Trade Creation and Trade Diversion in the North American Free Trade Agreement: The Case of Agricultural Sector[*]

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Abstract

This paper examines the impact of the U.S.-Mexico trade agreement under NAFTA. The results suggest that U.S. agricultural imports from Mexico have been responsive to tariff rate reductions applied to Mexican products. A 1 percent decrease in tariff rates is associated with an increase in U.S. agricultural imports from Mexico by 3.96 percent in the first six years of NAFTA and by 1.07 percent in the last six years of NAFTA. US imports from Mexico have also been attributable to the pre-NAFTA tariff rates. Overall, the results indicate that the U.S.-Mexico trade agreement under NAFTA has been trade creating rather than trade diverting.

Key words: agriculture sector, NAFTA, panel data, tariffs, trade creation, trade diversion.

JEL Classifications: **F10, F15, Q17, Q18, C31, C33.**

INTRODUCTION

The surge of free trade agreements (FTAs) has raised the question of their impact on the countries included in the FTA and on the rest of the world (Bhagwati and Krueger, 1995; Krueger, 1997). It is an issue that economists have long debated. The debate has divided economists between those who oppose FTAs and those who support them. The former group emphasizes trade-creating effects. By reducing (eliminating) trade barriers among members, FTA can improve resource allocation within a region and improve income for member countries. Production shifts toward the most efficient producers of specific commodities within the FTA and consumers are better off because they can purchase goods at lower prices. The latter group argues that FTAs are by definition discriminatory because they lower/eliminate barriers on internal trade while retaining barriers to trade with non-members and are, therefore, trade diverting. Even if an FTA results in internal trade creation, these proponents believe that such gains are likely to be outweighed by their trade diverting effects. In general, one would expect an FTA to result in some amount of both trade creation and trade diversion (Krueger, 1999; Venables, 2000). If the trade diversion is sufficiently large relative to the trade creation, the agreement could conceivably end up being harmful to the member countries.

The North American Free Trade Agreement (NAFTA) is one of the most comprehensive agreements in history. Like many other FTAs, the creation of NAFTA has been a subject of bitter discussions and division among politicians and economists, focusing on the impact that NAFTA might have on the trade and economic welfare (Fukao, Okuba, Stern, 2002). When NAFTA was being negotiated in the early 1990s, for example, many countries voiced concern that their exports to the United States (and, to a

lesser extent, to Canada and Mexico) would be displaced by NAFTA exports, even though in many products and industries those countries could be more competitive than NAFTA producers (Lederman *et al*., 2003). From the viewpoint of Mexico, this trade diversion is also important because it would entail a loss of fiscal revenues from replacing imports from third countries subject to tariffs with duty-free imports from the United States or Canada.

Despite the growing concern of the debate, NAFTA was expected to create new trade among the member countries. Through progressive elimination of tariff and nontariff barriers, bilateral trade flows among the United States, Canada, and Mexico were expected to increase. A number of reports have shown evidence of increased trade flows. The Congressional Budget Office (CBO), for example, analyzed that by 2001, NAFTA had increased U.S. exports to Mexico by 11.3 percent and had increased the U.S. import from Mexico by 7.7 percent (CBO, 2003). On the other part, the report also pointed out that the agreement had almost no effect on the U.S. trade balance with Mexico; and little effect on the change in U.S. GDP.

Considerable concern is also expressed not about the increased trade among the NAFTA member countries, but rather about the welfare implications of that increase. Agriculture is one of the sectors in which there is considerable concern about the potential effects of free trade agreements on domestic producers and consumers (Miljkovic and Paul, 2003). Prior to NAFTA implementation, for example, the impact of NAFTA on Mexican agriculture received a lot of rather pessimistic attention (Levy and van Wijnbergen, 1994). Recently, it has also become the subject of political controversy

as a consequence of the liberalization of certain sensitive products for Mexico, which was implemented in January 2003 (Lederman *et al*, 2003).

OBJECTIVES

Quantitative economic analysis of the potential effects of NAFTA has been done. However, few studies addressed whether new trade in the agricultural sector has been created at all. The objective of this study is to estimate and evaluate the benefits of NAFTA, emphasizing trade creation and trade diversion in the U.S.–Mexico agreements. This is particularly important because the liberalization of U.S.-Mexico trade is in an advanced stage; however, there are still many crucial trade disputes between the two countries such as in the case of sugar and High Fructose Corn Syrup (HFCS) and notably, the concern on the impact that NAFTA might have on the trade and economic welfare.

In order to evaluate the effects of NAFTA, US import demand functions from both Mexico and rest of the World (ROW) are analyzed [1]. There are certain aspects that make this study different from previous empirical work. First, this study focuses on the agricultural products within the 4-digit level of Harmonized Tariff Schedule (HTS). More importantly, this study utilizes commodities that were subject to the non-zero pre-NAFTA tariff rates. For agricultural products, this is crucial because NAFTA immediately reduced tariffs to zero for most agricultural products traded between the United States and Mexico. Including the zero pre-NAFTA tariffs in the analysis would reduce the variations of tariff rates and give biased estimates.

Second, the 12 years of NAFTA's implementation has provided adequate historical data to assess NAFTA trade impacts. Because tariffs are gradually reduced or eliminated, their impacts are also believed to diminish gradually or decay over time. As

such, the earlier years of NAFTA should experience higher impact on trade than the later period. This study proposes such measure by allowing the impacts of tariff reduction to differ during the NAFTA period.

Third, this study also seeks to assess the differential impacts of pre-NAFTA tariffs (initial tariff rates) on the U.S. imports from Mexico. Clausing (2001) provided discussions on the variation in initial tariff rates that may affect trade flows. He noted that because initial tariff rates were predetermined, they are useful for identifying the impact of tariff changes on trade flows. One could argue that NAFTA would have little or negligible impact on trade when pre-NAFTA tariffs were already low; and it would have bigger impacts for commodities having relatively higher pre-NAFTA tariff rates. By grouping the pre-NAFTA tariff rates and constructing dummy variables, this study is able to trace such impacts.

EMPIRICAL STUDIES OF FREE TRADE AGREEMENTS

Much empirical work has been devoted towards evaluating trade and welfare effects of FTAs. These studies have taken two main forms: computer simulation studies of the full general equilibrium effects of FTA membership and econometric studies of changes in trade flows (Venables, 2000; Burfisher *et al*., 2001). The ex-ante studies with computable general equilibrium (CGE) models utilize various simulation methods to analyze a calibrated model economy for a particular base year. Virtually, most of the studies analyzing the impacts of FTA on member countries as well as nonmembers have used a CGE model and find that trade agreements have been welfare improving, *i.e*. trade creation outweighed trade diversion (Kehoe and Kehoe, 1994; Krueger, 2000; Burfisher *et al.*, 2001). For the case of NAFTA, all the model agree that NAFTA would provide

positive gains to member countries with Mexico would enjoy the biggest gains and the U.S. would experience marginal increase in the economy. Canada would expect only minimal effects.

CGE-based FTA studies are not without criticism, however. Kehoe (2003), for example, argues that CGE models greatly underestimate the increases in trade resulting from NAFTA. The CGE model is also considered to lack detailed, up-to-date policy coverage and product disaggregation (Beghin and Aksoy, 2003). In response to these criticisms, researchers have used econometric methods with historical time series (and cross sectional) data to analyze the effects of FTAs on trade flows and welfare. This approach seeks to quantify the changes in trade flows attributable to membership in a FTA, and thereby identify trade creation and trade diversion. The most common approach is the gravity model, which regresses trade flows among trading partners on their respective economic size (*i.e*. GDP) and geographic distance as proxy for transportation costs. Dummy variables are typically used to capture the impact of various preferential trading agreements on trade flows. Some examples are studies given by Gould (1998), Krueger (1999), Zahniser *et al*. (2002), and Lederman *et al*. (2003). In general these studies agree that NAFTA was not a trade diverting agreement.

Similar to the CGE model, there are problems with the gravity approach. Clausing (2001) provided three points of weaknesses with regard to the gravity equation model. First, the use of dummy variables is considered to be inadequate in capturing the effects of preferential trade liberalization. Second, the gravity model does not indicate the extent of trade creation and trade diversion; hence it is difficult to assess the net effects of the agreements. The third problem is associated with the data used in the analyses. In most

cases, the studies utilized a very aggregate level such that it is difficult to exploit variations in the extent of trade liberalization across goods or industries (Clausing, 2001; p.680).

An extension of the gravity approach has been used to assess the impact of FTAs on trade and welfare. Unlike the gravity model that takes the model as an "ad hoc" representation, the current approach is developed based on a better-grounded economic theory such as demand theory. The work of Karemera and Koo (1994), Clausing (2000), and Fukao *et al*. (2002) are some examples. Karemera and Koo analyze the trade effects of removing tariff and nontariff barriers between the U.S.-Canadian free trade agreements using quarterly data from 1970 to 1987. They applied seemingly unrelated regression estimation (SUR) technique to estimate the demand functions based on the SITC classification (the United States) and SIC classification (Canada). They conclude that U.S. imports of Canadian goods were more sensitive to domestic and bilateral import prices than were Canadian Imports of U.S. goods. They also find that tariff and nontariff elimination would increase bilateral trade volume across all commodities traded, primarily trough trade creation and trade diversion.

Clausing (2001) was first to exploit tariff variation at the detailed commodity level using US import data from 1989 to 1994. He finds that tariff liberalization was responsible for the growth in US imports and there was little evidence of trade creation. Fukao, Okubo and Stern (2002) analyze US imports at the HS 2-digit level and 4-digit level for the period 1992-1998. They find that NAFTA tariff preferences had a significant effect on US imports in 15 cases. Their results also show that there was evidence of trade diversion especially in U.S. imports of textiles and apparel products from Mexico.

Another similar approach that uses tariff data to examine trade effects is McDaniel and Agama (2003) who estimate the effects of NAFTA on U.S. import demand for Mexican goods and Mexico's demand for U.S. exports. The results suggest that U.S. import demand for Mexican goods is responsive to tariff preferences, especially during the NAFTA years. Similarly, they find that Mexico's demand for U.S. exports was also responsive to the NAFTA preference.

ECONOMETRIC ANALYSIS

Empirical Specification

To evaluate the effects of NAFTA on the trade flows between the United States and Mexico, we construct import demand functions for the United States from Mexico as well as from the rest of the world (ROW). The import demand specification of the U.S. agricultural products from Mexico takes the form:

$$(1) \qquad \begin{aligned} \ln Q_{it}^{MEX} &= \alpha_0 + \alpha_1 \ln Y_t^{US} + \alpha_2 \ln(1 + TR_{it}^{MEX}) + \alpha_3 DNAFTA_t \\ &\quad + \alpha_4 TRDN_{1t} + \alpha_5 TRDN_{2t} + \alpha_6 DT_{It} + \alpha_7 DT_{2t} + u_{it} \end{aligned}$$

Where Q_{it}^{MEX} is the dollar volume of U.S. imports from Mexico for 4-digit HTS level at time period t, Y_t^{US} is the U.S. personal consumption expenditures (PCE) at time period t, and TR_{it}^{MEX} is the tariff rates against exporting country (Mexico) for 4-digit HTS level at period t. In order to take into account the lagged impact of tariff rates, we use lagged one period tariff rates. Economic theory suggests that PCE will have positive impact on the US imports from Mexico and conversely, tariff rates (TR_{it}^{MEX}) should have negative impact, *i.e.* a decrease in TR_{it}^{MEX} will induce more US imports from Mexico. DNAFTA is a dummy variable for NAFTA which takes the value of one during the NAFTA period

and zero otherwise. DNAFTA may not only measure the effect of NAFTA but may also represent other events that are not accounted in the model. u_{it} is the random disturbance term. We will discuss the properties of u_{it} in the estimation procedures.

NAFTA agreements provided that tariff rates should be gradually reduced. Tariff rates for most agricultural products were immediately eliminated as NAFTA was implemented, while some remaining tariffs will have been phased out in 10 to 15 years. It is believed that the effect of tariff reductions differ during the NAFTA period. Notably, the earlier reductions would be expected to have greater impacts. The impacts would diminish or decay as the tariff rates became closer to the phasing out period. To test this conjecture, we include $TRDN_{it}$, which is the multiplicative effects of tariff rates and NAFTA dummy variable. This specification will allow the effect of tariff reductions to differ during the NAFTA period. We break up this effect into two different periods: the first 6 years and the second 6 years periods [2]. $TRDN_{it}$ takes the following forms:

$$(2)\qquad TRDN_{1t} = \begin{cases} 1 & \textit{for observations between } 1994 \textit{ and } 1999 \\ 0 & \textit{elsewhere} \end{cases}$$

$$TRDN_{2t} = \begin{cases} 1 & \textit{for observations } 2000 \textit{ and on} \\ 0 & \textit{elsewhere} \end{cases}$$

The above specification suggests that the effect of tariff rates can be observed based on the following equation:

$$(3)\qquad \alpha = \alpha_2 + \alpha_4 TRDN_{1t} + \alpha_5 TRDN_{2t}$$

DT is a dummy variable for pre-NAFTA tariff rates. Analysts argue that the effect of NAFTA is very small or may be negligible when the tariff levels prior to NAFTA were already low. DT is included to test whether different pre-NAFTA tariff rates have different impacts on US import demand from Mexico. In order to conduct this analysis,

we split tariff levels into two categories as shown in equation (1). The DTs take the following forms:

$$(4)\qquad DT_{1t} = \begin{cases} 1 & if\ TR_{it}^{MEX} \le 10\% \quad for\ year \le 1993 \\ 0 & elsewhere \end{cases}$$

$$DT_{2t} = \begin{cases} 1 & if\ TR_{it}^{MEX} \ge 20\% \quad for\ year \le 1993 \\ 0 & elsewhere \end{cases}$$

Because tariff differentials among commodity groups are usually small, we do not include tariff rates from 10 percent to 20 percent. We expect to have negative signs for these dummy variables.

The import demand for the U.S. agricultural products from ROW is constructed to measure the trade diversion that might occur during the implementation of NAFTA. The independent variables consist of the tariff rates set by the U.S. against ROW (TR_{it}^{ROW}), tariff rates against Mexico (TR_{it}^{MEX}), DNAFTA, and quarterly dummy variables. In terms of economic theory, an increase in TR_{it}^{ROW} is expected to negatively affect the US imports from ROW. Conversely, an increase in TR_{it}^{MEX} is expected to positively affect the US imports from ROW. The central issue is overall on the coefficient of TR_{it}^{MEX}. If in fact trade diversion occurs, then TR_{it}^{MEX} must have a positive sign, meaning that a decrease in tariff rates against Mexico would reduce U.S. imports from ROW. With respect to DNAFTA, this variable may have a positive or negative sign. However, we expect that DNAFTA will have a positive impact because this variable captures not only NAFTA *per se* but also other events not included in the model.

Following the above discussion, the US import demand from Row is written as

$$\ln Q_{it}^{ROW} = \beta_0 + \beta_1 \ln(1+TR_{it}^{ROW}) + \beta_2 \ln(1+TR_{it}^{MEX}) + \beta_3 DNAFTA + \beta_4 Y_t^{US} + \beta_5 DQ_{1t} + \beta_6 DQ_{2t} + \beta_7 DQ_{3t} + u_{it} \quad (5)$$

Where Q_{it}^{ROW} is the dollar volume of U.S. imports from ROW of the 4-digit HTS level at period t, $DQ_{it}(i = 1,2,3)$ is quarterly dummy variable and other variables are as defined previously.

Estimation

Our empirical assessment of the specified equations is based on the panel data analysis. Within this framework, we are able to explore possible explanations for the heterogeneity in commodity groups or commodity characteristics. Potential reasons for the heterogeneity include different responses of import demand due to expected reductions in tariff rates, *i.e*. tariff schedules under NAFTA agreements and unobservable individual specific characteristics.

The general panel data model can be written as (See Baltagi, 2001; Hsiao, 2003; Wooldridge, 2002):

$$y_{it} = \sum_{k=1}^{K} X_{itk}\beta_k + u_{it} \qquad i = 1,.....,N; \quad t = 1,.....,T \quad (6)$$

Where N is the number of cross sections, T is the length of time series for each cross section, and K is the number of independent variables. The central feature of panel data analysis is the structure of error components u_{it}. The error components, u_{it}, can take different structures. The specification of error components can depend solely on the cross section to which the observation belongs or on both the cross section and time series. If the specification depends on the cross section, then we have $u_{it} = v_i + \varepsilon_{it}$; and if the

specification is assumed to be dependent on both cross section and time series, the error components follow $u_{it} = v_i + e_t + \varepsilon_{it}$. The term v_i is intended to capture the heterogeneity across individuals, and the term e_t is intended to represent the heterogeneity over time. In this study, we assume that the error components follow the former specification.

Furthermore, v_i and e_t can either be random or nonrandom, and ε_{it} is the classical error term with zero mean and homoscedastic covariance matrix. The nature of the error structures leads to different estimation procedures depending on the specification. Since our tests (Hausman's tests for random effects) show that the fixed effects model is preferred to random effects model, our reports are only based on the fixed effects specification. Because of the presence of autocorrelation, the specified models are estimated under first order autocorrelation.

DATA

According to the U.S. Harmonized Tariff Schedule (HTS) all of the products found in Chapters1-24, with the exception for fishery products in Chapters 3 and 16, are considered agricultural products. Certain other products outside of Chapters 1-24 are also considered agricultural products, particularly essential oils (Chapter 33), raw rubber (Chapter 40), raw animal hides and skins (Chapter 41), and wool and cotton (Chapters 51-52). We adopt this classification for the definition of agricultural sector. The data consist of 4-digit HTS system and range from 1989 to 2005 in a quarterly basis. Because most agricultural products traded between the US and Mexico were already subject to free trade before NAFTA was in effect (*i.e.*, zero tariff rates), we did not use all the 4-digit level classified under agricultural products. Instead we selected commodity groups in which they were subject to non-zero tariff rates prior to the implementation of

NAFTA. Besides, our selection of the commodity groups was also based on the consistency of the data during the selected period. The main reason for using the non-zero tariff rates is to obtain variation in the tariff rates so that it helps identifying the effects of tariff liberalization.

The value of US imports from Mexico is used to represent the quantity of import and applied US tariff is based on detailed data on import duties collected. The tariff rates for each commodity classification are calculated as the ratio of calculated duties to customs value. The drawback of this approach is that tariff rates can only be observed when there is trade (Romalis, 2004). When there is no trade, we estimate the tariff rates by taking the average of two surrounding available tariffs. This is possible because only minor percentage of our data with showing no trade. The customs value and calculated duties are extracted from USITC (United State International Trade Commission) data base. Data on personal consumption expenditures of the US are used to represent income. The data are from Bureau of Economic Analysis data base and converted into real values using consumer price indices published by Bureau of Labor Statistics.

RESULTS

US Imports from Mexico

Table 1 presents the econometric results for US import demand from Mexico. Specification (1) shows the effects of tariff rates on US imports by controlling NAFTA and allowing the effects to differ during the NAFTA period. Specification (2) reports the effect of tariff rates without controlling NAFTA. In general, most of the estimated coefficients are significant and posses the expected signs. The F statistics for testing the

joint significance of the individual (group commodity) effects strongly suggest the presence of an individual heterogeneity in the data.

Before turning to the detail discussion of the tariff and its impact on the US imports from Mexico, we will give a quick evaluation on the income variable. As shown in Table 1, the coefficients of income (PCE) are found to be significant in each specification with values of 1.1 and 1.2 for specification (1) and specification (2), respectively. These suggest that US agricultural imports from Mexico are responsive to income level with elasticity of 1.1 [3].

Specification (1) shows the impacts of tariff rates reduction on US imports from Mexico. As shown in Table 1, the coefficient of tariff rates is negative and significant. Controlling NAFTA and income, the estimated parameter shows that a 1 percent decrease in the tariff rates against Mexico would increase US imports of agricultural products by 1.7 percent. Note that this estimate indicates the impact of tariff rates during the whole period of the study. When considering the multiplicative effects, the sum of α_2 and α_4 indicates the effects of tariff rates reductions for the period of 1994 through 1999 and the sum of α_2 and α_5 shows the effects of tariff reductions for the period of 2000 to 2005. The effects of tariff rates during the 12 years of NAFTA is represented by the sum of α_2, α_4, and α_5. As can be seen, the coefficient of α_4 is significant and negative as expected. This means that the effects of tariff reductions during the first 6 years has been 3.96% increase of every 1 percent decrease in tariff rates against Mexico.

The coefficient of α_5 is positive and less than one but not significant. The relatively low parameter estimate is as expected due to the declining effects of tariff reductions. The insignificant parameter may be justified by the fact that some of the

commodities have been subject to trade liberalization (zero tariff rates) or at least have been in the period of low tariff level. Hence, any reduction of tariff levels in this period may not significantly affect the US imports from Mexico, as indeed shown in this study. Regardless of significance level, the effects of tariff reductions on US imports from Mexico have been an increase of 1.07% during the last 6 years of NAFTA and 3.37% during the NAFTA period. By estimating the model without NAFTA dummy variable and its associated multiplicative effects, we also found a similar magnitude of the effects of tariff reductions. As shown in specification (2), the coefficient of α_2 is negative and significant with its magnitude of -3.73%. This indicates that a 1 percent reduction in tariff rates has increased the US imports from Mexico by 3.73%.

Other important results are also given in Table 1. Researchers argue that the effects of NAFTA may be subject to the tariff levels prior to NAFTA implementation. Our specification enables us to track such effect in that it can show the different impact of tariff levels prior to NAFTA. The coefficients of α_6 and α_7 in the two specifications clearly show that the lower the pre-NAFTA tariff rates, the lower is the impact on the increase of US imports from Mexico as tariff rates are reduced. From specification (1), US agricultural imports from Mexico during the NAFTA period was approximately 34% higher than pre NAFTA for group commodities with pre-NAFTA tariff rates less than 10%. On the other hand, this figure was 63% for commodities that fall into the category of pre-NAFTA tariff rates greater than 20%.

Finally, the effect of DNAFTA on US agricultural imports from Mexico has been significant. US imports from Mexico during NAFTA were 68.8% higher than the entire period of analysis. However, one should note that these coefficients can not explain the

effect of NAFTA *per se* because this variable captures not only NAFTA but also other events that are not accounted in the model.

US Imports from ROW

One way to investigate the presence of trade diversion can be done by regressing US imports from ROW on tariff rates set by the US against Mexico. A positive sign of this variable indicates that trade diversion exists. Table 2 reports the econometric results for US import demand from ROW. Specification (1) shows estimation results for US import demand from ROW with tariff rates against Mexico that is intended to see whether trade diversion occurred while controlling for NAFTA. It also provides estimates of NAFTA dummy variable to test whether US imports from ROW increased during the NAFTA period. These two variables can be jointly used to justify whether trade diversion indeed occurred. Similarly, specification (2) gives estimates of the effects of both tariff rates against ROW and tariff rates against Mexico on US imports from ROW without controlling for NAFTA.

Except for tariff rates against Mexico and NAFTA dummy variable, all coefficients are significant at reasonable levels. They also posses expected signs. The coefficient of determination is 0.76 and the F-statistics for fixed effects tests show the presence of heterogeneity in commodity characteristics. The seasonal dummy variables show significant differences in US imports from ROW from quarter to quarter. In all cases, the US imports from ROW in the fourth quarter are higher than the first three quarters.

The US agricultural import demand from ROW seems to be income elastic with its magnitudes are 2.1 and 2.3 based on specification (1) and (2), respectively. It is

surprising that the NAFTA dummy variable is not significant at any reasonable level even though it has the expected sign. If it were significant we could have expected that US agricultural imports from ROW in the first 12 years of NAFTA were 10.5% higher than they would have been without NAFTA. Strong income effects in the United States likely negate this result.

The estimated results for the coefficients of tariff rates against ROW suggest that a 1% reduction in tariff rates against ROW is associated with 1.5% increase in US agricultural imports from ROW. This is clearly less than half of the effects of tariff reductions against Mexico on US agricultural imports from Mexico. This evidence suggests that the United States gives more preference to Mexican agricultural products than ROW agricultural products. This is not surprising given the fact that the United States and Mexico are tied to the NAFTA agreements along with other advantages such as geographical proximity. The parameter estimates of tariff rates against Mexico are positive. As previously stated, a positive sign of tariff rates indicates the presence of trade diversion. However, since these coefficients are not significant, we would argue that there is no significance evidence that NAFTA has caused trade diversion in agricultural sector, particularly those as a result of the United States and Mexico trade agreements.

Trade creation and Trade Diversion

As previously discussed, the net benefit of FTA as a whole derives from the portion of the new trade among the member countries (trade creation) and each particular portion of the new trade among the member countries which is a substitute for trade with nonmembers (trade diversion). The regression results show that tariff reductions during the NAFTA period had significant effects on US imports from Mexico, while the

coefficient of tariff rates against Mexico regressed on US imports from ROW was not significant, even though it has a positive sign. Before concluding that NAFTA has impacted trade flows, it would be informative to highlight the changes in US imports from NAFTA countries and ROW.

Figure 1 shows the shares of US imports of the selected 4-digit level HTS from Canada, Mexico, and ROW from 1989 to 2005. As the figure shows, there was an immediate sharp increase of US imports from Mexico after NAFTA's inception, before experiencing a slight decrease in 1996 and 1997. The share of US imports from Canada increased gradually with a slight decrease in 2003. The share of US imports from Mexico increased from 21% to 29% between 1989 and 2005. During the same period the share of US imports from Canada increased from 11.6% to 21%. In general we can conclude that there has been an upward trend in the share of US imports from both Mexico and Canada during the NAFTA period; and suggesting that NAFTA has been trade creating. Meanwhile, the share of US imports from ROW has degraded continually since 1989. Notably, US imports from ROW declined from 67.1% in 1989 to 50% in 2005.

The increase in the share of US imports from Mexico and Canada accompanied by a decrease in the share of US imports from ROW has raised the question whether the US shifted away its imports from ROW to the NAFTA members. It is very important to response to such concern because if in fact the US did shift its imports at the expense of ROW, there was clearly trade diversion. Figure 2 may clarify the issue. As depicted in this figure, US agricultural imports from Mexico, Canada, and ROW increased substantially from year to year with a slight decline in particular years. In general, the trend of US imports from NAFTA members and ROW suggest that the US did not shift

away its imports from ROW. The decline in the share of US imports from ROW was particularly due to the fact that US imports from NAFTA members grew faster than those from ROW.

Historical data show that there is evidence that US agricultural imports from Mexico have increased since the inception of NAFTA. But to what degree the increase is attributable to NAFTA is difficult to examine. Other important factors have also been responsible for the increase. Krueger (1999, 2000), for example, noted that the economic growth and the change in exchange rates were responsible for the growth in trade flows in the NAFTA region. However, while such other factors are of full consideration, we argue that NAFTA has been trade creating. Our conclusion is also supported by regression results. As shown in Table 1 and the discussions that follow, tariff rate reduction has had a positive impact on US imports from Mexico. This impact is even higher during the NAFTA period compared to the average of entire period. The other regression results in Table 2 clearly indicate that reductions in tariff rates against Mexico did not significantly lower US imports from ROW, suggesting that trade diversion did not occur to a significant degree.

If however, one still believed that trade diversion existed as the sign of TR_{it}^{MEX} in equation (5) was positive, we still argue that NAFTA has been net trade creating. This is because the absolute magnitude of the coefficient TR_{it}^{MEX} in equation (5) is far below the coefficient that measures the impacts of TR_{it}^{MEX} on US imports from Mexico.

CONCLUSIONS

This paper has estimated US agricultural import demand functions from both Mexico and ROW and examined the trade creation and trade diversion that may have

occurred in the US-Mexico agreements under NAFTA using panel data of 35 selected 4-digit level of Harmonized Tariff Schedule (HTS) from 1989-2005. The 35 commodity groups were selected on the basis of tariff rates that were not subject to zero tariff rates prior to NAFTA. The use of more disaggregated data and the non-zero pre NAFTA tariff rates has enabled us to examine the variations of tariff rates and also reduce bias that might have occurred if we included the zero pre NAFTA tariff rates in the analysis.

The results suggest that US agricultural imports from Mexico have been responsive to tariff rate reductions applied to Mexican products. A 1 percent reduction in tariff would increase US agricultural imports from Mexico by 1.7% in the entire period. Results also show that during NAFTA, a 1 percent decrease in tariff rates would increase US agricultural imports from Mexico by 3.96 percent in the first six years of NAFTA and by 1.07 percent in the last six years of NAFTA. Overall impact would be 3.34 percent increase in US imports from Mexico for a 1 percent decrease in tariff rates. The US imports from Mexico have also been attributable to the pre NAFTA tariff rates. Higher pre NAFTA tariff levels would result in a higher percentage increase in US agricultural imports from Mexico as tariff rates are reduced. Similarly, US imports from ROW have also significantly been affected by tariff rates applied to ROW. The effect, however, is lower compared to Mexico. We also found that US agricultural imports from Mexico during NAFTA were approximately 53 percent higher than the entire period. Conversely, there is no ample evidence for such case in US imports from ROW.

Overall we conclude that there is significant evidence that the US-Mexico trade agreement under NAFTA has been trade creating rather than trade diverting. This finding is especially important given arguments by Caribbean and other countries that

U.S.-Mexico trade has diverted commercial sales. The extent to which these results may be applicable to other agreements, such as Central America – Dominican Republic, is limited since each case must be empirically verified.

Footnotes

[1] Initially, we planned to estimate import demand for Mexico from the United States. However, due to data availability, especially the tariff rates for agricultural products set by Mexican Government for US agricultural products and the rest of the world, this analysis was not done. If such data were available, we would have been able to assess the bilateral trade in a more complete setting. Because of such constraints, we focus on US imports of selected agricultural products.

[2] It is possible to define yearly dummy variable to see the year to year effect. However, this may cause severe collinearity problem. Besides, observing tariff effects in the early years may also be difficult. Therefore, by defining two regimes in the first 12 years of NAFTA is a reasonable one.

[3] Because all variables, except for dummy variables, are in log values, the parameter estimates show the elasticity, showing the percentage change in the dependent variable associated with a 1 percent change in the corresponding independent variable. Our interpretation of the coefficient of dummy variables is based on suggestions by Kennedy (1981). Suppose that $\hat{c}$ is the estimate of a dummy variable coefficient c, its effect on the dependent variable (which is in log value) is given by $g^* = \exp(\hat{c} - \frac{1}{2}v(\hat{c})) - 1$, where $v(\hat{c})$ is an estimate of the variance $\hat{c}$. See also Halvorsen and Palmquist (1980) for interpretation on the coefficient of dummy variables in semilogarithmic equations.

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Table 1. Effects of Tariff Rates and NAFTA on US Imports from Mexico

	Specification 1	Specification 2
Tariff Rates Mexico, α_2	-1.691(0.818)**	-3.733(0.742)***
DNAFTA, α_3	0.528(0.093)***	-
Tariff Rates x DNAFTA1[a], α_4	-2.268(1.357)*	-
Tariff Rates x DNAFTA2[a], α_5	0.621(1.709)	-
Tariff Dummy 1, α_6	-0.286(0.121)**	-0.161(0.118)
Tariff Dummy 2, α_7	-0.477(0.159)***	-0.529(0.159)***
Personal Consumption Exp., α_1	1.122(0.026)***	1.167(0.025)***
Intercept, α_0	-0.911(0.112)***	-1.010(0.112)***
R^2	0.58	0.58
F Statistics for Fixed Effects Test	69.76	67.27
Number of Time Series	66	66
Number of Cross Sections	35	35
Total observations	2310	2310

Numbers in parentheses are estimated standard errors. *, **, and *** are significant at 10%, 5%, and 1%, respectively.

[a]Tariff Rates Mexico x NAFTA Dummy as a means of measuring multiplicative effects, allowing tariff rates effect to differ during NAFTA period (see definition in the empirical model specification).

Table 2. Effects of Tariff Rates and NAFTA on US Imports from ROW

	Specification 1	Specification 2
Tariff Rates ROW, β_1	-1.541(0.764)**	-1.594(0.763)**
Tariff Rates Mexico, β_2	0.897(0.583)	0.799(0.576)
DNAFTA, β_3	0.104(0.093)	-
Personal Consumption Exp., β_4	2.061(0.093)***	2.315(0.218)***
Dummy Quarter 1, β_5	-2.767(0.917)***	-3.493(0.653)***
Dummy Quarter 2, β_6	-1.274(0.369)***	-1.564(0.265)***
Dummy Quarter 3, β_7	-0.687(0.121)***	-0.778(0.090)***
Intercept, β_0	-7.887(1.419)***	-9.974(1.006)***
R^2	0.76	0.76
F Statistics for Fixed Effects Test	176.97	176.82
Number of Time Series[a]	66	66
Number of Cross Sections	35	35
Total observations	2310	2310

Numbers in parentheses are estimated standard errors. ** and *** are significant at 5% and 1%, respectively. [a]After adjusting first order autocorrelation.

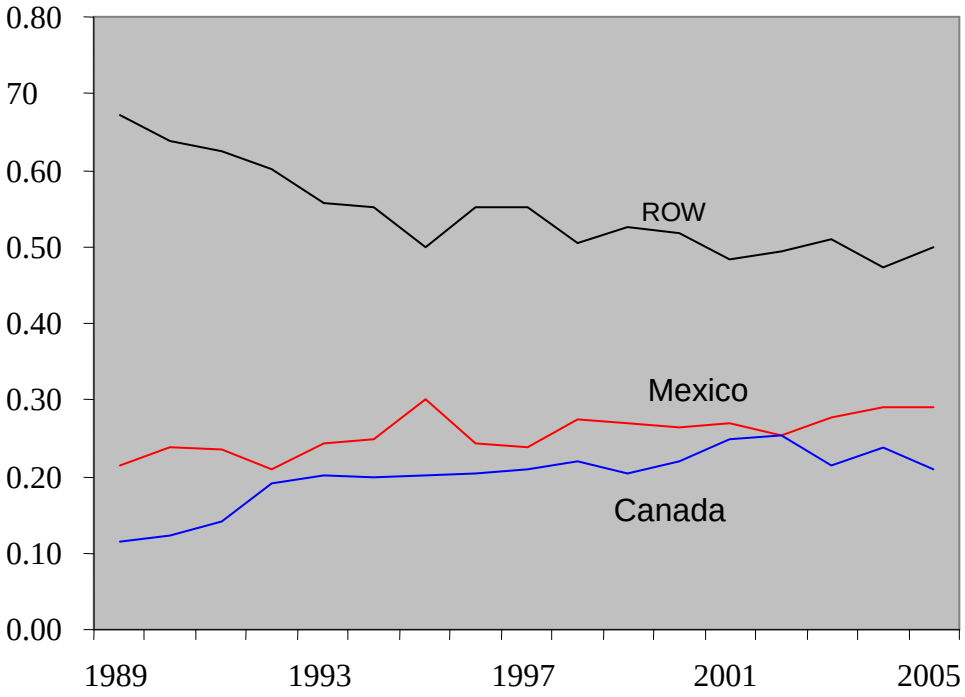

Figure1. Shares of US imports from Country of Origin

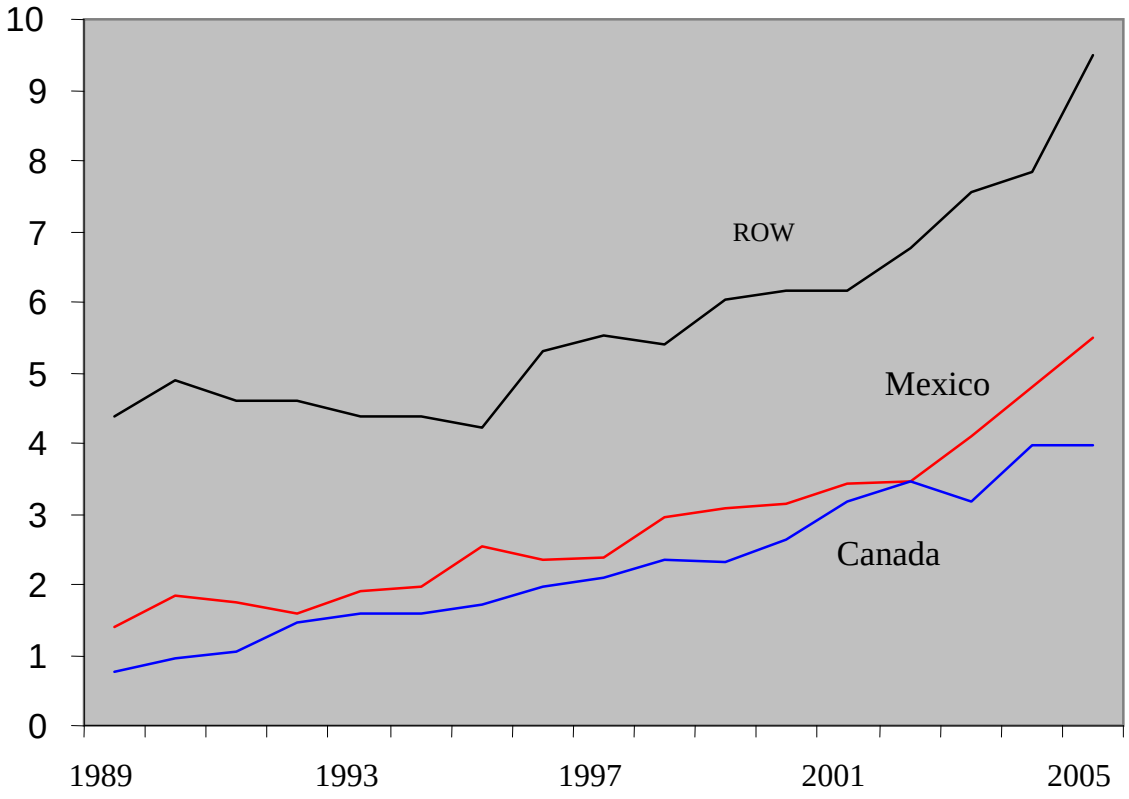

Figure 2. US Imports from Country of Origin ($ Billion)