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Trade Liberalization in Mexico: An Analysis of the Anti-Export Bias

Daniel J. Serra
Claremont McKenna College

CLAREMONT MCKENNA COLLEGE

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SUBMITTED TO

Professor Sven Arndt

AND

Dean Nicholas Warner

BY

Daniel Serra

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Abstract

Modern trade theory suggests that protectionist policies hinder exports by altering domestic prices and production incentives. This paper examines the effect of import tariffs on Mexican non-oil exports through a comprehensive analysis of the Mexican trade sector, including a breakdown of the most important free trade agreements for the Mexican economy, information on Mexican resource mobility and factor endowment, and analysis on Mexico's tariff structure. The paper finds that import tariffs on both intermediate and final goods have a direct and significant effect on exports, alluding to the existence of an anti-export bias, and argues that free trade is the most effective way to promote exports and allow for domestic price readjustment.

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I. Introduction

Trade has enabled us to share ideas, technologies, goods and services with one another, and has pushed economic and social development to its limit. It is safe to say that, today, no country can survive without trading, let alone complete isolation. Through trade, countries have the opportunity to specialize in relatively abundant goods and exchange them with nations from around the world. In particular, both developing and developed nations have an incentive to maximize efficiency and minimize opportunity cost by specializing and trading. Although most countries are beginning to make real efforts to move towards trade liberalization and adapt free trade agreements, many still have protectionist policies that supposedly support local employment and production.

Developing countries often make the argument that tariffs imposed on their exports by rich countries prevent them from completing their commercial goals[1]. In response, they either resort to export-promotion programs (tax concessions and subsidies), which are inefficient, or install their own protectionist policies. Tokarick (2007) argues that developing and developed countries alike have yet to understand that their own import protection patterns may be hindering their export performance. Through tariffs, taxes, import quotas and non-tariff barriers, countries can distort relative domestic prices of imports and exports, in essence creating an anti-export bias.

[1] Tokarick, Stephen. "How large is the bias against exports from import tariffs?" *World Trade Review* 6, no. 2 (2007): 193-212.

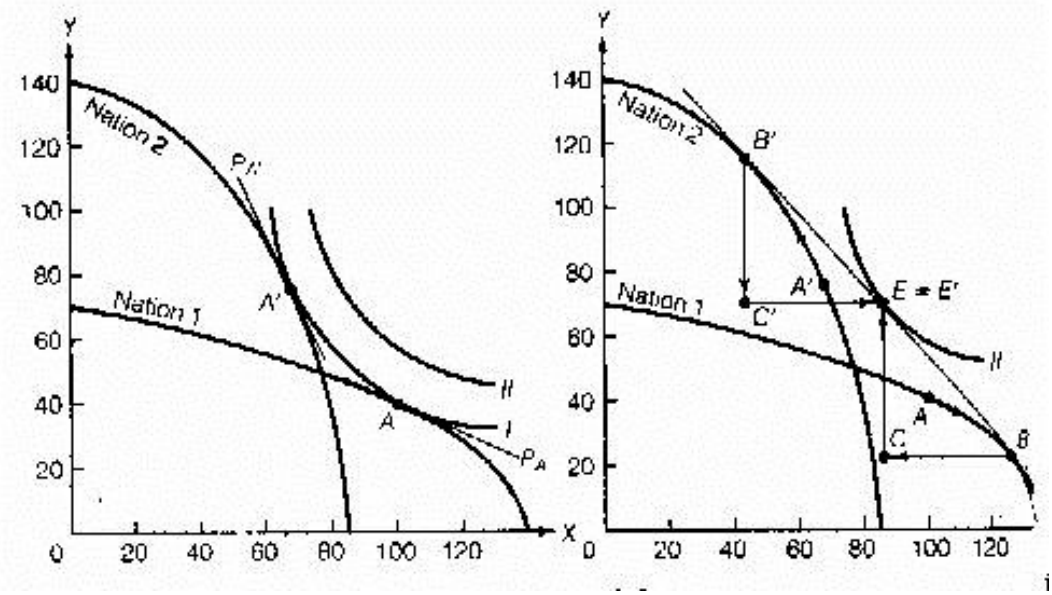
This paper focuses on determining the effects of trade liberalization on the anti-export bias of Mexico through an analysis of modern trade theory and two-factor trade models. Although research on the anti-export bias is extensive, limited research has been made with respect to Mexico. Similarly, much of the popular analysis on anti-export bias is outdated, for example Tokarick (2007) and Dornbusch (1992), both of whom have leading papers on trade liberalization in developing countries. More importantly, however, 2014 has marked the 20th anniversary of the North American Free Trade Agreement (NAFTA), which gives this paper particular importance and relevance in analyzing the effects of real trade liberalization efforts with respect to modern day trade scenarios and economic development.

This paper presents an initial analysis of modern trade theory relevant to Mexico's economy, and examines the effects of liberalization on Mexico's anti-export bias through general equilibrium models. Throughout the paper, we include a comprehensive analysis of Mexico's economic structure, including a brief introduction of Mexico's trade history, assumptions on resource mobility and factor endowment, and a breakdown of Mexico's tariff structure. We also estimate the relationship between import tariffs and the Mexico's non-oil exports, where results indicate a strong relationship between trade liberalization and export promotion. Not only do our results allude to the effects of trade liberalization on the anti-export bias, but they present evidence to encourage developing nations to make more concrete efforts towards liberalization.

II. Modern Trade Theory

The Heckscher-Ohlin theory maintains that a country's factor endowment will determine its relative comparative advantage in the production of goods (Carbaugh 2010). In essence, the model suggests that trade will be determined on the relative pre-trade prices of goods within each nation, all of which mostly depend on production possibility frontiers and demand. Assuming that technology and demand are relatively similar between trading nations, factor endowment thus becomes the decisive factor in establishing comparative advantage. As countries engage in trade agreements, they will specialize in the production of goods that require the use of relatively abundant resources for export, and import the goods that require the use of relatively scarce resources. By doing so, countries are able to produce outside of their production possibilities frontier, as exemplified in Figure 1. Panel 1 portrays both nation 1 and 2's production possibility frontier when they are in autarky and do not engage in trade. Panel 2, on the other hand, portrays the nation's production possibility frontier when they specialize and trade. Point E in Panel 2 shows that through trade, countries are able to produce outside of their original production possibilities frontier. It is particularly important to highlight that the production possibility frontiers assume full employment and production capacity, and are used to analyze two-good, two-factor models (import and export sectors). Taking this into consideration, any increase in the import sector will inevitably and directly lead to an equivalent decrease in the export sector, and vice versa.

Figure 1. The Factor-Endowment Theory in Autarky and Trade



Source: Carbaugh, Richard. International Economics. Mason, OH:South-Western Cengage Learning, 2011, pp 106

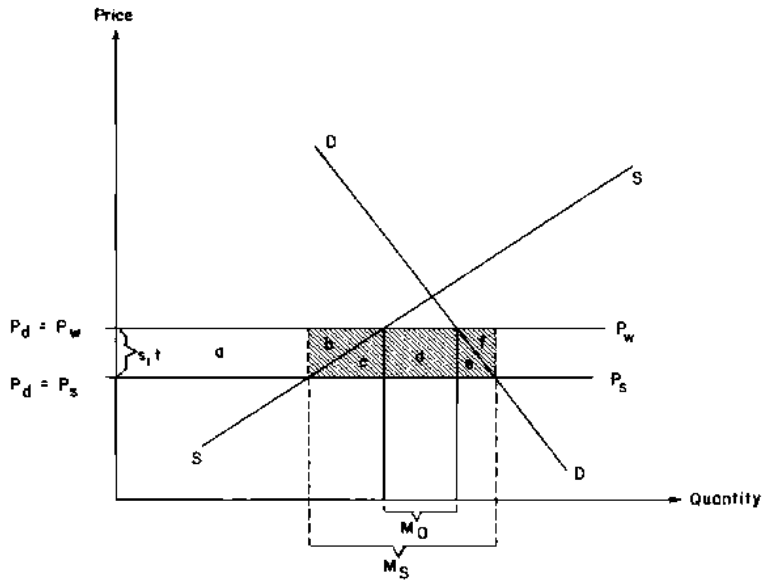
Assuming a two-factor model composed of capital and labor, a country that is labor abundant will produce goods that require labor, while a country that is capital abundant will produce goods that require capital. Relatively speaking, the labor-abundant country (country Z) has cheaper labor than the capital-abundant country (country Y), and vice versa. As the countries trade, country Z will demand more capital-intensive goods, causing country Y's demand for capital to increase (in order to meet Z's demand), leading to an increase in the price of capital in country Y. Similarly, due to specialization, country Z will produce less capital-intensive goods, lowering Z's demand and local price for capital. We can therefore claim that free trade leads to factor-price equalization between the two trading countries, where Z's originally high price of capital falls, and Y's relatively low price of capital rises.

In most cases, however, trade is not free. Protectionist policies directly affect factor-price equalization and local production incentives. Although protectionism can take several different forms, the most widely adapted policy tends to be through the use of import tariffs. A tariff can be defined as a tax or duty that is applied on a good that is being traded[2]. Specifically, an import tariff will be a tax on a good that is imported, while an export tariff is a tax levied on goods that are exported. There exist several different types of tariffs, of which *ad valorem, specific* and *compound*, are the most popular[3]. An *ad valorem* tariff takes the form of a percentage to be taxed on the price of the good, while a *specific* tariff is a fixed money amount for every unit of the imported good and a *compound* tariff is a combination of the two.

When tariffs are imposed on imports, they raise the price of the imported goods and reduce consumer surplus as well as generate a deadweight loss, as demonstrated by Figure 2. In a free-trade arrangement, the domestic price of a good will be equal to the world price, as is represented by point $P_D = P_S$. Considering domestic demand and supply, there will be either excess demand (shortage), or excess supply (surplus) for any good. Imports tend to deal with shortages, where excess demand is accounted for by imports, represented by M_S. When governments impose import tariffs, they effectively raise the price of the good, represented by $P_d=P_w$, causing the amount of imports to fall, as shown by M_D. This has implications for domestic producers as well as consumers, and ultimately leads to a deadweight loss of areas b and f[4].

[2] Carbaugh, Richard. International Economics. Mason, OH:South-Western Cengage Learning, 2011, pp. 107
[3] *Ibid*
[4] *Ibid*

Figure 2. Effect of Import Tariff on Local Economy



Source: Food and Agriculture Organization of the United States. Dairy imports in Sub-Saharan Africa. N.p., n.d. Web. 27 Apr. 2014.

Import tariffs also have a significant negative effect on exports. By raising the price of imports, tariffs inevitably raise the price of primary factor inputs (wages and rental rate of capital). If we continue our analysis of a two-factor two-good model, higher tariffs on labor-intensive imports will lead to a higher domestic wage rate. If we take labor to be mobile across all sectors, the increase in the wage rate will spread throughout the economy and raise the cost of production of exports, which will reduce production.

Lerner (1936) argues that there is symmetry between import tariffs and export taxes with regard to its effect on domestic relative prices. Following Lerner, we can define the effect of an *ad valorem* import tariff on relative domestic prices in a small country as[5]

[5] Tokarick, Stephen. "How large is the bias against exports from import tariffs?." *World Trade Review* 6, no. 2 (2007): 193-212.

$$\frac{P_X}{P_M} = \frac{PW_X}{PW_M(1+t)}, \quad (1)$$

and the effect of an export tax on relative prices as

$$\frac{P_X}{P_M} = \frac{PW_X\,(1-\tau)}{PW_M}, \quad (2)$$

where P_X and P_M are the prices of exports and imports and PW_X and PW_M are the corresponding world prices respectively. These two policies will have the same effect on domestic relative prices if

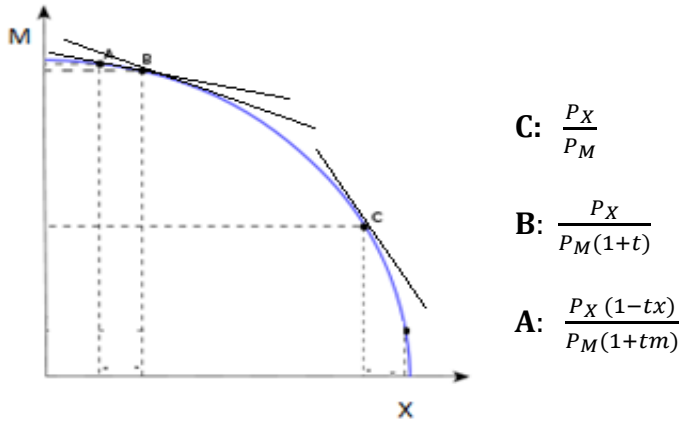
$$\tau = \frac{t}{1+t}. \quad (3)$$

Alternatively, if we were to assume that the rest of the world B, retaliates with import tariffs on A's exports, we could represent the effect of import tariffs on the relative domestic prices as

$$\frac{P_X}{P_M} = \frac{PW_X\,(1-tx)}{PW_M(1+tm)}, \quad (4)$$

creating a stronger anti-export bias than either import tariff alone, as exemplified in Figure 3.

Figure 3. Anti-export bias from protectionist policies in a two-country model



Source: Lerner, Abba P. "The symmetry between import and export taxes." *Economica* (1936): 306-313.

Beginning at a point C where there is free trade, if country Z were to adapt protectionist policies and apply import tariffs to Y's products, production would move along the curve to point B since local producers will focus on the production of importable goods. Additionally, if country Y were to retaliate and impose import tariffs on country Z's exports, production would move further along the curve to point A, deepening the anti-export bias. It is important, however, to bring to light the difference between the anti-export bias created by a country's own policies, and the effects of retaliation from other countries. Given the issue at hand, this paper focuses specifically on the creation of an own policy anti-export bias.

Several studies have analyzed tariff policies of developing countries in the fear that their tariff structure is ineffective; see Dornbusch (1992), Balassa (1965), and Krasner (1976). More specifically, Corden (1966) explores the effective protection rates and efficient tariff structures. In his paper, Corden presents the basic form of effective protection rates, where he defines the effective protection rate as the change in value-added per unit in an

economic activity made possible by a tariff structure relative to the absence of tariffs but under the same exchange rate (Corden 1966). Following Corden, if we were to take the case of an importable good *j*, which has only one input, *i*, which is also an importable, and assume that only import tariffs are imposed on both *j* and *i* and nothing else, we could mathematically represent the effective protection rate as[6]:

$$v_j = p_j(1 - a_{ij}), \tag{5}$$

$$v'_j = p_j\left[\left(1 + t_j\right) - a_{ij}(1 + t_i)\right], \tag{6}$$

$$g_j = \frac{v'_j - v_j}{v_j}, \tag{7}$$

and combining (5), (6) and (7),

$$g_j = \frac{tj - a_{ij}\, t_i}{1 - a_{ij}}, \tag{8}$$

where

v_j = value added per unit of j in absence of tariffs;
v'_j = value added per unit of j due to tariff structure;
g_j = effective protective rate for activity j;
p_j = price of unit j in absence of tariff;
a_{ij} = share of i in cost of j in absence of tariffs;
t_j = tariff rate on j;
t_i = tariff rate on i.

We can see that the effective protection rate depends on tariffs on outputs, inputs and the effective share of inputs under free trade. If we were to consider the different sizes of tariffs on inputs and final goods, it follows that if[7]:

$$t_j = t_i \rightarrow \ g_j = t_j = t_i \ , \tag{i}$$

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6 Greenaway, David, and Chris Milner. "Effective protection, policy appraisal and trade policy reform." *The World Economy* 26, no. 4 (2003): 441-456.
7 *Ibid*

$$t_j > t_i \rightarrow \ g_j > t_j > t_i \ , \qquad \text{(ii)}$$

$$t_j < t_i \rightarrow \ g_j < t_j < t_i \ , \qquad \text{(iii)}$$

$$t_j < a_{ij} \rightarrow \ g_j < 0 \quad , \qquad \text{(iv)}$$

$$t_j = 0 \rightarrow \ g_j = - t_i \frac{a_{ij}}{1- a_{ij}} \ , \qquad \text{(v)}$$

$$t_i = 0 \rightarrow \ g_j = \frac{t_j}{1- a_{ij}} \ . \qquad \text{(vi)}$$

The implications of this model are important in determining whether the tariff structure in any given country is effective relative to free trade. Noting that the effective protection rate can be either positive or negative, a negative effective protection rate would indicate that the current tariff structure is making the market less competitive with respect to free trade, whereas a positive effective protection rate alludes to the value added from the tariff structure. Incorporating intermediate inputs into our model, tariffs may be more or less effective depending on whether the intermediate inputs are taxed, and the extent of that tax. It is important, therefore, to include an analysis of intermediate inputs in order to determine whether a country's tariff structure works, and not only look at final importable and exportable goods. For example, considering an exportable with no tax or subsidy, whose only input is an importable paying a 20 per cent tariff and whose free trade share of the exportable is 40 percent, then the effective protection rate is – 13.33 percent, essentially representing an inadequate tariff structure. In the context of Figure 3, by removing tariffs on inputs, the cost to produce exportable goods is minimized and domestic prices begin to readjust, encouraging the production of exports and reducing the anti-export bias. Visually, this would be a movement along the curve towards point C.

Although developing and developed countries alike often adopt protectionist policies, several studies have argued that their effects on exports are different. Tokarick (2007) empirically examines the effect of import tariffs on exports and finds that it is in the best interest of developing countries to reduce their import tariffs as it leads to a 20 percent increase in exports. Developed countries' exports, on the other hand, would only increase by 4 percent were they to remove their own import tariffs. Many developing countries don't realize that their protectionist policies have significant effects on their export sector, even more so than developed nations. A prime example of this is the case of Brazil in the 1970s. Economists at the time argued that international demand conditions and increased protectionist policies on behalf of developed countries were hindering the Brazilian export sector. Applying Tokaricks' findings to this case, we could argue that Brazil is a small country and only accounts for a small proportion of world exports, which gives it the ability to expand regardless of world demand conditions. Furthermore, considering that Brazil itself had protectionist policies against imports, it would follow that its own commercial policy was directly affecting exports, more so than developed countries' own protectionist policies. Tyler (1983) finds that Brazil's protectionist policies accounted for a direct reduction of exports quantifiable to 10 percent, which not only serves to empirically support the theory behind trade liberalization, but highlights the importance for developing nations to eliminate protectionist policies.

The argument for trade liberalization, particularly for developing countries, only becomes stronger. Dornbusch (1992) presents the case of trade liberalization in Turkey. During the mid-1980s, Turkey practically eliminated all import tariffs and quotas, liberalized the

foreign exchange regime and allowed for a depreciation of the Turkish Lira. By 1990, Turkish exports had grown significantly, changing from -1 percent annually to 19.2 percent post-liberalization. Much like Brazil, trade liberalization seems to have induced export growth and domestic price readjustment.

The models used to calculate the effects of liberalization on welfare, exports and the anti-export bias vary among studies. Tokarick uses applied general equilibrium models that analyze exports and imports of primary goods and manufacturers alongside a non-traded sector. The value-added of these goods is computed using a two-factor model, assuming production to consist of labor (free to move across sectors and fully employed) and capital (sector specific). Tokarick measures the production of outputs by looking at value-added alongside domestic and intermediate goods, and highlights that tariffs tax exports by altering the prices of imported intermediate goods. Similarly, Caliendo and Parro (2012) find that intermediate goods are fundamental in demonstrating accurate effects of tariff inclusion and reduction. In fact, their study shows that models that include intermediate goods give results that are on average 40 percent stronger in terms of welfare effects. It becomes crucial to therefore include intermediate goods in any model analyzing the anti-export bias resulting from tariffs[8].

Tyler's model for anti-export bias calculations uses somewhat different theoretical considerations. Tyler analyzes exports and domestic market sales to determine the relative domestic price distortion. If we were to treat domestic market sales as both

[8] Given limited data on tariff disaggregation, this paper presents an initial analysis of intermediate inputs on the anti-export. Further research should include a specific breakdown of intermediate good and tariffs.

imports and non-tradable goods, and incorporate Tyler's assumptions such that exports and domestic market sales are substitutes in production – if domestic market prices rise in relation to export prices, producers will shift from export production to domestic market sales as it is now more profitable to do so – we can begin to see differences with the aforementioned models. In this particular case, there seems to be no limitations with the mobility of capital and labor, but rather that production depends on profit opportunities. It follows, at least theoretically, that there are several different valid approaches to quantifying the anti-export bias. A combination, therefore, of several general equilibriums models will lead to adequate calculations of the anti-export bias, where the effects of liberalization can be explained by any increase in exports in the relevant years.

Nonetheless, there are several country specific cases that go beyond general equilibrium models, in particular the cases of production sharing and offshoring. Although the importance of intermediate inputs has been widely discussed in most academic papers pertaining to trade liberalization, many fail to acknowledge the dilemma with respect to cross-border production sharing. More specifically, the models previously discussed tend to overlook the idea that production sharing can tighten the relationship between exports and imports. Take, for example, the case of the Mexican auto industry, where manufacturing factories import intermediate goods and components, assemble, and export final goods back to the United States. As the United States demands more final goods and Mexican exports grow, in this case from the assembly and exportation of the final goods, the Mexican auto-makers will require more intermediate components from the United States, which leads to an increase in imports. In essence, production sharing

leads to the scenario where exports bring in imports, and create a net trade balance. Feenstra and Hanson (2001) and Arndt (2010) explore the importance of this relationship in terms of intra-industry trade. Specifically, Arndt (2010) argues that there is a direct link between exports and imports in intra-industry trade that alters the trade balance and reduces the sensitivity of the trade balance to exchange rate movements. Furthermore, if this particular type of trade, which is related at both the industry and product level, is not accounted for in models, the importance of the effect of tariffs on exports may be overstated. This paper, however, primarily uses general equilibrium models given the availability of data[9].

[9] A brief analysis of intra-industry trade is included, but only touches the surface of the larger issue at hand. A limitation of this paper is the exclusion of proper production sharing analysis.

III. Trade Liberalization in Mexico

a. Data

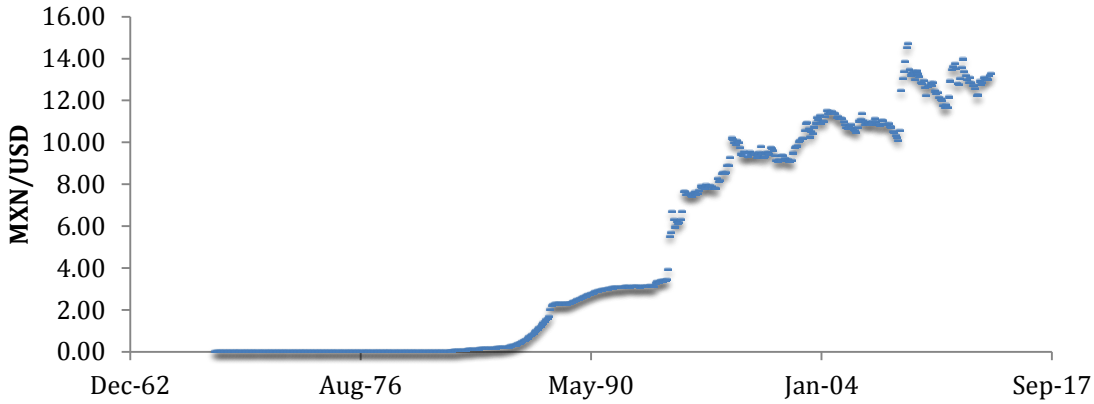
This paper uses data from the Banco de Mexico, the National Institute of Statistics and Geography (INEGI), and the Bureau of Economic Analysis. From the Banco de Mexico, we use monthly data for Mexican exports, imports and revenue from import tariffs from 1980-2014. From the Banco de Mexico we use historical exchange rates between the Mexican peso and the US dollar for the same period, and from INEGI, we collect information on sector productivity and population production by sector. We use data from the Bureau of Economic Analysis to obtain data on historical US GDP levels from 1980-2014.

The variables presented in this paper were determined from analysis of trade liberalization theory and past papers. In constructing them, we define Mexican exports and imports as non-oil exports and imports of goods only. This was determined because oil prices are subject to international pricing, and this paper focuses on the effect of liberalization with respect to domestic prices. The exchange rate is defined as the nominal exchange rate between the U.S. dollar and the peso since 1980, and is measured as Mexican pesos per United States dollars. Because more than 80 percent of Mexican exports go to the United States, and the peso was pegged to the dollar for a large section of these data, we limit the exchange rate to peso per dollar instead of adding other currencies. Lastly, US GDP is defined as GDP in terms of 2009 real dollars. Since non-

oil exports and imports were measured using 2009 dollars, we wanted to minimize and control for any variations that a different GDP measure might entail.

Simple analysis of the data demonstrates several important changes with respect to the exchange rate and Mexico's trade balance. Figure 4 presents a summary of the exchange rate. The major events affecting the exchange rate are during 1986, where economic challenges in Mexico caused the exchange rate to go above 1 for the first time, and during the end of 1994, where a devaluation of the peso caused a rapid increase in the exchange rate.

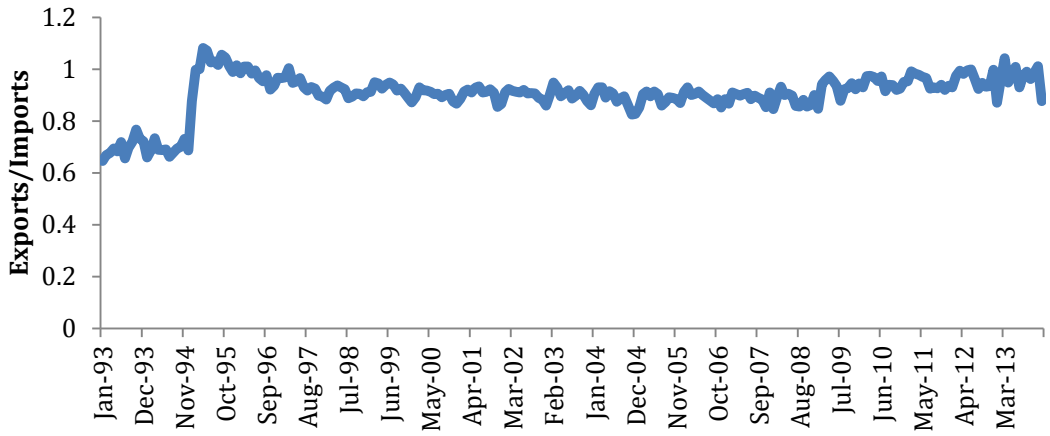
Figure 4. Variation in Exchange Rate (MX Peso/US Dollar)



Source: Banco de Mexico, Estadisticas en Tipo de Cambio Peso a Dollar.

Figure 5 presents Mexico's trade balance, which can be measured by the relationship between price and quantity of exports and imports. The data indicates that, up until 1994, Mexico had a trade deficit, where imports were larger than exports with the ratio hovering at around 0.7. In 1994, with the signing of the North American Free Trade Agreement (NAFTA), the trade deficit fell and Mexico's balance of trade jumped to a ratio of around 1.0.

Figure 5. Mexican Balance of Trade, 1993-2013



Source: Instituto Nacional de Estadistica y Geographia, Estadistica Balanza Comercial

Summary statistics for other variables are presented in the following sections. Specifically, see Figure 10 for a breakdown of intermediate tariff rates and their respective phase-out.

b. History of trade liberalization in Mexico

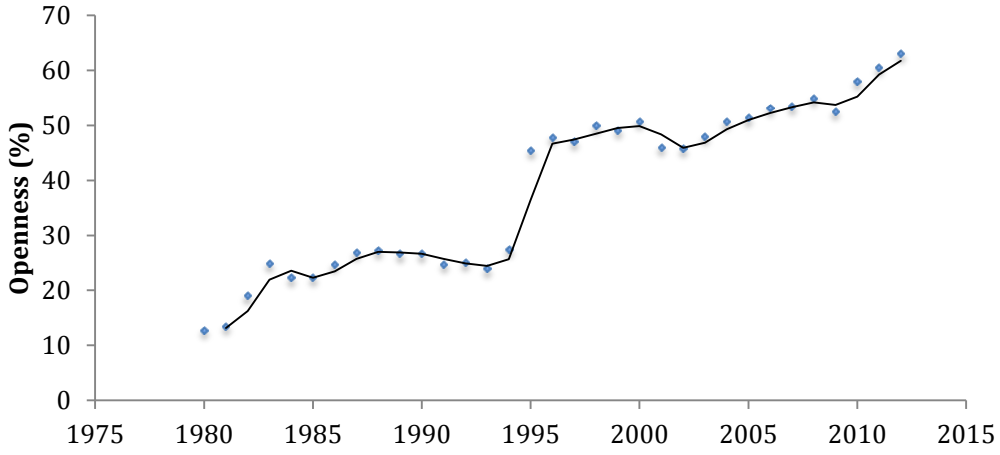
Trade liberalization in Mexico has been a subject of much debate. Although in the last decade Mexico has joined and signed over twelve free trade and economic complementation agreements, it was not until 1986 when Mexico joined the General Agreement on Tariffs and Trade (GATT)[10], that trade liberalization became a realistic economic approach. Mexico's entry into the GATT set the ground for the introduction of other free trade agreements, mainly with the European Union and North America. The GATT established the origins of trade liberalization in Mexico, requiring certain

[10] Kehoe, Timothy J. "A Review of Mexico's Trade Policy from 1982 to 1994." *World Economy - London*- 18 (1995): 130-135.

ownership and accountability with the international community to discipline its tariff behavior.

If we define economic openness as $\frac{(Exports+Imports)}{GDP}$ [11], analysis of pre- and post- GATT entry (1985 and 1987) will show that Mexico's openness changed from about 20 to 30 percent, as highlighted in Figure 6. Although a modest increase, the GATT was important in demonstrating Mexico's attitude towards liberalization and serious economic development. Interestingly, the GATT demonstrated the governments' limitations in creating drastic commercial policy reforms and highlighted the importance of investing in the export sector rather than the import sector, marking the beginning of the end of import substitution.

Figure 6. Mexico's Economic Openness



Source: Instituto Nacional de Estadistica y Geographia, Estadistica Balanza Comercial

[11] Carbaugh, Richard. International Economics. Mason, OH:South-Western Cengage Learning, 2011, pp.34

In 1987, Mexico created the Pacto de Solidaridad Economica (Pact for Economic Solidarity)[12], which added credibility and value to Mexico's liberalization attempts. The Pact complemented the GATT by putting a 20 percent tariff ceiling on practically all economic sectors[13], despite it not being an international requirement. Furthermore, the Pact's signaling effects encouraged further investment into the export sector by economic agents.

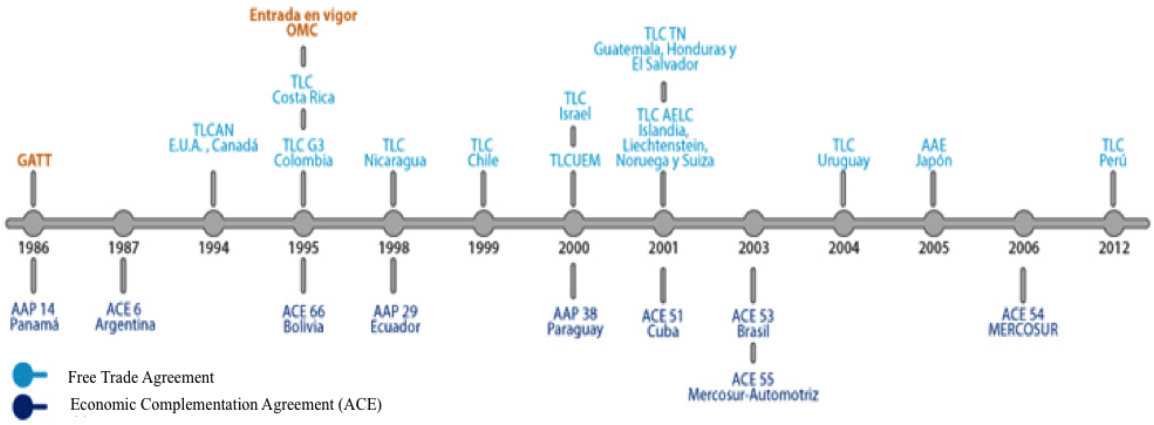
The next and arguably most effective trade agreement came in 1994 with the implementation of the North American Free Trade Agreement. Visually represented in Figure 6, NAFTA caused a drastic change in economic structure, leading to a jump in openness of roughly 20 percentage points (30 to 50 percent) in only a couple years. The reasons for NAFTA's success in structure changes may be particularly concentrated around Mexico's proximity and commercial relationship with North American countries (Canada and USA). Numerically, Mexico's exports grew by 30 percent during 1995, contrasting with 12 and 17 percent annual growth in the years leading to NAFTA[14].

Several trade agreements have been negotiated and signed since NAFTA, of which the Mexico and European Union Free Trade Agreement (TLCUEM) stands out the most. To date, Mexico has twelve Free Trade Agreements (FTA) with 44 countries, making it one of the most open economies in the world (Figure 7). Interestingly, these free trade agreements have not had the impact of NAFTA with regard to structural economic

[12] Kehoe, Timothy J. "A Review of Mexico's Trade Policy from 1982 to 1994." *World Economy - London-* 18 (1995): 130-135.
[13] *Ibid*
[14] Calculated using export information from INEGI

change. Although no particular reason for their modest performance can be singled out, an analysis of the countries with which these FTAs were negotiated leads to the understanding that pre-treaty trade must have been small and limited. More specifically, it is unlikely that an FTA with Peru, for example, would have a large effect on openness when total trade with Peru is and has been relatively small with respect to overall national trade.

Figure 7. Timeline of Mexican Free Trade Agreements



Source: Secretaria de Economia, Tratados de Libre Comercio Mexicanos

Using the same measure of openness as in Figure 6, we can test to see which commercial event had the biggest effect in changing Mexico's economic structure using a simple OLS rmodel with the following form:

$$Openness_t = \alpha_1 GATT_t + \alpha_2 NAFTA_t + \alpha_3 TLCUE_t + \varepsilon_t, \quad (9)$$

where openness is measured at time t and $GATT_t$, $NAFTA_t$, $TLCUE_t$ are binomial variables that take the value of 1 at 1986, 1994 and 2000 respectively.

Table 2. Structural Effect of Major Agreements

GATT	0.012
	(0.022)
NAFTA	0.097***
	(0.022)
TLCUE	-0.026
	(0.022)

Note: *,**,*** are significant at the 10,5 and 1 percent levels respectively. Standard Errors are presented in parenthesis.

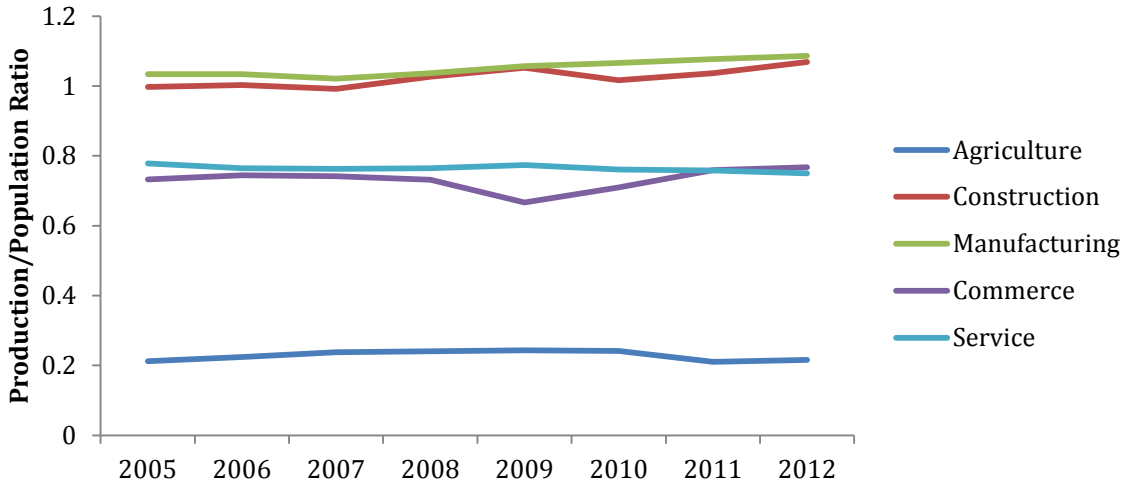
Table 2 shows that NAFTA was the event with the biggest positive impact with respect to the structural change of Mexico's openness and trade policy. Furthermore, the results also indicate that neither Mexico's FTA with the European Union (TLCUE) nor any other FTA's after NAFTA have had an impact on structural change, alluding perhaps to the limitations in size of pre-treaty trade.

c. Resource Mobility and Factor Endowment in Mexico

A major component of any two-factor model is factor endowment and resource mobility. Many models make the assumption that labor and capital can be allocated costlessly across sectors, such as Caliendo and Parro (2012). Although this assumption simplifies general equilibrium models and allows for concrete analysis of production and trade, it is important to acknowledge that in reality labor mobility is costly and ineffective, particularly in developing countries. Taking the case of Mexico, a simple analysis of production/GDP and working population/production sector ratios shows that current labor mobility is slow and, in particular sectors, labor is extremely ineffective. Figure 8 represents the production/working population ratio for some of the major economic sectors of Mexico. The key component of this figure lies in the low ratio of agriculture; about 0.2 for any given year. The implications of this ratio are that, despite agriculture

being quite small in terms of total production to GDP, there is still a large percentage of the working population specialized in this sector. Either there is little opportunity for labor mobility within the unskilled sectors, or labor is simply very unproductive.

Figure 8. Production to Working Population Ratio in Major Sectors



Source: Instituto Nacional de Estadistica y Geographia, Produccion Sectorial y PIB

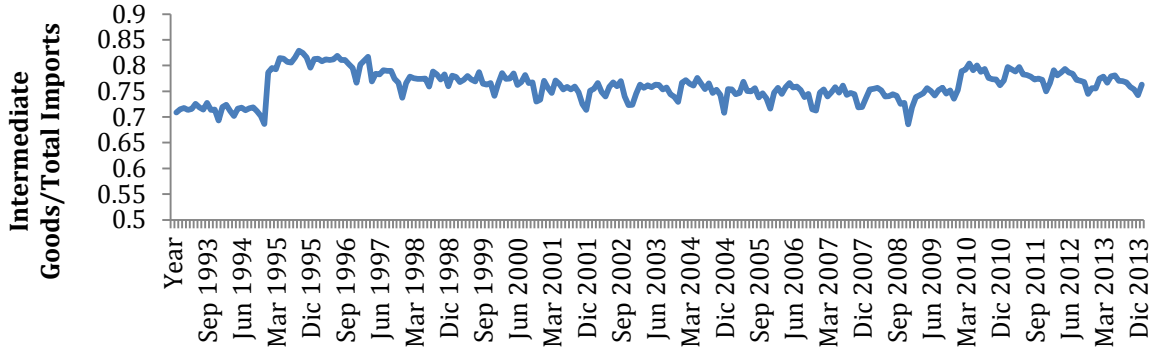
On the other hand, we find the expected ratios in sectors like manufacturing and construction, with values at approximately 1.0. These sectors are often associated with higher degrees of training and can arguably be classified as skilled labor. In these sectors, production and working population practically go hand in hand, alluding to stronger labor efficiency and mobility[15].

[15] If we were to isolate data of population by sector, we would expect to see movement from agriculture to manufacturing and services, alluding to the migration of rural to urban areas. The production ratios don't change because population migration and production are inter-correlated. No data is available pre-2005, but we would expect to see major migration changes beginning with the signing of NAFTA and onwards.

d. Mexico's tariff structure

Corden's discussion on effective protection rates highlights the importance of analyzing Mexico's tariff structure, particularly regarding intermediate inputs. Considering the magnified effects of intermediate input tariffs on the production of both exportable and importable goods, it is important that we decompose Mexico's tariff structure by types of good. As presented in Figure 9, intermediate inputs have been and continue to be a major component of total imports, climbing to levels near 80 percent in the last decade.

Figure 9. Share of Intermediate Goods in Total Imports



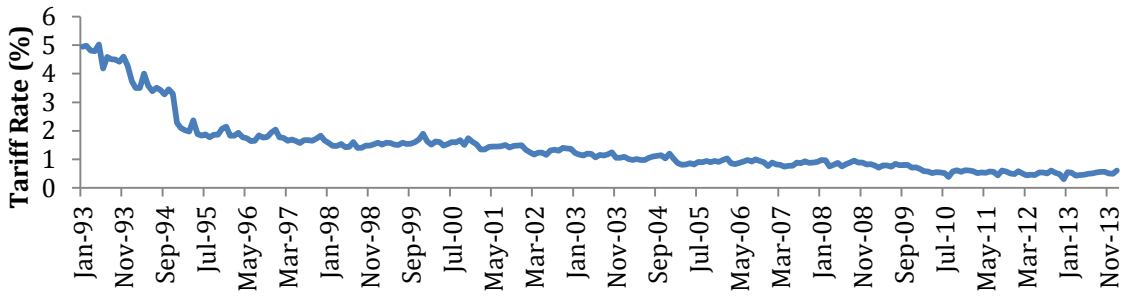
Source: Instituto Nacional de Estadistica y Geographia, Estadistica Balanza Comercial

The previous sections argue that NAFTA has been the most important free trade agreement for Mexico up to date. Considering NAFTA's members, the United States and Canada, two major developed nations, it is safe to assume that the tariff structure follows Corden's effective protection rate and structure. Although many developing countries often make tariff structure mistakes, this paper assumes that Mexico's tariff structure is adequate[16]. Despite exact data on specific tariff disaggregation by type of good, this

[16] Data on the share of inputs in the cost of the final good under free trade (a_{ij} in Corden's model) could not be collected for this paper. Therefore, an actual calculation of the effective protection rate was not possible.

paper uses the ratio of intermediate goods to total imports as a proxy for tariff rates on intermediate goods, which is presented in figure 10.

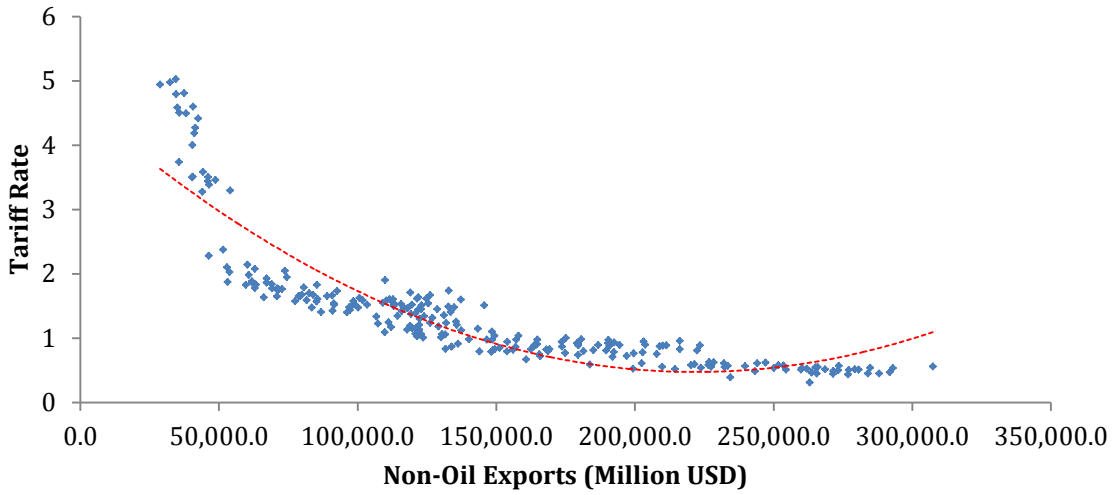
Figure 10. Effective Tariff Rate for Intermediate Inputs



Source: Instituto Nacional de Estadistica y Geographia, Estadistica Balanza Comercial

Two important spikes occur simultaneously between 1994 and 1995 in Figure 9 and Figure 10. Specifically, the year of and the year after NAFTA was signed, we can see the share of intermediate inputs in total imports increase from about 70 to 80 percent and the tariff rate decrease from about 3.5 to 2 percent. Returning to modern trade theory models, a decrease in the tariff rate of intermediate inputs will directly affect domestic prices and costs of exportable and importable goods. Assuming the majority of the intermediate input imports are used for exportable goods, a reduction in the tariff rate will minimize production costs and shift domestic prices and domestic production towards the exportable sector. As Figure 3 alludes to, this reallocation of prices and resources has a major effect on the reduction and potential elimination of the anti-export bias. A visual representation of the relationship between tariff reduction of intermediate goods and non-oil exports speaks to the reduction and possible elimination of the anti-export bias, as presented in figure 11.

Figure 11. Effect of Tariff Rate of Intermediate Inputs on Exports, 1993 - 2013



Source: Instituto Nacional de Estadistica y Geographia, Estadistica Balanza Comercial

We expect to see Mexico's exports continue to grow despite tariffs reaching a minimum. The key of this graph is to not only to highlight the immediate relationship between tariffs and exports, but to speak to the importance of sustainable free trade agreements.

e. Empirical Approach

Formally, the empirical model we estimate using OLS takes the form:

$$EXP_t = \alpha + \beta_1 Tarifft + \beta_2 GDPt + \beta_3 ER_t + \varepsilon_t, \quad (10)$$

where $Tariff_t$ is the implicit level of import tariffs at period t, GDP_t is the real GDP level of the United States at t, ER_t is the effective exchange rate at period t, and EXP_t are the Mexican non-oil exports at period t.

Specifically, we use non-oil exports as a proxy for the reduction of any anti-export bias. As presented in Figure 3, if a country's exports increase, the relative prices of importable

and exportable goods should adjust. In other words, domestic producers will shift from the production of imports to the production of exports as the price incentives are now efficiently allocated. Furthermore, it is important that one analyzes non-oil exports only given that oil exports are subject to global pricing and would not properly estimate the domestic price readjustment. The exchange rate must also be included in the model given that differences in the exchange rate affect exports and imports. Suppose that the US Dollar appreciates with respect to the Mexican Peso. This would effectively make US products more expensive relative to Mexican goods, and cause Mexican exports (US imports) to increase. By controlling for any changes in the exchange rate, one becomes more confident that the changes in non-oil exports are due to trade liberalization and its subsequent elimination of the anti-export bias. Similarly, it is important that we include US real GDP in our model, and thereby control for any 'natural' increases in demand of Mexican exports and US consumption in general. Lastly, the model includes a measure of import tariffs, which is a measure of direct liberalization. Import tariffs include both tariff rates on intermediate goods and general imports. We expect to see a strong negative relationship between import tariffs and exports, demonstrating the effect of trade liberalization on domestic price readjustment. All variables measured are continuous and logarithmic.

The results, presented in Table 3, indicate that US GDP, general tariffs (tariffs applied on final imports), and intermediate tariffs (tariffs applied on intermediate inputs) have a significant effect on exports. As expected, US GDP and exports are positively related; an increase in 1 percentage point of GDP is associated with an increase of 1.9 percentage

points in exports. The results also indicate that the relationship between general tariffs, intermediate tariffs and exports is negative and significant; a decrease of 1 percentage point in general tariffs and intermediate tariffs is associated with an increase of 0.27 and 0.29 percentage points of non-oil exports respectively. We find that the effect of intermediate tariffs is about 10 percent strong than the effect of general tariffs, supporting previous research on the strength of intermediate goods and tariff rates on export production. Although we find that the exchange rate has no significant effect on exports in this particular model, we cannot ignore the theoretical considerations of its impact on Mexican non-oil exports.

Table 3. Effect of GDP, Import Tariffs and Exchange Rate on Exports

US GDP	1.888***
	(0.988)
General Tariff	-0.266***
	(0.054)
Intermediate Tariff	-0.293***
	(0.057)
Exchange Rate	-0.201
	(0.138)

Note: *,**,*** are significant at the 10,5 and 1 percent levels respectively. Standard Errors are presented in parenthesis.

As discussed above, production sharing can distort the model by making the trade balance less sensitive to any changes in the exchange rate. In order to account for any effects of production sharing, we run regressions of non-oil exports separated by the main sectors in production. Specifically, we were able to obtain information on manufactured exports, where production sharing should theoretically have a large effect. Within manufactured goods, we analyzed the auto industry given Mexico's increasing share of total car exports to the United States and the rest of the world. Table 4 presents the results

from additional regressions looking at the manufacturing sector exports and auto industry exports. Comparing the results of the manufacturing sector (1) to our initial regression presented in Table 3, we see minimal changes with respect to the effect of tariffs on exports. It is safe to assert that Mexican exports from the manufacturing sector behave in similar ways to general non-oil Mexican exports. The main differences stand out with respect to the exchange rate, which becomes significant under regression (1); an increase of 1 percentage points in the exchange rate is associated with a 0.25 percentage point increase in manufacturing exports.

Table 4. Effect of GDP, Import Tariffs and Exchange Rate on Manufacturing Exports

	Manufacturing Sector	Auto Industry
	(1)	(2)
US GDP	1.977*	1.325
	(1.013)	(1.449)
General Tariff	-0.266***	-0.302***
	(0.056)	(0.079)
Intermediate Tariff	-0.293***	-0.328***
	(0.059)	(0.084)
Exchange Rate	0.249*	0.138
	(0.141)	(0.202)

Note: *, **, *** represent significance at the 10, 5 and 1 percent levels respectively. Standard Errors are presented in parenthesis.

Results from (1) also contrast with the results from the regression specific to the auto industry (2) as both the exchange rate and US GDP lose significance. Although the reasons behind the loss of significance of US GDP are not clear, there are theoretical explanations for the change in the exchange rate. As previously mentioned, intra-industry trade creates a direct link between exports and imports, and tightens the trade balance. Specifically, the direct link between exports and imports makes the trade balance less responsive to changes in the exchange rate, given that external factors will have less of an

effect on their relationship. In terms of the auto industry, which is intense with respect to production sharing, the particularly strong link between exports and imports leads to a decrease in the responsiveness of exports to exchange rates. The effects of production sharing on the Mexican auto industry are also visible in the increase of the effect of tariffs vis-à-vis manufacturing and general exports; a decrease of 1 percentage point in general and intermediate tariffs is associated with an increase of 0.30 and 0.33 percentage points in exports respectively. As theory suggests, if intra-industry and inter-product trade is a large share of total trade, as is the case for the auto industry, the effects and importance of the anti-export bias in overall trade may be overstated[17].

The implications of these results are threefold. To begin with, one could argue that, given the results at hand, production sharing is not dominant in the manufacturing sector as a whole, but rather in very specific sub-industries such as the auto industry. Second, that production sharing in terms of general exports may be larger than originally expected, accounting for the lack of significance in the exchange rate. Third, and most importantly, that trade liberalization contributes to the reduction of the anti-export bias as estimated by changes in exports. Effectively, reductions in both the general and intermediate tariff rates lead to domestic price readjustment within the Mexican import and export sectors.

[17] Further analysis including more concentrated data is necessary to understand the full implications of production sharing with respect to Mexican trade. We would expect to see additional effects on exports and exchange rates as exports continue to be divided by sector and industry.

IV. Conclusion

This paper has presented the most relevant theoretical considerations with respect to modern trade, focusing specifically on the applicability of general equilibrium models on trade analysis. Having acknowledged several exceptions and limitations to general equilibrium models, this paper has presented a comprehensive analysis of Mexico's economy and trade structure in an attempt to justify all theoretical assumptions. Specifically, this paper begins its analysis by looking at the effect on economic openness and structural change of the biggest free trade agreements in Mexico. We find that NAFTA was the most significant free trade agreement in terms of its effect on structural change, and base the core of Mexico's trade analysis on it thereafter. Our analysis continues with a breakdown of Mexico's factor mobility, where we find that the agriculture sector is highly unproductive considering its high labor availability, and allude to possible issues with respect to labor mobility in regard to unskilled labor.

A central message of this paper is establishing the relation between import tariffs and exports. We ultimately find that there is a strong negative relationship between import tariffs and exports, and argue that own policy protectionist policies directly affect the anti-export bias. Our results indicate that there is a difference between import tariffs on general goods and intermediate inputs, supporting the theory behind effective tariff structure and production. Empirically, we find that tariffs on intermediate inputs are around 10 percent stronger than tariffs on general imports with regard to their effect on exports. Specifically, we find that a reduction of 1 percentage points in general and

intermediate tariffs is associated with an increase in non-oil exports of 0.27 and 0.29 respectively. This is strong evidence for the readjustment of domestic prices and the effective reduction of the anti-export bias. The implications of this analysis, however, serve not only to highlight the importance of proper tariff structure, particularly regarding intermediate inputs, but to encourage developing nations to remove protectionist policies as to promote export production. Through protectionist policies, countries effectively alter domestic prices and enhance any existing anti-export bias. The key for export growth, therefore, lies not under specific export promotion programs, but under trade liberalization efforts altogether.

Although this paper has attempted to present empirical analysis that is fully supported by theory, there are several limitations that could not be accounted for. Future improvement of this subject will need to include more in depth analysis of production sharing given its particular importance to Mexico's economy. Although data for a proper breakdown of exports by sectors or for the relevant share of production sharing to total trade was not available, we can assume that the effects of exchange rate and tariffs will vary between sectors according to the degree of production sharing; sectors with significant production sharing will likely have less responsive exchange rate effects and slightly overestimated effects of tariffs on exports. Similarly, further disaggregation of tariffs and imports is necessary to be able to properly comment on Mexico's tariff structure. Lastly, full information on Mexico's factor endowment and mobility would enable us to talk about production and specialization with more confidence, and allow us to do a complete analysis of effects of trade in the Mexican economy.

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