in this border crossing are analyzed. This section shows how the high costs and times quantified for each activity of the actual cross-

border operation have remained in spite of the large investments in new bridges, roads, technology, trucks, information technology and reveals what is at the core of the problem.

Border Crossing inefficiencies have a secondary impact on overall trade that is more difficult to measure because many other variables affect overall trade. To measure the impact of these inefficiencies on the trade between the United States and Mexico, Section IV estimates the welfare impact of these inefficiencies on the associated economies using a CGE framework. Our counterfactual assumes the implementation of a “seamless freight flow” system similar to Europe’s Transport International Routier (TIR) system and calculating the time and cost differentials between such a TIR-like system and the status quo. We estimate net annual welfare gains for Mexico and the United States assuming the benefits from a seamless cross border processing system.

## **II. Context of the Research**

### **A. Previous Work on Border Crossing**

#### **1. Border Crossing in Europe**

Until recently Europe seemed to be the continent where regional trading arrangements were the most advanced, both in terms of formal agreements and the level of intra-regional trade. Most of this trade could be explained by the EC members’ size, level of development, proximity, and common borders (Frankel 1997, p.78). The European Union accounts for 30 percent of the world gross product, evaluated at recent exchange rates (Frankel, 1997, p. 37).

The Schengen agreement, which came into effect in 1995 abolished border controls between 26 European countries, kept those trucks moving. But where trucks go, so do refugees and there is evidence of Europe putting up barriers to control the wave of migrants breaking over its borders. (The Economist, February 6<sup>th</sup>, 2016.)

Open borders ease the flow of trade as well as individuals. Every year people make 1.3 billion crossings of the EU’s internal borders along with 57m trucks carrying €2.8 trillion (\$3.7 trillion) of goods.

Reintroducing controls such as checking passports and searching trucks is mostly an irritation, though the costs are mounting. A strategy unit of the French government estimates that in the short term

border checks within Schengen would cost France €1 billion-2 billion a year by disrupting tourism, cross-border workers and trade. If Schengen collapses the economic consequences would be more serious, it says: curtailing the free passage of goods permanently would amount to a 3% tax on trade within Schengen. The overall effect of hampering cross-border activity would reduce output in the Schengen area by 0.8%, or €10 billion, over the next decade.

The greatest pain will be felt by exporters. Over a third of road-freight traffic in Schengen crosses a border. Delays are creeping up. Around Salzburg in Austria trucks obliged to rest when they hit the limit. If waiting becomes a permanent feature DSLV, a German association of shippers, puts the direct costs at €3 billion a year for the EU as a whole, based on a one-hour delay for every lorry.

The German chamber of commerce says that once indirect costs, such as renting storage and the impact on transit-trade with non-EU countries, are taken into account the extra costs for Germany alone could run to €10 billion per year.

Calculations of potential costs depend on what happens if Schengen disappears: will spot-checks merely increase or will countries reintroduce border posts with barriers and barbed wire? Many firms, particularly those used to sending goods to non-Schengen countries such as Britain, may adapt swiftly to stricter border checks. Far worse than the direct costs to trade, says Guntram Wolff from Bruegel, a Brussels-based think-tank, would be the signal that European integration can go into reverse.

## **2. NAFTA Border Crossing Systems**

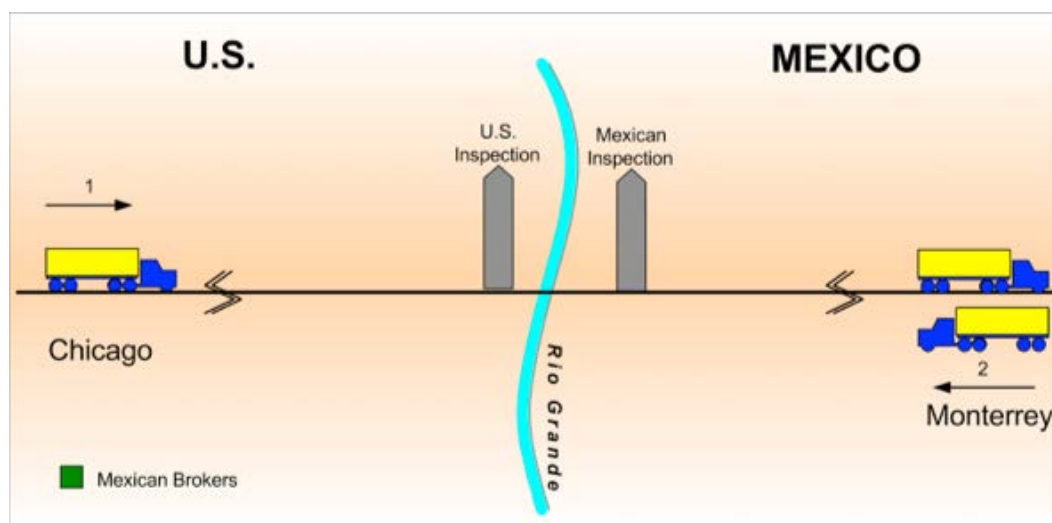
In theory, NAFTA assures a seamless border for the movement of trade among Canada, Mexico, and the United States. To implement this ideal, standardized information needs to be exchanged among the three countries, and the trucking companies or their agents should provide this information to Customs and other government officials in advance of each truck's arrival at the border. In this way, government officials can make their risk assessments and decisions beforehand and goods could thus be released or examined based on the pre-arrival information.

## **2.1 United States - Canada Border**

Something approximating this ideal situation occurs on the U.S.-Canadian border, excluding for the moment the additional security measures following the 9/11 events. The process starts one hour before the truck arrives at the government inspection facility. On the U.S. side, most of these decisions result in quick release of the merchandise while verification of the information takes place at a later stage. This occurs because the U.S. and Canada require each shipper to be covered by a bond or insurance policy that guarantees payments of any taxes or fees due. These procedures between the U.S. and Canada allow for many government actions to take place long after the goods have crossed the border. Any revenue losses detected during later government processing are theoretically protected by bonds. Mexico does not have a system of bonds and insurance and requires payment of taxes and fees through a Mexican broker in the U.S. side of the border before the merchandise is allowed into the country.

The United States and Canada share such links as common language, cultural heritage, legal and political systems, and economic development. Not surprisingly, these factors have boosted their trade and maintained a comfortable transit system environment with easy inspections that rely on a post-audit approach. Prior to the events of 9/11, the United States and Canada were a good example of institutional integration with a cross-border co-operation (Figure 1).

**Figure 1: NAFTA assumed border crossing system**



### 1. Evidence of Border Delay Costs Between Canada and the United States

OCC Borders and Trade Development Committee (OBTDC, 2005) estimates average border delay for traffic entering Canada to be between 30 and 60 minutes, while for traffic entering the US, wait time ranges from 10 minutes up to four hours. Belzer and Arbor (2003) estimate that the average time to cross the border from Canada to the U.S. is 2.5 longer than from U.S. to Canada. OBTDC (2004) claims that Canada absorbs 70 percent of the total costs associated with border delays, while OBTDC (2005) claims that the U.S. economy absorbs 40 percent of the cost of border delays. The estimation reported by OBTDC (2004) suggests border-delay costs representing \$1,100 per year for every Ontario taxpayer.

Simulation results in Nguyen and Wigle (2009) show that the impacts of delay costs on merchandise and services on welfare change for Canada as a whole is between -1% and -1.8%. Belzer and Arbor (2003) observe that for trade between Canada and the U.S. just-in-time delivery dominates largely inventory strategies. The most preferred mode to accommodate the just-in-time delivery is trucks. OBTDC (2005) confirms that trucks move 72.6% of the value of exports from the U.S. to Canada, while OBTDC (2004) claims that approximately 70% of Canada-US trade travels by truck. OBTDC (2004) states that a “just in time” logistics system implies that border delays result in substantial economic loss

for most sectors. Burt (2007), Globerman and Storer (2009) and Grady (2009) provide sectorial and national quantitative impact for Canada, and they show that the automotive industry is specifically affected.

Several studies have used gravity-type econometric tools to provide quantitative estimates of the impact of the 9/11 thickening of the Canada-U.S. border both at sectorial and global levels. For example, the estimates obtained by Grady, P. (2009) on selected sectors, real (volume) export of the Canadian Automotive (AUTO) sector to the U.S. has been cut by 8.9% as a consequence of the thickening of the border. The High Tech (TECH) and Transport (TRAN) sectors have been affected even more deeply (respectively -26.8% and -14.9%), while the Agriculture (AGRI) and Energy (RESO) sectors have been only modestly affected (-1.9% and 0%).

Georges, Mérette and Zhang illustrate the impact of post-9/11 security measures on trade *and* on foreign direct investment in Canada.<sup>4</sup> They use a three-region, nine-sector Computable General Equilibrium (CGE) model to estimate post-9/11 security-related border costs and assesses the impact of eliminating these costs on both trade (exports and imports) and foreign direct investment. In order to assess the economic benefits of decongesting the Canada-US border in a general equilibrium setting, is necessary to gauge the tariff-equivalent of the post-9/11 border security measures (including the trusted trader programs) that led to the export impacts of the following magnitude: Agriculture: -11.9; Food: -1.9, Textiles: -5.9; Manufactures: -5.9; Technology -26.8; Auto: -8.9; Services: -7.9; Transportation: -14.9.<sup>5</sup> What would have been the increase in the U.S. tariff that led to that magnitude of sectorial real export reduction due to the security measures? This very complex question is answered by simulating an

---

<sup>4</sup> Patrick Georges, Marcel Mérette, and Qi Zhang, “Assessing the Cost of Post-9/11 Security Measures and the Impact of a North American Security Perimeter –A Computable General Equilibrium Analysis”. Presented at the 14th Annual Conference on Global Economic Analysis, Venice, Italy, June 2011.

<sup>5</sup> Ibid.



imposed exogenous shock equal to the real export impact of the security measures, including the trusted trader programs.<sup>6</sup> Annex A presents The Customs-Trade Partnership Against Terrorism (C-TPAT).

The most direct impact of eliminating border delays imposed by U.S. security measures is on Canadian exports to the U.S. Firms of Canadian nationality located in Canada increase their export to the U.S. by 26.8 percent in the Technology (TECH) sector and 14.9 percent in the Transportation (TRAN) sector. Exports from Canada to the U.S. also increase significantly in the Textile (TEXT, 5.9 percent), Manufacturing (MANU, 5.9 percent), Automotive (AUTO, 8.9 percent) and Service (SERV, 7.9 percent). Exports to the U.S. of firms of U.S. and ROW nationality located in Canada also rise substantially.

Clearly, the post-9/11 border security measures, even when we include the trusted trader programs, have eroded any positive impact of the FTA/NAFTA. In fact, these post-9/11 border security measures have pushed Canada in a situation much worse than the pre-FTA period because FTA/NAFTA only reduced tariffs by around one per cent according to Grady (2009). Furthermore, if the security measures are specific to the Canada-U.S. border, then the competitiveness of Canadian firms in the U.S. market must have dramatically worsened with respect to firms from third countries.

Georges, Mérette and Zhang (2011) pointed out that as Canada's economy and prosperity is highly dependent on trade with the U.S., it has good reasons to have concerns with the security measures that have been implemented post-9/11 to secure the movement of goods and people. They found that beyond the possible impact on trade, an additional risk of border delays could be a shifting in the sourcing of U.S. firms away from Canadian suppliers. This risk increases with high-valued activities which depend on "just in time" processes. Consequently, border delays may distort investment decisions against Canada and its sectors that are most affected, generating sectorial and hence regional reallocation of resources. Even firms operating on a worldwide scale might be more reluctant to invest in Canada if they perceive a high likelihood of considerable delays in their supply chains. In such a case, border delays would divert foreign direct investment (FDI) away from Canada and hurt its GDP.

---

<sup>6</sup> Trusted trader programs were developed after 9/11/2001 by U.S. Customs to expedite legitimate trade and travel, including the Customs Trade Program Against Terrorism (C-TPAT). Inclusion in this program requires a substantial commitment of time and resources on the part of private sector participants.

## 2.2 United States - Mexico Border

The U.S.-Mexican border is the world's longest between a highly industrialized country and a developing one: 1,933 miles, separating four U.S. states from six Mexican ones. It features sharp differences in economic development, language, political and legal systems, culture, and race, plus the historic conflicts and the illegal traffic of drugs, arms and illegal aliens. These factors make the cross-border environment complex. This diversity presents serious challenges to Mexican and U.S. negotiators in their efforts to harmonize the trade facilitation policies across borders.

From an economic point of view, trade between U.S. and Mexico nearly tripled in value between 1982 and 1993, the year before NAFTA was signed, from about US \$27 billion to US \$76 billion. Since then, growth has been even more remarkable, from the \$76 billion figure to an estimated over a billion daily in 2009. U.S.-Mexico goods and services trade reached the major milestone of a half trillion dollars in 2011, as Mexico vies with China to become United States' second-largest trading partner, with \$397 billion worth of products being traded that year alone.

There is a high degree of economic interdependency between Mexico and the United States: Mexico exports about 80 percent of its trade value to the United States, while Mexico is the world's largest importer of U.S. products after Canada, exceeding Japan and the European Community. Each side of the border benefits from the economic activities on the other side. Conversely, both countries would also benefit from improving the efficiency of transport movements and associated logistics of cross-border trade. At the same time, Mexico's total population is over 120 million people, with 50 percent under 30 years of age. Mexico City alone (30 million people) has as many people as the whole of Canada. This younger generation and growing middle class is already demanding greater volumes and quality of goods and services. Undoubtedly, the optimization of transport movements and associated logistics of cross-border trade would benefit substantially both countries.

On the U.S.-Mexican border there are sharp differences in the legal systems, economic development, culture, language, and race plus the historic conflicts and the illegal traffic of drugs and illegal aliens. These factors make the cross-border environment complex. While NAFTA has had some

success in modernizing and standardizing legal treatment of cross border goods, the actual border practices, procedures and policies have not been successfully aligned. Transport integration has been NAFTA's most conflictive issue, particularly on the US-Mexico border. While many aspects of NAFTA are achieving their intended objectives, the provisions for trucking and transit systems are delayed and may never be implemented as originally intended. Safety and environmental regulations and anti-smuggling measures should be enforced, but they are not excuses for failing to implement agreements that allow truckers to cross national boundaries. In this regard, the U.S. and Mexican authorities have failed to abide by the letter and spirit of this agreement, which is also a precondition for creating the trust necessary to implement a trade agreement. Trade and transit agreements are not efficient if the parties involved need the courts for their enforcement, something that has already happened in Mexico and the United States.

#### **The Pilot Program: Mexican trucks head north of the border**

The pilot program was approved by the American and Mexican governments in March 2011 to halt some \$2.4 billion in tariffs on U.S. products. United States and Mexico agreed a three-year pilot program to allow Mexican firms to operate beyond a slim border trade zone in the US, as long as they comply with certain rules. In return, Mexico removed US\$2 billion on US-manufactured goods and agricultural products.

The US Department of Transportation (DoT) review the Mexican trucks, the complete driving record of each driver and require all drug testing samples to be analyzed in Department of Health and Human Services-certified laboratories in the US. Drivers will also be required to undergo an assessment of their ability to understand English and US traffic signs.

The Mexican Trucking Association CANACAR has questioned the level of investment for the Mexican trucking firms is substantial, Mexican trucks are required to comply with all US federal motor vehicle safety standards and have electronic monitoring systems to track hours-of-service compliance.

The program has also come under attack from the unions in the United States, International Brotherhood of Teamsters General President Jim Hoffa claimed opening the border endangered US highway safety, border security and warehouse and trucking jobs.

Only 14 Mexican carriers participated in the three-year program, which expired in October 2014. Another 17 truck companies have been dismissed or withdrew from the pilot. The DOT Inspector General suggested that 46 carriers at a minimum should be enrolled to obtain the needed statistical data to determine the safety of Mexican trucks and drivers operating in the United States. 2,400 crossings over the last two years are not enough samples to do a statistic significant analysis.

In January 2015 the U.S. Department of Transportation announced that Mexican motor carriers will soon be able to apply for authority to conduct long-haul, cross-border trucking services in the United States, marking a significant milestone in implementation of the North American Free Trade Agreement.<sup>7</sup>

In sum, many aspects of NAFTA are proceeding on schedule and are achieving their in-tended objectives. However, other aspects, such as trucking are proceeding slowly, if at all. The reasons have to do with conflicting economic interest, which are reflected in the politics and institutional arrangements in the three NAFTA countries.

### **Why have there been so few participants in the demonstration trucking program?**

One truck safety statistic, “out-of-service” rates, indicates that Mexican trucks operating in the United States are now safer than they were a decade ago. The data indicate that Mexican trucks and drivers have a comparable safety record to U.S. truckers. Another study indicates that the truck driver is usually the more critical factor in causing accidents than a safety defect with the truck itself. Service characteristics of long-haul trucking suggest that substandard carriers would likely not succeed in this market. As shipment distance increases, the relative cost of trucking compared to rail increases, and thus shippers utilizing long-haul trucking are willing to pay more because they require premium service, such as precise delivery windows or cargo refrigeration. These exacting service requirements would seem to

---

<sup>7</sup> See <http://www.fmcsa.dot.gov/newsroom/united-states-expand-trade-opportunities-mexico-through-safe-cross-border-trucking#sthash.ofjVKzeU.dpuf>.

disqualify truckers with unreliable equipment or incompetent drivers. In contrast, the short-haul “drayage” carriers that Mexican long-haul carriers would displace, typically use older equipment because of the many hours spent idling awaiting customs processing at the border.

Mexican carriers that have received long-haul authority, have to deal with a number of stumbling blocks, including lack of prearranged back hauls and higher insurance and capital costs, in addition to the customs processing delays. The short term impact is difficult to assess due to the low number of crossings under the pilot program. In the long run, use of drayage companies is likely to decline as they lose part of their market share to Mexican long-haul carriers. The most common trips for these carriers will probably be from the Mexican interior to warehouse facilities on the U.S. side of the border or to nearby cities in the border states.

## **B. 23 Years of NAFTA**

The North America Free Trade Agreement (NAFTA) took effect on January 1, 1994. In a formal sense, NAFTA expanded trade links between Canada, Mexico, and the United States by eliminating barriers to cross-border trade in goods and services, and establishing rules guaranteeing the permanent access of each country’s domestic products to the other North American markets. The advent of NAFTA was supposed to result in smoother border crossing.

The agreement recognizes and encourages the large and growing trade among the countries. The North American Free Trade Agreement has substantially boosted North America’s Competitiveness by enhancing access to a thriving combined market of 460 million inhabitants and a regional \$17 trillion output. The U.S. Chamber of Commerce credits NAFTA with increasing US trade in goods and services with Canada and Mexico from \$290 billion in 1993 to \$1.2 trillion in 2012. The United States trades more in goods and services with Mexico and Canada than it does with Japan, South Korea, Brazil, Russia, India, and China combined. Much of this growth has been due to increased trade between the United States and Mexico, where the trade balance swung from a \$1.7 billion U.S. surplus in 1993 to a \$61.4 billion deficit in 2012. Commerce between the United States and

Mexico is one of the great success stories of the global economy. In fact, in 2011 U.S.-Mexico goods and services trade reached the major milestone of one-half trillion dollars. The United States is Mexico's top trading partner, and Mexico, which has gained macroeconomic stability and expanded its middle class over the last two decades, is the United States' second largest export market and third largest trading partner.

From aerospace engineering in Queretaro to footwear assembly in Guanajuato, Mexico is shaping up to be a competitive and flexible manufacturer. Mexico's geographic proximity to the United States and high levels of internal wage and skill disparity made its manufacturing sector more competitive than China's after 2012. High-tech exports accounted for 17 percent of Mexican gross domestic product in 2012, while cars amounted to a quarter of all Mexican exports that same year. The high tariffs on high-tech products manufactured outside of NAFTA give Mexico a notable advantage. Particularly noteworthy is Mexico's booming aerospace industry. This sector has received the most foreign direct investment in the global industry for the past four years thanks in great part to the construction of a massive manufacturing plant by the Canadian company Bombardier in the central highlands of Mexico. These processes often link designers, developers, raw materials producers and parts manufacturers in the United States to high skilled labor, engineers, and plant managers in Mexico and Canada.

Challenges do remain for Mexico. Income disparity is a double-edged sword, and while the middle class grows at a slow pace, the country's poor education system continues to create a shortage of skilled labor for high value-added manufacturers considering a shift to Mexico. Organized crime continues to be a high-visibility issue that slows foreign investment, even as the current Mexican administration seems to have toned down some of its predecessor's more aggressive policies.

## **1. Principal Commodities**

Automobiles and electronics represent 60 to 70 percent of the value of trade transported by land. The principal manufactures transported by truck are nuclear reactors, boilers, machinery & mechanical appliances, vehicles, other than railway or tramway rolling stock, optical, photographic, cinematographic, measuring, medical instruments, furniture, bedding, mattress supports, cushions and similar stuffed

furnishings, special classification provisions, edible vegetables and certain roots and tubes, articles of iron and steel, articles of apparel and clothing accessories, not knitted or crocheted, and plastics and articles thereof.

## **2. Modes of Transportation**

Trucking, the primary mode of transportation in between NAFTA countries represents roughly 70 percent of trade by value. In theory, a reduction in tariffs should facilitate a more expeditious customs process at the ports of entry. However, NAFTA does not eliminate concerns about health, illegal migration, transport of illicit drugs, or national security (U.S. Department of Transportation, 2008). In fact, a complex border crossing system continues to exist despite NAFTA and creates delays and extra costs that can be considered non-tariff barriers to trade. Trucking is one of the most disputed elements in the Agreement. The Bureau Transportation Statistics (BTS) data reports 12 million border crossings by truck per year in the U.S.-Canada Border and 9 million trucks in the U.S.-Mexican border<sup>8</sup>.

Rail participation in U.S.-Mexican cross border has grown from 1 percent in 1999 to 15.4 percent in 2012 transporting mostly automobile parts and components. It is expected that rail will grow to 30 percent of the road freight within the next ten years. The main reason is that trains do not stop at the border for clearance by Mexican brokers, they stop only to change conductors at the border and the inspection is non-intrusive. These are huge advantages over trucks.

## **3. Security Measures after 9/11**

The practical economic implications of security measures put in place after the terrorist events of 9/11 have “thickened” the Canada-U.S.-Mexico borders, thereby increasing the costs and delays associated with cross border movement of goods, services and travelers. These security measures have a global impact on the logistics chain since they are applied to all countries, industrialized and less developed that export to the United States, not only to Canada and Mexico.

---

<sup>8</sup> Interview to Martin Rojas, ATA, Northern Virginia, February 2014.

Recent history has shown the consequences that result from a major disruption in truck travel. Immediately following the 9/11 terrorist attacks, significant truck delays at the Canadian and Mexican border crossings shut down several auto-manufacturing plants in the U.S. because just-in-time parts were not delivered.

The events of 9/11 in the United States caused a dramatic increase in security at the U.S.-Canada border. In the days following the attack, trucks were backed up over 40 kms away from the Ambassador Bridge in Ontario<sup>9</sup>. While many countries share the concerns over tighter security, these are particularly relevant to Canada, since close to 75 percent of Canadian trade is with the United States. This concern of stringent border inspections and inadequate infrastructures even extend to the added pollution from idling of large trucks and drivers. For pre-screened low-risk truck drivers, carriers, and importers, the FAST (Free and Secure Trade) program (CBSA 2008b) allows them more rapid clearance a pre-inspection checkpoints away from the border, reducing the wait times at the border itself.

#### **4. Trusted Traveler Shipper Programs**

Created after the events of 9/11, SENTRI, FAST, C-TPAT, Global Entry, allow vetted, low-risk individuals and shipments expedited passage across the border. Improving these programs and significantly expanding enrollment could increase throughput with minimal investments in infrastructure and staffing—all while strengthening security by giving border officials more time to focus on unknown and potentially dangerous individuals and shipments. These programs represent substantial time and resources to the participants. One of the most contentious issues surrounding border security concerns is visa delays or denials.

Prior to the terrorist attacks, estimates of the cost of time delays, paperwork, and compliance related to border crossing ranged from 5 percent to 13 percent on the value of goods involved (OECD, 2002a).

---

<sup>9</sup> Built in 1929, the Ambassador Bridge between Windsor, Ontario, and Detroit, Michigan, is the biggest commercial gateway between U.S and Canada taking more than 11 million vehicles each year, with an average of 10,000 trucks/day. This single bridge handles more than a quarter of total trade across the border.



Industry experts have estimated that the total costs of extra security measures implemented after the 9/11 events could amount to 1 to 3 percent of the value of traded goods (Leonard, 2001). Walkenhorst and Dihel (2006) find that these estimates were made soon after the events and seem to have decreased as international trade relations have returned to normal again. However, Nguyen and Wigle (2011) conclude in their paper that the economic costs of the delays may have been more severe than initially expected.

### **III. The Laredo Border Crossing Point**

According to the U.S. Department of Commerce, the Laredo cross point accounts for 40 percent of U.S.-Mexico overland merchandise trade by weight and 50 percent by value. Laredo's proximity to major highways gives motor carriers quick access to Mexico's industrial triangle of Monterrey, Guadalajara, and Mexico City. Laredo handles more freight than all U.S.- Mexico cross-border combined in terms of value, volume and number of entries. Laredo has more than 10,000 truck crossings/day.

Among the main products moving southbound through Laredo are electronics and electronic equipment; transportation equipment, automobiles and automobile parts, industrial machinery and computers; chemicals and allied products; petroleum and coal; textiles, optical instruments; and paper and cardboard products. Northbound, Laredo handles mainly vehicles and automotive parts; telecommunication equipment; and electrical equipment.

The trade through Laredo differs from that of other border regions. Although there are significant shipments to and from maquiladora factories adjacent to southern Texas, the majority of shipments through Laredo are bound to or sent from cities in the interior of Mexico, such as Mexico City, Guadalajara, and Monterrey. Mexico has four major transportation corridors: the Pacific, Chihuahua, Central and Gulf Coast. The Central Trade Corridor is the most important one, extending from Mexico City north to San Luis Potosí, Saltillo, Monterrey, and finally to Nuevo Laredo/Laredo, Texas.

U.S. and Mexico have done large investments in border crossing infrastructure, including the construction of new bridges, access roads, and inspection areas. The commercial traffic has been moved out of the cities to new bridges and roads outside the urban perimeter leaving the bridges and roads in the

cities for passenger traffic only. Laredo has four bridges with 22 crossing lanes, the Laredo bridge and the Lincoln-Juarez bridge, each with 2 lanes in each direction that handles mostly passenger vehicles; the Colombia Solidarity bridge build in 1990, connects Texas with Nuevo Leon, Mexico, has four lanes in each direction and the World Trade bridge, opened in September 2000, connects Laredo, Texas with Nuevo Laredo, State of Tamaulipas, Mexico, has four lanes in each direction and one rail bridge.

#### **A. Institutional Context and Rationale for Barriers: Laredo Border Crossing Process**

Delays are the most obvious problem in border crossing at Laredo, leading to congestion, uncertainty and higher costs. The time it takes trucks to cross the border into Mexico varies depending on the merchandise, time of day, and the day of week and even the time of year. Crossing times are a function of port infrastructure, government inspections, document clearance, importer's needs and brokering and forwarding procedures. A shipment could be held up for days because of problems anywhere in the process. In Laredo, however, U.S. and Mexican restrictions on trucks and the shipping process heighten traffic problems.

The present border crossing system is the result of: (1) prohibition of Mexican carriers in the United States and vice-versa; (2) restrictions imposed by the Mexican laws and rules and tolerated by the United States; (3) problems with data and the lack of a coordinated government inspection systems (which include Customs Service, Department of Transportation, Department of Agriculture, Immigration and Naturalization Service, Drug Enforcement Administration) between Mexico and the United States; (4) limited infrastructure; (5) cultural differences which include among others business practices.

Shipping by truck from the United States to Mexico is a unique process due to the practices of: (1) Mexican customs brokers on the southern border of the United States; and (2) the drayage industry at the border. At the core of the problem is the Mexican customs mind set and the support and obsolete international commercial procedures by some border cities and businessmen that lead to a complex border environment (Londoño-Kent, 2006).

The bottlenecks on southbound are due less to inadequate roads than to the way goods are transported across the border: “Southbound trucks must stop before crossing the border to have their cargo inspected and appraised by Mexican customs brokers. Mexico does not allow U.S. citizens to forward freight into Mexico. So, U.S. truckers must unload their cargo at Laredo warehouses. Then the Mexican freight forwarders shuttle it across the border, where it is usually transferred again to a Mexican long-haul trucker.” (Giermanski Nov. 2011)

### **1. The Mexican Customs Broker**

“Unlike U.S. brokers, the Mexican Customs broker is legally responsible and liable for the content of shipments across the border. Therefore, the process used by the Mexican customs brokers is more rigorous. The broker typically receives both the export declaration and bill of lading in advance of the truck’s arrival at their facility. With this information, the broker begins the preparation of the Mexican ‘Pedimentos’ required for cargo entering into Mexico. If the shipper is a frequent customer of the Mexican customs broker, minimal or no inspection may be undertaken. However, if the shipper is unknown to the broker or is an infrequent customer, a thorough inspection may be required to verify the contents and/or for classification purposes. When an inspection is required, the U.S. shipper may incur fees for the unloading and reloading the truck and for storage of the vehicle or trailer during the inspection.” (Barton-Ashman Associates 1996, pp.14 and 17).

### **2. The Drayage Industry**

The drayage industry is composed of small trucking firms that simply shuttle, transfer, or ferry goods across the border. Giermanski (1997) points out that the absolute advantage of Mexican brokers allows them to influence the drayage industry, contributing directly to the congestion, delays, and expense in border crossings.

The present system results in economic gains for: (I) Mexican brokers who provide services of warehousing, inspection, and classification, on the U.S. side of the border; (ii) the Laredo/Nuevo Laredo drayage industry; (iii) U.S. bankers that finance the construction of warehouses; (iv) the state and

municipal governments on both sides of the border who receive extra toll payments; (v) the Mexican states that receive a share of Customs tax collections and import duties; and (vi) the entire regional economy that provides goods and services to the above economic agents.

The U.S.-Mexican border landscape at the Laredo crossing point is very different from the European and the U.S.-Canadian context. Under the formal provisions of NAFTA, the border crossing should be seamless, clear and efficient. This would mean one truck with one driver from point A in the United States to point B in Mexico and vice-versa (see Figure 1). In theory, NAFTA assures a seamless border for the movement of trade between the Canada, Mexico, and the United States. To implement this ideal, standardized information should be agreed on by these countries and presented by the trucking companies or their agents to customs and other government officials in advance of each truck's arrival at the border. In this way, the government officials could make their risk assessments and decisions to examine the products, so merchandise, upon arrival at the border, could be released immediately released or examined based on the pre-arrival information. In reality, however, it takes several days, drivers and pieces of equipment. In fact it takes longer to cross Rio Grande than to go from Chicago to Laredo by truck (see Figure 2).

## **B. Times and Costs of the Border Crossing at Laredo**

In our study of the effects of practices of border crossing we obtained quantitative information from previous studies by Haralambides-Londoño-Kent (2004) and Londoño-Kent (2006) and updated this information through interviews with logistic service providers, the American Trucking Association, Embassy of Mexico, NAFTA office in Washington, D.C., consultants, U.S. exporters and the observations done by the borders users survey done by the U.S. Chamber of Commerce and the U.S. Chamber of Commerce in Mexico (2011) that included a wide array of border users from both Mexico and the United States. The questions were framed to identify issue areas requiring policy attention for the U.S.-Mexico trade community. These trade practitioners were asked to translate their typical border crossing experiences, from wait times to paperwork, into policy priorities. The results were aggregated to show broad industry trends.

Based on Haralambides-Londoño Kent (2004) the time to cross by truck from Laredo, Texas, to Nuevo Laredo, Mexico, a 10mile trip, usually takes from 2-5 days and may take longer, and the border crossing services cost between \$287 – \$636/truck. The border crossing services times and costs include handling costs and associated times of Mexican broker inspections for pre-clearance and storage; costs of loading and unloading; drayage costs and times of border crossing transport; inspections on the U.S. and Mexican sides (these costs and times are not incurred in other modes of transportation). These costs are present only when the border crossing is by truck and exclude costs such as pedimento, or legal document required for cargo entering into Mexico, duties, taxes and broker's commissions (costs that are involved in border crossing regardless the mode of transportation). What are the implications of these inefficiencies?

A simple calculation of the microeconomic impact of these extra costs of south-bound border crossings shows that the impact is apparently minimal: \$285-\$636 of border crossing costs/ trailer, with an average cost of \$30,000 cargo/trailer represents from 0.95% to 2.12% percent. But there are also hidden costs: the time waiting to cross, the uncertainty of time the process takes, pollution, congestion from border crossings with empty tucks, corruption, investments in infrastructure, and the cost of

maintaining the infrastructure. An increase of 1% to 2% in the costs due to border crossing inefficiencies is insufficient to explain the big price differences observed between United States and Mexico. A more important reason is possibly the time involved.

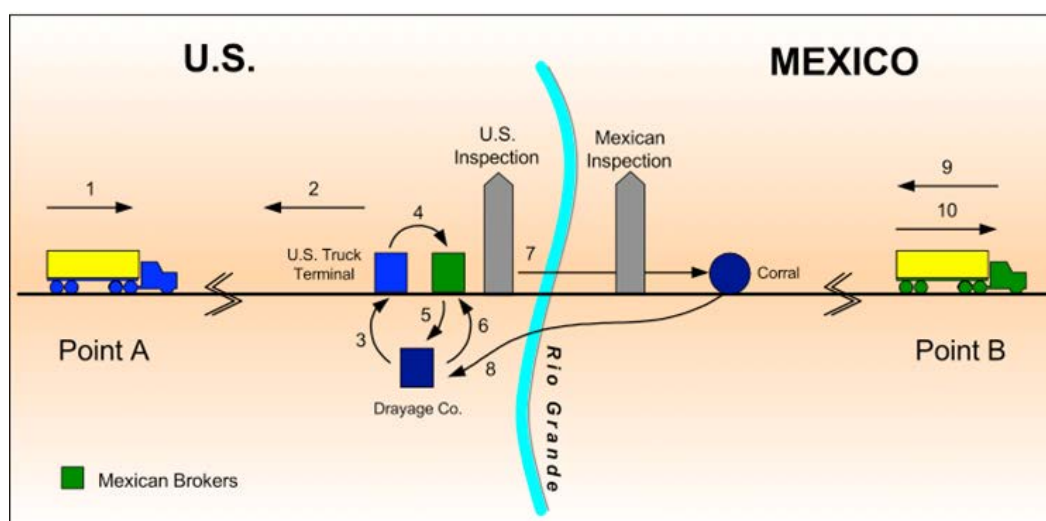
Hummels (2001) estimates indicate that each day saved in shipping time is worth 0.8 percent ad-valorem for manufactured goods. Considering that manufactures have to wait in Laredo from two to five days to cross the border southbound, Fox, Francois and Londoño-Kent (2003) estimate that the cost of time delays southbound is equivalent to 1.6 percent to 4 percent tariff or more, according to the number of days the cargo has to wait to cross the border.

The northbound crossing from Nuevo Laredo to Laredo takes 3–6 hours and costs \$150–\$300/truck, without considering the land security measure costs. Hummels (2001) estimates that each additional day spent in transport reduces the probability that the United States will source from that country by 1–1.5 percent. Northbound, the new security transit systems FAST, C-TPAT for cargo and SENTRI for passengers work well in the south border due to the lanes dedicated to them but they add congestion, costs, and delays.

A comprehensive analysis of the costs of border wait times and congestion to U.S. and Mexican Economies reports that the minimum waiting time to cross the border northbound at Laredo and Tijuana is about 3 hours, and ranges between 63-132 minutes at other borders (Wilson and Lee, eds., 2013, Table 2, p. 70). The cost to the regional economy in Nuevo Laredo alone is estimated in 2008 to be \$3.7 billion and to cost 134,000 jobs. The total cost of the waiting times is \$15.9 billion for the Mexican economy and over 300,000 jobs lost.

Because of the nature of trade between the United States and Mexico, the removal of the frictions in border crossing will facilitate the integration of the economies of these countries in a more efficient way. Reducing the time and the cost involved in shipping products will help the “just in time process” liberating inventory-holding and depreciation costs on shippers. These border-crossing frictions have pronounced implications for trade and the international organization of production.

Figure 2: Current situation crossing border southbound U.S.-Mexico



### C. Background on the Border Effects of U.S.-Mexican Trade

We are not the first to focus on the border effects of trade, but we are the first to look at the effects of transportation in border crossing in the trade flow. Rogers and Smith (2001) observe, “In perfectly integrated markets, prices of similar goods ought to be equalized, when those prices are denominated in a common currency”. If the price in one location rose substantially above that in another, market forces would tend to move prices back towards equality. However, empirical studies uniformly find large deviations from such a benchmark.” This is the case for the NAFTA countries where prices of traded products present big differences, especially U.S.-Mexican relative prices. Rogers and Smith estimate this border effect on U.S.-Mexican relative prices using consumer price indexes from cities in the United States, Canada and Mexico, and find that U.S.-Mexican price differentials are nearly an order of magnitude larger than are U.S.-Canada price differentials. They present evidence on alternative explanations of the large border effect for pairs of Mexican cities. These explanations include sticky prices and variable nominal exchange rates; formal or informal barriers to trade; and labor markets, marketing networks and distribution networks. They present evidence that the U.S.-Mexican price differential is not primarily due to the differences in U.S.-Mexican wages. Using the prices of 276 highly

disaggregated goods and services, they estimate the variability of declines during a period of stability of the peso (May 1988 to November 1994). The variability on goods and services prices fell by less than the variability of nominal and real exchange rates. Their results are strong evidence of a “nominal border effect” in relative prices within NAFTA that are not explained by the exchange rate differences or the U.S.-Mexican wages.

Rogers and Smith also stress that other real external influences are important. First, even after NAFTA is fully implemented and eliminates formal barriers to trade within the member countries, important informal barriers to trade remain. Second, marketing and distribution networks are more homogenous within countries than across borders, due in part to language, cultural differences, and tastes. Because of these factors, markets are segmented and prices can differ for identical products across locations. Lastly, labor markets are more integrated within countries than across borders, and this contributes to a large border effect on prices.

Although Rogers and Smith mention generically the informal barriers to trade under the first point, they do not provide any substantive analysis regarding their nature, impact, or how they came to be established and continue to be maintained. Engel and Rogers (2001) also mention the informal trade barriers that exist, even after NAFTA, as one possible explanation for the relatively large border effect for pairs involving Mexican cities, again without identifying or explaining them.

The advent of NAFTA in 1994 reduced formal trade barriers and was supposed to result in smoother border crossing. However, the price difference between the United States and Mexico during NAFTA has been higher than during the stable peso period leading up to 1994. This raises the possibility that informal trade barriers have increased after NAFTA, decreasing the positive impact of the reduction of formal trade barriers. The border crossing inefficiencies found at Laredo are important informal barriers to trade and a partial cause of the “real border effect”, as are exchange rates, wages, corruption, and the psychological effect of dealing with a market that has a different culture, language, legal and institutional system.



Hummels (1999) has estimated that language differences are a significant trade barrier and that sharing a common language lowers costs by an average of 5 percent. Price data indicate that importers will pay a 3 to 5 percent premium to trade with partners sharing a common language and a premium of 1 to 3 percent to trade with partners in contiguous countries. The growth of trade between United States and Mexico over the past 20 years has been impressive, but the restrictions on cross-border trucking generate congestion, long waits and extra costs. Both producers and consumers bear the burden of higher transaction costs. The result is that U.S. surface trade with Mexico continued to be markedly more expensive than U.S. trade with Canada before 9/11. This has changed since the U.S. introduction of the safety requirements for exports to U.S. due to the events of 9/11. U.S. Canada border now looks more like U.S.-Mexican border.

#### **IV. Estimating Effects of Border Measures**

In this section, we use the GTAP model to estimate the economic costs among the NAFTA countries of border frictions induced by the Mexican brokerage system as well as those brought about by heightened security measures. Estimates of losses due to the Mexican brokerage system drawn on earlier research by Haralambides and Londoño-Kent (2004) and Fox and Londoño-Kent (2003). These border measures pose substantial barriers to Mexican-bound trade, due both to time lost in transit at the border, as well as additional fees paid to the Mexican brokers.

##### **A. Estimating the Effect of the Mexican Brokerage System**

As outlined above, the prevailing brokerage system for entering goods into Mexico from the United States by truck involves substantial monetary costs and costs induced by the time required to cross the border. In order to model these two effects, we use two different aspects of the GTAP model. The additional fees associated with the brokerage system are modeled as an ad valorem equivalent tariff. Doing so accounts for the monetary benefit to Mexico of collecting the rents associated with the brokerage process. In actuality, these benefits accrue to the Mexican brokers. We approximate this gain by treating the benefits as a tariff, attributing the gain to the representative agent for Mexico within the

**Table 1: Simulating Mexican broker effect**

Barrier	Variable shocked*	
	Southbound	Northbound
Lost time	$\Delta \text{ams}(T, \text{US}, \text{Mex}) = +3\%$	$\Delta \text{ams}(T, \text{Mex}, \text{US}) = +0.25\%$
Brokerage Frictions	$\Delta \text{tms}(T, \text{US}, \text{Mex}) = -2\%$	$\Delta \text{txs}(T, \text{Mex}, \text{US}) = -0.75\%$

\* $T$  is the set of goods shipped predominantly by truck: pdr, wht, gro, v\_f, osd, c\_b, pfb, ocr, ctl, oap, rmk, wol, frs, fsh, cmt, omt, vol, mil, pcr, sgr, ofd, b\_t, tex, wap, lea, lum, ppp, crp, fmp, mvh, otn, ele, ome, omf.  
Excluded goods: coa, oil, gas, omn, p\_c, nmm, i\_s, nfm

model. This partially understates the benefits of removal, because we do not take into account the costs associated with the brokerage process. The instrument whereby we implement the liberalization is through GTAP's import tariff instrument, *tms*. We estimate the ad valorem tariff equivalent of southbound trade to equal 2 percent, while northbound trade faces a similar, but much smaller, barrier of 0.75 percent (see Table 1). We increase the prevailing tariff in the relevant trade flows between the United States and Mexico by these amounts in the baseline database, and then simulate their removal to arrive at an estimate of the benefits of liberalization.

The second substantial friction introduced by the Mexican brokerage system is time lost due to the complicated and drawn out process for transiting the border by truck. Relying on estimates from Hummels (1999), we estimate that the time lost in southbound commerce is equivalent to a 3 percent barrier, while northbound trade is subject to delays equal to a 0.25 percent barrier. Lost time in transit differs from the fees collected by Mexican brokers in that it represents a deadweight loss to trade. We model this using the GTAP variable *ams*, treating the removal of these delays in trade as an increase in the efficiency of the subject goods. Because of the relative magnitude of these barriers, as well as the fact that they are deadweight losses as opposed to tariff-like fees charged at the border, the benefits of removing these impediments are that much greater. Table 1 spells out in greater detail the sectors and shocks applied to the model to simulate liberalization of the trading regime.

## B. Estimating the Effect of Heightened Border Security

To estimate the effects of the current Mexican brokerage system and the prevailing security regime, we consider three different scenarios. In simulation 1, we estimate the effects of removing the

**Table 2: Welfare (million \$2011)**

Sim	Description	USA	Mexico	Canada	Non-NAFTA	World
1	Broker effect, no security	3,153	4,681	-305	-2,890	4,638
2	Broker effect, baseline security	9,263	8,427	4,586	-7,622	14,653
3	Broker effect, high security	14,959	12,085	9,113	-12,126	24,031

**Table 3: Change in aggregate imports, cif weights (percent)**

Sim	Description	USA	Mexico	Canada
1	Broker effect, no security	0.2	0.8	-0.1
2	Broker effect, baseline security	0.6	1.8	1.1
3	Broker effect, high security	0.9	2.9	2.3

broker effect only—no change in the security regime is included. Next, in simulation 2 we combine the Mexican broker effect with the baseline security effect as discussed above. Following Walkenhorst and Dihel (2006) and Nguyen and Wigle (2011), security costs are assumed to represent a 1 percent ad valorem cost on most goods traded among the NAFTA partners, with the exception of coal, petroleum, natural gas, refined petroleum products, electricity, and gas distribution.<sup>10</sup> Lastly, we consider the effect of simultaneously removing the Mexican broker effect and a high security cost, where the non-fossil-fuel goods barrier is increased from 1 to 2 percent.

The welfare effects of each of these simulations shown in Table 2; overall change in imports by country is shown in Table 3. Considering first the effects of the Mexican brokerage system, we see that this represents a substantial cost to the United States and Mexico, with U.S. welfare reduced by \$3.2 billion and Mexico's by \$4.7 billion. Note that the relative burden for Mexico is much greater than for the United States—about 0.4 percent compared to 0.02 percent—because of the much smaller size of the Mexican economy. For Canada and non-NAFTA countries, changes in the terms of trade drive their welfare declines, as a portion of the growth in trade between the United States and Mexico is diverted from other trading partners. The aggregate effect on trade for the NAFTA countries is shown in Table 3: streamlining the U.S.-Mexican border is estimated to increase total U.S. exports by 0.2 percent, and those

<sup>10</sup> The GTAP sector labels for these sectors are coa, oil, gas, p\_c, ely, gdt.

of Mexico by 0.8 percent. The bilateral trading relationship is driving each of those increases, with U.S. imports from Mexico estimated to increase by 0.4 percent, and Mexican imports from the United States by 5.9 percent as a result of streamlining.

The next two simulations consider the effect of reducing security-related delays among all the NAFTA countries. In simulation 2 we estimate the combined effect of reducing security-related frictions on all non-energy-related goods and services for all intra-NAFTA, combined with the previous streamlining of Mexican brokerage system. U.S. welfare rises by an additional \$6.2 billion, while Mexican welfare increases by \$3.7 billion. Canada also sees substantial gains, moving from a loss of \$300 million in the Mexican brokerage simulation to a gain of \$4.6 billion. Aggregate trade effects are of a similar magnitude, with U.S. total imports rising by 0.6 percent as compared to 0.2 percent, and Mexican imports growing by 1.8 percent, 1 percent higher than with brokerage effects alone. Canada's imports rise by 1.1 percent, compared to the prior decline of 0.1 percent. The larger relative effect on Mexico and Canada as compared to the United States come as no surprise, since the United States represents a much larger share of the other two partner countries' total trade. Changes in NAFTA border frictions similarly affect a much greater fraction of Canadian and Mexican trade as compared to that of the United States.

Our last simulation, number 3, is structurally the same as simulation 2, but with double the magnitude of security-related frictions, rising from 1 to 2 percent. Growth in welfare benefits attributable to security streamlining are less than twice as great: U.S. welfare rises by an additional \$5.6 billion compared to simulation 2, while that of Mexico rises by \$3.7 billion, and Canada's by \$4.5 billion. Import growth is closer to proportionate, rising by an additional 0.3 percent in the United States, and by 1.1 percent in Mexico and 1.2 percent in Canada.

## **V. Analysis, Conclusions and Recommendations**

The post-9/11 border security measures, even when we include the trusted trader programs, have eroded any positive impact of the FTA/NAFTA. In fact, these post-9/11 border security measures have

pushed Canada in a situation much worse than the pre- FTA period because FTA/NAFTA only reduced tariffs by around one per cent according to Grady (2009).

The concern of future terrorist attacks, the events of 9/11 triggered a variety of costs: (1) regulatory measures that cost governments increased surveillance and inspections; (2) demands on transport companies that entail new costs and longer delays at border crossings; (3) compliance costs borne by private agents; (4) producers trend to forgo the efficiency of “just in time” inventory to “just in case”, (5) increased demand for inventory deposit (6) increased demand of infrastructure for inspections, (7) increase pollution, (8) long and unpredictable wait times at the border crossings are costing the NAFTA economies many billions of dollars each year.

Because of the nature of trade between NAFTA countries, the removal of the frictions in border crossings will facilitate the integration of the economies of these countries in a more efficient way. Reducing the length and uncertainty of shipping time and the cost involved in shipping products will aid “just in time” inventory management, reducing the need to hold inventory and reducing depreciation costs on shippers. These border frictions have pronounced implications for trade and the logistics of global supply chains. Reducing supply chain barriers has a larger effect in trade and GDP growth than removing tariff barriers.

## VI. Bibliography

- Arvis, Jean-François, and Pilar Londoño-Kent (2009). "Global Review of Transit Systems: The Landlocked and Transit Countries Case". World Bank background paper, 2009.
- Barnes, Gary, and Peter Langworthy (June 2003). "The Per-Mile-Cost of Operating Automobiles and Trucks", Humphrey Institute of Public Affairs, U. Minnesota. Minnesota Department of Transportation Office of Research Services, Report no. MnDOT 2003-19.  
<http://www.cts.umn.edu/Publications/ResearchReports/reportdetail.html?id=670>
- Barton-Aschman, La Empresa (1997) "Binational Border Transportation Planning and Programming Process." [gov/binational/reports/task\\_8/toc8.html](http://gov/binational/reports/task_8/toc8.html).
- Belzer, M.H. and Arbor, A. (2003), "The Jobs Tunnel: The Economic Impact of Adequate Border-Crossing Infrastructure". Report produced for the Job Tunnel, Detroit River Tunnel Partnership.
- Boyer, Kenneth D., "American Trucking, NAFTA, and the Cost of Distance," *Annals of the American Academy of Political and Social Science*, September 1997, vol. 553.
- Burt, M. (2007), "Tighter Border Security and Its Effect on Canadian Exports", Paper presented in "The Conference Board of Canada".
- Canada Border Services Agency (CBSA) 2008b. "Free and Secure Trade (FAST)." Accessed 15 July 2008 at <http://cbsa-asfc.gc.ca/prog/fast-express/menu-eng.html>.
- Ferrantino, Geiger and Tsigas, "The Benefits of Trade Facilitation - A Modeling Exercise, Based on 2007 baseline.
- Fox, Alan, Joseph Francois, and Maria del Pilar Londoño-Kent, "Measuring Border Crossing Costs and their Impact on Trade Flows: The United States-Mexican Trucking Case", April 2003.  
[https://www.gtap.agecon.purdue.edu/access\\_member/resources/res\\_display.asp?RecordID=1282](https://www.gtap.agecon.purdue.edu/access_member/resources/res_display.asp?RecordID=1282)
- Frankel, J.A. (1997) "Regional Trading Blocs in the World Economic System" Institute for International Economics, Washington, D.C.
- Frankel, J. and Romer, D. (1996) "Trade and Growth." *NBER Working Paper*, No. 5476. Cambridge, MA: National Bureau of Economic Research.
- Giermanski, J.R. (1996) "Texas to Mexico: A Border to Avoid." *Journal of Borderland Studies*, Texas: Texas A & M International University, Volume X, Number 2.
- Giermanski, J.R. (1999) Texas: Laredo, interview February 19, 1999.
- Giermanski, J.R. (1999) "Why is so Hard to Cross the Border?" *Logistics Management*, July 1999.
- Giermanski, J.R. (Fall 1999) "Estimated Border Crossing Costs." Texas: Texas A&M International University, Laredo, TX, unpublished paper.

- Giermanski, J.R. (February 2000) “Know thy Broker: By choosing the right customs broker and taking advantage of new Mexican laws, shippers may be able to save time and money on shipments south of the border.” [http://www.scdigest.com/assets/Experts/Guess\\_Giermanski\\_11-11-21.php?cid=5201](http://www.scdigest.com/assets/Experts/Guess_Giermanski_11-11-21.php?cid=5201)
- Globerman, S. and P. Storer, (2009). “Border Security and Canadian Exports to the United States: Evidence and Policy Implications”, *Canadian Public Policy*, vol. 35(2), 171-86.
- Grady, Patrick (2009). “Were Canadian Exports to the U.S. Curtailed by the Post-9/11 Thickening of the U.S. Border?” MPRA Paper No. 21047, <http://mpra.ub.uni-muenchen.de/21047/>.
- Haralambides, H. E., and Maria del Pilar Londoño-Kent, “Supply chain bottlenecks: border crossing inefficiencies between Mexico and the United States”, *International Journal of Transport Economics*, Vol. XXXI No2 June 2004.
- Hummels, David, and Georg Schaur (2012). “Time as a Trade Barrier.” NBER working paper 17758, <http://www.nber.org/papers/w17758.pdf>.
- International Road Transport Union. “About the TIR System.” [http://www.iru.org/en\\_iru\\_about\\_tir](http://www.iru.org/en_iru_about_tir).
- Wilson, Christopher E., and Erik Lee, eds., *The State of the Border Report*. Mexico Institute, Woodrow Wilson International Center for Scholars, May 2013.  
<https://www.wilsoncenter.org/publication/the-state-the-border-report>.
- Leonard, J. (2001). “Impact of the September 11, 2001 Terrorist Attacks on North American Trade Flows”, e-Alert. Arlington, VA: Manufactures Alliance.
- Londoño-Kent, Maria del Pilar. (2006). “Institutional Arrangements that Affect Free Trade Agreements: Economic Rationality versus Interest Groups”. Erasmus Research Institute of Management (ERIM), Erasmus University, Rotterdam, ERIM Ph.D. Series Research in Management 78.
- Georges, Patrick, Marcel Mérette, and Qi Zhang, “Assessing the Cost of Post-9/11 Security Measures and the Impact of a North American Security Perimeter –A Computable General Equilibrium Analysis.” Presented at the 14th Annual Conference on Global Economic Analysis, Venice, Italy, June 2011. <https://www.gtap.agecon.purdue.edu/resources/download/5310.pdf>.
- Nguyen, T.T. and Randall M. Wigle (2011), “Border Delays Re-Emerging Priority: Within-Country Dimensions for Canada”. *Canadian Public Policy - Analyse de Politiques* Vol. XXXVII, No. 1 2011.
- Nguyen, T.T. and Randall M. Wigle (2009), “Welfare Costs of Border Delays: Numerical Calculations from a Canadian Regional Trade Model”, *Canadian Journal of Regional Science*, 32 (2), 203-222, ISSN: 0705-4580.
- OECD (Organization for Economic Cooperation and Development). 2002a. “The Impact of the Terrorist Attacks of 11 September 2001 on International Trading and Transport Activities”. Unclassified document TD/TC/WP (2002)final. Paris: OECD Publications.
- OCC Borders and Trade Development Committee (2005), “Cost of Border Delays to the United States Economy”. Report by Ontario Chamber of Commerce.

Rogers, John H. and Smith, Hayden P. (2001) "Border Effects Within the NAFTA Countries." Board of Governors of the Federal Reserve System, International Finance Discussion Papers, Number 698, March 2001, pp. 1-30.

Steps to a XXI Century U.S.-Mexico Border, Chamber of Commerce,  
[http://www.uschamber.com/sites/default/files/reports/2011\\_us\\_mexico\\_report.pdf](http://www.uschamber.com/sites/default/files/reports/2011_us_mexico_report.pdf)

U.S. Department of Transportation (1998) "Binational Border Transportation Planning and Programming Process," [gov/binational/reports/Task8/toc8.html](http://gov/binational/reports/Task8/toc8.html), p 76.

Walkenhorst, Peter and Dihel, Nora (2006) "Trade Impacts of Increased Border Security Concerns". The International Trade Journal, Volume XX, No. 1, Spring 2006

World Economic Forum. "International Trade." <http://www.weforum.org/issues/international-trade>

World Economic Forum. "Supply Chain & Transportation." <http://www.weforum.org/industry-partners/groups/supply-chain-transportation/>

World Economic Forum. Outlook on the Logistics and Supply Chain Industry 2012. 24.