

## Addicted to Dollars\*

Carmen M. Reinhart

*Kennedy School of Government, Harvard University, Cambridge, MA 02138*  
E-mail: Carmen\_reinhart@harvard.edu

Kenneth S. Rogoff

*Economics Department, Littauer Center, Harvard University*  
*Cambridge, MA 02138*  
E-mail: krogoff@fas.harvard.edu

and

Miguel A. Savastano

*International Monetary Fund, Washington DC 20431*  
E-mail: msavastano@imf.org

Many emerging market economies are dollarized in varying degrees. How important is this for the conduct of monetary policy and choice of exchange rate regime? We propose a composite measure of dollarization, identify its major trends, and ascertain its impact on the effectiveness of monetary and exchange rate policy. We find that, contrary to the presumption in the literature, a high degree of dollarization does not pose an obstacle to monetary control or to disinflation. A high level of dollarization does appear to increase exchange rate pass-through, reinforcing the claim that “fear of floating” is a greater problem for highly dollarized economies.

*Key Words:* Dollarization; Inflation; Exchange rates; External debt.

*JEL Classification Numbers:* E42, E52, F40.

\*Work on this paper started when the three authors were in the Research Department of the International Monetary Fund. Carmen M Reinhart Kenneth Rogoff are at Harvard University. The opinions expressed in the paper are exclusively those of the authors and do not represent the views of the IMF.

## 1. INTRODUCTION

Dollarization, in a broad sense, is increasingly a defining characteristic of many emerging market economies. Governments often borrow in dollars, individuals can hold dollar-denominated bank accounts, firms and households can borrow in dollars both domestically and from abroad. How important is this trend quantitatively and what are its implications for the conduct of monetary policy and the choice of exchange rate regimes? For those countries that wish they weren't so dollarized; how easy is to scale back? These questions have received a great deal of attention in both the theory and policy literature. Most of the answers thus far, however, have not been too convincing. Competing definitions of dollarization and, most importantly, lack of empirical support for the various hypotheses advanced have conspired against the emergence of anything resembling a consensus.

This paper attempts to move the debate forward and shed light on the critical questions. We propose a measure of dollarization that is broad both conceptually and in terms of country coverage. We use this measure to identify trends in the evolution of dollarization in the developing world in the last two decades, and to ascertain the consequences that dollarization has had on the effectiveness of monetary and exchange rate policy. We find that, contrary to the general presumption in the literature, a high degree of dollarization does not seem to be an obstacle to monetary control or to disinflation. Dollarization does, however, appear to increase exchange rate pass-through, reinforcing the claim that "fear of floating" is a greater problem for highly dollarized economies.

We then review the developing countries' record in combating their addiction to dollars. We try to explain why some countries have been able to avoid certain forms of the addiction, and examine the evidence on successful de-dollarization. We find that this record is not particularly encouraging; concretely, we are able to identify only two countries, out of a total of 85, that managed to achieve large and lasting declines in domestic dollarization without having to incur heavy costs in terms of financial disintermediation or capital flight.

## 2. WHAT IS A DOLLARIZED ECONOMY?

The definition of a dollarized economy has become quite elusive in recent years. For more than two decades up to the late 1990s the defining feature of a dollarized economy was the fact that domestic residents held foreign currency or financial assets denominated in foreign currency as part of their asset portfolio. After the Asia crises of the late 1990s, however, the term dollarization — and dollarized economy — started to be used by many to refer to the case of countries that did not issue a national currency, or that

opted to replace their national currency for a foreign, more stable, one.<sup>1</sup> At about the same time a different strand of literature developed the concept of liability dollarization, stressing the role that foreign currency borrowing by the private and public sectors had on the vulnerability of emerging market economies to external shocks and, hence, on key aspects of macroeconomic management.<sup>2</sup> Terminology aside, it is relatively straightforward, both conceptually and empirically, to establish a meaningful distinction between economies that do not have a national currency and those where dollarization is only of a partial nature. Distinguishing between the two other “types” of dollarization, however, is a much harder task. One reason for this is that, broadly speaking, the two concepts of dollarization focus on different sides of the balance sheet. Related complications are that the data used in empirical studies to gauge the presence and/or macroeconomic effects of either concept of partial dollarization have serious measurement problems, and that studies typically neglect the possible co-existence of both phenomena.

Figure 1 helps illustrate the severity of these problems. The figure depicts the foreign currency assets and liabilities of the private and public sector in a partially dollarized economy. The four boxes in the upper left corner of the figure, the foreign currency assets of households and firms, are the subject of analysis of the traditional literature on partial dollarization. The newer literature on liability dollarization, by contrast, is primarily concerned with entries on the right-side column; concretely, about the external foreign currency liabilities of households, firms, and the government.

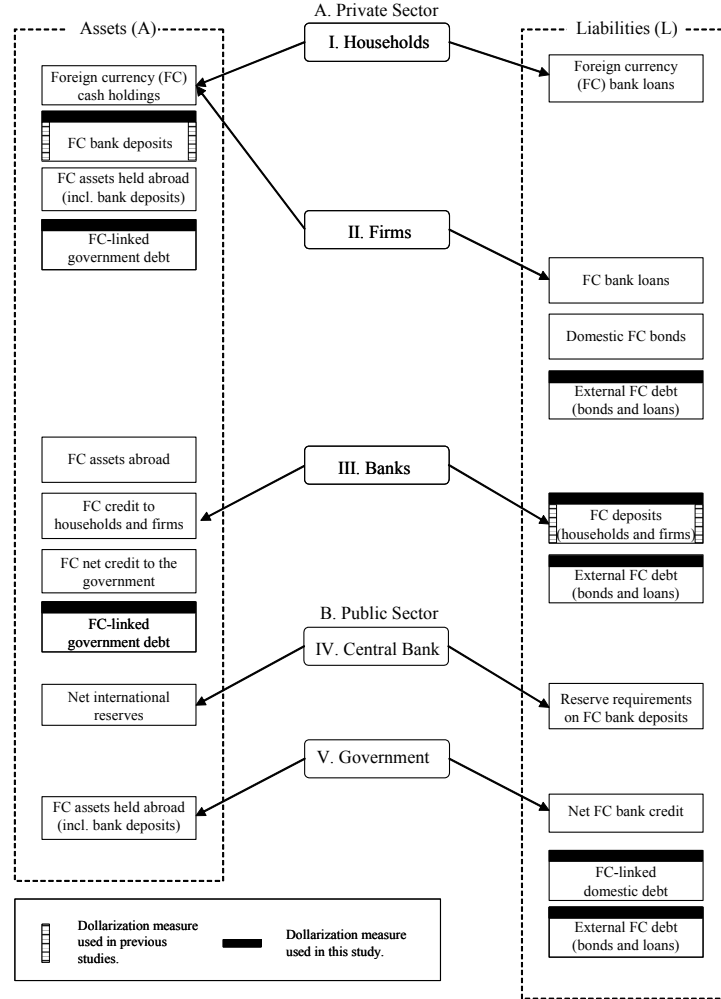
Lack of reliable data on the various foreign currency assets and liabilities depicted in the figure have constrained the measures of dollarization used in the empirical studies related to both strands of literature. The traditional literature on partial dollarization, for example, has adopted as a norm the use of foreign currency deposits in domestic banks — typically as a ratio to some other monetary aggregate — as the “best” indicator of dollarization.<sup>3</sup> Severe data shortcomings have repeatedly thwarted attempts to construct a reliable measure of partial dollarization that includes estimates of the other three foreign currency assets held by households and firms in partially dollarized economies — including, importantly, cash holdings of foreign currency.<sup>4</sup>

<sup>1</sup>See, for example, Calvo (1999, 2000), Edwards (2001) and the collection of papers in Salvatore et al. (2003).

<sup>2</sup>See Calvo (1999), and Caballero and Krishnamurty (2000).

<sup>3</sup>In terms of the figure, this means that the standard measure of dollarization in the empirical literature typically relies only on the foreign currency assets of domestic residents that are indicated in the two boxes with striped borders.

<sup>4</sup>The reliance on measures of dollarization that exclude cash holdings of foreign currency has created a serious disconnect between the theoretical concept of currency substitution that sparked the early empirical studies on dollarization and the findings of

**FIG. 1.** Foreign Currency Balance Sheet of a Partially Dollarized Economy

The problems with which the nascent empirical literature on liability dollarization is confronted are at least as serious. Sectoral data on the foreign currency liabilities of different economic agents, and on the linkages across the balance sheets of those agents, are simply not available for the large majority of countries (see Allen et al. (2002)). The few empirical studies on liability dollarization that exist have therefore relied on indirect mea-

these studies. See Calvo and Végh (1992) and Savastano (1992) for early discussions of this problem.

tures (such as the “pass-through” from the exchange rate to prices) rather than on quantity-based estimates of external foreign currency liabilities to gather support for their key hypotheses.<sup>5</sup>

### 3. AN ENCOMPASSING MEASURE OF PARTIAL DOLLARIZATION

A key objective of this paper is to take advantage of, and shed light on, the interconnection between the two competing concepts of partial dollarization. To this effect, we define a partially dollarized economy as one where households and firms hold a fraction of their portfolio (inclusive of money balances) in foreign currency assets and/or where the private and public sector have debts denominated in foreign currency.<sup>6</sup> This purposely broad definition covers the majority of economies in the world, as it excludes a priori only those countries or territories that are fully — or officially — dollarized.<sup>7</sup> Because we are interested in studying partial dollarization in the developing world, we do not include industrial countries in our sample.<sup>8</sup>

To make the above definition operational we employ two devices: (i) we construct a composite index of dollarization for every country in the sample; and (ii) we classify the countries into four categories according to the variety — or “type” — of dollarization they exhibit.

We define the composite index as the (normalized) sum of bank deposits in foreign currency as a share of broad money, total external debt as a share of GNP, and domestic government debt denominated in (or linked to) a foreign currency as a share of total domestic government debt. Each of the three components is previously transformed into an index that can take a value from 0 to 10. Hence, in the end, the composite index allows us to measure the degree of partial dollarization of every country in the sample on a scale that goes from 0 to 30 (see Appendix A).

We determine the variety of dollarization prevalent in each country at any point in time on the basis of two separate criteria: the degree of domestic dollarization and the amount of foreign borrowing by the private

---

<sup>5</sup>See, for example, Calvo and Reinhart (2000a) and Hausmann, Panizza and Stein (2001).

<sup>6</sup>The foreign currency need not be the U.S. dollar. Any economy where private sector assets and/or private or public sector debts are denominated in a currency different from the country’s own would be a dollarized economy according to this definition.

<sup>7</sup>The definition covers those countries that belong to a monetary union which have foreign (or domestic) debts denominated in a currency different from the currency of the union. Only those countries that were fully dollarized before 1980 were altogether excluded from the sample. See Edwards (2001) for a list of those countries.

<sup>8</sup>Concretely, our country sample excludes all those defined as “Advanced Economies” in the IMF’s World Economic Outlook, except for Hong Kong, Israel, Korea, Singapore and Taiwan.

sector. We gauge domestic dollarization by looking at the ratios of foreign currency deposits to broad money and of domestic government debt in foreign currency to total government debt; countries are then divided in two groups: those where both ratios are below 10 percent, and those where at least one of the ratios exceeds 10 percent. To gauge the amount of private foreign borrowing we look at the share of private sector debt in total external debt; here too, countries are divided in two groups: those where private sector debt accounts for at least 10 percent of total external debt, and those where the share is below 10 percent.

The two criteria put together allow us to classify the dollarized economies into four categories or “types,” as shown in Table 1. Countries where domestic and external liability dollarization co-exist are classified as Type I; countries where dollarization is predominantly of a domestic nature (i.e., where foreign borrowing by the private sector is relatively small) are classified as Type II; countries where dollarization is predominantly of an external nature (i.e., where domestic dollarization is negligible) and private foreign borrowing is not small are classified as Type III; and countries where domestic dollarization is low and where the bulk of the external liabilities are owed by the government are classified as Type IV.

**TABLE 1.**

Varieties of Dollarization

	Private sector debt accounts for <b>ten percent or more</b> of total external debt.	Private sector debt accounts <b>less than ten percent</b> of total external debt.
<b>At least ten percent</b> of broad money or of domestic public debt are denominated in or linked to a foreign currency.	Type I	Type II
<b>Less than ten percent</b> of broad money <b>and</b> of domestic public debt are denominated in or linked to a foreign currency.	Type III	Type IV

In our view, using the two-pronged approach just described to investigate the extent and effects of partial dollarization in the developing world has a number of advantages compared to the standard empirical study on partial dollarization.

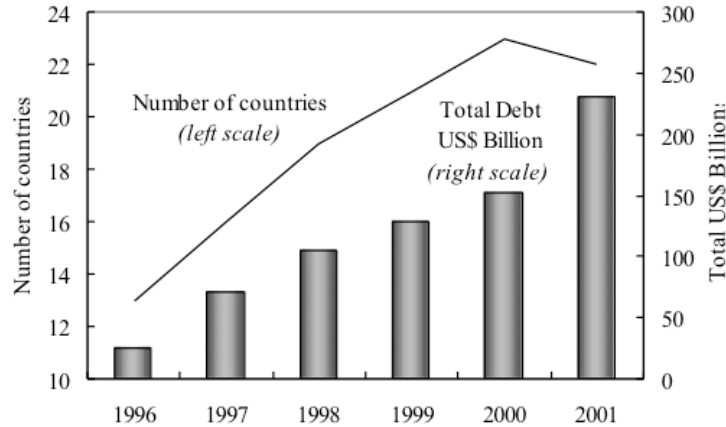
First, it produces a measure of dollarization for every country that encompasses both holdings of foreign currency assets by the private sector and the external foreign currency liabilities of the economy.

Second, the inclusion of domestic government debt in foreign currency in the composite index takes explicitly into account a form of domestic

dollarization that has become increasingly important in many countries and which has thus far been ignored by studies on dollarization (Figure 2).<sup>9</sup>

And third, the approach relies on quantitative indicators easily applicable to all countries to measure the degree and type of dollarization, hence reducing the scope for introducing bias in empirical analyses of the data caused by arbitrary manipulations of the sample.

**FIG. 2.** Locally Issued Government Debt in Foreign Currency: 1996-2001



Source: see Appendix A.

Of course, our methodology also has shortcomings. Three of these are worth discussing briefly.

First, owing mainly to lack of data, the composite index understates the “true” degree of dollarization in every economy. On the asset side, it does not account either for the cash holdings of foreign currency or for the deposits households and firms maintain in banks abroad (see Figure 1). The downward bias that these omissions impart to the measure of dollarization may be significant for many countries.<sup>10</sup> On the liability side, the composite index does not include local borrowing in foreign currency by the private

<sup>9</sup>This variety of dollarization is of relatively recent vintage. Argentina in the 1980s and Mexico in the early 1990s were probably two of the first instances where governments of developing countries that had a national currency borrowed locally in dollar-indexed instruments to finance their fiscal deficits. Governments of many countries, in Latin America and elsewhere, have adopted a similar financing strategy since then. In fact, figure 2 shows that, as of end-2001, a total of 22 countries had more than US\$ 230 billion of debt outstanding in instruments of this type — see Reinhart et al. (2003) for a further discussion.

<sup>10</sup>For estimates of the amount of US dollars in circulation in emerging economies, and their implications for the measures of dollarization, see Kamin and Ericsson (1993), Feige (1996), Feige et al. (2003), and Oomes (2003).

sector. The omission of bank loans in foreign currency is in part deliberate, out of concerns that their inclusion would introduce double-counting.<sup>11</sup> The omission of other forms of local borrowing in foreign currency (e.g., locally issued corporate bonds denominated in foreign currency), however, is due exclusively to lack of data.

Second, the ratio of external debt to GNP and the share of private sector debt in total external debt are admittedly coarse measures of external liability dollarization that do not allow to gauge accurately the size and/or propagation of sectoral balance sheet effects.

And third, the composite index combines variables that are generally not determined or explained by the same set of economic and/or institutional factors. For example, a past history of macroeconomic instability and high inflation is likely to be one of the root causes of a high degree of domestic dollarization, but would probably not be a good predictor of the size of a country's external debt.

Of the three shortcomings just mentioned, the last one is probably the least worrisome. The reason is that, because it measures dollarization along two different dimensions (degree and variety), our two-pronged methodology has the flexibility to test and cross-check any given hypothesis using all or part of the sample. Illustrating the usefulness of the methodology for ascertaining whether the regularities and trends in the data depend on the degree and/or type of dollarization is, in fact, a key objective of the empirical analyses of the following two sections.

#### 4. THE WORLDWIDE SPREAD OF THE ADDICTION

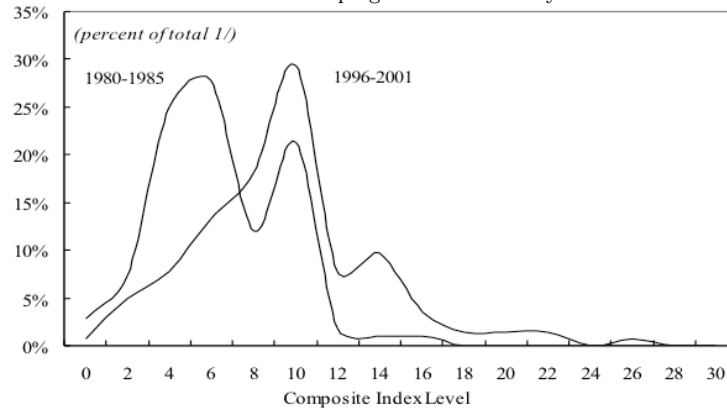
The application of the dual classification approach described above reveals a number of interesting trends in the evolution of dollarization in developing countries over the last two decades.

One fact that stands out is the notable increase in the degree and incidence of dollarization that has occurred in the developing world between the early 1980s and the late 1990s. Indeed, Figure 3 shows that the frequency distribution of the composite dollarization index (computed using five-year averages for each country) has shifted markedly to the right between 1980-85 and 1996-2001. What this shift indicates is that the degree of dollarization in developing countries has risen during that period. The number of economies with a composite index higher than 12, for example, was much larger in 1996-2001 than during 1980-85. The rising dollarization of bank deposits in many countries and the increased reliance on dollar-

---

<sup>11</sup>This is because, for prudential reasons, the share of foreign currency deposits in total bank deposits tends to be highly correlated with, and roughly the same size as, the share of foreign currency loans in total loans — see de Nicol et al. (2003), Figure 2, for recent evidence.



**FIG. 3.** Dollarization in the Developing World: The early 1980s and the late 1990s

Source: See Appendix A.

1/ Frequency distribution of all countries in the sample (including Type IV).

linked domestic debt by governments account for the bulk of the recorded increases in the composite index.

The higher incidence of dollarization — i.e., the increase in the number of partially dollarized economies — is captured by Table 2. According to the table, in the early 1980s less than 10 percent of the countries in our sample exceeded the low thresholds of domestic dollarization utilized to classify an economy as Type I or Type II; in the late 1990s, however, more than one-half of the sample exceeded one or both of those thresholds. The table also shows that two thirds of the countries were classified as Type IV economies in the early 1980s, which implies that, not so long ago, external liability dollarization of government debts was the predominant variety of dollarization in the developing world. By the late 1990s, however, the share of Type IV economies had fallen to almost one third.

The addition of new countries to the sample in the 1990s, especially the Transition Economies, and the increased availability of data on the variables used to construct the composite index, have indeed contributed to the changes in the aggregate indicators of dollarization reported in Table 2. Nonetheless, it is still the case that by the late 1990s ninety developing countries (almost two thirds of the sample) exhibited varieties of dollarization primarily linked to decisions and activities of the private sector.

Another important fact unveiled by our dual classification approach is the **large regional variation** that has characterized the spread, degree, and varieties of dollarization in developing countries during the last two decades. Table 3 illustrates this feature of the process of dollarization. The table shows that the average degree of dollarization in Africa has been similar to that prevalent in the Western Hemisphere throughout the years.

**TABLE 2.**  
Varieties of Dollarization in the Developing World: 1980-2001  
1980-1985

Number of cases and shares in parentheses			
	Private sector debt accounts for <b>ten percent or more</b> of total external debt.	Private sector debt accounts for <b>less than ten percent</b> of total external debt.	Total
<b>At least ten percent</b> of broad money or of domestic public debt are denominated in or linked to a foreign currency.	6 (5.6%)	4 (3.7%)	10 (9.3%)
<b>Less than ten percent</b> of broad money <b>and</b> of domestic public debt are denominated in or linked to a foreign currency.	26 (24.0%)	72 (66.7%)	98 (90.7%)
<b>Total</b>	32 (29.6%)	76 (70.4%)	108

1988-1993

Number of cases and shares in parentheses			
	Private sector debt accounts for <b>ten percent or more</b> of total external debt.	Private sector debt accounts for <b>less than ten percent</b> of total external debt.	Total
<b>At least ten percent</b> of broad money or of domestic public debt are denominated in or linked to a foreign currency.	8 (5.9%)	35 (25.5%)	43 (31.4%)
<b>Less than ten percent</b> of broad money <b>and</b> of domestic public debt are denominated in or linked to a foreign currency.	15 (10.9%)	79 (57.7%)	94 (68.6%)
<b>Total</b>	23 (16.8%)	114 (83.2%)	137

However, the dollarization experienced by most African countries has been of the type IV variety. In terms of domestic dollarization — i.e., foreign currency bank deposits and domestic government debt in foreign currency — Africa has consistently been the least dollarized region of the world, followed by Asia.

Table 3 also shows that domestic dollarization has been consistently high in the Middle East since the early 1980s, and in the Transition Economies since the early 1990s. Moreover, in the latter group the average composite index more than doubled, and reached levels similar to the average for the Western Hemisphere, in less than a decade. Lastly, the table shows that

**TABLE 2**—*Continued*  
1996-2001

Number of cases and shares in parentheses			
	Private sector debt accounts for <b>ten percent or more</b> of total external debt.	Private sector debt accounts for <b>less than ten percent</b> of total external debt.	Total
<b>At least ten percent</b> of broad money or of domestic public debt are denominated in or linked to a foreign currency.	29 (20.3%)	43 (30.0%)	72 (50.3%)
<b>Less than ten percent</b> of broad money <b>and</b> of domestic public debt are denominated in or linked to a foreign currency.	18 (12.6%)	53 (37.1%)	71 (49.7%)
Total	47 (32.9%)	96 (67.1%)	143

Source: See Appendix A.

dollarization has spread at a fairly steady pace across the three sub-regions of the Western Hemisphere since the 1980s, and that South America has consistently been among the most dollarized regions of the world.

As we have said, distinguishing among four varieties of dollarization facilitates the identification of key empirical regularities in dollarized economies. Hypotheses concerning the link between monetary policy and dollarization, for example, would seem a priori more applicable to countries that exhibit the first three varieties (types) of dollarization than to those classified as Type IV economies. The reason is that, conceptually, the relationship between government foreign borrowing — the primary form of dollarization in Type IV economies — and monetary policy is generally tenuous and weak, especially in cases where the public sector borrows mainly from official creditors. Empirical analyses of the links between monetary policy and dollarization, therefore, should probably exclude Type IV economies from the sample in order to obtain meaningful results.

Table 4 lists the ninety economies that comprise the sample of Type I to Type III economies for the period 1996-2001, ranked by the average value of the composite dollarization index. (The same economies grouped according to their variety of dollarization are listed in Appendix B.)<sup>12</sup>

The individual averages reported in the table reveal a fair amount of inter-regional and intra-regional variation in the degree of dollarization. For example, less than 50 percent of the countries with a composite index

<sup>12</sup>As noted earlier, the degree and variety of dollarization of each individual country was rarely the same in the early 1980s and in the late 1990s; the problems this presents for conducting empirical analyses are discussed in the following section.

**TABLE 3.**  
Varieties and Degrees of Dollarization, By Region: 1980-2001<sup>1</sup>  
1980-1985

	Number of countries			Composite Dollarization Index (scale: 0-30)	Foreign currency deposits to broad money (percent)	Total External Debt to GDP (percent)	Share of Private debt in total external debt (percent)
	Total	Types I-III	Types IV				
Africa	43	5	38	6	0	67	3
Emerging Asia	23	10	13	4	3	53	8
Middle East	13	6	7	5	11	38	4
Transition Economies	0	0	0	0	0	33	0
Western Hemisphere	29	15	14	6	5	60	10
of which:							
Caribbean	12	1	11	4	1	75	1
Central America	6	4	2	7	1	54	8
South America	11	10	1	7	10	58	20
Total	108	36	72				
1988-1993							
	Number of countries			Composite Dollarization Index (scale: 0-30)	Foreign currency deposits to broad money (percent)	Total External Debt to GDP (percent)	Share of Private debt in total external debt (percent)
	Total	Types I-III	Types IV				
Africa	46	7	39	8	2	114	2
Emerging Asia	26	14	12	6	8	88	7
Middle East	14	10	4	8	20	66	11
Transition Economies	22	15	7	4	17	37	3
Western Hemisphere	29	12	17	8	13	106	4
of which:							
Caribbean	12	2	10	6	4	198	1
Central America	6	2	4	8	11	101	4
South America	11	8	3	9	23	61	8
Total	137	58	79				

of 14 or higher (the group with “very high” dollarization) are from the Western Hemisphere,<sup>13</sup> whereas close to one third of the fifty countries with

<sup>13</sup>Ecuador recorded the highest degree of dollarization during this period (25 out of a maximum of 30) largely because it adopted the U.S. dollar as legal tender in the year 2000 and, hence, scored a 10 in two of the three components of the composite index in the last two years used to calculate the average. Contrary to most other countries at the top of Table 4, Ecuador did not exhibit a high degree of dollarization in the early 1990s.

**TABLE 3**—*Continued*  
1996-2001

	Number of countries			Composite Dollarization Index (scale: 0-30)	Foreign currency deposits to broad money (percent)	Total External Debt to GDP (percent)	Share of Private debt in total external debt (percent)
	Total	Types I-III	Types IV				
Africa	48	15	33	9	7	126	3
Emerging Asia	26	16	10	7	11	91	13
Middle East	14	12	2	8	21	60	19
Transition Economies	26	26	0	9	29	50	19
Western Hemisphere	29	21	8	10	23	62	11
of which:							
Caribbean	12	5	7	6	11	101	1
Central America	6	5	1	10	24	55	4
South America	11	11	0	14	35	47	27
Total	143	90	53				

Source: See Appendix A.

1/ Summary indicator for each region calculated as the unweighted average of all countries rounded to the nearest integer.

a composite index of 9 or higher (the groups where dollarization was “high” or “very high”) are Transition Economies, from both Asia and Europe.

## 5. DOLLARIZATION AND MONETARY POLICY—MUCH ADO ABOUT NOTHING?

A view widely held among economists and policymakers is that partial dollarization makes monetary policy more complex and less effective. A recent IMF Occasional Paper summarized this view when it stated: “The phenomenon of dollarization poses a challenge to the pursuit of a coherent and independent monetary policy” (Baliño et al., 1999, page 14). Similar assertions can be easily found in numerous surveys and studies on partial dollarization.

The conventional view is primarily anchored on theoretical results from the early literature on currency substitution, and on the fact that the first documented cases of partial dollarization in the developing world occurred in high inflation countries, especially from Latin America.<sup>14</sup> However, a closer look at the currency substitution models and at the empirical studies based on those models reveals a rather weak support for the view that dollarization hinders the effectiveness of monetary policy.

<sup>14</sup>Ortiz (1983) and Ramírez-Rojas (1985) were two of the first studies of the now vast empirical literature on dollarization inspired on currency substitution models.

**TABLE 4.**

Degrees of Dollarization: Composite Scores, 1996-2001 1/

Composite Index		Number of countries	Countries 2/
Level	in category		
Very High		<u>16</u>	
	25	(1)	Ecuador
	22	(1)	Bolivia
	21	(1)	Uruguay
	20	(1)	Argentina
	19	(1)	Bulgaria
	17	(2)	Lao, Nicaragua
	16	(2)	Angola, Peru
	15	(2)	Cambodia, Paraguay
	14	(5)	Guinea-Bissau, Lebanon, Mozambique, São Tomé & Príncipe, Zambia
High		<u>34</u>	
	13	(6)	Bosnia & Herzegovina, Ghana, Honduras, Jordan, Tajikistan, Turkey
	12	(8)	Congo DR, Croatia, Guinea, Indonesia, Malawi, Sierra Leone, Tanzania, Yemen
	11	(4)	Kyrgyz Republic, Mongolia, Russia, Vietnam
	10	(5)	Bahrain, Côte d'Ivoire, Jamaica, Moldova, Philippines
	9	(11)	Armenia, Belarus, Costa Rica, El Salvador, Estonia, Georgia, Hungary, Pakistan, Thailand, Turkmenistan, Uganda
Moderate		<u>32</u>	
	8	(9)	Egypt, Israel, Latvia, Lithuania, Macedonia, Papua New Guinea, Romania, St. Kitts and Nevis, Ukraine
	7	(9)	Brazil, Chile, Czech Republic, Guatemala, Haiti, Hong Kong, Kazakhstan, Malaysia, Slovak Republic
	6	(6)	Azerbaijan, Mauritius, Poland, Trinidad and Tobago, United Arab Emirates, Venezuela
	5	(5)	Albania, Colombia, Mexico, Solomon Islands, Uzbekistan
Low	4	(3)	Saudi Arabia, Slovenia, South Korea
		<u>8</u>	
	3	(1)	Kuwait
	2	(5)	China, Fiji, Netherlands Antilles, Singapore, South Africa
	1	(1)	Taiwan
0	(1)	Oman	

Source: See Appendices I and II.

1/ Individual country average for the period rounded to the nearest integer.

2/ Excluding Type IV countries.

The early theoretical models of currency substitution did produce important results concerning the effects that the presence of foreign currency could have on the exchange rate and monetary policy of an economy

that issued its own national currency. Many of those results have survived the passage of time and the adoption of new modeling techniques.<sup>15</sup> Nonetheless, it has been clear at least since Thomas (1985) that currency substitution is not the same as asset dollarization, and that some of the results obtained from models of currency substitution hinged critically on the assumption that the demand for foreign currency represents primarily a demand for a second means of payment rather than for another financial asset.

The vast empirical literature on dollarization in developing countries inspired by the early models of currency substitution has focused primarily on ascertaining whether the relative holdings of foreign money to domestic money (the “dollarization ratio”) in one or many countries can be explained by relative rates of return of the two monies, and several other variables. These studies generally have found that relative rates of return are indeed an important determinant of a number of variants of the dollarization ratio. Oftentimes, however, authors have used those results as a platform for making inferences about issues related to monetary policy that normally were implicit in the model used to derive the equations that were estimated in the studies, but that had not been tested directly—see Savastano (1996).

The new theoretical literature on liability dollarization also has produced results relevant for monetary policy. Of these, one that has attracted considerable attention is the association between liability dollarization and “fear of floating.” That is, the conjecture that the presence of liability dollarization — i.e., of private sector debts in foreign currency — will tend to make countries less tolerant to large exchange rate changes, out of concern of the adverse effects those changes may have on sectoral balance sheets and, ultimately, on aggregate output.<sup>16</sup> This key result has clear implications for monetary policy, in particular for the relationship between interest rates and exchange rate shocks and for the scope for countercyclical monetary policy. Nonetheless, these models do not find nor claim that monetary policy is ineffective to control inflation, or particularly difficult to conduct in practice.

As in the studies from the earlier strand, the main focus of the empirical work on liability dollarization has not been to test the effectiveness of monetary policy per se, but rather to detect and explain systematic differences in monetary policy responses across countries. Also as in the earlier literature, the results obtained by these newer (and fewer) studies are broadly

---

<sup>15</sup>Examples of these are the results that established a strong direct association between the degree of currency substitution and the volatility of a floating exchange rate, the instability of domestic money velocity, and the inflation rate needed to close a fiscal gap with revenues from seigniorage. See Calvo and Végh (1992, 1996) and Giovannini and Turtelboom (1994).

<sup>16</sup>See, for example, Calvo and Reinhart (2000b, 2002) and Céspedes et al. (2000).

supportive of their main hypotheses, as they tend to find systematic differences in responses of monetary policy across countries that are generally consistent with the hypothesis of fear of floating.<sup>17</sup> However, these studies have been less prone to make inferences about aspects of monetary policy that had not been tested directly. And typically have not interpreted their finding of systematic differences across countries in the responses of monetary policy as evidence of higher complexity or lower effectiveness of monetary policy, especially for inflation control.

Surprisingly, growing evidence of the persistence of domestic dollarization in countries where inflation was successfully abated does not seem to have weakened the conventional view regarding the presumed ineffectiveness of monetary policy in dollarized economies. Following the seminal study by Guidotti and Rodriguez (1992) several authors have documented that large and sustained falls in inflation generally have not been followed by a decline in domestic dollarization.<sup>18</sup> Moreover, a number of studies have explored the reasons for this empirical regularity—e.g., Uribe (1997), Ize and Levy-Yeyati (1998). The starting point for much of this literature has been the premise that high dollarization can indeed co-exist with low inflation; that is, that dollarization does not preclude monetary policy from attaining, and maintaining, its primary goal. It is not easy to reconcile this *prima facie* evidence of the effectiveness of monetary policy in partially dollarized economies with the notion that monetary policy is more challenging and/or less effective in the presence of dollarization. Nonetheless, that notion has tended to prevail.

It seems to us that further empirical work focused on the distinctive features of monetary policy in dollarized economies is needed to elicit a much needed revision of this entrenched conventional view. The dual classification approach developed in this paper is, we think, ideally suited for this task.

### 5.1. Another look at the effectiveness of monetary policy

In this sub-section and the next we present new evidence on the effectiveness and channels of monetary policy in partially dollarized economies. Our goal is to shed further light on the influences that dollarization exerts on monetary policy, taking advantage of our proposed broad definition of a dollarized economy and of our criteria for classifying those economies according to their degree and variety of dollarization.

The methodology we followed is fairly simple, and consists, for the most part, of using summary indicators for different groups and samples of dollarized economies to identify similarities and differences regarding key aspects

<sup>17</sup>See Calvo and Reinhart (2000b, 2002) and Hausmann, Panizza and Stein (2001).

<sup>18</sup>Examples include Mueller (1994), Savastano (1996), Mongardini and Mueller (2000), and Havrylyshyn and Beedies (2003).



of monetary policy. A strength of the methodology is that it allows us to assess the evidence in support of any given hypothesis or conjecture using data from many different sub-samples.<sup>19</sup> An obvious shortcoming is that, with one exception, we do not use formal econometric tests to properly control for the direct and indirect influences that other variables typically exert on any given indicator of monetary policy. Overall, we think that the gains we derive from the broad scope and multi-dimensional nature of our analysis outweigh the loss stemming from its lack of accuracy. Especially since our main goal is to help place future discussions and research on dollarization in the right context, rather than provide firm and definitive evidence on the consequences of dollarization for monetary policy. The logical place to start any assessment of monetary policy is to examine the policy's track record in delivering the main goals it is supposed to attain. There is little dispute that the overriding goal of monetary policy is to attain and maintain a low and stable rate of inflation, and that another important goal is to reduce the volatility of aggregate output — e.g., Fischer (1994). Most theoretical and empirical models of monetary policy of the last two decades have summarized this wide consensus by expressing the objective function of the monetary authority in terms of two main goals: the rate of inflation and a measure of output fluctuations — both expressed relative to some target or trend — e.g., Barro and Gordon (1983), Rogoff (1985).

It is well known that the track record of developing countries as a whole in complying with those two main objectives of monetary policy is fairly unimpressive, especially until the mid-1990s. Overall, the evidence for the sample of dollarized economies used in this study corroborates this well known fact. The evidence, however, also unveils a number of important patterns associated with particular degrees and/or varieties of dollarization.

With regard to the primary goal of monetary policy, the evidence in Tables 5 and 6 shows that the average inflation rate is consistently higher and more variable in countries with a high degree of dollarization than in countries where the degree of dollarization is low or moderate, in both the long and the short samples. The evidence also shows that, excluding Brazil, average inflation is the lowest in countries where dollarization is predominantly of the external variety (Type III economies). A third regularity captured in these tables is that average inflation tends to be much lower

---

<sup>19</sup>Specifically, the methodology allows us to use 10 to 14 observations to assess any given hypothesis or empirical regularity. These observations are the result of organizing the sample of dollarized economies in categories according to the level of the composite dollarization index (2 to 4 categories) and according to the variety or type of dollarization (3 categories), and from computing summary indicators for two different samples — the long (but smaller) sample with annual observations for the period 1980-2001, and the short (but larger) sample with annual observations for 1996-2001. See Appendix A.

and less volatile in the years 1996-2001 than in the sample covering the earlier period, reflecting the generalized fall in inflation in the developing world since the mid-1990s.

Clear patterns for output volatility and output growth are more difficult to detect. The one consistent regularity is that output growth is highly volatile in economies with external liability dollarization (Type III economies). The relation between output behavior and the degree of dollarization, however, is different in the two samples. In the long sample, average output growth is lower and less variable in countries with a high degree of dollarization.

**TABLE 5.**

Dollarization, Inflation and Output: Long Sample 1/

	By degree of dollarization		By type of dollarization		
	High-to-very high	Low-to-moderate	Type I	Type II	Type III
Inflation					
average	134.3	33.7	147.1	35.5	42.9
excluding Brazil		16.4			8.8
standard deviation	366.1	40.6	405.0	54.5	58.8
excluding Brazil		14.1			7.0
GDP growth					
average	2.7	3.7	3.1	3.1	3.9
standard deviation	4.2	4.7	4.7	5.3	5.3
Number of countries	15	30	13	12	17

1/ All countries classified as Types I, II and III for which the series of the composite dollarization index exists for most of the period 1980-2001 — see Appendix A.

However, in the short sample output growth is markedly more volatile in economies where dollarization is high, while the average growth performance is broadly similar in countries with high and low degrees of dollarization.

The ability to raise revenues from seigniorage is another benchmark commonly used in the literature to assess the effectiveness of monetary policy, or the value of monetary autonomy, in developing countries.<sup>20</sup> The theoretical foundations of this common practice are not nearly as solid as those that justify treating the inflation rate and output stability as the main goals of monetary policy.<sup>21</sup> Consider, for example, the optimal inflation

<sup>20</sup>For example, see Cukierman (1992), Fry, et al. (1996) and Berg and Borensztein (2000).

<sup>21</sup>Masson et al. (1997) argue that the prominent role that seigniorage continues to have on discussions of monetary policy in developing countries has hindered the

**TABLE 6.**

Dollarization, Inflation and Output: Short Sample 1/

	By degree of dollarization				By type of dollarization		
	Very high	High	Moderate	Low	Type I	Type II	Type III
Inflation							
average	91.5	35.5	14.6	3.1	14.3	54.1	7.4
excluding Angola	31.7						
standard deviation	157.2	33.8	10.4	1.6	12.2	73.9	4.2
excluding Angola	45.7						
GDP growth							
average	3.1	3.7	3.5	3.6	3.5	3.8	3.0
standard deviation	3.8	4.6	3.1	2.9	3.2	4.0	3.8
Number of countries	15	30	36	10	29	43	18

1/ All countries classified as Types I, II and III with an index of composite dollarization during the period 1996-2001

tax models. Those models implicitly assume that the central bank is little more than a tax collection agency for the government. Such assumption may be reasonable in countries or situations of extreme fiscal dominance (e.g., during periods of very high inflation) but not in general, as it precludes making any meaningful distinction between monetary policy and fiscal policy.

It turns out that the revenues from seigniorage do not differ much across the various categories of dollarized economies, especially in the late 1990s. In fact, Table 7 shows that from 1996 to 2001 the average revenue from money creation across the various groups of dollarized economies ranged from 11/2 to 2 percent of GDP and that the variability of those revenues across groups was also fairly similar. There are, however, a couple of differences among the groups that are worth noting. First, reflecting their different inflation performance, revenues from seigniorage are systematically higher in countries with a high degree of dollarization than in countries with low or moderate dollarization. And second, average seigniorage revenues are higher in countries where dollarization is predominantly of the domestic variety (Type II economies) than in countries with the other two types of dollarization.

Successful disinflations provide another yardstick against which to assess the relation between dollarization and the effectiveness of monetary policy. Our sample of dollarized economies includes 17 countries that were able to reduce inflation from a peak of 40 percent per year or more to single digits

---

emergence of widely agreed models and tools to assess the performance of monetary policy as an independent policy tool in those economies.

**TABLE 7.**  
Dollarization and Revenues from Seigniorage 1/  
(in percent of GDP)

	By degree of dollarization		By type of dollarization		
	high-to-very high	low-to-moderate	Type I	Type II	Type III
Long sample 2/					
Seigniorage (average)	2.60	1.40	1.98	2.98	1.06
standard deviation	2.37	2.08	1.96	3.15	1.86
Short sample 3/					
Seigniorage (average)	2.13	1.41	1.40	2.09	1.73
standard deviation	1.68	1.38	1.25	1.59	1.68

1/ Seigniorage calculated as the annual change in base money divided by nominal GDP, except in Argentina, Chile, Israel and Uruguay—see Appendix A.

2/ All countries classified as Types I, II and III for which the series of the composite dollarization index exists for most of the period 1980-2001—see Appendix A.

3/ All countries classified as Types I, II and III with an index of composite dollarization during the period 1996-2001—see Appendix B.

during the period 1980-2001.<sup>22</sup> Three salient features stand out from the examination of these episodes.

First, the degree of dollarization had no discernible effects on the duration of the disinflation. Specifically, the time it took these 17 countries to bring inflation down to single digits does not seem to have been influenced by whether dollarization was high or low at the time of the inflation peak (Figure 4, top chart). Except for Israel, which took almost 13 years to bring annual inflation below 10 percent, countries that had a high degree of dollarization when inflation was high did not take a much longer time to disinflate than countries with a lower degree of dollarization.

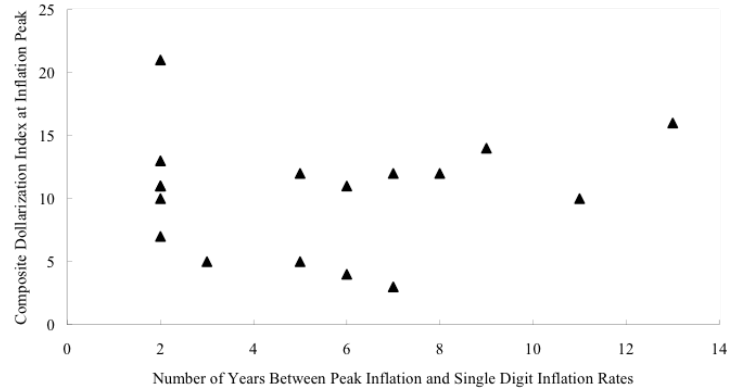
Second, the degree of dollarization at the time of the inflation peak does not appear to have influenced the growth performance during the disinflation. In fact, average output growth during the disinflation period in those countries where dollarization was relatively low at the time of the inflation peak is not vastly different from the average growth performance during the disinflation in countries that had a high degree of dollarization (Figure 4, bottom chart).

And third, successful disinflations generally have not been accompanied by large declines in the degree of dollarization. In fact, the top panel of

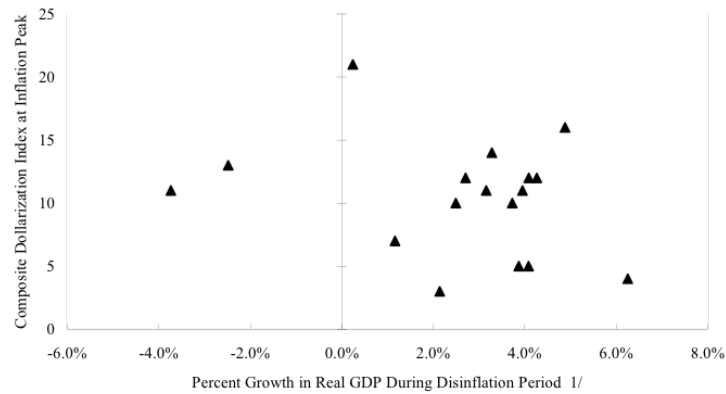
<sup>22</sup>The seventeen countries are: Argentina, Bolivia, Brazil, Bulgaria, Costa Rica, Dominican Republic, Guatemala, Indonesia, Israel, Kenya, Mauritius, Mexico, Nigeria, Peru, Philippines, Uganda and Uruguay. See Appendix A for details on the disinflation episodes.

**FIG. 4.** Inflation Stabilization and Output Growth in Dollarized Economies

*Dollarization has had no clear effects  
on the duration of disinflations,*



*or on GDP growth during disinflation.*



1/ Disinflation period defined as the number of years that it took for inflation to fall below 10 percent.

Figure 5 shows that the degree of dollarization at the end of the disinflation was the same or higher than at the time of the inflation peak in more than half of the episodes. Moreover, the fall in the degree of dollarization in many of the other episodes was generally small. This persistence of the dollarization process is consistent with the evidence on “hysteresis” found

by the studies mentioned earlier — which were based on a narrower measure of domestic dollarization.

The persistence of dollarization is a regularity that is also present in the larger sample of dollarized economies, and tends to be associated with the countries' inflation history. In fact, countries that had repeated bouts of high inflation over the last few decades generally exhibited a higher degree of dollarization in the late 1990s than countries with a better inflationary history (Figure 5, lower panel). Interpreting the (unconditional) probability of high inflation used in Figure 5 as a rough measure of monetary policy credibility gives some insights as to why achieving low inflation is generally not a sufficient condition for a rapid fall in the degree of dollarization; namely, a country with a poor inflationary history will need to maintain inflation at low levels for a long period before it can significantly reduce the probability of another inflation bout.<sup>23</sup>

The lower panel of Figure 5 also sheds light on the relationship between current levels of dollarization and the countries' exchange rate history. Parallel market exchange rates and pervasive exchange controls have been the norm rather than the exception in countries with a history of high inflation. Conversely, very few countries with hard pegs and unified exchange rates have experienced bouts of high inflation.<sup>24</sup> The evidence thus suggests a link between current levels of dollarization and countries' past reliance on exchange controls and multiple currency practices.

## 5.2. A look at the channels of monetary policy

Interest rates, monetary aggregates and the exchange rate are widely regarded as the three main channels through which monetary policy affects the economy. Even for industrial countries, however, there is considerably less consensus about the relative importance and role of those three channels in the monetary transmission process than there is about the main goals of monetary policy (Mishkin (1995)). For developing countries, where research on the monetary transmission process is much thinner, consensus is far more elusive. In fact, the wide disparities in financial deepening, fiscal dominance and integration to capital markets, and the uneven pace at which reform in those areas has proceeded in different countries and re-

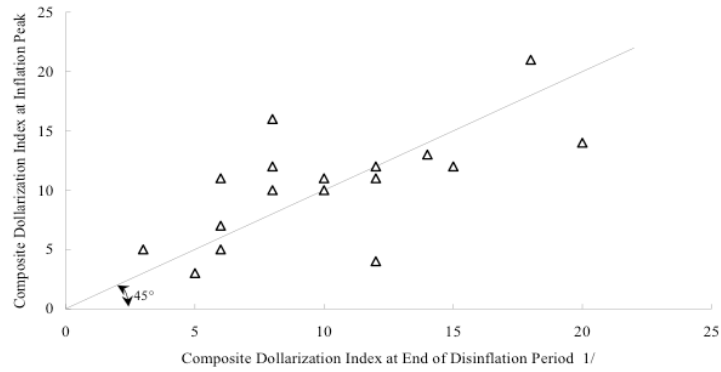
---

<sup>23</sup>The following section examines in detail the experience of countries that have recorded large declines in their degree of domestic dollarization, including in the context of disinflations.

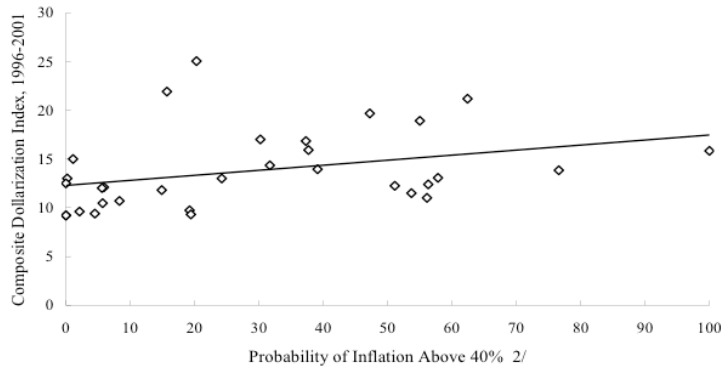
<sup>24</sup>Recent estimates by Reinhart and Rogoff (2002) show that more than 60 percent of all episodes where inflation exceeded 40 percent since the 1950s took place in countries that had dual and/or parallel exchange rates, and that less than 5 percent of countries with hard pegs and no parallel market for foreign exchange have had bouts of high inflation.

**FIG. 5.** The Persistence of Dollarization

*Disinflation has had no clear effects on the degree of dollarization.*



*Current levels of dollarization are related to the country's history of high inflation.*



1/ End of disinflation period is defined as the year when the inflation rate fell below 10 percent.  
 2/ Unconditional probability computed with monthly data on inflation for the period 1958-2001.

gions have held back progress in identifying the distinctive features of the monetary transmission mechanism in developing economies.<sup>25</sup>

There is particularly little analysis on the interest rate channel. Heavy reliance on interest rate controls, capital controls and monetary financing of fiscal deficits until the late 1980s (and, in some cases, until much later) rendered the interest rate channel of monetary transmission largely inoper-

<sup>25</sup>See Fry et al. (1996), Masson et al. (1997) and Kamin et al. (1998).

ative for many countries. Empirical research on this channel, including the one sparked by the recent literature on liability dollarization, has therefore been largely limited to the experience of the most advanced developing economies in the 1990s.

The problems surrounding empirical assessments of the other two channels are somewhat less severe. Money aggregates have gradually lost prominence in the monetary policy frameworks of many advanced developing economies that have attained low inflation, but in most non-industrial countries remain a core channel of transmission and continue to be used in the formulation of monetary policy. Furthermore, it is not too difficult to obtain reliable data on these aggregates for the majority of countries. Empirical analyses of the exchange rate channel, on the other hand, are constrained by some of the factors that hinder assessments of the interest rate channel, such as the high inflation and capital controls prevalent in many developing economies until the late 1980s. Nonetheless, those obstacles have become much less serious in recent years, and problems of data availability are not nearly as limiting as those affecting interest rate series.<sup>26</sup>

Reflecting this state of affairs, our analyses of the effects of dollarization on the monetary transmission process in dollarized economies focused primarily on the money aggregate channel. This allowed us to empirically assess whether the changes in this channel that were central to many theoretical predictions of the early literature on dollarization — namely, that dollarization affects the level and variability of money velocity, as well as the link between money and national income — were borne out by the data. In addition, we used data for the late 1990s to obtain estimates of the exchange rate “pass-through” and to examine the links between dollarization and exchange rate regimes, two aspects of the exchange rate channel important for both strands of the literature on partial dollarization.

Overall, the evidence on money velocity is fairly inconclusive. For a start, dollarization does not seem to have had much influence on the volatility of base money velocity. The standard deviation of the growth rate of base money velocity is broadly similar, and quite high, in groups comprising countries with different degrees of dollarization and different varieties of dollarization, in both the long and the short samples (Table 8). The pattern is largely the same for velocity measures constructed with M1 (see Appendix C). The volatility of broad money velocity, however, does differ across groups. In particular, the velocity of broad money seems to be somewhat less volatile in economies with a low-to-moderate degree of dollarization, as well as in countries where dollarization is predominantly of

---

<sup>26</sup>The information content of official exchange rate series is a different matter, however; see Reinhart and Rogoff (2002).



the external variety (Type III economies). Taken together, these patterns suggest that dollarization tends to increase the instability of broad money velocity (and, hence, of broad money demand), but does not seem to increase the instability of velocity measures of narrow monetary aggregates — i.e., of the aggregates often used in the formulation of monetary policy in developing countries.

**TABLE 8.**

Dollarization and Money Velocity 1/					
	By degree of dollarization		By type of dollarization		
	High-to-very high	Low-to-moderate	Type I	Type II	Type III
Panel A. Long Sample 2/					
Annual growth in velocity					
base money	2.4	2.3	2.3	3.1	3.1
broad money 3/	-1.0	-0.4	-1.0	0.2	-0.3
Standard deviation					
base money	19.4	20.2	23.9	21.5	19.9
broad money 3/	15.3	13.2	16.8	15.3	10.3
Panel B. Short Sample 4/					
Annual growth in velocity					
base money	-1.6	0.7	-0.8	-0.8	0.4
broad money 3/	-3.1	-1.6	-2.3	-1.5	-1.4
Standard deviation					
base money	14.3	16.7	14.5	16.7	17.3
broad money 3/	11.9	7.4	10.8	16.3	8.2

1/ Estimates of money velocity for two other monetary aggregates are reported in Appendix C.

2/ All countries classified as Types I, II and III for which the series of the composite dollarization index exists for most of the period 1980-2001 — see Appendix A.

3/ Including foreign currency deposits, except in Type III countries.

4/ All countries classified as Types I, II and III with an index of composite dollarization during the period 1996-2001 — see Appendix B.

The growth rates of money velocity for different monetary aggregates also exhibit dissimilar patterns. The average velocity of broad money shows a steady decline in all dollarized economies, in both the long and the short samples. The decline is most pronounced in countries with a high degree of dollarization, and in those where both domestic and external liability dollarization co-exist (Type I economies). In contrast, the average velocity of base money shows an increase in the long sample, and a smaller decline than that of broad money in the short sample. Two inferences can be made

from this dissimilar behavior of money velocity: first, the fall in the demand for domestic currency fueled by the high inflation of the 1980s seems to have largely abated by the late 1990s; and second, the joint existence of domestic and liability dollarization appears to have a positive effect on the financial deepening of dollarized economies.

Clear differences in the effects of dollarization on the monetary channel across dollarized economies are also difficult to detect on a wide range of money-growth correlations.

Monetary aggregates are strongly correlated with the rate of inflation in all dollarized economies (Tables 9-10). With a few exceptions — e.g., base money in economies with a low degree of dollarization, and a couple of other cases (see Appendix C) — the correlations between money and prices are uniformly high and statistically significant across all groups of dollarized economies, in the two samples. This evidence, while admittedly rough and tentative, is broadly consistent with the observed patterns on money velocity, and does not give much support to the view that reining in monetary growth is not an effective anti-inflationary policy in dollarized economies.

**TABLE 9.**

Money Growth Correlations: Long sample 1/

	By degree of dollarization		By type of dollarization		
	high-to-very high	low-to-moderate	Type I	Type II	Type III
Pairwise correlations, 2/	Money growth with				
Inflation					
base money	0.61	0.23	0.44	0.41	0.26
broad money 3/	0.73	0.48	0.61	0.44	0.43
GDP growth					
base money	-0.21	-0.02	-0.33	-0.14	0.16
broad money 3/	-0.13	0.00	-0.23	-0.13	0.33
Consumption growth					
base money	-0.31	-0.02	-0.25	-0.14	0.11
broad money 3/	-0.28	0.03	-0.17	-0.10	0.17

1/ All countries classified as Types I, II and III for which the series of the composite dollarization index exists for most of the period 1980-2001—see Appendix A.

2/ Contemporaneous correlations, average for the group. Number in bold indicates that correlations were statistically significant in more than one-half of the group. Correlations with other two monetary aggregates are reported in Appendix C.

3/ Including foreign currency deposits, except in Type III countries.

The correlation between monetary aggregates and real variables in dollarized economies, on the other hand, is either weak or non-existent. There

**TABLE 10.**  
Money Growth Correlations: Short sample 1/

	By degree of dollarization				By type of dollarization		
	very high	high	moderate	low	Type I	Type II	Type III
Pairwise correlations, 2/	Money growth with						
Inflation							
base money	0.93	0.68	0.61	0.21	0.59	0.88	0.44
broad money 3/	0.94	0.79	0.72	0.72	0.67	0.88	0.70
GDP growth							
base money	0.10	-0.07	0.09	0.27	-0.04	0.02	0.30
broad money 3/	0.14	-0.16	0.13	0.65	0.02	-0.03	0.28
Consumption growth							
base money	-0.11	-0.07	0.09	0.27	0.01	-0.09	0.17
broad money 3/	-0.08	-0.01	0.08	-0.32	-0.01	-0.06	0.13

1/ All countries classified as Types I, II and III with an index of composite dollarization for the period 1996-2001—see Appendix A.

2/ Panel correlations, contemporaneous. Statistically significant coefficients in hold. Correlations with other two monetary aggregates are reported in Appendix C.

3/ Including foreign currency deposits, except in Type III countries.

is some evidence of a positive and significant correlation between monetary aggregates and output growth in economies with a low degree of dollarization and in those where dollarization is predominantly external in the short sample (Table 10; Appendix C, Table 18). In all other cases, however, and particularly in the long sample, the correlations between money and aggregate output, and between money and real private consumption are not statistically significant, and are oftentimes negative. Based on these results, we would conjecture that factors different from dollarization are those that explain the low correlation between money and real variables, and hence the limited scope for countercyclical monetary policy, in developing countries.

We were able to find more conclusive evidence of systematic differences among the various categories of dollarized when we analyzed the pass-through from exchange rate to prices. Table 11 shows the results from panel regressions covering the period 1996-2001. The results suggest that the inflationary impact of exchange rate changes was indeed different across dollarized economies. Specifically, the pass-through from exchange rate to prices was the largest in economies where the degree of dollarization was very high and in those where there was little private liability dollarization (Type II economies), and was the lowest in economies where the degree of dollarization was low and in those where there was little domestic dollarization (Type III economies).

The regression results also suggest that in the large majority of dollarized economies — i.e., in the 66 countries where the degree of dollarization was either high or moderate during 1996-2001 — the pass-through coefficient is about 0.5, which is comparable to estimates found in other cross-country studies for developing countries.<sup>27</sup> These results are broadly supportive of one central premise of the hypothesis of “fear of floating,” namely, that a high pass-through coefficient is one of the reasons why central banks have little tolerance for large exchange rate changes.

TABLE 11.

Dollarization and Exchange-rate Pass-through: 1996-2001

Panel A. Regression Results (dependent variable: inflation) 1/											
A.1 By degree of dollarization											
	Lagged inflation	Real exchange rate (level)	Exchange rate change	Interactive coefficients				Time trend	Constant	Adjusted R2	No. of obs.
				high dollarization	moderate dollarization	low dollarization	openness 2/				
Coefficient	0.20	-0.01	0.67	-0.20	-0.17	-0.50	-0.08	-0.01	0.02	0.89	424
t-statistic	(10.91)	(-2.15)	(16.24)	(-5.99)	(-4.71)	(-4.28)	(-2.57)	(-1.52)	(1.20)		
A.2 By type of dollarization											
	Lagged inflation	Real exchange rate (level)	Exchange rate change	Interactive coefficients			openness 2/	Time trend	Constant	Adjusted R2	No. of obs.
				Type II dollarization	Type III dollarization						
Coefficient	0.19	-0.01	0.49	0.17	-0.18	-0.01	-0.01	0.03	0.89	424	
t-statistic	(10.21)	(-2.70)	(10.17)	(4.86)	(-2.13)	(-0.32)	(-2.21)	(2.02)			
Panel B. Implied pass-through coefficients											
By degree of dollarization				By type of dollarization							
	very high	high	moderate	low	Type I	Type II	Type III				
	0.67	0.47	0.50	0.22	0.49	0.66	0.31				

1/ Pooled estimation for 89 countries. Annual data.

2/ Openness defined as the average share of imports to GDP during 1996-2001.

The exchange rate regimes prevalent in our sample of dollarized economies during the period 1996-2001 also suggest a link between “fear of floating” and the degree of dollarization. As Table 12 shows, all groups of dollarized economies exhibited, de facto, remarkably similar degrees of exchange rate flexibility that corresponded broadly to regimes where the exchange rate fluctuated within relatively narrow bands.<sup>28</sup> In line with the results from

<sup>27</sup>Honohan and Shi (2002) obtain an average pass-through coefficient of about 0.3 using a similar specification and country sample, but longer time series, than those used in the regressions reported in Table 11. Kamin (1998) also estimates a similar equation using longer time series, and reports several regressions with a pass-through coefficient of 0.5 or higher.

<sup>28</sup>The exchange regimes associated with the scores of 7, 8 and 9 obtained in the exercise reported in Table 12 are, respectively, “de facto crawling pegs,” “de facto crawling

the pass-through regressions, however, countries with a very high degree of dollarization exhibited a significantly lower degree of exchange rate flexibility — i.e., more acute “fear of floating” — than the other dollarized economies.

**TABLE 12.**

Dollarization and Exchange Rate Flexibility: 1996-2001

	Degree of dollarization				Type of dollarization		
	Very high	High	Moderate	Low	Type I	Type II	Type III
Exchange rate flexibility 1/							
average score	6.8	9.0	8.4	8.9	7.7	8.8	8.7
standard deviation	3.1	3.8	3.7	3.2	3.7	3.7	3.3
number of countries	10	26	31	6	26	34	13
Test of equality of means	very high vs. rest of sample				Type I vs. rest of sample		
t-statistic 2/		-1.71				-1.23	
(degrees of freedom)		14				52	

Sources: Reinhart and Rogoff (2002) and Appendices I and II.

1/ Degree of exchange rate flexibility measured on a scale going from 1 (least flexible) to 15 (most flexible)—see Reinhart and Rogoff (2002), Table 4.

2/ Critical t-values at 90% confidence level are 1.35 for the first test and 1.30 for the second test.

## 6. COMBATING THE ADDICTION

The evidence reported in the previous section suggests that partial dollarization does not have first-order adverse effects on monetary policy, especially for the purpose of inflation control. This is not the same as saying that partial dollarization carries no costs. Partial dollarization indeed can create large currency mismatches in developing countries. Those mismatches tend to remain hidden during tranquil times but can wreak havoc in all sectors of the economy, and particularly in the banking system, pretty quickly after a large depreciation (Goldstein and Turner 2003). The dynamics of bank runs, and the scope for arresting them, including through the provision of central bank liquidity, also are quite different, and more complex, in economies with a high degree of domestic dollarization—e.g., de Nicoló et al. (2003); Gulde et al. (2003).

The financial fragility of dollarized economies was brought to the fore in the late 1990s by the Asian crises and, more recently, by the banking crises in Argentina and Uruguay. The evidence from these crises makes it clear

bands narrower than or equal to 2 percent” and “pre-announced crawling bands wider than or equal to 5 percent;” see Reinhart and Rogoff (2002), Table 4.

that an attitude of “benign neglect” towards partial dollarization in general, and towards domestic dollarization in particular, carries considerable risks. In fact, we would tend to agree that containing partial dollarization, and particularly domestic dollarization, is a worthy goal of economic policy in developing countries.

That being said, we are highly skeptical of recent proposals that outline the “road towards successful de-dollarization” without bothering to see what the evidence has to say about the origins of the addiction and about past attempts at combating it — e.g., Hausmann (2001), Levy-Yeyati (2003). We do not think that any “de-dollarization blueprint” that ignores history can be taken seriously. In our view, the merits of any such strategy ought to be assessed against, and contrasted with, the historical track record of countries that have largely avoided domestic dollarization, and of those which have managed to reduce significantly their degree of domestic dollarization. We provide a brief overview of those records in the rest of this section.

### 6.1. Avoiding Domestic Dollarization

Almost one-half of the developing economies in our sample did not exhibit a significant degree of domestic dollarization by the late 1990s (Table 2, bottom panel). These are the 71 economies classified as Type III and Type IV; that is, the countries where foreign currency deposits accounted for less than 10 percent of broad money and where less than 10 percent of the government’s domestic debt was denominated in foreign currency — or linked to the exchange rate (Appendix B).

Countries where bank deposits in foreign currency represented less than 10 percent of broad money exhibit wide differences among them, and can be usefully divided in three broad groups.

A first group is formed by countries that have not experienced periods of high inflation or severe macroeconomic instability and have managed to retain the bulk of private savings in their domestic financial system. India, many economies of South East Asia, and some from Northern Africa belong to this group.

A second group is formed by countries where large macroeconomic imbalances led to periods of high or very high inflation and where the authorities tried to avert the erosion of financial savings caused by inflation by promoting financial indexation schemes not linked to a foreign currency, and by imposing various types of capital controls. Brazil, Chile, Colombia, and Israel, to some extent (see below), belong in this group.

And the third group is comprised by countries where the authorities relied mainly on financial repression and capital controls to try to arrest the erosion of financial savings fueled by recurrent bouts of macroeconomic instability. Waves of capital flight and secular financial disintermediation

are central features of the countries in this group — e.g., Venezuela, Nigeria, and many other countries in Sub-Saharan Africa.<sup>29</sup>

As for avoiding the other form of domestic dollarization (locally issued public debt denominated in foreign currency), countries either have opted to refrain from issuing that type of instrument — the case of most Type III economies — or have been unable to do so due to the absence of a domestic bond market.

The above discussion illustrates clearly the endogenous character of domestic dollarization. Macroeconomic instability leads to financial adaptation. Countries with unstable macroeconomic environments facilitate such adaptation when they allow residents to hold financial assets indexed to a foreign currency or to some other stable unit of account, and stifle the adaptation when they impose additional distortions that lead to financial disintermediation and capital flight. These are the options governments have at their disposal to try to minimize the adverse effects of macroeconomic instability. They are all second-best, and they all entail costs. Theory and evidence suggest that the latter option is probably the most costly of the three. Ranking the other two, however, is more difficult.

In fact, domestic dollarization may not be the optimal form of indexation for most developing economies.<sup>30</sup> But it is also the case that in many of those economies financial markets are not large enough or deep enough to support a highly liquid market for indexed instruments. Simplicity, credibility and transparency also tend to tilt the scale in favor of dollarization compared to alternative indexation schemes. Overall, and notwithstanding its potential costs, it is an open question whether a rigorous comparison of the net gains of these two modalities of financial adaptation would show that avoiding domestic dollarization is the most suitable strategy (or the “natural” endogenous outcome) for all developing economies with a history of macroeconomic instability.

## 6.2. Undoing Domestic Dollarization

We have shown in Section V that reducing inflation is generally not sufficient to undo domestic dollarization, at least in five year-plus horizons. Nevertheless, some countries have managed to reduce their degree of domestic dollarization. To identify those countries it is again useful to treat separately cases where the reduction in domestic dollarization originated in a decline in locally issued foreign currency public debt from those that originated in a decline in the share of foreign currency deposits in broad money.

<sup>29</sup>Claessens (1997) and Ajayi and Khan (2000) provide recent estimates of capital flight from some of these countries.

<sup>30</sup>For analyses of the theory and practice of (non-dollar) indexation see Dornbusch and Simonsen (1983) and Lefort and Schmidt-Hebbel (2002).

The few governments in our sample that managed to de-dollarize their locally issued foreign currency obligations followed one of two strategies: they either amortized the outstanding debt stock at the original terms and discontinued the issuance of those securities, or they changed the currency denomination of the debt — sometimes, but not always, using market-based approaches. Mexico’s decision to redeem in U.S. dollars all the dollar-linked Tesobonos outstanding at the time of the December 1994 crisis (using the loans it received from the IMF and the US) and to cease issuing domestic foreign-currency denominated bonds thereafter, is one example of the former strategy. Argentina’s decision in late 2001 to convert to domestic currency the government bonds that it had originally issued in U.S. dollars (under Argentine law) is a recent example of the second.

Falls in domestic dollarization caused by declines in the share of foreign currency deposits to broad money are more common in our sample. To identify only those cases where the reversal of deposit dollarization was large and lasting, we searched for all those episodes where the ratio of foreign currency deposits to broad money satisfied the following three conditions: (a) experienced a decline of at least 20 percentage points; (b) settled at a level below 20 percent immediately following the decline; and (c) remained below 20 percent until the end of the sample period .

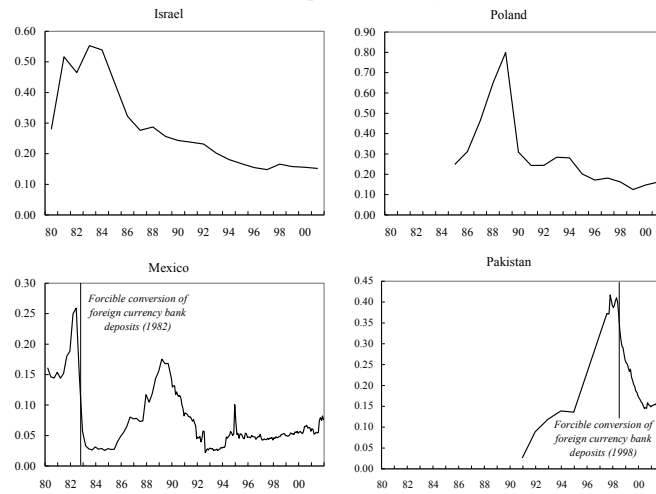
Only four of the eighty-five countries with data on foreign currency deposits met the three criteria during the period 1980-2001: Israel, Mexico, Pakistan and Poland (Figure 6). In sixteen other countries the ratio of foreign currency deposits to broad money declined by more than 20 percentage points during some interval of the 1980-2001 period. However, in some of these countries — e.g., Bulgaria and Lebanon — the deposit dollarization ratio settled at a level considerably higher than 20 percent following the decline. And in the majority of the other cases (12 out of the 16) the dollarization ratio fell below the 20 percent mark initially, but rebounded later to levels in excess of 20 percent.<sup>31</sup>

In three of the four cases that complied with the three conditions for a large and lasting decline of the deposit dollarization ratio, the reversal started the moment the authorities imposed restrictions on the convertibility of dollar deposits. In Israel, in late 1985, the authorities introduced a one-year mandatory holding period for all deposits in foreign currency, making those deposits substantially less attractive than other indexed financial instruments — see Bufman and Leiderman (1992). In Mexico and Pakistan, by contrast, the authorities forcedly converted the dollar deposits into deposits in domestic currency, in 1982 and 1998, respectively, using for

---

<sup>31</sup>This pattern was particularly common among the Transition Economies in the second half of the 1990s (e.g., Azerbaijan, Belarus, Lithuania and Russia), but was also present in other countries and periods — e.g., Bolivia and Peru in the early 1980s, and Egypt in the mid-1990s.



**FIG. 6.** De-dollarization of Bank Deposits: Israel, Poland, Mexico, and Pakistan 1/

Source: See Appendix I.

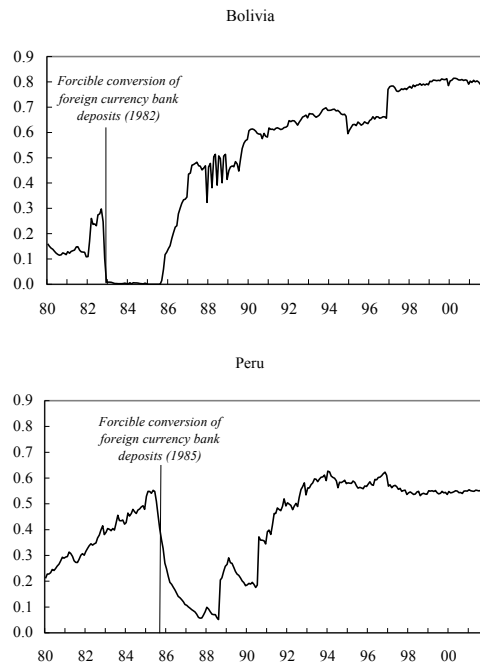
1/ Solid line depicts the share of foreign currency bank deposits in broad money

the conversion an exchange rate that was substantially below (i.e., more appreciated) than the prevailing market rate.

Interestingly, not all the countries that introduced severe restrictions on the availability of dollar deposits managed to lower the deposit dollarization ratio on a sustained basis. Bolivia and Peru adopted measures similar to those of Mexico and Pakistan in the early 1980s but, after some years of extreme macroeconomic instability that took them to the brink of hyperinflation, both countries eventually reallocated foreign currency deposits, and have since remained highly dollarized despite their remarkable success in reducing inflation — see Figure 7.

Even in the countries where the restrictions on dollar deposits have, thus far, led to a lasting decline of deposit dollarization the costs from de-dollarization were far from trivial. In Mexico, capital flight nearly doubled (to about US\$ 6.5 billion per year) and bank credit to the private sector fell by almost one-half in the two years that followed the forced conversion of dollar deposits, and the inflation and growth performance remained dismal for several years (see Dornbusch and Werner, 1994). In Pakistan, it is too recent to tell whether the compulsory de-dollarization of 1998 will be permanent or whether it will be eventually reversed, as was the case in Bolivia and Peru.

In the end, Israel and Poland appear as the only two cases on record of large and lasting reversals of deposit dollarization that had minimal side effects on financial intermediation and/or capital flight. In both cases

**FIG. 7.** Failed de-dollarization attempts: Bolivia and Peru 1/

Source: See Appendix I.

1/ Solid line depicts the share of foreign currency bank deposits in broad money.

the de-dollarization started almost at the same time as the authorities embarked on a (eventually successful) disinflation program centered around a strong exchange rate anchor, and the domestic financial system offered assets with alternative forms of indexation (Israel) or very high real interest rates (Poland)—see Bufman and Leiderman (1995) and Chopra (1994).

Whether the circumstances and conditions present in Israel and Poland can or should be replicated by other economies with a relatively high degree of domestic dollarization, is not all that clear, especially since it is not apparent that other types of indexation are always preferable to dollarization. In our view, those interested in drawing blueprints for de-dollarization need to tackle head on these difficult questions.

## 7. SUMMARY AND CONCLUSIONS

In this paper we propose a broader and more up-to-date definition of partial dollarization that encompasses private sector holdings of foreign

currency assets and private and public external foreign currency liabilities. With this new measure we identify recent trends in the evolution of dollarization in the developing world, take a fresh look at the conventional view regarding the supposed ineffectiveness of monetary policy in dollarized economies, and review the evidence on successful de-dollarization.

We show that there has been a large increase in the degree and incidence of dollarization in developing countries in the last two decades. By the late 1990s, 72 developing economies exhibited non-negligible degrees of domestic dollarization, and another 18 had relatively high exposure to private external liability dollarization. We argue that a history of high inflation, increased reliance of governments on locally-issued dollar-linked debt, increased access to global capital markets, and the appearance in scene of the Transition Economies are the key factors behind the recorded rise in worldwide dollarization. We also show that the spread of dollarization has not been uniform across or within regions; dollarization has been consistently high in the Middle East, in the Transition Economies since the 1990s and, especially, in South America, while it has been consistently low in Africa and in most of Asia.

Overall, we find little empirical support for the view that dollarization hinders the effectiveness of monetary policy. We show that average inflation has indeed been higher and more volatile in countries with a high degree of dollarization than in those where the degree of dollarization has been low or moderate.

However, we find no evidence that would suggest that dollarization makes it more difficult to bring down inflation from high levels, or that it alters or adds complexity to the monetary transmission process — particularly through systematic changes in the behavior of money velocity, or in the link between money and prices. Seigniorage revenues, a monetary policy aspect stressed by the early literature on dollarization, are found to be fairly similar — both in terms of levels and variability — across all categories of dollarized economies, especially in the late 1990s. Output fluctuations, and the scope for using countercyclical monetary policy to reduce them, are also found to be fairly similar in countries with different degrees and varieties of dollarization.

One area of monetary policy where we find systematic differences among the various categories of dollarized economies, at least in the recent period, is in the pass-through from exchange rate to prices. Concretely, our evidence suggests that during the late 1990s the inflationary impact of exchange rate changes was the largest in economies where the degree of dollarization was very high and in those where there was little private liability dollarization, and the lowest in countries where the overall degree of dollarization was low and domestic dollarization was negligible. We see these results as broadly supportive of recent theories of “fear of floating”

that identify a high pass-through coefficient as one key reason why central banks in emerging economies exhibit little tolerance to large exchange rate changes.

We then review developing countries' record in combating their addiction to dollars. Specifically, we provide a taxonomy of countries that have avoided domestic dollarization, and review the historical record of episodes of de-dollarization in the developing world over the last 25 years. We find that this record is not particularly encouraging. We are able to identify only two countries, out of a total of 85, that managed to achieve large and lasting declines in domestic dollarization without having to incur heavy costs in terms of financial intermediation or capital flight—Israel and Poland. If we include countries that paid those costs, we can probably add Mexico to the list. We argue that these few experiences provide the background that is most relevant for a discussion of de-dollarization strategies, including in particular the circumstances and conditions that may contribute to the success of those strategies, and the horizon over which it may be reasonable to expect concrete results from their adoption.

## APPENDIX A

### Sample, Methodology and Data Sources

#### COUNTRY SAMPLE

The sample of countries used in the study comprised, in principle, all non-industrial economies that issued a national currency during all or part of the period 1980-2001. Hong Kong, Israel, Korea, Singapore and Taiwan were the only members of the group defined as “Advanced Economies” in the IMF’s World Economic Outlook that were included in the sample. Countries for which it was not possible to obtain data on either foreign currency deposits in local banks or external debt for at least three consecutive years during the period 1980-2001 were excluded from the sample.

#### COMPOSITE DOLLARIZATION INDEX

The composite index of dollarization for each country was defined as the sum of the ratio of foreign currency deposits to broad money, the ratio of domestic government debt in foreign currency to total government debt, and the ratio of external debt to GNP. To construct the composite, each of the three variables were previously transformed into an index that took values ranging from 0 to 10. The criteria used to transform the ratios obtained from the raw data into indices are summarized in Table 13 below.

**TABLE 1.**

Indices of Dollarization	
Recorded value of ratio 1/ $x_i = 0$	Assigned Index value
$x_i = 0$	0
$0 < x_i \leq 0.1$	1
$0.1 < x_i \leq 0.2$	2
$0.2 < x_i \leq 0.3$	3
$0.3 < x_i \leq 0.4$	4
$0.4 < x_i \leq 0.5$	5
$0.5 < x_i \leq 0.6$	6
$0.6 < x_i \leq 0.7$	7
$0.7 < x_i \leq 0.8$	8
$0.8 < x_i \leq 0.9$	9
$x_i > 0.9$	10

$1/x_i$ ,  $i = 1, 2, 3$  represent the three ratios used to construct the composite

The composite index for each country was calculated for all years between 1980 and 2001 for which actual data existed for at least one of the three ratios. The average degree of dollarization for different sub-periods and/or regions reported in the tables and figures of Section IV is the average of the annual values of the composite index for each country in the corresponding group — in most cases the group average was rounded to the nearest integer.

The ranges for the composite index that were used to group the countries according to their degree of dollarization in Table 4 of the main text and in all the tables of Section V were the following:

**TABLE 2.**

Degrees of Dollarization	
Degree	Composite index value
Very High	14-30
High	9-13
Moderate	4-8
Low	0-3

### VARIETIES OF DOLLARIZATION

The degree of domestic dollarization and of private sector access to foreign borrowing were the variables utilized to assign all countries in the sample to one of the four varieties (types) of dollarization summarized in Table 1 of the main text.

As noted in the text, domestic dollarization was gauged by looking at the ratios of foreign currency deposits to broad money and of domestic government debt in foreign currency to total domestic government debt. Countries where none of the two ratios exceeded 10 percent during a particular period were regarded as having a negligible degree of domestic dollarization and were assigned to the bottom row of Table 1 — i.e., were pre-classified as Type III or Type IV economies. Countries where at least one of the ratios exceeded 10 percent were assigned to the top row of Table 1, and, hence, were pre-classified as Type I or Type II economies.

Private sector access to foreign borrowing was gauged by looking at the share of private sector debt in total external debt — a variable not utilized to construct the composite index. Countries where the share was below 10 percent were regarded as having limited access to international capital markets and were assigned to the right-side column of Table 1 — i.e., were pre-classified as Type II or Type IV economies. Countries where the share was 10 percent or higher were assigned to the left-side column of Table 1, and, thus, were preclassified as Type I or Type III economies.

The variety of dollarization prevalent in each country was assessed at three different intervals of the 1980-2001 period: 1980-1985, 1988-1993, and 1996-2001 (see Tables 2 and 3 of the main text). In each sub-period, the thresholds for gauging the degree of domestic dollarization and of private sector access to foreign borrowing were calculated by taking the average of the annual ratios for the corresponding years. Since the external debt series for the majority of countries ended in the year 2000, however, the private sector access to foreign borrowing for the sub-period 1996-2001 was assessed on the basis of the average from 1996 to 2000.

### PERIOD COVERAGE

The length of the composite index series in each country was determined primarily:

- (i) by the length of the series on foreign currency deposits (in economies classified as Type I or Type II); and/or
- (ii) by the length of the series on external debt (in economies classified as Type III or Type IV).

There was a high variance in the length of the composite index series across the countries of the sample. One reason for this was the appearance

in scene of the Transition economies in the early 1990s; another one was the sheer lack of long time series on the currency composition of bank deposits. To deal with this problem, all empirical analyses of the effects of dollarization on monetary policy in Section V, except the one on disinflation episodes (see below), was undertaken using two different-sized samples:

- (i) a long sample, comprising about 48 countries for which there were annual observations for the composite dollarization index and the other relevant variables for all (or most of) the period 1980-2001;<sup>1</sup> and
- (ii) a short sample, comprising the 90 countries for which there were annual data for all the variables for the period 1996-2001.

The countries that formed part of the two samples are listed below.

Long sample: Angola, Bahrain, Bolivia, Brazil, Bulgaria, Cameroon, Chile, Colombia, Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, Egypt, El Salvador, Fiji, Guatemala, Honduras, Hong Kong, Hungary, Indonesia, Israel, Jordan, Kenya, Korea, Kuwait, Lebanon, Malaysia, Mauritius, Mexico, Netherlands Antilles, Niger, Nigeria, Pakistan, Peru, Philippines, Papua New Guinea, Poland, Romania, Saudi Arabia, Singapore, St. Kitts and Nevis, Taiwan, Thailand, Turkey, United Arab Emirates, Uganda, Uruguay and Venezuela.

Short sample: Albania, Angola, Argentina, Armenia, Azerbaijan, Bahrain, Belarus, Bolivia, Bosnia-Herzegovina, Brazil, Bulgaria, Cambodia, Chile, China, Colombia, Congo DR, Costa Rica, Cote d'Ivoire, Croatia, Czech Republic, Ecuador, Egypt, El Salvador, Estonia, Fiji, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, Hong Kong, Hungary, Indonesia, Israel, Jamaica, Jordan, Kazakhstan, Korea, Kyrgyz Republic, Lao, Latvia, Kuwait, Lebanon, Lithuania, Macedonia, Malawi, Malaysia, Mauritius, Mexico, Moldova, Mongolia, Mozambique, Netherlands Antilles, Nicaragua, Oman, Pakistan, Paraguay, Peru, Philippines, Papua New Guinea, Poland, Romania, Russian Federation, Sao Tomé and Principe, Saudi Arabia, Sierra Leone, Singapore, Slovak Republic, Slovenia, Solomon Islands, South Africa, St. Kitts and Nevis, Taiwan, Tajikistan, Tanzania, Thailand, Trinidad and Tobago, Turkey, Turkmenistan, United Arab Emirates, Uganda, Ukraine, Uruguay, Uzbekistan, Venezuela, Vietnam, Yemen and Zambia.

### DISINFLATION EPISODES

Table 15 below summarizes key features of the seventeen disinflation episodes discussed in Section V (Figures 4 and 5). Specifically, the table shows the years and the inflation rates corresponding to the beginning

<sup>1</sup>The size and composition of the sample varied slightly depending on whether the analysis focused on the types of dollarization (41 countries) or the degree of dollarization (45 countries)

**TABLE 3.**  
Disinflation Episodes

	In-sample peak		First year below 10%	
	year	inflation (annual rate, in percent)	year	inflation (annual rate, in percent)
Argentina	1989	3080	1994	4.2
Bolivia	1985	11750	1993	8.5
Brazil	1990	2948	1997	6.9
Bulgaria	1997	1058	1999	2.6
Costa Rica	1982	90	1993	9.8
Dominican Republic	1990	50	1992	4.3
Guatemala	1990	41	1995	8.4
Indonesia	1998	58	2000	3.7
Israel	1984	374	1997	9.0
Kenya	1993	46	1995	1.6
Mauritius	1980	42	1983	5.6
Mexico	1987	132	1993	9.8
Nigeria	1995	73	1997	8.2
Peru	1990	7482	1997	8.6
Philippines	1984	47	1986	-0.3
Uganda	1987	200	1993	6.1
Uruguay	1990	113	1999	5.7

and end of each disinflation episode?defined as the year when the annual inflation rate reached its in-sample peak, and the first year when it fell below 10 percent.

### DATA SOURCES

Foreign Currency Deposits: data on foreign currency deposits were obtained from a number of sources. These included (number of countries in parenthesis): the IMF’s Money and Banking electronic database, MBT-S, (44 countries), the IMF’s International Financial Statistics, IFS, (13 countries); data provided by IMF country desks (26 countries), IMF staff documents (6 countries) and national sources — e.g., central bank websites or annual reports?(9 countries).

Broad Money: the IMF’s MBTS and IFS were the primary sources for the series on broad money for about 70 countries. In those cases where the series on foreign currency deposits was obtained from a source different from the MBTS and IFS, care was taken to ensure that the broad money series used to compute the “dollarization ratio” (i.e., the ratio of foreign currency deposits to broad money) included foreign currency deposits. For



the other 24 countries, broad money series were provided by IMF country desks (12 countries) or obtained from IMF staff documents (6 countries) and from national sources (6 countries).

External Debt: for most countries in the sample the series on external debt (total and private) were taken directly from the World Bank's Global Development Finance (GDF) database — which, as of December 2002, only contained data up to the year 2000. For those countries in the sample not included in the GDF (e.g., Hong Kong, Israel, Saudi Arabia, Singapore) external debt series were obtained from the Joint OECD-BIS-IMF-World Bank Statistics on External Debt website and/or from IMF staff documents.

Domestic public debt denominated in foreign currency information on this variable was solicited to, and provided by, IMF desks economist and corroborated with national sources. Altogether, we were able to collect data series on this variable for about 23 countries for the period 1996-2001 (see Figure 2).

The series on Gross Domestic Product (nominal and real) and Real Private Consumption were obtained from the IMF's World Economic Outlook (WEO) database. In all countries where the data on external debt originated in the World Bank's GDF, the Gross National Product (in U.S. dollars) was used as the denominator of the external debt-to-output ratio. In the other cases the ratio was constructed using the WEO series of Gross Domestic Product in U.S. dollars.

For most countries, the (annual) series on consumer price indices and reserve money (used to construct the series on inflation and seigniorage) were taken directly from the IFS. In the cases of Guinea, Lebanon, São Tomé and Príncipe, Tajikistan, Turkmenistan, United Arab Emirates, and Uzbekistan the consumer price indices series were taken from the WEO. Data on exchange rates (end of period) were also obtained from the WEO and the IFS.

Seigniorage was defined as the annual change in the monetary base divided by nominal GDP in all countries except Argentina, Chile, Israel and Uruguay. In these four countries, the IFS series of reserve money include indexed and/or remunerated deposits. To control for this, seigniorage was defined as the annual change in M1 divided by nominal GDP in the cases of Argentina, Chile and Uruguay; and as the change in the monetary base excluding foreign currency deposits divided by nominal GDP in the case of Israel.

**APPENDIX B**  
**Velocity and Money Growth Correlations-Additional Estimates**

Panel A. Type I economies 1/

		Index 2/			
		Foreign currency bank deposits	Domestic debt in foreign currency	External Debt	Composite
1	Argentina	6	9	5	20
2	Azerbaijan	4	0	2	6
3	Bahrain	4	0	6	10
4	Bolivia	8	7	7	22
5	Brazil	0	3	4	7
6	Hong Kong	5	0	2	7
7	Croatia	7	0	5	12
8	Czech Republic	2	0	5	7
9	Estonia	4	0	6	9
10	Hungary	2	0	7	9
11	Indonesia	3	1	9	12
12	Israel	2	0	6	8
13	Kazakhstan	3	1	3	7
14	Kyrgyz Republic	3	0	8	11
15	Latvia	4	0	4	8
16	Lebanon	6	3	5	14
17	Lithuania	4	0	4	8
18	Macedonia	4	0	5	8
19	Mozambique	4	0	10	14
20	Paraguay	5	6	4	15
21	Peru	6	4	6	16
22	Philippines	3	0	7	10
23	Poland	2	0	4	6
24	Romania	4	1	3	8
25	Saudi Arabia	2	0	2	4
26	Slovak Republic	2	0	5	7
27	Tajikistan	3	0	10	13
28	Turkey	5	3	5	13
29	United Arab Emirates	3	0	3	6

Source: See Appendix A.

1/ Countries where at least 10 percent of broad money or of domestic public debt are denominated in a foreign currency and where the stock of private non guaranteed external debt is more than 10 percent of total debt.

2/ Average for the period rounded to the nearest integer.

Panel B. Type II economies 1/

		Index 2/			
		Foreign currency bank deposits	Domestic debt in foreign currency	External Debt	Composite
1	Albania	2	0	3	5
2	Angola	6	0	10	16
3	Armenia	4	0	5	9
4	Belarus	6	2	1	9
5	Bosnia & Herzegovina	6	0	7	13
6	Bulgaria	4	5	9	19
7	Cambodia	7	0	8	15
8	Congo DR	2	0	10	12
9	Costa Rica	4	2	3	9
10	Ecuador	7	9	9	25
11	Egypt	3	1	4	8
12	El Salvador	2	3	3	9
13	Georgia	4	0	5	9
14	Ghana	3	0	10	13
15	Guatemala	0	4	3	7
16	Guinea	2	0	10	12
17	Guinea-Bissau	4	0	10	14
18	Haiti	3	0	3	7
19	Honduras	3	0	10	13
20	Jamaica	4	0	7	10
21	Jordan	3	0	10	13
22	Lao	7	0	10	17
23	Malawi	2	0	10	12
24	Moldova	2	0	7	10
25	Mongolia	3	0	8	11
26	Netherlands Antilles	2	0	0	2
27	Nicaragua	7	0	10	17
28	Pakistan	3	1	6	9
29	Russia	3	2	6	11
30	São Tomé & Príncipe	4	0	10	14
31	Sierra Leone	2	0	10	12
32	Slovenia	4	0	0	4
33	St. Kitts and Nevis	3	0	5	8
34	Tanzania	3	0	10	12
35	Trinidad and Tobago	2	0	4	6

Panel B. Type II economies 1/(continued)

		Index 2/			
		Foreign currency bank deposits	Domestic debt in foreign currency	External Debt	Composite
36	Turkmenistan	3	0	6	9
37	Uganda	3	0	6	9
38	Ukraine	3	2	4	8
39	Uruguay	9	9	4	21
40	Uzbekistan	2	0	3	5
41	Vietnam	3	0	8	11
42	Yemen	3	0	9	12
43	Zambia	4	0	10	14

Source: See Appendix A.

1/ Countries where at least 10 percent of broad money or of domestic public debt are denominated in a foreign currency and where the stock of private non guaranteed external debt is less than 10 percent of total debt.

2/ Average for the period rounded to the nearest integer.

Panel C. Type III economies 1/

		Index 2/			
		Foreign currency bank deposits	Domestic debt in foreign currency	External Debt	Composite
1	Chile	1	1	5	7
2	China	0	0	2	2
3	Colombia	0	1	4	5
4	Côte d'Ivoire	0	0	10	10
5	Fiji	0	0	2	2
6	Korea	0	0	4	4
7	Kuwait	0	0	3	3
8	Malaysia	1	0	6	7
9	Mauritius	0	0	6	6
10	Mexico	1	0	4	5
11	Oman	0	0	0	0
12	Papua New Guinea	1	0	7	8
13	Singapore	0	0	2	2
14	Solomon Islands	0	0	5	5
15	South Africa	0	0	2	2
16	Taiwan	0	0	1	1
17	Thailand	1	0	8	9

		Index 2/			
		Foreign currency bank deposits	Domestic debt in foreign currency	External Debt	Composite
18	Venezuela	1	0	5	6

Source: See Appendix A.

1/ Countries where less than 10 percent of broad money and of domestic public debt are denominated in a foreign currency and where the stock of private non guaranteed external debt is more than 10 percent of total debt.

2/ Average for the period rounded to the nearest integer.

Panel D. Type IV economies 1/			
1	Algeria	28	Kenya
2	Bangladesh	29	Lesotho
3	Barbados	30	Madagascar
4	Belize	31	Maldives
5	Benin	32	Mali
6	Bhutan	33	Mauritania
7	Botswana	34	Morocco
8	Burkina Faso	35	Myanmar
9	Burundi	36	Nepal
10	Cameroon	37	Niger
11	Cape Verde	38	Nigeria
12	Central African Rep.	39	Rwanda
13	Chad	40	Samoa
14	Comoros	41	Senegal
15	Congo	42	Seychelles
16	Djibouti	43	Sri Lanka
17	Dominica	44	St. Lucia
18	Dominican Republic	45	St. Vincent & Grenadines
19	Equatorial Guinea	46	Sudan
20	Eritrea	47	Swaziland
21	Ethiopia	48	Syrian Arab Republic
22	Gabon	49	Togo
23	Gambia	50	Tonga
24	Grenada	51	Tunisia
25	Guyana	52	Vanuatu
26	India	53	Zimbabwe
27	Iran		

1/ Countries where less than 10 percent of broad money and of domestic public debt are denominated in a foreign currency and where the stock of private non guaranteed external debt is less than 10 percent of total debt.

**APPENDIX C**  
**Velocity and Money Growth Correlations — Additional Estimates**

**TABLE 1.**

	Dollarization and Money Velocity				
	By degree of dollarization		By type of dollarization		
	High-to- very high	Low-to- moderate	Type I	Type II	Type III
Panel A. Long Sample 1/					
Annual growth in velocity					
M1	2.4	1.6	1.9	3.1	2.0
M2 2/	1.3	1.8	1.6	1.4	-0.3
Standard deviation					
M1	15.0	13.2	17.2	15.5	12.9
M2 2/	16.7	17.9	19.3	17.7	10.3
Panel B. Short Sample 3/					
Annual growth in velocity					
M1	-1.1	-0.5	0.9	0.0	-1.2
M2 2/	-0.5	2.1	-3.3	-1.8	-1.4
Standard deviation					
M1	11.9	11.0	13.4	16.3	11.6
M2 2/	13.9	15.4	9.5	14.0	8.2

1/ All countries classified as Types I, II and III for which the series of the composite dollarization index exists for most of the period 1980-2001 — see Appendix A.

2/ Broad money excluding foreign currency deposits.

3/ All countries classified as Types I, II and III with an index of composite dollarization during the period 1996-2001 — see Appendix B.

**TABLE 2.**  
Money Growth Correlations: Long Sample 1/

	By degree of dollarization		By type of dollarization		
	High-to-very high	Low-to-moderate	Type I	Type II	Type III
Pairwise correlations, 2/	Money growth with				
Inflation					
M1	0.60	0.33	0.53	0.47	0.31
M2 3/	0.57	0.40	0.62	0.39	0.43
GDP growth					
M1	-0.09	0.11	-0.11	-0.03	0.24
M2 3/	-0.28	0.17	-0.13	-0.19	0.33
Consumption growth					
M1	-0.20	0.11	-0.12	-0.07	0.17
M2 3/	-0.29	0.23	-0.07	0.10	0.17

1/ All countries classified as Types I, II and III for which the series of the composite dollarization index exists for most of the period 1980-2001 — see Appendix A.

2/ Contemporaneous correlations, average for the group. Number in bold indicates that correlations were statistically significant in more than one-half of the group.

3/ Broad money excluding foreign currency deposits.

**TABLE 3.**  
Money Growth Correlations: Short Sample 1/

	By degree of dollarization				By type of dollarization		
	Very high	High	Moderate	Low	Type I	Type II	Type III
Pairwise correlations, 2/	Money growth with						
Inflation							
M1	0.94	0.70	0.69	0.26	0.60	0.89	0.53
M2 3/	0.92	0.81	0.58	0.64	0.71	0.87	0.57
GDP growth							
M1	0.10	0.00	0.19	0.39	0.12	0.05	0.27
M2 3/	0.16	-0.11	0.10	0.64	0.07	0.09	0.25
Consumption growth							
M1	-0.13	0.01	0.13	0.16	0.13	-0.10	0.14
M2 3/	-0.07	-0.02	0.10	0.16	-0.01	-0.06	0.13

1/ All countries classified as Types I, II and III for which the series of the composite dollarization index exists for most of the period 1980-2001 — see Appendix B.

2/ Panel correlations, contemporaneous. Statistically significant coefficients in bold.

3/ Broad money excluding foreign currency deposits.

## REFERENCES

- Ajayi, S. Ibi and Mohsin Khan, eds, 2000. External Debt and Capital Flight in Sub-Saharan Africa. (Washington DC: International Monetary Fund).
- Allen, Mark, Christoph Rosenberg, Christian Keller, Brad Setser, and Nouriel Roubini, 2002. A Balance Sheet Approach to Financial Crisis. IMF Working Paper 02/210 (December).
- Baliño, Tomás, Adam Bennett, and Eduardo Borensztein, 1999. Monetary Policy in Dollarized Economies. Occasional Paper 171, (Washington DC: International Monetary Fund).
- Barro, Robert and David Gordon, 1983. A Positive Theory of Monetary Policy in a Natural Rate Model. *Journal of Political Economy* **91**, 589-610.
- Berg, Andrew and Eduardo Borensztein, 2000. The Pros and Cons of Full Dollarization. IMF Working Paper 00/50 (March).
- Bufman, Gil and Leonardo Leiderman, 1992. Simulating an Optimizing Model of Currency Substitution. *Revista de Análisis Económico* **Vol. 7, No. 1**, 109-124.
- Bufman, Gil and Leonardo Leiderman, 1995. Israel's Stabilization: Some Important Policy Lessons, in R. Dornbusch and S. Edwards (eds), Reform, Recovery, and Growth: Latin America and the Middle East, (Chicago: University of Chicago Press for NBER), pp. 177-222.
- Caballero, Ricardo and Arvind Krishnamurthy, 2000. Dollarization of Liabilities: Underinsurance and Domestic Financial Underdevelopment. NBER Working Paper 7792, (Cambridge, Mass: National Bureau of Economic Research).
- Calvo, Guillermo, 1999. On Dollarization, draft, Department of Economics, University of Maryland, April.
- Calvo, Guillermo, 2000. Capital Markets and the Exchange Rate — With Special Reference to the Dollarization Debate in Latin America, draft, Department of Economics, University of Maryland, April.
- Calvo, Guillermo and Carmen M. Reinhart, 2000. When Capital Inflows Come to a Sudden Stop: Consequences and Policy Options, in P. Kenen and A. Swoboda (eds), Reforming the International Monetary and Financial System, pp. 175-201 (Washington DC: International Monetary Fund).
- Calvo, Guillermo and Carmen M. Reinhart, 2000. Fixing for Your Life, in S. Collins and D. Rodrik, (eds) Brookings Trade Policy Forum 2000, (Washington DC: Brookings Institution).
- Calvo, Guillermo and Carmen M. Reinhart, 2002. Fear of Floating. *Quarterly Journal of Economics* **117, 2**, 379-408.
- Calvo, Guillermo A. and Carlos A. Végh, 1992. Currency Substitution in Developing Countries: An Introduction. *Revista de Análisis Económico* **Vol. 7, No. 1**, 3-27.
- Calvo, Guillermo A. and Carlos A. Végh, 1996. From Currency Substitution to Dollarization: Analytical and Policy Issues, in G. Calvo, Money, Exchange Rates, and Output, 153-175 (Cambridge, Mass: MIT Press).
- Céspedes, Luis, Roberto Chang and Andrés Velasco, 2000. Balance Sheet Effects and Exchange Rate Policy. NBER Working Paper 7840, (Cambridge, Mass: National Bureau of Economic Research).
- Chopra, Ajai, 1994. Monetary Policy and Financial Sector Reform, in L. Ebrill et al., Poland: The Path to a Market Economy, Occasional Paper 113, (Washington DC: International Monetary Fund).



- Claessens, Stijn, 1997. Estimates of Capital Flight and Its Behavior. *Revista de Análisis Económico* **Vol. 12, No. 1**, 3-34.
- Cukierman, Alex, 1992. Central Bank Strategy, Credibility and Independence: Theory and Evidence, (Cambridge, Mass: The MIT Press).
- De Nicoló, Gianni, Patrick Honohan, and Alain Ize, 2003. Dollarization of the Banking System: Good or Bad? IMF Working Paper, 03/146 (July)
- Dornbusch, Rudiger and Mario Simonsen (eds), 1983. Inflation, Debt and Indexation, (Cambridge, Mass: MIT Press).
- Dornbusch, Rudiger and Mario Simonsen and Alejandro Werner, 1994. Mexico: Stabilization, Reform, and No Growth. *Brookings Papers on Economic Activity* **Vol. 1**, 253-315.
- Edwards, Sebastian, 2001. Dollarization: Myths and Realities. *Journal of Policy Modeling* **Vol. 23**, 249-265.
- Feige, Edgar L., 1996. Overseas Holdings of U.S. Currency and the Underground Economy, in S. Pozo (ed.), *Exploring the Underground Economy*, (Kalamazoo: W.E. Upjohn Institute for Employment Research).
- Feige, Edgar L., Michael Faulend, Velimir Sonje and Vedran Susic, 2003. Unofficial Dollarization in Latin America, in D. Salvatore et al. (eds) *The Dollarization Debate*, New York: Oxford University Press.
- Fischer, Stanley, 1994. Modern Central Banking, in F. Capie, et al. (eds) *The Future of Central Banking*, (New York: Cambridge University Press).
- Fry, Maxwell, Charles Goodhart, and Alvaro Almeida, 1996. *Central Banking in Developing Countries: Objectives, Activities and Independence*, (London and New York: Routledge).
- Giovannini, Alberto and Bart Turtelboom, 1994. Currency Substitution, in F. van der Ploeg (ed.), *Handbook of International Macroeconomics*, (Cambridge, Mass: Blackwell).
- Goldstein, Morris and Philip Turner, 2003. Controlling Currency Mismatches in Emerging Economies, draft, Institute of International Economics, (August)
- Guidotti, Pablo and Carlos A. Rodriguez, 1992. Dollarization in Latin America: Gresham's Law in Reverse? *IMF Staff Papers* **39**, 518-544.
- Gulde, Anne-Marie, David Hoelscher, Alain Ize, Alfredo Leone and David Marston, 2003. Dealing with Banking Crises in Dollarized Economies, in C. Collins and R. Kincaid (eds) *Managing Financial Crises: Recent Experience and Lessons from Latin America*, Occasional Paper 217, (Washington DC: International Monetary Fund).
- Hausmann, Ricardo, 2001. A plan B for Argentina, draft, Kennedy School of Government, Cambridge, Mass. (October).
- Hausmann, Ricardo, Ugo Panizza, and Ernesto Stein, 2001. Original Sin, Passthrough, and Fear of Floating, draft, Kennedy School of Government, Cambridge, Mass.
- Havrylyshyn, Oleh and Christian Beddies, 2003. Dollarization in the Former Soviet Union: From Hysteria to Hysteresis. *Contemporary Economic Studies* **Summer**, 1-29.
- Honohan, Patrick and Anqing Shi, 2002. Deposit Dollarization and the Financial Sector in Emerging Economies. Working Paper, Development Research Group, The World Bank.
- Ize, Alain and Eduardo Levy-Yeyati, 1998. Dollarization and Financial Intermediation: Causes and Policy Implications. *IMF Working Paper* **98/22**, (March).

- Kamin, Steven, 1998. A Multi-country Comparison of the Linkages between Inflation and Exchange Rate Competitiveness. International Finance Discussion Papers, No. 603, (Washington DC: Board of Governors of the Federal Reserve System).
- Kamin, Steven and Neil Ericsson, 1993. Dollarization in Argentina. International Finance Discussion Papers, No. 460, (Washington DC: Board of Governors of the Federal Reserve System).
- Kamin, Steven and Neil Ericsson, Philip Turner and Jozef Van't dack, 1998. The Transmission Mechanism of Monetary Policy in Emerging Market Economies: An Overview. *BIS Policy Papers* **No.3**, (Basle: Bank for International Settlements).
- Lefort, Fernando and Klaus Schmidt-Hebbel (eds), 2002. Indexation, Inflation, and Monetary Policy, (Santiago de Chile: Banco Central de Chile).
- Levy-Yeyati, Eduardo, 2003. Financial Dedollarization: A Carrot and Stick Approach, draft, Universidad Torcuato di Tella, (April)
- Masson, Paul, Miguel Savastano and Sunil Sharma, 1997. The Scope for Inflation Targeting in Developing Countries. *IMF Working Paper* **97/130**, (October).
- Mishkin, Frederic, 1995. Symposium on the Monetary Transmission Mechanism. *Journal of Economic Perspectives (Fall)* **Vol. 9, No. 4**.
- Mongardini, Joannes and Johannes Mueller, 2000. Ratchet Effects in Currency Substitution: An Application to the Kyrgyz Republic. *IMF Staff Papers* **Vol. 47, No. 2**, 218-237.
- Mueller, Johannes, 1994. Dollarization in Lebanon. *IMF Working Paper* **94/129**, (October).
- Oomes, Nienke, 2003. Network Externalities and Dollarization Hysteresis: The Case of Russia. *IMF Working Paper* **03/96** (May).
- Ortiz, Guillermo, 1983. Currency Substitution in Mexico: The ?Dollarization? Problem. *Journal of Money, Credit, and Banking* **15**, 174-185.
- Ramrez-Rojas, C. Luis, 1985. Currency Substitution in Argentina, Mexico, and Uruguay. *IMF Staff Papers* **32**, 629-667.
- Reinhart, Carmen and Kenneth Rogoff, 2002. The Modern History of Exchange Rate Arrangements: A Reinterpretation. NBER Working Paper 8963, (Cambridge, Mass: National Bureau of Economic Research).
- Reinhart, Carmen, Kenneth Rogoff and Miguel Savastano, 2003. Debt Intolerance. *Brookings Papers on Economic Activity* **1**, 1-74 (Washington DC: Brookings Institution).
- Rogoff, Kenneth, 1985. The Optimal Degree of Commitment to an Intermediate Monetary Target. *Quarterly Journal of Economics* **100**, 1169-1190.
- Salvatore, Dominick, James Dean and Thomas Willett (eds), 2003. The Dollarization Debate, New York: Oxford University Press
- Savastano, Miguel A., 1992. The Pattern of Currency Substitution in Latin America: An Overview. *Revista de Análisis Económico* **Vol. 7, No. 1**, 29-72.
- Savastano, Miguel A., 1996. Dollarization in Latin America: Recent Evidence and Some Policy Issues, in P. Mizen and E. Pentecost (eds), *The Macroeconomics of International Currencies: Theory, Policy, and Evidence*, (Brookfield, Vt: Edward Elgar).
- Thomas, Lee R., 1985. Portfolio Theory and Currency Substitution. *Journal of Money, Credit, and Banking* **Vol. 17**, 347-57.
- Uribe, Martin, 1997. Hysteresis in a Simple Model of Currency Substitution. *Journal of Monetary Economics* **Vol. 40, 1**, 185-202.