Effect of financial dollarization on economic development in Latin America

By

Inmer Antonio Avalos Baños

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
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MASTER OF DEVELOPMENT POLICY

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charge:

Professor Shu-Chin LIN, Supervisor

Professor Tae-Hee CHOI

Professor Wook SOHN

Approval as of December, 2014.

Abstract

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This thesis studies the relationship between financial dollarization and economic development in the period 2000-2012, and how this relationship depends on countries' economic development. We focus on Latin American countries and use a quantile regression approach to estimate the effect of financial dollarization on economic development. We find that financial dollarization in terms of foreign currency deposits has a negative and significant effect on economic development, but it shows a decreasing pattern. It implies that the effect is going to be nil when countries attain economic development. When we use foreign currency credits as a measure of financial dollarization, we find a negative and statistically significant effect of financial dollarization on economic development. The result shows an inverted U-shape pattern. It implies that as a country develops, the effect of financial dollarization on economic development would first increases and then later decreases.

Acknowledgements

First of all I would like to express my sincere gratitude to the Almighty God; it would not be possible to write this thesis without his support. I also want to express my sincere thankfulness to my dearest advisor professor Shu Shin-Lin for her guidance, patience, and continuous support during this process. In addition, I would like to thank to professor Tae-Hee Choi, member of the POS committee.

To my dearest parents Ana Baños and Clemente Avalos, for their constant pray, encouragement, patience, and support during the whole period of the study of this master at KDI School.

Finally, I would like to thank the Central Reserve Bank of El Salvador and the Inter-American Development Bank for its financial support and for allowing me to undertake this master program.

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1. Introduction

The main purpose of this thesis is to study the relationship between financial dollarization and economic development, and how this relationship depends on countries´ economic development. We focus on Latin America, which according to Garcia and Sosa (2011) is "one of the most dollarized regions in the world" (p.3). In this thesis we measure financial dollarization in term of foreign currency deposits and foreign currency credits.[1]

Financial dollarization, according to Garcia and Sosa (2011), is a "process in which a large share of residents' assets and liabilities are denominated in U.S. dollars" (p.3). This is a rational response to (1) high inflation, (2) banking, and (3) economic crises, and through it, economic agents and governments are trying to prevent or minimize the risk to different economic crises. Nonetheless, financial dollarization may bring some negative effects, such as limitation to the central bank in its functions as lender of last resort, less effectiveness of the monetary policy, and increases in risks to the financial system. Since most of the countries in Latin America are facing this phenomenon of financial dollarization, it is important to estimate the effect of financial dollarization on economic development.

Most of the current literature related to this topic is focused on determinants of financial dollarization, the effect of financial dollarization on financial depth, and the relationship between financial dollarization and inflation. Some focus on the impact of financial dollarization on economic development. In that respect, Fernandez Arias (2005) finds, "FD contributes to financial depth only under high inflation" (p.8). He also argues that, "FD does not appear to

[1] Foreign Currency Deposits is measured as percentage of total deposits and Foreign Currency Credits as percentage of total credits.

contribute to faster average growth" (p.9). In relation to inflation, Ize and Levy (2003) get a result which suggests that financial dollarization is going to persist if the inflation volatility remains high in relation to exchange rate volatility, which occurs, even if the inflation environment is low (p.344). This study is different from the work already done in this area, in that it focuses on the relationship between financial dollarization and economic development, and whether this relationship depends on countries' economic development.

The hypothesis we would like to test are: (1) whether financial dollarization will affect economic development, and (2) whether this relationship will depend on the level of economic development.

In order to approach this issue, we utilize the quantile methodology to estimate the rates of change for all parts of the distribution of the dependant variable. This is important since countries may have different levels of economic development, and the effect on most is different according to the GDP per capita of each country. Economic development can be driven by some policies other than financial dollarization. Consequently these results may be affected by endogeneity issues; therefore, we apply IV quantile to overcome this problem. We instrument our foreign currency deposits and credits with its values in the first year for each period.

Using data on 20 Latin America countries with foreign currency deposits and 15 with foreign currency credits as a measure of financial dollarization over the period 2000-2012, we find that financial dollarization in terms of foreign currency deposits has had a negative and significant effect on economic development; however, it shows a decreasing pattern. In other words, the impact decreases as the economy develops, and it will eventually go away. It implies that the effect is going to be nil when countries attain economic development.

When we use foreign currency credits as a measure of financial dollarization, we find a negative and statistically significant effect of financial dollarization on economic development. The result shows an inverted U-shape pattern. It implies that as a country develops, the effect would first increase and then later decreases. The findings suggest that there is a negative effect of financial dollarization on economic development on Latin America countries. It implies that policy toward reducing the level of financial dollarization of the country can be one effective instrument to promote economic development.

This paper will proceed as follows. Chapter 2 includes an overview of dollarization and financial dollarization and theoretical framework. Chapter 3 explains the data used and the methodology adopted, which is quantile regression. Chapter 4 presents the results and main findings, and finally Chapter 5 contains the conclusion.

2. Literature Review

2.1. Overview

According to Kokenyne, Ley, and Veyrune (2010) dollarization[2] "refers to the use by the residents of one country of assets (or liabilities) denominated in another country´s currency," (p.4). It usually occurs as a response to poor performance of the national currency in achieving its main goals, and as a result the government makes the decision to fully dollarize the economy. This is a policy that has been applied in a few countries. According to the International Monetary Fund classification in the Annual Report on Exchange Arrangements and Exchange Restrictions 2013, the formally dollarized countries include those noted in figure 1 below:

Figure 1: Fully Dollarized Coutries

Country	Year adopted	Currency adopted
Ecuador	2000	U.S. dollar
El Salvador	2001	U.S. dollar
Kiribati	1979	Australian dollar
Kosovo	1999	euro
Marshall Islands	1986	U.S. dollar
Micronesia	1986	U.S. dollar
Montenegro	1999	euro
Palau	1994	U.S. dollar
Panama	1904	U.S. dollar
San Marino	1999	euro
Timor-Leste	2000	U.S. dollar
Tuvalu	1966	Australian dollar
Zimbabwe	2009	U.S. dollar

Source: Annual Report on Exchange Arrangements and Exchange Restrictions, International Monetary Fund 2013.

[2] Include the use of any foreign currency as a legal tender.

There are different types of dollarization, including partial, de facto[3] and financial dollarization. Most of the developing countries around the world are facing a certain level of financial dollarization; that is the main concern of this study, but this thesis will focus on Latin America, which is considered as one of the most highly dollarized regions.

Financial dollarization is a phenomenon that most of the Latin America countries are facing; however, the relationship between financial dollarization and economic development has not been properly studied. The literature related to this topic focuses on determinants of financial dollarization, inflation as a main determinant, and financial dollarization. A few focus on economic growth and development; most analyze the relationship between fully dollarized countries and economic growth.

2.2. Empirical Literature Review

According to the study done by Edwards and Magendzo (December 2001), full dollarization has a negative effect on economic development. They find "dollarized countries have had a statistically lower rate of GDP per capita growth than that non-dollarized ones. Both the mean and median growth differences are approximately 1% per year," (p.13). They also analyze the effect on inflation and find that in comparison with non-dollarized economies the inflation rate is lower. They used data from 14 independent countries and 15 non-independent territories over the period of 1970-1998.

Edwards (May 2001), studies the economic performance of the countries that are fully dollarized. He finds that in comparison to other countries the growth rate and inflation are significantly lower in fully dollarized countries, (p.13). He uses data from 11 countries over the period 1970-1998, and to make a comparison he uses a group of developed and developing

[3] De facto dollarization is when various economic agents start using foreign currency in their transactions.

countries; the control group includes all the countries with data available, but countries with fixed exchange regime and dollarization were excluded from the control group.

Levy Yayeti (2006), finds that in countries with financial dollarization, the risk of banking crises is higher than in countries without financial dollarization and the relationship between financial dollarization and economic growth is negative and significant. Its evidence does not show that financial dollarization contribute with the financial depth, (p.113). Besides that in the studies done by De Nicolo, Giani, Honaban and Ize (2003), Domac and Martinez (2003), Honohan and Shi (2003) and Honohan (2004). They find that the economic growth is slower for countries with financial dollarization.

Related to dollarization and financial integration, Arellano and Heathcote (2010) compare countries with floating exchange rate regimes to countries with dollarized regimes. They find that "the historical experience of countries that have delegated control of monetary policy is consistent with the idea that dollarizing can make it easier for a country to borrow. In particular, countries that recently adopted the dollar or the euro experienced a decline in the cost of sovereign borrowing," (p.968).

Rennhack & Nozaki (2006) find, with regard to Latin America, "that financial dollarization (FD) is a rational response to uncertainty about inflation. FD tends to remain high in countries with unstable and high domestic inflation and with institutions that undermine confidence in the outlook for inflation," (p.12). They use a sample of 62 countries over the period 1990-2001. The sample includes countries from Latin America, Asia, and Africa as well.

Ize and Levy (2003) present "a model of financial dollarization based on a portfolio selection approach [and]…find that financial dollarization displays high persistence whenever the expected volatility of the inflation rate remains high in relation to that of the real exchange rate,

even after price stabilization has been achieved," (p.323). The sample includes 46 countries over the period 1990-1995.

Holand, Resende, and Vieira (2012), find that financial dollarization increases even after the inflation decreases. They also find that inflation risk is one of the main determinants of financial dollarization. In their study they use a sample of 79 developed and developing economies for the period 1991-2006, the sample includes countries from five continents.

Fernandez Arias (2005), using cross-country data, finds that the level of financial dollarization affects the inflation rate. When countries are facing a high level of dollarization, the inflation rate is higher and more volatile, which contradicts the current literature that suggests that dollarization reduces inflation. However, it is important to consider that according Fernandez Arias, financial dollarization does not affect the implementation of disinflation policies, (p.7).

Reinhart, Rogoff, and Sabastone (October 2003), find that, "fear of floating" is the biggest worry for countries that are highly dollarized, and that contrary to the current literature, a high level of dollarization does not affect the monetary control, and it is not an obstacle for disinflation, (p.3). In their investigation they use a sample of 85 countries with data available. As methodology, they use a summary of indicator for different groups. The groups were formed considering the characteristics of each country.

Neanidis and Savva (2008), find that in countries with high level of domestic dollarization, the depreciation risk is an important determinant of foreign currency deposits. The foreign currency loans are determined by different factors like the matching between domestic loans and deposits and the quality of the institutions and financial integration. Their sample includes monthly data from 11 emerging economies over the period 1993-2006. As methodology they use random effect, fixed effect and feasible generalized least square, (p.1872).

Most of the research related to this topic is focused on determinants of financial dollarization, the relationship between it and inflation and financial depth, consequences of financial dollarization, relation of exchange rate, and its relation with domestic dollarization. Some focus on the impact of financial dollarization on economic development. They use different methodologies like fixed effect and random effect, generalized method of moments, pool OLS models, and most focus on cross-country analysis. There are a few analyses about a specific country. In our analysis, we utilize quantile methodology to estimate the rates of change for all parts of the distribution of the dependant variable. This is important since countries may have different levels of economic development and the effect on most is different according with the GDP per capita of each country.

3. Data and Model Specification

3.1. Data

In this section, we describe the data used in the regression model. There are different measures of financial dollarization, but in this study we use foreign currency deposits as a percentage of total deposits and foreign currency credits as a percentage of foreign currency credits to measure the level of financial dollarization. The dependant variable is the GDP per capita measured in constant dollars, from the World Development Indicator (WDI) 2014.

We also include a set of control variables to mitigate the effect of omitted variables bias; these include: (1) inflation proxied by the percentage changes in the consumer price index to capture the effect of inflation on economic development; (2) openness to international trade, defined as the sum of exports and imports as a share of GDP, to control for the effect of trade openness on economic development; (3) investment measured by gross capital formation as a percentage of GDP to account for the potential economic development effect of physical capital; (4) government consumption as a percentage of GDP, and (5) population growth. Except inflation and population growth, all variables are specified in natural logs.

Our sample consists of 20 Latin American countries with foreign currency deposits, and 15 with foreign currency credits. All have annual data for the period 2000-2012, and all the variables are taken from International Development Bank, except GDP per capita constant, which is taken from WDI dataset 2014.

In figure 2, we show the level of financial dollarization, using as a measure, the foreign currency deposits as percentage of total deposits; and in figure 3, we use the foreign currency credits as percentage of total credits.

Figure 2: Scatter plot of GDP per capita and foreign currency deposits

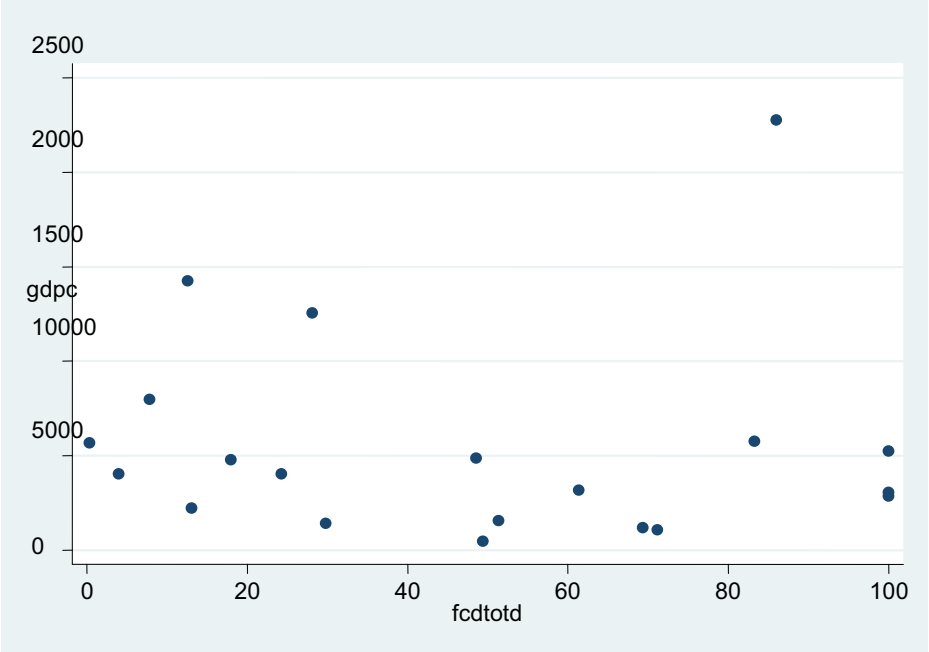
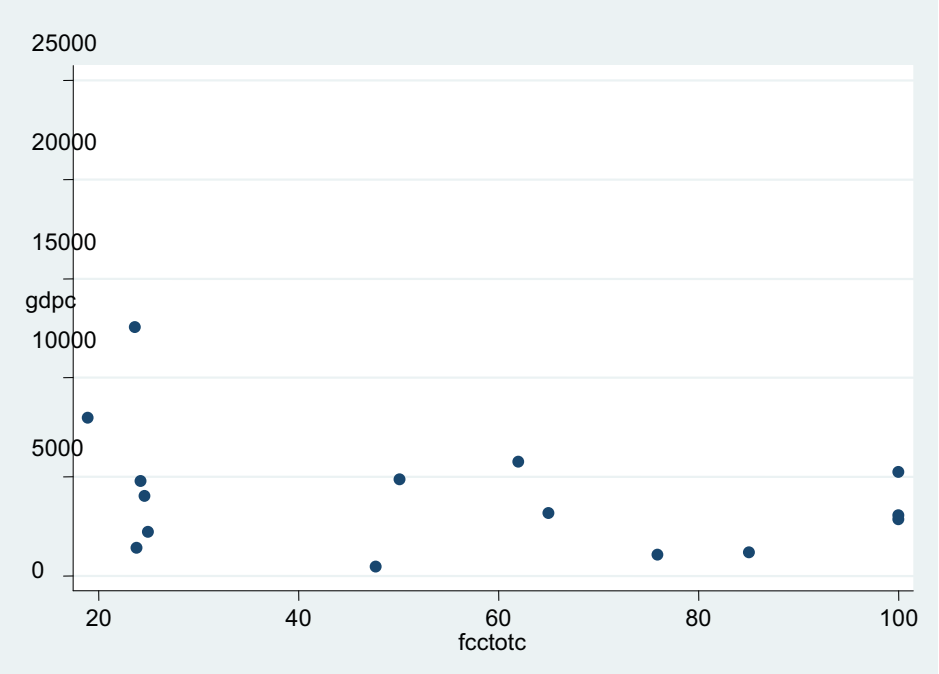
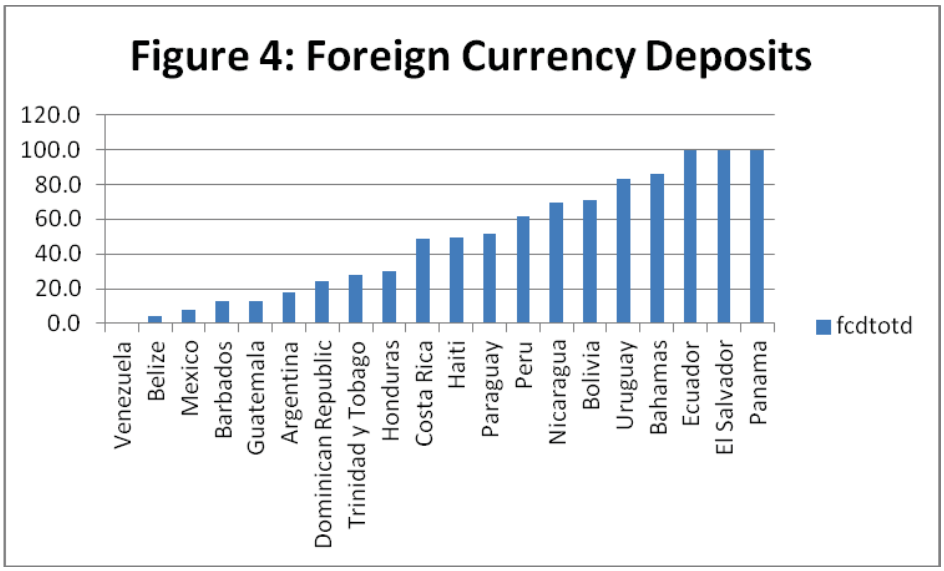


Figure 3: Scatter plot of GDP per capita and foreign currency credits



Figures 4 and 5 show the list of countries and level of financial dollarization in terms of foreign currency deposits, and foreign currency credits respectively. It is important to mention that Ecuador, El Salvador, and Panama are fully dollarized and the data is the average for the period 2000-2012.



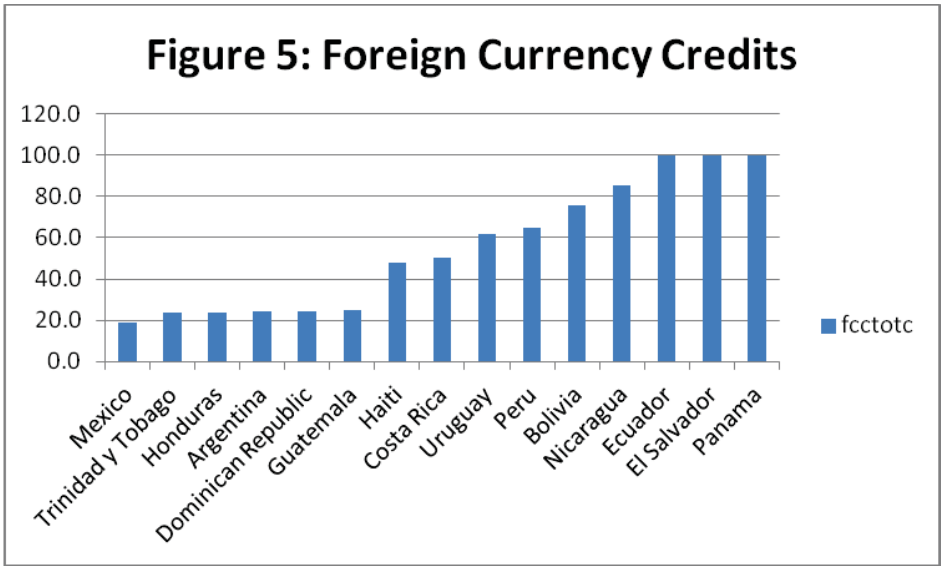


Table 1 shows the summary statistics and correlation matrix of variables. As expected, financial dollarization is highly volatile since the standard deviation for foreign currency deposits is 34.41% and foreign currency credit is 31.71%.

Table 1: Descriptive Statistics

	Gdpc	*fcdtotd*	*fcctotc*	*inflation*	*trade*	*gconsumpt*	*investment*	*Popgrowth*
Panel A: Summary Statistics								
Mean	5,436.36	47.93	54.83	7.64	80.61	82.848	20.21	1.44
Median	4,052.05	45.40	50.35	5.55	74.15	81.80	19.25	1.50
Standard deviation	5,352.60	34.41	31.75	8.75	30.60	12.97	4.95	0.66
Maximum	24,212.40	100.00	100.00	96.10	171.30	124.60	33.60	2.90
Minimum	435.30	0.20	8.00	-1.10	21.90	41.00	9.40	-0.10
Panel B: Correlation Matrix								
gdpc	1.0000							
fcdtotd	-0.2134	1.0000						
fcctotc	-0.2841*	0.9007*	1.0000					
inflation	-0.1830	-0.275*	-0.027	1.0000				
trade	0.0658	0.1630	0.0815	-0.2061	1.0000			
gconsumpt	-0.5242*	0.2205*	0.1438	-0.1360	-0.0231	1.0000		
investment	-0.1935	-0.0570	-0.126	0.1191	0.1727	0.2853*	1.0000	
popgrowth	-0.3163*	-0.2010	-0.033	0.0748	0.2783*	0.2181	0.2400*	1.0000

Note: * indicates significance at the 5% level.

3.2. Model Specification

To explore the relationship between financial dollarization and economic development, our main empirical strategy is to employ quantile regression analysis[4]. Quantile regression was first introduced by econometricians (Koenker and Bassett 1978) in the 1970s. This is an extension of the linear model for estimating rates of change in all the parts of the distribution of the dependent variable, (p.414). The model can be written as:

$$Qy(q/X) = \beta_0(q)X_0 + \beta_1(q)X_1 + \beta_2(q)X_2 +,...,+\beta_n(q)Xn + u_i \qquad (1)$$

[4] See Koenker and Bassett 1978 for more detail about quantile regression analysis.

Where (Qy) notation indicates the dependant variables, X represents the explanatory variables (main and control variables), β represents the coefficient estimate in each quantile, and the (q) notation indicates that the parameters are for a specific q quantile, where q ϵ (0, 1).

The general form can be denoted as: $Q_q(yi/xi) = x'\beta_q$ (2)

The aim of the traditional least square estimation is to minimize the sum of least squared error, which is given by the following equation:

$$\min \sum_{i=1}^{n} (y_i - \alpha - X_i'\beta)^2 \quad (3)$$

Where y_i represents the dependant variable, X_i the explanatory variables, α denotes the intercept and β denotes the slope parameters. The least squared estimator is weak when there are outliers in the data because the residual is going to be large. If we square these residuals, we are giving more weight to the outlier and as a result we get biased estimates. Additionally, it is important to consider that the effect of X on Y on the conditional mean may differ from the effect on higher or lower values.

The main objective of minimizing the sum of squared is to find values that minimize the error. The objective of quantile regression is to minimize the absolute deviation from q^{th} conditional quantile, which is written as:

$$\min \sum_{i=1}^{n} \rho\tau(y_i - \varepsilon(x_i, ?\beta) \quad (4)$$

Where ε denotes the conditional quantile, and $\rho\tau$ represents the check function.

In order to obtain the conditional median function, we have to set the quantile (q) at ½. We then employ an optimization method to find values of β that minimize the weighted sum of

absolute deviation. The minimizing problem can be solved by using a linear programming method.

We split the sample period 2000-2012 into 4 non-overlapping 3- year periods (except for the last period for which we average our data for four years). Then we estimate two regression models. In the first model, we used the foreign currency deposits as a measure of financial dollarization; in the second model, we used the foreign currency credits.

In our model, *gdpc* denotes the (logarithm of) the GDP per capita measured in constant dollar. Foreign currency deposits as a percentage of total deposits is equal to *fcdtotd*. *Inflation, trade, gconsumpt, investment and popgrowth* are control variables described in the previous section, and *ui* is the disturbance term. Our main interest is to test whether the effect of financial dollarization on economic development, β_1 is statistically significant.

4. Estimation Results

4.1 Quantile Results

4.1.1 Foreign currency deposits

In the first set of regressions, we used foreign currency deposits as a measure of financial dollarization. Table 2 reports OLS and quantile regressions results of the effect of financial dollarization on economic development; in these regressions we do not include time dummies variables. It shows that the effect of financial dollarization on economic development, except for higher quantile, is negative and statistically significant. Additionally, when we move from a lower to a higher quantile, we observe a clear pattern, which is that the effect decreases, and for the 90^{th} quantile, while not statistically significant, it becomes positive. It implies that development reduces the effect of financial dollarization, and decreases when a country´s economic development increases.

We find strong evidence of a negative and significant effect of financial dollarization on economic development when we use foreign currency deposits as measure of financial dollarization. These findings are robust, since the result is consistent with different methodology, and it suggests that the marginal effect of financial dollarization on economic development is increasing with a higher level of financial dollarization, but is decreasing when countries reach a higher level of economic development.

Regarding other control variables, the coefficient estimate on *inflation* is negative and statistically significant. Except for the higher quantiles, the coefficient is still negative, but not significant. It means that inflation exerts a negative effect on economic development, but it has the same pattern as foreign currency deposits. In other words, the coefficient estimate is decreasing when we move to a higher quantile and it becomes insignificant. It implies that the effect of inflation is going to decrease when countries attain a high level of economic

development. The coefficient estimate on *trade* is positive, but not statistically significant, except for the quantile 75th where it is statistically significant at the 10% level; indicating trade has an unimportant impact on economic development. The coefficient estimate on *govconsump* is negative and statistically significant, except for the higher quantiles, where the coefficient is not significant, even at the 10% level; it implies that government consumption has a negative effect for countries with low GDP per capita, but it will become insignificant when countries attain a high level of economic development.

The coefficient estimate on *investment* is negative for the quantile 50^{th}, but it is not statistically significant. Then for lower and higher quantiles, the effect is positive, but except for the quantile 90^{th}, still not significant even at the 10% level. It means that investment has very little power in explaining the changes in economic development. Finally, the coefficient estimate on *popgrowth* is negative and statistically significant, except for the quantile 90th, where the coefficient is negative, but not significant. It suggests that popgrowt has negative impacts on economic development, but when countries achieve a high GDP per capita, the effect becomes insignificant.

We focus our discussion on the quantile regression, but it is important to note that the OLS shows a negative and statistically significant effect of financial dollarization on economic development. This result is consistent, since the effect is negative and statistically significant in all the models (OLS and IV regressions with and without time dummies variables).

Table 2: Foreign Currency Deposits without time dummies variables

		Quantiles				
Model	**OLS**	10	25	50	75	90
Fcdtotd	-0.176***	-0.409***	-0.292***	-0.213**	-0.219*	0.050
	(0.064)	(0.070)	(0.077)	(0.099)	(0.119)	(0.160)
Inflation	-0.015***	-0.038**	-0.027**	-0.021	-0.007	-0.013
	(0.005)	(0.018)	(0.011)	(0.013)	(0.008)	(0.015)
Trade	0.295	0.326	0.171	0.179	0.448*	0.193
	(0.232)	(0.564)	(0.126)	(0.194)	(0.251)	(0.595)
Gconsumpt	-2.212***	-2.042**	-1.827***	-2.166***	-1.166	-2.088
	(0.514)	(0.815)	(0.382)	(0.490)	(0.779)	(2.045)
Investment	-0.022	0.134	0.123	-0.193	0.100	1.950
	(0.379)	(0.726)	(0.358)	(0.428)	(0.680)	(1.244)
Popgrowth	-0.176***	-0.312***	-0.253***	-0.196***	-0.217***	-0.170
	(0.061)	(0.085)	(0.047)	(0.069)	(0.080)	(0.174)
_cons	7.883***	7.682***	7.388***	8.339***	5.662***	5.355
	(1.053)	(1.715)	(0.845)	(0.919)	(1.622)	(4.250)
R^2	0.44					
N	80	80	80	80	80	80

Dependant variable is GDP per capita

Standard error in parenthesis. *Significance at 10%; ** significance at 5%; ***significance at 1%. All regressions do not include time dummies.

In the second set of regressions, we again used foreign currency deposits as a measure of financial dollarization, but this time we include the time dummies variables, in order to control the time effect. Table 3 reports OLS and quantile regressions results of the effect of financial dollarization on economic development. We got very consistent results, since the coefficient estimation is negative and statistically significant, except for higher quantiles where the coefficient becomes positive, but statistically insignificant. Additionally, we observe a decreasing pattern. It implies that the effect of financial dollarization on economic development is decreasing when countries reach a higher level of economic development.

When we use foreign currency deposits as measure of financial dollarization and include time dummies, we find strong evidence of a negative and significant effect of financial

dollarization on economic development. These findings are robust; since the result is consistent with different methodology, it suggests that the marginal effect of financial dollarization on economic development is higher for those countries with a high level of financial dollarization, but it is going to decrease when countries reach economic development.

Regarding other control variables, the coefficient estimate on *inflation* is negative and statistically significant. Except for the higher quantiles, the coefficient is still negative, but not significant. It means that inflation exerts a negative effect on economic development, but it has the same pattern as foreign currency deposits. It implies that the effect of inflation is going to decrease when countries attain a high economic development. The coefficient estimate on *trade* is positive, but not statistically significant, even at the 10% level, indicating *trade* has unimportant effect on economic development. The coefficient estimate on *govconsump* is negative and statistically significant, except for the higher quantiles, where the coefficient is not significant, even at the 10% level; it implies that government consumption has a negative effect on economic development for countries with low GDP per capita, but it will become insignificant when country´s attain a higher level of economic development.

The coefficient estimate on *investment* is negative for the 50^{th} quantile and statistically significant. Then for lower and higher quantiles, the effect is positive, but not significant even at the 10% level. It means that investment has very little power to explain the changes in economic development, except for the 50^{th} quantile. The coefficient estimate on *popgrowth* is negative and statistically significant. It suggests that *popgrowt* has negative impacts on economic development.

Table 3: Foreign Currency Deposits with time dummies variables

		Quantile				
Models	OLS	10	25	50	75	90
Fcdtotd	-0.176***	-0.416***	-0.367***	-0.267***	-0.183	0.008
	(0.066)	(0.068)	(0.090)	(0.087)	(0.115)	(0.162)
Inflation	-0.015***	-0.039*	-0.033**	-0.025**	-0.008	-0.012
	(0.005)	(0.021)	(0.013)	(0.012)	(0.007)	(0.007)
Trade	0.290	0.483	0.253	0.220	0.360	0.532
	(0.243)	(0.516)	(0.329)	(0.246)	(0.259)	(0.381)
gconsumpt	-2.208***	-2.105***	-1.761**	-1.717***	-1.243	-1.829
	(0.525)	(0.766)	(0.716)	(0.613)	(0.962)	(1.487)
investment	-0.043	0.121	0.006	-0.752*	0.135	1.576
	(0.395)	(0.672)	(0.628)	(0.396)	(0.878)	(1.375)
popgrowth	-0.175***	-0.282***	-0.303***	-0.217***	-0.214**	-0.245*
	(0.063)	(0.071)	(0.061)	(0.071)	(0.083)	(0.139)
_cons	7.906***	7.420***	7.403***	8.327***	5.881**	4.905
	(1.087)	(1.668)	(1.731)	(1.499)	(2.298)	(3.286)
R^2	0.44					
N	80	80	80	80	80	80

Dependant variable is GDP per capita

Standard error in parenthesis. *Significance at 10%; ** significance at 5%; ***significance at 1%. All regressions include time dummies.

4.1.2 Foreign currency credits

In the third set of regressions, we used foreign currency credits as a measure of financial dollarization; in these regressions we do not include time dummies variables. Table 4 reports OLS and quantile regressions. It shows that financial dollarization has a negative and statistically significant effect on economic development, except for lower quantiles. The results show an inverted U-shaped pattern, which implies that the effect is going to increase with the country´s economic development, later, it falls.

These findings are robust, since the result is consistent with different methodology, and it suggests that the marginal effect of financial dollarization on economic development is increasing

with the level of financial dollarization, and the effect rises with the country′s economic development, but later, it falls.

Regarding other control variables, the coefficient estimate on *inflation* is negative, but it is not statistically significant in all the models. The coefficient estimate on *trade* is positive, but it is not statistically significant. The coefficient estimate on *government consumption* is negative and statistically significant in all models. It implies that consumption has a negative effect on economic development. The coefficient estimate on *investment* is negative, but it is not statistically significant. It means that investment has very little power in explaining the changes in economic development. Finally, the coefficient estimate on *popgrowth* is negative, but statistically significant only for higher quantiles. It suggests that *popgrowt* has negative effect on economic development in countries with high GDP per capita.

Table 4: Foreign currency credits without time dummies

		Quantile				
Models	OLS	10	25	50	75	90
Fcctotc	-0.304***	-0.380	-0.396***	-0.234	-0.375***	-0.422***
	(0.107)	(0.284)	(0.148)	(0.176)	(0.105)	(0.117)
Inflation	-0.006	-0.041	-0.018	-0.008	-0.002	-0.002
	(0.004)	(0.026)	(0.019)	(0.015)	(0.009)	(0.007)
Trade	0.092	0.369	0.091	0.146	0.282	0.198
	(0.194)	(0.525)	(0.300)	(0.318)	(0.289)	(0.227)
gconsumpt	-2.311***	-1.697	-2.093**	-2.503***	-2.270***	-2.533***
	(0.434)	(2.085)	(1.020)	(0.608)	(0.632)	(0.759)
investment	-0.621*	-0.008	-0.625	-0.730	-0.428	-0.584
	(0.313)	(1.179)	(0.761)	(0.571)	(0.534)	(0.464)
popgrowth	-0.128**	-0.331	-0.211	-0.077	-0.119**	-0.131***
	(0.054)	(0.266)	(0.143)	(0.071)	(0.053)	(0.037)
_cons	9.257***	7.137**	9.097***	9.549***	8.824***	9.815***
	(0.872)	(3.119)	(1.831)	(1.368)	(1.825)	(2.090)
R^2	0.64					
N	60	60	60	60	60	60

Dependant variable is GDP per capita

Standard error in parenthesis. *Significance at 10%; ** significance at 5%; ***significance at 1%. All regressions do not include time dummies.

In the fourth set of regressions, we again used the variable foreign currency credits as a measure of financial dollarization, but in this case we include time dummies variables, in order to control the time effect on economic development. Table 5 reports OLS and quantile regressions. We find that the effect of financial dollarization on economic development is negative and statistically significant at the 1% level, except for the 25th quantile, which is not significant. It implies that countries that increase the level of financial dollarization through foreign currency credits will have a higher negative effect on economic development. The results show an inverted U shape pattern, which implies that when the country´s economic development increases, the effect is going to increase and later the country´s economic continue development the effect falls. Except for the 25th quantile, which is not significant, we find strong evidence of a negative and significant effect of financial dollarization on economic development. It suggests that the marginal effect of financial dollarization on economic development is increasing with the level of financial dollarization.

Regarding other control variables, the coefficient estimate on *inflation* is negative, but it is not statistically significant in all the models, except for the 10th quantile. It suggests that inflation has a negligible effect on economic development, when we use foreign currency credits as a measure of financial dollarization. The coefficient estimate on *trade* is positive, but not statistically significant, and for the 90th quantile is negative, indicating trade has an unimportant impact on economic development.

The coefficient estimate on *government consumption* is negative and statistically significant in all models, except for the 10th quantile is still negative, but it is not significant, even at the 10% level. It implies that government consumption has a negative effect on economic development, and that the effect is insignificant in lower quantiles. The coefficient estimate on *investment* is negative, and statistically significant for higher quantiles. It means that investment

has a negative effect on economic development for higher quantiles, but the effect is not significant for lower quantiles. Finally, the coefficient estimate on *popgrowth* is negative, and statistically significant in all the models. It implies that *popgrowth* has a negative and significant effect on economic development.

Table 5: Foreign currency credits with time dummies

		Quantile				
Model	OLS	10	25	50	75	90
Fcctotc	-0.292**	-0.926***	-0.402	-0.324***	-0.277***	-0.409***
	(0.111)	(0.301)	(0.266)	(0.120)	(0.083)	(0.096)
inflation	-0.005	-0.038*	-0.021	-0.008	-0.001	-0.002
	(0.004)	(0.020)	(0.017)	(0.011)	(0.008)	(0.007)
Trade	0.044	0.191	0.084	0.182	0.101	-0.051
	(0.206)	(0.461)	(0.313)	(0.264)	(0.172)	(0.215)
gconsumpt	-2.336***	-0.889	-1.910***	-2.363***	-2.666***	-3.212***
	(0.444)	(0.985)	(0.634)	(0.564)	(0.487)	(0.582)
investment	-0.670**	-1.276	-0.388	-1.036**	-1.248**	-1.177**
	(0.324)	(0.983)	(0.817)	(0.487)	(0.486)	(0.576)
popgrowth	-0.118**	-0.335**	-0.242**	-0.106*	-0.066**	-0.068**
	(0.056)	(0.139)	(0.104)	(0.057)	(0.029)	(0.030)
_cons	9.423***	8.156***	8.510***	9.823***	10.792***	12.284***
	(0.911)	(1.838)	(1.457)	(1.345)	(1.452)	(1.668)
R^2	0.65					
N	60	60	60	60	60	60

Dependant variable is GDP per capita

Standard error in parenthesis. *Significance at 10%; ** significance at 5%; ***significance at 1%. All regressions include time dummies.

Figure 6: Quantile regression using foreign currency deposits

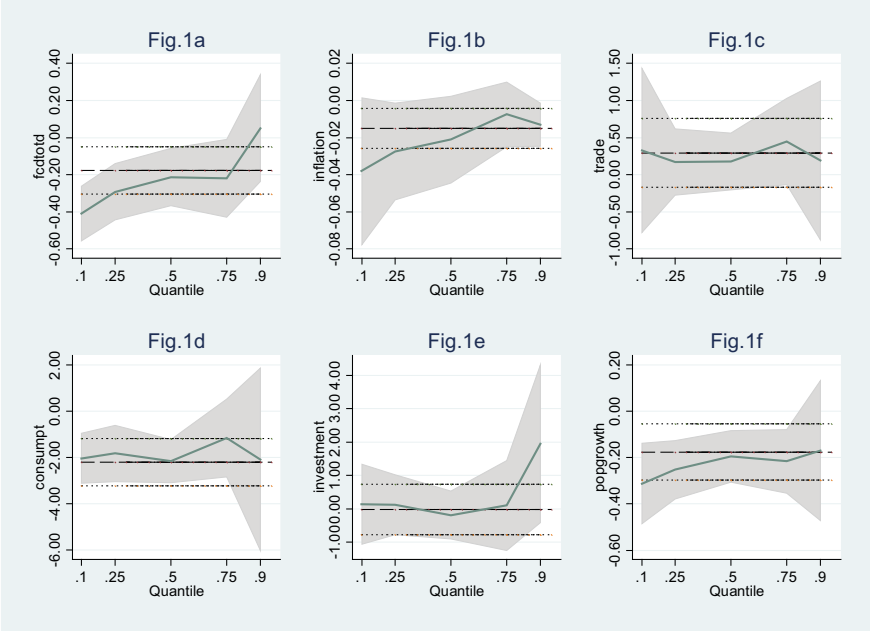
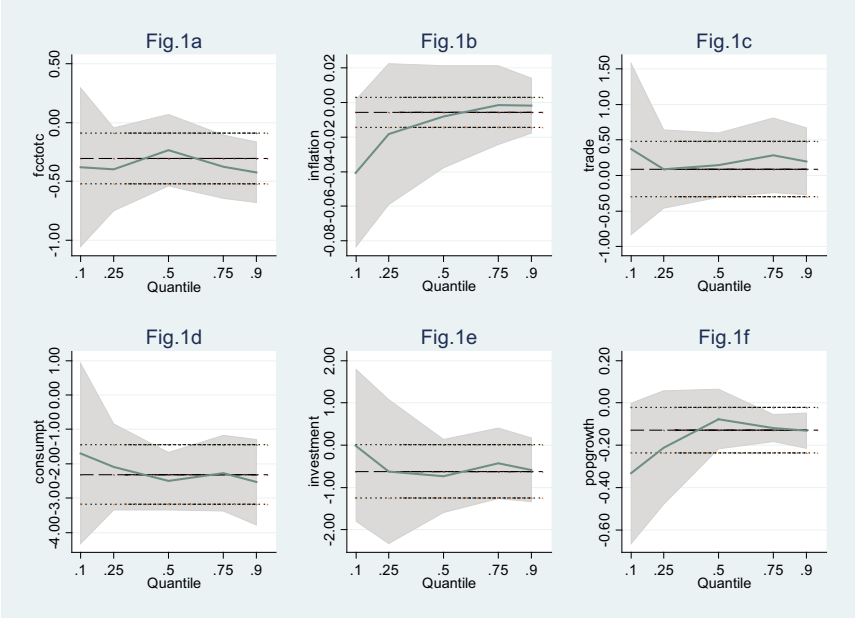


Figure 7: Quantile regression using foreign currency credits



4.2 IV Quantile Results

4.2.1 Foreign Currency Deposits

Our previous set of regressions of OLS and quantile regression do not address the issue of endogeneity bias. Therefore, we want to address the endogeneity problem and in order to control it, we instrument our foreign currency deposits with its values in the first year for each period.

In the fifth set of regressions, we used foreign currency deposits as a measure of financial dollarization, and in order to control the problem of endogeneity bias, we instrument the foreign currency deposits with its values in the first period. Table 6 reports OLS and quantile regressions results of the effect of financial dollarization on economic development, in these regressions we do not include time dummies variables. We find that the effect of financial dollarization on economic development, except for higher quantiles, is negative and statistically significant. Additionally, the results show a clear decreasing pattern. It means, when the countries achieve a higher level of economic development, the effect of financial dollarization measured in terms of foreign currency deposits is going to decrease and eventually go away.

When we instrument our main variable, we find strong evidence of a negative and significant effect of financial dollarization on economic development. These findings are robust, since the result is consistent with different methodology, and it suggests that the marginal effect of financial dollarization on economic development is increasing with a higher level of financial dollarization. It also means that if the countries achieve economic development, the effect on financial dollarization will not be significant. The countries that already have a high economic development are not significantly affected by financial dollarization in terms of foreign currency deposits.

Regarding other control variables, the coefficient estimate on *inflation* is negative, and statistically significant for lower quantiles. The coefficients estimations for the 75^{th} and 90^{th}

quantiles are still negative, but they are not statistically significant, even at the 10% level. It suggests that, when we use foreign currency deposits as a measure of financial dollarization, inflation has a negative effect on economic development in all the models, even though for higher quantiles is not significant. The coefficient estimate on *trade* is positive in all models, but not statistically significant, even at the 10% level. The coefficient estimate on *government consumption* is negative and statistically significant in all models. The coefficient estimate on *investment* is positive, except for the 50th quantile, where the coefficient is negative, but in all models it is not statistically significant, even at the 10% level. Finally, the coefficient estimate on *popgrowth* is negative and statistically significant in the different models.

Table 6: IV Estimation Foreign Currency Deposits without time dummies variables

		IV Quantile				
Model	IV	10	25	50	75	90
fcdtotd	-0.177***	-0.413***	-0.297***	-0.215***	-0.219**	0.050
	(0.062)	(0.125)	(0.089)	(0.078)	(0.087)	(0.133)
inflation	-0.015***	-0.038***	-0.027***	-0.021***	-0.007	-0.013
	(0.005)	(0.010)	(0.007)	(0.007)	(0.007)	(0.011)
Trade	0.296	0.327	0.195	0.181	0.447	0.193
	(0.222)	(0.455)	(0.324)	(0.284)	(0.317)	(0.486)
gconsumpt	-2.210***	-2.005**	-1.805**	-2.130***	-1.168*	-2.088*
	(0.491)	(1.005)	(0.715)	(0.627)	(0.701)	(1.073)
investment	-0.023	0.110	0.120	-0.200	0.100	1.950**
	(0.362)	(0.746)	(0.531)	(0.465)	(0.520)	(0.797)
popgrowth	-0.176***	-0.316***	-0.259***	-0.190**	-0.217**	-0.170
	(0.058)	(0.121)	(0.086)	(0.075)	(0.084)	(0.129)
_cons	7.880***	7.651***	7.319***	8.276***	5.666***	5.355**
	(1.006)	(2.059)	(1.464)	(1.283)	(1.435)	(2.197)
R^2	0.44					
N	80	80	80	80	80	80

Dependant variable is GDP per capita

Standard error in parenthesis. *Significance at 10%; ** significance at 5%; ***significance at 1%. All regressions do not include time dummies.

In the sixth set of regressions, we used one more time the variable foreign currency deposits as a measure of financial dollarization, but this time we use time dummies variables for controlling the time effect on economic development, and in order to control the problem of endogeneity bias, we instrument our main variable foreign currency deposits with its values in the first period. Table 7 reports OLS and quantile regressions results of the effect of financial dollarization on economic development. We find that for lower quantiles, the financial dollarization has a negative and statistically significant effect on economic development, the 75th quantile is still negative, but it is not significant, and the coefficient estimation of the 90th quantile, it is positive and not significant. When we move to a higher quantile the coefficient estimate decreases and eventually, it becomes positive; however, it is not statistically significant. It means, when countries achieve a higher level of economic development, the effect of financial dollarization in terms of foreign currency deposits is going to decrease and will eventually go away.

All the models show a clear pattern of decreasing effect of financial dollarization when countries obtain a higher GDP per capita, and eventually, it turns positive and insignificant. These findings are robust, since the result is consistent with different methodology, and it suggests that the marginal effect of financial dollarization on economic development is increasing with a higher level of financial dollarization. It also means that if countries achieve a higher economic development the effect on financial dollarization will not be significant. The countries that already have a high economic development are not significant affected by financial dollarization in terms of foreign currency deposits.

Regarding other control variables, the coefficient estimate on *inflation* is negative, and statistically significant for lower quantiles. The coefficients estimation for the 75th and 90th quantiles are still negative, but for both it is not statistically significant, even at the 10% level. It

suggests that, when we use foreign currency deposits as a measure of financial dollarization, *inflation* has a negative and significant effect on economic development for those countries with lower GDP per capita. The coefficient estimate on *trade* is positive in all models, but it is not statistically significant, even at 10% level; indicating trade has very little power in explaining the changes on economic development.

The coefficient estimate on *government consumption* is negative and statistically significant in all models, except for the 75th quantile, where the effect still negative, and not significant. Our findings suggest that government consumption has a negative and significant effect on economic development, except for 75th quantile. Finally, the coefficient estimate on *popgrowth* is negative and statistically significant in all the models. It means that *popgrowt* has a negative and significant effect on economic development.

Tables 7: IV estimation foreign currency deposits with time dummies variables

		IV Quantile				
	IV	10	25	50	75	90
Fcdtotd	-0.177***	-0.416***	-0.371***	-0.267***	-0.141	0.007
	(0.062)	(0.126)	(0.096)	(0.083)	(0.088)	(0.129)
Inflation	-0.015***	-0.039***	-0.034***	-0.025***	-0.007	-0.012
	(0.005)	(0.011)	(0.008)	(0.007)	(0.007)	(0.011)
Trade	0.291	0.483	0.260	0.220	0.461	0.532
gconsumpt	-2.204***	-2.105**	-1.756**	-1.717**	-1.000	-1.826*
	(0.491)	(1.018)	(0.772)	(0.670)	(0.707)	(1.037)
investment	-0.044	0.121	-0.002	-0.751	-0.161	1.578**
	(0.370)	(0.771)	(0.585)	(0.508)	(0.536)	(0.785)
popgrowth	-0.175***	-0.282**	-0.301***	-0.217***	-0.206**	-0.245*
	(0.059)	(0.124)	(0.094)	(0.082)	(0.086)	(0.126)
_cons	7.901***	7.420***	7.398***	8.327***	5.522***	4.899**
	(1.017)	(2.106)	(1.597)	(1.387)	(1.463)	(2.145)
R^2	0.44	80	80	80	80	80
N	80					

Dependant variable is GDP per capita

Standard error in parenthesis. *Significance at 10%; ** significance at 5%; ***significance at 1%. All regressions include time dummies.

4.2.2 Foreign Currency Credits

In the seventh set of regressions, we used foreign currency credits as a measure of financial dollarization, and in order to control the problem of endogeneity bias, we instrument our main variable foreign currency credits with its values in the first period. Table 8 reports OLS and quantile regressions results of the effect of financial dollarization on economic development. We find that the effect of financial dollarization on economic development is negative and statistically significant. It means that when we use foreign currency credits as a measure of financial dollarization, the effect on economic development is negative and significant. The results show an inverted U-shape pattern, which mean that the effect of financial dollarization increases with the country´s development, but then it falls.

We find strong evidence of a negative and significant effect of financial dollarization on economic development. These findings are robust, since the result is consistent with different methodology, and it suggests that the marginal effect of financial dollarization on economic development increases with the level of foreign currency credits.

Regarding other control variables, the coefficient estimate on *inflation* is negative, and statistically significant, but the marginal effect decreases when we move to a higher quantile. It suggests that inflation has a negative effect on economic development when we use foreign currency credits as a measure of financial dollarization. The coefficient estimate on *trade* is positive, but not statistically significant, indicating *trade* has very little power explaining the changes on economic development.

The coefficient estimate on *government consumption* is negative and statistically significant in all models, except for 25^{th} quantile, which is still negative, but not significant. It implies that consumption has a negative effect on economic development. The coefficient estimate on *investment* is negative, and significant for 50^{th} quantile, the other quantile coefficients

are not significant. It means, except for 50th quantile, investment has very little power in explaining the changes in economic development. Finally, the coefficient estimate on *popgrowth* is negative, and statistically significant, however, the 50th quantile is not significant. It suggests that *popgrowt* has a negative effect on economic development, except for the 50th quantile.

Table 8: IV estimation foreign currency credits without time dummies variables

		IV Quantile				
	IV	10	25	50	75	90
Fcctotc	-0.340***	-0.758**	-0.398***	-0.234*	-0.375***	-0.436**
	(0.102)	(0.340)	(0.154)	(0.129)	(0.143)	(0.179)
inflation	-0.006	-0.051***	-0.018***	-0.008	-0.002	-0.002
	(0.004)	(0.014)	(0.006)	(0.005)	(0.006)	(0.007)
Trade	0.105	0.138	0.093	0.146	0.282	0.170
	(0.183)	(0.615)	(0.279)	(0.234)	(0.259)	(0.324)
Fcctotc	-0.340***	-0.758**	-0.398***	-0.234*	-0.375***	-0.436**
	(0.102)	(0.340)	(0.154)	(0.129)	(0.143)	(0.179)
inflation	-0.006	-0.051***	-0.018***	-0.008	-0.002	-0.002
	(0.004)	(0.014)	(0.006)	(0.005)	(0.006)	(0.007)
Trade	0.105	0.138	0.093	0.146	0.282	0.170
	(0.183)	(0.615)	(0.279)	(0.234)	(0.259)	(0.324)
gconsumpt	-2.272***	-1.035	-2.087***	-2.503***	-2.270***	-2.614***
	(0.409)	(1.375)	(0.624)	(0.524)	(0.580)	(0.725)
investment	-0.645**	-0.507	-0.627	-0.730*	-0.428	-0.551
	(0.295)	(0.995)	(0.452)	(0.379)	(0.420)	(0.525)
popgrowth	-0.130***	-0.308*	-0.211***	-0.077	-0.119*	-0.129
	(0.050)	(0.171)	(0.078)	(0.065)	(0.072)	(0.090)
_cons	9.252***	7.604***	9.088***	9.549***	8.824***	10.000***
	(0.820)	(2.775)	(1.260)	(1.057)	(1.170)	(1.463)
R^2	0.64					
N	60	60	60	60	60	60

Dependant variable is GDP per capita

Standard error in parenthesis. *Significance at 10%; ** significance at 5%; ***significance at 1%. All regressions do not include time dummies.

In the eighth set of regressions, we used foreign currency credits as a measure of financial dollarization, and in order to control the problem of endogeneity bias, we instrument our main variable foreign currency credits with its values in the first period. We include time dummies

variables in these regressions. Table 9 reports OLS and quantile regressions results of the effect of financial dollarization on economic development. We find that the effect of financial dollarization on economic development is negative and statistically significant in all the models. It means that when we use foreign currency credits as measure of financial dollarization, the effect on economic development is negative, and statistically significant, even for countries with high economic development. The coefficient estimations show an inverted U-shape pattern; it means that when the country reaches a higher level of economic development, the effect rises, but later, it falls.

When we instrument our main variable, we find strong evidence of a negative and significant effect of financial dollarization on economic development. These findings are robust since the result is consistent with different methodology, and it suggests that the marginal effect of financial dollarization on economic development increases with the level of foreign currency credits.

Regarding other control variables, the coefficient estimate on *inflation* is negative and statistically significant for lower quantiles, but when we move to a higher quantile, the marginal effect decreases and for higher quantiles, becomes insignificant. It suggests that inflation has a negative effect on economic development when we use foreign currency credits as a measure of financial dollarization; however, for higher quantiles the effect is not significant. The coefficient estimates on *trade* is not statistically significant, indicating *trade* has very little power explaining the changes in economic development.

The coefficient estimate on *government consumption* is negative and statistically significant in all models. It has an increasing pattern when we move to a higher quantile. It implies that *government consumption* has a negative effect on economic development. The coefficient estimate on *investment* is negative, and significant for higher quantiles, the other

quantile coefficients are not significant. It means investment has a negative effect on economic development in the countries with high GDP per capita, but very little power in explaining the changes in economic development for countries with lower economic development. Finally, the coefficient estimate on *popgrowth* is negative, and statistically significant, however, when we move to a higher quantile, the results show a decreasing pattern, since the coefficient estimates is lower for higher quantiles. It suggests that *popgrowt* has a negative effect on economic development.

Table 9: IV estimation foreign currency credits with time dummies variables

		IV Quantile				
Model	IV	10	25	50	75	90
Fcctotc	-0.332***	-0.938***	-0.403**	-0.323**	-0.297**	-0.411**
	(0.103)	(0.314)	(0.164)	(0.131)	(0.148)	(0.195)
inflation	-0.005	-0.037***	-0.021***	-0.008	0.000	-0.002
	(0.004)	(0.013)	(0.007)	(0.005)	(0.006)	(0.008)
Trade	0.062	0.222	0.084	0.182	0.218	-0.048
	(0.189)	(0.584)	(0.306)	(0.243)	(0.276)	(0.363)
gconsumpt	-2.291***	-0.789	-1.910***	-2.363***	-2.434***	-3.209***
	(0.407)	(1.260)	(0.659)	(0.525)	(0.595)	(0.783)
investment	-0.695**	-1.325	-0.388	-1.036***	-1.186***	-1.178**
	(0.297)	(0.925)	(0.484)	(0.385)	(0.437)	(0.575)
popgrowth	-0.121**	-0.342**	-0.242***	-0.106	-0.089	-0.069
	(0.051)	(0.160)	(0.084)	(0.067)	(0.076)	(0.100)
	(0.080)	(0.248)	(0.130)	(0.104)	(0.117)	(0.154)
_cons	9.406***	7.997***	8.510***	9.823***	10.106***	12.276***
	(0.833)	(2.597)	(1.359)	(1.082)	(1.227)	(1.615)
R^2	0.65					
N	60	60	60	60	60	60

Dependant variable is GDP per capita

Standard error in parenthesis. *Significance at 10%; ** significance at 5%; ***significance at 1%. All regressions do not include time dummies.

5. Conclusion

What is the effect of financial dollarization on economic development in Latin America countries? To answer this important question, we analyzed the relationship between financial dollarization and economic development. We used cross-country series for foreign currency deposits and foreign currency credits as a measure of financial dollarization, covering 20 countries with data of foreign deposits and 15 with foreign credits over the period 2000-2012.

We find that financial dollarization has a negative and significant effect on economic development, but decreases as a country's economic development grows. The results show a decreasing pattern, which implies that the development reduces the effect of financial dollarization on economic development, and its effect decreases as a country´s economic development increases. The findings also show a nonlinear link between financial dollarization and economic development. These are the results for the models where we instrument our foreign currency deposits (fcdtotd) variable with its values in the first year of the subsample periods (average of 3- and 4- years for the last subsample period); the goal of instrumenting this variable is to control the endogeneity bias. It is important to mention that the findings are very consistent in comparison with the set of regression without IV.

The negative effect is the result that is usually found that countries with less economic development are not doing well in trade, which is one of the reasons why countries increase the level of financial dollarization. Additionally if the financial system is not developed then those countries cannot avoid the risk of financial dollarization. In the case of countries with higher economic development, the effect is not significant since the financial system of those countries is well developed; they have financial instruments for protecting the risk generated by financial dollarization. It implies that policy toward declining the level of financial dollarization of a

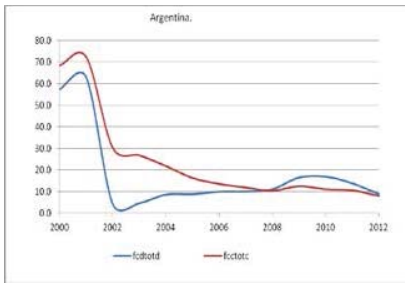
country can be one effective instrument to promote economic development. However, this policy should be applied to countries with low economic development and financial dollarization in terms of foreign currency deposits.

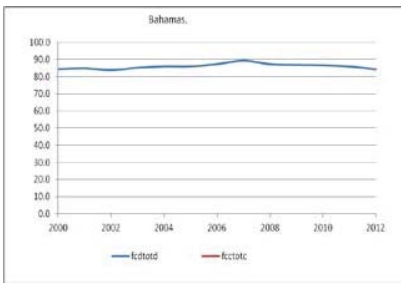
For the second model, we instrument our foreign currency credits (fcctotc) variable. We find a negative and significant effect of financial dollarization on economic development when we use foreign currency credits as measure of financial dollarization. The findings suggest that there is a negative effect of financial dollarization on economic development in Latin American countries. The results show an inverted U shape, which means the effect rises when country´s economic development increases, but later on falls. The negative effect is because the countries with low economic development do not have a developed financial system, consequently they do not have financial instruments to protect them from the risk of financial dollarization. Additionally when they attain a higher economic development, the level of financial dollarization is going to be higher, and then the effect is going to increase. It means that for those countries with financial dollarization in terms of foreign currency credits, a policy toward declining the level of financial dollarization can be an effective instrument to achieve economic development, but this policy will benefit more those countries with lower economic development.

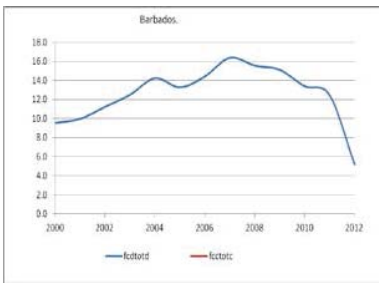
As a robustness check, we use OLS and quantile regression without including time dummies. In order to control the time effect, we include time dummies and the results are consistent.

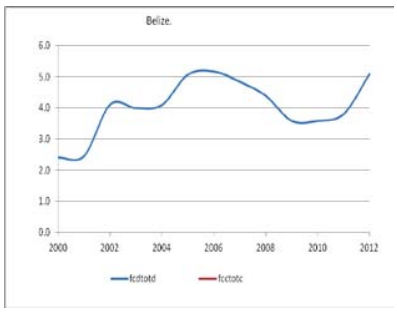
APPENDICES

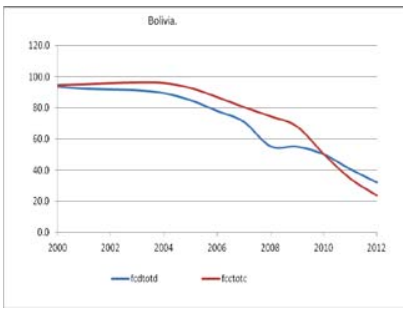
Financial Dollarization

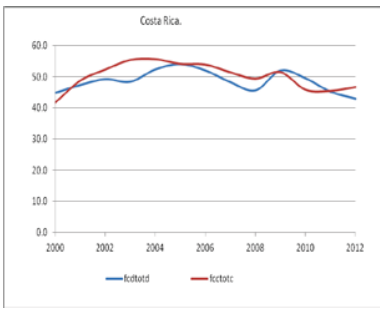


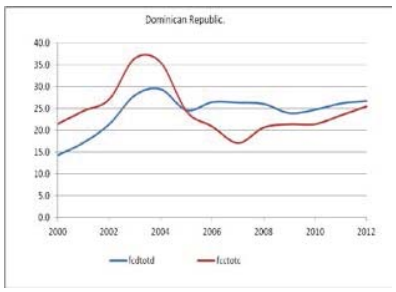


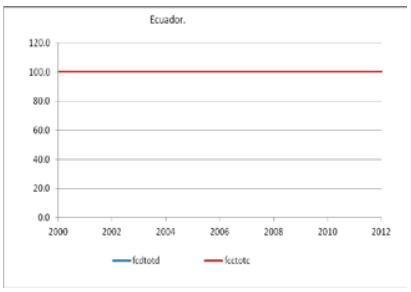


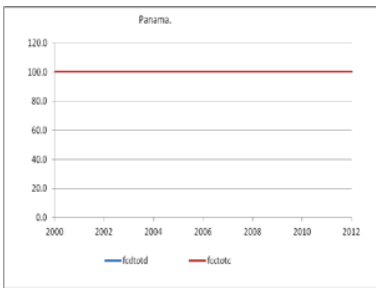


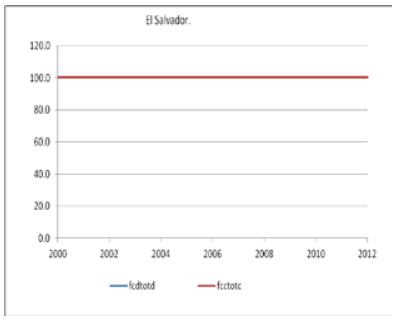


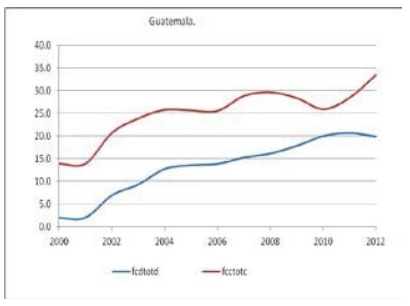


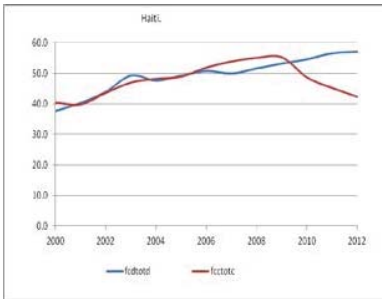


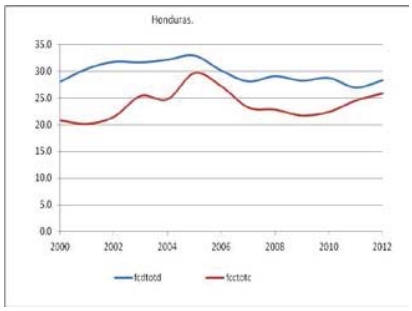








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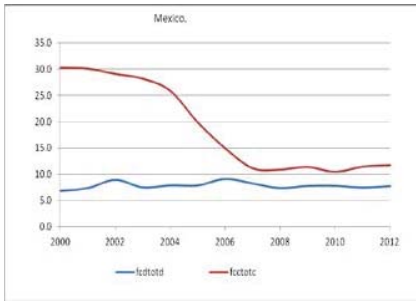
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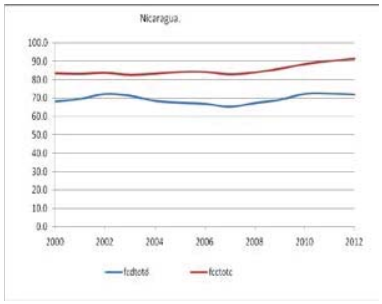
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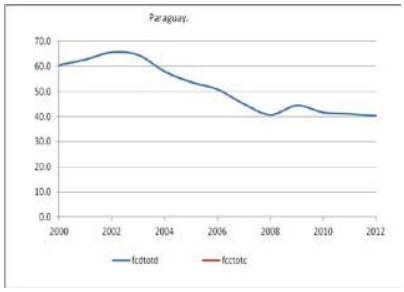
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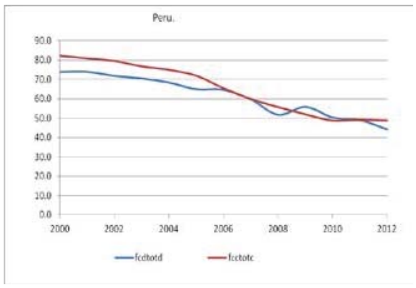
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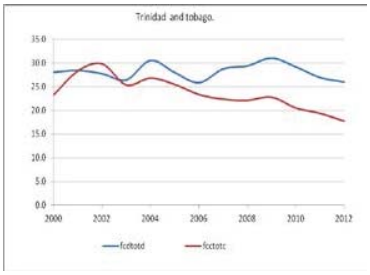
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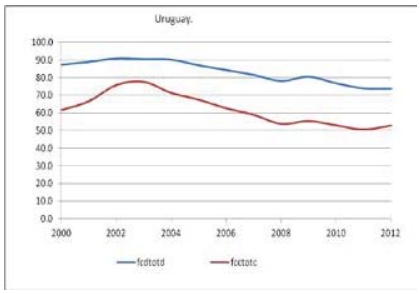
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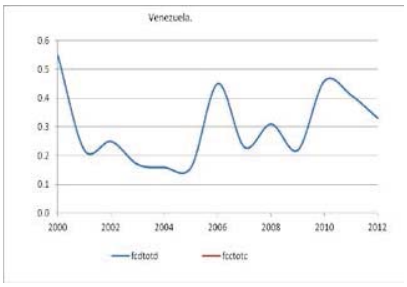
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2010
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