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# **Analysis of the impact of dollarization and CAFTA-DR on El Salvador's Trade Flows**

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# **Analysis of the impact of dollarization and CAFTA-DR on El Salvador's Trade Flows**

**Luis Sandoval, Jaime Malaga and Carlos Carpio**

## **Introduction**

In January of 2001, El Salvador adopted the U.S. dollar as its currency, going through a full dollarization process that fixed the exchange rate at 8.75 *colones* (El Salvador's former currency) per U.S. dollar and that took the *colón* out of circulation. The process of dollarization was surrounded by both high expectations and criticisms. The economic sectors that favored the process argued that dollarization would reduce inflation, increase trade and attract international investment among others benefits. Those that criticized it argued that El Salvador would not only lose the ability to manage its own monetary policy but it would mean a loss of identity.

Later, in 2005, El Salvador signed CAFTA-DR which is a bilateral trade agreement between the United States and five Central American countries and the Dominican Republic. The signing of this agreements also had supporters and detractors. Those in favor of the process argued that it would be good for the economy through the boost of the exports to the United States. On the other hand, several economic and business groups expressed concerns about the ability of the local industry to compete with the U.S. imports.

Although several studies were conducted to evaluate the potential benefits of these two events on El Salvador's Trade flows, studies evaluating the actual impact of these events are very limited. Thus, the main objective of this study is to evaluate the impact of both dollarization and CAFTA-DR in El Salvador's bilateral trade.

## **Literature Review**

### *Dollarization and trade*

According to Alesina and Barro (2001) there are two main arguments against dollarization: national pride (important countries are supposed to have their own currency) and the loss of monetary policy. The main argument favoring dollarization is a decrease in transaction costs. In the case of El Salvador, supporters argued at the time, using dollars would definitely facilitate trade of goods and services not only with its main trade partner, the United States, but also with any other country that also used the U.S. dollar, such as Ecuador and Panama.

Academic studies conducted previously to the dollarization process supported the view of those favoring dollarization in El Salvador. For example, according to a study conducted by Rose (2000) countries that share the same currency are likely to trade up to three times more than they would if they had different currencies. There are several potential explanations to the positive effect of dollarization on trade. Rose (2000) suggested that having a common currency commits governments to long term integration which boosts the confidence of the private sector to invest more in trade. A common currency also implies financial integration, which lowers the cost of trading. Finally, increases in trade had been found to have important benefits for the population. Frankel and Romer (1999) estimated that increasing the trade to Gross Domestic Product (GDP) ratio by 1% increases the income per capita between 0.5 and 2%, which seems like a reasonable welfare gain to justify pro- trade policies.

## *CAFTA-DR*

The CAFTA-DR is a free trade and economic integration agreement between five Central America countries (Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua), the Dominican Republic and the United States. It was signed on August 5 of 2004 and entered into force in March 1<sup>st</sup> of 2006 in El Salvador and in different dates thereafter for each country (WTO 2014). For the United States, this was the first time signing a free trade agreement with a group of developing economies (Office of the United States Trade Representative, 2014).

The expected benefits for Central America were an easier access to their main export market (the United States), greater direct investment, and a strengthening of the institutions related to trade and investment (Ayhan, Rebucci and Schipke 2005). The treaty immediately reduced the tariffs of more than 80% of non-agricultural and non-textiles U.S. exports. Tariffs on other products would experience gradual reductions varying from 5 to 20 years. It is important to mention that Central American exports to the United States had already preferential treatment as result of the Central America Basin Initiative (CBI).<sup>1</sup> Moreover, previously to CAFTA-DR El Salvador had been working to reduce import/export tariffs. During the 1980s the average tariff was 20.3 percent, during the early 1990s were 11.3 percent and by 1999 tariffs had reach an average of 5.7% (Ayhan, Rebucci and Schipke 2005).

### **Conceptual Framework**

The gravity model is one of the tools most commonly used to study international trade flows. For example, gravity models have been used to estimate the impact on trade of trade

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<sup>1</sup> The CBI was a program that entered into force on January 1<sup>st</sup> of 1984, intended to help the economic recovery of the Central America Basin. The program gave Central American products tariff free access to the U.S. market, Puerto Rico and the Virgin Islands. CAFTA-DR granted Central America even more access to the U.S. market.

agreements, common currencies, language, common colonizer and exchange rate volatility among others (Baldwin & Taglioni 2006).

The origins of the gravity model are attributed to Tinbergen (1962), Poyhonen (1963) (Baldwin & Taglioni 2006; Rose 2000) and Linnemann (1966) (Baldwin & Taglioni 2006). The name of the model and its fundamentals come from the law of gravity, which states the force of attraction of two objects is proportional to the product of their masses ( $M_1$  and  $M_2$ ) divided by their squared distance ( $d_{12}$ ) (Baldwin & Taglioni 2006). The main equation underlying the force of gravity is:

(1)  $force\ of\ gravity = \frac{M_1 M_2}{(d_{12})^2}$  where  $M_1$  and  $M_2$  are the masses of the objects and  $d_{12}$  is the distance separating the centers of the objects.

In economics we replace the force of gravity with the monetary value of bilateral trade and the masses with the GDPs of the countries of interest. More specifically, we can use the following specification that follows the idea of the gravity model (Bergstrand, 1985)

$$(2) \quad PX_{ij} = \beta_0 (Y_i)^{\beta_1} (Y_j)^{\beta_2} (D_{ij})^{\beta_3} (A_{ij})^{\beta_4} u_{ij},$$

where:  $PX_{ij}$  is the value of the trade flow from country  $i$  to country  $j$  in U.S. dollars,  $Y_i$  is the dollar value of country  $i$  GDP,  $Y_j$  is the dollar value of country  $j$  GDP,  $D_{ij}$  is the distance from the economic center of country  $i$  to country  $j$  and  $A_{ij}$  are other factors that promote or restrict trade.

Equation 2 constitutes the basis of any gravity empirical model for trade analysis. In addition, a log transformation of Equation 2 is used in empirical models in order to facilitate estimation of the  $\beta_i$  parameters ( $i=1, \dots, 4$ ). It is expected that the parameter estimate of country  $i$

$(\beta_1)$  and  $j$  ( $\beta_2$ ) GDPs to have positive sign since increases in income should increase trade between the two countries. The parameter estimate of distance is expected to have a negative sign ( $\beta_3$ ) since greater distance increases transportation costs and complicates communication and knowledge of trade regulations. When the gravity models include any  $A_{ij}$  variables, they are often referred as augmented gravity models and their sign is ambiguous since it would depend on what is being evaluated. The specific  $A_{ij}$  variables of this research are dollarization and CAFTA-DR.

## Methods and Procedures

### *Empirical Model*

To evaluate the impact of dollarization and CAFTA-DR in El Salvador's trade flows we used the following empirical model:

(3)

$$\ln(T_{ES,j})_t = \beta_0 + \beta_1 \ln(GDP_{ES,t} * GDP_{j,t}) + \beta_2 \ln(GDPpc_{ES,t} * GDPpc_{j,t}) + \beta_3 \ln Dist_{ES,j} \\ + \beta_4 Dollar_{ES,j,t} + \beta_5 FTA_{ES,j,t} + \beta_6 Cont_{ES,j} + \beta_7 Language_{ES,j} + \varepsilon_{ES,j,t}.$$

where:

Table 1. Variables of El Salvador country specific gravity model.

Variable	Description
$\ln(T_{ES,j})_t$	Natural log of El Salvador's imports or exports.
$\ln(GDP_{ES,t} * GDP_{j,t})$	Natural log of El Salvador and country j GDPs.
$\ln(GDPpc_{ES,t} * GDPpc_{j,t})$	Natural log of the product of El Salvador and country j per capita GDPs.
$\ln Dist_{ES,j}$	Natural log of the distance from San Salvador to country j's capital city.
$Dollar_{ES,j,t}$	Dummy variable that indicates dollarization.
$FTA_{ES,j,t}$	Dummy variable that indicates the presence of CAFTA-DR.
$Cont_{ES,j}$	Dummy variable that indicates if country j has a common border with El Salvador.
$Language_{ES,j}$	Dummy variable that indicates if El Salvador and country j both speak Spanish.

The model initially also included the variable common colonizer, which was a dummy variable that indicated if El Salvador and country j where both colonized by Spain. However, this variable contained the exact same information as the variable Language causing a perfect multicollinearity problem; hence, it was eliminated from the model.

It is expected for the parameter signs to be positive for GDP, GDP per capita, contiguity and language; distance is expected to be negatively signed. According to the economic literature, dollar and CAFTA-DR are expected to positively affect trade.

Notice that the empirical model differs slightly from the theoretical model. After reviewing the work of other authors (Rose 2000; Rivera 2007 and Valarezo 2008) it was decided that the empirical shown above was the most appropriate country specific gravity model to evaluate the impact of dollarization and CAFTA-DR on El Salvador's trade flows.



## *Data*

The study uses trade data from the period 1994 to 2013 between El Salvador and 13 other countries the United States, Guatemala, Mexico, China, Honduras, Costa Rica, Ecuador, Brazil, Panama, Venezuela, Japan, Nicaragua and Germany. These countries account for about 80% of El Salvador's bilateral trade.

Imports and exports data were obtained from El Salvador's Central Bank of Reserve. GDP and GDP per capita were obtained from the World Bank's World Development Indicators (2014). Information about distance between capital cities, language and contiguity were obtained from Jon Haveman's International Trade Data. Since the GDP data obtained from the World Bank is expressed in constant 2005 prices exports and imports were also deflated to 2005 prices using the U.S. consumer price index.

## *Econometric procedures*

Gravity models can be estimated using panel or cross sectional data. The difference in using panel data over cross sectional data is that the first one allows more modeling flexibility for the researcher (Greene 2011). Hence, the gravity model described in the previous sub-section was estimated using panel data.

The basic framework for analyzing panel data can be described using the following equations:

$$y_{it} = x'_{it}\beta + z'_i \alpha + \varepsilon_{it}$$

where  $x_{it}$  is a  $k \times 1$  vector of repressors excluding the constant term, the vector  $z_i$  contains a set of observable or unobservable time invariant variables that account for the heterogeneity of the individual effects, and  $\beta$  and  $\alpha$  are parameter vectors. Three model structures were used in this

research: pooled regression, fixed effects and random effects. Pooled regression assumes that  $z_i$  contains only a constant term. Fixed effects assumes that  $z_i$  is unobserved but correlated with  $x_{it}$ .

The fixed effects can be written as:

$$y_{it} = x'_{it}\beta + \alpha_i + \varepsilon_{it},$$

where  $\alpha_i$  includes all the observable effects ( $z'_i \alpha$ ) and is a group of constant specific parameters in the regression.

Finally, the random effects model assumes that individual heterogeneity is not correlated with  $x_{it}$  and takes the form the following form:

$$y_{it} = x'_{it}\beta + \alpha + u_i + \varepsilon_{it}$$

$$y_{it} = \alpha + x'_{it}\beta + w_{it},$$

thus, the random effect model has the form of a linear regression with a compound disturbance with  $w_{it} = u_i + \varepsilon_{it}$

## **Findings**

### *Descriptive statistics*

We first explore the historic evolution of El Salvador's trade flows (Figure 1) from 1994 to 2005. As shown in the figure 1, El Salvador has been running a trade deficit during the entire period of study. In addition, the deficit has been increasing through time. Moreover, it is not evident from the graph any major changes in imports and exports due to Dollarization and/or CAFTA-DR.

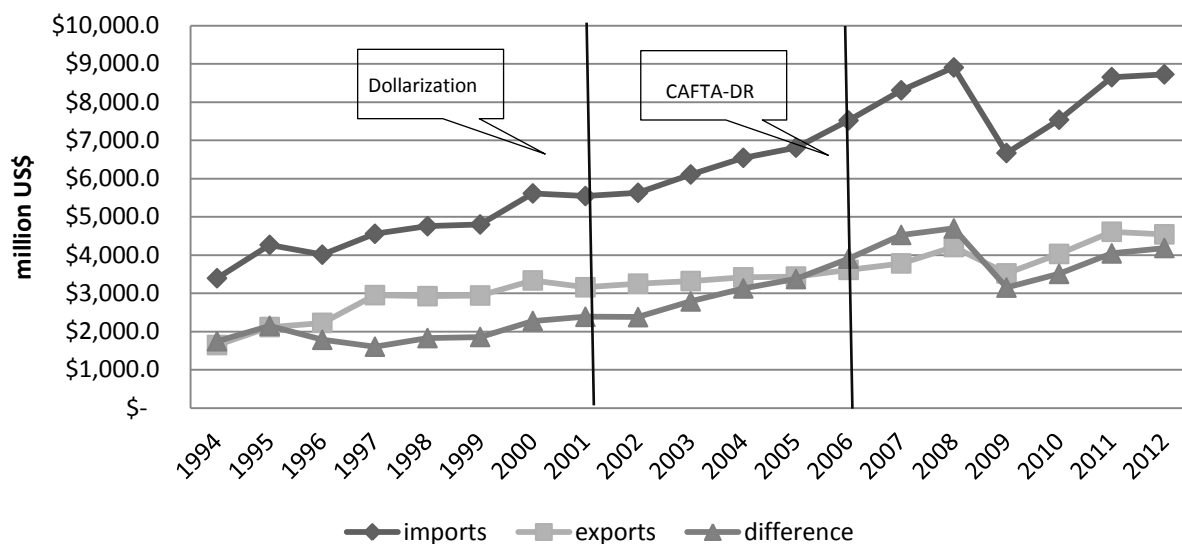


Figure 1. El Salvador's imports and exports from 1994 to 2012 (2005 US dollars).

We also explore the evolution of El Salvador's total trade with selected countries: the United States, its main trade partner; Guatemala and Honduras that share common border and language, and, Panama and Ecuador that have also adopted the U.S. dollar as its currency. As before, it is not evident from the graph any major effect of Dollarization and CAFTA-DR on the trade patterns with these countries. In the case of Panama and Ecuador there seems to be a slight increase in trade with El Salvador; however from the graph it is difficult to argue if it is significant or not.

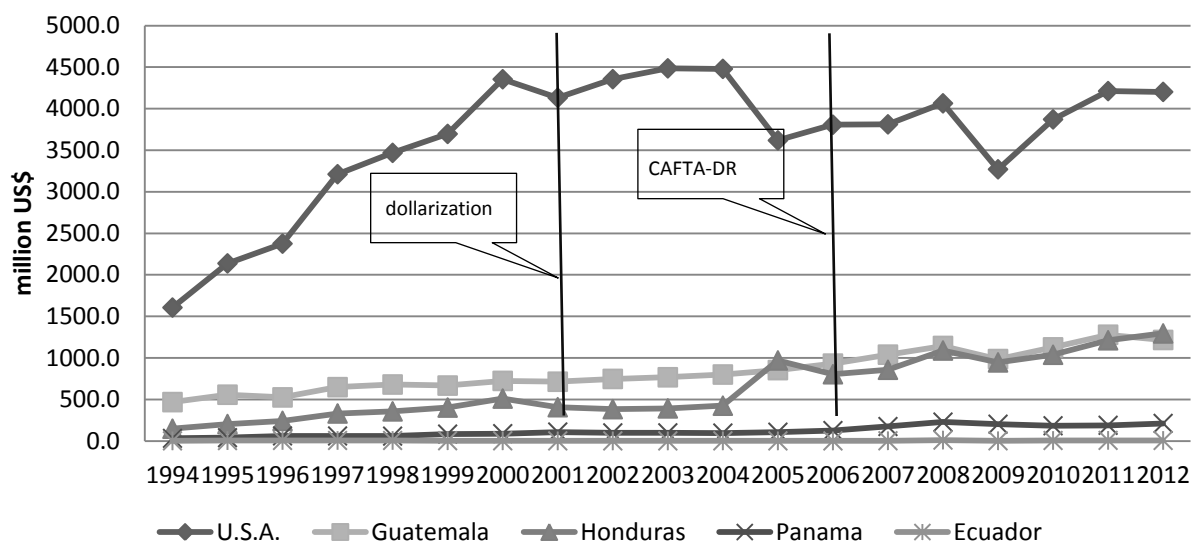


Figure 2. El Salvador's bilateral trade for selected countries (2005 US dollars).

### *Estimation results and discussion*

To evaluate the impact that the dollarization and CAFTA-DR have had on El Salvador's trade flows imports and exports were evaluated separately. Because panel data was available, three models were estimated for imports, and three models were estimated for exports. The models estimated were pooled, fixed effects and random effects models. To evaluate what model was better suited to estimate the impact that dollarization and CAFTA-DR have had on El Salvador's trade flows we conducted F-tests and Hausman tests. The F-tests test the hypothesis that the group effects and time effects are equal to zero. Thus, if we fail to reject the null hypothesis it is not necessary to estimate fixed effects because the pooled model is an efficient estimator. On the other hand, rejection of the null hypothesis provides evidence that there are indeed fixed effects. The Hausman test helps to choose between the fixed effects and random effects models. Under the null hypothesis the parameter estimates of the random effects are consistent and efficient while the parameter estimates of the fixed effects model are consistent

but inefficient. If the null hypothesis holds, the random effects model should be used, if rejected, the fixed effects model is the one that should be used (SAS 2015)

When modeling El Salvador's imports the F-test was significant, resulting in the rejection of the null hypothesis of no fixed effects. The Hausman test also resulted in the rejection of the null hypothesis indicating that the model best suited for evaluating the impact of dollarization and CAFTA-DR in El Salvador imports is the fixed effects model. Estimation results using the three alternative models are shown in table 2.

Table 2. Parameter estimates for El Salvador's imports.

Variable	Pooled model	Fixed effects model	Random effects model
Intercept	6.3479 (0.9086)	-17.9843 (6.4427)	-21.7307 (2.8613)
Log of GDP	0.5183* (0.0360)	1.7676* (0.6981)	-0.1300 (0.1547)
Log of GDP per capita	0.1254* (0.1254)	0.1827 (0.7194)	1.7014* (0.2365)
Log of distance	-0.9950* (0.0707)		
Dollarization	0.7658* (0.1029)	-0.2802* (0.1262)	-0.0299 (0.1237)
CAFTA-DR	0.2510* (0.1125)	-0.1223 (0.1173)	0.0699 (0.0988)
Contiguity	-0.3934* (0.1579)		
Common language	0.0475 (0.1673)		

\* denotes significance at  $\alpha=0.05$ . Standard errors are shown in parenthesis.

It can be quickly appreciated that the main driver of El Salvador's imports is the interaction between the magnitudes of their economies, which is captured in the log of GDP. The log of GDP per capita was expected to capture the interaction between the preferences of the

consumers, but even that it has positive sign it is not statistically significant. The parameter estimate for dollarization suggests that having adopted the dollar as currency has actually decreased imports by about 24%<sup>2</sup>. The parameter estimate for CAFTA-DR suggests that the free trade agreement has decreased imports by about 11%, however it is not statistically significant. Because when using a fixed effects model the time invariant variables cannot be estimated, we use the pooled model to interpret distance, contiguity and common language. The log of distance has the expected sign and indicates that El Salvador tends to import less from countries farther away. The dummy for contiguity has a negative sign, which is opposite to the expected. This can be easily explained by the fact that El Salvador's main commercial partner, the United States, from which El Salvador gets about 50% of its imports, is not a neighboring country. The dummy for common language has the expected positive sign indicating that El Salvador tends to import more from countries that speak Spanish.

When modeling El Salvador's exports, the results of the F-test and Hausman test also suggested that the model best suited for evaluating the impact of dollarization and CAFTA-DR on El Salvador's exports is the fixed effects panel model. The parameter estimates of the three alternative models are shown in table 3.

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<sup>2</sup> Interpretation of the parameter estimates for dollarization and CAFTA-DR is made using the formula  $100(e^{\beta}-1)$ .

Table 3. Parameter estimates for El Salvador's exports.

Variable	Pooled model	Fixed effects model	Random effects model
Intercept	0.9612 (2.0964)	-4.8319 (10.9146)	-32.3085 (5.5333)
Log of GDP	0.0013 (0.0832)	2.9837* (1.1826)	-0.5429 (0.3268)
Log of GDP per capita	1.3494* (0.1097)	-1.2445 (1.2187)	2.4399* (0.4717)
Log of distance	-2.4077* (0.1631)		
Dollarization	-0.0590 (0.2375)	-0.6015* (0.2138)	-0.4029* (0.2037)
CAFTA-DR	0.5222* (0.2597)	-0.5078* (0.1987)	0.0045 (0.1660)
Contiguity	-0.8581* (0.3643)		
Common language	-2.7339* (0.3861)		

\* denotes significance at  $\alpha=0.05$ . Standard errors are shown in parenthesis.

Focusing on the preferred fixed effects, the log of GDP variable, which captures the interaction between El Salvador and the other economy, it also appears as the main driver of El Salvador's exports. The log of GDP per capita is negative and not significant. The parameter estimate for dollarization suggest that having adopted the dollar decreased exports by 45% and the parameter estimate of CAFTA-DR suggests that the free trade agreement also decreased exports by around 39%. Regarding the time invariant variables whose parameters are only available in the pooled mode, the log of distance indicates that El Salvador exports less to countries farther away. The signs of contiguity and common language have negative sign, which is opposite to the expected, suggesting that El Salvador exports less to its neighboring countries and to those that speak Spanish. This also can be explained by the fact that The United States is El Salvador main exports destination, accounting for about 50% of El Salvador's exports.

The parameter estimates of dollarization and CAFTA-DR are negative for imports and exports indicating that the adoption of both policies has not had the expected positive impact in El Salvador's trade flows. The estimated magnitude of the impact of dollarization, which suggests that having the dollar as currency has decreased imports by 24% and decreased exports by 45% seems too high and indicates the necessity for additional inquiry, being the case the same for CAFTA-DR. Because of the significant share of the United States in El Salvador's trade flows, we wanted to run additional models where the trade with The United States is not account for.

The F test and the Hausman tests also provided evidence indicating that the fixed effects models are the best models to evaluate the impact of dollarization and CAFTA-DR on El Salvador' trade. Table 4 shows the fixed effects models for imports and the fixed effects models for exports where the trade with the United States is not accounted for.

Table 4. Parameter estimates for El Salvador's imports with the U.S. trade.

Variable	Fixed effects - imports	Fixed effects - exports
Intercept	-19.5336 (7.1356)	3.9838 (11.9116)
Log of GDP	1.5820 (0.8163)	4.1810* (1.3626)
Log of GDP per capita	0.3757 (0.8275)	-2.4336 (1.3814)
Dollar	-0.2195 (0.1671)	-0.9845* (0.2790)
CAFTA-DR	-0.0866 (0.1434)	-0.7052* (0.2394)

\* denotes significance at  $\alpha=0.05$ . Standard errors shown in parenthesis.

In the imports model none of the parameter estimates are significant, indicating that dollarization and CAFTA-DR have not had a positive or negative impact in El Salvador's



imports. When we observe the exports model, the log of GDP continues to be variable driving El Salvador's exports. Dollarization and CAFTA-DR continue to have a negative and significant impact on exports, in the magnitudes of 62% and 50% respectively. These values continue to be too high to be a realistic estimation of the impact that dollarization and CAFTA-DR have had on El Salvador's trade flows. It is possible that the dummy variables for dollarization and CAFTA-DR might be capturing something else that is driving the behavior of El Salvador's trade flows. Further analysis are needed to explore this issue.

## **Conclusion**

The overall conclusion of this study is that there is no evidence indicating that dollarization or CAFTA-DR have had a positive and significant impact on El Salvador's imports or exports.

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