

# Left in the Agricultural Dust: the Effects of the North American Free Trade Agreement on the Mexican Agricultural Sector

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## **Abstract**

This paper investigates the claims of Mexican farmers that the North American Free Trade Agreement (NAFTA) and U.S. agricultural subsidies are to blame for their recent unemployment and inability to compete in the global and domestic markets. This paper begins with an analysis of employment trends, changes in Mexico's GDP composition, Mexico's trade balance, and Mexico's and the U.S.' level of subsidies, from approximately the year 1990 to 2005. The study finishes by using time series data and an empirical trade model to estimate the effects of U.S. subsidies on Mexico's agricultural trade ratio. The results indicate that U.S. agricultural subsidies have no effect on the Mexican agricultural trade ratio, however NAFTA itself does. The results could indicate that U.S. subsidies are not the culprit for Mexican farmers' displacement. Rather, it is some other aspect of the agreement.

## Acknowledgements

I would like to thank my advisor, Professor Jilani, who challenged me to be a confident economist. I would also like to thank Norm Medieros. Without Norm's help ...I would still be looking for data.

A special thank you to Matthew Mesick who showed me how to cross my Ts and dot my Is.

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## **Introduction:**

Before joining NAFTA in 1994, Mexico's two pronged economic development strategy consisted of both import substitution and a large public sector. This model, which emphasized domestic production of formerly imported goods, created jobs and stimulated economic growth. However, this economic growth came with a price, and in 1982 Mexico faced an economic crisis, precipitated by its large external debt.<sup>1</sup>

In order to extricate themselves from this crisis, the Mexican government liberalized its trade policy, first joining the General Agreement on Tariffs and Trade (GATT) and later, the North American Free Trade Agreement (NAFTA) in 1994. This marked the first time that developing, Mexico, and developed, the United States and Canada, nations signed a free trade agreement.

Since its inception, NAFTA has been controversial. People on all sides of the argument, in each country, claim that the agreement already has, or shortly will, hurt them economically. In fact, many economists have done studies to determine NAFTA's effects on all three members.\*

Politicians and economists alike expressed concern that the lower wages demanded by Mexican industrial workers would take jobs from the United States, and to a lesser extent, Canada. Independent presidential candidate, entrepreneur and Texan, Ross Perot famously predicted that the massive loss of U.S. jobs would make a "giant sucking sound." Conversely, many feared that the heavily subsidized and mechanized U.S. agricultural industry would overwhelm the small and non-mechanized Mexican farmers.

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<sup>1</sup>John J. Audley, "Introduction," *NAFTA's Promise and Reality*, <http://www.carnegieendowment.org/files/nafta1.pdf> (January 2008):5.

\* The following section of this thesis offers a brief literature review.

In this thesis, I will not speak to the effects NAFTA has had on the U.S. or Canada. Nor will I speak to the overall welfare of the Mexican nation post NAFTA. Instead, I will focus on a group that has continued to appear in the news since NAFTA was signed, Mexican farmers. Disgruntled and displaced farmers have protested in the streets as recently as February 2008, complaining about the complete removal of tariffs on corn. Yet, can these farmers fairly blame the trade agreement for the recent problems in their lives?

Economic development follows average patterns: the modernization of agriculture, increased productivity in this sector, and the decline of absolute numbers of workers in agriculture. Farming jobs may have been lost simply as a result of the economy developing. Thus, this thesis will attempt to distinguish between the effects of economic development and joining NAFTA on the Mexican agricultural sector. To accurately do this, we will examine the extent of structural change in the Mexican economy, how has employment in each sector (agricultural, manufacturing, service) changed, and document change in production and trade patterns, level of exports and imports, and subsidies. Essentially, this thesis seeks to get to the heart of the question: are the 1.3 million jobs lost in the agricultural sector, from 1993 to 2002, a result of economic development and restructuring, or have Mexican farmers been left in the agricultural dust of the North American Free Trade Agreement? <sup>2</sup>

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<sup>2</sup> Ibid.

## Literature Review:

As stated in the introduction, NAFTA has been a topic of discussion since its commencement in 1994; politicians on both sides have argued for and against it and are currently continuing to do so. However, this topic has not remained solely in the hands of politicians. Joseph E. Stiglitz [2006], the winner of the Nobel Prize in Economics, wrote an opinion piece for *The New York Times*, “The Broken Promise of NAFTA”. This piece broadly outlines how NAFTA affected the U.S. and Mexico over a ten-year period. He begins by stating that NAFTA was not all bad for Mexico. He argues that, it helped the country recover quickly from the 1994 financial crisis. However, he points to the fact that Mexico was exporting large quantities, from their factories near the border, to the U.S. at that point. Those exports have since fallen because of the weakening U.S. economy and competition with China. Additionally, he states U.S. subsidized corn will pose an up-hill battle for Mexican corn farmers and claims income disparity and poverty have risen.

CNN, one of the world’s leading news agencies, posted an article on its website entitled “Mexican Farmers Protest NAFTA”. This article by Harris Whitbeck [2008] is one of the latest of many pieces published by the popular news media shedding light on the Mexican farming community’s struggles since the inception of NAFTA. This article discusses the January 31<sup>st</sup>, 2008 protest, during which hundreds of thousands of Mexican farmers took to the streets in order to protest Mexico’s repeal of all tariffs on goods imported from Canada and the United States. January 1<sup>st</sup>, 2008 marked the end of the fourteen-year phase-out of tariffs under NAFTA. The farmers want their government to renegotiate NAFTA because they believe heavily subsidized agricultural goods from the other NAFTA members are making it hard for them to sell their

products. The Mexican government responded by saying that grain prices have stabilized and they will not renegotiate NAFTA. The livelihoods of these farmers are at stake and for them, the stability of prices is irrelevant; they are still too low. Farmers cannot afford fertilizer for their crops and are being forced to find new ways to feed themselves.

While both of these articles provide relevant background and context to the current debate on NAFTA, neither looks at concrete data, which is essential to addressing the issue. Many economists have attempted to understand if there is a sound economic basis for the argument that NAFTA has had an overall negative effect on the welfare of Mexico. A few others have looked more specifically at NAFTA's effect on Mexican farmers. The *Global Economy Journal* published Fernando Borraz and Jose Ernesto Lopez-Cordova's [2007] study, "Has Globalization Deepened Income Inequality in Mexico?".

This study uses household survey data from Mexico's Instituto Nacional de Estadística, Geografía e Informática (INEGI) to analyze the changes in income distribution across Mexican states since 2006, and relate these changes to regional differences in globalization, measured by involvement in trade. The study finds, in some contrast with Stiglitz, that globalization has not increased income inequality in Mexico. It is important to note that while the study states that overall the income distribution has become more equitable, some states in the central and southern part of the country did not see income disparity decline. One hypothesis they offer for these surprising results is that in the northern states, which are more closely linked to the global economy, women without high levels of education have more employment opportunities.

The study focuses on changes in income distribution because it is an important determinant of a country's welfare, and because recent publications from the World Bank suggest that economic growth is positively impacted by more equal income distribution. Past

studies focused primarily on wage inequality. However, Borraz and Lopez-Cordova, who focus on income as measured by household monetary income per family member and assign equal weights to adults and children, believe that doing so only offered a “partial look at the issue”. They explain that increased globalization in an area could raise the demand for unskilled workers. This would raise the opportunity cost of working at home for women. Thus, these women would enter the work force and the average household income might increase, especially in low-income homes.

Interestingly enough, the same journal published “Economic Effects of NAFTA on Mexico” by Dominick Salvatore [2007]. This study argues that the effects of NAFTA on Mexico have been miscalculated, mostly because the effects cannot be assessed by looking at factors such as employment pre and post-NAFTA. The correct way, Salvatore argues, is to measure the effects on trade, investments, competition and efficiency. To do this, a counterfactual simulation is needed. Salvatore concludes that overall specialization, competition, productivity and efficiency increased in Mexico since the inception of NAFTA. More specifically, this is a result of NAFTA accompanied by the general liberalization of trade and investment.<sup>3</sup> This study does not address the Mexican farming community. However, it does address increased productivity and efficiency, both factors of economic development which effect employment in all sectors.

Malcolm Gillis’ and his co-writers [2007] discuss what happens when a country becomes more developed in chapter three of their book, *The Economics of Development*. Specifically, this chapter discusses labor-surplus economies. This type of economy means that workers can be moved to other non-agricultural sectors without a reduction in farm output. It is possible that Mexicans lost their farming jobs because they were not needed there, i.e. they were

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<sup>3</sup>Dominick Salvatore, "Economic Effects of NAFTA on Mexico," *The Global Economy Journal* 7 (October 2007): 11.

redundant or there was disguised unemployment. The economics of development and structural change must be taken into consideration when discussing NAFTA and changes in labor force participation.

One study that does speak specifically to the farming sector is “NAFTA’S Promise and Reality.” This study was sponsored by the Carnegie Endowment for International Peace and co-authored by John J. Audley, Demetrios G. Papademetriou, Sandra Polaski and Scott Vaughn [2004]. These authors’ analysis “focuses on people, their communities, and the choices they make as they attempt to negotiate their social and economic environments”.<sup>4</sup> Most importantly, for my focus, they look into rural employment, agricultural production and land use. One of the many conclusions of this study is that NAFTA has not helped the Mexican job market overall. While productivity and investment caused a surge of 500,000 jobs in manufacturing, 1.3 million jobs were lost in the agricultural sector during 1994-2002.<sup>5</sup>

The study explains that rural Mexico has had to develop several survival techniques because of the sudden depression in the rural agricultural sector. The authors suggest that if the government implemented more policies to help farm laborers, such as policies that stop the dumping of subsidized crops which principally come from the United States, this depression could have been avoided. The study focuses primarily on subsidies and the loss and gain of jobs in different sectors to determine how Mexican farming has been hurt. To show that the agricultural sector has been negatively affected by NAFTA the authors break down the pattern of trade into sectors to illustrate that the overall net surplus masks a growing deficit in agricultural trade. They also graph over time the decline of jobs in the agricultural sector. While this study

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<sup>4</sup> John J. Audley, “Introduction,” *NAFTA’s Promise and Reality*, <http://www.carnegieendowment.org/files/nafta1.pdf> (January 2008):6.

<sup>5</sup> Ibid.

does not reference Borraz and his co-author's study, it rejects their findings that income inequality has declined.

Two of the most current studies done on NAFTA's effects on the agricultural sector are "Mexico Twelve Years after the Implementation of the NAFTA," by Alfredo Sánchez Daza and Gloria de la Luz Juárez [2007], and "The Effects of NAFTA and Domestic Reforms in the Agriculture of Mexico: Predictions and Facts," by Antonio Yunez Naude and J. Edward Taylor [2006]. In "Mexico Twelve Years after the Implementation of the NAFTA," Daza and Juárez reflect on the problems NAFTA has caused in Mexico and what the Mexican agricultural sector has and has not taken advantage of since the inception of the agreement.

One section of Daza and Juárez's study is completely devoted to Mexico's agricultural sector and the initial conditions set by NAFTA concerning this sector. This study establishes that the initial agreement was not ignorant to the fact that Mexico's agricultural sector needed special conditions in order to thrive with trade liberalization. For example, Mexico was allowed to place restrictions on imports of grains and other basic products such as corn and beans, with the understanding that these restrictions would be converted first into taxes, and 15 years later a gradual tax relief would occur. The signatories agreed to this in order to "ensure that the domestic prices of some relevant products were higher than the international price... a significant protection for sensitive products was thus guaranteed".<sup>6</sup> Mexico's agricultural sector needed time to make their products more competitive. Yet, the study concludes that the fifteen-year period allotted to the Mexican agricultural sector to become stronger was not sufficient. In addition, the study claims that subsidies and disloyal practices by the U.S. also hindered the

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<sup>6</sup> Alfredo Sánchez Daza and Gloria de la Luz Juárez, "Mexico Twelve Years After the Implementation of NAFTA," *Análisis Económico* 49 (2007): 38.

sector's ability to compete. According to the authors, this is why the reason why Mexican farmers took to the streets as CNN reported.

In "The Effects of NAFTA and Domestic Reforms in the Agriculture of Mexico: Predictions and Facts" Naude and Taylor apply a disaggregated rural economy-wide model (DREM) to simulated policy changes. This model, unlike those used in previous studies, does not assume that small agricultural farmers will be affected the same way as commercial farmers. It also shows that NAFTA did not have the effects that were anticipated. Mostly it shows that economic liberalization results "...neither in market access, specialization and a more efficient use of scarce resources, nor in the development of agriculture".<sup>7</sup> This is primarily a result of the fact that marketing supports were lent to commercial farmers and this support isolated these farmers from competition under NAFTA. Thus, the commercial farmers were not harmed by the agreement, but rather the subsistence farmers were. Also, and most importantly, the study states that trade liberalization does not necessarily result in domestic goods being unable to compete with foreign goods, even when foreign producers enjoy subsidies provided by their governments.

In the empirical section of this thesis, I will be attempting to estimate the effects of agricultural subsidies on Mexico's agricultural trade ratio (the ratio of Mexico's agricultural exports to Mexico's agricultural imports). I will base my model off of two studies that look into similar relationships: *The Global Economic Review's* "Determinants of Malaysian Trade Balance: An ARDL Bound Testing Approach", by Jurita Duasa [2007], and The Center for Agricultural Policy and Trade Studies' "Determinants of the U.S. Trade Balance in Consumer-Oriented Agricultural Products," by Renan Shuang, Won W. Koo and Jeremy W. Mattson [2007].

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<sup>7</sup> Antonio Yunez Naude and J. Edward Taylor, "The Effects of NAFTA and Domestic Reforms in the Agriculture of Mexico: Predictions and Facts," *Region et Developpement* 23 (2006): 161.

The paper by Renan Shuang and his co-authors, on the determinants of the U.S. trade balance in agricultural goods, seeks to identify the determinants for U.S. trade of consumer-oriented agricultural products by using an empirical trade model. The study's primary empirical trade model is designed based on international trade theory, which states that bilateral trade of a good is mainly influenced by bilateral exchange rate and the difference in prices of the good. Their specification is expressed as:

$$(1) \quad Q t^{\text{ex}} = \alpha_0 + \alpha (P t^f - P t^{\text{us}}) + \beta RE t^{\text{us}f} + \sum \lambda_k Z_t + \varepsilon_t$$

Where  $Q t^{\text{ex}}$  represents U.S. exports to a foreign country in time  $t$ , and  $P t^f$  and  $P t^{\text{us}}$  are average prices of consumer-oriented agricultural and food products in the foreign country and the United States, respectively.  $RE t^{\text{us}f}$  is the real exchange rate between the U.S. and the foreign country.  $Z_t$  is a vector of other independent variables that may affect bilateral trade, and  $\varepsilon_t$  is a random error term.  $Z_t$  represents other variables such as consumer income, foreign direct investment, market openness, and a demographic variable that reflects the change in consumer tastes and preferences. Consumer income is included as a control because as consumer income increases, ceteris paribus, demand for imports of high-value food increases. Market openness is considered because it is hypothesized that a relatively open foreign market will improve the U.S. trade balance for consumer-oriented products. Foreign direct investment (FDI) is included because many studies have been conducted to analyze the relationship between FDI and trade, to test whether FDI is a complement or substitute to trade. We know that there exists a correlation or a relationship between FDI and trade, but both theory and empirics support that they are compliments and substitutes of each other. The demographic variable is included because an

increase of foreign-born residents in the U.S. would tend to an increase in foreign consumer-oriented imports. Finally, three dummy variables were added to account for NAFTA, the Asian financial crisis and the difference between developing and developed countries.

However, Shuang and his co-authors could not find data on average prices, thus bilateral trade volume ( $TV_t$ ) was used as a proxy. Their first equation was rewritten as:

$$(2) Q_t^{ex} = \alpha_0 + \alpha TV_t + \beta RE_t^{usf} + \sum \lambda_k Z_t + \epsilon_t$$

Instead of looking at solely U.S. exports, the study wanted to look at U.S. trade balance.

Therefore, they used the U.S. export share as a dependent variable. They chose this dependent variable over the traditional export to import ratio because it can be easily transformed into log form and the export share variable is defined even if there is only trade occurring one way between the U.S. and a foreign country. Finally,  $Z_t$  is replaced by per capita income in the U.S. ( $Y^{us}$ ), per capita income of the foreign country ( $Y_f$ ), market openness (OP) which is measured by total trade volume to GDP, U.S. FDI ( $FDI^{us}$ ), and demographic change in the U.S. (DEMO).

The final equation the study uses is:

$$(3) \ln(Q_t^{ex} / TV_t) = \alpha_0 + \alpha \ln(t TV) + \beta \ln(RE_t^{usf}) + \gamma_1 \ln(Y^{us}) + \gamma_2 \ln(Y^f) + \gamma_3 \ln(OP) + \gamma_4 \ln(FDI_f^{us}) + \gamma_5 DEMO + \gamma_6 D^{NAFTA} + \gamma_7 D^{afc} + \gamma_8 D^{dev} + \epsilon_t$$

Jurita Duasa examines the relationships between overall trade balance, real exchange rates, income, and money supply in Malaysia in “Determinants of Malaysian Trade Balance: An ARDL Bound Testing Approach”. The data used in this study is collected from *IMF Statistics* and the *Bank Negara Malaysia Bulletin*. They use similar variables as those in the previous

study. However, the dependent variable is the more traditional ratio of exports to imports. The method used is a bound testing approach to co integration, developed within an ARDL framework. The results of the study provide strong evidence that money supply and income play a role in the long-run trade balance compared to exchange rates.

## **Growth and Structural Change:**

To truly understand the effects that NAFTA has had on the Mexican agricultural sector, one needs to first take an in depth look into the overall condition of the Mexican economy. This is essential because the Mexican agricultural sector may be suffering because of natural economic development and growth, rather than simply because of NAFTA. Generally, as an economy develops, structural change occurs and societies change from rural to urban. We should expect the role of agriculture to diminish, as the industry and service sectors expand. Additionally, sectoral output and production change in a developing economy, and are accompanied by employment changes. In absolute terms fewer people are employed in agriculture, and the share of the labor force employed in agriculture declines. However, the structural change implies that the displaced workers from the agricultural sector would be absorbed or employed in a different sector. In this thesis, I will examine structural output and employment changes in Mexico from the years 1989- 2004/2006, to determine what the effects of NAFTA have been and the degree to which NAFTA may be fairly blamed for negatively affecting the Mexican agricultural sector.

Thus, to determine if the Mexican economy is growing and experiencing this type of structural change this section will analyze annual GDP growth, GDP per capita (to adjust for population growth), structural change in employment, and composition changes of GDP.

### **Growth:**

According to a report published by the U.S. Library of Congress [1996], Mexico has experienced a fluctuating economy, periods of rapid growth and recessions, since 1970. In 1994,

the year NAFTA was signed, the Mexican peso collapsed and an economic crisis ensued. In 1996, the Mexican economy began to see signs of strong growth again. According to official data provided by The World Bank, shown in Table 1, GDP as well as GDP per capita has grown moderately since 1986. The following table shows that average annual growth of GDP from 1986- 2006 was 2.8 % and from 1996-2006 it was 3.1%. Mexico’s post NAFTA and peso crisis growth has been “extraordinary”.<sup>8</sup> In other words, Mexico’s growth has been better than pre-NAFTA, but low by other developing country standards.

Table 1: Data and the Measurement of Growth

(Annual Growth in %)

Year	GDP	GDP per capita
1986-1996	2.8	.9
1996-2006	3.1	1.9

**Structural Change:**

Table 1 demonstrates that there has been slight growth in GDP per capita over the past twenty years, from 1986-2006. These numbers do not directly indicate that Mexico’s economy was developing. Thus, the following section will analyze if structural change has occurred in Mexico. Usually, this structural change can be observed in the change of labor patterns and the change in the composition of GDP.

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<sup>8</sup> The World Bank, “Mexico at a Glance,” [http://devdata.worldbank.org/AAG/mex\\_aag.pdf](http://devdata.worldbank.org/AAG/mex_aag.pdf) (September 2007).

## LABOR:

Traditionally, as an economy develops, sectors such as farming lose workers, and other sectors such as service and manufacturing will gain workers. We will look at the three broad sectors in Mexico: the primary (including agriculture, fisheries, forestry and animal husbandry), the secondary (including mining, manufacturing, construction and utilities), and the tertiary (including transportation, communications, household and business services, social services, and technology and education).

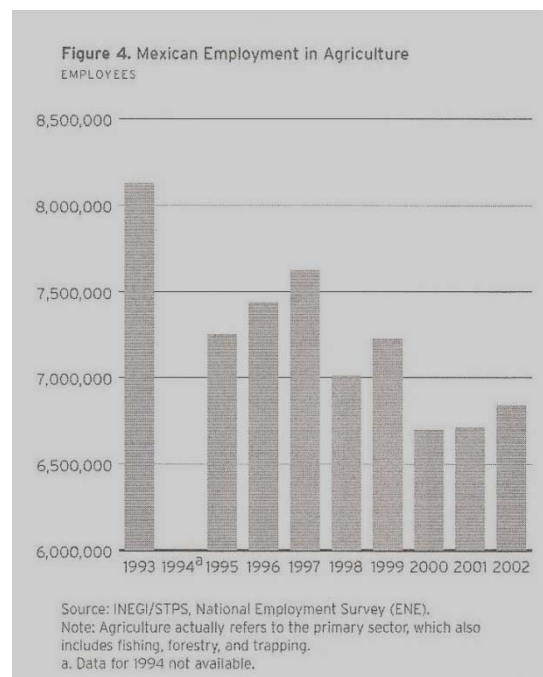
According to standard development texts, such as Gillis' *The Chinese Economy: Transitions and Growth* [2007], in a developing economy the labor force should slowly move out of the primary sector and productivity should increase in this sector as a result of better human and physical capital. The secondary sector should see increased employment in the beginning of development, yet the tertiary sector will not see an immediate change. However, after a certain threshold, the primary and secondary sectors should decrease their share of employed labor force, as the tertiary increases. Inherent in this generalization is that overall jobs are not lost, rather gained, as the economy reorganizes itself and the labor force allocation changes accordingly. The following figures address how these structural patterns apply to Mexico.

### Agriculture:

According to a report published by the Carnegie Endowment for International Peace, Mexico has suffered job losses in the agricultural sector over the last decade. In the late 1980's this sector saw an increase in employment. By the end of 1993, the Mexican agricultural sector employed 8.1 million people. This was two years before NAFTA was signed. However, by the

end of 2002 the employment in this sector declined by 1.3 million people, to 6.8 million.<sup>9</sup> It is important to note again that there was a devaluation of the peso in 1994. These massive numbers of job losses in agriculture could be a result of a trade deficit with the U.S in agricultural goods.

Figure 1: Employment in the Agricultural Sector (includes fishing, forestry, trapping and farming)<sup>10</sup>



The above graph shows how the primary sector, which includes farming, fishing, forestry and trapping, has shown an overall decrease in employment levels since 1993. Additionally, the USDA Foreign Agricultural Service published a report, “Mexico, NAFTA, and Agriculture, A Snapshot”, which provides data on the unemployment rates specific to farmers and farm workers. The report states:

<sup>9</sup> Sandra Polaski, “Job Wages and Household Income,” *NAFTA’s Promise and Reality*, <http://www.carnegieendowment.org/files/nafta1.pdf> (January 2008): 17.

<sup>10</sup> Ibid:20.

The number of farmers declined from 4.3 million in 1991 to 2.7 million in 2003 according to the National Employment Survey. Between 1999 and 2003, farmer numbers dropped in all categories except the “Owner without Land” category (thought to be principally farmers with livestock grazing on rented land), which increased markedly. Data from the Secretariat of Agriculture’s PROCAMPO subsidy program suggest that the number of farmers stabilized between 2003 and 2005.<sup>11</sup>

Therefore, not only did overall agricultural employment decline, but since just before the implementation of NAFTA, overall farming employment declined by 1.6 million between 1991 and 2003.

Table 2: Number of Farmers and Farm Workers in Mexico (1991-2003)<sup>12</sup>

Year	1991	1995	1998	1999	2000	2001	2002	2003
Number of Farmers and Farm Workers	5,526,967	5,642,897	5,708,186	5,708,186	5,255,760	NA	4,771,471	3,728,209

#### Manufacturing:

In Mexico, two types of manufacturing have to be considered, maquiladora (export assembly plants) and non-maquiladora. Non-maquiladora manufacturing employed 1.4 million in January of 1994. During the peso crisis, this number declined sharply. However, in May 2000 some of these losses were made up for, but then declined again until 2003. In May 2003, there

<sup>11</sup> David Williams and Gabriel Hernandez, “Mexico, NAFTA, and Agriculture, a Snapshot,” <http://www.fas.usda.gov/gainfiles/200607/146208468.pdf> (2006).

<sup>12</sup> Ibid.

were 1.3 million jobs in non-maquiladora manufacturing. This is about 100,000 less than in the year NAFTA took effect. However, employment in maquiladora manufacturing saw increased employment between 1994 and 2001, approximately 800,000 jobs were added. Between 2001 and 2003, 250,000 of these jobs were lost. Thus, since NAFTA net job creation in maquiladora manufacturing has been 550,000 jobs. This is an expected result of trade liberalization.<sup>13</sup>

The Carnegie Endowment study makes an important point that only part of the change in maquiladora and non-maquildaora employment since 1994 can be attributed to NAFTA. As a result of the peso devaluation in 1994, the US dollar could buy twice as many Mexican products as before. In fact, the U.S. International Trade Commission (USITC) found that “the peso-devaluation had a larger impact on Mexican exports of manufactured products to the US than all NAFTA-related tariff changes combined”.<sup>14</sup>

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<sup>13</sup> Sandra Polaski, “Job Wages and Houshold Income,” *NAFTA’s Promise and Reality*, <http://www.carnegieendowment.org/files/nafta1.pdf> (January 2008).

<sup>14</sup> Ibid.

Figure 2: Employment in Non-Maquiladora Manufacturing<sup>15</sup>

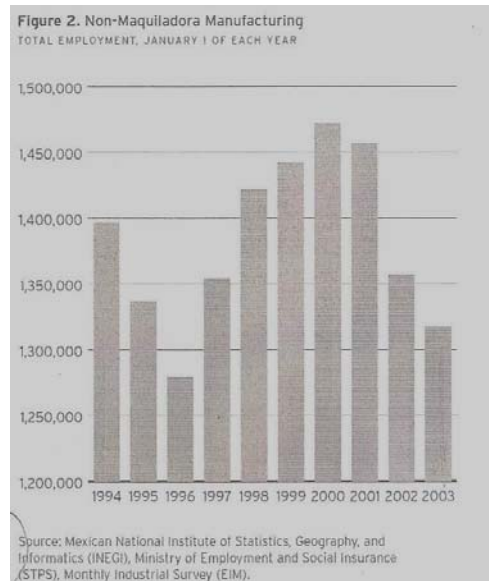
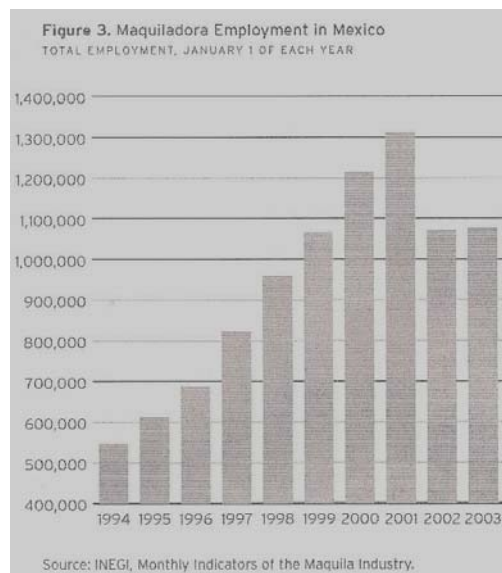


Figure 3: Employment in Maquiladora Manufacturing<sup>16</sup>



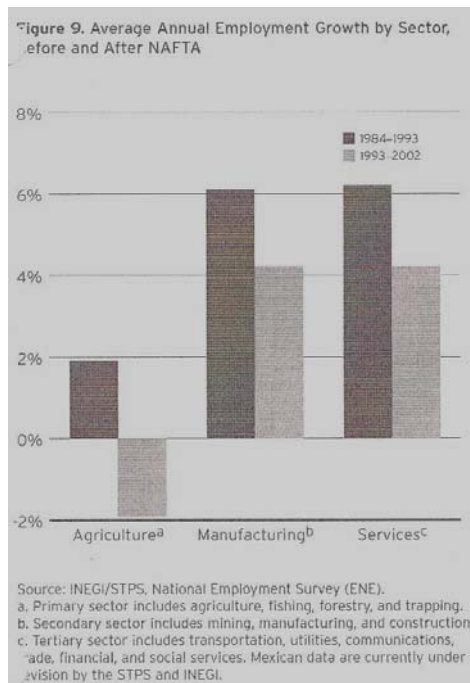
<sup>15</sup> Ibid:15.

<sup>16</sup> Ibid:16.

Service:

The tertiary sector is reported to have grown in labor employment from 51 % before NAFTA to 57% in 1997. <sup>17</sup>The Carnegie Foundation claims these workers were transferred over from the displaced agricultural workers. Specifically, the agricultural sector fell from being 25.7% of employment of total labor force in 1993 to 17.3 % in 2002. The majority of these displaced agricultural workers are speculated to have entered the informal sector. 46 % of employment in Mexico in the late 1990's was in the informal sector, this sector includes street vendors and personal services. <sup>18</sup>

Figure 4: Average Annual Employment Growth by Sector, Pre and Post NAFTA <sup>19</sup>



<sup>17</sup> Ibid:24.

<sup>18</sup> Ibid:24.

<sup>19</sup> Ibid:25.

## COMPOSITION OF GDP:

As previously stated, structural change can also be observed in the changing shares of GDP in the primary, tertiary and secondary sectors. Traditionally, in a developing economy the secondary and tertiary sectors would see a growing compositional share or component of GDP and the primary sector would see a significant decline as a percentage of GDP.

When analyzing the data provided by the World Bank, it is easy to see a steady decline of the agricultural sector's contribution to Mexico's GDP over the period from 1989 to 2006. On the other hand, the manufacturing sector had two distinct periods of change. From 1989 to 1993/1994 the manufacturing sector's percent of GDP declined steadily. However, in 1995, after the inception of NAFTA, the percentage increased only to decline again steadily until 2006. In the service sector three distinct periods can be observed. From 1989 to 1994 the service sector's percent GDP increased steadily. However, from 1995 to 1999 the service sector stayed constant at 66% while the manufacturing sector increased in share of GDP. Then, from 2000 to 2006 the sector experienced slight growth. Following the typical trends of a growing economy, the agricultural sector's percent GDP has declined. However, it has declined steadily and in small increments. The manufacturing sector demonstrated inconsistencies, but its share of GDP declined by the end of the seventeen-year period, 1989-2006. The service sector increased steadily over the period.

Table 3: Percent of GDP for the Agricultural Sector <sup>20</sup>

Time	1989-1991	1992	1993-1997	1998-1999	2000-2006
% of GDP	8	7	6	5	4

Table 4: Percent of GDP Manufacturing Sector<sup>21</sup>

Time	1989	1990-1991	1992	1993-1994	1995-1999	2000-2001	2002	2003-2006
% of GDP	22	21	20	19	21	20	19	18

Table 5: Percent of GDP Service Sector<sup>22</sup>

Time	1989	1990-1991	1992	1993-1994	1995	1996	1997-1999	2000	2001	2002-2005	2006
% of GDP	63	64	65	67	66	65	66	68	68	70	69

### **Conclusion:**

GDP growth and structural changes in GDP composition and employment are indicators of economic growth and development. While the overall trend shows a typical pattern of economic development, with a large shift in employment out of the agricultural sector into the service sector and a 50% decrease in agriculture's share of GDP and a 9% increase in the service sector's share of GDP, this may be misleading. The Carnegie Foundation points out, many of the

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<sup>20</sup> WDI Online, <http://ddp-ext.worldbank.org/ext/DDPQQ/showReport.do?method=showReport> (2007).

<sup>21</sup> Ibid.

<sup>22</sup> Ibid.

new service jobs are in the informal sector. Additionally, GDP growth was not as high as expected in a developing economy. It cannot be clearly discerned that the reason 1.3 million jobs were lost in the agricultural sector is because of economic development. Thus, the next section will examine import and export levels as well as subsidy competition between members of NAFTA to better understand the drastic changes in Mexico employment numbers.

## **Agricultural Policies:**

In order to best comprehend why the shares of the labor force employed in each sector of the economy (primary, secondary and tertiary) did change dramatically, yet Mexico's overall GDP did not, Mexico's agricultural policies pre and post NAFTA must be thoroughly analyzed.

### **Pre-NAFTA Agricultural Policy Reforms:**

According to a report issued by the United States Department of Agriculture (USDA), "Farm Policy Reforms and Harmonization in the NAFTA" [1997],

Mexican agricultural policy reforms began in the late 1980's. Before that, Mexico supported its agriculture through subsidized inputs, guaranteed producer prices food, processing subsidies, retail price controls, and high import barriers. In 1988, Mexico sharply lowered tariff protection and converted most import quotas to tariffs following its accession to the GATT. However, import licensing remained an important instrument for price support, particularly for corn, a staple crop produced by Mexico's large subsistence farm sector. In 1991, Mexico began to lower agricultural input subsidies and to reduce the pervasive role of the government in purchasing, storing, and distributing agricultural commodities. Mexico reduced subsidies to corn and wheat millers and eliminated most retail food price controls. Guaranteed producer prices and government purchases were continued only for corn and beans.<sup>23</sup>

Antonio Yunez Naude and Edward Taylor's *The Effects of NAFTA and Domestic Reforms in the Agriculture of Mexico: Predictions and Facts* [2006] outlines more clearly exactly what the policies were that brought about the changes listed above. CONASUPO (National Company for Popular Subsistence) was a state company that bought staples from farmers at specified prices

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<sup>23</sup> Mary E. Burfisher, Sherman Robinson, and Karen Theirfeldrer, "Farm Policy Reforms and Harmonization in the NAFTA," <http://www.ers.usda.gov/publications/aer771/aer771h.pdf> (1997).

and either sold them to processors and consumers at low prices or processed the staples themselves. This state company was the government's primary tool of government intervention in agriculture. This institution began to have trouble in 1991 and this initiated the changes in the role of government in purchasing agricultural commodities.

The USDA report, "Farm Policy Reforms and Harmonization in the NAFTA", does not mention that in 1991 commercial farmers of staples received assistance from ASERCA (Support Services for Agricultural Marketing) in regions where production of basic crops was higher than demand. This support was created primarily to alleviate the stress being placed on these farmers because of outside competition, which resulted from trade liberalization. The Mexican government created ASERCA to help large surplus farms compete, mostly in the northern states.<sup>24</sup>

### **During NAFTA's Consideration and Post-NAFTA Policies:**

In 1993, PROCAMPO (Program of Direct Support to the Countryside) replaced CONASUPO's input subsidies, price supports, and import protection with grants to producers of staple crops.

However, in 1994, with the signing of NAFTA, borders were opened and trade was liberalized with Mexico's northern neighbors, Canada and the United States. This resulted in lowering the prices of imports and competition between Mexican producers and their northern counterparts. The Alliance for the Countryside (Alianza) was created in 1995 to help commercial farmers to improve their inputs and to promote the growth of export crops. It is important to note that subsistence farmers were not included in Alianza.

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<sup>24</sup> Antonio Yunez Naude and J. Edward Taylor, "The Effects of NAFTA and Domestic Reforms in the Agriculture of Mexico: Predictions and Facts," *Region et Developpement* 23 (2006): 163.

In 2002, the United States increased the subsidies provided to its farmers. In order to continue to compete with U.S. crops, the Fox administration signed Acuerdo Nacional Para el Campo<sup>25</sup>, a domestic program, in 2003. This accord defines policies that were to be implemented for rural development. These policies were primarily implemented to help large commercial farmers continue to be competitive. The smaller rural families that relied on farming did not receive the same treatment.

### **Subsidies and their Effects:**

It is impossible to understand the history of Mexico's agricultural policies without understanding subsidies. An agricultural subsidy is a sum paid to farmers to supplement their income in the hopes of influencing the price and supply of the commodities being produced in international markets. As previously stated, Mexico provided subsidies to its farmers when the trade barriers were dropped with the signing of NAFTA in 1994. However, Mexico was not the only member of the trade agreement to provide their farmers with subsidies. The United States is known to heavily subsidize its agricultural sector in order to compete internationally. These U.S. subsidies are said to be the reason Mexico's agricultural sector has suffered, especially since the U.S. is one of Mexico's top trading partners (others are Canada, Spain, South Korea and Japan).<sup>26</sup> To test this hypothesis, the next section offers a detailed look into who is being subsidized and by how much. It seeks to answer two questions-could it be that commercial farmers have been subsidized sufficiently by the Mexican government to compete with the U.S.

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<sup>25</sup> "Palacio Nacional, Acuerdo Nacional para el Campo por el Desarrollo de la Sociedad Rural y la Soberanía y Seguridad Alimentataria," <http://www.economia.gob.mx/pics/p/p1676/ANC.pdf> (April 2003).

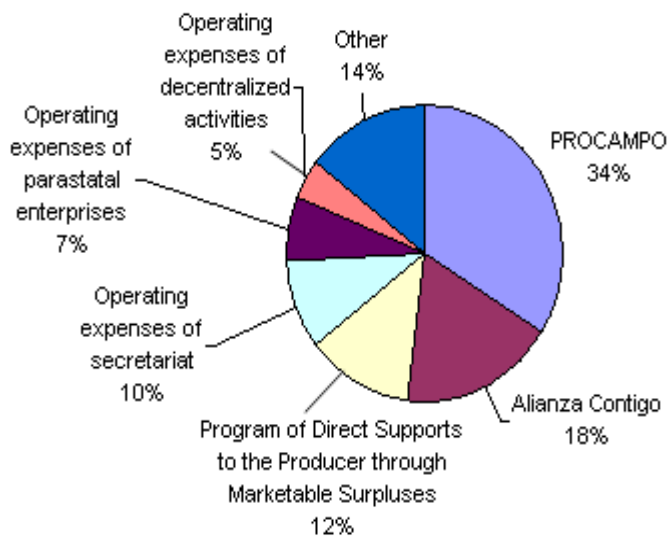
<sup>26</sup> The U.S. Library of Congress, "Chapter 3: Economy," *Mexico: Country Study*, [http://lcweb2.loc.gov/cgi-bin/query/r?frd/cstdy:@field\(DOCID+mx0037\)](http://lcweb2.loc.gov/cgi-bin/query/r?frd/cstdy:@field(DOCID+mx0037)) (June 1996).

subsidies, yet the small famers have not? Could this be the reason that employment composition changed drastically, yet the GDP composition did not?

MEXICO:

According to information provided by the USDA, their Mexican counterpart, SAGARPA (The Secretariat of Agriculture, Livestock, Fishing and Food), had a budget of 3.7 billion USD in 2004. The following chart clearly demonstrates what these 3.7 billion dollars were designated to.

Figure 5: Mexico's Agricultural Secretariat's Budget for 2004<sup>27</sup>



Source: SAGARPA.

As Figure 5 shows, The Program of Direct Support for the Countryside (PROCAMPO) accounted for 34 % of SAGARPA's budget for 2004, that is \$1,258,000,000. This program provides any producer who cultivates a legal crop on eligible land PROCAMPO payments, which are made on a per hectare basis. Eligible land is considered land that produces: corn, sorghum, beans, wheat, barley, cotton, safflower, soybeans, or rice. For spring-summer 2004, PROCAMPO gave US\$102 per hectare (10,000 square meters) for producers with less than 5

<sup>27</sup> The United States Department of Agriculture Economic Research Service, <http://www.ers.usda.gov/Briefing/Mexico/Policy.htm> (November 2004).

hectares and US\$85 per hectare for all others.<sup>28</sup> The more hectares a farmer has, the more money they will receive from the government.

Alianza accounts for 18 %, which is \$666000000, of SAGARPA's 2004 budget. However, this support is not received by all farmers. Alianza, as described in the policy section, helps commercial farmers invest in improvements to promote efficiency and growth of crop exports.

The Program of Direct Supports to the Producer through Marketable Surpluses for Productive Reconversion, Integration of Agrifood Chains, and Attention to Critical Factors (Direct Supports to the Producer through Marketable Surpluses) is a new program created in 2003 as part of Fox's plan to help rural agriculture. This program contains an important new subprogram called the Subprogram of Direct Supports to Target Income (Target Income Subprogram) that guarantees participating producers of selected crops that their income from the market will not fall below a certain level. So far, the Mexican government has defined target incomes for 10 crops. Other activities within Direct Supports to the Producer through Marketable Surpluses include supports for price insurance and the provision of collateral. When all of these activities are taken into account, the program is responsible for about 12 % of SAGARPA's 2004 expenditures, \$444,000,000.

#### UNITED STATES:

While Mexico did provide support to their farmers, mostly commercial, the United States also budgeted a large amount to support its agricultural sector. According to the 2004 budget summary released by the USDA, "The Department's 2004 budget supports the requirements of the Farm Security and Rural Investment Act of 2002 (Farm Bill) which, combined with a strong

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<sup>28</sup> Ibid.

crop insurance program, provides a strong market-oriented economic safety net for farmers.”<sup>29</sup>

The safety net that the USDA set up for the farmers included expanding international programs by 6.2 billion dollars. This number is nearly double of what Mexico spent on all of its programs combined. 4.2 billion dollars are designated toward CCC’s Export Credit Guarantee Program and the rest is distributed amongst the Market Access Program, Export Enhancement Program and the U.S. Foreign Foods Assistance Activities. Clearly, the numbers speak for themselves. U.S. farmers are receiving a tremendous amount of support from their government to compete in the global trading market. Numbers are unclear as to how many people received these funds in both countries because the data was not complete.

### **How has U.S. - Mexico Trade Changed Over Time:**

Now that we know how much each country subsidizes their agricultural sector, it is important to analyze whether or not these subsidies have actually affected trade for either Mexico or the United States. The following chart reveals how Mexico agricultural exports to the United States and imports from the United States have changed since before NAFTA and after NAFTA was implemented.

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<sup>29</sup> USDA, “2004 Budget Summary,” <http://www.usda.gov/agency/obpa/Budget-Summary/2004/master2004.pdf> (2004).

Table 6: Mexico Agricultural Trade with the U.S. Excluding Fish and Forest Products (In Millions of Dollars in Current Prices)<sup>30</sup>

	Year	Mexico Exports (Annual Average)	Mexico Imports (Annual Average)	Trade Balance
U.S.	1991-1993	2542	3476	(934)
	2003-2005	7298	8593	(1295)

According to data provided by the USDA, from 1991-1993 Mexico exported \$2,542,000,000 worth of agricultural goods to the United States. However, it did import more, \$3,476,000,000 more, from the United States. This resulted in an agricultural trade deficit. From 2003-2005, Mexico exported more than double the amount it did ten years prior to the United States. However, the United States exported almost triple the amount to Mexico in 2004. Thus, the agricultural sector again experienced a trade deficit. Mexico's agricultural trade deficit with the United States from 1993-2004 changed by \$361,000,000.

However, when agriculture is broken down into its sub sectors, each sector has fared differently:

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<sup>30</sup> USDA, "Mexico: Trade," <http://www.ers.usda.gov/Briefing/Mexico/Trade.htm> (November, 2006).

Table 7: Mexico's Agricultural Trade with the U.S. Broken Down by Good (In Millions of Dollars in Current Prices)<sup>31</sup>

A) Animal and Animal Products

	Year	Mexico Exports (Annual Average)	Mexico Imports (Annual Average)	Trade Balance
U.S.	1991-1993	408	1,186	(778)
	2003-2005	654	2,484	(1830)

B) Grains and Feeds

	Year	Mexico Exports (Annual Average)	Mexico Imports (Annual Average)	Trade Balance
U.S.	1991-1993	51	896	(845)
	2003-2005	295	2356	(2061)

C) Fruits and Preparation

	Year	Mexico Exports (Annual Average)	Mexico Imports (Annual Average)	Trade Balance
U.S.	1991-1993	322	81	241
	2003-2005	1,131	248	883

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<sup>31</sup> Ibid.

D) Nuts and Preparation

	Year	Mexico Exports (Annual Average)	Mexico Imports (Annual Average)	Trade Balance
U.S.	1991-1993	55	33	22
	2003-2005	131	99	32

E) Vegetables and Preparation

	Year	Mexico Exports (Annual Average)	Mexico Imports (Annual Average)	Trade Balance
U.S.	1991-1993	923	150	773
	2003-2005	2,691	732	1959

F) Oilseeds and oilseed products

	Year	Mexico Exports (Annual Average)	Mexico Imports (Annual Average)	Trade Balance
U.S.	1991-1993	38	633	(595)
	2003-2005	53	1502	(1449)

### G) Sugar

	Year	Mexico Exports (Annual Average)	Mexico Imports (Annual Average)	Trade Balance
U.S.	1991-1993	35	155	(120)
	2003-2005	344	271	73

Animal and Animal Products, Grains and Feed, and Oilseeds and Oilseed Products maintained negative trade balances. However, the trade balance in all other three categories improved.

Now that it is clear how Mexico-U.S. agricultural trade has fared, the following figure provided by the World Trade Organization demonstrates how Mexico's agricultural sector has fared with the world since NAFTA was signed:

Table 8: Mexico's Agricultural Trade from 1990-2006 (in US Dollars in Current Prices)<sup>32</sup>

Year	Exports	Imports	Trade Balance
1990	3466086395	5374444000	-1908357605
1991	3892745000	5294870000	-1402125000
1992	3838662080	7024023104	-3185361024
1993	4442012104	6826161840	-2384149736
1994	5071329107	8306574000	-3235244893
1995	7188943216	6272706960	-916236256
1996	7239425408	8545852480	-1306427072
1997	7875454320	8902801312	-1027346992
1998	8184109432	9566462640	-1382353208
1999	8145377448	9579111456	-1433734008
2000	9100388100	10988964160	-1888576060
2001	8796041232	12166817792	-3370776560
2002	8936313960	12693490016	-3757176056
2003	9875457127	13816449765	-3940992638
2004	11142216800	15379861862	-4237645062
2005	12557201207	16457064010	-3899862803
2006	14693982243	18461284625	-3767302382

<sup>32</sup> The World Trade Organization, "International Trade Statistics 2007," [http://www.wto.org/english/res\\_e/statis\\_e/its2007\\_e/its07\\_toc\\_e.htm](http://www.wto.org/english/res_e/statis_e/its2007_e/its07_toc_e.htm) (2007).

It appears that Mexico's agricultural trade with the world has remained negative, except for the year the peso collapsed. Since about 1998, Mexico's agricultural trade balance has steadily declined.

### **CONCLUSION:**

Mexico has implemented several agricultural policies since the commencement of NAFTA to help its farmers compete in the global market. However, some of these agricultural policies, such as those that subsidize, are only aimed at helping large commercial farmers. In addition, the U.S. has implemented more aggressive agricultural policies, subsidies, to help its farmers. This could account for the fact that GDP has not changed drastically and yet employment in the agricultural sector has declined and there has been an increase in "service jobs". Large farmers can compete with the US, yet small farmers who do not receive sufficient help from their government cannot. This is demonstrated by Mexico's overall agricultural trade balance with the world, which has steadily declined since NAFTA. It could be that only a very selective pool is still producing agricultural goods. This begs the question, are U.S. subsidies to blame for this? The following section will be an econometric analysis to determine how much US subsidies have affected Mexico's agricultural trade balance with the world.

## **Empirical:**

### **Empirical Model:**

In order to investigate the complaints of Mexican farmers that NAFTA and U.S. subsidies are affecting their business, I attempt to provide estimates for these effects. My empirical trade model is based on the previously mentioned studies, “Determinants of Malaysian Trade Balance: An ARDL Bound Testing Approach,” by Renan Zhuang and his co-authors, [2007], and “Determinants of the U.S. Trade Balance in Consumer-Oriented Agricultural Products,” by Jurita Duasa [2007]. The trade model of this thesis will follow the established format of log-log. The empirical model is specified as follows:

$$\begin{aligned} \ln(Q^{\text{ex}} / Q^{\text{im}}) = & \alpha_0 + \alpha \ln(Y^m) + \beta \ln(Y^{\text{us}}) + \gamma_1 \ln(\text{RE}) + \gamma_2 \ln(\text{FDI}) + \gamma_3 \ln(S^{\text{us}}) \\ & + \gamma_4 \ln(S^m) + \gamma_5 D^{\text{NAFTA}} + \gamma_6 D^{\text{mpc}} + \boldsymbol{\varepsilon} t \end{aligned}$$

The dependant variable in the equation is Mexico’s agricultural export to import ratio ( $Q^{\text{ex}} / Q^{\text{im}}$ ). Traditionally, this is the dependent variable used. Zhuang [2007] does not use this dependent variable, rather they use U.S. export share. The main reasons they do this is that the export share variable is defined even if there is only one-way trade between the U.S. and a trading partner. This does not apply in this case because we are looking at Mexico’s agricultural trade with the rest of the world.

The independent variables that are traditionally included that may affect trade typically include: the real exchange rate, market openness, total trade volume, foreign direct investment, a demographic variable, and per capita income. For the purpose of this thesis, we will be looking at GDP per capita Mexico ( $Y^m$ ) and GDP per capita US ( $Y^{\text{us}}$ ), real exchange rate (RE), foreign

direct investment (FDI), U.S. subsidies ( $S^{US}$ ) and Mexican subsidies ( $S^m$ ). The dummy variables we will be including are NAFTA ( $D^{NAFTA}$ ) and the Mexican Peso Crisis ( $D^{mpc}$ ). The GDP per capita serves to capture effects of rising income on increases in demand for imports. We include both Mexico and the U.S. since the U.S. is such a significant player in Mexico's agricultural trade and we wanted to account for this. The U.S. buys approximately 85% of Mexico's agricultural exports and accounts for approximately 65% of its agricultural imports.<sup>33</sup> We will be using the real exchange rate because an increase in the real exchange rate means the depreciation of the Mexican peso relative to the dollar, and thus favors Mexican exports to a foreign country. Foreign direct investment (FDI) is included because, although the specific relationship between foreign trade and direct investment (FDI) is much debated, it is agreed that FDI does affect trade balance. The debate is whether the FDI-export relationship is a complementary or substitute relationship. We are including U.S. subsidies because the main goal of this paper is to see what effects NAFTA, and in particular, U.S. subsidies have had on the Mexican agricultural sector. Obviously, if we are including U.S. subsidies, Mexican subsidies should also be included. Domestic agricultural subsidies will also have an impact of the trade balance. Also, NAFTA is included because trade liberalization will have obvious impacts on Mexico's trade balance. A dummy variable for the Mexican Peso crisis is also included. During the years 1994 and 1995 the peso collapsed and thus foreign countries were able to import more from Mexico.

In my model we will not be using a demographic variable, a total trade volume variable or a variable for market openness. For the purpose of this thesis a demographic variable is not needed. Traditionally, this variable is used because if there is a large foreign population in the country, there is an expected increase of foreign imports. However, Mexico has a fairly

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<sup>33</sup> USDA, "Mexico: Trade," <http://www.ers.usda.gov/Briefing/Mexico/Trade.htm> (2006).

homogenous population and in all likelihood agricultural trade would not be affected were there a desire for foreign imports.

In my empirical model, the sign for  $\alpha$  is expected to be negative. An increase in Mexico GDP per capita would increase demand for imports, and thus deteriorate the Mexican agricultural trade ratio. The sign for  $\beta$  is expected to be positive. An increase in GDP per capita in the U.S. would lead Mexico to export more agricultural products and thus improve Mexico's agricultural trade balance. The sign for  $\gamma_1$  is expected to be positive. The exchange rate represents the Mexican peso per U.S. dollar. An increase in the exchange rate means the depreciation of the Mexican peso and thus favors Mexican exports to the U.S. The sign for  $\gamma_2$  is expected to be positive or negative since the relationship between FDI and trade is unclear. The sign on  $\gamma_3$  is expected to be negative because an increase in U.S. subsidies would increase U.S. domestic output and lower imports into the U.S. The sign on  $\gamma_4$  is expected to be positive. An increase in Mexican subsidies would decrease foreign imports. The sign on  $\gamma_5$  is expected to be negative. While both Mexican agricultural exports and imports have increased under NAFTA, imports have grown at a faster pace than exports as seen in the Agricultural Policies section of this thesis. For example, between 1997 and 2006 Mexico's agricultural exports grew by 79%. However, during this same period imports grew by 172%. The sign for  $\gamma_6$  is expected to be positive since exports increased dramatically during the year when the peso crisis occurred.

## **Data:**

I use time series data covering a fifteen-year period, each year divided into quarters, from 1990 to 2005. Annual time series data for Mexican agricultural exports and imports are obtained from the World Trade Organization. Annual time series data for Mexican GDP per capita and U.S. GDP per capita are obtained from the United Nations Statistics Division online database. These data are expressed in constant U.S. dollar terms. The United Nations provided annual time series data for the real exchange rate as well. Annual time series data for FDI was provided by The World Bank's online database, WDI. It was difficult to find subsidy information for both Mexico and the U.S. that used the same criteria for reporting. Thus, data from the OECD's "Producer and Consumer Price Support Estimates" was used. This database reports both U.S. and Mexican price support estimates. These are the data used for the subsidy variable. This variable is defined by the OECD to be, "an indicator of the annual monetary value of gross transfers from consumers and taxpayers to support agricultural producers... arising from policy measures which support agriculture..."<sup>34</sup> The Mexican price support estimates (PSE) are reported by the OECD in terms of pesos. Thus, I divided each year's PSE value by the real exchange rate for the given years in order to get the value in terms of U.S. dollars.

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<sup>34</sup>OECD, "Producer and Consumer Support Estimates OECD Database 1986-2006 User Guide," <http://www.oecd.org/dataoecd/12/50/39579148.pdf> (2006):6.

## Results and Discussion:

Tables 9 and 10 below summarize the estimation results. All but two variables in the agricultural trade balance ratio regression are statistically significant at the 5 % level. However, not all of the estimated parameters have the expected signs. Specifically, the estimated coefficient for the Mexico GDP per capita, ( $Y^m$ ), is 1.25 and statistically significant at the 1% level. This implies that a 1% increase in Mexican GDP per capita, ceteris paribus, would increase the Mexican agricultural trade ratio by 1.25%. This indicates that Mexico's trade ratio would increase if Mexican GDP per capita increased. This is contrary to what was predicted. This could be because as GDP grows, imports grow but not of food items, which are more like necessities rather than luxuries. In addition, the estimated coefficient for U.S. GDP per capita, ( $Y^{U.S.}$ ), was statistically insignificant. Zhuang and his co-author's found the estimated coefficient on ( $Y^{U.S.}$ ) to be statistically significant and negative.

The estimated coefficient for FDI, (FDI), is 1.89 and statistically significant at the 1% level. It means that a 1% increase in FDI will result in a 1.89% increase in Mexico's agricultural trade ratio. It was predicted that the coefficient on FDI would be either positive or negative as a result of the continuing debate. This positive result appears to support the argument that FDI and trade are substitutes, that an increase in direct foreign investment into Mexico results in Mexico exporting more.

The estimated coefficient for real exchange rate, (RE), is 6.00 and is statistically significant at the 1% level. That is a 1% increase in the real exchange rate will result in a 6.00% increase in Mexico's agricultural trade ratio. This is what was predicted. As the real exchange rate increases the Mexican peso is depreciating and thus the U.S. dollar can buy more of Mexico's exports. Hence the increase in Mexico's agricultural exports.

The estimated coefficient for U.S. agricultural subsidies, ( $S^{U.S.}$ ), is 1.69 and is statistically significant at the 1% level. That is a 1% increase in U.S. subsidies will result in a 1.69% increase in Mexico's agricultural trade ratio. This is not what was predicted. It is expected the U.S. would tend to import less the higher the U.S. subsidies are, especially in competing agricultural goods such as corn. The estimated coefficient on Mexican agricultural subsidies, ( $S^m$ ), is statistically insignificant.

The estimated coefficient for the dummy variable NAFTA, ( $D^{NAFTA}$ ), is -2.377 and is statistically significant at the 1% level. That is in the year when NAFTA was signed and the subsequent years, Mexico's agricultural trade ratio decreased by 2.77%. This suggests that NAFTA did have a negative effect on Mexico's agricultural sector.

The estimated coefficient for the dummy variable Mexican peso crisis, ( $D^{mpc}$ ), is 1.53 and statistically significant at the 1% level. That is in 1994 and 1995 the Mexican peso crisis resulted in a 1.53% increase in Mexico's agricultural trade ratio. This was to be expected because with the devaluation of the peso, the U.S. dollar can buy more and thus Mexico's exports increased.

Table 9: OLS Regression Estimation Results \*

Parameters	Independent Variables	Estimates
$\alpha$	Mexican GDP per capita, ( $Y^m$ )	1.25 (.406)
$\beta$	U.S. GDP per capita, ( $Y^{us}$ )	2.30 (1.20)*
$\gamma_1$	Real exchange rate, (RE)	6.00 (1.16)
$\gamma_2$	Foreign direct investment, (FDI)	1.89 (.280)
$\gamma_3$	U.S. agricultural subsidies, ( $S^{us}$ )	1.69 (.304)
$\gamma_4$	Mexican agricultural subsidies, ( $S^m$ )	-.327 (.231)*
$\gamma_5$	Dummy for NAFTA, $D^{NAFTA}$	-2.37 (.399)
$\gamma_6$	Dummy for Mexican peso crisis, ( $D^{mpc}$ )	1.53 (.466)

\* Note: Dependent variable is Mexican agricultural trade ratio. Standard errors are in parentheses. An asterisk signifies that the coefficient's estimate was insignificant.

As a base for comparison, I also ran a regression using all of the previously listed independent variables on Mexico's overall trade ratio, which includes agriculture. All but two variables in the overall trade balance ratio regression are statistically significant at the 5 % level. In particular, the estimated coefficient for the Mexico GDP per capita, ( $Y^m$ ), is  $-.17$  and statistically significant at the 4% level. This implies that a 1% increase in Mexican GDP per capita, ceteris paribus, would decrease the Mexican overall trade ratio by  $.17\%$ . This indicates that Mexico's trade ratio would decrease if Mexican GDP per capita increased. This result is what I had initially predicted with the agricultural trade regression. Increased GDP per capita should lead to an increase in imports because the population is wealthier and demands more goods. In addition, the estimated coefficient for U.S. GDP per capita, ( $Y^{U.S.}$ ), was statistically significant in contrast with the prior regression. The estimated coefficient for U.S. GDP per capita is  $.662$ . However, it is statistically significant at the 12% level. This means a 1% increase in the U.S. GDP per capita ratio will result in a  $.66\%$  increase in Mexico's overall trade ratio. This also is in agreement with what I had initially predicted for the agricultural model.

The estimated coefficient for FDI, ( $FDI$ ), is  $-.189$  and statistically significant at the 3% level. It means that a 1% increase in FDI will result in a  $1.89\%$  decrease in Mexico's trade ratio. This could be because as foreign investors begin to build plants in Mexico, the need to import materials from their own countries grows for immediate input goods.

The estimated coefficient for real exchange rate is statistically insignificant, as is the estimated coefficient for U.S. agricultural subsidies. However, the estimated coefficient on Mexican agricultural subsidies, ( $S^m$ ), is statistically significant at the 1% level. The estimated coefficient is  $-.05$ . That is a 1% increase in Mexican agricultural subsidies will result in a  $.05\%$  decrease in Mexico's overall trade ratio.

The estimated coefficient for the dummy variable NAFTA, ( $D^{NAFTA}$ ), is .224 and is statistically significant at the 1% level. That is in the year when NAFTA was signed and the subsequent years, Mexico's trade ratio increased by .22%. This suggests that NAFTA did not have a negative effect on Mexico's overall trade ratio. In other words, this is very different from the agricultural trade balance which was negatively affected.

The estimated coefficient for the dummy variable Mexican peso crisis, ( $D^{mpc}$ ), is -.113 and statistically significant at the 2% level. That is in 1994 and 1995 the Mexican peso crisis resulted in a .113% decline in Mexico's agricultural trade ratio. This was not what was predicted. It points to the fact that crucial imports were now more expensive.

Table 10: OLS Regression Estimation Results \*

Parameters	Independent Variables	Estimates
$\alpha$	Mexican GDP per capita, ( $Y^m$ )	-.171 (.041)
$\beta$	U.S. GDP per capita, ( $Y^{us}$ )	.663 (.122)
$\gamma_1$	Real exchange rate, (RE)	.130 (.114)*
$\gamma_2$	Foreign direct investment, (FDI)	-.190 (.027)
$\gamma_3$	U.S. agricultural subsidies, ( $S^{us}$ )	.053 (.032)*
$\gamma_4$	Mexican agricultural subsidies, ( $S^m$ )	-.052 (.011)
$\gamma_5$	Dummy for NAFTA, $D^{NAFTA}$	.224 (.051)
$\gamma_6$	Dummy for Mexican peso crisis, ( $D^{mpc}$ )	-.114 (.049)

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\* Note: Dependent variable is Mexican agricultural trade ratio. Standard errors are in parentheses. An asterisk signifies that the coefficient's estimate was insignificant.

## **Summary and Conclusion:**

Since NAFTA's inception, Mexican farmers have protested the agreement, claiming that disproportionate U.S. agricultural subsidies have hurt their businesses, and in some cases left the farmers with no other choice than to change occupation. In order to investigate these farmers' claims, I began by analyzing the current status of the Mexican economy. It could have been that these farmers were being displaced as a result of structural change in employment that comes about in a developing economy. However, it appears that the Mexican economy has only grown slightly. This statistic hints that the displacement is not a result of structural change. Thus, an in-depth analysis of U.S. agricultural subsidies, Mexican subsidies and Mexico's overall and agricultural trade balance was conducted. The comparison of U.S. agricultural subsidies and Mexican agricultural subsidies demonstrated that the U.S. provides more than double the amount in assistance to their farmers, as compared to Mexico. In addition, Mexico's agricultural trade balance with the rest of the world has declined steadily since NAFTA. Thus, the following question begged to be answered: to what extent are the farming job losses (1.3 million) and Mexico's negative and deteriorating agricultural trade balances a result of the disproportionate U.S. agricultural subsidies, and membership in NAFTA, more generally.

To assess these impacts, I used an international trade model to empirically test the effects of U.S. agricultural subsidies and NAFTA on Mexico's agricultural trade ratio and Mexico's overall trade ratio. In the agricultural model it appears as though U.S. agricultural subsidies do not affect Mexico's agricultural trade ratio negatively. However, NAFTA does. The estimation coefficient is -2.38 and statistically significant at the 1% level. This indicates that although U.S.

agricultural subsidies are not affecting agricultural trade ratio negatively, the North American Free Trade Agreement more generally has contributed to a decline in the agricultural trade balance for Mexico. Perhaps it could be that opening borders exacerbates some differences between developed and developing worlds.

In the overall trade ratio model, U.S. agricultural subsidies were insignificant. However, NAFTA has a positive effect on Mexico's overall trade ratio (the estimation coefficient is .224).

Although U.S. agricultural subsidies may not be the cause of job losses in Mexico's agricultural sector, the results indicate that NAFTA may be. Mexico needs to realize that although joining NAFTA may have been good for the country in several ways, they cannot ignore one of their most traditional employment sector, the agricultural sector. It could be the case that NAFTA has helped the service sector, yet farmers do not have the education to join it and are thus forced to "create" jobs and be a part of the "informal" service sector. Perhaps what Mexico needs is to institute policy that insures the rural population will receive formal schooling and training.

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