

**STRICT DOLLARIZATION
AND ECONOMIC PERFORMANCE:
An Empirical Investigation**

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ABSTRACT

In this paper we analyze the macroeconomic record of “strictly dollarized” economies. In particular, we investigate whether dollarized countries have historically exhibited faster growth and lower volatility than countries with a domestic currency. We analyze this issue by using a treatment regression analysis that estimates jointly the probability of being a dollarized country, and outcome equations. Our analysis indicates that the probability of being a dollarized country depends on regional, geographical, political and structural variables. Our results also suggest that GDP per capita growth has not been statistically different in dollarized and in non-dollarized countries. We also find that volatility has been significantly higher in dollarized than in non-dollarized economies. These results are robust to the estimation technique, and to the sample used.

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I. Introduction

A number of authors have recently argued that (some) emerging nations should give up their domestic currency and adopt an advanced nation's currency as legal tender. This policy option has received the name of "*official dollarization*," even if the advanced country's currency is other than the dollar. There is wide agreement among economists that countries that give up their currency, and delegate monetary policy to an advanced country's (conservative) central bank, will have lower inflation than countries that pursue an active domestic monetary policy. Work by Engel and Rose (2002), Eichengreen and Hausmann (1999), and Edwards (2001) has found that dollarized countries have had a significantly lower rate of inflation than countries with a domestic currency.¹

There is much less agreement, however, on the effects of dollarization on real economic variables, such as growth, employment and volatility. According to its supporters, dollarization will positively affect growth through two channels: First, dollarization will tend to result in lower interest rates, higher investment and faster growth (Dornbusch 2001). And second, by eliminating currency risk, a common currency will encourage international trade; this, in turn, will result in faster growth. Rose (2000), and Rose and Van Wincoop (2001), among others, have emphasized this trade channel. Other authors, however, have been skeptical regarding the alleged benefits of dollarization. Indeed, according to a view that goes back at least to Meade (1951), countries with a hard peg – including dollarized countries – will have difficulties accommodating external shocks. This, in turn, will be translated into greater volatility, and may even lead to lower economic growth (Parrado and Velasco 2002, Broda 2001).

What is surprising, however, is that there have been very few comparative analyses on economic performance under dollarization. Most cross-country studies have focused on "independent currency unions," and have included very few observations on strictly dollarized countries. For instance, the Engel and Rose (2002) data set includes 26 countries that do not have a currency of their own, and have data on real GDP per capita. Of these, only seven use another nation's currency, and only two -- Panama and Puerto Rico -- use a convertible currency as legal tender, and are thus "strictly dollarized" countries. The study on exchange rate regimes by Ghosh et al. (1995) does not include nations that do not have a domestic currency. The IMF (1997) study on exchange rate

systems excluded dollarized countries, and the recent paper by Levy-Yeyati and Sturzenegger (2003) does not include nations that do not have a central bank.²

In this paper we analyze empirically the historical record of *strictly dollarized* economies. We investigate whether, as argued by its supporters, dollarization is associated with superior macroeconomic performance, as measured by faster GDP growth and lower GDP growth volatility. The reason for focusing on strictly dollarized countries is simple: the policy debate in the emerging world is whether these countries ought to adopt an “advanced” country's currency as a way of achieving credibility. For Argentina it is very different to delegate monetary policy to the Federal Reserve, than delegating it to a *Mercosur* central bank run by Brazilians and Argentineans.³ Comparing economic performance in dollarized countries and in countries with a currency of their own is not easy, however. The problem is how to define an appropriate “control group”. In this paper we tackle this issue by using a treatment regressions technique that *estimates jointly* the probability of being a dollarized country, and outcome equations on GDP per capita growth and on GDP growth volatility.⁴

Our analysis on the probability of a country being dollarized relies on two strands of literature: the optimal currency areas literature pioneered by Mundell (1961), and the literature on the political economy of currency regimes. Scholars working on political economy have focused on the distributive and credibility consequences of alternative exchange rate systems (Frieden 2003). Bernhard et al. (2002) and Freeman (2002) have argued that it is important to analyze episodes where hard pegs and central bank independence reinforce themselves as “credibility enhancing” institutions. In this paper we investigate the experience of a group of countries that have done precisely this. Indeed, dollarization is a regime with the hardest of hard pegs; central bank independence is complete, as monetary policy is fully delegated to foreigners.

Our analysis differs from other work in this general area in several respects. First, we have made an effort to include data on a large number of strictly dollarized countries. This has not been easy, as most strictly dollarized countries are very small and their data are not included in readily available data sets. After significant effort we were able to obtain data on GDP per capita growth for 16 strictly dollarized countries. Our data set, then, is significantly more general than the data set used by other researchers, including

Engel and Rose (2002). Second, we focus directly on two real macroeconomic variables – real GDP per capita growth, and growth volatility. Other studies, in contrast, have analyzed performance in an indirect fashion, and have focused on ancillary variables such as the level of international trade and/or interest rates.⁵ Third, our empirical approach allows us to estimate jointly the probability of being a “strictly dollarized country” and the effect of dollarization on two outcome variables. And fourth, we explicitly introduce political economy considerations into the analysis.⁶ The rest of the paper is organized as follows: In Section II we discuss historical experiences with “dollarization.” In Section III we use “treatment regressions” to analyze the effects of “dollarization” on GDP growth and volatility. Finally, in Section IV we provide some concluding remarks.

II. Strict Dollarization During 1970-1998

Countries that use a foreign *convertible* currency as legal tender may be divided into two groups: (a) *independent* nations; and (b) territories, colonies or regions within a national entity. Panama is an example of the first group, while Puerto Rico belongs to the second group. Panel A in Table 1 contains a list of countries and territories that have had an official dollarized system at any time during 1970-1998, and that have data on key macroeconomic variables such as inflation and GDP growth.⁷ These countries are very small indeed, and many are city-states well integrated into their neighbors’ economies. In Panel B of Table 1 we provide data on some key variables for our dollarized sample, as well as for non-dollarized countries for 1970-1998. The majority of the countries in Table 1-A are extremely open, and in most of them there are no controls on capital mobility or on any type of financial transactions. These fundamental characteristics of the dollarized economies – very small and extremely open – already suggest that using a broad control group of *all non-dollarized* countries, which are much larger and not as open, may indeed generate biased results.

III. Dollarization and Real Macroeconomic Performance: The Evidence

III.1 The Empirical Model

In order to analyze the conditional effect of “dollarization” on real performance, we estimate jointly “outcome equations” and equations on the probability of being a dollarized country. We consider two outcome variables: GDP per capita growth and growth volatility. The data set covers 1970 through 1998, and includes 148 countries and

territories. Growth is defined as average GDP growth per capita for 1970-1998; volatility is the standard deviation of GDP growth per capita during the same period. The base empirical model is given by equations (1) through (4):

$$(1) \quad y_j = \mathbf{x}_j \beta + \gamma \delta_j + \mu_j$$

$$(2) \quad \delta_j = \begin{cases} 1, & \text{if } \delta^*_j > 0 \\ 0, & \text{otherwise} \end{cases}$$

$$(3) \quad \delta^*_j = \mathbf{w}_j \alpha + \varepsilon_j .$$

Equation (1) is the macroeconomic performance equation; y_j stands for each of the performance variables of interest; \mathbf{x}_j is a vector of covariates for the traditional determinants of economic performance. δ_j is a dummy variable (i.e. the *treatment variable*) that takes a value of one if country j is “strictly dollarized,” and zero otherwise. μ_j is an error term, whose properties are discussed below. β and γ are parameters to be estimated. The dollarization dummy is assumed to be the result of an unobserved latent variable δ^*_j , as described in equation (2). δ^*_j , in turn, is assumed to depend linearly on vector \mathbf{w}_j . Some of the variables in \mathbf{w}_j may be included in \mathbf{x}_j (Maddala 1983, p. 120).⁸ α is a parameters vector to be estimated, and ε_j is an error term. Error terms μ_j and ε_j are assumed to be bivariate normal, with a zero mean and a covariance matrix given by:

$$(4) \quad \begin{pmatrix} \sigma & \zeta \\ \zeta & 1 \end{pmatrix}$$

If the performance and dollarization equations are independent, the covariance term ζ in equation (4) will be zero. If equation (1) is estimated by least squares, the treatment effect will be overestimated -- Greene (2000, p. 934). In this paper we use a maximum

likelihood procedure to estimate (1) – (4) jointly. The model in equations (1) – (4) will satisfy the consistency and identifying conditions of mixed models with latent variables if the outcome variable y_j is not a determinant of the treatment equation -- that is, if y is not one of the variables in w in equation (3).⁹ In our case this is a reasonable assumption. Although the *initial level* of GDP per capita may affect the probability of being a dollarized country, its rate of change, or the second moment of its rate of change is unlikely to have an impact on this decision. In the estimation we also impose a number of exclusionary restrictions; a number of variables in vector w_j are not included in vector x_j . In order to deal with potential endogeneity problems, we also estimated the system using the instrumental variables treatment procedure suggested by Wooldridge (2002).

III.2 Basic Results

We estimated the model in equations (1) through (4), using a cross section of 148 countries (average data for 1970-1998).¹⁰ We proceed as follows: We first discuss the specification for the probability of being dollarized. We then discuss the specification for the outcome equations on growth and volatility. Then, we present the results from the (joint) estimation of both models. We finally discuss extensions and robustness.

III.2.1 Equation Specification

a. The Treatment Equation: In specifying the treatment equation (3) on the probability of being dollarized, we draw on two interrelated bodies of work: (1) optimal currency areas; and (2) the political economy of exchange rate regimes. Mundell (1961, p. 181) argued that the “optimum currency area is the region.” By this he meant that regional considerations – geographical proximity and the existence of factor mobility, among other – were more important than national (or sovereign) considerations in determining optimal currency areas. This regional-based approach has been present in most subsequent work on the subject. Following Mundell, we include a number of “regional variables” in our empirical analysis on the probability of being a “dollarized” country: (a) a dummy variable that takes the value of one if the economy in question is an independent nation, and zero if it is a territory. Since factor mobility is much lower across independent nations than between a dependent territory and the “home country”, we expect the coefficient to be negative. (b) A dummy variable that takes the value of one if the country has a common border with a nation whose currency the IMF defines as

a “convertible currency.”¹¹ We expect its estimated coefficient to be positive. (c) A dummy variable that takes the value of one if the country in question is an island or archipelago. Since island-archipelago countries are relatively isolated, they tend to be self-contained regions. We expect this variable to have a negative coefficient in (3).

The political economy literature has emphasized both credibility and distributive issues. From a credibility perspective, countries that give up their domestic currency are countries that are willing to “tie their hands.” These are usually countries where temptation to inflate is significant, and/or countries whose monetary institutions lack credibility (Person and Tabellini, 2000). Frieden (2003) has argued that from a distributive perspective, politically powerful groups will try to influence the selection of the exchange rate regime in a way that benefits their interests. According to him, since dollarization eliminates currency risk, this regime will have a high degree of political support in countries with a large external sector and a high degree of openness. Based on these views, in the estimation of the treatment equation we included the following political economy covariates: (d) an index that captures the credibility motive for dollarizing. This index was constructed as a composite of institutional, structural and economic variables that affect the authorities’ decision to “tie their hands” (see the Appendix).¹² We called this index *credibility*. Its sign is expected to be negative, as higher numbers reflect a higher degree of credibility. (e) An indicator of the degree of openness of the economy. Following Frieden (2003), we expect that more open countries – or countries with lower trade barriers – are more likely of being dollarized. We used two alternative variables to measure openness: an openness index developed by Wacziarg and Welch (2003), and the average tariff (the coefficient of the tariff variable is expected to be negative).¹³ And (f), a dummy variable that takes the value of one if the country has a free trade agreement with an advanced nation. We expect this coefficient to be positive, capturing the fact that dollarization is a step towards “deep integration,” and that it tends to take place once some form of trade integration has been accomplished. In addition, the following covariates were also included in the specification of the treatment equation (3)¹⁴: (h) the log of population measured in millions of people, as an index of the country’s size. We expect its coefficient to be negative, as larger countries are less likely to use another nation’s currency. And (i), the log of initial (1970) GDP, taken as a

measure of the country's economic size. We expect a negative coefficient.

b. The Outcome Equations: Our analysis focused on two outcome variables: (a) GDP per capita growth, (b) growth volatility. A difficulty in undertaking this analysis is that most of the “dollarized” countries have limited data availability. For instance, almost none of them have data on education attainment. Nevertheless, and after searching in a number of alternative data sources, we were able to include a number of covariates in the outcome equations for per capita growth, and volatility (see the Appendix).

In the GDP growth model we included, as customary, initial GDP, a measure of openness, and a variable that captures geographical location. Our geography variable -- which we call “tropics”-- is defined as the absolute distance from each country to the equator.¹⁵ Following Leamer (1997) and Sachs (2000), we expect its coefficient to be negative.¹⁶ We included regional dummies, and the “common currency” dummy. In some of the equations, we included dollarization interacted with structural variables. This allows us to investigate whether the effect of dollarization has depended on structural characteristics, such as the degree of openness and the level of development.¹⁷

In the outcome equation of the volatility model we include: initial GDP, openness, regional dummies and the dollarization dummy. Since poorer countries have a limited capacity to absorb external shocks – they lack well-developed domestic capital markets, have limited access to international borrowing and their exports are highly concentrated - - we expect that both coefficients of initial GDP and openness to be negative (Frenkel and Razin 1987). As in the growth models, in some specifications we introduced the dollarization dummy interacted with openness and initial GDP.

III.2.2 Main Results

In Table 2 we summarize the results obtained from the estimation of treatment models for GDP growth and volatility. The table contains two panels. The upper panel includes the results from the outcome equation; the lower panel contains the estimates for the “treatment equation” on the probability of being a dollarized country.

Probability of Being a Dollarized Country: The results are reported in the lower panel. As may be seen, the results are similar across models and are quite satisfactory. The majority of the coefficients have the expected signs, and are statistically significant at conventional levels. These results indicate that the probability of being a “dollarized”

country is higher for very small, not independent countries, that are also very open (or have low tariffs). Sharing a border with a country with a convertible currency has no effect on the probability of being a dollarized country, while, as expected, *island* has a negative coefficient. As may be noted, the estimated coefficient of the *credibility* index is significantly negative, as expected. The coefficient of the “trade agreement” variable is positive, and significant in two of the equations.

GDP per Capita Growth and Growth Volatility: Equations 2.1 through 2.4 in Table 2 are for growth. As may be seen, the traditional regressors have the expected signs: initial GDP has a negative and significant coefficient suggesting that there is “conditional convergence.” Both the openness and the tariffs variables are significant, indicating that more open economies (i.e. economies with lower tariffs) have tended to exhibit a higher rate of GDP growth. The “tropics” or “distance” variable is always negative, but not significant. When “tropics” is excluded from the analysis, the other results are not altered in a significant way. In terms of the exchange rate regime, the results in Table 2 show that the coefficient of the “dollarization” dummy is negative in three of the four regressions; in all four regressions the dummy is not statistically significant. Also, the coefficients for the variables that interact dollarization and openness and dollarization and the log of initial GDP are not statistically significant. The point estimates in equations 2.1 and 2.2 suggest that the dollarization effect on yearly GDP growth has been on average between -0.5% and -1%.¹⁸ These point estimates, however, should be taken with a grain of salt; remember that the coefficients are not statistically significant. Overall, the results on GDP growth in Table 2, then, provide evidence that contradicts the claim that dollarized countries have outperformed (in terms of growth) countries with a currency of their own.

Equations 2.5 through 2.8 in Table 2 are for volatility. As may be seen, the dummy variable for “strict dollarization” is in every equation significantly positive, indicating that dollarized countries have experienced a higher degree of volatility than countries with a currency of their own. The point estimates of these dummies in equations 2.5 and 2.6 (2.59 and 2.46) are quite high, suggesting that the “volatility disadvantage” of dollarized countries has been substantial. With regard to the other covariates, the results in Table 2 confirm our prior that openness (i.e. lower tariffs)

reduces volatility – a result that is in line with a number of theoretical results in international economics. In addition, our equations indicate that the initial level of GDP is not a significant determinant of growth volatility. Also, and as expected, the coefficient of “tropics” is positive, and significant in three of the equations.

According to equation 2.7, the coefficient of the interaction between dollarization and initial GDP is significantly negative. This suggests that dollarized countries with higher income will experience a lower degree of volatility than dollarized countries with lower GDP per capita. More specifically, the results in equation 2.7, may be interpreted as follows: in a country with a GDP per capita of US\$ 7,000, dollarization has resulted in higher volatility of approximately 1 percentage point per year. On the other hand, in a country with a GDP per capita of US\$ 1,000, dollarization has resulted in higher volatility of 4.7 percentage points per year. A possible explanation for this result is that higher income countries have an economic structure (including institutions) that allows them to absorb external shocks better than lower income nations. In equation 2.8 the term that interacts dollarization and openness is significantly negative. This suggests that dollarization has resulted in higher volatility in countries that are less open. This is consistent with models that suggest that more open economies are better equipped to deal with external shocks, such as terms of trade disturbances (Frenkel and Razin, 1997).

A particularly important question is whether the results reported in Table 2 are robust. We addressed this issue in several ways: (a) We used Cook’s influence procedure and DF-betas to investigate the potential role of outliers. (b) We analyzed whether the dollarization dummy is picking up the effect of omitted variables, including the effect of the country’s size on volatility. (c) We estimated an instrumental variables (IV) version of the treatment regression approach to deal with possible endogeneity issues (see Wooldridge 2002 for details on this IV method). (d) We used alternative credibility indexes constructed with subsets of the variables described in the data appendix. All of these checks indicate that the main results reported in Table 2 are very robust: in every case the coefficient of the dollarization dummy was negative and non-significant in the growth equation, and it was significantly positive in the volatility model.¹⁹

IV. Concluding Remarks

In this paper we have analyzed, from a comparative perspective, economic

performance in strictly dollarized economies. A difficulty in performing this type of analysis refers to defining the “control group.” We tackled this issue by using a “treatment effects model” developed in the labor economics literature; this method allows us to jointly estimate the probability of being a “strictly dollarized country,” and the effect of having this particular monetary regime on specific macroeconomic outcomes. Estimation using this technique yields results that are different from those obtained from simple comparisons using a large control group of all with-domestic-currency countries. More specifically, we found that dollarized countries have had a slightly lower rate of growth than countries with a domestic currency; this difference, however, is not statistically significant. We also found that GDP volatility has been significantly higher in dollarized economies, than in with-currency countries.

Our results indicate that the probability of being a dollarized country depends on regional, geographical, political and structural variables. The probability of being “dollarized” is higher for very small, not independent countries (or territories), that are very open, and have a low degree of credibility. In order to measure credibility we build an index as a composite of institutional, structural and economic variables. Our results are robust to sample, equation specification and estimation technique.

Appendix: Data Sources and Construction

Bilateral trade agreement: Takes the value of one for countries that have a bilateral trade agreement with a developed country according to the World Trade Organization.

Border: This dummy variable takes the value of one if the country has a common border with a nation whose currency is defined, by the IMF, as a “convertible currency.”

Credibility index: We constructed two indexes. One based on principal-components, and one using regressions. The variables included are: a dummy for French legal system (*leg_french*), years since independence (*indepy*), political instability (*instability*, see Kaufmann et al., 1999), a dummy for exporters of non-fuel primary products (*exp_prim*) and the average inflation rate of neighbor countries (*neigh_inf*). When we used principal components the index for country K is:

$$\text{Credibility}_k = -0.38 \cdot \text{leg_french}_k + 0.36 \cdot \text{indepy}_k - 0.66 \cdot \text{instability}_k - 0.49 \cdot \text{exp_prim}_k - 0.19 \cdot \text{neigh_inf}_k.$$
 For more details see Edwards and Magendzo (2003).

Distance from tropic: Corresponds to the negative of the absolute value of the latitude, where the latitude has been normalized dividing it by 90.

Gross Domestic Product (GDP): Obtained from the United Nations Monthly Bulletin of Statistics Online, in 1990 US dollars. Initial GDP corresponds to 1970 GDP or to the earliest available datum for each country. Per capita GDP is calculated dividing by *population*. This was obtained from the U.S. Census Bureau.

Independent: This is a dummy variable that takes the value of one for independent countries. Source: CIA, “The World Fact Book”.

Island: This is a dummy variable that takes the value of one if the country in question is an island or archipelago. Source: CIA, “The World Fact Book”.

Openness: We use the Wacziarg and Welch (2003) openness indicator. We used data from a variety of sources to supplement the Wacziarg and Welch index for countries not covered in their sample.

Tariff: We use Wacziarg and Welch (2003) average tariffs. From this source we obtain data on tariffs for the majority of the countries in our sample. We completed the data with the World Bank's WDI (2003) and from a variety of sources – including the CIA– especially for the smaller countries in our sample.

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Table 1
Dollarized and Non-Dollarized Countries: Basic Data

A. Dollarized Countries and Territories with Available Data

USA	Liberia* ¹ , Marshall Islands ¹ , Micronesia ¹ , Palau ¹ , Panama ¹ , and Puerto Rico
New Zealand	Cook Islands
France	Andorra ¹ (also Spanish peseta)
Australia	Kiribati ¹ , Tonga ¹ , Nauru and Tuvalu ¹
Italy	San Marino ¹
Denmark	Greenland
Switzerland	Liechtenstein ¹
Belgium	Luxembourg ¹

B. Summary Statistics
(Mean)

	<i>Dollarized</i>	<i>Non-Dollarized</i>
Per-Capita GDP Growth	0.62%	0.92%
Standard Deviation of GDP Growth	2.31	2.04
Population	536,609	32,680,479
Initial GDP	8,185	4,310
Distance from Tropic	0.25	0.31
Distance from World Center	5,976	5,761
Credibility index	0.10	0.23
Independent (%)	47	90
Border (%)	26	21
Openness (%)	50	27
Island (%)	58	24
Tax heaven (%)	32	12
Number of Countries	16	146

* Dollarized until 1982

¹ denotes that the country is independent at the time of this writing. Kiribati became independent in 1980; the Marshall Islands in 1987; Palau in 1995; and Tuvalu in 1979.

Table 2: Dollarization, Growth and Volatility: Treatment Regressions

	(2.1)	(2.2)	(2.3)	(2.4)	(2.5)	(2.6)	(2.7)	(2.8)
	Growth	Growth	Growth	Growth	Volatility	Volatility	Volatility	Volatility
<i>A. OUTCOME EQUATIONS</i>								
Log of initial per capita GDP (1970)	-0.466 (2.60)**	-0.263 (1.38)	-0.470 (2.63)**	-0.493 (2.74)**	0.085 (0.34)	-0.330 (1.28)	-0.040 (0.17)	-0.186 (0.73)
Openness	2.828 (6.11)**	--	2.787 (5.98)**	3.008 (6.13)**	-3.831 (5.97)**	--	-3.441 (5.43)**	-3.388 (4.87)**
Average Tariffs	--	-0.384 (3.93)**	--	--	--	0.512 (3.81)**	--	--
Tropics	-2.262 (1.39)	-2.836 (1.64)	-2.136 (1.31)	-2.399 (1.48)	4.130 (1.86)*	4.593 (1.96)*	2.862 (1.29)	4.112 (1.77)*
Dollarization Dummy	-0.568 (0.82)	-0.998 (1.25)	-3.452 (0.81)	0.330 (0.31)	2.590 (2.62)**	2.455 (2.48)**	18.308 (6.13)**	4.770 (6.75)**
Dollarization Dummy* Log GDP(70)	--	--	0.332 (0.69)	--	--	--	-1.968 (4.73)**	--
Dollarization Dummy* Openness	--	--	--	-1.316 (1.08)	--	--	--	-3.095 (2.13)**
<i>B. TREATMENT EQUATIONS</i>								
Log of population	-1.164 (3.37)**	-0.793 (3.67)**	-1.159 (3.36)**	-1.167 (3.34)**	-1.422 (3.33)**	-0.847 (3.57)**	-2.004 (8.99)**	-1.851 (9.11)**
Log of initial per capita GDP (1970)	0.122 (0.30)	0.044 (0.14)	0.104 (0.26)	0.149 (0.36)	-0.294 (0.78)	-0.191 (0.63)	-0.092 (0.19)	-0.061 (0.10)
Openness	3.470 (3.03)**	--	3.482 (3.01)**	3.473 (3.07)**	4.318 (3.80)**	--	5.908 (9.06)**	5.223 (7.96)**
Average Tariffs	--	-0.310 (2.71)**	--	--	--	-0.376 (3.16)**	--	--
Island	-1.730 (1.83)*	-1.429 (1.89)*	-1.738 (1.87)*	-1.718 (1.78)*	-2.171 (2.06)**	-1.310 (1.64)	-3.226 (6.49)**	-3.288 (6.19)**
Border Dummy	-1.132 (1.09)	-0.365 (0.52)	-1.129 (1.09)	-1.107 (1.06)	-1.379 (1.33)	-0.578 (0.84)	-2.242 (0.04)	-2.487 (1.18)
Credibility Index	-1.187 (2.10)**	-0.611 (1.75)*	-1.175 (2.09)**	-1.200 (2.09)**	-1.187 (2.31)**	-0.495 (1.50)	-1.707 (6.63)**	-1.701 (6.82)**
Independence Dummy	-2.662 (2.44)**	-1.808 (2.20)**	-2.615 (2.38)**	-2.715 (2.50)**	-2.755 (2.42)**	-1.741 (2.04)**	-3.464 (5.69)**	-3.843 (2.66)**
Trade Agreement Dummy	2.281 (1.44)	1.399 (1.22)	2.318 (1.49)	2.235 (1.37)	2.656 (1.99)**	1.094 (1.24)	3.602 (2.31)**	4.108 (6.90)**
N	148	148	148	148	148	148	148	148
Wald Chi2	74.62	50.03	75.26	76.21	69.23	46.90	857.17	142.95
Prob>chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Absolute value of z statistics in parentheses. All equations include regional dummies; these are not reported due to space considerations. All equations were estimated using a maximum likelihood procedure.

* significant at 10%, ** significant at 5% .

ENDNOTES

¹ See Frankel and Rose (2002), Calvo and Mishkin (2003), and Panizza et al. (2002).

² Most studies on dollarization have focused on the case of Panama. See Goldfajn and Olivares (2001), Moreno-Villalaz (1999), Bogetic (2000) and Edwards (2001).

³ In Edwards and Magendzo (2003) we deal with all “common currency” countries.

⁴ Ideally, we would have liked to include consumption volatility. Unfortunately, most small dollarized countries do not have data on consumption. On treatment regression models see, for example, Maddala (1983), Greene (2000) and Wooldridge (2002).

⁵ See Frankel and Rose (2002), Powell and Sturzenegger (2003) and Klein (2002).

⁶ On political economy see Persson and Tabellini (2000) and Lohmann (2000).

⁷ We follow the U.S. Congress’ Joint Economic Committee, and concentrate on territories with a high degree of administrative autonomy. That is, we exclude territories that are fully administered by the central power. This is an important distinction for interpreting the “credibility” coefficient in the regressions reported in Table 2.

⁸ It is assumed, however, that $\delta * j$ does not depend on y_j .

⁹ See Heckman (1978), Maddala (1983) and Angrist (2000) for details on identification of models with mixed structures.

¹⁰ Volatility is the standard deviation of per capita GDP growth. For some countries the average is for a shorter period. For Liberia we used data for 1970-1981.

¹¹ In some regressions, we replaced “border” with a variable that indicates if the country is fully “surrounded” by another country. Its coefficient was not significant, however.

¹² Two *credibility* indexes were constructed: one based on principal components and one based on regressions. See the appendix for details. Results for both indexes were very similar. In Table 2 we present results for the principal components index.

¹³ Wacziarg and Welch (2003) persuasively argue that, in spite of the Rodrik and Rodriguez (1999) criticism, this indicator is a comprehensive measure of openness. We use the Wacziarg and Welch tariff variable for most countries. For the rest we constructed a tariff average using national and international data sources.

¹⁴ Unfortunately, there are no available data on other regional variables of interest, including a generalized index of factor mobility or of synchronicity of shocks.

¹⁵ In this definition, the equator receives a value of zero and the poles a value of -1 .

¹⁶ See also Easterly and Levine (2003), and Venables et al. (2002).

¹⁷ We have imposed a number of exclusionary restrictions: many covariates included in the probability equations are excluded from the outcome equations. We also assume that the “tropics” variable, which is included in the outcome equations, reflects “economic distance” and does not capture the influence of institutional variables.

¹⁸ The point estimates in equation 2.3 indicate that the effect of dollarization on growth has ranged from -2.1% to -0.1%, depending on the initial level of GDP per capita. The results in 2.4 suggest that dollarization has had an effect on growth ranging from -0.99% to 0.33%, depending on the degree of openness. Remember, however, that the dollarization coefficients are not significant.

¹⁹ The results from these robustness checks are available from the authors on request.