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Dollarization in Latin America:
Recent Evidence and Some Policy Issues

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Abstract

This paper examines the pattern of dollarization in Latin America, focusing on the experience of five countries (Argentina, Bolivia, Mexico, Peru and Uruguay) during 1970-1993. It presents evidence on the relative size of dollarization, the allocation of foreign currency deposits, and the behavior of money velocity. The discussion stresses the role of institutional factors, macroeconomic conditions, and the dynamics of money demand in shaping the dollarization process; it also highlights the shortcomings of indicators frequently employed to analyze the phenomenon. The paper provides a brief critical assessment of the empirical literature on dollarization, and identifies areas where further research seems warranted.

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Summary

The notion that dollarization is a common and widespread phenomenon in Latin America is often found in analytical and policy discussions. Casual and formal evidence reported in numerous studies since the early 1980s would appear to support such a presumption. A closer look at this literature, however, conveys the distinct impression that the studies are not necessarily referring to the same phenomenon. Some use the term "dollarization" (widely, but wrongly, regarded as a synonym for currency substitution) to describe the occurrence of capital flight, others to explain the behavior of the parallel (black) market exchange rate, and yet another group--a growing majority--to refer to the use of foreign money as a store of value, unit of account, and/or medium of exchange within the domestic economy. Moreover, recent evidence has raised doubts about the generality and robustness of what once was thought to be a well-defined, regime-invariant relationship between macroeconomic stability, domestic inflation, and the degree of dollarization.

This paper argues that the variety of approaches to the phenomenon of dollarization and the apparent theoretical inconsistency of some of the empirical regularities observed in Latin America can be reconciled. All that is required is to incorporate fully into the analysis two key and related elements that typically give shape to a process of dollarization: the dynamics of the flight from money, and the country's institutional framework. In this light, the paper argues that the high degree of dollarization currently observed in several countries of the region is fundamentally an endogenous outcome: the flip side of a gradual flight from domestic money that was fueled by prolonged and recurrent episodes of macroeconomic instability, and that was strongly influenced by the countries' institutional settings (including the availability of the option of holding foreign currency deposits in domestic banks) and the public's expectations.

The paper examines the pattern of dollarization between 1970 and 1993 in five Latin American countries: Argentina, Bolivia, Mexico, Peru, and Uruguay. The five countries experienced episodes of high inflation and allowed (intermittently) foreign currency deposits in their financial systems during that period, and have attracted most of the attention in the empirical literature on dollarization in Latin America. The paper presents evidence on the relative size of dollarization, the allocation of foreign currency deposits of the public at home and abroad, and the behavior of money velocity. The discussion identifies stylized facts and common features of the dollarization process in the five countries, and highlights the shortcomings and biases of the indicators most frequently employed in empirical analyses of the phenomenon. The paper also reviews some of the main modeling and policy issues that have arisen in discussions of dollarization in Latin America; it provides a brief critical assessment of the relevant empirical and policy literature, and identifies areas where further research seems warranted.

I. Introduction

High and variable inflation rates encourage a flight from domestic money and raise the demand for alternative assets, including those denominated in foreign currency. The recent monetary history of Latin America is plagued with prolonged and recurrent episodes of high inflation. 1/ It would therefore seem to follow that what is frequently referred to as currency substitution (CS) is a common and widespread phenomenon in Latin America. A vast empirical literature would appear to confirm this presumption. In fact, since the early 1980s numerous studies claim to have found evidence of the presence of currency substitution, or "dollarization," in several Latin American economies. 2/

A closer look at this literature, however, conveys the distinct impression that the studies are not necessarily referring to the same phenomenon. Some use the terms CS or dollarization to describe the occurrence of capital flight (Agénor and Khan (1992), Márquez (1987)), others to explain the dynamics of the parallel (black) market exchange rate (Canto (1985), Canto and Nickelsburg (1987)), and yet another group--a majority--to call attention to the widespread use of foreign money as a store of value, unit of account and/or medium of exchange within the domestic economy (Ramírez-Rojas (1985), Melvin (1988)). Moreover, a casual examination of the regional evidence raises questions about the generality and robustness of the relation between macroeconomic instability, high inflation and CS or dollarization. For example, Brazil and Chile experienced several episodes of high inflation in the 1970s and 1980s which did not seem to give rise to a significant process of CS. At the other end of the spectrum, Panama underwent a process of "full dollarization"--by adopting the U.S. dollar as legal tender shortly after its independence--as a result of a constitutional ruling that was not influenced by a history (or a prospect) of high inflation. In addition, it has recently been observed that a number of Latin American countries which succeeded in reducing high inflation seem to have experienced a resurgence, rather than a decline, in their degree of dollarization (Guidotti and Rodríguez (1992)).

1/ Eight of the eleven countries that experienced chronic high inflation between 1960 and 1990 were in Latin America (Easterly, et al. (1995)). The inflation experience of these economies is well documented and has been analyzed extensively; see, for instance, Bruno, et al. (1991), Bruno (1993), Calvo and Végh (1994), Dornbusch, et al. (1990), Dornbusch and Edwards (1991, 1995), Heymann and Leijonhufvud (1995) and Végh (1992).

2/ Some of the most representative studies of this literature are probably those of Ortiz (1983), Canto (1985), Ramírez-Rojas (1985), Beckerman (1987), Canto and Nickelsburg (1987), Fasano-Filho (1987), Márquez (1987), Melvin (1988), Agénor and Khan (1992), Clements and Schwartz (1992), Rojas-Suárez (1992) and Savastano (1992). For a complete list of references, see the recent surveys by Calvo and Végh (1992), Claassen and de la Cruz (1993) and Giovannini and Turtelboom (1994).

The variety of approaches to the phenomenon of dollarization and the apparent inconsistency of some of the empirical regularities observed in Latin America seem rather unwieldy. However, this paper will argue that most of the discrepancies tend to disappear when full account is taken of two related elements that typically give shape to a process of dollarization: (i) the dynamics of the flight from money; and (ii) the country's institutional framework.

Regarding the flight from money, there is by now abundant evidence showing that the demand for real domestic money balances is quite resilient to increases in the rate of inflation. Sudden outbursts of inflation do not generally lead to a massive flight from the domestic money, nor do protracted periods of high inflation erode at the same time or pace the three basic functions of the national currency. Instead, the flight from money in high inflation countries tends to be a gradual process, whereby the national currency loses in asynchronized sequence its usefulness as a store of value, unit of account and medium of exchange. The store-of-value function is typically the first one to go, but it usually takes a prolonged period of high inflation--or a hyperinflationary burst--before the domestic money starts losing its roles of unit of account and, especially, of medium of exchange (Calvo and Végh (1992), Heymann and Leijonhufvud (1995)). Nevertheless, it is also well established that once the flight from money has taken place--i.e., once the public has found means to economize on its holdings of domestic money--a reversal is difficult to bring about; in other words, the demand for real money balances in high inflation countries is likely to exhibit strong "hysteresis" or "ratchet" effects (Piterman (1988), Arrau, et al. (1993), Kamin and Ericsson (1993)).

Whether the flight from domestic money results in a rapid and sizable process of dollarization, however, will depend largely on the country's institutional framework. In general, the relative importance of foreign currency as an inflation hedge will be inversely related to the economy's level of financial development. An economy with a well-developed financial market is, in principle, capable of adapting rapidly to a high inflation environment by offering a rich set of fairly liquid, high-yield instruments denominated in domestic currency ("near monies") that preserve the real value of the public's portfolio. In contrast, a "financially repressed" economy undergoing high inflation generally offers domestic residents few options other than to seek protection in foreign-currency-denominated assets and instruments. Even in these circumstances, however, the process of dollarization is influenced by institutional factors, particularly those regulating the domestic holding and circulation of foreign money.

In fact, the pattern and manifestations of a process of dollarization in a country with strict foreign exchange and capital controls will generally be different from those of a country where residents are allowed to maintain foreign currency deposits (FCD) in domestic banks, or where the foreign currency has (quasi) legal tender status. In the former, the demand for foreign currency will have to be satisfied circumventing existing restrictions, and will be reflected

in the holding of foreign currency assets abroad (capital flight) and of foreign currency notes outside the banking system. This demand will typically put pressure on the (parallel market) exchange rate and on the country's international reserves, and, over time, will drain resources from the formal financial system. In contrast, a country that imposes lesser restrictions on the holding of foreign currency--for example, by allowing fully-convertible FCD--may preclude the shift of assets abroad, and even induce their repatriation, in exchange for a dollarization of the domestic financial system. Provided that the authorities internalize the policy constraints implied by the ready availability of foreign currency assets, this institutional arrangement may contribute to strengthening the country's external reserves position, ease pressures in the foreign exchange market and boost domestic financial intermediation (Dornbusch and Reynoso (1989), Savastano (1990)). The net effect of facilitating the domestic holding of foreign currency on the actual pattern and speed of dollarization, however, will hinge on the public's expectations regarding the overall stance of macroeconomic policies and, in particular, the sustainability of the foreign exchange regime.

Most of the literature on dollarization in Latin America tends to overlook, or at least downplay, the factors just discussed. For a variety of reasons, ranging from semantics to analytical convenience and measurement problems, the typical study focuses on certain (usually one) aspects of the process of dollarization. The relation between those aspects and the other possible manifestations of the phenomenon, however, are rarely made explicit or discussed. The role of FCD in the dollarization process of some Latin American countries is a case in point. A number of studies take the existence of these deposits as prima facie evidence of dollarization or currency substitution. While this generally is a reasonable assumption, it begs the question of why these deposits were allowed in the first place, and whether their presence made a difference for the behavior of other macroeconomic variables--especially the demand for domestic money. These are important questions. For instance, few would argue outright that the decision to allow FCD causes dollarization or that the relative size of FCD is a good indicator of the extent by which foreign currency is used for settling domestic transactions; nonetheless, these are precisely the type of implicit assumptions that are commonly made in empirical analyses and policy discussions of dollarization.

This paper examines the pattern of dollarization between 1970 and 1993 in five Latin American countries: Argentina, Bolivia, Mexico, Peru and Uruguay. The five countries experienced episodes of high inflation and allowed (intermittently) FCD in their domestic financial system during that period. However, the sample is not exhaustive on either account. There are other countries in the region that experienced chronic high inflation--e.g., Brazil, Chile--and/or that allowed FCD domestically--e.g., Chile, Dominican Republic, Paraguay--during those years; and there is also Panama. Furthermore, several other Latin American countries have shown symptoms of dollarization in the form of recurrent waves of capital flight and/or extensive parallel currency markets over the past two decades

II. One Period Model

The model is adapted from that in Alesina and Tabellini (1987). It consists of a representative firm and a worker, and two policy institutions: a central bank that chooses the level of inflation, and a fiscal authority that sets distortionary taxes and government spending. In this one period version of the model there is no debt. Section V will introduce debt explicitly. While debt may be issued in the short run, in the long run, adjustment must be made to either taxes, government spending or seigniorage to maintain a stable debt/GDP ratio.

Society's loss function or the loss function of a social planner is given by:

$$V_S = \frac{1}{2} [s_\pi \pi_t^2 + s_x (x_t - x^*)^2 + s_g (g_t - g^*)^2] \quad (1)$$

This loss function may be interpreted as reflecting the preferences of society or alternatively the average of the political parties. It is in contrast to the fiscal authority's loss function in equation (3) below. The social planner desires to have inflation (π) as close as possible to the target level of zero, and to minimize the deviations of output (x) and government spending (g) from their target levels x^* (full employment) and g^* respectively. Whether zero is the appropriate inflation target is beyond the scope of this paper, but see the discussion in Lipsey (1990). Using a target of π different from zero does not alter the general conclusion. The targets x^* and g^* are those desirable in the presence of nondistortionary taxes, where g^* is the desired level of spending on public goods. s_π , s_x and s_g denote the weights that the social planner places on the various objectives. 1/

The central bank has the following loss function, which it minimizes through its choice of inflation. 2/ The central bank cares about deviations of inflation from its target level and deviations of output from its target x^* , but not about the level of government spending. This loss function is generally the only one considered in the Barro-Gordon style analysis.

$$V_M = \frac{1}{2} [m_\pi \pi_t^2 + m_x (x_t - x^*)^2] \quad (2)$$

The parameter $\mu = m_x / m_\pi$ denotes the relative weight the central bank places on output compared to inflation. It is often interpreted in the

1/ In Debelle and Fischer (1994) s_g is set equal to zero. No conclusions are changed, however, some of the results below are more analytically tractable.

2/ The central bank actually controls the money stock, which is assumed to map directly into the inflation rate as shown below.

(Edwards (1989), Lessard and Williamson (1987)). The choice of the sample, therefore, is somewhat arbitrary, and is explained mainly by data and space considerations, and by the fact that the five countries selected have attracted most of the attention in the empirical literature on dollarization in Latin America.

The paper proceeds as follows. Section II identifies the stylized facts and common features of the dollarization process in the five countries. It presents and discusses evidence on the relative size of dollarization, on the allocation of the foreign currency holdings of domestic residents, and on several indicators of money velocity. A main theme of the section is stressing the role played by institutional factors and macroeconomic developments in shaping the actual pattern of dollarization in those countries. Section III reviews some of the main analytical, modelling and policy issues raised by dollarization. The discussion is selective, and focused on those aspects of the phenomenon that have figured most prominently in the Latin American context. 1/ The section provides a brief critical assessment of the empirical and policy literature on dollarization in the region, and identifies areas where further research seems warranted.

II. The Pattern of Dollarization: Stylized Facts

The five Latin American countries whose dollarization experience will be examined in this section either allowed or eased restrictions on the holding of foreign currency deposits (FCD) in their domestic banking system in the 1970s. In all cases the measure followed a period of external crises, and was either preceded or accompanied by a large exchange rate devaluation as well as by a tightening of financial policies aimed at restoring macroeconomic equilibrium. 2/ While the rationale for adopting this measure was not always stated clearly, it was generally expected that the creation of FCD would help stave off capital flight, strengthen international reserves, and boost domestic financial intermediation.

1/ For a more comprehensive and systematic discussion of the analytical issues raised by dollarization in developing countries see Calvo and Végh (1992) and Giovannini and Turtelboom (1994).

2/ Restrictions on the holding of FCD were eased (eliminated) in Argentina in the fourth quarter of 1978 (at the start of the "Tablita" episode); in Bolivia in October 1973 (nine months after a 68 percent devaluation ended a 16-year fixed exchange rate peg); in Mexico in March 1977 (following the 37 percent devaluation of September 1976); in Peru in the first quarter of 1978 (following a 3-month float that led to a 60 percent depreciation of the sol); and in Uruguay in October 1974 (when a 70 percent devaluation marked the start of a comprehensive liberalization program). For detailed analyses of these episodes, see Corbo and de Melo (1987), Edwards (1989), Ortiz (1983), Ramos (1986) and Savastano (1992).

In every country the institutional regulations affecting the convertibility, liquidity and rate of return of FCD underwent numerous changes through the years. On the basis of these changes, it is possible to classify the five countries into two broad groups. In the first, comprising Bolivia, Mexico and Peru, the authorities reimposed severe restrictions on the holding and convertibility of FCD at one point, but lifted these restrictions after some time. In contrast, in the second group, formed by Argentina and Uruguay, FCD remained essentially convertible since they were allowed and were never confiscated. Distinguishing these two groups at the outset brings to the fore the role of institutional factors, which are important for at least three reasons. First, they have implications for the empirical measure of dollarization. In fact, as noted before, when FCD are not allowed (or fully convertible) the public has to circumvent existing restrictions to satisfy its demand for foreign currency--by holding foreign currency notes or deposits abroad--which complicates the recording of dollarization. Second, the evolution of institutional regulations illustrate the fact that the authorities' policies and objectives in the areas of financial reform and capital account convertibility are rarely time invariant, and may not be time consistent. Indeed, the sequence of measures whereby FCD were first allowed, then practically banned, and subsequently reallocated in Bolivia, Mexico and Peru are typical examples of the incomplete and failed attempts at financial and capital account liberalization that were common in Latin America in the 1970s and 1980s. ^{1/} And third, institutional factors influence the expectations that the public needs to form about a broadly defined "confiscation risk," which in turn affect its decisions of where and how to maintain its holdings of foreign currency. As the ensuing discussion will show, all these elements played a crucial role in shaping the pattern of dollarization in the five countries under analysis.

1. Dollarization: How big is it?

Every empirical study on currency substitution or dollarization has to tackle the question of how to measure the phenomenon. This, in turn, requires dealing with two major issues: (i) defining precisely what is meant by dollarization; and (ii) finding data that corresponds closely to that definition. If dollarization is defined in a broad sense, that is

^{1/} FCD were declared inconvertible in Bolivia and Mexico in 1982 (in November and August, respectively) and in Peru in July 1985. In all cases the measure was accompanied by the reimposition of foreign exchange and capital controls that limited severely the issuance of new FCD, and by a large devaluation followed by a short-lived fixed exchange rate. Generally, the outstanding stock of FCD was forcedly converted into domestic currency at an exchange rate much lower than that prevailing in the parallel market. FCD were reallocated in Bolivia in September 1986, in Mexico in December 1985, and in Peru in September 1988. In the last two countries, however, a wide range of exchange and capital controls remained in place until much later, and FCD only regained full convertibility when those controls were abolished--in December 1987 in Mexico, and in August 1990 in Peru.

as a process whereby a foreign currency (i.e., the U.S. dollar) substitutes for most (all) of the functions performed by the national currency, then the ideal measure would have to take into account all foreign currency balances held by domestic residents. In principle these would include foreign currency notes, foreign currency deposits in the domestic banking system and foreign currency deposits held abroad, but exclude foreign-currency-denominated bonds and all other nonmonetary assets. ^{1/} Alternatively, if dollarization is defined narrowly as the process whereby the foreign currency displaces the domestic currency primarily in its role as a medium of exchange--arguably, a definition that seems more consistent with a wide range of theoretical models of currency substitution--then the ideal measure would probably have to exclude also all (most) interest-bearing deposits and assets in foreign currency (Calvo and Végh (1992)).

Regardless of the definition chosen, studies on the issue are bound to face severe data constraints. In fact, as is widely acknowledged, obtaining reliable estimates of the public's holdings of foreign currency maintained outside the domestic banking system presents a major challenge. For instance, while there are at least two sources of data on foreign currency deposits abroad by country of origin (the U.S. Treasury Bulletin and the International Financial Statistics of the IMF), the series reported differ in their country and time coverage, as well as in the type of deposits included. More importantly, the usefulness of those series depends on an accurate recording of the country of origin of depositors, a piece of information that is likely to be concealed--especially if the originating country has extensive exchange controls and/or high tax rates on interest income. ^{2/} Reliable estimates of the foreign currency notes circulating in any given country are even more difficult to obtain. The few systematic attempts at gauging this aggregate (notably, those of Melvin and Afcha (1989) for Bolivia, and Kamin and Ericsson (1993) for Argentina) rely either on very stringent assumptions or on data that are not generally available, and, thus, are not easily replicable for other countries. Reflecting these constraints,

^{1/} Analytically, the exclusion of bonds and other nonmonetary assets ensures focusing the attention on the degree of substitutability between "monies"--loosely defined here as those aggregates that provide "liquidity services". In practice, however, the distinction between, say, a time deposit in foreign currency and a short-term bond denominated in foreign currency may be quite tenuous, especially in a high inflation environment and/or in a context of high capital mobility. In fact, as will be noted in Section III, the difficulties for distinguishing empirically the substitutability between "monies" from a more general set of arbitrage conditions among financial assets of varying degrees of liquidity denominated in different currencies is a perennial source of confusion in the empirical literature on dollarization and CS.

^{2/} Partly because of these reasons, Lessard and Williamson (1987) consider that the series on foreigners' deposits by country of origin reported in the U.S. Treasury Bulletin provide only a lower bound estimate of capital flight from Latin America.

the norm in empirical studies has been to employ imperfect measures of dollarization that exclude either the foreign currency deposits held abroad, the foreign currency notes circulating domestically, or both. In this regard the present study is no exception, as the stylized facts presented are based on "broad" concepts of dollarization which nonetheless exclude domestic residents' holdings of foreign currency balances outside the (domestic and foreign) financial system. Departing from common practice, however, the discussion below aims at shedding some light on the shortcomings and biases of the "conventional" measures of dollarization, as well as on the inferences that may be drawn from them.

Figure 1 depicts the behavior by quarter of two common indicators of dollarization and of the rate of inflation in Bolivia, Mexico, Peru and Uruguay from 1970 to 1993, and in Argentina from end-1979 to 1993. The first indicator ($FCD/M3$, dark shaded areas) represents the FCD in the domestic banking system expressed as a share of the broad money supply--inclusive of FCD. The second indicator (F^*/M^* , light shaded areas) represents all foreign currency deposits held by domestic residents at home and abroad expressed as a share of their total monetary assets.^{1/2/} Both indicators are bounded between zero and unity and are measured in percentage terms on the left-hand axes. The quarterly rate

1/ Specifically, F^*/M^* is the ratio of the sum of FCD in domestic banks and foreign currency deposits abroad (FDA) to the sum of M2 and foreign currency deposits at home and abroad. All foreign currency deposits were converted into domestic currency using the official exchange rate.

2/ Except for foreign currency deposits abroad, all the series were obtained from documents and publications of the central banks of the respective countries. The IFS series on "cross-border bank deposits of nonbanks by residence of depositor" were used as the indicator of FDA from end-1981 onwards. For the earlier period (1970:1-1981:3) these series were spliced with those reported in Table CM-I-4 of the U.S. Treasury Bulletin--except for Bolivia, whose data are not included in the bulletin. An alternative series of FDA, based solely on the data reported in the U.S. Treasury Bulletin, was also used to construct F^* . Compared to the spliced series depicted in Figure 1, this alternative estimate of F^* was somewhat smaller in absolute terms, but otherwise displayed a remarkably similar behavior over the sample period in the four countries.

of inflation (solid line), a rough proxy of the opportunity cost of holding domestic money, is measured on a logarithmic scale on the right-hand axes. 1/

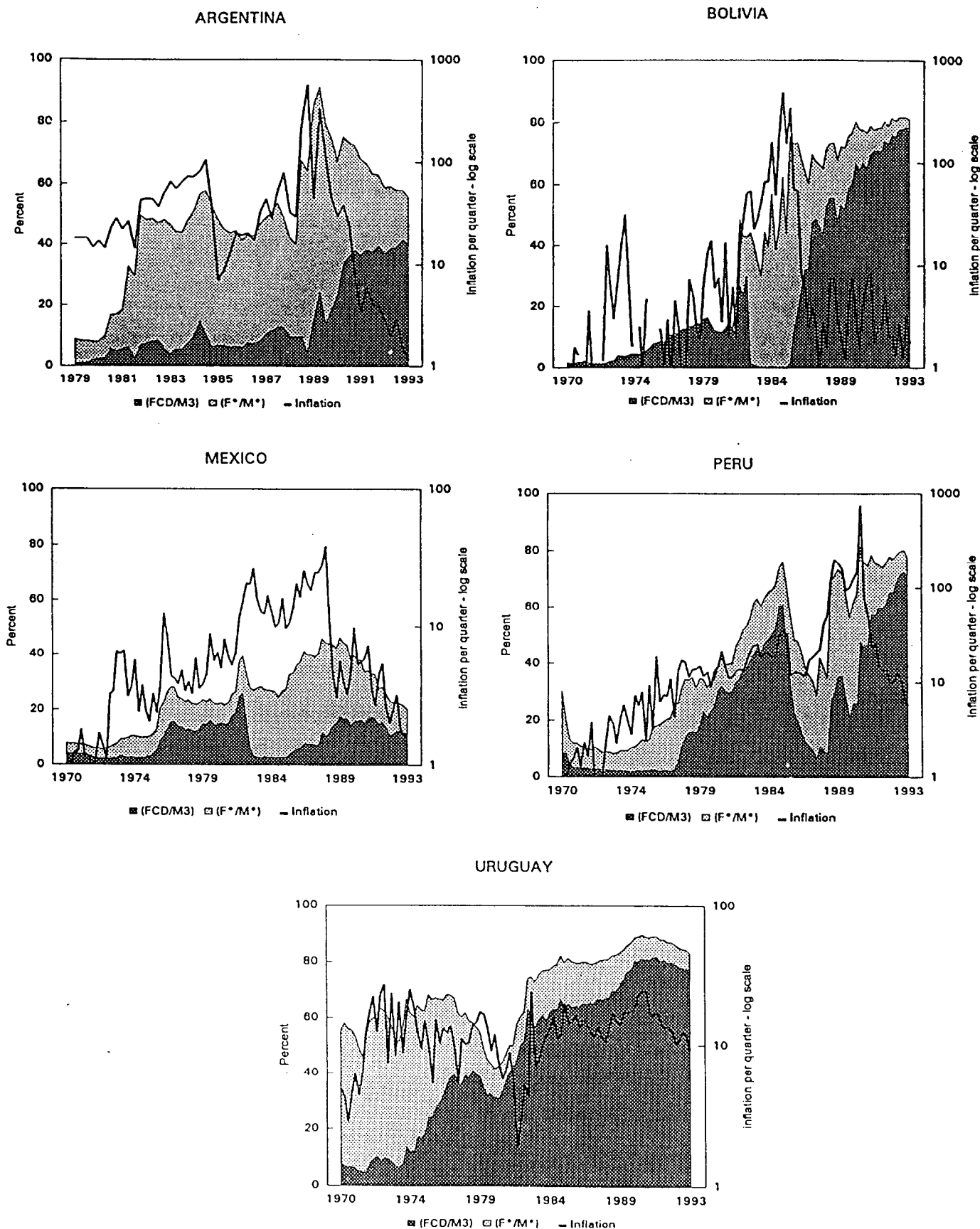
The figure shows that the degree of domestic dollarization implied by the ratio of FCD to M3 varied substantially across countries and fluctuated greatly over time. In spite of these variations, there are certain similarities in the pattern of dollarization depicted by this indicator. In the countries that suspended the convertibility of FCD (Bolivia, Mexico and Peru), three common features are particularly noticeable. First, from the time when restrictions on FCD were eased until they were reimposed the share of FCD in M3 grew steadily, albeit at different rates, alongside a gradual rise in domestic inflation. Thus, prior to the reimposition of controls this dollarization ratio had reached 26 percent in Mexico, 30 percent in Bolivia, and over 60 percent in Peru, whereas domestic inflation, in average annual terms, had increased from 30 to 60 percent in Mexico, from 30 to 130 percent in Bolivia, and from 40 to 160 percent in Peru. Second, in every country domestic inflation peaked at a time when FCD were not fully convertible; therefore, judging by this measure, the high-inflation outbursts experienced by these countries in the 1980s coincided with relatively low levels of domestic dollarization. And third, the restoration of FCD convertibility led to a rapid rise in dollarization in spite of the drastic fall in inflation that either accompanied (Bolivia) or followed shortly (Mexico and Peru) the lifting of controls. In Bolivia and Peru, for example, the dollarization indicator soon reached levels that exceeded those recorded during the rising inflation period; thus, by end-1993 the ratio FCD/M3 hovered around 70 percent in Peru and 80 percent in Bolivia, even though inflation had been brought down from extremely high levels to annual rates of 40 percent and 9 percent, respectively. 2/

In the other two countries (Argentina and Uruguay) the behavior of this dollarization measure over the past two decades was more dissimilar. In Uruguay, the share of FCD in M3 rose rapidly and quite steadily after 1974, while domestic inflation wandered around a "chronic" range

1/ The financial repression that prevailed in most of these economies until the late 1970s--and in some cases well into the 1980s--makes it very difficult to obtain (construct) long, consistent and reliable series on more elaborate and appropriate measures of the opportunity cost of holding domestic money (such as the interest rate differential between monetary and nonmonetary assets denominated in foreign and domestic currency). The lack of these data precludes a more precise assessment of the relative influence of assets' real rates of return on the pattern of dollarization in these countries during the sample period, and complicates even further the task of detecting the potentially different behavior of indicators corresponding to broad and narrow concepts of dollarization.

2/ In Mexico, however, this dollarization measure did not reach the levels of the early 1980s when dollar deposits were reallocated. After reaching a peak of 18 percent in mid-1991, the share of FCD in M3 fell and stabilized around the 11-12 percent range in 1992-93.

**Figure 1. Dollarization Ratios and Inflation
Quarterly 1970:1-1993:4 ^{1/}**



^{1/} Except Argentina (1979:4 - 1993:4).

(Rodríguez (1990)). The share declined slightly during the exchange-rate-based stabilization program initiated in October 1978, but shot up to 60 percent and resumed an upward trend after a large devaluation marked the end of that program in November 1982. By the end of 1993, when annual inflation fell below 55 percent for the first time in a decade, this dollarization ratio exceeded 75 percent. In Argentina, in contrast, the share of FCD in M3 during the 1980s was remarkably low despite a high--and often extreme--degree of price instability. Although the average annual rate of inflation exceeded 300 percent between 1979 and 1989, the share of FCD in broad money averaged 7 percent and never surpassed 15 percent. According to this measure, dollarization became relatively important in Argentina only after the comprehensive stabilization programs of December 1989 (the Bonex Plan) and March 1991 (the Convertibility Plan) brought inflation under control. ^{1/} In fact, from mid-1991 to 1993, as inflation fell from an annual rate of over 200 percent to single-digit levels, the ratio of FCD to M3 rose to, and hovered around, the 40 percent mark.

This casual inspection unveils several shortcomings of the ratio FCD/M3 as a measure of dollarization. First and foremost, the informational content of the ratio in any given country depends on the existing institutional framework as well as on the expectations of the public regarding the "confiscation risk". In general, the ratio will be more valuable as an indicator of the degree of domestic dollarization in situations where FCD are allowed with minimum restrictions, the public has confidence on the authorities' commitment to preserve the convertibility of these deposits, and it seems reasonable to assume a stable relationship between dollar deposits in the domestic banking system and the alternative outlets for holding foreign currency. From the above discussion, it is quite apparent that these conditions did not always hold in the countries under analysis. Second, the indicator is not suitable for making inferences about the behavior of the demand for domestic money underlying the process of dollarization. Many factors that influence the evolution of the indicator--for instance, changes in the allocation of foreign currency holdings of the public--are essentially unrelated to the fundamental determinants of the demand for domestic money balances; hence, any inference about the latter would need to take explicit account of developments in money velocity, rates of return on the various assets, and, more generally, the overall level of financial intermediation. And finally, the indicator does not account for the possibility that a

^{1/} For a detailed analysis of these stabilization episodes see Dornbusch (1995) and Kiguel and Liviatan (1995).

fraction of the deposits in foreign currency in the domestic banking system represents foreign currency holdings of nonresidents. 1/

By focusing on a broader set of foreign currency holdings of domestic residents, the second indicator (F^*/M^*) provides a partial remedy to some of these shortcomings. In fact, Figure 1 shows that the pattern of dollarization depicted by this indicator differs from that implied by the ratio of FCD to M3 in at least two important respects. First, in all countries the degree of dollarization recorded appears to have been consistently higher than that suggested by the share of FCD in broad money. The downward bias of the latter measure is particularly large in the case of Argentina, where the public, arguably perceiving a high confiscation risk, maintained the bulk of its foreign currency holdings outside the domestic banking system during the 1980s. And second, this dollarization indicator appears to be somewhat less sensitive to changes in the institutional framework. For instance, the figure shows that residents of these countries held a nonnegligible fraction of their total monetary assets in foreign currency even before FCD were allowed in their domestic banking system, and that they continued to do so in the periods where FCD were made inconvertible in Bolivia, Mexico and Peru. Moreover, unlike the first indicator, the F^*/M^* ratio appears to track relatively well the large swings in the rate of inflation. According to this measure, domestic dollarization rose during the high-inflation outbursts of the 1980s in Argentina, Bolivia and Peru, and either fell (Argentina, Mexico) or remained relatively stable (Bolivia, Peru) following the successful stabilization programs of the late 1980s and early 1990s. Specifically, the indicator shows that by end-1993 the degree of dollarization had fallen to 55 percent in Argentina and to 20 percent in Mexico--from peaks of 70 percent and 40 percent, respectively--and that in Bolivia, Peru and Uruguay it had stabilized around the 80-85 percent range.

2. Foreign currency holdings, capital flight, and international reserves

The allocation of the foreign currency holdings of domestic residents is a key element in the pattern of dollarization. The public's decision as to where and how to maintain its foreign currency not only affects the measure of domestic dollarization, but is likely to have important macroeconomic consequences. In general, that decision will be guided by risk and return considerations. Specifically, given a set of foreign exchange and capital controls, the public will try to allocate its desired foreign currency holdings according to its expectations about the

1/ However, with the probable exception of Uruguay--whose role as an offshore financial center for the region strengthened significantly in the 1980s--such an omission is unlikely to introduce an important bias to this measure of dollarization. The high degree of macroeconomic instability and financial repression exhibited by these countries until the late 1980s not only did not attract inflows of foreign capital, but fueled recurrent waves of capital outflows (Lessard and Williamson (1987)).

differences in the risk-adjusted rates of return of three broad assets (FCD in domestic banks, foreign currency notes and foreign currency deposits abroad), which typically will be perceived as less-than-perfect substitutes.

The resulting allocation will influence developments in the domestic money and foreign exchange markets. In particular, it can be shown in a simple open-economy portfolio framework that the short-run pressures on international reserves, interest rates and the (parallel market) exchange rate will tend to be lower, the larger the fraction of the foreign currency portfolio allocated to FCD. ^{1/} Thus, the actual allocation of foreign currency holdings of the public in any given episode will generally provide useful information on the relative effectiveness of dollar deposits for staving-off capital flight and strengthening the country's external assets position.

Figure 2 presents evidence on these aspects of the process of dollarization. The first column (Panel A) depicts, for each country, the ratio of FCD held in domestic banks to the total deposits in foreign currency held at home and abroad (solid line, left axis--in percent) and the parallel market premium (dotted line, right axis--logarithmic scale) between 1970 and 1993. ^{2/3/} The second column (Panel B) plots the evolution in nominal U.S. dollars of FCD in domestic banks, foreign currency deposits abroad (FDA) and gross international reserves of the central bank over the same period.

Overall, the evidence reported seems to suggest that domestic residents did allocate their foreign currency holdings guided by risk and return considerations, and that such allocation had important effects on the international reserves of the central bank. In fact, Panel A shows that the ratio of FCD to total deposits in foreign currency (FCD/F^*) was inversely related to the parallel market premium in all countries. Periods of high parallel market premia, normally a symptom of extensive exchange and capital controls, broadly correspond to periods where residents held most of their foreign currency deposits outside the domestic banking system. Underscoring the importance of the public's expectations of a confiscation risk, this pattern is observed not only in periods where FCD were not allowed, but also in those intervals where dollar deposits co-existed with several other exchange restrictions (e.g., Argentina in the 1980s, Mexico

^{1/} See Savastano (1990). In a related model, Rodríguez (1993) also calls attention to the direct relationship between the share of foreign currency holdings maintained in domestic banks and the stock of international reserves.

^{2/} Except for Argentina and Bolivia, where the period covered begins in the fourth quarter of 1979 and 1981, respectively.

^{3/} The parallel market premium is equal to the ratio of the parallel market exchange rate to the official exchange rate, minus unity, and is expressed in percentage terms. The data on parallel market rates were obtained, primarily, from central bank documents and from the World Currency Yearbook (various issues).

