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Exchange Rate Regimes and Financial Dollarization: Does Flexibility Reduce Bank Currency Mismatches?

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Exchange Rate Regimes and Financial Dollarization: Does Flexibility Reduce Bank Currency Mismatches?

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Abstract

The dollarization of bank deposits and credit is widespread in developing countries, resulting in varying degrees of currency mismatches in domestic financial intermediation, which in turn may accentuate balance sheet problems and thus financial fragility. It is widely argued that flexible exchange rate regimes encourage banks to match dollar-denominated liabilities with a corresponding amount of dollar-denominated assets, ameliorating currency mismatches. Does the behavior of dollar deposits and credit in financially dollarized economies support that presumption? A new database on deposit and credit dollarization in developing and transition countries is assembled and used to address this question. Empirical results suggest that, if anything, floating regimes seem to exacerbate, rather than ameliorate, currency mismatches in domestic financial intermediation, as those regimes seem to encourage deposit dollarization more strongly than they encourage matching via credit dollarization.

Keywords: Exchange rate regimes, dollarization, currency mismatches.
JEL Classification Number: F33, G21

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1 Introduction

Partial dollarization, defined as the holding by residents of a significant share of their assets and liabilities in the form of foreign-currency-denominated instruments, is prevalent in many developing and transition economies.[1] This phenomenon, which has historically been a response to economic turmoil and high inflation, has persisted – even increased – in various parts of the developing world during the last decade, despite growing price stability. Financial intermediation in particular has become heavily dollarized in many countries. This process of financial dollarization has been reflected in varying patterns of dollarization of bank deposits and loans, which in turn have influenced the extent of currency mismatches in financial intermediation.

In general, the currency mismatches of banks and firms, and the resulting foreign currency exposure, are seen as a source of financial fragility. One of the debates about the causes of those mismatches relates to the exchange rate regime. There are two views on the links between regimes and mismatches – in particular, on the question of whether greater flexibility encourages hedging. The majority view (e.g. Burnside, Eichenbaum, and Rebelo 1999, Mishkin 1996, Obstfeld 1998) would appear to be that fixed exchange rates encourage currency mismatches because banks and firms do not hedge their dollar liabilities: they overlook the need to limit their open foreign currency positions, since they believe themselves to be immune to exchange rate fluctuations given the commitment from the authorities to defend the peg.[2] Therefore, the argument goes, floating exchange rates would encourage banks and firms to match dollar liabilities with a corresponding quantity of dollar assets, as they seek to limit their exposure to

[1] Following the usual vocabulary, this paper employs the terms "dollar" when referring to any foreign currency and "peso" when referring to any domestic currency. Also, the term "dollarization" in this paper does not refer to the adoption of a foreign currency as legal tender ("full dollarization").

[2] It would also appear that this is the conventional wisdom among international organizations when explaining the Asian crisis. For instance, the *68th Annual Report* of the BIS (1998, p. 124) states that "long-standing policies of fixed or quasi-fixed exchange rates probably nurtured a misperception of exchange rate risk. With a flexible exchange rate, and frequent movements in both directions, firms and households learn from their daily experience to take account of exchange risk." Furthermore, in an IMF volume, Johnston, Darbar, and Echeverría (1999, p. 290)

exchange risk. An exchange rate that fluctuates more freely would constantly remind banks and firms of the importance of limiting their unhedged dollar liabilities.

On the other hand, there is a notable minority view (e.g. Eichengreen and Hausmann 1999, McKinnon 2001), which argues that greater flexibility increases the cost of hedging and therefore may not lead to lower currency mismatches. This view emphasizes that the cost of insurance against exchange risk goes up with exchange rate volatility. Insofar as floating regimes lead to greater volatility, therefore, they may raise the cost of insurance and result in less hedging, rather than more.

In the context of dollarized banking systems, this debate centers more prominently on the currency composition of deposits and credits. An implication of the majority view would be that floating regimes would encourage banks to match dollar deposits with dollar loans. Note, however, that greater exchange rate flexibility also enhances the attractiveness of dollar deposits as households seek to insure themselves against currency risk. Whether banks can and will respond to this further increase in dollar deposits by further increasing dollar loans is an open question. Substituting foreign-currency-denominated loans for domestic-currency-denominated loans trades one source of risk (default risk, reflecting the fact that sudden depreciations leave some firms unable to repay) for another (currency risk). As the minority view would put it, the cost of dollar credit as insurance against currency risk is greater default risk. Banks may have good reasons to regard it as undesirable to move too far to one or the other extreme of this tradeoff. Flexible exchange rates thus may encourage deposit dollarization more strongly than they encourage credit dollarization. Currency mismatches may therefore be greater, not lower, under floating regimes. For all these reasons, the overall effect of greater exchange rate flexibility on credit and deposit dollarization, and thus on currency mismatches in financial intermediation, is an empirical question.

In most developing economies, credits and deposits account for a significant portion of total bank assets and liabilities. Therefore, currency mismatches in financial intermediation may greatly shape the overall foreign currency exposure of dollarized

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state that unhedged borrowing emerged out of "expectations that relatively stable exchange rates would be maintained indefinitely."

banking systems. However, despite the obvious relevance of the topic, there has been little theoretical work and exactly zero systematic empirical work on the determinants of the currency composition of bank assets and liabilities in dollarized countries. Most of the partial dollarization literature has focused on the dollarization of currency transactions (currency substitution) rather than the dollarization of financial intermediation.[3] In particular, while the dollarization of deposits has been extensively studied in the context of currency substitution, the dollarization of bank loan portfolios has received scant theoretical attention and no systematic empirical analysis, even though deposit and credit dollarization are the two sides of the same (dollar) coin. Moreover, there does not appear to be a single systematic empirical study, as far as I am aware, on the links between the exchange rate and bank currency mismatches in dollarized economies or elsewhere in the developing world. This paper attempts to contribute toward filling these gaps.

To analyze the effects of exchange rate flexibility on financial dollarization and currency mismatches in financial intermediation, I assemble a new database on dollarization. Its first component is data on dollar-denominated bank credit and deposits in a large number of developing and transition economies for the past two decades. Its second component is information on bank regulations in the same sample of dollarized countries. Using these data, I study the impact of the exchange rate regime on credit dollarization, deposit dollarization, and currency mismatches, explicitly controlling for the institutional and regulatory framework. I use alternative variable definitions, different estimation procedures, a battery of sensitivity tests, and deal with potential endogeneity.

I find little support for the view that flexible exchange rate regimes reduce currency mismatches in domestic financial intermediation. If anything, the opposite seems to be true. Deposit dollarization is significantly greater under floating regimes, while credit dollarization does not appear to differ significantly across regimes. Since exchange rate flexibility encourages deposit dollarization much more strongly than it encourages credit dollarization, floating exchange rates result in greater deposit-credit

[3] For surveys on the extensive currency substitution literature, see Calvo and Végh (1996) and Giovannini and Turtelboom (1994).

mismatches. These results hold across different variable definitions, estimation methods, and robustness checks.[4]

Insofar as currency mismatches in financial intermediation can significantly shape the overall foreign currency exposure of banking systems in dollarized economies, these results, if correct, are a blow to the widely believed presumption that floating regimes alleviate such exposures. And if overall currency mismatches indeed undermine financial stability – as most economist believe – then these results suggest that exchange rate flexibility may not necessarily enhance safe and sound financial systems in developing countries, which would have important implications for exchange rate policy.

The remainder of this paper is organized as follows. Section 2 outlines the theoretical links between exchange rate flexibility and financial dollarization (based on a simple portfolio model presented in Appendix A), as well as the main methodological issues to address in analyzing such links. Section 3 introduces the new dollarization database and other data used. Section 4 presents empirical evidence on the impact of exchange rate regimes on dollarization and currency mismatches in financial intermediation. Section 5 discusses the implications of the results as well as some caveats. Section 6 concludes.

2 Conceptual and Empirical Considerations

2.1 A Simple Conceptual Framework

How does greater exchange rate flexibility affect credit and deposit dollarization? From a theoretical point of view, the answer can be ambiguous, due to potentially offsetting

[4] Before proceeding, an important caveat is in order. This paper focuses on the effects of exchange rate regimes on currency mismatch in domestic financial intermediation. A complete assessment of the impact of regimes on *overall* bank currency mismatches is not the main focus of this paper, as it would require additional data on hedging in insurance markets against currency risk and on the currency denomination of other components of bank balance sheets. These data are unfortunately scarce. I do touch on those issues, but in a more limited way, as detailed below. I elaborate on this and other caveats below.

effects of exchange risk and default risk. Appendix A presents a simple model of two-currency banking under exchange rate and default uncertainty.[5] The model incorporates two main assumptions. First, it assumes that ex ante lending and deposit rates do not fully reflect depreciation and default shocks, so that ex post returns may be affected by those shocks. For example, a depreciation shock may occur between the time of peso loan disbursement and the time of loan repayment and may therefore reduce the ex post return (in dollar terms) on the peso-denominated loan. Second, it assumes that agents are risk averse, which is crucial for analyzing the impact of uncertainty on deposit and credit dollarization. With these two assumptions, it is straightforward to assess the impact of the volatility of depreciation and default shocks on dollarization. To keep the analysis as simple as possible, the model further assumes that loans and deposits are purely supply-determined. Even under these strong assumptions, it turns out that exchange rate uncertainty and default risk create ambiguity about the overall impact of exchange rate flexibility on dollarization.

In the model, the bank determines its optimal amounts of peso and dollar loans taking into account depreciation risk (which affects the ex-post rate of return in peso loans) and dollar loan default risk (which affects the ex-post rate of return of dollar loans).[6] A higher variance of depreciation unambiguously reduces the issue of peso loans, which become riskier and therefore less attractive. However, more volatile depreciation has two offsetting effects on the supply of dollar loans: a positive effect based on expected returns, and a negative effect based on risk. Depreciation shocks increase the relative ex post return of dollar assets, but the volatility of such shocks increases uncertainty, which the risk-averse bank dislikes. In particular, the higher the existing levels of dollar lending, the stronger the negative risk effect.

The damaging effects of sharp depreciations on firms' ability to repay dollar loans during recent developing-country crises suggest that dollar loan default is a function of exchange rate depreciation. Extended to include this source of endogenous dollar loan default, the model suggests additional effects of exchange rate volatility on

[5] The portfolio approach to banking was pioneered by Pyle (1971), and Hart and Jaffee (1974). Ize and Levy-Yeyati (1998) use a related framework to analyze financial dollarization.
[6] For simplicity, peso loan default is not considered.

lending. In general, the negative, offsetting effect of volatility on dollar lending is unambiguously stronger than in the exogenous loan default case. As a result, the increase of loan dollarization due to greater exchange rate volatility is unambiguously lower.[7] Again, the intuition is simple: depreciation shocks create an incentive for the bank to dollarize its loan portfolio; however, insofar as such shocks also increase dollar loan default risk, they also create an additional incentive for the bank to reduce the supply of dollar loans.

A similar framework can be used to tackle the depositor's problem. The representative depositor faces two sources of uncertainty: depreciation risk and deposit loss risk. Depreciation risk affects the ex post return on peso deposits. Deposit loss risk, based on the inability of the bank to repay deposits in the presence of insolvency problems (which are themselves a function of dollar loan default), affects the return of both peso and dollar deposits. This risk may be greater for dollar deposits, however, because they are also subject to forced convertibility and confiscation risk in periods of bank distress.[8] I normalize peso deposit loss risk to zero, and only consider the dollar-to-peso deposit loss risk differential, which affects the return to dollar deposits.

As in the bank's case, more volatile depreciation implies an unambiguously negative effect on peso deposits and two offsetting effects (one based on expected returns, one based on risk) on dollar deposits. However, with endogenous loan default, the potential increase in deposit dollarization due to greater exchange rate volatility is unambiguously lower.[9]

The overall implications are the following:

- Greater exchange rate flexibility may increase credit dollarization, but offsetting effects are present. In particular, the more sensitive dollar loan non-performance is to depreciation, the weaker is the positive impact of exchange rate volatility on dollar lending.

[7] The precise effect depends upon the elasticity of dollar loan default to the rate of depreciation.
[8] This type of risk is illustrated by the experience of several Latin American countries during the 1980s, when dollar deposits were either frozen or converted into pesos at a highly depreciated exchange rate. Argentina's 2001-2002 *corralito* is a reminder that restrictions on deposits can also occur nowadays.
[9] Again, the precise effect depends upon the elasticity of perceived dollar deposit loss risk to bank solvency problems, as well as the elasticity of dollar loan default to depreciation.

- Greater exchange rate flexibility may also increase deposit dollarization. Deposit loss risk weakens this effect if such risk is perceived to be greater for dollar deposits.
- The overall impact of exchange rate flexibility on mismatches is ambiguous a priori. An increase in mismatches is more likely the larger the elasticity of dollar loan non-performance to depreciation and the lower the perceived dollar deposit loss risk.

2.2 Empirical and Methodological Issues

Understanding the links between exchange rate flexibility and currency mismatches in financial intermediation is ultimately an empirical issue. As mentioned above, a potential implication of the majority view is that floating rate regimes reduce those mismatches. Testing such implication is equivalent to testing whether, compared to more rigid regimes, floating regimes lead to higher credit dollarization vis-à-vis deposit dollarization, thus reducing currency mismatches in financial intermediation. The ultimate goal of this paper is thus to estimate the following relationship:

$$Dollarization_{it} = \beta' Exchange\,Rate_{it} + \gamma' Controls_{it} + \varepsilon_{it} \quad (1)$$

Dollarization stands for a measure of either credit or deposit dollarization, or for the corresponding deposit-credit mismatch. *Exchange Rate* stands for a set of variables related to the exchange rate regime. The term *Controls* represents a vector of other explanatory variables affecting dollarization (to be detailed later). Finally, ε is a disturbance term.

There are three main methodological issues to consider in attempting to estimate this relationship: a) inconsistency between the *de jure* and *de facto* nature of exchange rate regimes and cross-regime contamination; b) the persistence of dollarization; and c) endogeneity.

Differences between *de jure* and *de facto* regimes clearly matter: for instance, countries where authorities claim to have a flexible regime but actively limit exchange rate fluctuations may exhibit different patterns of dollarization and mismatch from those where authorities act consistently with the reported regime. In addition, the periods

around regime changes deserve careful attention. If residents expect the collapse of a peg and a large devaluation, they may reduce their holding of peso assets. More importantly, the collapse of the peg may generate a burst of dollarization (particularly deposit dollarization), which can be mistakenly regarded as being caused by the subsequent flexible regimes. This problem of regime change "contamination" needs to be accounted for.

On the other hand, financial dollarization appears to be persistent. Countries that suffered high inflation in the past may still have high levels of dollarization, despite years of inflation stability. This is the case for several Latin American countries.[10] Hysteresis may therefore have an important role in explaining dollarization, which may greatly transcend regime changes.

A final methodological issue is the problem of endogeneity. The presence of dollar-denominated assets in financial intermediation increases the substitutability of assets and makes the exchange rate more sensitive to portfolio reallocations. Thus, dollarization can result in a more volatile exchange rate and increase the need for a flexible regime. On the other hand, the exchange rate regime is a policy decision, partly based on the level of financial dollarization. Therefore, the direction of causality may run in the opposite direction: for example, countries with high dollarization and/or high mismatches may choose to fix their exchange rate.[11]

3 Data

3.1 Dollarization Data

The unbalanced panel data set assembled for purposes of this paper consists of monthly observations, mainly from the early 1990s to the first months of 2000. Data on the aggregate volume of deposit money banks' foreign-currency-denominated deposits of

[10] For example, dollarization in Argentina, which greatly accelerated during periods of high inflation in the late 1980s and early 1990s, remained high throughout the late 1990s, despite very low inflation during that period.

residents are available for 92 developing and transition economies. Data on the aggregate volume of deposit money banks' foreign-currency-denominated credit to the resident private sector are available for 40 developing and transition economies, almost all of which also have dollar deposits data. This sample of countries covers all regions of the world. The time span varies across countries, with some having data from as early as 1975 and some having data only from about 1995 onwards.[12] The main sources are data used by the IMF in constructing its *International Financial Statistics*, as well as printed Central Bank bulletins from the monetary authorities of several countries. Appendix B presents more detailed information on country sample, data definitions, availability, and sources. These data allow for the construction of currency mismatch measures for 37 countries.

I define dollarization in two ways. The first definition emphasizes the *behavior* of credit and deposit dollarization by scaling dollar credit and deposits by total credit and deposits, respectively. The second definition provides a sense of the *magnitude* of credit and deposit dollarization by scaling dollar credit and deposits by total assets and liabilities, respectively. The first definition focuses on portfolio allocation decisions, while the second focuses on the relative importance of the financial dollarization process.[13] Given these considerations, the dollarization ratios constructed are:

- Credit dollarization ratio. This is measured as: a) the ratio of dollar credit to the private sector over total credit to the private sector; or as b) the ratio of dollar credit to the private sector over total assets.
- Deposit dollarization ratio. This is measured as: a) the ratio of dollar deposits over total deposits; or as b) the ratio of dollar deposits over total liabilities.
- Deposit-credit mismatch ratio. This is measured as the difference between dollar deposits and dollar credit divided by total bank liabilities.

Some data limitations should be noted. While bank credit to the private sector represents the bulk of total bank credit for most countries, in a few transition economies

[11] Poirson (2001) reports that countries with higher deposit dollarization are more likely to adopt a fixed exchange rate regime.

[12] Frequent changes in the format of primary sources are a major reason for the diverse time coverage.

credit to the public sector is considerable. More importantly, although private credit and deposits represent the bulk of domestic assets and liabilities, as well as an important component of total assets and liabilities, the analysis would greatly benefit from the inclusion of data on other components of bank balance sheets.[14] Finally, data on domestic- and foreign-currency lending and deposit interest rates are important in assessing the role of interest rate differentials for financial dollarization, but they are unfortunately scarce.[15]

While the dollarization data are available at a monthly frequency, several explanatory variables are not (e.g. World Bank macroeconomic data, regulatory data, or exchange rate regimes, detailed below). I therefore convert the dollarization data to annual frequency in the empirical analysis below. As a result, the annualized data end in 1999.[16]

3.2 Regulatory Arrangements Data

Analyzing the determinants of dollarization requires controlling for the institutional and regulatory arrangements under which banking takes place. For instance, several dollarized economies temporarily restricted dollar deposits and/or credit heavily.[17]

[13] As it is shown below, it turns out that the use of both definitions of dollarization yields very similar results.

[14] In particular, it would be useful to have data on foreign assets and liabilities in dollars, as banks could have open dollar positions with non-residents to finance dollar lending to domestic firms. In any event, the focus of this paper on dollarization and mismatches in domestic financial intermediation ameliorates these limitations.

[15] I have been able to assemble information on these variables for a more limited sample of countries. There are data on the dollarization of credit to the public and other sectors for up to 29 countries, data on the dollarization of banks' foreign assets and liabilities for 22 countries, and data on the dollarization of banks' total assets and liabilities for 7 countries. In addition, there are data for deposit and lending interest rates in pesos and dollars for 15 countries. All of these data have different degrees of country coverage. Unless stated otherwise, these additional data are not usually employed in the empirical analysis below, given that they do not cover a large enough number of countries.

[16] Finally, there are a few instances in which values for dollar credit or deposits are equal to zero, principally when the data come from electronic sources. Unfortunately, it is not clear whether this means that the actual value was zero (e.g. values for dollar credit were zero because dollar credit was prohibited) or whether the data were missing. Therefore, I only work with strictly positive values of the relevant variables, and set any zero value to missing.

[17] Bolivia, Mexico, and Peru during the 1980s are the best-known examples.

Insofar as those restrictions were usually accompanied by pegged rates, one could mistakenly attribute a low level of dollarization to the fixed regime. Similarly, regulations may freely allow dollar deposits but restrict dollar credit, thus creating a mismatch that has little to do with banks' optimizing behavior. Moreover, some countries restrict dollar deposits or credit to some sectors (e.g. residents that earn foreign exchange from abroad), thus affecting the pattern of financial dollarization above and beyond the true impact of the exchange rate regime.[18] And the fact that the regulatory framework can be time-varying renders econometric techniques such as fixed effects unable to fully control for it.

To my knowledge, there is no source of comprehensive regulatory information on financial dollarization to date. The most comprehensive database on bank regulation and supervision currently available, compiled by Barth, Caprio, and Levine (2001), says nothing about dollarization or currency mismatch regulations. To overcome these data limitations, I gathered qualitative information on the regulatory arrangements of dollarization from various issues of the IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* and other IMF publications. The information collected allows for the construction of two binary indicators:

- Whether a country allows residents' dollar deposit accounts freely or with minor conditions, as opposed to severely restricting them, limiting them to certain residents (e.g. individuals or firms that earn foreign exchange), or prohibiting them.
- Whether a country allows dollar lending freely or with minor conditions, as opposed to severely restricting them, limiting them to certain residents (e.g. individuals or firms that earn foreign exchange), or prohibiting them.

3.3 Exchange Rate Regime Data

I employ the standard exchange rate regime classification widely used in the empirical literature and based on the regime reported by monetary authorities to the IMF and

[18] Most previous research on partial dollarization fails to control for the regulatory environment.

published in the IMF *Annual Report on Exchange Arrangements and Exchange Restrictions*. In general, this classification distinguishes regimes as fixed (single pegs or basket pegs), intermediate (limited flexibility, cooperative arrangements, crawling pegs or bands, or managed floats following a predetermined set of indicators), and floating (managed floats with no pre-announced path for the exchange rate or independent floats). However, the regime that countries claim to operate may be different from the regime actually followed: many self-described floaters continuously try to minimize exchange rate volatility, and some pegged regimes frequently readjust their parity. To address these inconsistencies, I revised and corrected this classification to account for coding errors, and I reconciled this *de jure* information with a new *de facto* IMF classification (available only from 1999 onwards) that distinguishes between managed floats and *de facto* pegs under managed floating.[19] These data are available at an annual frequency.[20]

To assess the robustness of the results to the exchange rate regime classification used, I also estimate (but do not report) the regressions below using the annual regime data constructed by Levy-Yeyati and Sturzenegger (LYS 2000) as an alternative classification. The LYS classification is based on cluster analysis and takes into account actual exchange rate volatility, the volatility of exchange rate changes, and the volatility of reserves.[21] I indicate below whether the results are sensitive to the regime classification used.[22]

Other explanatory variables come from standard sources, such as the *International Financial Statistics* of the IMF and the *World Development Indicators* of the World Bank. Such variables include inflation, nominal exchange rates, trade openness, interest rates, terms of trade, land area, etc., as detailed below.

Savastano (1992, 1996) is a notable exception.

[19] I thank Virgilio Sandoval for kindly providing the new *de facto* IMF regime data.

[20] To further correct errors with the *de jure* IMF data and make it as close to actual exchange rate behavior as possible, I also reviewed data on frequent and infrequent parity adjusters, first used in Ghosh et al. (1997), available until 1996. I thank Holger Wolf for kindly providing these data.

[21] Note, however, that LYS do not use interest rate data in their analysis, which represents a major limitation, as interest rates can be extensively used to fix and defend the exchange rate. In addition, they classify countries as fixers if they exhibit low exchange rate variability but high reserve volatility, but they do not account for the presence of capital controls, which may minimize the need of using reserves to manage the peg. Finally, this classification is available for significantly fewer observations in my sample.

[22] All unreported results mentioned below are available upon request.

4 Empirical Analysis

4.1 Graphical Analysis

Appendix C displays the dollarization series for a subset of countries in the sample that have data on both dollar credit and deposits.[23] It can be seen that some countries have very low (but not zero) credit dollarization (e.g. Turkmenistan, Sao Tome and Principe) or deposit dollarization (e.g. Colombia).[24] Some countries have a large share of credit denominated in dollars but, since credit is a small part of total assets, a low ratio of dollar credit to total bank assets (e.g. Albania).[25] In addition, temporary restrictions in the use of dollar instruments for financial intermediation (e.g. Peru in 1985-1990) have had a major but temporary impact on dollarization.

Event-study analysis yields more concrete patterns. Figure 1 compares the average values of the dollarization series around the time of floating rate regime adoptions with the average values of the series for countries under fixed or intermediate regimes that never adopted flexibility. The top part uses the series scaled by total credit/deposits, while the bottom part uses the series scaled by total assets/liabilities.

[23] Each figure in Appendix C consists of two parts. The top part shows the series scaled by total credit and deposits, while the bottom part shows the series scaled by total assets and liabilities. Credit dollarization is denoted by circles and deposit dollarization is denoted by a continuous line. All values are percentages. Figure C1 shows the dollarization patterns for non-floating countries (countries under fixed or intermediate regimes for the whole period for which they have data for both dollar credit and deposits); Figure C2 shows the series for floating countries; and Figure C3 shows the series for countries that experienced both non-floating and floating regimes at one point or another in the sample period. Monthly data are used, and sample periods and scales vary by panel.

[24] Those cases may affect the empirical analysis. For instance, Sao Tome and Principe has a very large mismatch and, since it has a floating regime, would impact the result in the direction of associating floating with mismatch. To assess the robustness of the results, I also estimate the regressions excluding these unusual cases below. It turns out that the results are insensitive to this issue.

[25] As sensitivity analysis (discussed below), I also estimated the regressions excluding those countries and including (when data are available) credit to other sectors in the credit dollarization definition for some transition economies where credit to the public sector in dollars was a large share of bank total assets (e.g. Turkmenistan). The results below are robust to these cases.

The panels show the pattern of deposit and credit dollarization and mismatches two years before and after floating regime adoptions (that is, changes from either fixed to floating or from intermediate to floating regimes).[26] Time is measured in the horizontal axis (from –2 to +2 years around regime changes). In each panel, the vertical line is the time of the regime change, and the horizontal line is the average value of the relevant dollarization series for the non-floating observations. The average values of the dollarization series during regime changes are surrounded by two-standard-error bands. Annualized data are used.

Deposit dollarization significantly increases after the adoption of a flexible regime. Credit dollarization also goes up, but not significantly. As a result, the deposit-credit mismatch rises significantly as well. This is the first evidence that floating regimes do not yield greater credit dollarization vis-à-vis deposit dollarization. Currency mismatches in financial intermediation seem to go up, not down, in other words, during the first years after the adoption of floating regimes.[27]

4.2 Descriptive Statistics and Comparison of Means

The previous event-study analysis focused on the periods around regime changes. As it is shown below, comparing the means of the relevant variables across regimes during "tranquil" periods (periods where no regime changes occurred) yields a similar message: floating regimes seem to be associated with greater deposit dollarization and larger mismatches. In order to focus on tranquil periods, I henceforth use a two-sided, one-year exclusion window around regime changes that led to the adoption of a floating regime. This exclusion window helps avoid potential regime contamination:

[26] I do not consider the case of changes from flexible to non-flexible regimes, as those events were rare in my sample period, and because they are not relevant for the purpose of testing the impact of floating regimes adoptions on dollarization.

[27] I also use the LYS classification in an analogous event study (not reported). The patterns appear to be different. Compared to the average value in the non-floating observations, deposit dollarization is higher before a regime change, and continues to be higher after such change. However, credit dollarization is not significantly different from its non-floating average before or after the adoption of a floating regime, nor is the degree of currency mismatch. Although one cannot say that the mismatch increases after the adoption of a LYS floating regime, one can safely state that they do not decline, contrary to the implications of the majority view.

dollarization may increase before and principally after the collapse of a peg, and such an increase may be misleadingly attributed to the subsequent floating regime.

Table 1 reports descriptive statistics of deposit and credit dollarization and currency mismatches across regimes. Clearly, dollarization and mismatches are significantly higher under floating than under fixed regimes. Under flexible regimes, credit dollarization is about twice as much as under fixed regimes, while deposit dollarization is nearly three times as much. Mismatches, which are virtually equal to zero under fixed regimes, are about 6 per cent of total liabilities under floating regimes. These patterns hold regardless of the denominators used to scale dollar credit and deposits.[28]

Similar information is conveyed in Table 2. This table reports a basic version of equation (1), in the form of the pooled OLS regression:

$$Dollarization_{it} = \beta_0 + \beta_1 Intermediate_{it} + \beta_2 Floating_{it} + \varepsilon_{it} \quad (2)$$

where *Dollarization*, *Intermediate*, and *Floating* are self-explanatory. Here, β_0 is the mean of the relevant dollarization ratio under fixed regimes (the reference group), while $\beta_0 + \beta_1$ and $\beta_0 + \beta_2$ are the means under intermediate and flexible regimes, respectively. The coefficient of interest is β_2.[29]

Both credit and deposit dollarization are significantly higher in floating regimes, in both the economic and statistical senses. When scaling by total credit and deposits, credit dollarization is 15 per cent higher under floating regimes than under fixed exchange rates (t-statistic: 4.3), and deposit dollarization is 25 per cent higher (t-statistic: 14.5). When scaling by total assets and liabilities, the numbers are 7 per cent (t-statistic: 3.9) and 11 per cent (t-statistic: 12.3), respectively. As a result, deposit-credit mismatches are also higher: while such mismatches are not statistically different from zero under

[28] When using the LYS regime data, dollarization and mismatches are also lowest under fixed regimes, but they are highest under intermediate rather than under flexible regimes. However, the number of usable observations under LYS floats is much smaller than the number of usable observations under IMF floats, due mainly to the exclusion windows used throughout the paper.
[29] For consistency with subsequent regression analysis, I estimate this equation using heteroskedasticity-robust standard errors.

fixed regimes, they are about 6 per cent of total bank liabilities under floating regimes (t-statistic: 4.5). This is strong evidence against the implications of the majority view.[30]

4.3 OLS Analysis: Benchmark Results

So far, the evidence suggests that mismatches in financial intermediation are larger under flexible regimes than under fixed regimes. Does this still hold after controlling for other factors affecting dollarization?

The answer seems to be "yes." I now estimate an extension to equation (2), in the form of the pooled OLS regression with heteroskedasticity-robust standard errors:[31]

$$Dollarization_{it} = \beta_0 + \beta_1 Intermediate_{it} + \beta_2 Floating_{it} + \gamma_1 MacroControls_{it} + \gamma_2 HistoricalControls_{it} + \gamma_3 RegulatoryControls_{it} + \varepsilon_{it} \quad (3)$$

The macroeconomic controls include the following:

- *Interest rate differential*. One of the determinants of dollarization in the model in Appendix A are lending and deposit rate differentials relative to the risk-free rate. I use the difference of the country's money market rate with respect to the rate in the United States as a proxy.
- *Trade/GDP*. It can be argued that trade dependence encourages dollarization, as relatively large export and import sectors may need foreign currency for their transactions and may require dollar accounts. On the other hand, foreign exchange earnings of exporters may reduce their need of dollar credit from resident banks. The ratio of trade (exports plus imports) to GDP is used to control for openness.

[30] A slightly different picture emerges when using the LYS regimes. Unreported results using this alternative classification suggest that credit dollarization appears to be no different in fixed or flexible regimes. On the other hand, deposit dollarization as a share of total deposits is about 12 per cent higher under flexible regimes (t-statistic: 3.7); as a share of total liabilities, it is about 6 per cent higher (t-statistic: 3.5). However, currency mismatches do not clearly differ across regimes. Similar results obtain when conducting additional multivariate estimations (analogous to those discussed below).

[31] Appendix B presents more detailed information about the controls used.

- *Inflation*. Inflation has been a key determinant of dollarization in many countries. It is also a good proxy for the macroeconomic mismanagement that may fuel dollarization.[32]
- *Depreciation*. Large and sudden downward movements of the exchange rate have also exacerbated nominal instability and dollarization. In addition, this variable serves to control for potential valuation effects. [33]
- *Time trend*. As the movement towards floating regimes has accelerated in the past ten years, so has dollarization. To distinguish the impact of floating regimes on dollarization from a common trend, I add a time trend.[34]

The set of historical variables used to control for hysteresis and persistence effects includes:

- *Maximum historical rate of inflation*. High inflation or hyperinflation at one point in the past may have led to the acceleration of dollarization in many countries. Even if low inflation is achieved later, hysteresis effects may persist (e.g. Argentina, Bolivia, Nicaragua, Peru). Including the highest past rate of inflation controls for these effects. I define the maximum historical rate of inflation as the "running" maximum: if in a given year a new maximum is reached, it replaces the previous one, until a higher rate of inflation is achieved in a subsequent year.[35]
- *Maximum historical rate of depreciation*. For the same reasons, including the highest past rate of depreciation controls for hysteresis effects. The definition of this variable is similar to that of the maximum historical inflation above.

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[32] In addition, there is some evidence (Ghosh et al. 1997) suggesting that inflation is higher under floating regimes, so its inclusion avoids potential omitted-variable problems.

[33] Valuation effects may be present regardless of the currency used to express the values of the variables. In particular, any dollarization ratio will increase after depreciation by construction. If all volumes are expressed in their peso value, the ratio's numerator will increase, but only one part of its denominator (the dollar component) will. On the other hand, if all volumes are expressed in their dollar values, its numerator will stay constant, but its denominator will go down (as the dollar value of the denominator's peso component decreases).

[34] Given collinearity among some controls – particularly inflation and depreciation – I include them alternatively in different specifications, as shown below. However, including them together did not change the results for the coefficients of interest.

Finally, the set of regulatory variables affecting dollarization includes the two binary indicators mentioned previously:

- *Foreign currency loans allowed*. This indicator explicitly controls for whether dollar credit can be freely issued.
- *Foreign currency deposits allowed.* Similarly, this indicator explicitly controls for whether dollar deposits can be freely issued.

Table 3.a reports results scaling the dollarization series by total credit and deposits, and Table 3.b reports results scaling the dollarization series by total assets and liabilities. Table 3.c reports estimations for the currency mismatch variable. In each table, I use a variety of specifications to assess the robustness of the results. More specifically, each of Tables 3.a and 3.b reports eight columns, which contain four pairs of specifications. Each pair consists of one regression for credit dollarization and an analogous regression for deposit dollarization. Table 3.c uses the same four specifications in the mismatch regressions.

Contrary to the implications of the majority view, Tables 3.a and 3.b report some evidence that credit dollarization is *lower* under floating regimes. The point estimate for the floating regime coefficient is always negative, but it is significant only in half of the credit dollarization regressions. On the other hand, there is overwhelming evidence that deposit dollarization is significantly higher under floating regimes: Table 3.a suggests that the ratio of dollar deposits to total deposits is about 10 to 12 per cent higher, while Table 3.b indicates that the ratio of dollar deposits to total liabilities is 6 to 7 per cent higher under flexible exchange rates.[36] All these coefficients are significant at the 99 per cent confidence level. And the fact that the results reported in Table 3.a are similar to those reported in Table 3.b suggests that they are insensitive to scaling.[37]

[35] Note that this definition may result in a time-invariant maximum inflation for many countries, as the highest level of inflation usually took place in the 1980s in many cases, while dollarization data are usually available from the early 1990s onwards.

[36] The intermediate regime category exhibits qualitatively similar patterns.

[37] Unreported results using the LYS classification suggest that credit dollarization is significantly and consistency *lower* under floating. Deposit dollarization is higher under floating regimes, but the coefficient is not statistically significant in several specifications. Finally, there is some evidence that currency mismatches are higher under LYS floating regimes, but it is not robust.

More importantly, Table 3.c shows that floating regimes are consistently associated with greater, not lower, mismatches. This effect is economically large and statistically significant in all regressions: as a share of total bank liabilities, currency mismatches are 7 to 8 per cent higher under exchange rate flexibility.

The performances of current inflation and depreciation are relatively poor. Even when included separately to ameliorate collinearity problems, the coefficients of inflation and depreciation are insignificant in many specifications. On the other hand, maximum inflation and depreciation have a significant explanatory power in both deposit and credit dollarization regressions, even more than their contemporaneous counterparts, underlining the importance of past events in shaping current dollarization. Their coefficients are positive and generally significant: countries that suffered high inflation or experienced large depreciation in the past are more prone to have large dollarization of both credit and deposits in the present.

The time trend confirms the presumption that both deposit and credit dollarization have increased over time; on the other hand, it would appear that mismatches have declined. Furthermore, the regulatory indicators have a very large explanatory power, confirming the importance of the institutional framework in the dollarization process. The performance of interest rate differentials is poor. Finally, the results for trade openness suggest a negative link with dollarization; perhaps residents in relatively closed economies need to rely more on bank-supplied foreign exchange.

In sum, the evidence strongly suggests that floating exchange rate regimes do not lead to greater credit dollarization, while they result in significantly higher deposit dollarization. As a consequence, currency mismatches are *greater* under floating regimes.[38]

[38] I also estimated the regressions with standard errors that are robust to country clustering, thus relaxing the assumption of within-country independence. The results are less well defined, but the evidence that deposit dollarization is higher under floating regimes still holds unscathed.

4.4 Robustness Tests

To assess the robustness of these findings, I conducted extensive sensitivity analysis. To save space, I only report the results scaling the dollarization series by total credit and deposits, as scaling by total assets and liabilities continues yielding qualitatively identical results.

Deposit insurance. The presence of deposit insurance may reduce depositors' incentives to withdraw their funds in periods of banking turmoil, principally if coverage includes foreign currency deposits. Insofar as deposit insurance is part of the existing financial safety net, it may also affect banks' incentives and the pattern of credit dollarization. But the effects of deposit insurance on dollarization and mismatches are not clear at priori. I use a binary annual indicator constructed by Demirgüç-Kunt and Detragiache (2000) for the presence of an explicit deposit insurance scheme that covers dollar accounts. Results are reported in the first three columns of Table 4. It would appear that mismatches are lower under the presence of deposit insurance. However, the channel for this effect is not clear: neither credit nor deposit dollarization seems to be different under deposit insurance. In any event, the key result still holds: currency mismatches are larger under floating exchange rates.

Forward markets. The presence of an insurance market against exchange risk may influence banks' behavior regarding mismatches and open currency positions. Although data on the volume of hedging activities in insurance markets are not available, I constructed an indicator for the existence of a forward exchange market, based on information from the country pages of the IMF *Annual Reports* for the past two decades.[39] The last three columns of Table 4 show the impact of this binary indicator. The relevant results are insensitive to its inclusion: floating regimes are still associated with greater deposit dollarization and larger currency mismatches. In addition, it seems as if the presence of a forward market reduces dollarization and mismatches. Perhaps the availability of insurance against currency risk reduces the need for banks and

[39] This dummy takes the value of one if a forward market was reported to exist, and zero if such market was reported to be underdeveloped, heavily regulated, or nonexistent.

depositors to dollarize their assets: they might prefer to hedge their exposures in the form of forward contracts instead of in the form of dollar loans and deposits.

Managed vs. independent floats. The IMF floating group includes managed floats without a predetermined path for the exchange rate as well as independent floats. Is this aggregation critical? That is, are the results being driven by one of the components of the IMF "float" dummy? To answer this question, I disaggregate the floating dummy into its two subcomponents and include them concurrently. The results are shown in Table 5. Interestingly, *both* kinds of floats – managed and independent – are associated with larger mismatches. And column 2 suggests that managed floats increase credit dollarization, while independent floats reduce it.

Additional sensitivity analysis. I undertook other robustness tests, estimating permutations to the benchmark specifications. Those permutations included:

- Using a two-year exclusion window instead of the one-year window.
- Changing the definition of credit dollarization and currency mismatches by including bank credit to other sectors of the economy (when such data were available).
- Dropping outliers and excluding countries with implausibly low or high mismatch (e.g. countries where credit dollarization was extremely low while deposit dollarization was very large).
- Using the IMF regime data but restricting the sample to the observations for which LYS regime data are also available, to account for sampling differences between the two regime classifications.
- Adding regional dummies for the transition economies, South America, and Asia.
- Using the lagged values of the right-hand-side variables instead of their current values.
- Using year dummies as time effects instead of the time trend.

None of these sensitivity tests significantly changes the main results.

4.5 Panel Data Estimation

The cross-regime OLS analysis above is useful for answering the question: "How much more or less dollarization and mismatches do countries under flexible regimes have, compared to those under fixed regimes?" The fixed effect ("within") estimator exploits the time dimension of the panel data set around country averages and is therefore useful to answer a related question: "What is the effect of adopting a floating regime on dollarization and mismatches?" Both questions are very important in terms of policy-making. However, the latter is of paramount policy relevance, insofar as the majority view advocates that fixed-rate countries should *adopt* greater exchange rate flexibility. In answering this question, I still use one-year exclusion windows around regime changes, to avoid regime change contamination.

Results with the fixed effect estimator are shown in Table 6. For comparison, I also report random effect estimates.[40] As before, the coefficient of the floating regime indicator in the credit dollarization regressions is negative but statistically insignificant. On the other hand, deposit dollarization is significantly greater after the adoption of floating regimes, as the fixed effect estimate shows. Remarkably, the coefficient of the floating regime indicator is almost identical in both the fixed and random effect regressions -- 4.5 per cent. Mismatches are significantly larger under floating regimes: as a share of total bank liabilities, they are 12 per cent larger in the fixed effects regression and 8 per cent larger in the random effect regression.[41]

There is an important point to be made about these results. In order to exploit the time variation of the data using the within estimator, a sufficient number of switches from non-floating to floating regimes are needed. In my sample, there are 22 switches for the credit dollarization regressions, 48 switches for the deposit dollarization

[40] Results using the "between" estimator (not reported) suggest similar patterns. Results using the LYS data yield less precise fixed effect estimates, as the number of usable observations with LYS regimes is small.

[41] To further account for the persistence of dollarization, I also estimated fixed- and random-effect regressions allowing for autocorrelated disturbances. The results are less precise in both credit and deposit dollarization regressions. Nevertheless, the coefficient of the floating regime indicator is positive and significant in the mismatches regressions: the fixed effect coefficient is 11 per cent and the random effect coefficient is 8 per cent.

regressions, and 21 switches for the mismatch regressions. Ideally, an appropriate number of switches would be about 25 or 30 in number, as to make the within estimator viable. Nevertheless, despite the relatively small number of switches, the coefficient of the floating regime indicator in the fixed effect mismatch regression is large and significant at the 99 per cent confidence level.[42]

4.6 Endogeneity

So far I have assumed that the exchange rate regime is exogenous with respect to dollarization. But the exchange rate regime is a policy decision, based in part on the financial characteristics of the economy. This raises at least the possibility of endogeneity.

There are reasons to think that endogeneity is not driving the results. Under high dollarization of bank liabilities (e.g. deposit dollarization) and large currency mismatches, the monetary authorities may be concerned about the potentially destabilizing impact of depreciation shocks. As a consequence, they may be inclined to implement and maintain a fixed exchange rate. In this context, endogeneity could create a bias in favor of floating regimes and *lower* dollarization and mismatches. But the results above suggest that the opposite is the case.

On the other hand, greater dollarization and mismatches may still force countries to float (for example, a currency crisis may be partly fueled by mismatches). However, the exclusion windows used throughout this analysis address this problem. At the same time, in a scenario of asset substitution like financial dollarization, the greater sensitivity of the exchange rate to portfolio reallocations by residents (which is the domestic equivalent to greater capital mobility) may create an additional incentive to adopt a more flexible exchange rate.

To address these possibilities, I report instrumental variable estimations. The standard optimal currency area literature suggests that if real shocks are prevalent, a country may choose exchange rate flexibility. On the other hand, small economies have

[42] In any case, it would be desirable to expand the time span of the data in future research, as to have a higher number of switches and be able to obtain more precise fixed effect estimates.

an incentive to peg their exchange rate. Therefore, I use terms-of-trade shocks and land area as instruments. As a third instrument, I use the value of the exchange rate regime (for intermediate and floating) in 1974 or, if 1974 regime data are not available, the earliest available year. Given that dollarization in most countries did not begin until after the early 1980s, the 1974 value of the regime should be regarded as plausibly exogenous or at least predetermined.

The results, reported in Table 7, suggest that endogeneity does not drive the results. I report IV estimates along with their OLS counterparts for comparison. Deposit dollarization is still overwhelmingly and significantly higher under flexible exchange rate regimes. Note that the estimated coefficients of floating regimes in the deposit dollarization regressions are larger when they are estimated by instrumental variables: while the OLS estimate is 10 per cent, the IV estimate is 37 per cent. (Both of them are significant at the 99 per cent confidence level). This is evidence that the potential bias worked against the OLS results reported previously. On the other hand, the estimated impact of the floating regimes on credit dollarization is negative but insignificant regardless of estimation method. More importantly, the mismatch ratio is still greater under floating regimes after controlling for endogeneity; however, the point estimate of the floating regime indicator is statistically insignificant due to larger standard errors.[43] However, while the Hausman test rejects the null hypothesis of exogeneity in the credit and deposit dollarization regressions, it fails to reject exogeneity in the mismatch regression (with a P-value of 0.3).

I calculated these results using 2SLS. The endogenous right-hand-side variables (the intermediate and floating regime indicators) are not continuous, though. In the first stage, some fitted values of the intermediate and floating dummies may lie beyond the [0,1] interval. In order to account for the dichotomous nature of the regime indicators, I proceed as follows. First, I estimate an ordered probit equation using the three regimes as one polychotomous dependent variable and the instrumental variables mentioned above as regressors. Then, I use the fitted probabilities of the intermediate and floating

[43] I also estimated the regressions using political variables (such as the average number of revolutions and the average number of political crises during the sample period, using data from the Arthur S. Banks Cross National Time Series Data Archive) as additional instruments. The unreported results are qualitatively the same.

regimes from this probit regression as instruments in a 2SLS estimation. The results using this procedure are reported in Table 8 and are fairly similar to those reported in the preceding table. Credit dollarization is negatively but insignificantly linked with floating regimes, while deposit dollarization is significantly higher under flexibility, regardless of estimation method. Remarkably, the floating regime coefficient in the mismatch IV regression (14 per cent) is larger than its OLS counterpart (8 per cent) and it is statistically significant (at the 90 per cent confidence level). Again, the evidence suggests that any bias was working against the OLS results above. A Hausman test again fails to reject the null of exogeneity in the currency mismatch regression (with a P-value of 0.38).

In conclusion, IV estimates show that the results are not driven by potential endogeneity of the regime.[44] In particular, it is fair to say that the OLS evidence reported earlier on a positive coefficient of floating regimes on the mismatch regressions is robust to endogeneity, as the IV estimations yield less efficient but still positive coefficients while formal tests fail to reject the null hypothesis of exogeneity.

5 Discussion and Caveats

Summing up, all the evidence presented in this paper yields the same message: floating regimes encourage deposit dollarization more strongly than they encourage matching via credit dollarization; as a result, they exacerbate currency mismatches in financial intermediation. The question is: Why does this robust stylized fact obtain?

The theoretical framework outlined above suggests that default risk may play an important role in shaping these results. However, empirical scrutiny on the role of default risk requires gathering data on the share of non-performing dollar loans in a large number of countries and analyzing the links between exchange rate flexibility and dollar loan default rates. This is beyond the scope of this paper and is left for future research.

[44] Analogous unreported estimations fixing the sample to a common number of observations for each IV-OLS pair of regressions yield similar results.

More generally, it is of paramount importance to study more closely the determinants of banks' supply of dollar loans in the context of risk management. Credit dollarization leads to diversification and redistribution of exchange risk that could in principle be stabilizing. The results in this paper suggest that banks in developing countries are not willing to transfer such a risk to firms – or, at least, they are not any more willing to do so under flexible exchange rates. If that is the case, we need to understand this issue better.[45]

That said, it is also important to keep a number of caveats in mind. A first caveat, already mentioned earlier in the paper, is that deposit-credit mismatches do not account for all the foreign currency exposure of banks. A bank facing a deposit-credit mismatch may hedge by purchasing dollar-denominated securities. It may also conduct off-balance sheet transactions and buy insurance in forward markets. Regrettably, the necessary data to analyze this issue more closely are non-existent for a large number of countries.

A second caveat, also mentioned previously, relates to domestic- and foreign-currency lending and deposit interest rates, as well as the corresponding spreads. These interest rates may be adjusted in order to help compensate existing mismatches and reduce overall risk. But again, lack of data is a major limitation to further study this matter.

A third caveat is the presence of foreign banks in several dollarized economies. A foreign bank may choose to leave some liabilities unhedged in country A but may hold excess dollar assets in country B. If so, it may be perfectly hedged, even though data in country A give the impression that it is not. Pursuing this issue further would require reliable micro-level data on the currency denomination and location of assets and liabilities of foreign banks, which are not readily available.

Finally, a fourth caveat is whether there can be an "optimal" degree of mismatch in financial intermediation. It is not clear whether a perfectly matched banking system

[45] This analysis has largely ignored dollar credit demand by firms and dollar deposit demand by banks. In particular, it has assumed that changes in dollar volumes are mainly supply-driven. While the focus of this paper on equilibrium volumes of loans and deposits minimizes this limitation, further research is clearly desirable to identify the effects of exchange rate flexibility on both supply and demand of dollar credits and deposits.

exhibits lower overall risk than a slightly mismatched one, given the trade-off between currency risk and default risk. And the slightly mismatched banking system may compensate its greater deposit-credit mismatch by holding more dollar securities. (Of course, whether it is socially optimal that banks hold a greater proportion of their dollar assets in the form of securities in international markets, rather than in the form of credit to finance productive domestic investment, represents an additional welfare issue to consider). Both theoretical and empirical research on that direction is needed.

6 Concluding Remarks

The currency and financial crises of the 1990s reignited the debate on the impact of exchange rate regimes. One aspect of that debate concerns the links between the exchange rate regime and currency mismatches. The majority view on the issue has it that greater flexibility encourages banks and firms to limit their foreign currency exposure. This view is appealing and generally accepted by many. Nevertheless, it has never been tested systematically.

This paper is a first attempt to test it. I study whether flexible exchange rate regimes are associated with lower currency mismatches in financial intermediation. To that end, I assemble a comprehensive database on the dollarization of bank deposits and credit in a large number of developing and transition economies, along with accompanying bank regulatory arrangements.

The results do not support the presumption that flexibility is associated with a reduction of currency mismatches in the banking systems of financially dollarized countries. Most (if not all) of the evidence goes against such presumption. Floating exchange rate regimes result in higher deposit dollarization vis-à-vis credit dollarization. Therefore, currency mismatches in financial intermediation are more severe under exchange rate flexibility. These results are robust to the inclusion of a variety of controls, different definitions of dollarization and mismatches, the presence of outliers, different specifications, different estimation methods, and the potential presence of endogeneity.

If these results are right, and insofar as currency mismatches in financial intermediation are an important component of banks' overall foreign currency exposures, they constitute the first systematic evidence that flexible exchange rate regimes may exacerbate such exposures in developing countries. This is an important implication, deserving serious attention. If this is indeed the case, policymakers in dollarized economies, as well as academics and multilateral organizations, might wish to reassess the desirability of greater exchange rate flexibility and its impact on open foreign currency positions. Of course, further research is needed to conclude whether these results apply to overall currency mismatches in banks' (and firms') balance sheets, as well as to hedged and unhedged exposures in insurance markets. Until that research is done, however, the burden of proof is in the majority view's side. Perhaps it is time to look at the minority view more seriously.

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7 Appendices

A A Simple Model of Two-Currency Banking under Exchange Rate and Default Uncertainty

A.1 Assumptions

1. Lending and deposit rates are contracted ex ante or at least do not fully reflect exchange rate depreciation shocks, so that ex post returns may be affected by such shocks.
2. Agents are risk averse.
3. Banking is perfectly competitive, so that all rates of return are given.
4. Optimal levels of credit are supply-determined by banks. (Firms have a passive role in loan dollarization.)
5. Optimal levels of deposits are supply-determined by depositors. (Banks have a passive role in deposit dollarization.)

A.2 Loan Dollarization: Basic Setup

Consider a representative bank making decisions over a one-period horizon.[46] The bank has to decide, as a portfolio manager, how to allocate its available funds, W_L, in domestic currency ("peso") denominated loans L_1 and foreign currency ("dollar") denominated loans L_2. The random real returns of peso and dollar loans are $\tilde{r}_{L1}$ and $\tilde{r}_{L2}$, respectively.[47] The bank invests the rest of its available wealth in a riskless asset with deterministic return r_{L0}. All volumes are expressed in their dollar values.

The real rates of return, in dollar terms, of peso and dollar loans are defined as

[46] This framework is related to that of Freixas and Rochet (1997), chapter 8. Maturity mismatch issues are purposely excluded.
[47] Random variables are denoted by a tilde (~), while expected values are denoted by a bar (-).

$$\begin{aligned}\tilde{r}_{L1} &= c_{L1} - \tilde{e} \\ \tilde{r}_{L2} &= c_{L2} - \tilde{\theta}\end{aligned} \tag{A.1}$$

where c_{L1} and c_{L2} are the non-random components of their respective real rates of returns, $\tilde{e}$ is a random depreciation shock, and $\tilde{\theta}$ is a random dollar loan non-performance probability shock.[48] These variables are assumed to have finite means (which could be zero) and variances, and positive covariance.

The dollar value of the random profits of the bank is

$$\tilde{\pi} = r_{L0}(W_L - L_1 - L_2) + \tilde{r}_{L1}L_1 + \tilde{r}_{L2}L_2$$

which can be re-written in terms of excess returns as

$$\tilde{\pi} = r_{L0}W_L + (\tilde{r}_{L1} - r_{L0})L_1 + (\tilde{r}_{L2} - r_{L0})L_2 \tag{A.2}$$

The objective function that the risk-averse bank seeks to maximize is

$$F_L(L_1, L_2) = U_L(E(\tilde{\pi}), \text{var}(\tilde{\pi})) \equiv U_L(\mu_\pi, \sigma_\pi^2) \tag{A.3}$$

where U_L is a Von Neumann-Morgenstern utility function with $\partial U_L/\partial \mu_\pi > 0$ and $\partial U_L/\partial \sigma_\pi^2 < 0$.[49]

The first order conditions for a maximum are

$$\begin{aligned}\frac{\partial U_L}{\partial L_1} &= \frac{\partial U_L}{\partial \mu_\pi}\frac{\partial \mu_\pi}{\partial L_1} + \frac{\partial U_L}{\partial \sigma_\pi^2}\frac{\partial \sigma_\pi^2}{\partial L_1} = 0 \\ &= \frac{\partial U_L}{\partial \mu_\pi}(\overline{r}_{L1} - r_{L0}) + 2\frac{\partial U_L}{\partial \sigma_\pi^2}\left[\text{var}(\tilde{r}_{L1})L_1^* + \text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2})L_2^*\right] = 0\end{aligned} \tag{A.4}$$

and

$$\begin{aligned}\frac{\partial U_L}{\partial L_2} &= \frac{\partial U_L}{\partial \mu_\pi}\frac{\partial \mu_\pi}{\partial L_2} + \frac{\partial U_L}{\partial \sigma_\pi^2}\frac{\partial \sigma_\pi^2}{\partial L_2} = 0 \\ &= \frac{\partial U_L}{\partial \mu_\pi}(\overline{r}_{L2} - r_{L0}) + 2\frac{\partial U_L}{\partial \sigma_\pi^2}\left[\text{var}(\tilde{r}_{L2})L_2^* + \text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2})L_1^*\right] = 0\end{aligned} \tag{A.5}$$

These conditions can be expressed in matrix form as

$$\frac{1}{2}\begin{pmatrix}\frac{\partial U_L}{\partial \mu_\pi} \\ \frac{\partial U_L}{\partial \sigma_\pi^2}\end{pmatrix}\begin{pmatrix}\overline{r}_{L1} - r_{L0} \\ \overline{r}_{L2} - r_{L0}\end{pmatrix} + \begin{pmatrix}\text{var}(\tilde{r}_{L1}) & \text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2}) \\ \text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2}) & \text{var}(\tilde{r}_{L2})\end{pmatrix}\begin{pmatrix}L_1^* \\ L_2^*\end{pmatrix} = \begin{pmatrix}0 \\ 0\end{pmatrix} \tag{A.6}$$

---

[48] Alternatively, $\tilde{\theta}$ can also be interpreted as a shock to the share of non-performance dollar loans. Without loss of generality, it is assumed that non-performing dollar loans pay nothing to the bank. For simplicity, non-performing *peso* loans are not introduced.

and, thus, the optimal values of L_1 and L_2 can be written as

$$\begin{pmatrix} L_1^* \\ L_2^* \end{pmatrix} = \frac{\lambda_L}{\Delta_L} \begin{pmatrix} \text{var}(\tilde{r}_{L2}) & -\text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2}) \\ -\text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2}) & \text{var}(\tilde{r}_{L1}) \end{pmatrix} \begin{pmatrix} \overline{r}_{L1} - r_{L0} \\ \overline{r}_{L2} - r_{L0} \end{pmatrix} \tag{A.7}$$

where $\lambda_L = -\frac{\partial U_L}{\partial \mu_\pi} \Big/ 2\frac{\partial U_L}{\partial \sigma_\pi^2} > 0$ is a constant, $\Delta_L = \text{var}(\tilde{r}_{L1})\,\text{var}(\tilde{r}_{L2}) - \text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2})^2 > 0$ is the determinant of the (positive definite) variance-covariance matrix, and $\overline{r}_{Li}$ is the expected value of $\tilde{r}_{Li}$, for $i = 1,2$. The expressions for the optimal values of peso and dollar loans are

$$L_1^* = \frac{\lambda_L}{\Delta_L}\left[\text{var}(\tilde{r}_{L2})(\overline{r}_{L1} - r_{L0}) - \text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2})(\overline{r}_{L2} - r_{L0})\right] \tag{A.8}$$

$$L_2^* = \frac{\lambda_L}{\Delta_L}\left[-\text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2})(\overline{r}_{L1} - r_{L0}) + \text{var}(\tilde{r}_{L1})(\overline{r}_{L2} - r_{L0})\right] \tag{A.9}$$

both of which are positive values provided that $\text{var}(\tilde{r}_{L2})(\overline{r}_{L1} - r_{L0}) > \text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2})(\overline{r}_{L2} - r_{L0})$ and $\text{var}(\tilde{r}_{L1})(\overline{r}_{L2} - r_{L0}) > \text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2})(\overline{r}_{L1} - r_{L0})$. These conditions are henceforth assumed to hold. Finally, equation (A.1) above can be used to write

$$\begin{aligned} &\overline{r}_{L1} = c_{L1} - \overline{e} \\ &\overline{r}_{L2} = c_{L2} - \overline{\theta} \\ &\text{var}(\tilde{r}_{L1}) = \text{var}(\tilde{e}) \\ &\text{var}(\tilde{r}_{L2}) = \text{var}(\tilde{\theta}) \\ &\text{cov}(\tilde{r}_{L1}, \tilde{r}_{L2}) = \text{cov}(\tilde{e}, \tilde{\theta}) > 0 \end{aligned} \tag{A.10}$$

A.3 Effect of Volatility on Dollar Lending

With exogenous dollar loan default, it can be shown that

$$\frac{\partial L_1^*}{\partial\, \text{var}(\tilde{e})} = -\frac{L_1^*}{\Delta_L}\frac{\partial \Delta_L}{\partial\, \text{var}(\tilde{r}_{L1})} < 0 \tag{A.11}$$

$$\frac{\partial L_2^*}{\partial\, \text{var}(\tilde{e})} = \underbrace{-\frac{L_2^*}{\Delta_L}\frac{\partial \Delta_L}{\partial\, \text{var}(\tilde{r}_{L1})}}_{<0} + \underbrace{\frac{\lambda_L}{\Delta_L}(\overline{r}_{L2} - r_{L0})}_{>0} \tag{A.12}$$

and

[49] Consistent with the experience of dollarized economies, the bank maximizes the value of its objective function expressed in the hard currency, the dollar.

$$\frac{\partial L_1^*}{\partial \text{var}(\tilde{\theta})} = \underbrace{-\frac{L_1^*}{\Delta}\frac{\partial \Delta_L}{\partial \text{var}(\tilde{r}_{L2})}}_{<0} + \underbrace{\frac{\lambda_L}{\Delta_L}(\overline{r}_{L1} - r_{L0})}_{>0} \tag{A.13}$$

$$\frac{\partial L_2^*}{\partial \text{var}(\tilde{\theta})} = -\frac{L_2^*}{\Delta_L}\frac{\partial \Delta_L}{\partial \text{var}(\tilde{r}_{L2})} < 0 \tag{A.14}$$

Higher volatility of depreciation and default negatively affects optimal loan issues, as equations (A.11) and (A.14) show. Intuitively, such greater variance renders the ex post return of the risky assets more volatile, which makes them less attractive given risk aversion. In addition, the cross-effects in equations (A.12) and (A.13) suggest a positive (substitution) effect based on expected excess returns, and a negative, offsetting effect based on risk. The intuition is simple: depreciation (dollar loan default) shocks increase the relative ex post return of dollar (peso) assets, but the volatility of such shocks increases uncertainty, which the risk-averse bank dislikes. Furthermore, the higher the level of loan issues, the stronger the negative risk effect.

Let $\tilde{\theta}$ be now a function of $\tilde{e}$, so that

$$\tilde{\theta} = \theta(\tilde{e}) + \tilde{\xi} \tag{A.15}$$

where $\frac{\partial \theta(\tilde{e})}{\partial \tilde{e}} > 0$ and $\tilde{\xi}$ is a zero-mean random shock orthogonal to $\tilde{e}$.

With endogenous dollar loan default, the effects of changes in exchange rate volatility are different from those in equations (A.11) and (A.12). Using a first-order Taylor expansion to obtain expressions for the variance of $\theta(\tilde{e})$ and the covariance term, it can be shown that

$$\frac{\partial L_1^*}{\partial \text{var}(\tilde{e})} = \underbrace{-\frac{L_1^*}{\Delta_L}\frac{\partial \Delta_L}{\partial \text{var}(\tilde{r}_{L1})}}_{<0} + \underbrace{\frac{\lambda_L}{\Delta_L}\left(\frac{\partial \theta(\overline{e})}{\partial \tilde{e}}\right)^2(\overline{r}_{L1} - r_{L0})}_{>0} \underbrace{-\frac{\lambda_L}{\Delta_L}\left(\frac{\partial \theta(\overline{e})}{\partial \tilde{e}}\right)(\overline{r}_{L2} - r_{L0})}_{<0} \tag{A.16}$$

and

$$\frac{\partial L_2^*}{\partial \text{var}(\tilde{e})} = \underbrace{-\frac{L_2^*}{\Delta_L}\frac{\partial \Delta_L}{\partial \text{var}(\tilde{r}_{L1})}}_{<0} + \underbrace{\frac{\lambda_L}{\Delta_L}(\overline{r}_{L2} - r_{L0})}_{>0} \underbrace{-\frac{\lambda_L}{\Delta_L}\left(\frac{\partial \theta(\overline{e})}{\partial \tilde{e}}\right)(\overline{r}_{L1} - r_{L0})}_{<0} \tag{A.17}$$

Once dollar loan default becomes endogenous, there are additional effects of exchange rate volatility on both peso and dollar loans. In general, the negative, offsetting effect of volatility on dollar lending is now unambiguously stronger than in

the exogenous loan default case. The exact extent of this additional negative effect depends upon the elasticity of dollar loan default to the rate of depreciation.

A.4 Deposit Dollarization: Basic Setup

Consider a representative depositor deciding how to allocate her available wealth, W_D, between peso and dollar deposits, D_1 and D_2, with rates of return $\tilde{r}_{D1}$ and $\tilde{r}_{D2}$. The depositor invests the rest of her available wealth in a riskless asset with deterministic rate of return r_{D0}.[50] Again, all rates of return are given, and all volumes are expressed in their dollar values.

There are two sources of uncertainty: depreciation risk and deposit loss risk. Depreciation risk affects the real return (in dollar terms) on peso deposits. Deposit loss risk, based on the potential inability of the bank to repay deposits in the presence of insolvency problems (which are themselves a function of dollar loan default), affects the return of both peso and dollar deposits. However, that risk may differ between deposits. In particular, it may be greater for dollar deposits, because they are also subject to convertibility (even confiscation) risk. I normalize peso deposit loss risk to zero, and only consider the dollar-to-peso deposit loss risk differential. Therefore, the real returns of deposits have the familiar expressions

$$\begin{aligned} \tilde{r}_{D1} &= c_{D1} - \tilde{e} \\ \tilde{r}_{D2} &= c_{D2} - \tau(\tilde{\theta}) \end{aligned} \tag{A.18}$$

Equation (A.18) has the same interpretation as equation (A.1). The only difference is $\tau(\tilde{\theta})$, which captures dollar deposit loss risk, so that $\frac{\partial \tau(\tilde{\theta})}{\partial \tilde{\theta}} > 0$.

The total return in dollar terms of the depositor's portfolio can be written as

$$\tilde{R} = r_{D0} W_D + (\tilde{r}_{D1} - r_{D0}) D_1 + (\tilde{r}_{D2} - r_{D0}) D_2 \tag{A.19}$$

and the depositor's objective function is

$$F_D(D_1, D_2) = U_D(E(\tilde{R}), \text{var}(\tilde{R})) \equiv U_D(\mu_R, \sigma_R^2) \tag{A.20}$$

where $\partial U_D / \partial \mu_R > 0$ and $\partial U_D / \partial \sigma_R^2 < 0$.

Given the similarity with the bank's problem, it follows that

$$D_1^* = \frac{\lambda_D}{\Delta_D}\left[\text{var}(\tilde{r}_{D2})(\overline{r}_{D1} - r_{D0}) - \text{cov}(\tilde{r}_{D1}, \tilde{r}_{D2})(\overline{r}_{D2} - r_{D0})\right] \tag{A.21}$$

$$D_2^* = \frac{\lambda_D}{\Delta_D}\left[-\text{cov}(\tilde{r}_{D1}, \tilde{r}_{D2})(\overline{r}_{D1} - r_{D0}) + \text{var}(\tilde{r}_{D1})(\overline{r}_{D2} - r_{D0})\right] \tag{A.22}$$

where $\lambda_D = -\frac{\partial U_D}{\partial \mu_R} \Big/ 2\frac{\partial U_D}{\partial \sigma_R^2} > 0$ and $\Delta_D = \text{var}(\tilde{r}_{D1})\,\text{var}(\tilde{r}_{D2}) - \text{cov}(\tilde{r}_{D1}, \tilde{r}_{D2})^2 > 0$.

The equivalent to equation (A.10) also holds, with the exception of $\text{var}(\tilde{r}_{D2}) = \left(\frac{\partial \tau(\bar{\theta})}{\partial \tilde{\theta}}\right)^2 \text{var}(\tilde{\theta})$ and $\text{cov}(\tilde{r}_{D1}, \tilde{r}_{D2}) = \left(\frac{\partial \tau(\bar{\theta})}{\partial \tilde{\theta}}\right)\text{cov}(\tilde{e}, \tilde{\theta}) > 0$.

A.5 Effect of Volatility on Dollar Deposits

The impact of greater variance of $\tilde{e}$ and $\tilde{\theta}$ with exogenous dollar loan default is

$$\frac{\partial D_1^*}{\partial\, \text{var}(\tilde{e})} = -\frac{D_1^*}{\Delta_D}\frac{\partial \Delta_D}{\partial\, \text{var}(\tilde{r}_{D1})} < 0 \tag{A.23}$$

$$\frac{\partial D_2^*}{\partial\, \text{var}(\tilde{e})} = \underbrace{-\frac{D_2^*}{\Delta_D}\frac{\partial \Delta_D}{\partial\, \text{var}(\tilde{r}_{D1})}}_{<0} + \underbrace{\frac{\lambda_D}{\Delta_D}(\overline{r}_{D2} - r_{D0})}_{>0} \tag{A.24}$$

$$\frac{\partial D_1^*}{\partial\, \text{var}(\tilde{\theta})} = \left[\underbrace{-\frac{D_1^*}{\Delta_D}\frac{\partial \Delta_D}{\partial\, \text{var}(\tilde{r}_{D2})}}_{<0} + \underbrace{\frac{\lambda_D}{\Delta_D}(\overline{r}_{D1} - r_{D0})}_{>0}\right]\left(\frac{\partial \tau(\bar{\theta})}{\partial \tilde{\theta}}\right)^2 \tag{A.25}$$

$$\frac{\partial D_2^*}{\partial\, \text{var}(\tilde{\theta})} = \left[-\frac{D_2^*}{\Delta_D}\frac{\partial \Delta_D}{\partial\, \text{var}(\tilde{r}_{D2})}\right]\left(\frac{\partial \tau(\bar{\theta})}{\partial \tilde{\theta}}\right)^2 < 0 \tag{A.26}$$

With endogenous dollar loan default, the impact of exchange rate volatility on peso and dollar deposits is

$$\frac{\partial D_1^*}{\partial\, \text{var}(\tilde{e})} = \underbrace{-\frac{D_1^*}{\Delta_D}\frac{\partial \Delta_D}{\partial\, \text{var}(\tilde{r}_{D1})}}_{<0} + \underbrace{\frac{\lambda_D}{\Delta_D}\left[\left(\frac{\partial \tau(\bar{\theta})}{\partial \tilde{\theta}}\right)\left(\frac{\partial \theta(\bar{e})}{\partial \tilde{e}}\right)\right]^2(\overline{r}_{D1} - r_{D0})}_{>0} \underbrace{-\frac{\lambda_D}{\Delta_D}\left[\left(\frac{\partial \tau(\bar{\theta})}{\partial \tilde{\theta}}\right)\left(\frac{\partial \theta(\bar{e})}{\partial \tilde{e}}\right)\right](\overline{r}_{D2} - r_{D0})}_{<0} \tag{A.27}$$

and

[50] This riskless asset could be understood as cross-border dollar deposits (assuming that banks abroad do not face solvency or confiscation issues).

$$\frac{\partial D_2^*}{\partial \text{var}(\tilde{e})} = \underbrace{-\frac{D_2^*}{\Delta_D}\frac{\partial \Delta_D}{\partial \text{var}(\tilde{r}_{D1})}}_{<0} \underbrace{+\frac{\lambda_D}{\Delta_D}(\overline{r}_{D2} - r_{D0})}_{>0} \underbrace{-\frac{\lambda_D}{\Delta_D}\left[\left(\frac{\partial \tau(\bar{\theta})}{\partial \bar{\theta}}\right)\left(\frac{\partial \theta(\bar{e})}{\partial \bar{e}}\right)\right](\overline{r}_{D1} - r_{D0})}_{<0} \qquad \text{(A.28)}$$

Greater exchange rate volatility reduces peso deposits and may increase dollar deposits. However, with endogenous loan default, the potential increase of dollar deposits due to greater exchange rate volatility is unambiguously lower. The precise extent of this additional negative effect depends upon the elasticity of perceived dollar deposit loss risk to bank solvency problems, as well as the elasticity of dollar loan default to depreciation.

B Data Appendix

B.1 Data Definitions and Sources

Abbreviations: AREAER: IMF *Annual Report on Exchange Arrangements and Exchange Restrictions* country pages (various issues). CB: Central Bank bulletins (various countries/issues). IFS: IMF *International Financial Statistics*. MBS: IMF Money and Banking Statistics data. WDI: World Bank *World Development Indicators*.

Dollarization Data

Raw Data

- Total credit to the resident private sector issued by resident banks. Source: line 22d of IFS.
- Foreign-currency-denominated ("dollar") credit to the resident private sector issued by resident banks. Sources: CB and MBS.
- Total assets of resident banks. Sources: CB and MBS.
- Total deposits of residents held in resident banks. Source: lines 24 plus line 25 of IFS.
- Foreign-currency-denominated ("dollar") deposits of residents held in resident banks. Sources: CB, MBS, and lines 25.a and 25b of IFS.
- Total liabilities of resident banks. Sources: CB and MBS.

Definition of Dependent Variables

- Credit dollarization (percent). First definition: ratio of dollar credit to total credit. Second definition: ratio of dollar credit to total assets.
- Deposit dollarization (percent). First definition: ratio of dollar deposits to total deposits. Second definition: ratio of dollar deposits to total liabilities.
- Currency mismatches (percent): Ratio of gap between dollar deposits and dollar credit to total liabilities [i.e. (dollar deposits – dollar credit) * 100 / (total liabilities)].

Exchange Rate Regime Data

Default classification: IMF regimes. Source: AREAER. (Revised and corrected using information provided by Virgilio Sandoval and Holger Wolf, via personal correspondence.)

- Fixed regimes: binary for fixed exchange rate regimes against a particular currency, a basket of currencies, or SDR.
- Intermediate regimes: binary for limited flexibility or managed floats with a pre-announced path for the exchange rate.
- Floating regimes: binary for managed floats with no pre-announced path for the exchange rate or independent floats.

Alternative classification (for sensitivity analysis): LYS regimes. Source: Levy-Yeyati and Sturzenegger (2000). See their paper for definitions of fixed, intermediate, and floating regimes. Fixed regimes in this paper include their "high-credibility pegs" group.

Regulatory Controls

- Foreign currency loans allowed: binary for whether or not dollar loans are freely or almost freely allowed. Source: AREAER, other IMF publications.
- Foreign currency deposits allowed: binary for whether or not dollar deposits are freely or almost freely allowed. Source: AREAER, other IMF publications.

Other Controls

- Interest rate differentials (percentage points): difference of line 60b of IFS with that of the United States. If line 60b is unavailable, line 60c is used. If line 60c is unavailable, line 60 is used. Source: IFS

- Trade (percent): ratio of exports plus imports to GDP. Source: WDI.
- Inflation (percent): percentage change of CPI, as reported by source. If series is unavailable, percentage change of GDP deflator, as reported by source. Source: WDI.
- Depreciation (percent): first difference of the log of the nominal exchange rate * 100. Source: WDI.
- Maximum historical inflation: running maximum value of inflation rate (as defined above).
- Maximum historical depreciation: running maximum value of depreciation rate (as defined above).
- Forward market indicator: binary for whether a forward market was reported to exist, as opposed to being reported to be underdeveloped, heavily regulated, or nonexistent. Source: AREAER.
- Deposit insurance: binary for whether there is an explicit deposit insurance scheme that covers foreign currency accounts. Source: Demirgüç-Kunt and Detragiache (2000).

Instruments

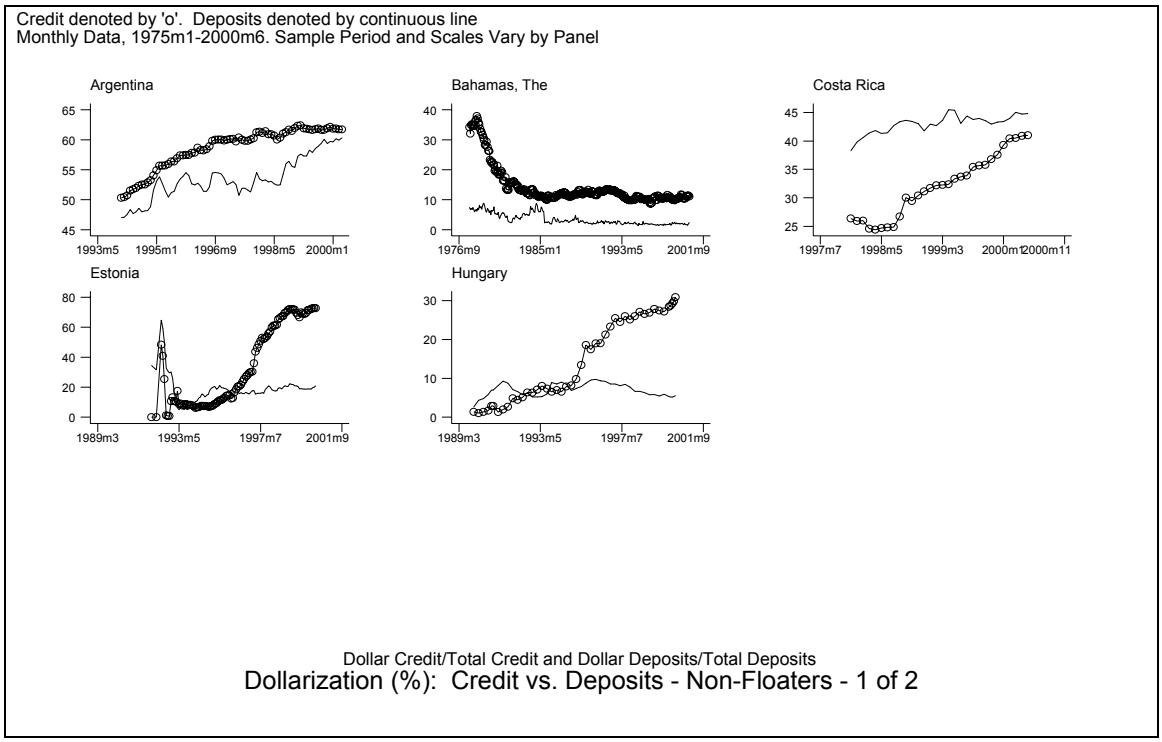
- Terms-of-trade shocks (percent): first difference of the log of terms-of-trade index in goods and services * 100. Source: WDI.
- Land area in squared kilometers. Source: WDI.
- Initial exchange rate regime: IMF regime in 1974 or earliest year available. Source: AREAER.

B.2 Country Coverage and Dollarization Data Availability

Country	Deposits	Credit	Country	Deposits	Credit	Country	Deposits	Credit
Albania	1994-99	1994-99	Haiti	1997-99	1997-99	Qatar	1993-99	--
Angola	1995-99	--	Hong Kong, China	1990-99	--	Romania	1990-99	--
Antigua and Barbuda	1979-99	--	Hungary	1989-99	1989-99	Russian Federation	1993-99	1993-99
Argentina	1994-99	1994-99	Indonesia	1992-99	1992-99	Rwanda	1994-99	--
Armenia	1994-99	1994-99	Israel	1981-99	1975-99	Sao Tome and Principe	1995-99	1995-99
Bahamas, The	1975-99	1977-99	Jordan	1993-99	--	Saudi Arabia	1975-99	1992-99
Bahrain	1984-99	--	Kenya	1995-99	--	Sierra Leone	1996-99	--
Bangladesh	1987-99	--	Korea, Rep.	--	1975-99	Slovak Republic	1993-99	--
Barbados	1975-99	--	Kuwait	1981-99		Slovenia	1991-99	--
Belarus	1998-99	1996-99	Kyrgyz Republic	1995-99	1995-96	South Africa	--	1992-99
Belize	1976-99	--	Lao PDR	1987-99	1987-99	St. Kitts and Nevis	1979-99	--
Bhutan	1993-99	--	Latvia	1993-99	--	St. Lucia	1979-99	--
Bolivia	1975-99	1996-99	Lithuania	1993-99	1993-99	St. Vincent & Grenadines	1979-99	--
Bulgaria	1995-99	--	Malawi	1996-99	--	Sudan	1992-99	--
Cambodia	1993-99	1993-99	Malaysia	1996-99	1996-99	Suriname	1975-76	--
Cape Verde	1995-99	--	Maldives	1981-99	1985-99	Syrian Arab Republic	1975-99	--
Chile	1976-99	1976-99	Malta	1975-84	--	Tanzania	1993-99	--
Colombia	1990-99	1990-99	Mauritius	1992-99	--	Thailand	1982-99	--
Comoros	1998-99	--	Mexico	1997-99	1997-99	Tonga	1994-99	--
Congo, Dem. Rep.	1975-99	--	Moldova	1998-99	1998-99	Trinidad and Tobago	1996-99	--
Costa Rica	1997-99	1997-99	Mongolia	1993-99	1994-99	Turkey	1986-99	--
Cyprus	1991-99	--	Mozambique	1991-99	--	Turkmenistan	1998-99	1998-99
Czech Republic	1993-99	1997-99	Myanmar	1991-99	--	Uganda	1993-99	--
Dominica	1988-99	--	Netherlands Antilles	1975-99	--	Ukraine	1992-99	1998-99
Egypt, Arab Rep.	1980-99	1980-99	Nicaragua	1996-99	1996-99	United Arab Emirates	1981-99	--
El Salvador	1982-99	--	Nigeria	1992-99	--	Uruguay	1998-99	1998-99
Estonia	1991-99	1991-99	Oman	1975-99	--	Vanuatu	1981-99	--
Ethiopia	1998-99	--	Papua New Guinea	1976-81, 87-99	1979-99	Venezuela	1996-99	1996-99
Georgia	1995-99	1995-99	Paraguay	1988-99	1988-99	Vietnam	1992-99	1992-99
Grenada	1979-99	--	Peru	1975-99	1975-99	Yemen, Rep.	1990-99	--
Guatemala	1997-99	1997-99	Philippines	1982-99	--	Zambia	1998-99	--
Guinea	1989-99	--	Poland	1991-99	1996-99	Zimbabwe	1993-99	--

C Graphical Appendix for Selected Countries

Figure C.1: Financial Dollarization, Non-Floaters



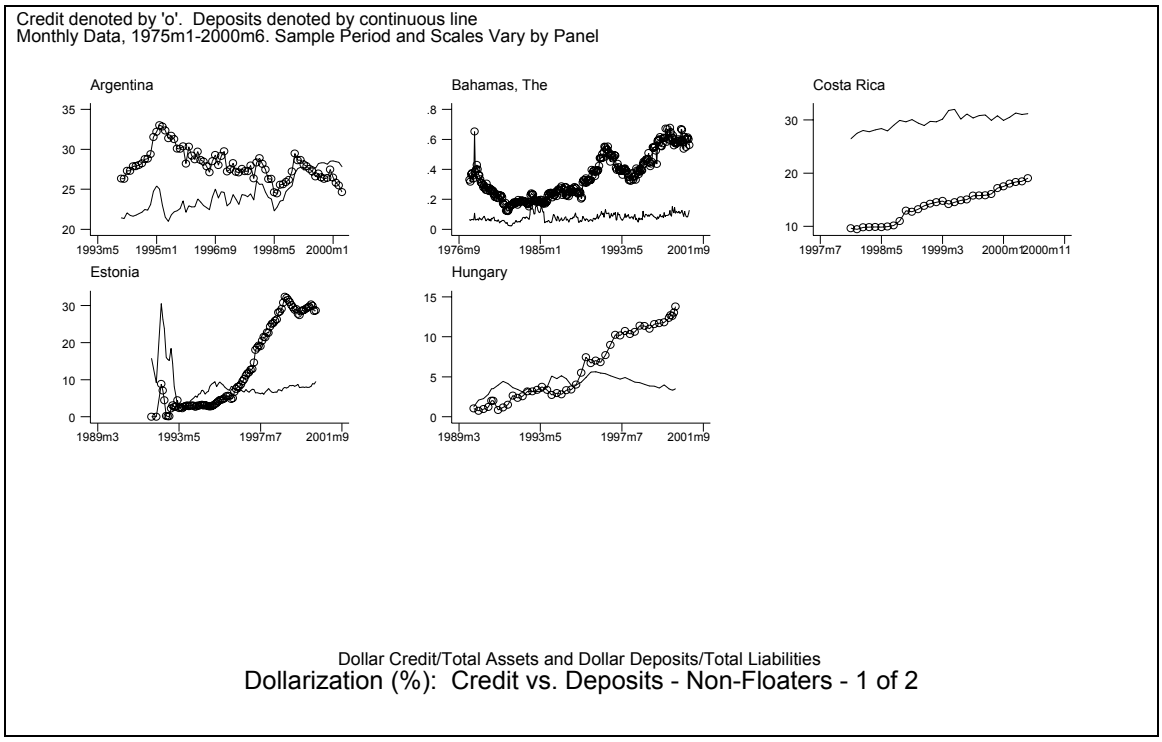
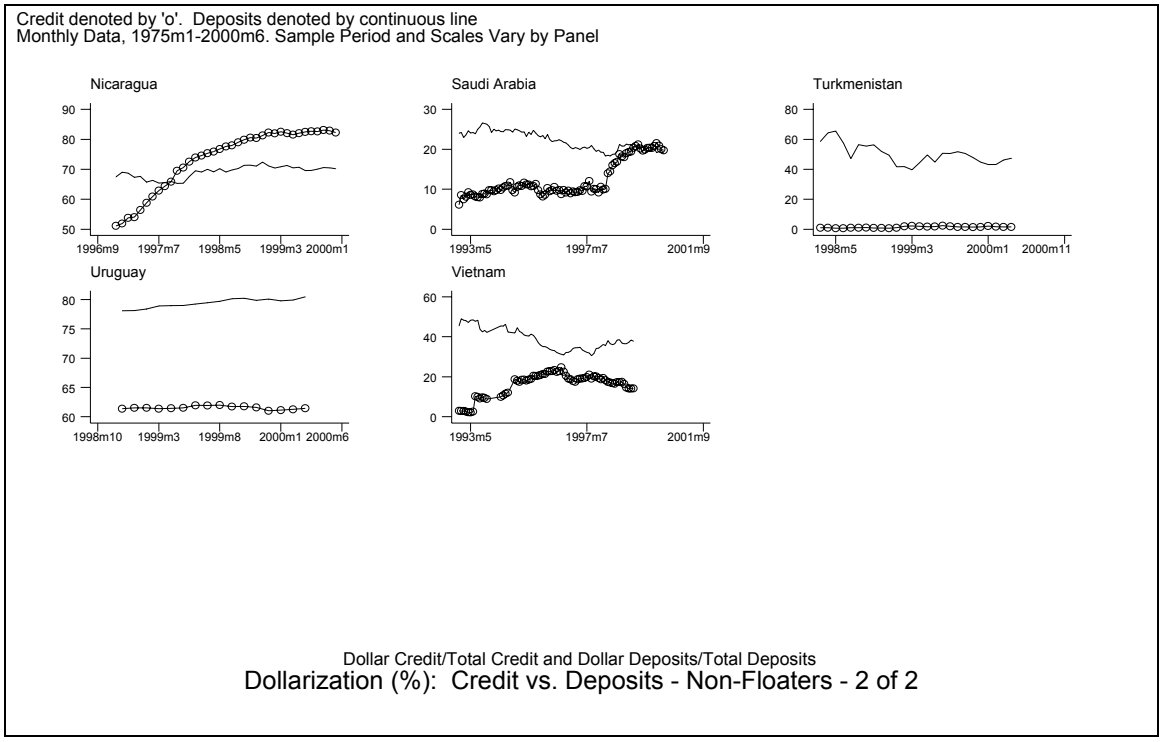


Figure C.1 (Concluded)



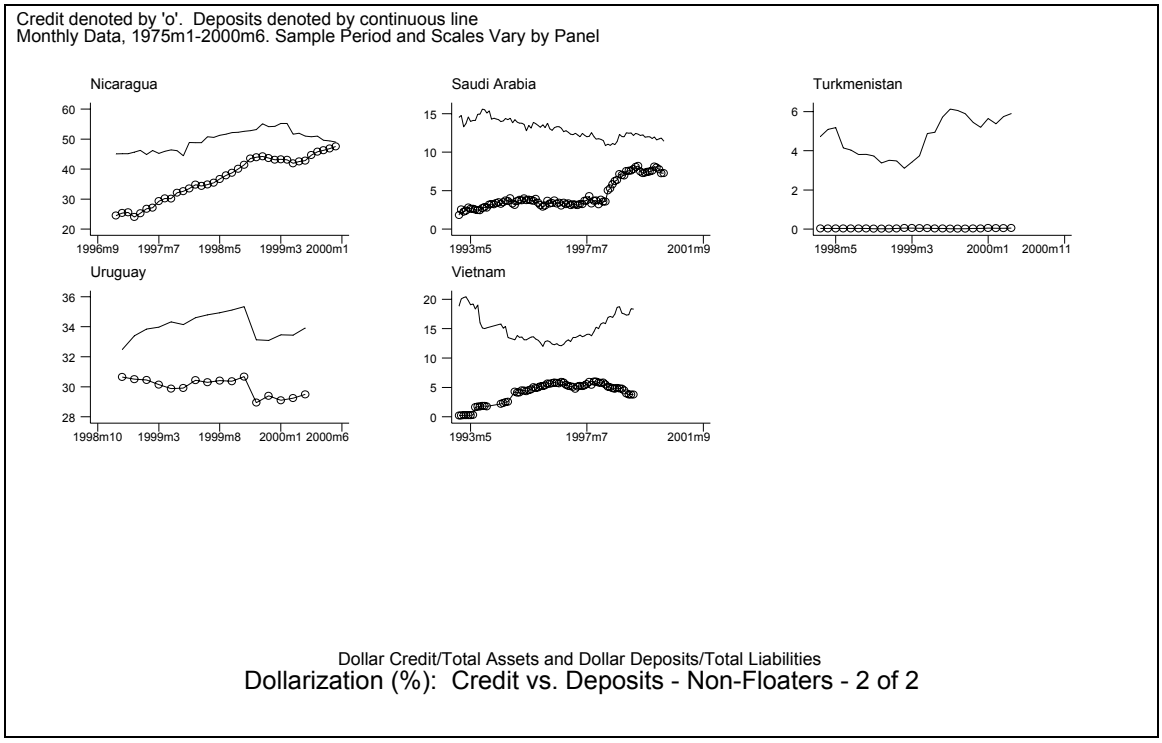
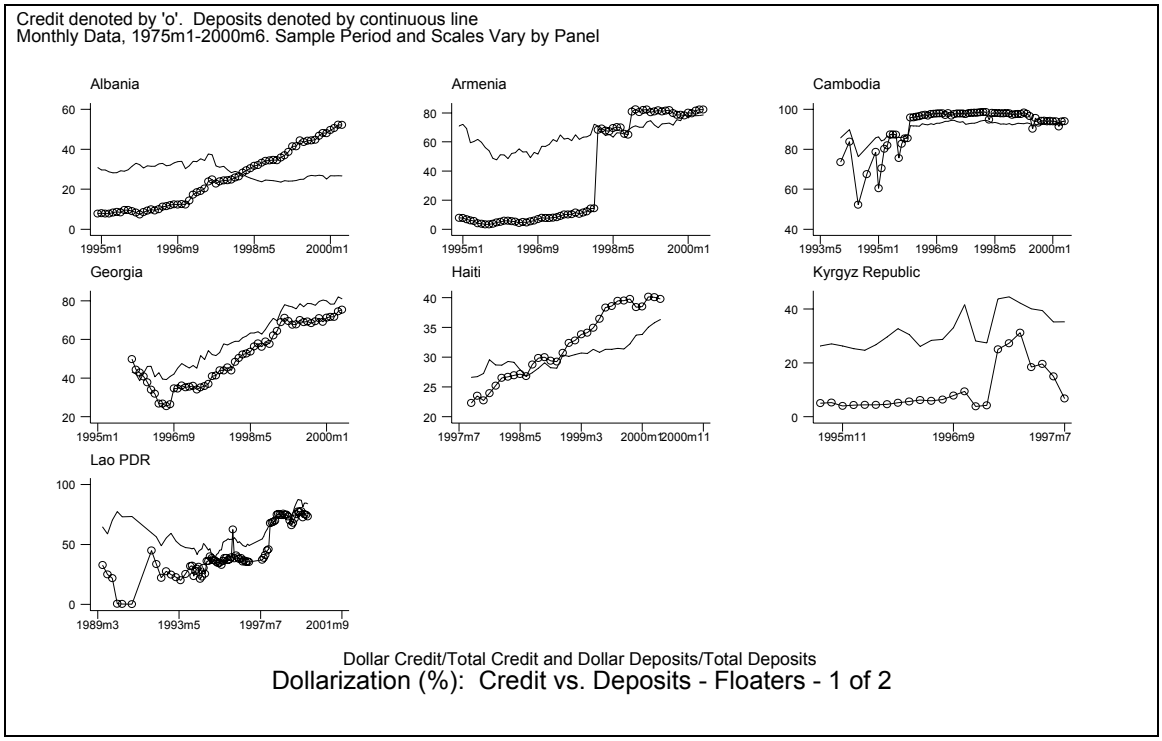


Figure C.2: Financial Dollarization, Floaters



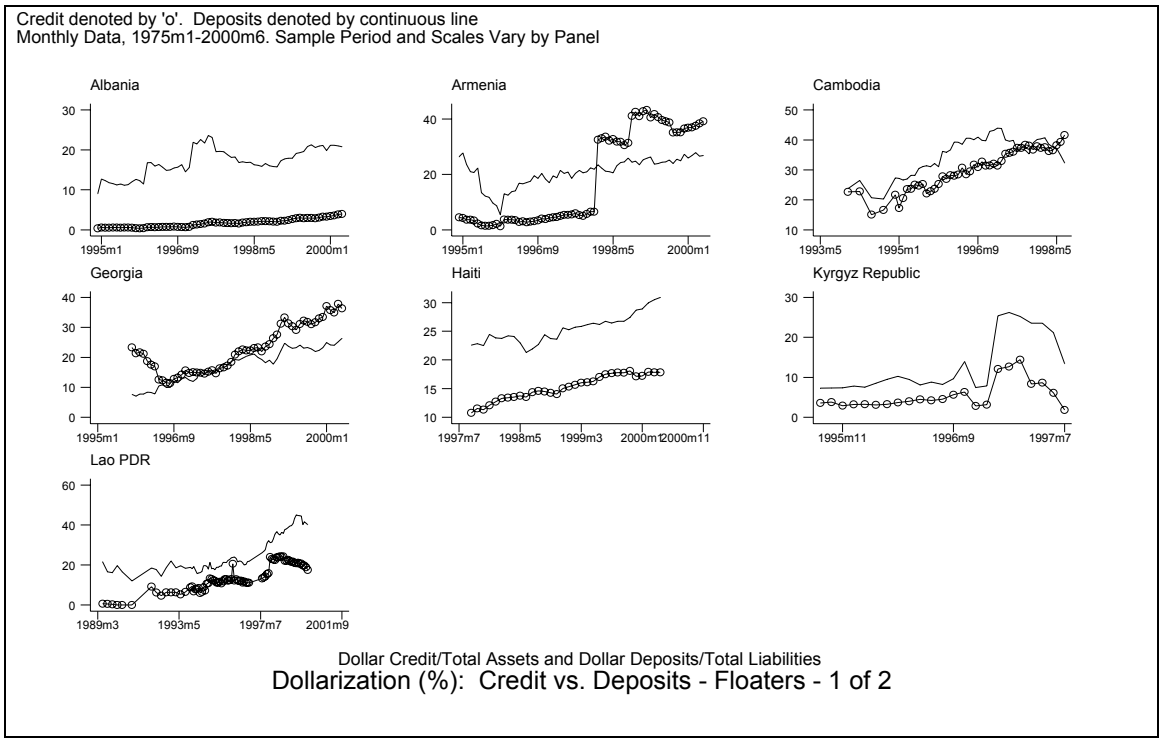
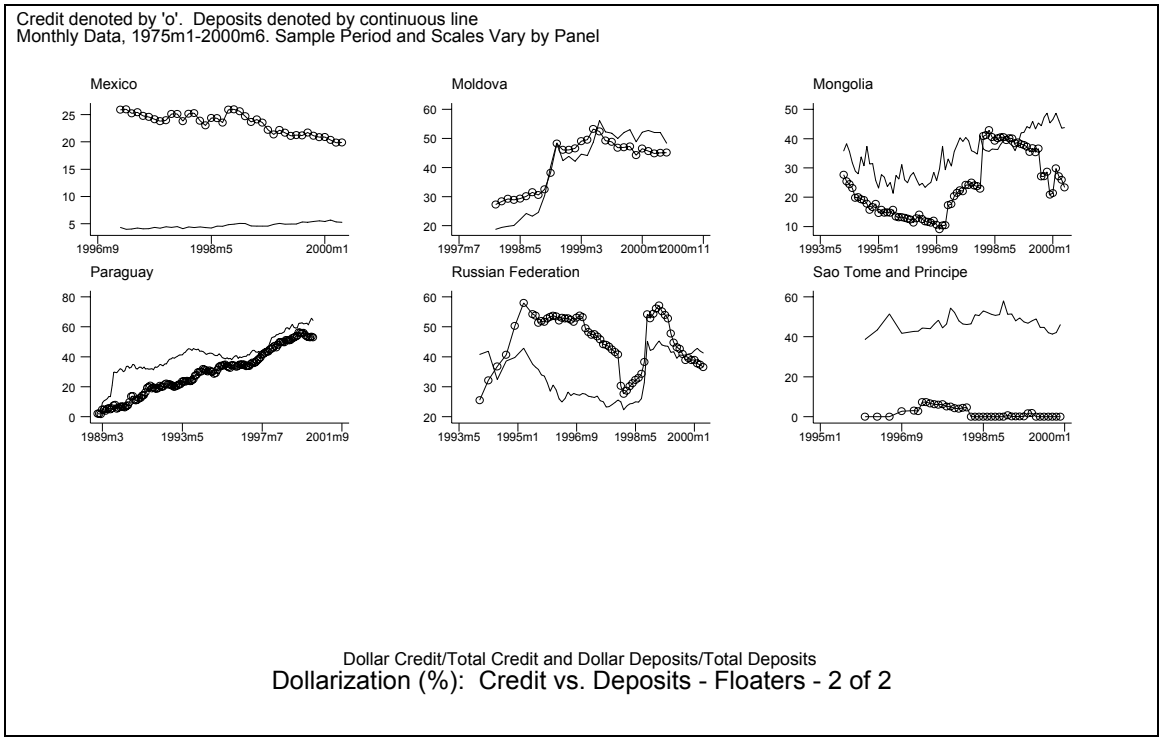


Figure C.2 (Concluded)



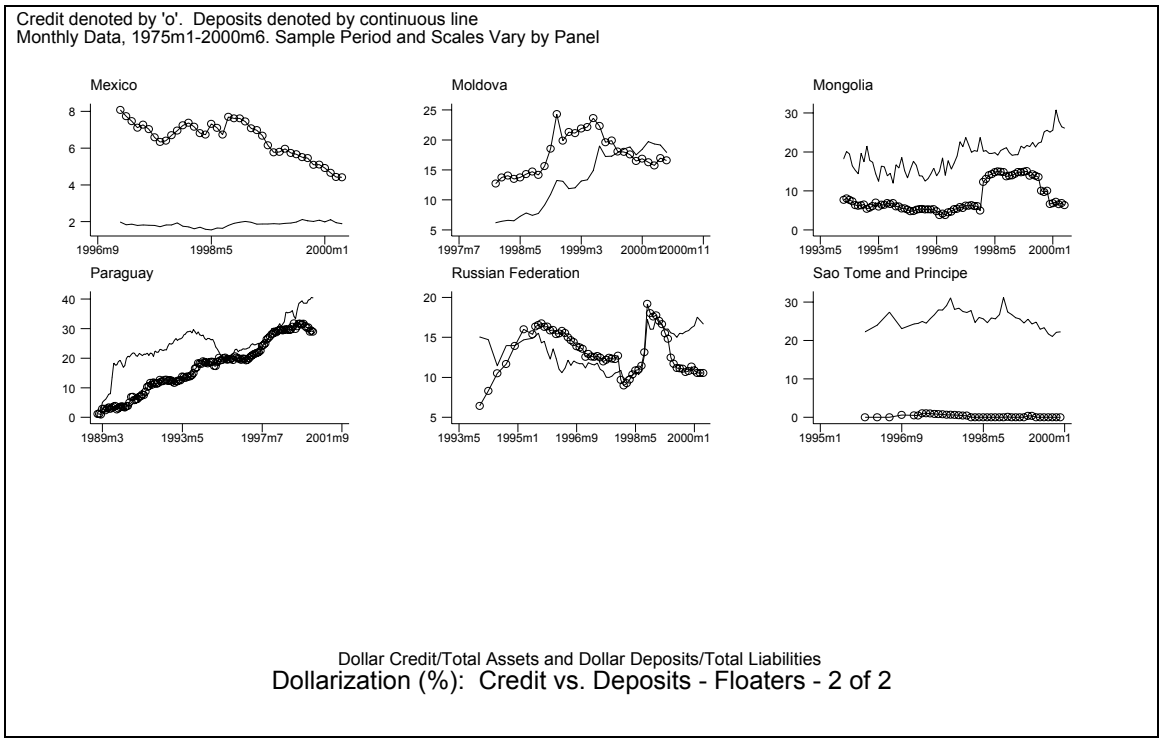
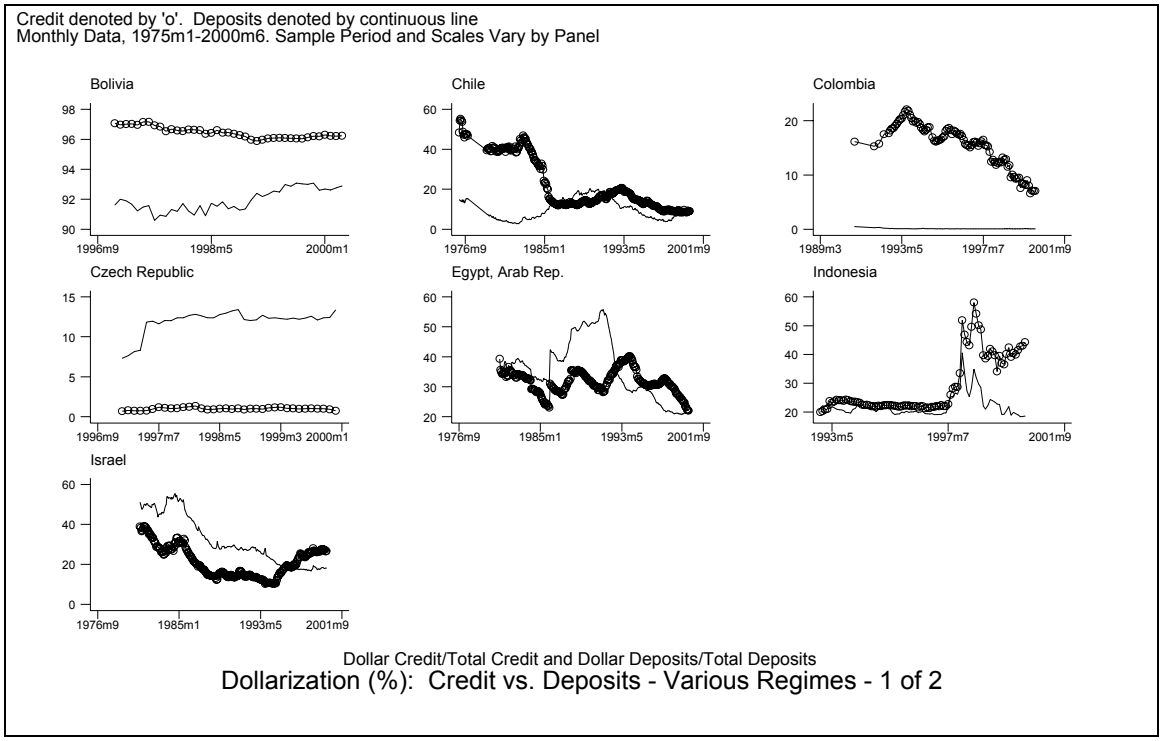


Figure C.3: Financial Dollarization, Countries Under Several Regimes



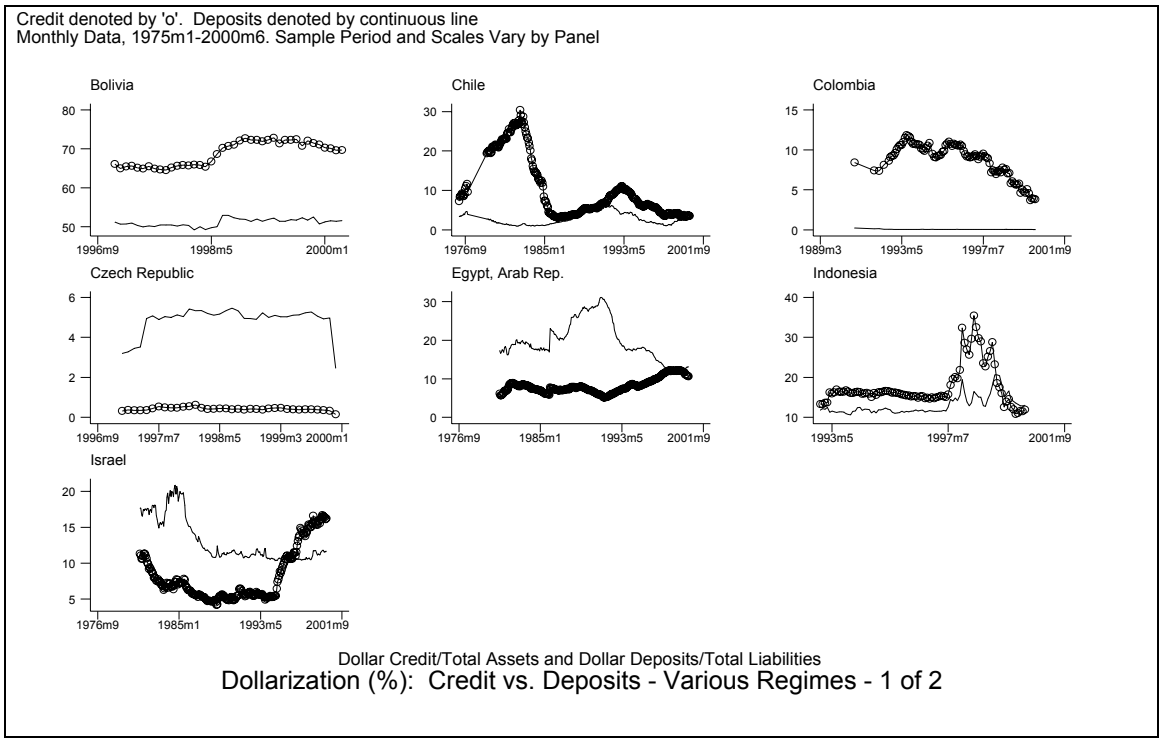
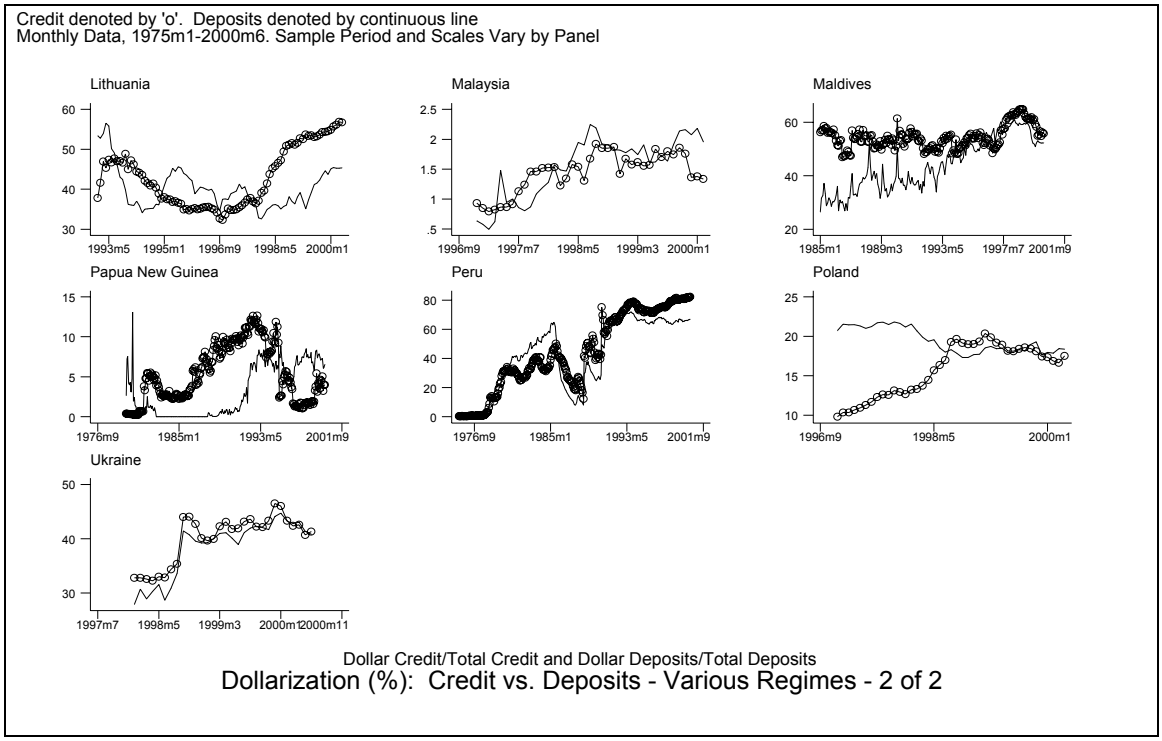
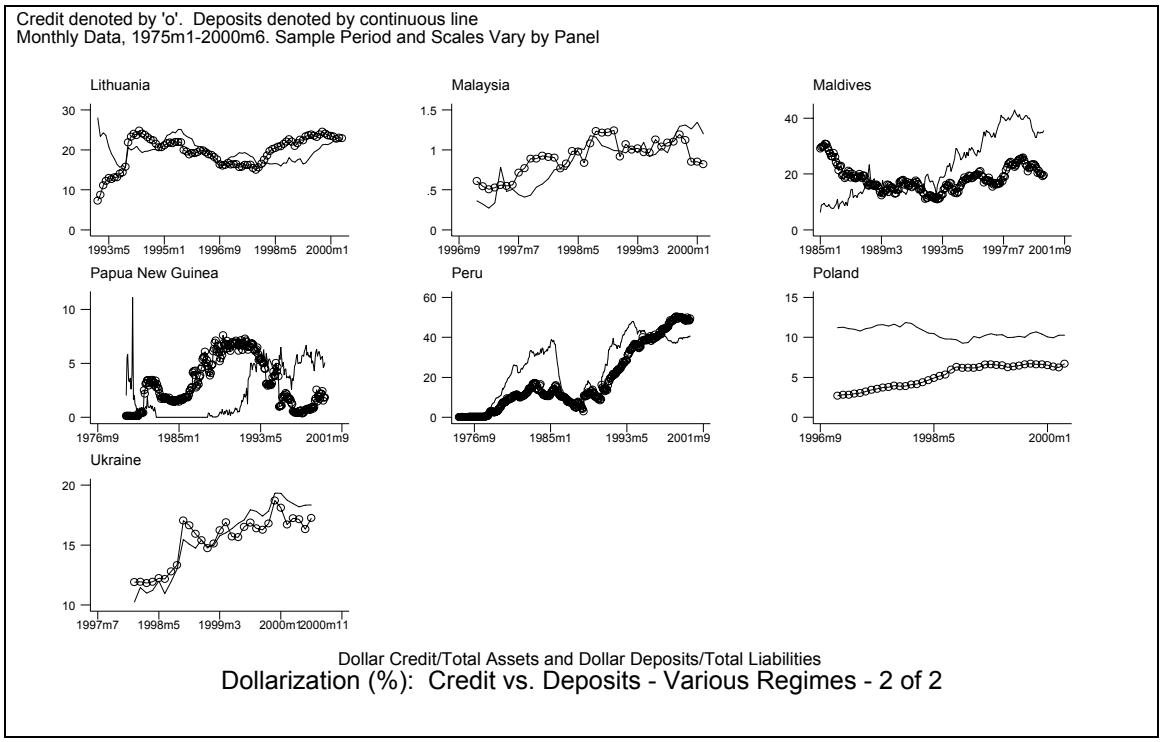


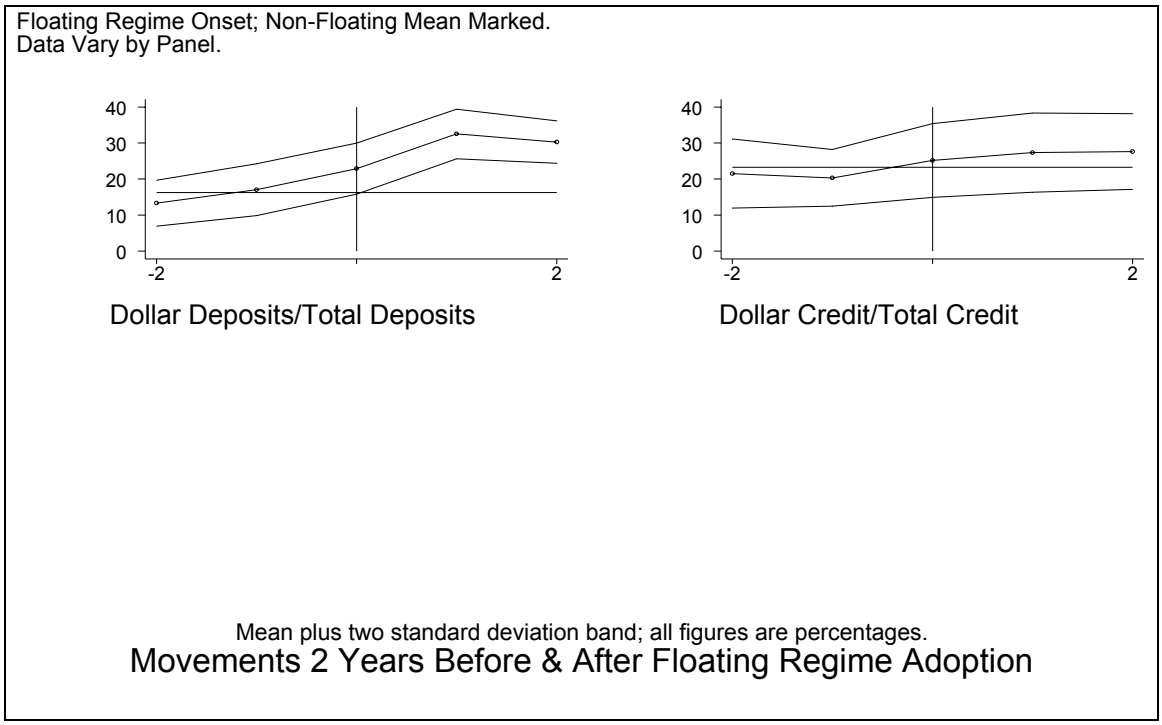
Figure C.3 (Concluded)

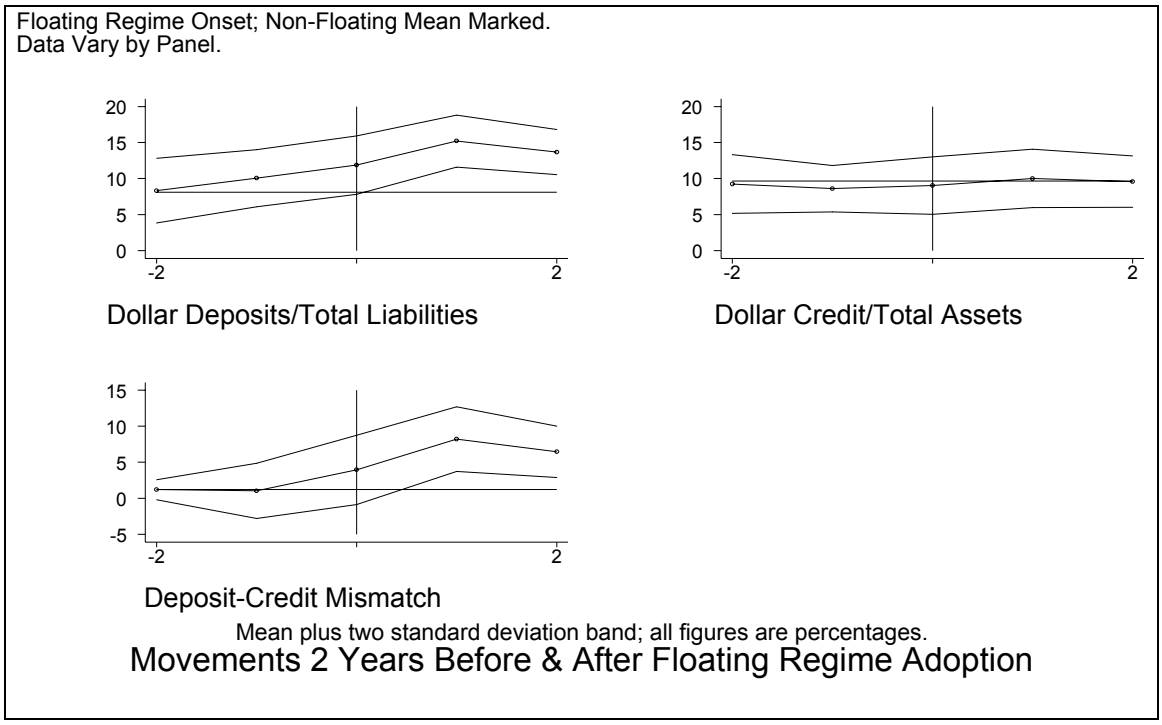




8 Figure and Tables

Figure 1: Effect of Floating Regime Adoption





Note: In all tables below, a two-sided, one-year exclusion window around floating regime adoptions is used.

Table 1
Descriptive Statistics of Dollarization Ratios Across Regimes

	(1) Dollar Credit/ Total Credit	(2) Dollar Deposit/ Total Deposit	(3) Dollar Credit/ Total Assets	(4) Dollar Deposit/ Total Liabilities	(5) Deposit-Credit Mismatch
All					
Countries	40	92	39	88	37
Observations	358	1018	352	929	314
Mean	27.23	21.64	10.95	10.38	2.83
Std. Deviation	23.32	22.10	11.88	11.43	9.42
Fixed Regimes					
Observations	108	515	108	498	98
Mean	21.86	12.83	7.77	6.49	0.27
Std. Deviation	18.45	17.99	9.05	10.00	8.44
Intermediate Regimes					
Observations	123	185	123	160	106
Mean	24.47	25.77	11.32	13.81	2.17
Std. Deviation	20.73	19.86	12.26	12.10	9.66
Floating Regimes					
Observations	97	226	91	193	82
Mean	36.56	37.01	14.15	17.01	6.17
Std. Deviation	28.21	22.57	13.13	10.19	9.35

Table 2
OLS Regressions on Exchange Rate Regimes

	(1) Dollar Credit/ Total Credit	(2) Dollar Deposit/ Total Deposit	(3) Dollar Credit/ Total Assets	(4) Dollar Deposit/ Total Liabilities	(5) Deposit-Credit Mismatch
Intermediate Regime	1.019	12.104***	2.766**	6.476***	2.227
	(2.657)	(1.663)	(1.372)	(1.070)	(1.357)
Floating Regime	14.768***	24.714***	6.503***	10.706***	6.260***
	(3.449)	(1.707)	(1.671)	(0.870)	(1.407)
Constant	21.791***	12.297***	7.651***	6.302***	-0.086
	(1.921)	(0.814)	(0.949)	(0.468)	(0.955)
Observations	300	868	294	797	259
Adjusted R^2	0.08	0.23	0.05	0.16	0.07

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3.a
OLS Regressions on Regimes and Controls: Credit and Deposit Dollarization (I)

	(1) Dollar Credit/ Total Credit	(2) Dollar Deposit/ Total Deposit	(3) Dollar Credit/ Total Credit	(4) Dollar Deposit/ Total Deposit	(5) Dollar Credit/ Total Credit	(6) Dollar Deposit/ Total Deposit	(7) Dollar Credit/ Total Credit	(8) Dollar Deposit/ Total Deposit
Intermediate Regime	-13.383***	7.261***	-14.837***	7.244***	-9.564***	7.659***	-10.583***	4.301**
	(2.794)	(2.216)	(2.783)	(2.216)	(2.411)	(1.994)	(2.536)	(1.926)
Floating Regime	-5.154	12.720***	-7.842**	12.334***	-6.775**	11.225***	-5.466*	10.293***
	(3.588)	(2.116)	(3.710)	(2.085)	(3.000)	(1.876)	(3.256)	(1.696)
Trade/GDP	-0.140***	0.013	-0.145***	0.013	-0.061*	0.032*	-0.049	0.065***
	(0.033)	(0.020)	(0.033)	(0.020)	(0.032)	(0.019)	(0.034)	(0.018)
Inflation	0.050	0.001*			0.027	-0.003***		
	(0.051)	(0.000)			(0.067)	(0.001)		
Interest Differentials	-0.007	0.062***	-0.013	0.063***	0.015	0.051***	-0.028	0.061***
	(0.042)	(0.013)	(0.020)	(0.018)	(0.054)	(0.010)	(0.022)	(0.016)
FC Loans Allowed	18.190***		18.778***		15.596***		16.972***	
	(2.010)		(2.078)		(1.908)		(2.027)	
FC Deposits Allowed		14.997***		14.936***		13.537***		12.479***
		(1.401)		(1.365)		(1.358)		(1.217)
Depreciation			0.175***	0.023			0.179***	-0.058***
			(0.065)	(0.019)			(0.066)	(0.018)
Depreciation Maximum							0.087***	0.102***
							(0.015)	(0.007)
Inflation Maximum					0.006***	0.004***		
					(0.001)	(0.001)		
Time Trend	1.255***	0.480***	1.290***	0.445***	0.903***	0.391***	0.701***	0.186**
	(0.201)	(0.106)	(0.197)	(0.103)	(0.171)	(0.097)	(0.195)	(0.090)
Constant	1.497	-6.506**	1.200	-6.125**	-0.224	-6.758***	-3.398	-9.445***
	(3.846)	(2.645)	(3.760)	(2.622)	(3.859)	(2.528)	(3.915)	(2.396)
Observations	215	574	212	587	215	574	212	587
Adjusted R^2	0.34	0.37	0.35	0.37	0.54	0.48	0.52	0.51

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3.b
OLS Regressions on Regimes and Controls: Credit and Deposit Dollarization (II)

	(1) Dollar Credit/ Total Assets	(2) Dollar Deposit/ Total Liabilities	(3) Dollar Credit/ Total Assets	(4) Dollar Deposit/ Total Liabilities	(5) Dollar Credit/ Total Assets	(6) Dollar Deposit/ Total Liabilities	(7) Dollar Credit/ Total Assets	(8) Dollar Deposit/ Total Liabilities
Intermediate Regime	-4.873*** (1.431)	4.005*** (1.146)	-4.969*** (1.417)	4.094*** (1.143)	-2.112** (1.068)	4.257*** (1.057)	-2.264* (1.310)	2.767*** (1.045)
Floating Regime	-2.492 (1.896)	6.513*** (1.096)	-2.668 (1.945)	6.265*** (1.071)	-3.341** (1.429)	6.229*** (1.020)	-1.157 (1.573)	5.540*** (0.910)
Trade/GDP	-0.078*** (0.019)	-0.013* (0.007)	-0.077*** (0.019)	-0.011 (0.007)	-0.020 (0.015)	-0.006 (0.007)	-0.017 (0.016)	0.012* (0.006)
Inflation	-0.022 (0.018)	0.000*** (0.000)			-0.030 (0.030)	-0.001* (0.001)		
Interest Differentials	0.018 (0.015)	0.025*** (0.006)	-0.005 (0.009)	0.018*** (0.006)	0.026 (0.024)	0.013 (0.008)	-0.015 (0.010)	0.016*** (0.005)
FC Loans Allowed	7.723*** (1.000)		8.091*** (1.035)		6.100*** (0.855)		6.942*** (0.999)	
FC Deposits Allowed		7.435*** (0.753)		7.304*** (0.734)		6.861*** (0.736)		6.165*** (0.671)
Depreciation			0.017 (0.029)	0.017* (0.010)			0.020 (0.026)	-0.021* (0.011)
Depreciation Maximum							0.056*** (0.010)	0.047*** (0.005)
Inflation Maximum					0.004*** (0.000)	0.002*** (0.001)		
Time Trend	0.672*** (0.115)	0.209*** (0.050)	0.689*** (0.115)	0.188*** (0.049)	0.426*** (0.080)	0.176*** (0.046)	0.314*** (0.095)	0.073* (0.042)
Constant	-0.023 (1.935)	-0.840 (1.076)	-0.858 (1.977)	-0.740 (1.066)	-1.733 (1.847)	-0.908 (1.022)	-3.781* (2.006)	-2.288** (0.945)
Observations	212	556	212	571	212	556	212	571
Adjusted R^2	0.28	0.37	0.28	0.36	0.64	0.44	0.52	0.47

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3.c
OLS Regressions on Regimes and Controls: Currency Mismatches

	(1) Deposit-Credit Mismatch	(2) Deposit-Credit Mismatch	(3) Deposit-Credit Mismatch	(4) Deposit-Credit Mismatch
Intermediate Regime	3.564*	3.274*	0.560	3.222*
	(1.830)	(1.815)	(1.601)	(1.897)
Floating Regime	8.148***	7.161***	6.510***	7.145***
	(1.700)	(1.707)	(1.542)	(1.729)
Trade/GDP	0.009	0.007	-0.021	0.005
	(0.015)	(0.016)	(0.016)	(0.017)
Inflation	0.029		0.032	
	(0.027)		(0.030)	
Interest Differentials	-0.014	-0.011	-0.016	-0.011
	(0.021)	(0.012)	(0.024)	(0.012)
FC Loans Allowed	-3.194*	-3.479*	-2.829*	-3.450*
	(1.723)	(1.826)	(1.672)	(1.857)
FC Deposits Allowed	3.476	4.105*	3.635	4.111*
	(2.299)	(2.351)	(2.273)	(2.369)
Depreciation		0.081*		0.080*
		(0.045)		(0.045)
Inflation Maximum			-0.001***	
			(0.000)	
Depreciation Maximum				-0.001
				(0.007)
Time Trend	-0.404***	-0.417***		-0.408***
	(0.114)	(0.121)		(0.125)
Constant	5.711*	5.722*	2.317	5.793*
	(3.163)	(3.185)	(2.607)	(3.232)
Observations	177	177	177	177
Adjusted R^2	0.12	0.13	0.16	0.13

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4
OLS Regressions with Deposit Insurance and Forward Market Indicators

	(1) Dollar Credit/ Total Credit	(2) Dollar Deposit/ Total Deposit	(3) Deposit-Credit Mismatch	(4) Dollar Credit/ Total Credit	(5) Dollar Deposit/ Total Deposit	(6) Deposit-Credit Mismatch
Intermediate Regime	-8.160***	2.800	2.879	-9.306***	3.278	3.822*
	(2.396)	(1.960)	(1.816)	(2.902)	(2.158)	(2.044)
Floating Regime	-1.465	7.894***	5.212***	-4.404	9.209***	6.831***
	(3.069)	(1.775)	(1.682)	(3.271)	(1.740)	(1.757)
Trade/GDP	-0.034	0.077***	-0.015	-0.035	0.061***	0.022
	(0.036)	(0.019)	(0.017)	(0.042)	(0.019)	(0.018)
Inflation	0.057	-0.002***	0.013	0.055	-0.002***	0.035
	(0.080)	(0.001)	(0.024)	(0.084)	(0.001)	(0.026)
Depreciation Maximum	0.082***	0.100***	0.004	0.088***	0.098***	-0.001
	(0.018)	(0.007)	(0.009)	(0.016)	(0.007)	(0.008)
Interest Differentials	-0.025	0.037***	-0.000	-0.027	0.037***	-0.026
	(0.065)	(0.011)	(0.019)	(0.070)	(0.010)	(0.020)
FC Loans Allowed	14.576***		-1.849	17.442***		-0.941
	(2.091)		(1.748)	(2.790)		(1.710)
FC Deposits Allowed		14.027***	6.750***		13.183***	3.450
		(1.357)	(2.191)		(1.374)	(2.247)
Time Trend	0.581***	0.191*	-0.293***	0.763***	0.183*	-0.323**
	(0.184)	(0.098)	(0.108)	(0.212)	(0.101)	(0.148)
Deposit Insurance	5.650	-0.950	-6.296***			
	(4.546)	(1.766)	(2.176)			
Forward Market				-2.526	-0.648	-5.963***
				(3.211)	(1.489)	(1.714)
Constant	-1.866	-10.185***	3.165	-4.197	-8.699***	6.005*
	(4.614)	(2.390)	(2.838)	(4.921)	(2.564)	(3.353)
Observations	206	506	171	200	548	165
Adjusted R^2	0.51	0.51	0.17	0.50	0.51	0.20

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5
OLS Regressions Disaggregating IMF Floating Regime

	(1) Dollar Credit/ Total Credit	(2) Dollar Credit/ Total Credit	(3) Dollar Deposit/ Total Deposit	(4) Dollar Deposit/ Total Deposit	(5) Deposit-Credit Mismatch	(6) Deposit-Credit Mismatch
Intermediate Regime	1.019	-8.591***	12.325***	3.900**	2.227	3.389*
	(2.662)	(2.499)	(1.671)	(1.960)	(1.359)	(1.976)
Managed Floating	27.621***	10.163**	28.464***	14.976***	5.438***	7.431***
	(5.543)	(4.773)	(2.843)	(2.572)	(1.808)	(2.379)
Independent Floating	8.798**	-6.555**	22.756***	7.104***	6.638***	8.487***
	(3.670)	(3.302)	(1.930)	(1.836)	(1.616)	(1.825)
Trade/GDP		-0.022		0.066***		0.001
		(0.035)		(0.018)		(0.017)
Inflation		0.026		-0.002***		0.029
		(0.071)		(0.001)		(0.027)
Depreciation Maximum		0.099***		0.102***		-0.004
		(0.015)		(0.007)		(0.008)
Interest Differentials		-0.002		0.035***		-0.015
		(0.058)		(0.010)		(0.022)
FC Loans Allowed		15.245***				-3.080
		(2.260)				(1.886)
FC Deposits Allowed				12.393***		3.622
				(1.225)		(2.507)
Time Trend		0.577***		0.206**		-0.374***
		(0.191)		(0.090)		(0.120)
Constant	21.791***	-3.244	12.297***	-9.921***	-0.086	6.022*
	(1.924)	(4.493)	(0.814)	(2.451)	(0.957)	(3.254)
Observations	301	210	867	570	260	175
Adjusted R^2	0.12	0.54	0.23	0.52	0.06	0.11

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6
Panel Regressions

	(1) Dollar Credit/ Total Credit Fixed Effects	(2) Dollar Credit/ Total Credit Random Effects	(3) Dollar Deposit/ Total Deposit Fixed Effects	(4) Dollar Deposit/ Total Deposit Random Effects	(5) Deposit-Credit Mismatch Fixed Effects	(6) Deposit-Credit Mismatch Random Effects
Intermediate Regime	0.039	-0.017	-4.642***	-4.140***	-0.102	-0.310
	(2.736)	(2.537)	(1.363)	(1.347)	(1.631)	(1.519)
Floating Regime	-5.394	-1.232	4.523**	4.527***	11.712***	8.174***
	(5.126)	(3.547)	(1.760)	(1.639)	(3.011)	(1.986)
Trade/GDP	0.086	0.034	0.005	0.020	-0.041	-0.009
	(0.062)	(0.046)	(0.020)	(0.018)	(0.034)	(0.025)
Inflation	0.009	-0.003	-0.001***	-0.001***	0.041**	0.051***
	(0.039)	(0.035)	(0.000)	(0.000)	(0.021)	(0.019)
Depreciation Maximum	0.033	0.098***	0.125***	0.121***	0.072*	0.005
	(0.067)	(0.018)	(0.006)	(0.006)	(0.039)	(0.010)
Interest Differentials	0.035	0.032	0.026***	0.027***	-0.034*	-0.032*
	(0.032)	(0.031)	(0.007)	(0.007)	(0.017)	(0.017)
FC Loans Allowed	52.567**	24.239***			-26.550*	-4.644
	(25.383)	(6.025)			(15.372)	(4.280)
FC Deposits Allowed			5.333***	6.737***	-1.273	1.220
			(1.659)	(1.585)	(5.603)	(3.932)
Time Trend	0.431*	0.336*	0.040	0.049	-0.573***	-0.377***
	(0.252)	(0.196)	(0.060)	(0.060)	(0.166)	(0.125)
Constant	-34.160*	-12.231*	4.487**	4.734*	27.173***	9.668***
	(17.484)	(6.532)	(2.227)	(2.784)	(9.556)	(3.697)
Country Effects	33	33	76	76	31	31
Observations	210	210	570	570	175	175
R^2	0.50		0.62		0.22	

Standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 7
IV Regressions

	(1) Dollar Credit/ Total Credit IV	(2) Dollar Credit/ Total Credit OLS	(3) Dollar Deposit / Total Deposit IV	(4) Dollar Deposit/ Total Deposit OLS	(5) Deposit-Credit Mismatch IV	(6) Deposit-Credit Mismatch OLS
Intermediate Regime	-34.001*** (10.178)	-9.374*** (2.565)	-2.626 (7.609)	4.036** (1.955)	17.463* (9.449)	3.467* (1.927)
Floating Regime	-12.115 (11.730)	-3.575 (3.217)	37.054*** (9.796)	9.662*** (1.697)	3.154 (6.975)	8.258*** (1.713)
Trade/GDP	-0.079 (0.058)	-0.043 (0.036)	0.133*** (0.043)	0.064*** (0.018)	0.037 (0.036)	0.002 (0.017)
Inflation	-0.041 (0.078)	0.046 (0.078)	-0.002*** (0.001)	-0.002*** (0.001)	0.072* (0.042)	0.028 (0.028)
Depreciation Maximum	0.075*** (0.018)	0.089*** (0.015)	0.102*** (0.011)	0.098*** (0.007)	0.009 (0.009)	-0.003 (0.007)
Interest Differentials	0.057 (0.062)	-0.018 (0.064)	-0.002 (0.032)	0.038*** (0.011)	-0.038 (0.034)	-0.014 (0.023)
FC Loans Allowed	18.307*** (2.646)	16.275*** (2.123)			-8.347*** (3.126)	-3.201* (1.842)
FC Deposits Allowed			3.547 (2.874)	12.494*** (1.223)	13.374*** (4.857)	3.682 (2.459)
Time Trend	1.140** (0.475)	0.664*** (0.197)	-0.433 (0.301)	0.215** (0.090)	-0.641* (0.376)	-0.381*** (0.118)
Constant	2.515 (5.594)	-2.895 (4.537)	-6.860** (3.103)	-9.747*** (2.454)	-0.726 (5.277)	5.954* (3.219)
Hausman χ^2 test [P-value]		24.14 [0.00]		32.56 [0.00]		10.63 [0.30]
Observations	189	210	465	570	154	175
R-squared	0.32	0.53	0.21	0.52		0.16

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.
Instruments in 2SLS: terms-of-trade changes, land area, intermediate and floating regime for earliest year available (usually 1974).

Table 8
IV Regressions with Fitted Probabilities as Instruments

	(1) Dollar Credit/ Total Credit IV	(2) Dollar Credit/ Total Credit OLS	(3) Dollar Deposit/ Total Deposit IV	(4) Dollar Deposit/ Total Deposit OLS	(5) Deposit-Credit Mismatch IV	(6) Deposit-Credit Mismatch OLS
Intermediate Regime	-71.884** (35.647)	-9.374*** (2.565)	30.685 (18.896)	4.036** (1.955)	31.175** (12.530)	3.467* (1.927)
Floating Regime	-22.169 (23.517)	-3.575 (3.217)	40.893*** (10.939)	9.662*** (1.697)	14.460* (7.755)	8.258*** (1.713)
Trade/GDP	-0.171 (0.110)	-0.043 (0.036)	0.178*** (0.056)	0.064*** (0.018)	0.072* (0.040)	0.002 (0.017)
Inflation	-0.097 (0.105)	0.046 (0.078)	-0.002** (0.001)	-0.002*** (0.001)	0.094* (0.050)	0.028 (0.028)
Depreciation Maximum	0.045 (0.032)	0.089*** (0.015)	0.093*** (0.012)	0.098*** (0.007)	0.014 (0.012)	-0.003 (0.007)
Interest Differentials	0.093 (0.084)	-0.018 (0.064)	-0.003 (0.040)	0.038*** (0.011)	-0.057 (0.038)	-0.014 (0.023)
FC Loans Allowed	21.976*** (4.740)	16.275*** (2.123)			-9.554*** (3.626)	-3.201* (1.842)
FC Deposits Allowed			3.531 (2.912)	12.494*** (1.223)	16.962*** (6.360)	3.682 (2.459)
Time Trend	1.878* (1.125)	0.664*** (0.197)	-0.756* (0.394)	0.215** (0.090)	-1.247*** (0.460)	-0.381*** (0.118)
Constant	12.862 (11.782)	-2.895 (4.537)	-10.120*** (3.840)	-9.747*** (2.454)	-2.479 (6.613)	5.954* (3.219)
Hausman χ^2 test [P-value]		5.56 [0.70]		17.25 [0.02]		8.62 [0.38]
Observations	189	210	465	570	154	175
R-squared		0.53	0.23	0.52		0.16

Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.
Explanatory variables in preliminary ordered probit regression: terms-of-trade changes, land area, exchange rate regime for earliest year available (usually 1974).
Instruments in 2SLS: Fitted probabilities of intermediate and floating regimes from preliminary ordered probit regression.