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**Impacts of the U.S.-Central America-Dominican Republic Free Trade Agreement**

**(CAFTA-DR) on U.S. Fruit Exports – the Apple Case**

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**Impacts of the U.S.-Central America-Dominican Republic Free Trade Agreement  
(CAFTA-DR) on U.S. Fruit Exports – the Apple Case**

**ABSTRACT**

The U.S.-Central America-Dominican Republic Free Trade Agreement (CAFTA-DR) levels the playing field of trade between the United States and the six CAFTA-DR partner countries. Half of U.S. farm products gain immediate tariff-free access to the markets of the CAFTA-DR region. All tariffs will be eliminated in 20 years. Under CAFTA-DR, tariffs on an important U.S. fresh fruit export to the region, fresh apples, declined from an initial base of 15%-25% in CAFTA-DR countries to zero immediately upon enforcement. The specific objective of this research is to analyze the impact of tariff elimination under CAFTA-DR on the trade of U.S. fresh apples. Generalized Method of Moments (GMM) is used for the analysis involving an excess-supply-excess-demand model with monthly trade data from January 2000 to December 2010. The more telling empirical results indicate that for each of the six CAFTA-DR countries, tariff elimination positively promotes U.S. apple exports to this region.

**Key words:** CAFTA-DR, trade liberalization, tariff elimination, Generalized Method of Moments (GMM).

## **Introduction**

The U.S.-Central America-Dominican Republic Free Trade Agreement (CAFTA-DR) is a regional trade agreement designed to level the playing field between the United States and the six CAFTA-DR trade partners. It was designed to expand economic opportunities by eliminating tariffs, opening markets, promoting transparency and facilitating investment among its members. CAFTA-DR calls for eventual duty and quota free market access on essentially all products.

The agricultural sector is one of the most important aspects of the agreement. As the agreement takes effect with each country, more than half of U.S. farm exports gain immediate duty-free access to the area. Specifically, tariffs on U.S. fresh apples, an important U.S. fresh fruit export, were reduced from an initial base of 15%-25% in CAFTA-DR countries to zero immediately upon enforcement.

Unlike former regional integration in the 1950s and 1960s, which were mainly between countries with similar economic development, CAFTA-DR is the first FTA between the United States and a group of developing countries in the Caribbean Basin and perhaps a step toward the Free Trade Area of Americas. CAFTA-DR is one of the important tests of the complex political and economic integration across North and South America, given the fact that in no other geographically contiguous area of the world do we see such large disparities in sizes and levels of development among countries, coupled with such intense patterns of trade, investment, and labor market interdependence (Hinojosa-Ojeda 2003). Therefore, its achievement and lessons have important implications for other less-developed regions.

This research focuses on analyzing the effect of CAFTA-DR on U.S. fresh apple exports to the region. Through analysis involving an excess-supply-and-excess-demand model, we expect to identify how and to what extent tariff elimination affects trade. The next three sections review related literature, summarize the agreement and its benefits. The fifth section describes methodology and data sources. The last section presents empirical results and concludes.

### **Related Literature**

During the negotiation of the agreement, the U.S. International Trade Commission conducted an investigation using computable general equilibrium (CGE) models to assess the likely impact of the CAFTA-DR on the U.S. economy as a whole and on specific industrial sectors and the interests of U.S. consumers (USITC, 2004). This investigation comprehensively examined economywide impacts and concluded that the agreement benefits to U.S. exporters, but the overall impact on the U.S. economy is expected to be small because of the relatively small CAFTA-DR market size and low income levels. However, this study lacks detailed coverage of agricultural commodities. Other studies are generally descriptive. Hornbeck (2008) summarizes the impetus for the agreement and the trade relations between the United States and the six CAFTA-DR countries and gives descriptive analysis of the agreement's potential effect. Storrs et al. (2005) summarizes and explains each of the six countries' economic conditions.

Studies on the U.S. agricultural sector are generally descriptive in a broad sense and do not cover agricultural commodities in detail (Paggi et al. 2005; Paggi,

Yamazaki, and Josling, 2005). Studies on the Central America countries and the Dominican Republic pay more attention to rural welfare than trade liberalization (Morley, 2006; Morley, Nakason, and Pineiro, 2007; Taylor, Naude, and Jesurun-Clements, 2010).

Few studies analyze the impact of the CAFTA-DR after its enforcement. The Foreign Agricultural Service (FAS) fact sheet on the agreement (USDA, FAS, 2009) gives trade value changes but does not cover specific commodities. Taylor, Naude, and Jesurun-Clements (2010) analyze the impact of the agreement on the welfare of CAFTA-DR rural households and conclude that the agreement generates positive net effects on rural welfare despite reduced nominal incomes for rural households. The FAS early assessment of the agreement (USDA, FAS, 2010) also presents trade changes under the agreement but does not further analyze its correlation with tariff elimination. We believe an empirical analysis of actual bilateral trade change under CAFTA-DR would be helpful to better understand the actual impact of the agreement.

### **Summary of CAFTA-DR**

CAFTA-DR basically replaces U.S. unilateral preferential trade treatments extended to the CAFTA-DR countries under the Caribbean Basin Economic Recovery Act (CBERA), the Caribbean Basin Trade Partnership Act (CBTPA), and the Generalized System of Preferences (GSP). Though most of the trade commodities from CAFTA-DR countries already enjoy zero or low tariffs to the U.S. market under the above three free trade agreements, these preferential treatments are subject to termination and change at any time and could allow to be expired by doing nothing if

CAFTA-DR was not successfully implemented (Morley, 2006). CAFTA-DR makes the preferential access permanent, and further opens the U.S. market, especially the agricultural sector, to CAFTA-DR countries (USTR, 2011).

CAFTA-DR was implemented on a rolling basis. It took effect between the United States and El Salvador, Honduras, and Guatemala, respectively, in March, April, and July of 2006. The agreement entered into force for the Dominican Republic and Nicaragua in March and April of 2007, and Costa Rica joined in January 2009 (USDA, FAS, 2009). It calls for eventual duty and quota free market on essentially all goods. The agricultural sector is one of the most important aspects of the agreement. As the agreement takes effect with each country, more than half of U.S. farm exports gain immediate duty-free access to the area. Tariffs of other products will be phased out within 5 to 15 years, while sensitive commodities, which are important sources of income and/or main dietary staples, are given 5-10 years of grace to start tariff elimination. All tariffs are to be eliminated in 20 years (USTR, 2011).

Prior to the agreement, each CAFTA-DR country imposed high tariffs or restricted Tariff-Rate Quotas (TRQs) on U.S. agricultural goods. For example, U.S. fruit and nut goods faced an average import tariff of 15%, while The WTO permitted tariff bounds as high as 138% on certain fresh fruits. This placed U.S. fruits at a disadvantage relative to fruits from Argentina, Chile, and Mexico. CAFTA-DR levels the playing field between the United States and the CAFTA-DR partner countries. More than 70% of U.S. fruit and nut products gained immediate zero-tariff access to the region upon enforcement. Specifically, tariffs on U.S. fresh apple exports (HS

code 08081000) were reduced from an initial base of 15% in Costa Rica, El Salvador, Honduras, and Nicaragua, 20% in the Dominican Republic, and 25% in Guatemala to zero immediately upon enforcement (USTR, 2011). This tariff reduction is considerable especially given the relatively large trade volume of fresh apples and growth potential.

### **Benefit of CAFTA-DR**

The CAFTA-DR partner countries are basically small countries with small populations and economic resources with some differences in level of development (Table 1). However, combined, Central America and the Dominican Republic are top markets for U.S. agricultural goods. The CAFTA-DR region is currently the 12th largest goods trading partner with \$48 billion total two-way goods trade during 2010, 8th if EU countries and NAFTA countries are respectively grouped as one entity. Trade between the United States and the CAFTA-DR partners has been increasing especially after the agreement. The total value of U.S. bilateral trade with the six CAFTA-DR partners increased 37% from 2005 to 2010, from \$35 billion to \$48 billion. U.S. exports to the region grew 43% from 2005 to 2010 reaching a record level of over \$24 billion which was very favorable compared to the 25% growth experienced during the five-year (2001-2005) period before the agreement. U.S. agricultural exports to the region have increased on average 85% since 2005, reaching over \$4.2 billion in 2010 with a surplus of \$460.5 million. Specifically, U.S. agricultural exports were up 72% for Costa Rica, 98% for the Dominican Republic, 80% for El Salvador, 76% for Guatemala, and 91% for Nicaragua in 2010 from 2005



(Figure 1). The CAFTA-DR countries represent the third largest U.S. export market in Latin America, behind Mexico and Brazil. Intermediate and consumer-ready goods, including fresh fruits, are becoming more prominent in CAFTA-DR countries (Paggi et al., 2005). During the first five-year period of CAFTA-DR (2005-2010), total U.S. fresh fruit exports to the region increased on average 139%, from more than \$5 million to more than \$12 million (Figure 2). As one of the top five apple producers, the United States takes a substantial share of the CAFTA-DR apple markets – its share of total world apple exports to this region varies from 30% to 60% in different countries in different years (UN Comtrade).

CAFTA-DR provides U.S. farmers and ranchers access to more than 48 million consumers. The six CAFTA-DR countries have a combined gross domestic product (GDP) valued at \$170 billion and per capita GDP ranging from \$ 1,096 to \$7,350 in 2010. The CAFTA-DR countries have been experiencing sustained strong economic growth. The growing domestic demand and rising income in these countries are stimulating U.S. agricultural exports (Meade, Muhammad, and Rada, 2011). The CAFTA-DR regional economy has almost doubled since 1990, and is expected to expand another 65% by 2020. By 2020 the region's primary source of growth for U.S. exports will be the middle class which is expected to account for 40% of households in the CAFTA-DR countries, up from just 24% in 2000. The expected growth of the middle class and the concomitant increase in food demand and retail food purchases imply new export opportunities for U.S. food and agricultural producers (USDA, FAS, 2006).

## Methods and Data

The focus of this research is to estimate the impact of tariff reduction on U.S. fresh apple exports to the CAFTA-DR region. An excess-supply-and-excess-demand model with Generalized Method of Moments (GMM) estimation is used. Monthly trade data from January 2000 to December 2010 are used to analyze the impact of tariff elimination.

U.S. excess supply of apples to each CAFTA-DR country can be modeled as an allocation decision made by U.S. producers. Thus, the quantities of apples exported to each CAFTA-DR country are assumed to be a function of U.S. apple production, U.S. domestic prices, tariff level and the prices of U.S. apples exported to the CAFTA-DR country and to the rest of the world (ROW), respectively. Apples are marketed throughout the year, but the harvest season is primarily during August to October, and the usually peak marketing season is from September to December (USDA, NASS, 2006). In order to account for this marketing seasonality, we add a seasonality dummy variable for the months from September to December. Thus, the excess supply equation for each CAFTA-DR partner country is

$$(1) \quad Q_{usexp} = f(\text{Produx}, P_{usexp}, P_{us}, P_{usrow}, \text{Tariff}, D_s),$$

where

$Q_{usexp}$  = quantity of U.S. apples exported to the country,

$\text{Produx}$  = U.S. apples cold storage as proxy for production,

$P_{usexp}$  = price of U.S. apples exported to the country,

$P_{us}$  = U.S. domestic fresh market apple price,

Pusrow = price of U.S. apples exported to ROW,

Tariff = a dummy variable that accounts for the elimination of the tariff on U.S. apples,

and

Ds = U.S. apple production seasonality dummy for September to December.

We expect the quantity of U.S. apples exported to each CAFTA-DR country to be positively related to U.S. production, seasonality, the export price to CAFTA-DR countries and tariff elimination, and negatively related to U.S. domestic price and ROW the export price. The expected positive sign on the tariff elimination dummy represents an expected structural shift in supply as a result of the free trade agreement. The expectation goes beyond traditional static trade theory where the incidence of a tariff or elimination of a tariff is determined from static excess supply and demand curves (Koo, and Kennedy, 2005).

The CAFTA-DR countries produce none or very few apples domestically, so we specify the quantity of U.S. apples demanded by each CAFTA-DR country as a function of the country's income level, and the price of U.S. apples exported to the country and U.S. competitor price. However, for estimation the inverse functional form is used (Ferris, 2005). Each CAFTA-DR country's excess demand equation for U.S. fresh apples is

$$(2) Q_{usexp} = f(P_{usexp}, P_{comp}, GDP),$$

where

$Q_{usexp}$  = quantity of U.S. apples exported to the country,

$P_{usexp}$  = price of U.S. apples exported to the country,

$P_{comp}$  = Price of U.S. competitor APPLES exported to the country, and

GDP = the country's real GDP.

We expect the quantity of U.S. apples demanded by each CAFTA-DR country to be positively affected by income level and U.S. competitor price, and negatively related to the price of U.S. apples exported to the country.

#### *Data Sources*

Monthly U.S. apple exports to each CAFTA-DR country and to ROW in quantities, values, and thus prices are from the USDA, FAS Global Agricultural Trade System dataset. Quantities of U.S. monthly fresh apples in cold storage as a proxy for production are from the USDA, NASS *Cold Storage Annual Summary*. Monthly apple prices received by U.S. growers are from the USDA, NASS Data and Statistics dataset. Annual quantities, values, and therefore prices of ROW apples exported to CAFTA-DR countries are from the UN Commodity Trade Statistics database. These prices are used as a proxy for U.S. competitor prices. Income data (GDP) are from the IHS Global Insight database for Costa Rica, Guatemala, and Honduras, and from central banks for the Dominican Republic, El Salvador, and Nicaragua. Nominal GDP is converted to constant (2005) U.S. dollars using real exchange rates from the USDA, ERS Agricultural Exchange Rate dataset. Tariff changes under the CAFTA-DR are obtained from the Office of U.S. Trade Representative website for CAFTA-DR. All prices are deflated by the U.S. Consumer Price Index from USDL, BLS.

#### *Econometric Considerations*

Quarterly GDP are converted into monthly data using cubic spline interpolation

(Chamberlain Economics, 2010). The quantity of apples exported to each of the six countries is small compared to total U.S. apple exports to the world (less than 1%), thus it is very unlikely that such small quantities can impact U.S. domestic or ROW prices. For the excess supply equation the U.S. export price ( $P_{usexp}$ ) to CAFTA-DR is the instrumented variable, while for the inverse excess demand equation U.S. export quantity ( $Q_{usexp}$ ) to CAFTA-DR is the instrumented variable in a GMM model with heteroskedasticity-autocorrelation (HAC) robust standard errors to address the endogeneity problem.

### **Empirical Results**

For the excess supply equation the estimation results are generally consistent with expectations. The coefficient signs for the price of U.S. apple exports ( $P_{usexp}$ ) to CAFTA-DR countries are positive except for Guatemala. However, the only significant coefficient is for Costa Rica, by far the most affluent of the CAFTA-DR countries on a per capita income basis. The own-price supply elasticity for Costa Rica is 6.42. Coefficients for U.S. production ( $Produs$ ) are positive and significant across all countries showing a strong ebb and flow pattern of exports with U.S. production. The U.S. production elasticity with respect to excess supply ranges from 0.62 to 1.28. The coefficient for the domestic price of U.S. apples ( $P_{us}$ ) has the correct negative sign across the board but is significant for only three CAFTA-DR countries. The elasticity for the U.S. domestic apple price with respect to excess supply ranges from -0.61 to -0.99 for the countries with significant coefficients. The coefficient for the U.S. price to the rest of the world ( $P_{usrow}$ ) has the correct negative sign and is

significant for the three more affluent CAFTA-DR countries. For the remaining countries the coefficient is not significant. The elasticity for the U.S. price to the rest of the world with respect to excess supply ranges from -1.46 to -8.47 for the countries with significant coefficients. The coefficient for the seasonal dummy (Ds) has the correct positive sign and is significant for all of the CAFTA-DR countries except Honduras, one of the less affluent countries. Finally, the coefficient for the tariff dummy (Tariff) is consistent across all CAFTA-DR countries with the expected positive sign and significant. Thus, the free trade agreement has resulted in positive shifts in supply ranging from 27% to 1,405%, depending on the CAFTA-DR country. The two most correctly consistent explanatory variables in the excess supply equation are U.S. production (Produx) and the tariff dummy (Tariff).

For the inverse excess demand equation the estimation results are mixed except with respect to the income variable. The coefficient for the quantity of U.S. apple exports (Qusexp) is correctly negative and significant for the two more affluent countries, Costa Rica and the Dominican Republic. The price flexibilities for quantity of U.S. apple exports for Costa Rica and the Dominican Republic are -0.03 and -0.05, respectively. The coefficient for the price of competing apples (Pcomp) is positive as expected and significant except in the case of El Salvador. El Salvador aside, the price flexibilities for the price of competing apples range from 0.18 to 0.51. The coefficient for the income variable (GDP) is positive and significant across the board, indicating the importance of continued economic growth in the CAFTA-DR countries for expanding U.S. apple exports. Price flexibilities for the income variable range from

0.05 to 9.15. The findings regarding the importance of economic growth are consistent with USDA, FAS (2006) projections as well as the conclusions of Meade, Muhammad, and Rada (2011).

### **Conclusions**

As the first free trade agreement involving a developed country and a group of less-developed countries in the Caribbean Basin, and perhaps a step toward the Free Trade Area of Americas, the CAFTA-DR is one of the most important tests for trade liberalization among countries with large disparities in size and development level. We developed an excess-supply-and-excess-demand model to analyze the impact of tariff elimination on U.S. apple exports to the region. The Generalized Methods of Moments (GMM) with HAC standard errors was used for the analysis.

The estimation results show strong positive relationship between tariff elimination and the growth of U.S. apple exports to each of the six partner countries. Going beyond traditional static trade theory, the analysis shows substantial structural change in excess supply as a result of the free trade agreement. Another finding was that income level in each of the six countries plays a major positive role in expanded U.S. apple exports.

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**Table 1.** Economic indicators of CAFTA-DR countries, 2010

| Indicators              | Costa Rica | Dominican |             |
|-------------------------|------------|-----------|-------------|
|                         |            | Republic  | El Salvador |
| Population (million)    | 4.64       | 10.23     | 6.19        |
| GDP (billion U.S.\$)    | 35.01      | 50.87     | 21.80       |
| GDP per capita (U.S.\$) | 7,350      | 5,152     | 3,717       |
| Real GDP Growth (%)     | 3.8%       | 5.5%      | 1%          |
| Inflation               | 5.6%       | 6.9%      | 1.1%        |

| Indicators              | Guatemala | Honduras |           |
|-------------------------|-----------|----------|-----------|
|                         |           | Honduras | Nicaragua |
| Population (million)    | 14.38     | 7.62     | 5.82      |
| GDP (billion U.S.\$)    | 40.77     | 15.34    | 6.38      |
| GDP per capita (U.S.\$) | 2,839     | 2,015    | 1,096     |
| Real GDP Growth (%)     | 2.4%      | 2.4%     | 3%        |
| Inflation               | 3.9%      | 4.6%     | 5.7%      |

Source: The World Bank, World Development Indicator Database.

**Table 2.** Definition of Variables for the Estimation Model

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| Variable | Definition  |
|----------|---|
| Qusexp   | Quantity of U.S. apples exported to the CAFTA-DR country (10, 000MT)              |
| Pusexp   | Price of U.S. apples exported to the country ( U.S.\$/ kg)                        |
| Pus      | U.S. domestic fresh market apple price (U.S.\$/kg)                                |
| Pusrow   | Price of U.S. apples exported to ROW (US\$/kg)                                    |
| Pcomp    | Price of U.S. competitor apples exported to the country (U.S.\$/kg)               |
| Produx   | U.S. apple cold storage as proxy for production (100 MT)                          |
| Tariff   | The country's tariff on U.S. apples, dummy variable, 1 if no tariff, 0 otherwise. |
| Ds       | U.S. apple production seasonality dummy, 1 if September to December, 0 otherwise. |
| GDP      | The county's real GDP (billion U.S.\$)  |

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Note: Prices and GDP are in 2005 U.S. dollars.

**Table 3.** Estimation Results for U.S. Apples Exported to CAFATA-DR

| Excess Supply <sup>a</sup> |                          |                          |                           |                           |                          |                             |
|----------------------------|--------------------------|--------------------------|---------------------------|---------------------------|--------------------------|-----------------------------|
| Variables                  | Costa Rica               | Dominican Republic       | El Salvador               | Guatemala                 | Honduras                 | Nicaragua                   |
| Constant                   | 7.182588**<br>(2.180184) | 5.493602<br>(4.488366)   | 5.805382**<br>(1.183898)  | .2913387<br>(1.232547)    | -6.763564<br>(5.496116)  | -.2184831<br>(.3470891)     |
| Pusexp                     | 37.41688**<br>(6.641231) | 6.599576<br>(11.57917)   | .523112<br>(1.740023)     | -5.508593<br>(5.808305)   | 10.35822<br>(11.27739)   | .5859783<br>(.597955)       |
| Produx                     | .0287066**<br>(.002942)  | .039147**<br>(.0035013)  | .0163163**<br>(.0013664)  | .0498956**<br>(.0058263)  | .037026**<br>(.0087142)  | .0039601**<br>(.0007247)    |
| Pus                        | -.1865559<br>(2.591064)  | -4.137254<br>( 2.593359) | -3.740503**<br>(1.771935) | -5.756148**<br>(1.717546) | -1.604146<br>(2.227258)  | -.9674809 **<br>( .2199413) |
| Pusrow                     | -43.9738**<br>(5.656992) | -14.25158*<br>(8.50361)  | -5.93762**<br>(2.400393)  | 4.259115<br>(2.586347)    | -2.779277<br>(2.625474)  | .0150133<br>(.2787671)      |
| Ds                         | 4.716478**<br>(.3891341) | 7.083273**<br>(1.218299) | 3.215157**<br>(.4718504)  | 1.734725**<br>(.245471)   | -.5377155<br>(1.288997)  | .3723362**<br>(.1033823)    |
| Tariff                     | 3.233618**<br>(.8553017) | 5.143645**<br>(.8573558) | 2.07553**<br>(.7166625)   | 4.093588**<br>(.8611898)  | 1.852865**<br>(.7992352) | .5866127**<br>(.1503533)    |

Table 3 continued

| Inverse Excess Demand <sup>b</sup> |                           |                           |                           |                          |                          |                          |
|------------------------------------|---------------------------|---------------------------|---------------------------|--------------------------|--------------------------|--------------------------|
| Variables                          | Costa Rica                | Dominican Republic        | El Salvador               | Guatemala                | Honduras                 | Nicaragua                |
| Constant                           | .3110615**<br>(.0355481)  | .6983507**<br>(.0326978)  | -.0912919**<br>(.0176248) | .0129193<br>(.0294878)   | .4917722**<br>(.0708074) | .138318**<br>(.0342562)  |
| Qusexp                             | -.0045097**<br>(.0008298) | -.0066925**<br>(.0009164) | .0083706**<br>(.0010966)  | .0058531**<br>(.0004265) | .0063631**<br>(.0014763) | .0041927<br>(.0094044)   |
| Pcomp                              | .4615512 **<br>(.0656037) | .252967**<br>(.0379848)   | -.5472098**<br>(.0373647) | .5448919**<br>(.0628773) | .3197977**<br>(.1367884) | .614909**<br>(.0864882)  |
| GDP                                | .0727695**<br>(.0065688)  | .0067456**<br>(.0018151)  | 5.760931**<br>(.1228029)  | .1036829**<br>(.0044013) | .0962782**<br>(.0186279) | .6110623**<br>(.0848403) |

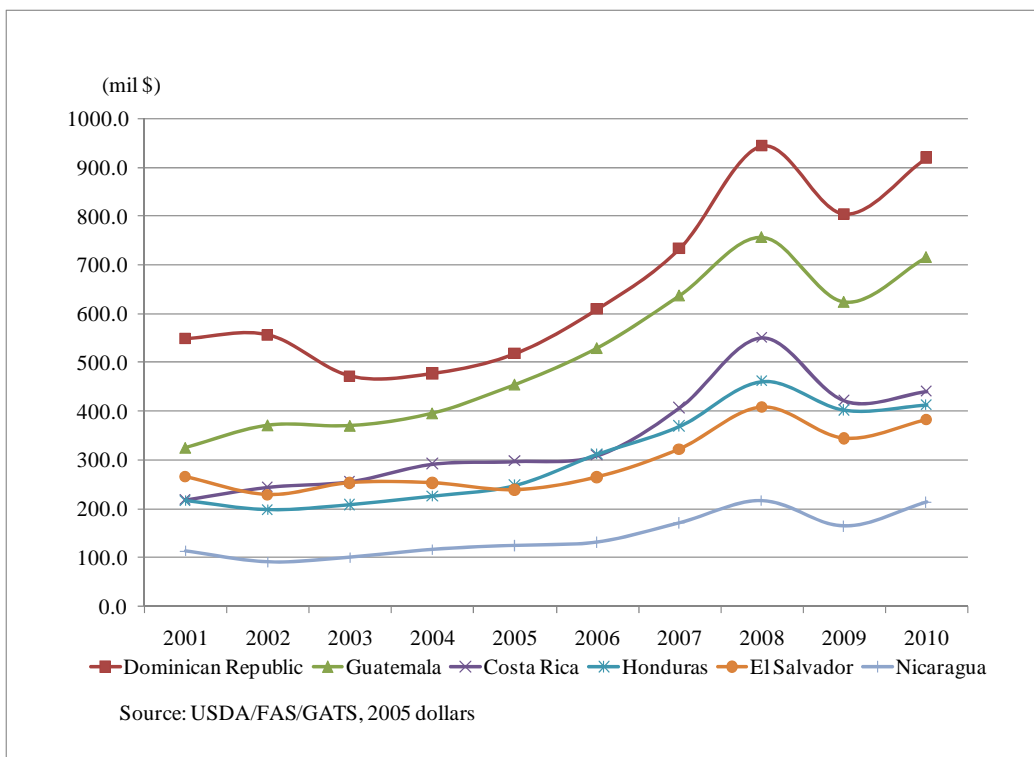
Note:

\*\*Significant at the 5% level, \*significant at the 10% level.

Numbers in parentheses are HAC standard errors of the estimated parameters.

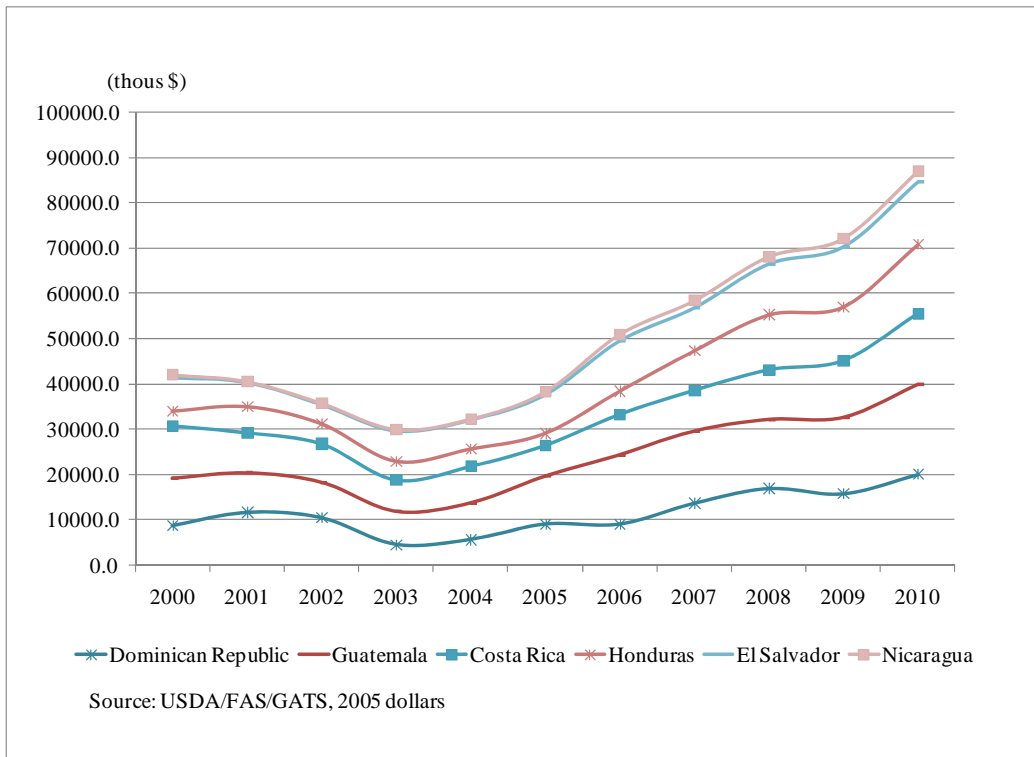
<sup>a</sup> The instrumented variable is Pusexp and the instruments are Probus, Pus, pusrow, ds, tariff, pcomp, and gdp.

<sup>b</sup> The instrumented variable is Qusexp and the instruments are Pcomp, GDP, probus, pus, pusrow, ds, and tariff.



**Figure 1.** U.S. Agricultural Exports to CAFTA-DR, 2000-2010





**Figure 2.** U.S. Fresh Fruit Exports to CAFTA-DR, 2000-2010