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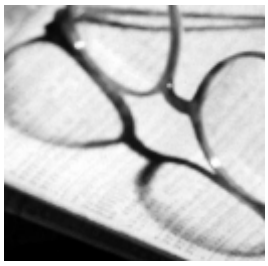


FINANCIAL DOLLARISATION:
EVALUATING THE CONSEQUENCES

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SUMMARY

Financial dollarisation, defined as the holding by residents of foreign currency assets and liabilities, has been placed at the forefront of the policy debate in developing economies. The reasons include its alleged influence on the conduct of monetary policy and, most prominently, the deleterious impact of exchange rate depreciations on the solvency of dollar debtors (the balance sheet effect). However, the vast analytical literature on these issues contrasts with the scarcity of empirical work to support or refute these implications. This paper contributes to fill this gap. Using a new updated database, the paper revisits the evidence on the determinants of financial dollarisation, and tests whether the impact on monetary and financial stability, and economic performance predicted by the theory is verified in the data. It finds that financially dollarised economies display a more unstable demand for money, a greater propensity to suffer banking crises after a depreciation of the local currency, and slower and more volatile output growth, without significant gains in terms of domestic financial depth. In this light, the case for an active de-dollarisation policy is discussed.

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1. INTRODUCTION

Residents in developing economies save and borrow in the foreign currency. On average, by the end of 2000, 35 percent of domestic bank deposits (and a comparable share of domestic banks loans) in developing economies was foreign denominated –44 percent, if we exclude countries where dollar deposits are legally banned. So was virtually all their stock of external obligations. This phenomenon, generically labelled financial dollarisation (FD), has been increasingly seen both in academic and policy circles as a source of concern due to its potentially adverse implications for monetary and financial stability, and overall economic performance.[2] The purpose of this paper is to evaluate empirically whether and to what extent these concerns are validated by the data.

1.1. What is it?

The term dollarisation has been used to denote diverse set of related phenomena. Thus, while official (or de jure) dollarisation refers to the case in which the foreign currency is given (usually exclusive) legal tender status, unofficial (or de facto) dollarisation is broadly used to indicate the use of a foreign currency alongside the national currency when the former is not legal tender. In turn, a distinction is usually made between two types of de facto dollarisation: currency substitution (the use of the foreign currency as medium of exchange) and asset substitution (its use as store of value). This distinction is not merely rhetorical, as currency and asset substitution are phenomena of a different nature. In particular, one would expect the nominal peso-dollar interest rate differential to affect the currency composition of cash holdings. Thus, high inflation (to the extent that it leads to an exchange rate depreciation that is reflected in the interest rate differential) should foster currency substitution. By contrast, the composition of interest-bearing financial assets (to the extent that interest rates adjust to equalize real returns across currencies) should be immune to the inflation *level*.[3] Indeed, the early empirical tests of dollarisation that were based on models of currency composition but, due to the lack of data on foreign currency holdings, used dollarisation ratios such as the dollar share of bank deposits or M2, reflected primarily the composition of interest-bearing deposit, that is, asset substitution.[4]

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[2] Following what has become standard in the dollarisation literature, dollar and foreign currency, and peso and local currency are used here interchangeably.

[3] Thomas (1985) provides an early discussion of this point.

[4] Calvo and Vegh (1992) highlights this definitional problem. Anecdotal evidence (some of which is discussed below) indicates that the two phenomena behave quite differently, and that the degree of asset substitution tends to exceed that of currency substitution in most cases. Recent efforts to measure actual foreign currency holdings have helped revived the empirical literature on currency substitution. See, for example, Feige (2002).

Whereas asset substitution focuses on the asset side of the balance sheet, specifically asking whether and why residents save in a foreign currency, the more recent literature have centred on the concept of liability dollarisation (which, predictably, denotes the dollarisation of residents´ liabilities), in line with the view of dollar debt as a source of currency exposure and vulnerability to external shocks.[5] Around the same time, the term financial dollarisation (FD) was coined to refer more broadly to the holding by the country's residents of financial assets and liabilities denominated in the foreign currency, explicitly acknowledging the fact that observed dollarisation reflects both the demand and the supply of dollar assets, and that any analysis of its causes and persistence should take into account both sides of the market.[6] This definition, which brings together the two strands of the debate on de facto dollarisation, comprises any financial asset (domestic and external) denominated in a foreign currency, as long as a resident (private or public) is on either side of the contract –including, naturally, official lending to the country. This is the phenomenon studied in this paper.

1.2. Where is it?

The literature of financial dollarisation has tended to focus on Latin American countries, where most of the earlier work on currency substitution was motivated (as a result of a history of high inflation), and where the persistence of dollarisation was more readily apparent. However, the evidence shows that the phenomenon is far from regional. A cursory look at the distribution of economies with deposit dollarisation ratios above 10 percent shows a fairly balanced picture (Figure 1).

In fact, by 2000, out of the ten countries with the largest deposit dollarisation ratio, one could find two from East Asia (Cambodia and Laos), four transition economies, including one country in the EMU accession list (Armenia, Azerbaijan, Croatia and Georgia), one from Africa (Angola) and only three from Latin America (Bolivia, Nicaragua, and Uruguay). Moreover, even in emerging countries such as Malaysia or Thailand where deposit dollarisation is not significant due to legal restrictions, there still exists a substantial stock of external dollar liabilities.[7] Ultimately, as this paper documents in more detail below, FD has proved important and persistent in developing countries around the globe.

[5] See (Calvo, 1999) for an early reference.
[6] See Ize and Levy Yeyati (2003).
[7] Following standard conventions, by external liability I refer to an obligation issued under international (as opposed to domestic) Law. Thus, debt issued under New York Law would be domestic if the issuer is a U.S. resident and external otherwise, irrespective of the nationality of the holder.

1.3. Why do we care?

The early literature inspired by currency substitution models tended to regard dollarisation as an obstacle for the conduct of monetary policy. Specifically, it argued that dollarised economies exhibit a more unstable demand for money and a more elastic price response to monetary shocks, as the currency composition of liquid balances becomes more sensitive to devaluation expectations. While the argument is more naturally related to currency substitution, monetary policy may still be influenced by FD (or, more specifically, by deposit dollarisation) to the extent that the composition of deposits impact on the demand for reserves. At any rate, the conventional view that dollarisation poses a challenge to monetary policy has not lost ground among policy makers (see, e.g., Baliño et al., 1999), and deserves to be revisited in a systematic way.

More recently, the dollarisation debate has centred on the incidence of *balance sheet effects*. In a nutshell, the concern stems from the fact that widespread FD inevitably introduces a currency imbalance for the economy as a whole. This imbalance may affect the banking sector, if local banks fund themselves in foreign currency (for example, through dollar deposits or foreign borrowing) and on-lend the proceeds domestically in the local currency. More typically, however, currency mismatches are present at the borrower's level, as local banks, constrained by prudential limits on their foreign currency position, lend their dollars to borrowers whose income is largely denominated in the local currency (or, more precisely, follows closely the evolution of the local price index). This currency imbalance creates balance sheet problems in the event of a sharp real exchange rate depreciation, as the increase in the local currency value of dollar liabilities outpaces the increase in assets –even for the case of currency balanced banks, to the extent that their dollar debtors are no longer able to service their loans. A similar argument can be made for the sovereign debt: foreign-currency denominated external liabilities increases the vulnerability of the country to sizeable depreciations of the local currency. In turn, the resulting exposure to real exchange rate changes amplifies the impact of real shocks or speculative attacks on the currency, ultimately leading to massive bankruptcies, economic contraction and financial collapse.[8]

It was the stream of financial crises in Asia that triggered the interest in the balance sheet channel. As Krugman (1999) summarizes the Asian episodes, "descriptive accounts both of the problems of the crisis countries and of the policy discussions that led the crisis to be handled in the way it was place extensive emphasis on the problems of firms' balance sheets." This view has

[8] Stimulated by the recent episodes of financial distress, the topic of balance sheet effects in dollarized economies have spawned a large analytical literature that include, among many others, Krugman (1999), Chang and Velasco (2000), Aghion, Banerjee and Bacchetta (2000), Cespedes, Chang and Velasco (2004), and Caballero and Krishnamurty (2002).

only consolidated over time. Currency mismatches certainly played a role in the end-2000 Turkish banking crisis, where "banks' net (foreign currency) open positions nearly doubled during the first nine months of 2000," (OECD, 2001), and were key drivers of the currency collapses in Brazil (1999), Argentina (2002) and Uruguay (2002). Looking back to the record of recent financial crises, Hausmann and Velasco (2004) find that "in Asia and elsewhere, the preponderance of dollar debts was very much at the root of this vulnerability to financial panic".

In addition to its impact on financial fragility, this balance sheet effect may detract from, and ultimately invert the effectiveness of exchange rate adjustments to buffer real shocks.[9] Thus, examining the reasons why devaluations have been economically so costly in emerging economies, Frankel (2004) concludes that "…on the list of contractionary channels, the balance sheet effect is the one that has dominated in terms of attention from researchers, and I think appropriately so." As a result, financially dollarised economies would exhibit greater output volatility. Moreover, this real exchange rate exposure may explain the procyclical pattern of international capital flows to financially dollarised emerging economies, as negative real shocks that tend to depreciate the local currency increase at the same time the leverage ratio of dollar debtors, amplifying the effect of the cycle on the debtor's capacity to pay.

To what extent this balance sheet effect materializes in reality? To what extent dollarised economies are more prone to suffer financial crisis, and exhibit a more volatile and unstable growth as the theory envisages? The answer to these questions is still subject to debate. The vast body of analytical literature on FD and currency mismatches contrasts with the scarcity of empirical work to support or refute its implications.[10] The same can be said, to a lesser extent, of the consequences of FD on the conduct of monetary policy. The purpose of this paper is to contribute to fill this gap.

1.4. What does the paper do?

The paper examines whether the consequences of FD predicted by theory are verified in the data. To do that, it proceeds in steps. The next section covers the critical and controversial issue of measurement, describes a new updated database on alternative sources of FD (and the still important data limitations), and presents basic statistics describing levels, trends and geographical distribution. Section 3 presents a summary of the main (often complementary)

[9] Cespedes, Chang and Velasco (2003) provide a stylized analytical illustration of this point. This, in turn, may lead the monetary authorities to limit the flexibility of exchange rates, which may explain the tendency to attenuate exchange rate fluctuations through foreign exchange intervention under formally floating exchange rate regimes highlighted by Calvo and Reinhart (2002), and the finding that financially dollarized countries tend to adopt more rigid exchange rate regimes reported in Levy Yeyati and Sturzenegger (2003).

[10] The few exceptions include De Nicoló et al. (2003), Arteta (2002), and Calvo et al. (2003).

explanations of FD proposed by the theoretical literature, and reports some (old and new) supporting empirical tests. Section 4 tackles the key questions of the paper. After analysing in more detail the link between FD, on the one hand, and monetary policy and the balance sheet effect of a depreciation of the local currency, on the other, it proposes different empirical tests based on the available evidence. The results show that financially dollarised economies tend to exhibit a higher price elasticity to monetary shocks (and, partially as a result, higher inflation rates), greater propensity to suffer banking crises after exchange rate depreciations, and slower and more volatile output growth, with no significant gain in terms of domestic financial depth. In this light, Section 5 discusses the case for an active de-dollarisation policy, and concludes.

2. MEASURING FD

In the context of the FD debate, measurement is certainly a non-trivial aspect for at least two reasons. First, the relevant aspect of FD (and, in turn, the way it is measured) is not independent of the particular issue under study. For example, any impact that FD may have on monetary stability is likely to arise from the link between the (unobserved) currency composition of liquid balances, and the composition of residents' savings (captured, for example, by the deposit dollarisation ratio). Similarly, testing the influence of FD on banking crisis propensity would require a measure of the dollarisation ratio of the balance sheet of domestic financial institutions. As noted, matching dollar liabilities by lending in dollars to non-dollar earners mitigates the balance sheet effect of a real devaluation only to a very minor degree, as the currency exposure is simply transfer to the dollar borrower at the expense of greater credit risk. Hence, a focus on the gross (rather than the net) short currency position would be appropriate, for which the share the onshore deposit dollarisation ratio and the share of foreign bank liabilities would be reasonably good proxies. By contrast, the contractionary balance sheet effect of exchange rate depreciations on economic performance may also be channelled through the dollarisation of liabilities in the non-financial sector. Therefore, a test of the link between FD and output volatility would need to consider, in addition, alternative sources of dollar indebtedness (including dollar loans and bonds, as well as official lending).

A second reason why measurement plays an important role is of a more practical nature: the choice of a measure is severely constrained by data availability, in terms of both country and period coverage. Reliable data is already available on official credit (reported in the World Bank's *Global Development Finance*), cross-border loans and, for a more limited sample,

external bonded debt (the last two items are reported by the BIS).[11] In addition, a substantial amount of information on the currency composition of domestic deposits can be collected from different sources. The deposit dollarisation series compiled for this paper assembles data reported in various central bank bulletins and International Monetary Fund Article IV Staff Reports, as well as previous empirical work by De Nicoló et al. (2003), Arteta (2002), and Baliño et al. (1998). As a result, the final series covers over 1524 observations for 122 developed and developing countries over the period 1975-2002.[12] In turn, deposit dollarisation ratios can be used as a sensible proxy for domestic loan dollarisation, since they often mirror each other due to the presence of prudential limits on banks' foreign exchange positions (Figure 2).

On the other extreme, reliable information on the currency composition of domestic public debt is quite difficult to produce, while data on (both the composition and the level of) domestic private debt in developing countries is a rarity. [13] For this reason, no measure of dollarisation of domestic bonded debt is used in the empirical analysis below.

2.1. FD and the currency mismatch

The emphasis on gross (domestic and external) dollar liabilities made in this paper explicitly takes sides on an issue that is certainly far from settled. In general, a currency mismatch could be defined as "the sensitivity of net worth or of the present value of net income to changes in the exchange rate" (Goldstein and Turner, 2004), which, for the purpose of measurement, could be characterized simply by the net foreign currency position (that is, foreign currency assets minus foreign currency liabilities). However, the *level* at which the netting should be carried out (individual households and firms, the government, the financial and non-financial sector, the economy as a whole) is far from obvious.

One strand of the literature on currency mismatches stresses the need to centre on the country's foreign currency indebtedness vis à vis non-residents, in the view that "the assets and liabilities of residents cancel out in the aggregate", with no impact on economic performance

[11] While no information on the currency of denomination of cross-border loans is provided by the BIS, it is reasonable to assume (as I do here) that they are mostly denominated in the currency of the country where they are originated.

[12] Data reported in those sources were checked for consistency and, in many cases, revised accordingly. The sample used here excludes de jure dollarized economies. The data can be downloaded directly from http://www.utdt.edu/~ely/papers.html. Table A2 in the Appendix presents a list of countries and periods covered. See also Table A1 for a list of variable definitions and sources.

[13] Reinhart et al. (2003) construct a dollarization index based on the dollarization ratios of domestic deposits, external debt and domestic public debt. However, as they state in the appendix, available data on the latter covers only 23 countries for the period 1996-2001, which severely limits the size of the sample. Alternatively, assuming that all domestic public debt is denominated in the local currency (as in Claessens et al., 2003) would understate FD, as governments in financially dollarized countries such as Argentina, Brazil or Turkey issue substantial amounts of dollar (or dollar-linked) debt domestically.

(Eichengreen et al., 2003). This approach, however, suffers from at least two important shortcomings. First, the available data do distinguish between residents and non-residents holders, and the implicit association between external debt and non-resident holders typically assumed in the measures proposed by this literature is at least debatable.

More importantly, even if this distinction were feasible, there are reasons to believe that the domestic aggregation hypothesis is not verified in practice. Even in the extreme case of a financially dollarised economy that holds no foreign asset or liability, there may be still be a currency imbalance at the micro level, as resident holders of dollar assets typically differ from resident holders of dollar liabilities. If so, at the time of a real exchange rate adjustment, individual mismatches, rather than netting out, would lead to massive bankruptcies, as dollar debtors are unable to repay their dollar lenders. Note that the same argument also applies to the alternative approach proposed by Goldstein and Turner (2004), where they measure the currency mismatch as the *aggregate* net foreign currency position (inclusive of domestic debt).[14] While netting makes sense at the level of individual agents (e.g., the public sector), the aggregate net position is likely to understate the potential balance sheet problem. The case of a dollarised banking sector is a clear example. The fact that, in the aggregate, every dollar deposit is matched by a dollar loan does not eliminate the currency exposure of dollar indebted firms, and does not protect the banking sector from a deposit run in anticipation of a solvency problem.[15] At any rate, while gross liabilities overstates the real degree of currency mismatch, I believe that, for the purpose of the present study, the bias is still much smaller than that introduced by the aggregation of nets.

2.2. A first glance at the numbers

Table 1 provides a quick look at the levels and trends of deposit dollarisation. The ratios have increased on average during the 90s, going from 20 to 32 percent by the end of the decade, with maxima of more than 90 percent (Cambodia and Bolivia). In addition, deposit dollarisation grew or remained relatively stable in most developing countries despite a marked decline in inflation rates across the board during the last decade. For ease of comparison, the table reports deposit dollarisation and inflation data for a consistent set of countries. The dollarisation numbers do not differ much from the simple averages, although levels are slightly higher for the transition sub-

[14] Their measure is also extremely informationally demanding: the authors are able to compile data for only 22 countries.

[15] In addition, note that aggregating the positions of the public and private sectors would presume that a government can resort to the (sometimes substantial) stock of foreign assets held by residents to avoid a sovereign default. Moreover, even in those cases in which individual agents *are* currency balanced ex-ante, it is easy to conceive the case in which they file for bankruptcy after diverting their foreign currency assets right before the currency collapse.

sample. In all cases, the persistence of dollarisation levels contrasts with inflation rates that declined sharply to one-digit levels in all cases.

It has been pointed out that the currency denomination of portfolios usually adjusts only partially to temporary changes in the real exchange rate (Baliño et al., 1999). If so, sudden real exchange rate appreciations such as those that followed price liberalization in transition economies may lead to overstate the early dollarisation levels. However, this does not appear to be the case here: the transition sample exhibits a *positive* trend, particularly steep given that the figures correspond to the shorter 1995-2000 period (Figure 3). Figure 4 further illustrates this evolution, showing that for 15 out of 21 European transition countries the deposit dollarisation ratio increased over the period 1998-2001 (the last three years covered by the data), confirming the growing incidence of FD within the region.[16]

Table 2 complements this first pass, illustrating the magnitude of the different sources of liability dollarisation assessed in the database, normalized by the country's GDP as a way of capturing the associated exposure. Specifically, the table reports dollar deposits (here used as a proxy for onshore dollar loans), official (bilateral and multilateral) loans, cross-border bank loans, and external (private and public) bonded debt, for the years 1995 and 2000, based on a consistent sample of developing countries for which data on all sources are available for the two years, and excludes offshore financial centres where FD is typically large but of a different nature that the one studied here. In addition, the table presents averages for the emerging and non-emerging sub-samples.

Note that different sources of dollarisation are likely to reflect different underlying factors. For example, the rationale for government borrowing in foreign currency and dollarisation of onshore bank loans are not necessarily connected. However, they all have in common their implications in terms of currency mismatches, and the simple comparison in the table is a helpful illustration of their relative importance.

Indeed, the data reveal a number of interesting facts. First, the large incidence of both domestic and external bank loans relative to external bonded debt, somewhat in contrast with the emphasis that the literature on currency mismatches typically places on the latter. The same can be said of the importance of official debt, by far the main source of liability dollarisation. Second, most ratios has been increasing (or, for the case of official lending, stable), indicating that the trends identified for deposit dollarisation are not an isolated phenomenon. Third, as expected, non-emerging developing countries show a much stronger reliance of official lending (which

[16] This is not independent of the surge in euroization induced by the prospect of monetary integration, to which I come back below.

explains the larger overall FD), as opposed to emerging economies where bonded debt (while still below other sources) plays a relatively major role. Finally, the ratio of deposit dollarisation over GDP yields comparable numbers across the different groups.[17] The table also shows the statistics for Latin American and transition sub-samples: although FD has been consistently higher for the former, the advance of FD has been much more pronounced for the latter, in line with the evolution of deposit dollarisation documented above. Thus, the evidence clearly indicates that FD, in its different varieties, has become a pervasive characteristic in the developing world.

3. THE DRIVERS

The literature have provided over the years a number of explanations to account for the high and persistent levels of FD in developing economies, reflecting the various angles from which the phenomenon has been studied. With a few exceptions, however, the empirical tests of these theories have been partial (addressing one aspect but controlling imperfectly for the others) and have suffered from limited data availability. Moreover, some of the most recent explanations have not been tested at all.

It is useful then to summarize this body of analytical work from a broader perspective to highlight its links and complementarities, and to revisit it in light of the new available data. The survey presented in this section does not intend to provide an exhaustive account. Rather, it focuses on what I believe are the key hypotheses proposed by the literature, to examine the extent to which they are supported by the data.

3.1. The theories

As noted, the early literature on dollarisation was primarily interested in the currency substitution phenomenon and its influence on the conduct of monetary policy. As a result, the first explanations tended to stress the negative connection between the demand for the local currency (and its use for transactions purposes), on the one hand, and the rate of inflation (or, alternatively, the memory of past inflation episodes), on the other. As such, they are relevant to the theme of this paper only to the extent that currency substitution influences the currency composition of savings. This influence, however, appears to be weak: anecdotal evidence indicates that the phenomenon of currency substitution tends to be relatively minor in those countries that exhibit

[17] Emerging economies are defined as those included in J. P. Morgan's EMBI Global portfolio.

high FD levels, as wages and most goods and services are denominated and transacted in the local currency.[18]

Box 1. The currency substitution view

Dollarisation was interpreted by the early literature as a currency substitution phenomenon. Standard models of CS would predict that ratio between local and foreign currency nominal balances, c, to be a function of the nominal interest rates in each currency, so that $c = f(i, i^*)$, with $f'_1 < 0, f'_2 > 0$, where i, i^* are the peso and dollar interest rates, respectively. In turn, assuming interest rate parity, $i = i^* + E(\Delta e)$ (where $E(\Delta e)$ denotes the expected rate of devaluation), $c = f(i^*, E(\Delta e))$. Thus, to the extent that inflation is ultimately reflected in the nominal exchange rate, expected inflation should foster CS.

This view was challenged by the persistence of dollarisation in the 90s, at a time when inflation rates in dollarised countries declined markedly. This persistence has been attributed by the CS view to long-lasting memories of *past* inflation that induce high inflation expectations even after years of price stability (Savastano, 1996). Alternatively, it has been viewed as the consequence of the fixed cost of switching to the dollar as a conventional medium of payment. More precisely, if a long period of inflation and depreciation is needed to justify the switch to the dollar, once this is done, a similarly long period of appreciation is needed to revert the process (Guidotti and Rodríguez, 1992). Again, this hypothesis would imply that dollarisation is a response to past rather than current inflation.

More recently, inspired by the renewed interest in FD, the literature has produced a number of analytical models that are more directly linked to the view of dollarisation as an asset substitution phenomenon. For the purposes of this survey, these models can be broadly classified in three groups: i) a *portfolio view* that explains FD as the optimal portfolio choice for a given distribution of real returns in each currency; ii) *a market failure view* that explains FD as the suboptimal response to a market imperfection; and iii) an *institutional view* that emphasizes how institutional failures can foster FD, either by introducing new distortions or by reinforcing the channels discussed in the previous two groups.

[18] Typical exceptions are big-ticket items (e.g., real estate). On this, see Ize and Parrado (2002).

3.2. The portfolio view

Ize and Levy Yeyati's (2003) portfolio approach starts from the assumption that risk-averse resident investors choose their asset portfolio to optimise the risk/return profile in terms of the local consumption basket. Thus, while the real return on peso assets is affected by changes in the inflation rate, the real return on dollar assets is influenced by unexpected changes in the real exchange rate. Then, in the absence of real interest rate differentials across currencies, the investor chooses the currency composition of savings so as to minimize the variance of portfolio returns, which is shown to depend on the volatility of the inflation and the real depreciation rates. If so, it can be shown that the dollarisation ratio is directly proportional to the coefficient of exchange rate pass-through.

Box 2. Deriving the portfolio model

Assume that the investment menu of risk-averse resident investors comprises two options: dollar and peso interest-bearing bank deposits, with real returns equal to $r_p = E(r_p) - \mu_\pi - \mu_s$, and $r_d = E(r_d) - \mu_s$, respectively, where μ_π and μ_s are zero-mean disturbances to the local inflation and real devaluation rates, and $E(r^j)$ denotes the expected real return on the assets. Assume further that investors maximize the following utility function:

$$\max_{xj} \; U = E(r) - Var(r) / 2$$

with $x_j \geq 0$, $j = p, d$, denote the peso and dollar shares, respectively, and $r = \Sigma_j x_j r_j$ the real return on the portfolio.

Then, it can be shown that, if the uncovered interest rate parity condition holds, the dollar share of the optimal investment portfolio (which replicates the minimum variance portfolio) is equal to

$$mvp \equiv (var(\pi) + cov(\pi,s)) / (var(\pi) + var(s) + 2cov(\pi,s)).$$

Moreover, replacing $\mu_s \approx \mu_e - \mu_\pi$, where e denotes the nominal rate of devaluation, the deposit dollarisation ration simplifies to $mvp=var(\pi)/cov(\pi,e)$, the coefficient of a simple regression of the inflation rate on the nominal exchange rate, that is, a crude measure of the exchange rate pass through.

The intuition is clear if we consider the extreme case of perfect pass-through, in which inflation and nominal exchange rate changes cancel out to leave the real exchange rate constant. In this economy, the real value of dollar assets would be fixed in real terms, and the minimum

variance portfolio would be fully dollarised. More generally, as the variability of inflation increases relative to that of the real devaluation rate, peso assets become more risky and less attractive.

A number of implications can be derived from this model. First, exchange rate regimes matter only in combination with monetary policy. From the previous analysis, it follows that a mix of flexible exchange rates and inflation targeting minimizes dollarisation incentives. By contrast, floating exchange rates in a context of high and volatile inflation may have the opposite effect.[19] Second, more open countries are likely to display higher dollarisation ratios, to the extent that a larger import component is reflected in a higher pass-through. Third, residents and non-residents choose their portfolios differently: peso instruments look relatively more attractive to local savers (borrowers) than to foreigners, because they mirror more closely their stream of future consumption (income). As a result, the optimal dollarisation ratio is lower for the resident investor.[20] For the same reason, from the standpoint of the resident investor, real assets (such as CPI-indexed deposits) should generally dominate dollar assets, as they minimize (and, if perfectly indexed, fully eliminate) the variability of real returns.[21]

3.3. The market failure view

A second group of explanations point to a dollarisation bias related with the presence of market imperfection and externalities –and an inadequate regulatory framework that fails to address them.

The dollarisation bias in Broda and Levy Yeyati (forthcoming) arises from the combination of two ingredients: a positive correlation between the probability of default and the real exchange rate, and imperfect information on the currency composition of the borrower. As the authors show that, if interest rates cannot be made contingent on the currency composition of the borrower's liabilities, and if the scrap value of a failed debtor is distributed among creditors on a pro rata basis, the borrower finds dollar funding relatively cheaper, and dollarises. The

[19] The case of pegged regimes (when the peg currency is the one used for financial assets) is ambiguous. If the peg is fully credible, the problem becomes indeterminate, as the two currencies are identical and the issue of denomination no longer plays a role. If the peg is not fully credible (if there is a positive probability of an exchage rate realignment), the dollarization ratio would be determined by the expected pass-through at the time of the realignment, irrespective of the probability of a regime change (Ize and Parrado, 2002).

[20] This point, originally made by Thomas (1985) and discussed in more detail in Levy Yeyati (2004), may help explain why dollarization ratios are particularly high in international markets. This resident-nonresident distinction is in line with the evidence that past debt de-dollarization processes have been driven by a deepening of the domestic markets (Bordo et al., 2002), and that the dollarization ratio of government bonds is negatively related with the size of domestic financial markets (Claessens et al., 2003, Eichengreen et al., 2003).

[21] Note that the same is true for the borrower to the extent that the CPI is closely correlated with the price of the firm's output.

reason is simple. Since dollar lenders fare better in default states when the exchange rate is higher, interest rate arbitrage requires that peso lenders fare better in non-default states. But a limited liability borrower only pays in the non-default states when peso lenders are expected to receive more. Hence, the lower effective cost of (and the preference for) the dollar.

A similar argument can be applied for the case of a uniform creditor guarantee: to the extent that it increases the recovery value of a failed investment, it enhances the benefits of the dollar in default states, increasing the peso premium in non-default states.[22] The case of full deposit insurance is a good illustration. Since dollar (but not peso) depositors are provided protection against exchange rate risk in default states at the expense of the deposit insurance agency, the value of deposit insurance is higher for dollar lenders. It follows that any insurance scheme that fails to incorporate in the premium this difference in value would favour dollar intermediation.

Jeanne (2000) highlights how a peso problem (namely, a large peso interest rate premium due to devaluation expectations) can give rise to dollarisation in the presence of another market imperfection: non-linear liquidation costs. In this case, the currency composition is optimally chosen to minimize the probability of default and avoid facing liquidation costs. Thus, if the devaluation threat is unlikely, the borrower may opt for the cheaper dollar. A non-credible peg provides a natural example: individuals assign a small probability to a change in the exchange rate but, if the change materializes, they expect the local currency to collapse. This small probability of a large devaluation may widen the peso-dollar spread to a point at which the default risk of a peso borrower indebted at a high interest rate exceeds the risk of a dollar borrower that faces a sure death only in the unlikely devaluation scenario. In this context, the borrower would prefer to take his chances with the foreign currency. The argument, however, can be readily extended to the case of a flexible exchange rate regime, inasmuch as the distribution of exchange rate changes is sufficiently skewed.

A third group of explanations attribute the dollarisation bias to the presence of externalities that generate the perception of implicit debtor guarantees (Burnside et al., 2001). The social cost of massive bankruptcies following a sharp devaluation makes a debtor bailout ex-post optimal for the government. In turn, borrowers anticipate this bailout and price currency risk accordingly. Much in the same way as in the case of deposit insurance, a debtor guarantee is more valuable for dollar debtors (because it pays when dollar debts are more costly) and introduces a dollar advantage. The implicit debtor guarantee argument highlights the time

[22] Conversely, the dollar advantage (and the dollarization bias) disappear if the recovery value is zero.

inconsistency of the government's promise to limit its involvement in the resolution of a financial crisis with widespread negative externalities.[23]

Box 3. The market failure view

The dollarisation bias discussed in Broda and Levy Yeyati (forthcoming) can be illustrated by means of a simple example. A limited-liability borrower invests in a project with a gross return pR (where p denotes the domestic price index) financed entirely by risk-neutral lenders. The end-of-period (peso-dollar) exchange rate $e \in \{e^l, e^h\}$, with $e^l < p(e^l) < 1 < p(e^l) < e^h$, and $Prob(e = e^l) = q$, where the current rate is normalized to 1.

Key to the argument is the assumption that the probability of default is higher in times of high real exchange rates. For simplicity, assume here that the borrower defaults if and only if there is a devaluation, in which case the residual value of the defaulter, $(1-\theta)\, p(e^l)R$, is distributed on a pro rata basis among creditors, who recover a fraction $\delta(\lambda) = (1-\theta)p(e^l)R \,/\, [(1-\lambda)\, r_p + \lambda\, e^h r_d\,]$ of their claims (where θ denotes the liquidation cost, λ is the dollar share of the debtor's liabilities, and r_p and r_d are the peso and dollar interest rates).

It follows that the interest rates in each currency have to satisfy the arbitrage condition $r_p[q + (1-q)\delta] = r_d[qe^l + (1-q)\,\delta e^h]$, from which, rearranging, we obtain

$$s \equiv (r_p - e^l r_d) = e^l\,(1-q)\delta(\,e^h - e^l\,)/[q + (1-q)\delta] > 0.$$

where s represents the additional return demanded by peso lenders to compensate for the lower return on peso assets in the event of a devaluation cum default.

In turn, if the currency composition of liabilities is not observed by the lender, the borrower's problem can be expressed (in real terms) as:

$$max_\lambda\, \pi = [q/\, p(e^l)]\; [p(e^l)R - (1-\lambda)\, r_p - \lambda\, e^l r_d]$$

from which $\pi' = [q/\, p(e^l)]\; s > 0$. Hence, the borrower chooses to borrow in dollars ($\lambda = 1$). Intuitively, while dollar lenders benefit at the expense of peso lenders in the event of default, the peso premium in non-default states is effectively paid to peso lenders by the borrower, who therefore finds dollar rates relatively more attractive.

Note that the dollar advantage increases with the effective recovery ratio. Thus, a (currency-blind) *creditors' guarantee*, to the extent that it raises this ratio, fosters dollarisation.

[23] The argument goes beyond the case of bailouts: any implicit debtor insurance, to the extent that defaults are correlated with the real exchange rate, would favor dollarization. For example, the accumulation of international reserves may fuel the dollarization of the banking sector, if they are perceived by commercial banks as increasing the probability that the central bank provides dollar liquidity in the event of a dollar shortage (Broda and Levy Yeyati, 2003).

For example, deposit insurance strengthens the dollarisation bias whenever its coverage $\delta_I > \delta$. Similarly, the fact that the recovery ratio depends negatively on the liquidation cost θ indicates that the dollarisation bias is proportional to the protection of creditors rights. The result has been used by De la Torre and Schmukler (2003) to argue that the bias should be stronger for emerging markets´ *external* debt, to the extent that international markets are less burdened by long bankruptcy procedures, confiscation risk, corruptible judges and other factors eroding the value of the creditors´ claim.

The previous example can be adapted to illustrate how a *peso problem* may introduce a financial dollarisation bias in the presence of liquidation costs, according to Jeanne's (2002) argument.

First, note is that r_p increases with the expected post-devaluation exchange rate, e^h. Then, if investors expect a currency collapse, the peso interest rate may pushed so high as to make peso funding financially unviable if the devaluation does not materialize, that is, $p(e^l)R < r_p < p(e^h)R$. In this case, while dollar debtors still default in the event of a devaluation, peso debtors need the devaluation to avoid default (as the resulting inflation dilutes their peso liabilities).

Next, assume for simplicity that borrowers can choose between pesos and dollars but not a combination of both (and that this choice is observed). Therefore, at the time of choosing between currencies, the debtor compares the expected real returns associated with dollar and peso funding:

$$\pi_{\lambda=1} = [q/\,p(e^l)]\,[p(e^l)R - e^l\,r_d] >< [(1\text{-}q)/\,p(e^h)]\,[p(e^h)R - e^h\,r_p] = \pi_{\lambda=0}$$

which, using the interest rate arbitrage conditions, yields:

$$\pi_{\lambda=1} = R - (1\text{-}q)\theta R - r_f\,e^m/\,p(e^l) >< R - q\theta R - r_f\,e^m/\,p(e^h) = \pi_{\lambda=0}$$

Then, if agents assign a small probability q to a very large devaluation (a non-credible peg is a natural example), borrowers prefer to risk bankruptcy due to a currency mismatch rather than the more likely insolvency due to the lofty peso rates that incorporate the expectations of a currency collapse (as in the so-called "peso problem").

It is immediate to see how a ***debtors´ guarantee*** that reduces (or eliminates) the probability of default contingent on a large devaluation tilts the balance of the previous tradeoff in favor of dollar funding. Imagine that, in the event of a currency debacle, debtors expect to be bailed out with probability β. Then, it follows that $\pi_{B,\,\lambda=1} = R - \beta(1\text{-}q)\theta R - r_f\,e^m/\,p(e^l)$, which increases with β.

3.4. The institutional view

There are a number of ways in which the quality of institutions may introduce or enhance the dollarisation drivers previously discussed. For the example, to the extent that weak institutions detract from the credibility of a commitment not to bail out dollar debtors in the event of a sudden devaluation, they may compound the mispricing associated with implicit government guarantees (De Nicoló et al., 2003).

On the other hand, currency-blind policies fostering dollarisation may be the result of a deliberate policy choice. As De la Torre et al.'s (2003) stress for the case of a Argentinean peg, discriminating across currencies, while appropriate for a prudential perspective, would have been at odds with a government's quest to build confidence on the exchange rate anchor. Inverting the argument, the dollar-friendly regulation could be interpreted as a commitment mechanism (as the government borrowed credibility by making the costs of a devaluation prohibitively high) or, following De la Torre et al. (2003), as "a high-stakes strategy to overcome a weak currency problem."[24] In either case, dollarisation could be viewed seen as the collateral cost of low institutional credibility.

A related explanation points at the temptation of a peso-indebted government to inflate away the real burden of the debt (Calvo and Guidotti, 1990). If the government has no way to commit to low inflation (if its inflation credentials are poor), expectations that anticipate this behaviour lead to high peso interest rates and the familiar inflation bias that, to the extent that the government cares about inflation, would dissuade it from issuing peso debt. In this case, public debt dollarisation could be interpreted as a deliberate decision by the issuer to avert the inflation bias.[25] The argument can be framed as a multiple-equilibrium story in which the equilibrium is determined by the government's credibility. If the repudiation-by-inflation decision hinges on the trade-off between the cost of repudiation and the cost of servicing the debt, a poor institutional track record (associated with high repudiation expectations and high interest rates) would be self-fulfilling as it increases to debt burden and tilts the balance in favour of repudiation. If so, the government may choose to dollarise its obligations as a (costly) way to commit to low inflation.

[24] Rajan (2004) argues that institutions may also influence FD works through their effect on inflation, as countries with poor institutions tend to rely more strongly on the inflation tax during economic downturns.

[25] Note, however, that the model refers to price indexation, which under their assumption of purchasing power parity is indistinguishable from dollar-indexation. In a more general context, however, CPI indexation should dominate dollar indexation as it eliminates the incentive to monetise while avoiding the undesired real exchange rate exposure. Note also that the model concentrates on the denomination of sovereign debt, and in principle cannot be extended to dollar borrowing by atomistic individuals.

Conversely, a good institutional record would be associated with low repudiation expectations, low interest rates, and no inflation bias.

3.5. The drivers in the data

To what degree are observed dollarisation ratios explained by these theories? A preliminary assessment of the relative importance of some of the drivers listed above is reported by De Nicoló et al. (2003), who find support for the portfolio and institutional view. Here, I briefly revisit and extend these results by regressing the deposit dollarisation ratio on a set of basic controls intended to capture the main drivers.

Some of the candidate variables are natural choices. For example, the average past inflation (Δp_avg) can be used to capture the currency substitution view.[26] Similarly, the dollar share of the minimum variance portfolio (*mvp*) can be readily computed from historical inflation and real depreciation rates (see Box 2) to test the portfolio model. A key factor highlighted by the market failure view, namely, the positive correlation between the probability of default and the real exchange rate, is partially proxied by the correlation between real GDP growth and real exchange rate changes (*rer_cyc*): the more procyclical the real exchange rate, the stronger the dollarisation bias. I include the initial GDP per capita (*gdppc_i*), which captures both economic and institutional factors that may influence the development of local currency markets.[27] Finally, I add a variable that measures the degree of legal restrictions on onshore dollarisation (*restrictions*) revised and extended from the index compiled by De Nicoló et al. (2003) based on the International Monetary Fund's AREAER.[28]

Institutional variables are more elusive. Most of the standard indicators of institutional quality are broadly defined, and available only for recent years. Of them, I use a composite index (*composite*) that averages six governance indicators compiled by Kaufmann et al. (1999), where large values indicate greater institutional development, with the caveat that the indicators are computed only since 1996. Alternatively, I use the Country Policy and Institutional Assessment

[26] The average inflation rate is measured in levels instead of logs to avoid missing the negative inflation years, which would bias the sample towards high inflation countries. The average depreciation rate (highly correlated with avergae inflation as expected) yielded similar results as those reported below.

[27] Since, as noted, economic size may also influence the development of local currency financial assets, the country's GDP was also tested but failed to be significant. These results (as well as all others that are mentioned in the text but omitted from the tables) are available upon request.

[28] While the index of restrictions corresponds to the year 2000, we can reasonably assume that the degree of restrictiveness in individual countries is relatively constant over time. Indeed, the index exhibits a high and statistically significant correlation with annual dollarization ratios in different years. For a description of how the index is constructed, see De Nicoló et al. (2003).

(*cpia*) assembled by the World Bank, which covers a longer period but only for developing economies.[29]

Exchange rate pegs (or, more generally, exchange rate anchors) are also highlighted by the institutional view as possible drivers of FD.[30] To test this hypothesis, I construct a *peg* dummy, equal to one whenever the exchange rate regime is classified as a fix, using both the *de jure* regime classification compiled by Ghosh et al. (2003), and the de facto classification prepared by Levy Yeyati and Sturzenegger (forthcoming). Whereas the former reproduces the official assessment of the regime periodically reported by the country's authorities to the International Monetary Fund, the latter groups regimes based on actual changes in exchange rate and international reserves. Both classifications tend to differ substantially, reflecting deviations of actual exchange rate policies from announced ones. Note that, while both approaches are used in the tests below, for the purposes of this section de jure regimes would seem to capture more closely the explicit exchange rate commitment that may inhibit a discrimination across currencies or fuel the perception of implicit exchange rate guarantees.[31]

Table 3 presents the results. The first half of the table report regressions of the average dollarisation ratios over the 1990-2001 period on averages of the controls over the same period, while the second half focuses on dollarisation ratios as of end-1999 based on past values of the controls. Results are comparable in both cases.[32]

As can be seen, the link between deposit dollarisation ratios and past inflation (column 1) weakens once *mvp* is included (column 2), and ceases to be significant when initial per capital income is added (column 3). On the other hand, the coefficients for this last two variables, as well as that for the restrictions index, are significant and of the expected sign.[33] Results are basically unaltered when I add the measure of the procyclicality of the real exchange rate, *rer_cyc*, which exhibits a significant and negative coefficient, as expected. It may be argued that existing

[29] Governance indicators are available for years 1996, 1998, 2000 and 2002. The CPIA index is composed of 20 different components covering macroeconomic and sectoral policies, as well as issues such as the rule of law and corruption, each rated ordinally by country specialists on a scale of 1-6, using standardized criteria. It is available for the period 1977-1999, and covers 133 in the latest year.

[30] In addition, to the extent that under a peg the real exchange rate adjust only partially to external shocks, pegs (and other rigid exchange rate arrangements) may be conducive to the build-up of a peso problem.

[31] Other factors are more difficult to identify empirically. For example, a peso problem depends on unobserved expectations and, even under the assumption that uncovered interest rate parity holds, data on peso-dollar domestic interest rate differential are available for very few countries. On the other hand, any computation of the real exchange rate misalignment would require a controversial estimation of equilibrium exchange rates. The same is valid for the role of creditor and debtor guarantees highlighted by the market failure view, which in most situations tend to be implicit and thus unobservable in the data.

[32] The data for all the empirical tests in the paper are annual.

[33] Not surprisingly, the average deposit dollarization level falls from roughly 30% in unrestricted countries to 10% in restricted ones.

explanations apply less naturally when portfolio choices are restricted by law, as in this case FD may materialize through a flight to foreign dollar-denominated assets not captured by the deposit dollarisation ratio. However, results do not differ when I restrict attention to countries without dollarisation restrictions (column 5).

A number of reasons suggest that the previous findings should be interpreted as indicative of an association rather than a proof of causality. For example, FD may lead to higher exchange rate pass-through coefficients (of which *mvp* as a crude approximation) or may increase the impact of real exchange rate changes on economic activity (strengthening the procyclicality of exchange rates).[34] To partially mitigate these endogeneity concerns, I rerun the specification in column 4 using the dollarisation ratio by end-1999 (column 6): the results are virtually identical.

I use this specification to test the two institutional indicators and the peg dummies (all included lagged). Both *composite* and *cpia* (the latter for the smaller developing country sample) appear with a positive but not significant coefficient (columns 7 and 8). Note, however, that per capita income is no longer significant either, possibly due to its very high sample correlation with the two institutional indexes (of 0.88 and 0.57, respectively). Indeed, when the per capita income is excluded, the coefficients of both *composite* and *cpia* are larger and significant (columns 9 and 10). Thus, these (highly collinear) controls may be interpreted as alternative indicators of institutional quality. However, these findings should be taken with caution, as the high correlation may also reflect the impact of economic performance on institutional quality as perceived by the country's residents.[35] Finally, the coefficients for the de jure peg dummy have the wrong (negative) sign and fail to be significant (column 11).[36]

In sum, the tests confirm previous empirical findings: they provide support to the portfolio view and are broadly consistent with the view that poor institutional quality fosters FD. In addition, they contribute some preliminary backing for the market failure view by showing that dollarisation is significantly higher in countries where the procyclicality of the real exchange rate is stronger. On the other hand, the data fail to reveal a link between exchange rate regimes and FD. More generally, while the limited time spanned by the sample should caution against

[34] I come back to these issues in the next section.

[35] The interrelation of institutions and growth has already been noted in the literature (see, e.g., Chong and Calderón, 2000). In addition, governance indicators (largely based on resident polls), may be influenced by economic performance if residents' *perceptions* of institutional quality are affected by economic downturns or crisis episodes that put institutions to test and make their limitations more visible. The use of the *cpia* index, to the extent that it is prepared by external observers atenuates in part these concerns.

[36] Note that this is not due to a correlation between the peg dummy and *mvp*: the correlation between the two is only 0.0747, and not significant. The use of a de facto peg dummy based on the classification of Levy Yeyat and Sturzenegger yield a similar results. Also in line with the institutional view, I tested for the incidence of the inflation bias by including the central government balance over GDP, both alone and interacted with the institutional indicators, under the hypothesis that fiscally stressed governments face a larger temptation to inflate, and that the associated peso premium is compounded by low this institutional credibility. No statistically significant links were found in this case.

interpreting the results as indication of causality, the evidence show that a large share of cross-country differences in FD can be attributed to the some of the economic and institutional factors highlighted in the literature.

4. THE CONSEQUENCES

4.1. Dollarisation and monetary policy

The earlier literature stressed the fact that dollarisation, by reducing the costs of switching to the foreign currency to avoid the effects of inflation, may increase the volatility of money demand, impinging on the capacity of the central bank to conduct monetary policy. While this concern was rooted in the view of dollarisation as a currency substitution phenomenon, a similar argument could be made regarding the dollarisation of domestic savings. Specifically, as the flight to readily available foreign-currency assets becomes less costly, the demand for reserve money in a dollarised economy should be more sensitive to a monetary expansion or a to change in the exchange rate.

A cursory look at the data confirms this view: the inflation response of monetary shocks is indeed stronger in dollarised economies. To illustrate the point, Figure 5 plots the elasticity of the inflation rate with respect to changes in broad money, on the average deposit dollarisation ratio.[37] As can be seen, the elasticity increases significantly as FD deepens.

To explore this hypothesis further, I use a simple specification based on the log linearisation of a standard money demand equation, to which I add the change in the nominal peso-dollar exchange rate, the deposit dollarisation ratio, and the interaction of the latter with the changes in broad money, to get:

$$\Delta p_{it} = \alpha_1 \Delta m2_{it} + \alpha_2 \Delta gdp_{it} + \alpha_3 \Delta intrate_{it} + \alpha_4 \Delta er_{it} + \alpha_5 dollar_{it} + \alpha_6 \Delta m2_{it} * dollar_i + \tau_t + \psi_i + \xi_{it}$$

[37] The elasticity is estimated as the coefficent of a simple (country-by-country) regression of the inflation rate on broad money changes.

where Δp, $\Delta m2$ and Δgdp are the log changes of the consumer price index, broad money and real output, $\Delta intrate$ is the change in the nominal interest rate, *dollar* is the deposit dollarisation ratio, and τ and ψ are year and country fixed effects –which capture, respectively, the worldwide decline in inflation rates, and country-specific factors, such as institutional quality, that may influence both inflation and FD.[38] The onshore deposit dollarisation ratio is our best estimate of the currency composition of the demand for money and thus the appropriate measure of FD to study these issues.[39]

Note that this reduced-form specification is not intended to examine the elasticity of the inflation rate with respect to the money supply (captured by the coefficient α_1), but rather to assess whether and to what extent FD affects it. More precisely, the hypothesis to be tested (FD increases the sensitivity of inflation to a monetary expansion) would imply that $\alpha_6 > 0$.

Overall, the results in Table 4 confirm this prior, indicating that dollarisation is associated with a greater sensitivity of inflation to changes in the monetary aggregate. The first column presents the baseline specification.[40] The coefficients display the correct sign (positive for money growth, exchange rate changes and interest rates, negative for output growth). Column (2) includes the interaction of the average dollarisation ratio with the money growth rate ($\Delta m2\_dollar\_avg$). The coefficient is large, has the expected positive sign (indicating that more dollarisation raises the elasticity of inflation) and is statistically significant. The same results are obtained when I replicate the previous regressions using the *current* dollarisation ratio (*dollar*) instead of its average (column 3).

The implications of this greater elasticity for the long-run inflation rate are not straightforward. The empirical observation that dollarised economies are characterised by significantly larger inflation rates (the correlation between the average deposit dollarisation and inflation rates is a highly significant 0.50) cannot be taken as an indication that monetary policy is less effective under FD, since it is possibly capturing the inverse direction of causality (that is, the one that goes from a high and unstable inflation to FD) or, alternatively, the fact that an expansionary monetary policy leads to both high inflation and financial dollarisation. Moreover, a sharper price response to changes in the monetary aggregate does not limit per se the scope for monetary policy. On the contrary, it suggests that a reduction in the rate of money growth would

[38] Tests of several additional variables (openness, government consumption, the exchange rate regime) yielded similar results as those reported here at the cost of a loss of observations, and are therefore omitted for brevity.
[39] By contrast, the connection between money demand and other sources of FD is, ex ante, ambiguous.
[40] Here, as well as in all other tests using annual data, standard errors rteported in the tables are robust to clustered heteroskedasticity.

have a stronger stabilizing effect. The fact that in most developing economies a steady decline in inflation materialized despite high and persistent FD seems to support this possibility.

What can we say, then, about the impact of FD on inflation? The last three columns of Table 4 address this question. Column 4 shows the result of a cross-section regression of average inflation on the average GDP, the average dollarisation ratio, plus three regional dummies (denoting Latin American, Sub Saharan African and transition economies) and the *composite* governance index to control for institutional quality. As can be seen, dollarised economies display higher inflation rates on average.

However, a positive association between dollarisation and inflation can go in both directions, as a high and unstable inflation can foster deposit dollarisation. To dispel concerns that the result is reflecting the reverse causality, in column I instrument dollarisation using the index of restrictions to onshore dollarisation (*restrictions*), which is highly correlated with deposit dollarisation for each of the years covered by the sample but uncorrelated with the inflation rate once FD is controlled for (as column 4 shows). The instrumental variable estimation shows a positive and significant (indeed stronger) association between dollarisation and inflation. More importantly, When the average money growth rate ($\Delta m2\_avg$) is introduced in the next column, the FD coefficient, while smaller, is still positive and significant. Thus, while the correlation between FD and inflation is largely explained by the fact that money growth rates happen to be larger in dollarised economies (the sample correlation between the average money growth and deposit dollarisation is 0.47 and highly significant), financially dollarised economies do exhibit higher inflation rates independently of the path followed by the monetary aggregates.

4.2. Dollarisation and financial fragility

Perhaps the concern most frequently emphasized in relation to FD is its deleterious impact on the vulnerability to default in the financial sector (financial fragility).

Recent work has reported some supporting evidence. De Nicoló et al. (2003) find that dollarised banking sectors are characterized by higher insolvency risk (as measured by the Z-index, a proxy of the probability of default)[41] and higher deposit volatility (a result that is in line with the greater volatility of broad money reported in the previous section). Calvo et al. (2003),

[41] The Z-index measures the probability that a loss (i.e., a negative ROA) exceeds the bank's equity capital (*EQ*) or

$$P(ROA \leq -\frac{EQ}{A}) \leq \frac{\sigma_{ROA}^2}{\left(\mu_{ROA} + \frac{EQ}{A}\right)^2} \equiv \frac{1}{Z^2}$$

Thus, a smaller Z would indicate a larger risk exposure.

in related work, document that the propensity of emerging economies to suffer "sudden stops" in capital inflows (that is, sharp capital account reversals) increases with the degree of FD, which they measure as the sum of dollar deposits and foreign liabilities in the domestic banking sector, computed as a share of GDP.

Closer to the focus of this paper, Domac and Martínez Pería (forthcoming) find that ratio of foreign liabilities to assets of local banks is positively correlated with the probability of facing a systemic banking crisis. This is at odds, however, with Arteta (2003), who fails to find, albeit for a smaller sample, a significant link between onshore deposit dollarisation and the probability of a banking crisis. Thus, it appears that the incidence of FD on financial fragility and crisis propensity due to the presence of balance sheet effects –certainly one the main themes of the FD debate–still needs to be validated by the evidence.

In this section I revisit this issue. I model the probability of a banking crisis as a function of the change in the nominal exchange rate (Δer), and two measures of FD: a deposit dollarisation dummy (*dollar_10*) that equals 1 whenever the deposit dollarisation ratio for the previous year exceeds 10%, and the ratio between local banks´ foreign currency liabilities and assets (*FL/FA*), which captures non-deposit liability dollarisation in the domestic banking system. In turn, the crisis event is captured by a dummy (*crisis*) that equals one for the first period of the crisis, and zero in non-crisis periods. Crises would typically have a strong influence on both the exchange rate and the degree of dollarisation. To mitigate this potential endogeneity problem, I drop from the sample all crisis observations following the first crisis year, and lag all control variables. Note that, through the balance sheet channel, FD should increase the propensity of a crisis *for any given exchange rate change* –indeed, in a non-dollarised economy, there is a priori no reason to expect that a devaluation should have a negative impact on the stability of the banking sector. Then, it follows that a test of the presence of balance sheet effects should focus on the interaction between the exchange rate change and each of the FD measures: a positive coefficient of these interactions would be supportive of the balance sheet hypothesis.

The tests are reported in Table 5. The first regression includes as controls only the devaluation rate and the two FD proxies, and yields the expected results: both devaluations and FD increase crisis propensity. In column 2, I add the interaction terms. As can be seen, while both interactions are positive and significant, the coefficient of the exchange rate change ceases to be significant.[42] Similarly, the total effect of both FD variables is positive and significant, at

[42] In fact, it turns negative, suggesting that banking sectors in non-dollarized economies actually may benefit from an exchange rate adjustment, possibly due to its positive impact on the real economy. Unfortunately, the coefficients are not significant and more testing is needed to assess whether this positive effect is actually in place.

the expense of that of the exchange rate change. Thus, not only does the incidence of exchange rate changes in crisis propensity increase with FD; exchange rate shocks have a negative impact on financial stability *only* in the presence of FD.

This result is strikingly robust to the inclusion of additional controls. Column 3 adds a number of (lagged) standard crisis determinants: the inflation rate, changes in the terms of trade (Δtt), the real interest rate (*realint*), the real GDP growth rate, and the ratios of M2 to international reserves, private credit to GDP, liquid assets to total bank assets, and capital flows to GDP. Column 4 controls for institutional factors (under the hypothesis that poor institutional quality increases the incidence of banking crises), adding the *composite* index and the real GDP per capita as broad controls for institutional quality. Finally, columns 5 controls for capital account reversals ("sudden stops") in the previous year. The additional variables tend to display the expected sign, although only a few are statistically significant at conventional levels, possibly due to multicollinearity problems. More importantly, the coefficients of the variables of interest remain significant and of comparable value despite the substantial loss of observations.

This point is further illustrated in Figure 6. For the first panel, I use the model of column 2 to compute the probability of a banking crisis as a function of the change in the exchange rate, for low and high deposit dollarisation ratios (*highdoll* equal to zero and one, respectively), keeping *FL/FA* constant and equal to its mean. In the second panel, I do the same setting *FL/FA* at its minimum and maximum values, and keeping deposit dollarisation at its mean. Two things are apparent from this exercise: i) exchange rate changes have visible effect on crises propensity in the presence of FD: in both cases, the steep positive slope of the high dollarisation curve contrasts with the flat slope for non-dollarised economies; ii) the economic effect appears to be sizable: the probability of a banking crisis after a 100 percent devaluation increases by about 15 percent when we go from zero to full deposit dollarisation, and by 8% when foreign liabilities of domestic banks go from zero to 16 times foreign assets.

The previous results substantiate the concern linking FD with financial fragility through the balance sheet channel. Dollarisation advocates, however, has often stressed that this undesired consequence should be weighted against the beneficial effects of onshore dollarisation on local intermediation, in countries where financial markets would otherwise be insufficiently developed due to a weak currency problem. A final answer to the question about whether FD helps develop domestic markets in weak currency economies remains elusive, as empirical testing is undermined by the scarcity of data and the difficulty to control for all relevant factors that may influence both currency denomination and financial development.

However, a recent study by De Nicoló et al. (2003) provides some valuable preliminary insights. By regressing financial depth (measured as the M2 to GDP ratio) on the deposit dollarisation ratio plus a number of additional controls, they find that dollarisation is not associated per se with deeper markets, except in high inflation countries where it appears to have a countervailing effect.[43]

A cursory look at the data further illustrates the point. The first panel of Figure 7 plots the M2-to-GDP ratio as of end-2000, and the dollarisation ratios for 1999. Offshore centres are singled out in the figure by a square marker. As can be seen, three of them are clear outliers relative to what appears to be a significant negative association. Once offshore centres are excluded from the sample, a simple regression of financial depth on deposit dollarisation yields a highly significant and *negative* correlation. Simultaneity is certainly a concern here, as financial underdevelopment and FD may be merely symptoms of the same structural problems, without any causal connection between each other. However, the second panel shows that the same negative link (this time significant at the 5 percent level) is verified using the restrictions index. The fact that legal restrictions on onshore dollarisation –seldom modified and largely independent of the current macroeconomic context –are negatively correlated with financial depth suggests, if not that FD inhibits the deepening of the financial sector, at least that the disintermediation effect typically attributed to the use of legal limits as a way to prevent or undo FD have been overstated. [44]

In sum, while concerns related to financial fragility seem to be supported by the evidence, there seems to be little empirical ground for the foregone conclusion that dollarised countries are compensated with the benefit of more liquid domestic financial markets.

4.3. Dollarisation and growth

The final test of the net effect of FD lies in its implication for growth and output volatility. However, to my knowledge there are no empirical studies that systematically address this issue.[45]

The previous discussion already suggests a number of different channels that may connect FD and output volatility. For example, if FD detracts from the capacity to use the real exchange as a buffer against real shocks, dollarised countries are likely to exhibit greater cyclical

[43] The same results are obtained using the present database.
[44] A related argument (see. e.g., Reinhart et al., 2003) points at the sharp disintermediation that followed the attempts to de-dollarize the domestic banking sector through a forceful conversion to the local currency (including Bolivia in 1982, Mexico in 1982, Peru in 1985, Pakistan in 1998, and Argentina in 2002). However, since most of these attempts were conducted were a currency (and deposit) run was already underway, the specific role of the conversion in the contraction of the domestic banking sector cannot be readily identified.
[45] Reinhart et al. (2003) do compare average growth rates for low and high dollarization economies, with mixed results.

volatility. If, in addition, financially dollarised economies, due their sensitivity to currency fluctuations, were more prone to suffering banking crises and episodes of capital flight, the sharp economic contractions typically induced by the latter would also contribute to output variability. By contrast, while there are reasons to believe that output volatility per se may inhibit growth (see, e.g., Ramey and Ramey, 1995), and that the adverse real effects of financial crises (more likely in dollarised economies) may be highly persistent, the link between FD and long-run growth is a priori less transparent.

A cursory look at the data yields interesting preliminary insights. The first panel of Table 6 reports the means test of growth and growth volatility (Δgdp_avg and Δgdp_sd) for high a low dollarisation countries, defined as those with average deposit dollarisation ratios above or below the sample median. As can be seen, the latter display significantly faster and more stable growth than the former. Similar conclusions can be drawn from the correlations in the second panel. Thus, a bird's eye look at the data appears to indicate that dollarisation does have a negative association with growth performance.

This is consistent with the results of the cross-section regressions presented in Tables 7 and 8. Table 7 reports the results for output volatility. In the first specification, which includes controls for initial GDP, initial human capital (proxied by secondary school enrolment, *sec*), terms of trade volatility (Δtt), and institutional quality, plus three regional dummies, dollarisation is significantly and positively related with volatility. However, the potential endogeneity of dollarisation certainly qualifies the previous result. Instruments for FD in this context are bound to be controversial, since most of them could be linked, at least theoretically, to output volatility. Moreover, our main candidate, restrictions on dollar deposits, turns out to be correlated with the dependent variable (column 2). The portfolio view of FD suggests a possible alternative: the volatility of inflation and the real devaluation rates (Δp_sd and Δrer, respectively), are both uncorrelated with the residuals of regression (1) and correlated with deposit dollarisation (explaining close to 30% of the cross-country variability of *dollar_avg*). In turn, the positive link between FD and output volatility is not lost when I instrument the latter by these two variables. The previous result still holds after controlling for *size* (measured as the dollar GDP at the beginning of the period) and including an *industrial* country dummy.[46]

However, the efforts to trace this link to the presence of balance sheet effects are more disappointing. Under this hypothesis, FD attenuates or reverts the expected countercyclical

[46] Business cycles tend to be milder in industrial countries where FD is virtually null, and in large economies where more developed (peso-denominated) local financial market tend to substitute for foreign dollar borrowing. In both cases, the ommited variable may bias the results —although size proved not to be a significant driver of domestic FD, and may apply more specifically the external debt (Eichengreen et al., 2003).

behaviour of exchange rates: ultimately, large devaluations in highly dollarised economies may lead to episodes of financial distress in line with the findings of section 4.2. To capture this channel, I include the correlation between output and exchange rate changes, which should increase with FD, and the number of capital account reversals, *sudden stops*, to capture the presence of sharp disruptions in local financial markets.[47] While both variables yield the expected positive sign, the coefficient of FD is almost unchanged, confirming the robustness of the link. However, the result should be taken with a pinch of salt. The fact that it cannot be clearly accounted for in terms of the channels discussed above, combined with the lack of a fully convincing instrument, suggests the need for further research.

As noted in section 2, the FD literature that emphasizes the incidence of the net aggregate currency mismatch had focused primarily on external foreign currency liabilities, particularly bonded debt.[48] While this does not deny the relevance of onshore dollarisation as a source of financial distress, offshore dollarisation certainly played a role in recent financial crises and helps explain the ruinous consequences of currency collapses in economies where onshore dollarisation was only marginal. In principle, we would expect to observe a negative link between measures of offshore dollarisation and output volatility, as cyclical variations or sharp declines in the value of the local currency are amplified by a deterioration in the capacity to pay of local debtors (including the government). This link is explored in the last three columns in Table 7, where I replicate the previous tests using the ratio of (private plus public) foreign-denominated bonded debt over GDP (*dollar_bond_ avg*) as a measure of the external dollarisation. In this case, As can be seen, output volatility is positively and significantly correlated with the level of foreign currency bonds for non-industrial economies –but not for industrial ones– even after controlling for economic size, real exchange rate cyclicality, and sudden stops.

Finally, Table 8 reports the results for the growth regressions. First, the average growth rate is regressed on the average dollarisation ratio and a group of standard controls such as initial per capita GDP, initial human capital (proxied by the ratio of secondary school enrolment at the beginning of the period, *sec*), the average investment-to-GDP ratio (*invgdp_avg*) and population growth (*popg_avg*), and regional dummies. As the table indicates, dollarisation is negatively associated with growth. Endogeneity, again, is a natural obstacle, this time aggravated by the fact that nearly all conceivable instrument has been related in one way or another with growth by the vast growth literature. As before, we resort to the *restrictions* index, a second best choice that, to

[47] Similar results were obtained including, instead, the number of banking or currency crises, and excluding offshore financial centres.
[48] See, e.g., Eichengreen et al (2003) and Berganza and García Herrero (2003).

the extent that it represents a long-standing legal arrangement, should in principle be little influenced by growth performance. The IV results are even stronger, almost doubling the FD coefficient without altering the others, and robust to the inclusion of economic size and the sudden stop dummy.

As before, the table tests the impact of external dollarisation, this time with no success. Indeed, the coefficient turns positive when deposit dollarisation is dropped to gain observations, and is (barely) significant at 14 percent for the sub-sample of developing economies (column 7). This positive association may due to the fact that virtually all external debt in developing economies is denominated in foreign currency. Then, inasmuch as fast growth tend to facilitate access to international bond markets, the positive connection between the former and a larger external debt-to-GDP ratio may be simply reflecting the reverse causality.

Overall, these findings suggest that FD has a detrimental effect on the real economy. While more detailed and longer data are still needed to address potential endogeneity problems more conclusively, this preliminary exploration supports the view that, for a dollarised developing economy, the growth path is likely to be slower and more hectic than for the rest.

4.4. Robustness: Using a matching approach

Consider the following linear specification $y_{it} = B\mathbf{x}_{it} + \Gamma D_{it} + \varepsilon_{it}$, where y is the variable under study (for example, the growth rate), D is our "treatment" (for example, the degree of financial dollarisation), **x** is a vector of additional regressors, and ε is the error term. If the link between the y and any x is non-linear, and if x is, in addition, correlated with D, the estimated coefficient of D could erroneously capture the non-linear part of the link between y and x. The matching approach, which consists in "matching" observations that are associated with similar values of the regressors, can be used to deal with the possibility of this "selection on observables" bias.

The matching approach attempts to reproduce the conditions of a natural experiment by comparing treated and untreated observations with similar characteristics. An efficient way of conducting this comparison is by matching observations according to their treatment propensity score, s –in this case, the probability of being financially dollarised– as a function of the additional regressors, **x**. In this way, a multidimensional problem (matching countries based on each of the regressors **x)** is reduced to a one-dimensional problem (matching them based on the

score *s*).[49] I use this approach here to verify the robustness of the cross-country results on inflation, output volatility and growth reported above.

To implement this approach, I need to define the treatment, and the specification to estimate the propensity score. For the first purpose, I construct a high dollarisation dummy (*highdoll*) equal to one for those observations that exhibit a dollarisation ratio above the sample median of 20 percent, and define high-dollarisation observations (*highdoll* = 1) as my treatment group –leaving low-dollarisation observations as the control group. In turn, I estimate the propensity score as a logit function of highdoll in terms of the controls included in the cross-section regressions that I want to check. I use models 5 and 6 in Table 4 for the case of inflation (in line with those results, I expect that the inclusion of the average money growth rate should sensibly reduce the incidence of FD on inflation), model 5 of Table 7 for output volatility, and model 1 of Table 8 for growth.[50]

Once that all observations are scored and ranked accordingly, I compute two alternative matching estimators: the stratification estimator (*STE*) and the nearest neighbour estimator (*NN*). The results, summarized in Table 9, broadly confirm the previous findings. Inflation is higher in dollarised economies, even after controlling for the rate of broad money growth. FD is also associated with greater output volatility –although the coefficient is smaller when the stratification estimator is used. Finally, growth rates are, on average, sensibly smaller in financially dollarised economies: more than 1 percentage point below those in non-dollarised economies.[51]

Box 4. Matching Estimators

I compute the matching estimators reported in Table 9 in the following way. First, I estimate the propensity score, *s*, by running a logit regression of the treatment (*highdoll*) on the vector of regressors **x** included in the original linear regression. Then, I rank the observations according to their estimated propensity scores and group them into 3 strata. The equivalence between matching based on the full set of regressors and matching based on the propensity score applies only to treatments and controls on the common support of *s*. To ensure that this is the case, I discard countries with a propensity score lower than the lowest (or higher than the highest)

[49] See Rosenbaum and Rubin (1983), Dehejia and Wahba (1999), and Heckman, et al (1997) for details, and Persson (2001) and Edwards and Magendzo (2002) for recent applications to macroeconomic problems.
[50] Dummies are dropped in all cases.
[51] Reassuringly, substituting highdoll for dollar in specification N of Table NN yields a coefficient of -0.1 and a *t* of -2.96.

among treated observations. Thus, while the treatment to control ratio increases with the estimated propensity score, there are always both treatments and controls in each stratum.

After checking that the score has successfully formed homogenous strata (using an equality of means test between treatments and controls within each stratum for all the regressors), I estimate the treatment effect (namely, the impact of high dollarisation on the variable of interest) using two alternative matching estimators: the *stratification estimator* (STE), and the *nearest neighbour estimator* (NN).

This STE is computed as the weighted average of the average differences in the dependent variable of interest between high- and low-dollarisation groups within each stratum, weighing each difference by the number of treated observation included in the stratum. More precisely, the stratification estimator can be expressed as:

$$STE = \frac{1}{N^T}\left[\sum_{i\in T}\Delta y_i^T - \left(\sum_b \frac{N_b^T}{N_b^C}\sum_{i\in C_b}\Delta y_i^C\right)\right]$$

where b identifies the stratum, H and L are the sets of low and high dollarisation observations and N^H, N^L are the number of observations of each type. Finally, I compute the variance of STE as:

$$Var(STE) = \left(\frac{1}{N^T}\right)\left[Var(\Delta GDP_i^T) + \sum_b \frac{N_b^T}{N^T}\frac{N_b^T}{N_b^C}Var(\Delta GDP_i^C)\right]$$

In turn, the *NN* matches each treated observation with the untreated observation with which it has the smallest difference in propensity score. Note that this implies that the same control may be paired with more than one treated observation, and that not all controls are used by the procedure. After all treated observations are matched, the *NN* simply conducts a means test between the treatments and the selected controls.

4.5. Is euroisation different?

Eastern European economies provide perhaps the most striking example of a growing FD trend. A close look at individual countries within this group reveals that, with different patterns, and after declining from very high early levels at the onset of price liberalization, dollarisation

remained stable or increased in recent years (Figure 4).[52] Yet the dollarisation debate in Europe has been dominated by a focus on official euroisation, undoubtedly influenced by the prospect of monetary integration –and the belief in its inevitability–, at the expense of a discussion on de facto euroisation, on which surprisingly little has been done (another reason why FD tends to be mistakenly perceived as a Latin American issue).

The surge of FD in Europe could be in principle attributed, at least in part, to the prospects of monetary integration with the euro area. This influence materializes through increased trade and financial links with Euroland, the growing euro-orientation of exchange rate regimes (which derive much of their credibility from an eventual adoption of the euro), or even the benign view of financial euroisation by the local authorities (see, e.g., Padoa-Schioppa, 2002). In this regard, euroisation may be tolerated (and even encouraged) as a transition phenomenon in the path to full monetary integration; indeed, new and prospective EMU members may find it difficult to restrict the spontaneous euroisation of their financial systems given the restrictions the membership imposes regarding capital mobility. In sum, FD may be viewed as the reflection of the growing acceptance of the euro as store of value, in anticipation of official euroisation.

Is this euro difference visible in the data? More precisely, is FD, presumably due to an increasing use of euro-denominated deposits, deeper in Europe than elsewhere? One can start to answer this question by checking whether dollarisation for Eastern European countries is indeed higher than what would be explained by its drivers. With this in mind, I compare the predicted deposit dollarisation ratio (computed using model 6 of Table 3) with actual ratios for the years 1999 and 2001 (Figure 8). The objective of the exercise is twofold. On the one hand, to check whether these countries present consistently higher FD ratios than predicted. On the other, to examine whether such deviations tended to increase in the two years following the launch of the euro. At first sight, the answer to both questions appears to be positive. With the exception of Estonia and Poland, Eastern European countries exhibit FD ratios at or above the predicted values, which in most cases increased (albeit slightly) after 1999, pushing the average deviation from 5.3 percent in 1999 up to 8.6 percent in 2001.

However, these deviations are not large enough to conclude that the proximity of the euro zone alters the nature of FD in Europe.[53] On the contrary, the basic determinants identified in section 3 appear to account for FD in the region reasonably well. Moreover, FD in Eastern

[52] The initial levels may have reflected in many cases a transitory valuation effect, namely, the combination of a rapidly depreciating real exchange rate and a relatively stable currency composition of deposits.
[53] From a statistical perspective, if we add a Eastern European dummy to the previous specification, the coefficient is significant only at 10.5 percent.

Europe predates euro convergence (as witness, for example, the cases of Poland or Hungary) and only gradually is the euro becoming a driving factor. This explains why the euro share of foreign currency deposits rose only marginally in 2001 in most cases (pushing the average from 31 to 33.1 percent) without displacing the dollar (Figure 9).[54] Thus, the increase in euro deposits –sometimes hailed as a signal of euro expansion– largely mirrors a parallel increase in dollar deposits. In sum, while the euro has successfully replaced former European currencies (particularly, the Deutsche mark) as store of value, the widespread and growing FD that characterized Eastern Europe in recent years cannot be attributed to a renewed demand for euro assets.

If euroisation is not ostensibly different from dollarisation in terms of its drivers, what about its consequences? Can we say that the conclusions drawn in this section apply to the case of prospective EMU members in the same way as to, say, Latin American economies? The answer here needs to be even more nuanced than in the previous case, since there is simply not enough evidence since the inception of the euro to make an empirical judgement.

While an analysis of the consequences of euro integration far exceeds the scope of this paper, it would be naïve not to recognize a number of factors that make euroisation unique. First, EMU as an end-condition qualifies the prudential concerns highlighted in this section, inasmuch as it reduces the probability of sudden exchange rate fluctuations by increasing the incentives to quasi-peg to the euro –even at a pre-accession stage– and enhancing the credibility of such an arrangement.[55] In this regard, financial euroisation in EMU accession countries is comparable to (and face similar risk as) FD under a *credible* peg. Although a sudden regime switch (and, in particular, a sharp real depreciation of the local currency) is likely to have the same damaging economic consequences as in any other financially dollarised economy, it represents an event risk that, in the context of a euroised Eastern European economy, it is arguably a remote possibility. Second, it poses a signalling problem that resembles the case of FD under a currency board: how can local governments (and the ECB) voice prudential concerns about financial euroisation without undermining the confidence on the forthcoming monetary integration –itself a powerful commitment mechanism for policy reform? Where would these risks be coming from if not from

[54] The previous comparison excludes Hungary and the Slovak Republic, for which there is no data for 2000, and Kosovo, and Serbia and Montemegro, which are officially dollarized.

[55] Thus, the Ecofin Council report to the European Council on the exchange rate aspects of enlargment (Ecofin, 2000), still the ECB's last word on the issue, states that "[p]otential EU members wishing to join ERM II relatively swiftly after accession are *already now* expected to consider their policies with a view to their prospective membership in ERM II."

the failure of the convergence process? This may explain why position of Eastern European governments on FD can be best described as one of benign neglect –and why the ECB has been so reticent to express its views on the issue.

However, as long as monetary integration is not guaranteed, the implications of euroisation should be in principle no different than those of dollarisation. As ECB Vice-President Lucas Papademos (2004) reminds us, the high degree of de facto euroisation in Croatia "may entail some specific financial stability risks, especially if the degree of de facto euroisation in assets and liabilities does not match. These risks call for tight prudential regulation…While the adoption of the euro will eventually do away with these problems, it should not be regarded simply as a means to the end of overcoming these risks. Rather, the challenge is to enhance the attractiveness of financial intermediation in local currency, which would help to lessen the incentives to use foreign currencies in domestic transactions." This argument could be applied, with only marginal rewording, to the rest of Eastern Europe –particularly in those many cases in which, unlike Croatia, FD still favours the dollar.

5. FINAL REMARKS

The previous section showed that financially dollarised economies tend to display a greater sensitivity of domestic prices to money creation and –possibly as a result– higher inflation rates, a greater propensity to suffer systemic banking crises, and a slower and more volatile output growth, without any visible gain in terms of domestic financial depth. In sum, the evidence confirms the concerns typically associated with FD –and casts doubt on the financial intermediation argument often invoked in its favour. Overall, these findings provide a case for promoting de-dollarisation as an active policy.

The discussion of the main FD drivers in section 3 offers some guidance as to how to proceed. In particular, the preliminary evidence advices in favour of a monetary policy aimed at a stable inflation in a context of a flexible exchange rate regime (as suggested by the portfolio approach), combined with reliable institutions –although the specific institutional aspect involved (protection of creditors rights? monetary institutions that prevent inflationary surprises?) is not fully clear from the empirical evidence.

However, the persistent dollarisation levels exhibited by many well-managed economies around the globe suggest that a sound monetary policy and better institutions may not be sufficient. Moreover, policy credibility and institutional quality take time to build –and, to the extent that they tend to be eroded during crises episodes, may take longer in financially dollarised

economies. Even in a best-case scenario in which these aspects are properly addressed, there may still be market imperfections that ultimately favour dollar intermediation. For example, a high correlation between currency and default risk (a significant dollarisation driver proxied in Table 3 by the cyclical behaviour of the real exchange rate) may be largely due to FD, as dollarised debtors tend to go bankrupt after a sharp devaluation. Thus, dollarisation can generate its own seed and, to the extent that it involves a negative externality, should be addressed through prudential regulation. Ultimately, the tests indicate that the long-run cost of reducing onshore dollarisation through legal restrictions are rather small.

It is on these grounds that an *active* de-dollarisation strategy can be formulated. Any such strategy should entail a two-way approach.[56] On the one hand, financial regulation and safety nets should be revised to address ex-ante the factors that favour the use of the dollar. On the other, peso instruments should be introduced and promoted to limit the impact of more stringent regulation in terms of domestic financial intermediation.

On the first front, one thing to note is that standard prudential best practices have traditionally addressed currency imbalances only at the bank level and through limits on open currency positions, and have remained silent on the higher credit risk of dollar loans to non-dollar earners. The use of prudential norms to limit the currency exposure at the firm level has started to gained attention only recently, after the limits of existing regulations became apparent in the recent banking crises in Argentina or Uruguay.[57] In this regard, the menu goes from proportional tax-like measures (such as higher risk weights or provisioning requirements for dollarised bank assets) to simpler quantitative limits (such as maximum loan dollarisation ratios or restrictions on the application of dollar funds).

In addition, in those economies where dollar intermediation is allowed, financial safety apply uniformly across currencies. Examples abound: currency-blind deposit insurance schemes and liquid asset requirements, and even the traditional lender-of-last-resort liquidity assistance by the central bank, effectively discriminate in favour of highly dollarised banks that are more exposed to balance sheet effects. Given the positive correlation between exchange rate risk and credit risk in financially dollarised economies, any safety net would be typically more valuable for dollar instruments, and needs to be priced accordingly. This can be done, for example, through a larger deposit insurance contribution on dollar deposits, or a liquid asset requirements

[56] See Levy Yeyati (2003) for a detailed discussion along these lines.
[57] See Levy Yeyati et al. (2004). Not surprisingly, it is in those countries that the prudential rules are being revised along these lines.

proportional to the dollar share of the bank's liabilities, in both cases increasing the ex-ante cost of dollar intermediation.[58]

This prudential approach that reduces the appeal of dollar assets needs to be complemented with the development of peso markets that enhance the attractiveness of peso substitutes. While the Chilean and Israeli precedents suggest that inflation-indexed assets may have good chances to compete with dollar assets in inflation prone economies, indexation is not necessary to foster demand for local currency deposits in low inflation countries, and have played no role in recent experiencies in Poland or post-Tequila Mexico. Indeed, indexation is not free from contractual risk: experiences in Argentina and Uruguay in the late 70s ended up in forceful de-indexation when inflation picked up.[59]

Peso substitutes involve not only (indexed and non-indexed) local currency deposits and loans, but also the domestic capital market, essential to substitute peso domestic debt for dollarized external debt. That was the path chosen by countries such as Australia (due to a growing concern about currency mismatches after floating its currency in 1984) and Mexico (after the cautionary lesson of the 1994 Tequila crisis). The historical record on de-dollarisation also highlights the leading role of public sector debt management in the provision of liquidity and benchmark issues for the new market at the start-up stage.[60] International financial institutions (IFIs) have also a role to play in a de-dollarisation strategy. As is well known, residents in developing economies hold important stocks of foreign assets due to credit and confiscation risk, which is only partially correlated with the currency risk that underlies onshore FD. In the absence of peso-denominated investment-grade assets, the offshorisation of domestic savings automatically reduces the supply of peso funds and increase liability dollarisation, even in a context of stable inflation and floating exchange rates. If so, IFIs can issue high-grade local-currency paper and use the proceeds to fund peso loans to developing economies (or swap existing ones). By decoupling currency from country risk, these issues would meet the demand of resident investors willing to take a position in their own currency but wary of speculative assets – or local pension funds willing to reduce their country exposure.[61] In so doing, they would reduce

[58] Prudential limits such as restrictions on deposit insurance or commitments not to bailout dollarized debtors are hard to honour during a massive meltdown; hence, the emphasis of ex-ante costs as opposed to contingent threats.

[59] Argentina provides yet another, more recent example of the contractual uncertainty that may undermine indexation: to mitigate the impact of the currency collapse on dollar debtors, dollar mortgages were pesified and indexed to the CPI in early 2002, only to be re-indexed to a (flatter) wage index a few months down the road.

[60] See Bordo et al. (2002). Regulations limiting the financial choices of institutional investors (particularly, pension funds) have often contributed to reduce these early costs (Chile, Colombia, Mexico and, more recently, Poland are good examples).

[61] The role of IFIs in decoupling sovereign and currency risk has been highlighted by Eichengreen and Hausmann (2004). The focus on resident savers as the prime targets of local-currency IFI bonds is emphasised in Levy Yeyati (2004).

the substantial currency exposure introduced by dollarised official lending, while helping to start up a market for long peso securities.

In sum, while sound and credible monetary and fiscal policies, and reliable institutions are necessary conditions for any successful de-dollarisation strategy, they are not sufficient. If de-dollarisation is to be taken as a policy objective, a proactive agenda with specific measures to mitigate the presence of dollar-friendly externalities and to enhance the attractiveness of peso substitutes is needed to complement long-term policies. Ultimately, the economic implications of FD justify the effort.

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Table 1. Deposit dollarisation and inflation

			Balanced sample					
		Dollarisation	Dollarisation	Inflation	Latam		Transition*	
					Dollarisation	Inflation	Dollarisation	Inflation
	mean	19.8	21.5	46.3	24.7	65.5	35.8	30.4
	median	*15.6*	*17.8*	*15.8*	*18.3*	*17.4*	*30.0*	*24.8*
1990	Obs.	51	31	31	15	15	12	12
	min	0.1	0.1	2.1	0.6	3.0	12.6	3.9
	max	85.8	85.8	432.8	85.8	432.8	66.6	101.5
	mean	31.4	27.5	11.5	32.6	3.9	44.0	11.0
	median	*27.8*	*18.7*	*3.1*	*16.3*	*3.7*	*45.5*	*9.5*
2000	Obs.	97	31	31	15	15	12	12
	min	0.1	0.5	-0.9	1.5	-0.9	17.5	-0.8
	max	93.2	92.4	187.2	92.4	10.5	81.2	37.6

*Due to data availability, for transition economies I use 1995 as the early date.

Table 2. Dollar liabilities over GDP: alternative sources
(non-industrial countries excluding offshore financial centers; balanced sample)

		Domestic deposits	Cross-border loans	External bonded debt	Official long-term debt	Total*
			Full sample			
	mean	5.89	9.96	1.28	37.46	54.60
	median	*4.16*	*7.43*	*0*	*25.35*	*44.10*
1995	Obs.	59	59	59	59	59
	min	0	0	0	0	8.03
	max	26.96	60.98	35.02	222.65	250.78
	mean	9.03	13.93	3.32	36.54	62.82
	median	*8.23*	*9.52*	*0*	*26.36*	*50.54*
2000	Obs.	59	59	59	59	59
	min	0.02	0	0	0	15.62
	max	37.61	126.91	25.75	148.64	157.15
			Emerging economies			
	mean	6.90	14.78	4.28	17.07	43.03
	median	*7.30*	*10.91*	*1.80*	*9.99*	*42.60*
1995	Obs.	17	17	17	17	17
	min	0.22	2.66	0	0	11.97
	max	17.20	53.81	35.02	72.90	83.69
	mean	9.76	13.74	8.49	16.25	48.24
	median	*8.41*	*12.30*	*6.44*	*7.91*	*50.42*
2000	Obs.	17	17	17	17	17
	min	0.03	3.03	0	0	17.25
	max	30.72	25.44	25.75	69.87	79.28
			Non-emerging economies			
	Mean	5.48	8.01	0.07	45.72	59.28
	median	*3.74*	*4.70*	*0*	*32.03*	*44.36*
1995	Obs.	42	42	42	42	42
	min	0	0	0	3.22	8.03
	max	26.96	60.98	2.83	222.65	250.78
	Mean	8.73	14.01	1.23	44.76	68.72
	median	*8.06*	*7.06*	*0*	*33.06*	*52.47*
2000	Obs.	42	42	42	42	42
	min	0.02	0	0	2.66	15.62
	max	37.61	126.91	14.64	148.64	157.15

Table 2. Dollar liabilities over GDP: Alternative sources (continued)

		Domestic deposits	Cross-border loans	External bonded debt	Official long-term debt	Total*
			Latin America			
	mean	6.81	15.27	1.26	28.49	51.83
	median	*4.83*	*10.55*	*0*	*21.00*	*45.07*
1995	Obs.	18	18	18	18	18
	min	0	0.92	0	4.97	19.76
	max	26.96	60.98	8.31	96.54	111.95
	mean	10.85	26.07	3.88	22.21	63.01
	median	*10.00*	*13.39*	*0*	*19.74*	*50.00*
2000	Obs.	18	18	18	18	18
	min	0.02	3.07	0	2.55	18.82
	max	37.61	126.91	25.75	71.11	157.15
			Transition Economies			
	mean	6.04	12.32	1.01	47.69	67.06
	median	*4.10*	*9.48*	*0*	*32.60*	*55.85*
1995	Obs.	40	40	40	40	40
	min	0	0	0	0	11.97
	max	26.96	60.98	8.31	222.65	250.78
	mean	9.16	16.97	2.83	43.31	72.27
	median	*8.69*	*10.67*	*0*	*30.27*	*60.83*
2000	Obs.	40	40	40	40	40
	min	0.02	0	0	0	17.25
	max	37.61	126.91	25.75	148.64	157.15

Note: Excludes outliers: Nicaragua and Sao Tome & Principe.

Table 3. Dollarisation drivers

Dependent variable: Deposit dollarisation ratio (dollar)

	dollar_avg [a]					dollar (1999)					
					Unrestricted						
	1	2	3	4	5	6	7	8	9	10	11
restrictions	**-0.064*** **	**-0.053*** **	**-0.066*** **	**-0.059*** **		**-0.068*** **	**-0.066*** **	**-0.072*** **	**-0.065*** **	**-0.073*** **	**-0.064*** **
	(0.010)	*(0.010)*	*(0.010)*	*(0.011)*		*(0.012)*	*(0.014)*	*(0.014)*	*(0.015)*	*(0.015)*	*(0.013)*
Δp_avg [a]	**1.694*** **	**0.999** **	**0.755**	**1.135**	**1.302**	**0.561**	**0.357**	**-0.190**	**0.376**	**-0.123**	**-0.183**
	(0.405)	*(0.503)*	*(0.541)*	*(0.781)*	*(0.850)*	*(1.208)*	*(1.126)*	*(1.264)*	*(1.083)*	*(1.211)*	*(1.055)*
mvp [a]		**0.297*** **	**0.283*** **	**0.301*** **	**0.320*** **	**0.359*** **	**0.393*** **	**0.474*** **	**0.391*** **	**0.451*** **	**0.391*** **
		(0.075)	*(0.081)*	*(0.084)*	*(0.090)*	*(0.089)*	*(0.100)*	*(0.089)*	*(0.096)*	*(0.082)*	*(0.109)*
gdppc_i			**-0.047*** **	**-0.049*** **	**-0.047*** **	**-0.059*** **	**-0.014**	**-0.035**			**-0.054*** **
			(0.013)	*(0.015)*	*(0.018)*	*(0.016)*	*(0.027)*	*(0.024)*			*(0.014)*
rer_cyc				**-0.100** **	**-0.128** **	**-0.120** **	**-0.096** **	**-0.124** **	**-0.093** **	**-0.114** **	**-0.122** **
				(0.045)	*(0.053)*	*(0.046)*	*(0.043)*	*(0.050)*	*(0.042)*	*(0.050)*	*(0.054)*
composite_1							**-0.082**		**-0.105*** **		
							(0.054)		*(0.029)*		
Cpia_1								**-0.082**		**-0.116** **	
								(0.056)		*(0.053)*	
jurepeg_1											**-0.046**
											(0.062)
lysfix_1											
constant	**0.259*** **	**0.192*** **	**0.558*** **	**0.546*** **	**0.527*** **	**0.662*** **	**0.334***	**0.787*** **	**0.228*** **	**0.663*** **	**0.625*** **
	(0.027)	*(0.028)*	*(0.106)*	*(0.121)*	*(0.150)*	*(0.134)*	*(0.193)*	*(0.230)*	*(0.042)*	*(0.211)*	*(0.120)*
Observations	106	105	100	91	68	92	81	68	81	68	85
R-squared	0.26	0.39	0.46	0.47	0.42	0.50	0.56	0.54	0.56	0.52	0.52

Robust standard errors in parentheses.
significant at 10%; ** significant at 5%; *** significant at 1%.
[a] Computed based on monthly data for the periods 1990-2001 (models 1 to 5) and 1990-1999 (models 6 to 11).

Table 4. Dollarisation and inflation

Dependent variable: Inflation (Δp)

	FE	FE	FE	OLS	IV [a] (averages)	IV [b] (averages)
	1	2	3	4	5	6
Δm2	**0.564*** **	**0.321*** **	**0.395** **			**0.904*** **
	(0.081)	*(0.086)*	*(0.158)*			*(0.104)*
Δgdp	**-0.243*** **	**-0.351*** **	**-0.145**	**-3.914** **	**-4.010** **	**-1.551** **
	(0.079)	*(0.102)*	*(0.147)*	*(1.737)*	*(1.694)*	*(0.758)*
Δintrate	**0.000*** **	**0.000*** **	**0.000*** **			
	(0.000)	*(0.000)*	*(0.000)*			
Δer	**0.324*** **	**0.287*** **	**0.381*** **			
	(0.071)	*(0.080)*	*(0.099)*			
Δm2_dollar_avg		**0.746*** **				
		(0.262)				
Δm2_dollar			**0.471***			
			(0.242)			
dollar_avg				**0.534** **	**0.639*** **	**0.186***
				(0.226)	*(0.201)*	*(0.101)*
composite				**-0.042** **	**-0.032**	**0.001**
				(0.021)	*(0.030)*	*(0.013)*
latam				**0.062**	**0.059**	**0.019**
				(0.049)	*(0.048)*	*(0.024)*
safrica				**0.117***	**0.121** **	**0.054**
				(0.061)	*(0.061)*	*(0.033)*
transition				**0.022**	**0.001**	**0.052**
				(0.094)	*(0.085)*	*(0.057)*
restrictions				**-0.007**		
				(0.014)		
constant	**-0.007**	**-0.003**	**0.005**	**0.190** **	**0.166***	**-0.023**
	(0.015)	*(0.017)*	*(0.043)*	*(0.075)*	*(0.085)*	*(0.039)*
Observations	2961	2050	1071	98	98	96
R-squared	0.85	0.86	0.89	0.42	0.42	0.83

Standard errors robust to heteroskedasticity and, in fixed-effect specifications, to clustering by country-specific observations, in parentheses.

significant at 10%; ** significant at 5%; *** significant at 1%.

[a] Instruments: Δgdp_avg, composite_avg, latam, safrica, transition and restrictions.

[b] Instruments: Δm_avg, Δgdp_avg, composite_avg, latam, safrica, transition and restrictions.

Table 5. Dollarisation and financial fragility

Dependent variable: Crisis dummy						
	1	2	3	4	5	6
Δer	0.588***	-0.829	-0.610	-1.205	-1.209	-2.321
	(0.158)	(0.706)	(1.128)	(1.393)	(1.409)	(1.552)
FL/FA	0.000***	0.003**	0.005**	0.006*	0.006*	0.007
	(0.000)	(0.001)	(0.002)	(0.003)	(0.003)	(0.005)
dollar	0.745**	0.674*	0.676	0.477	0.477	0.411
	(0.348)	(0.359)	(0.416)	(0.426)	(0.428)	(0.448)
FL/FA * Δer		0.072**	0.101**	0.122*	0.122*	0.146
		(0.031)	(0.046)	(0.064)	(0.064)	(0.095)
dollar * Δer		**1.310***	**2.027***	**2.543***	**2.544***	**3.196****
		(0.695)	*(1.049)*	*(1.347)*	*(1.373)*	*(1.335)*
Δp			**-1.549**	**-1.510**	**-1.508**	**-1.092**
			(1.053)	*(1.127)*	*(1.085)*	*(1.177)*
Δtt			**0.014**	**0.012**	**0.012**	**0.011**
			(0.012)	*(0.012)*	*(0.012)*	*(0.013)*
realint			**-0.000****	**-0.000***	**-0.000***	**-0.000****
			(0.000)	*(0.000)*	*(0.000)*	*(0.000)*
M2/reserves			**-0.005**	**-0.007**	**-0.007**	**-0.006**
			(0.011)	*(0.016)*	*(0.017)*	*(0.017)*
Δgdp			**0.001**	**-0.006**	**-0.006**	**-0.001**
			(0.033)	*(0.037)*	*(0.039)*	*(0.039)*
private credit/gdp			**-0.723**	**0.554**	**0.552**	**0.795**
			(1.112)	*(1.300)*	*(1.293)*	*(1.336)*
cash/assets			**-0.944**	**-0.820**	**-0.820**	**-0.922**
			(1.014)	*(1.111)*	*(1.110)*	*(1.334)*
capital flows/gdp			**-1.548**	**-0.498**	**-0.496**	**-0.575**
			(1.411)	*(1.425)*	*(1.400)*	*(1.536)*
gdppc_i				**0.000****	**0.000****	**0.000****
				(0.000)	*(0.000)*	*(0.000)*
composite_avg				**-0.659***	**-0.659***	**-0.671***
				(0.371)	*(0.371)*	*(0.347)*
sudden stop					**0.012**	**-0.243**
					(0.956)	*(0.903)*
currency crisis						**1.109***
						(0.617)
constant	**-3.555*****	**-3.493*****	**-2.455*****	**-2.737*****	**-2.737*****	**-2.912*****
	(0.292)	*(0.300)*	*(0.529)*	*(0.481)*	*(0.484)*	*(0.496)*
Observations	1104	1104	535	483	483	483
F-tests						
dollar + dollar *Δer		**5.77**	**7.10**	**5.24**	**5.24**	**7.11**
(p-value)		*(0.016)*	*(0.008)*	*(0.022)*	*(0.022)*	*(0.008)*
FL/FA + FL/FA*Δ er		**5.27**	**4.86**	**3.56**	**3.57**	**2.33**
(p-value)		*(0.022)*	*(0.027)*	*(0.059)*	*(0.059)*	*(0.127)*
Δer+FL/FA*Δer+dollar*Δer		**0.30**	**3.94**	**2.53**	**2.52**	**1.15**
(p-value)		*(0.583)*	*(0.047)*	*(0.112)*	*(0.112)*	*(0.283)*

Notes: All regressors lagged one period. The crisis dummy equals one for the first year of a banking crisis. Subsequent crisis years dropped from the sample. The variable dollar equals one if the deposit dollarisation ratio exceeds 10%.
Robust standard errors in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 6. Dollarisation and growth

Panel A. Means tests

	Low dollarisation *(std dev.)*	High dollarisation *(std dev.)*	Means-tests *(p-value)*
mean Δgdp_avg)	**0.035**	**0.026**	**-0.010**
	(0.015)	*(0.019)*	*(0.002)*
mean (Δgdp_sd)	**0.042**	**0.065**	**0.023**
	(0.023)	*(0.043)*	*(0.000)*
Number of countries	64	60	

Note: Low (high) dollarisation countries are those with average dollarisation ratios below (above) the sample median (20%).

Panel B. Correlations

	Δgdp_avg *(p-value)*	Δgdp_sd *(p-value)*
dollar_avg	**-0.2700** *(0.000)*	**0.3814** *(0.000)*
Δgdp_sd	**-0.2276** *(0.000)*	

Table 7. Output volatility regressions

Dependent variable: Growth volatility (Δgdp_sd)

	OLS	OLS	IV [a]	IV [b]	IV [c]	OLS [d]	OLS [d]	OLS [d]
							Non industrials	Non industrials
	1	2	3	4	5	6	7	8
dollar_avg	**0.019****	**0.047*****	**0.038***	**0.038****	**0.040****			
	(0.009)	*(0.016)*	*(0.019)*	*(0.016)*	*(0.017)*			
dollar_bond_avg						**0.054****	**0.193****	**0.197****
						(0.023)	*(0.074)*	*(0.092)*
gdppc_i	**0.007****	**0.009****	**-0.002**	**0.004***	**0.005****	**0.000**	**0.000**	**0.000**
	(0.003)	*(0.003)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.000)*	*(0.000)*	*(0.000)*
sec	**-0.029***	**-0.021**	**-0.021**	**-0.006**	**0.000**	**-0.021**	**-0.012**	**-0.024**
	(0.016)	*(0.022)*	*(0.018)*	*(0.017)*	*(0.013)*	*(0.016)*	*(0.015)*	*(0.020)*
Δtt_sd	**0.002*****	**0.002*****	**0.001*****	**0.001*****	**0.001*****	**0.001****	**0.001****	**0.001****
	(0.000)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.001)*	*(0.001)*	*(0.001)*
composite_avg	**0.000**	**-0.002**	**0.007**	**0.004**	**0.001**	**0.004**	**0.002**	**0.001**
	(0.006)	*(0.006)*	*(0.005)*	*(0.005)*	*(0.004)*	*(0.006)*	*(0.006)*	*(0.006)*
latam	**-0.007**	**-0.008**	**-0.007**	**-0.013****	**-0.011****	**-0.004**	**-0.005**	**-0.002**
	(0.006)	*(0.006)*	*(0.005)*	*(0.005)*	*(0.005)*	*(0.005)*	*(0.005)*	*(0.007)*
transition	**0.011****	**0.009**	**-0.001**	**-0.005**	**0.002**	**0.012**	**-0.003**	**0.010**
	(0.005)	*(0.006)*	*(0.005)*	*(0.006)*	*(0.007)*	*(0.008)*	*(0.019)*	*(0.021)*
safrica	**-0.003**	**0.001**	**-0.001**	**-0.002**	**0.001**	**0.003**	**0.007**	**0.005**
	(0.007)	*(0.010)*	*(0.007)*	*(0.006)*	*(0.006)*	*(0.007)*	*(0.007)*	*(0.009)*
Δp_sd		**-0.012**						
		(0.013)						
Δer_sd		**0.031**						
		(0.093)						
restrictions		**0.005***						
		(0.003)						
industrial				**-0.022*****	**-0.017****	**-0.014****		
				(0.008)	*(0.008)*	*(0.006)*		
size				**-0.002****	**-0.002****			**-0.000**
				(0.001)	*(0.001)*			*(0.002)*
sudden stop					**0.006****			**0.008***
					(0.002)			*(0.005)*
rer_cyc					**0.016***			**0.018**
					(0.008)			*(0.026)*
constant	**0.022****	**0.013**	**0.032*****	**0.048*****	**0.045*****	**0.022****	**0.015**	**0.016**
	(0.010)	*(0.016)*	*(0.009)*	*(0.013)*	*(0.012)*	*(0.009)*	*(0.009)*	*(0.024)*
Observations	73	66	66	66	66	103	82	80
R-squared	0.59	0.64	0.44	0.55	0.62	0.32	0.31	0.36

Robust standard errors in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%.

[a] Instruments: Δp_sd, Δer_sd, gdppc_i, sec, Δtt_sd, composite_avg, latam, transition and safrica.

[b] Instruments: Δp_sd, Δer_sd, gdppc_i, sec, Δtt_sd, composite_avg, industrial, size, latam, transition and safrica.

[c] Instruments: Δp_sd, Δer_sd, gdppc_i, sec, Δtt_sd, composite_avg, sudden stop, rer_cyc, industrial, size, latam, transition and safrica.

[d] Averages and standard deviations taken for the period 1993-2001 for which bond data is available.

Table 8. Growth regressions

Dependent variable: Average growth rate (Δgdp_avg)

	OLS	OLS	IV [a]	IV [b]	IV [c]	OLS [d]	OLS [d]
		(exc. offshore)					Non-industrials (exc. offshore)
	1	2	3	4	5	6	7
dollar_avg	**-0.016***	**-0.021****	**-0.049*****	**-0.046*****	**-0.066*****		
	(0.009)	*(0.010)*	*(0.018)*	*(0.017)*	*(0.023)*		
dollar_bond_avg					**-0.006**	**0.059**	**0.107**
					(0.015)	*(0.047)*	*(0.071)*
gdppc_i	**-0.006*****	**-0.006*****	**-0.006*****	**-0.006*****	**-0.006*****	**0.020*****	**0.027*****
	(0.001)	*(0.001)*	*(0.002)*	*(0.002)*	*(0.002)*	*(0.007)*	*(0.003)*
sec	**-0.004**	**0.002**	**0.003**	**0.004**	**0.017**	**-0.071*****	**-0.055*****
	(0.014)	*(0.013)*	*(0.018)*	*(0.020)*	*(0.020)*	*(0.021)*	*(0.021)*
invgdp_avg	**0.136*****	**0.145*****	**0.132*****	**0.135*****	**0.149*****	**0.044**	**0.002**
	(0.039)	*(0.039)*	*(0.046)*	*(0.045)*	*(0.054)*	*(0.059)*	*(0.054)*
popg_avg	**0.418*****	**0.424*****	**0.595*****	**0.555*****	**0.629*****	**-0.572**	**-1.346*****
	(0.130)	*(0.120)*	*(0.185)*	*(0.179)*	*(0.187)*	*(0.366)*	*(0.394)*
m2/gdp_avg	**0.004**	**-0.004**	**0.007**	**0.005**	**-0.008**	**0.020***	**0.010**
	(0.006)	*(0.007)*	*(0.009)*	*(0.009)*	*(0.008)*	*(0.011)*	*(0.017)*
composite_avg	**0.004**	**0.003**	**0.004**	**0.003**	**0.002**	**-0.028*****	**-0.024*****
	(0.004)	*(0.004)*	*(0.005)*	*(0.005)*	*(0.005)*	*(0.010)*	*(0.008)*
latam	**-0.009****	**-0.009****	**-0.004**	**-0.004**	**-0.003**	**0.002**	**-0.007**
	(0.004)	*(0.004)*	*(0.006)*	*(0.006)*	*(0.007)*	*(0.006)*	*(0.006)*
transition	**-0.012****	**-0.012****	**-0.005**	**-0.006**	**-0.004**	**0.046*****	**0.012**
	(0.005)	*(0.005)*	*(0.006)*	*(0.006)*	*(0.007)*	*(0.012)*	*(0.015)*
safrica	**-0.013****	**-0.012****	**-0.009**	**-0.008**	**-0.006**	**0.009**	**0.015**
	(0.006)	*(0.006)*	*(0.007)*	*(0.007)*	*(0.008)*	*(0.009)*	*(0.009)*
size				**-0.000**			
				(0.001)			
currency crisis				**-0.001**			
				(0.001)			
constant	**0.011**	**0.011**	**0.008**	**0.010**	**0.007**	**0.032**	**0.057*****
	(0.012)	*(0.012)*	*(0.014)*	*(0.017)*	*(0.015)*	*(0.019)*	*(0.021)*
Observations	64	62	62	60	60	95	73
R-squared	0.63	0.63	0.54	0.57	0.47	0.38	0.52

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

[a] Instruments: gdppc_i, sec, invgdp_avg, popg_avg, M2/gdp_avg, composite_avg, latam, transition, safrica and restrictions.

[b] Instruments: gdppc_i, sec, invgdp_avg, popg_avg, M2/gdp_avg, composite_avg, latam, transition, safrica, restrictions, size and currency crisis.

[c] Instruments: dollar_bond_avg, gdppc_i, sec, invgdp_avg, popg_avg, M2/gdp_avg, composite_avg, latam, transition, safrica, restrictions, size and currency crisis.

[d] Averages and standard deviations taken for the period 1993-2001 for which bond data is available.

Table 9. Matching estimators

Dependent variable	Stratification			Nearest Neighbour		
	Treatments	Controls	Estimator	Treatments	Controls	Estimator
Inflation[a]	47	53	**0.205** *(4.040)*	47	24	**0.217** *(4.387)*
Inflation[b]	47	51	**0.141** *(2.676)*	47	17	**0.117** *(1.955)*
Output Volatility[c]	28	39	**0.007** *(0.971)*	28	16	**0.014** *(2.264)*
Growth[d]	27	26	**-0.012** *(-2.453)*	27	18	**-0.013** *(-2.121)*

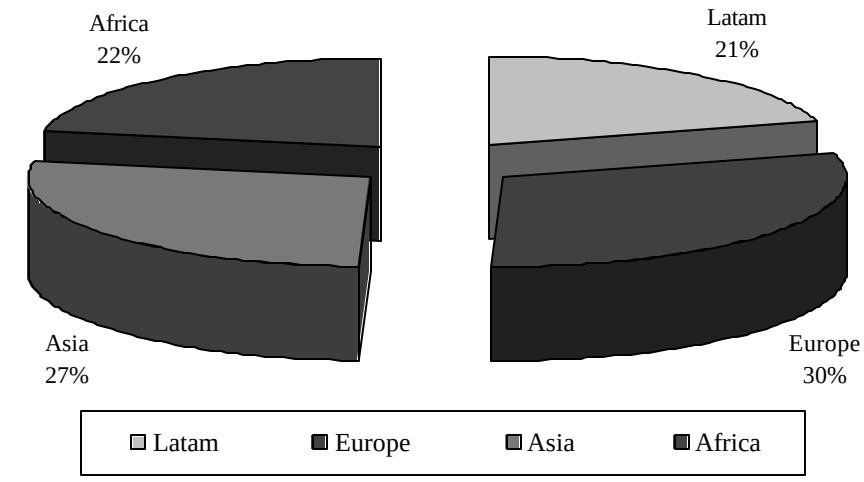
t-statistics in parentheses.
Observations matched according to a propensity score computed based on a logit model of *highdoll* on:

[a] Δgdp_avg composite_avg

[b] Δgdp_avg composite_avg Δm _avg

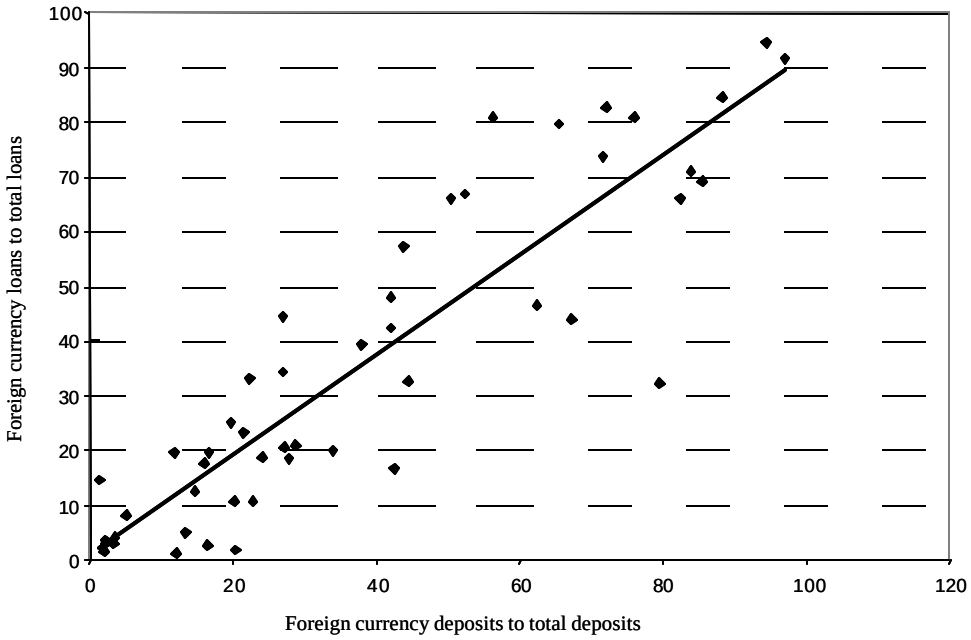
[c] gdppc_i sec Δtt_sd composite_avg sudden stop rer_cyc

[d] gdppc_i sec invgdp_avg popg_avg



Number of Observations: 73

Figure 1. Regional distribution of non-industrial countries with deposit dollarisation above 10% in 2000



Note: Foreign currency loans sourced from De Nicoló et al. (2003) and Arteta (2002).

Figure 2. Deposit and loan dollarisation

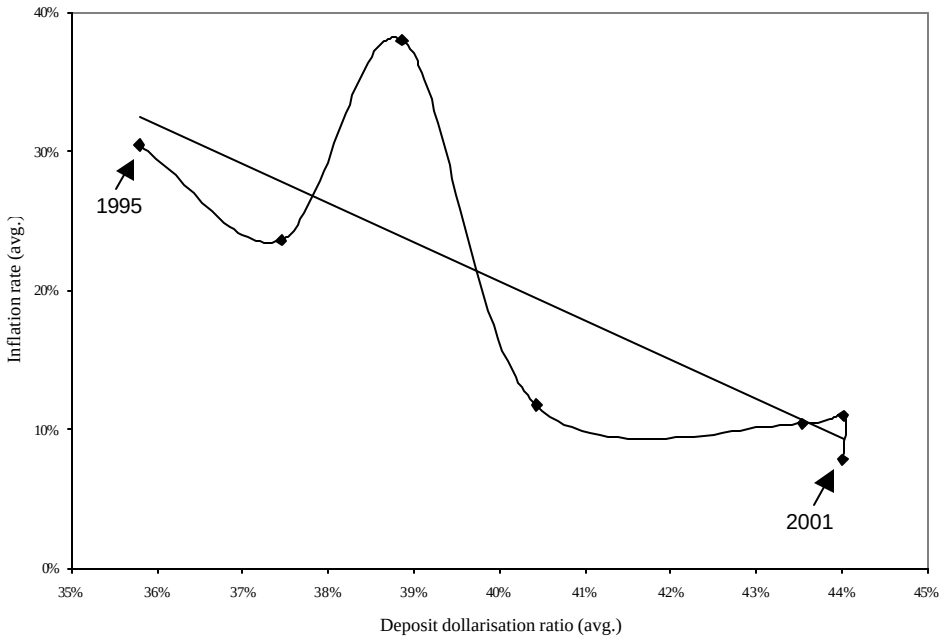


Figure 3. FD and inflation in transition economies (1995-2001)

Note: Computed based on a balanced sample that includes: Armenia, Bulgaria, Croatia, Hungary, Lithuania, Latvia, Moldova, Mongolia, Poland, Romania, Slovak Republic, Slovenia.

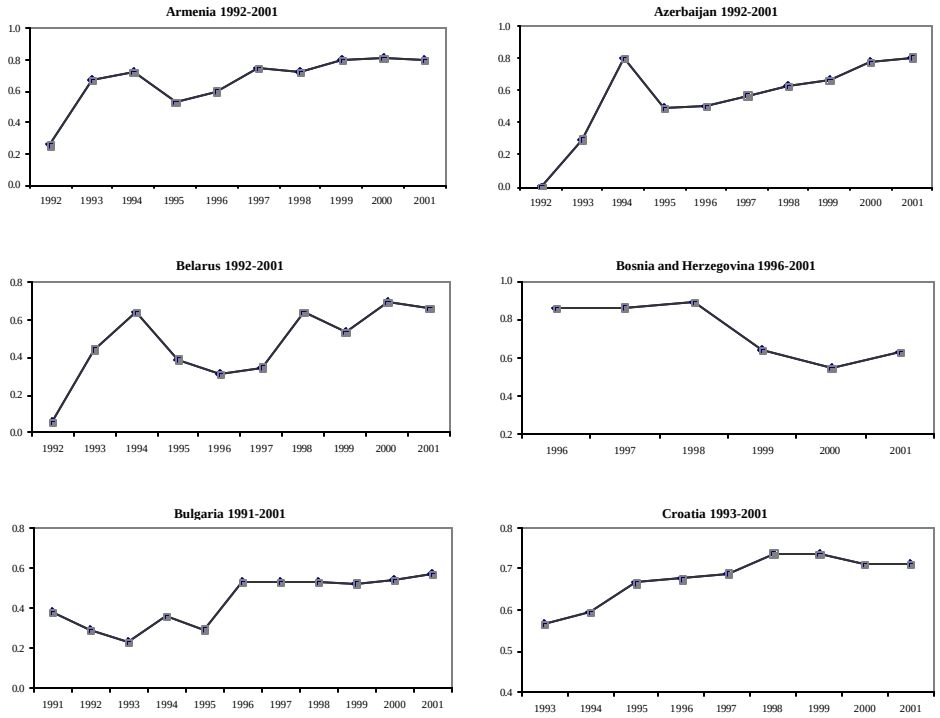


Figure 4. Deposit dollarisation ratios in Eastern European economies

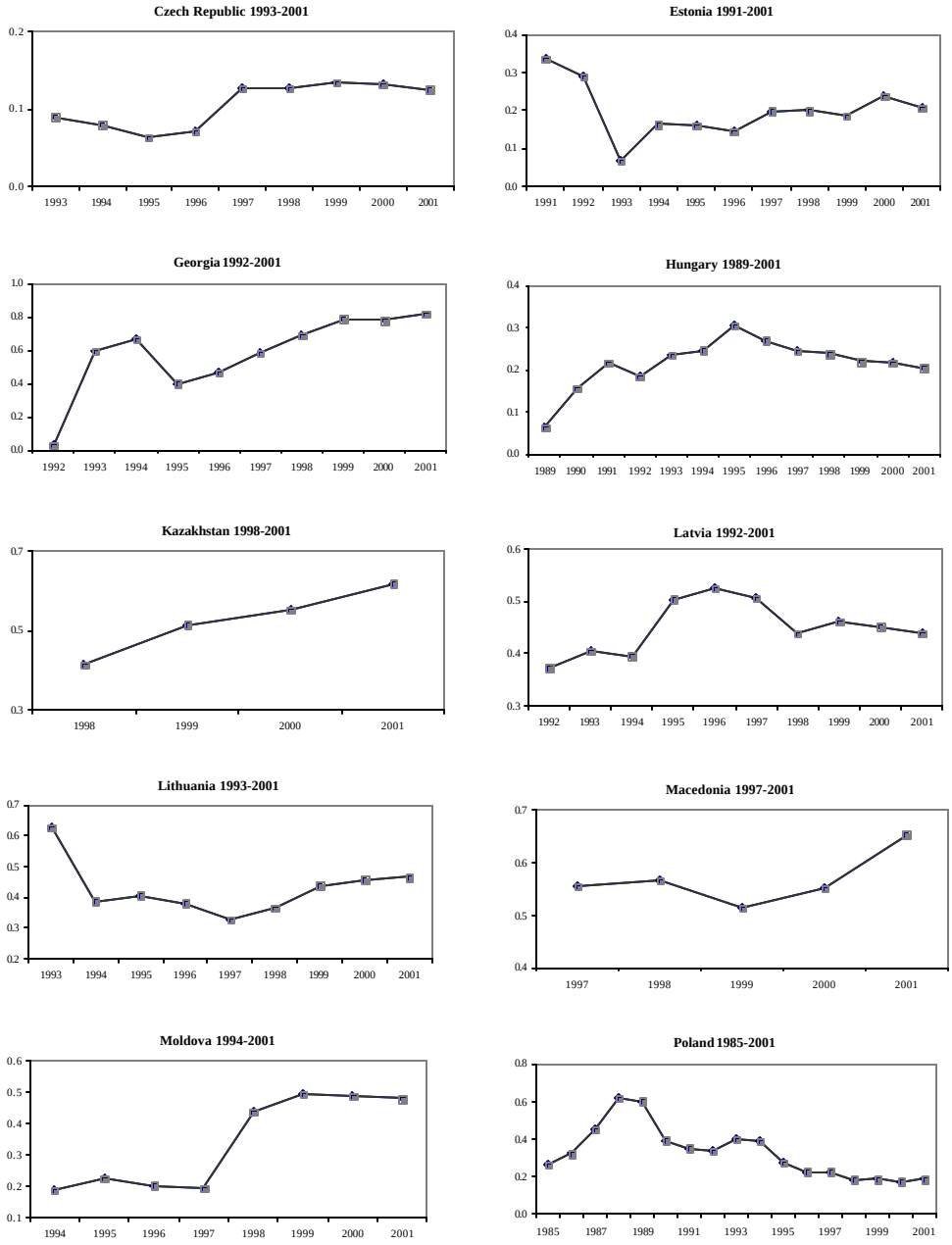


Figure 4. (cont.) Deposit dollarisation ratios in Eastern European economies

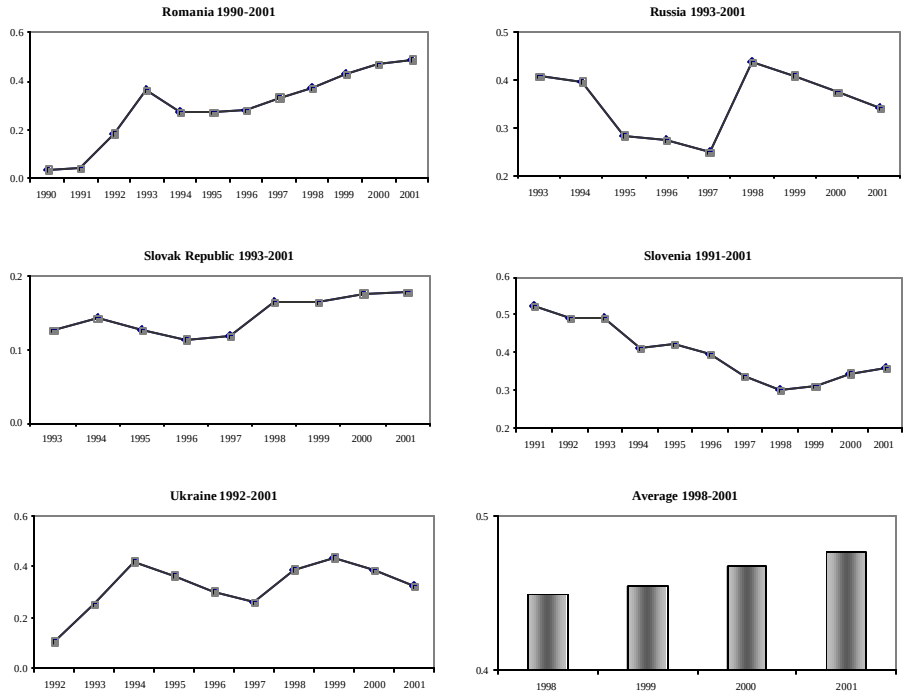
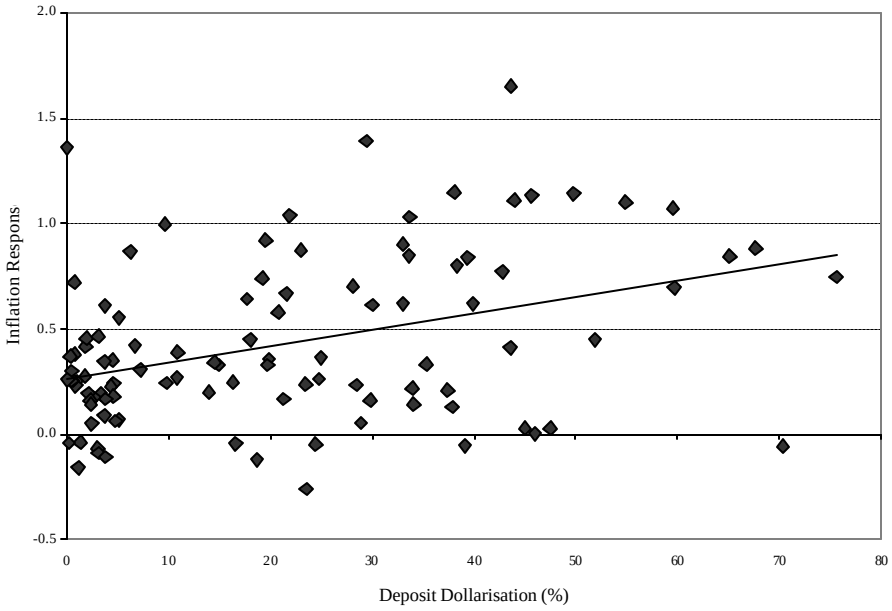


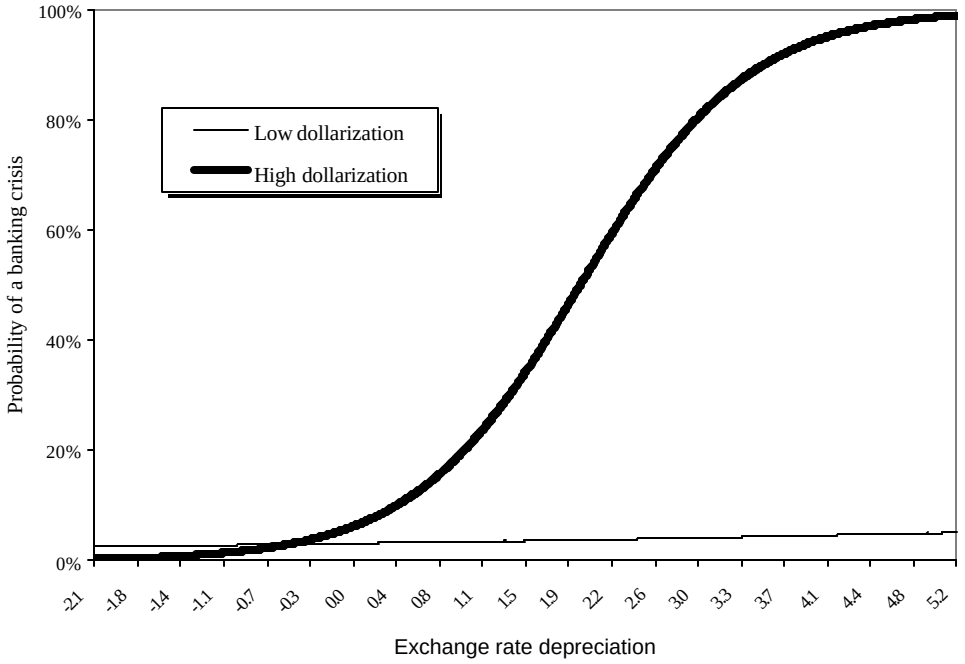
Figure 4. (cont.) Deposit dollarisation ratios in Eastern European economies



Notes: The trendline represents the locus of the fitted values of a simple regression of inflation elasticy with respect to changes in broad money on the average deposit dollarisation ratio (the elasticity is estimated as the coefficent of a simple "country-by-country" regression of the inflation rate on broad money changes excluding outliers). The regression cofficient is 0.773 with a t-statistic of 3.79.

Figure 5. FD and inflation elasticity to monetary shocks

Panel A. **Controlling for deposit dollarisation ratios**



Panel B. **Controlling for bank foreign liability ratios**

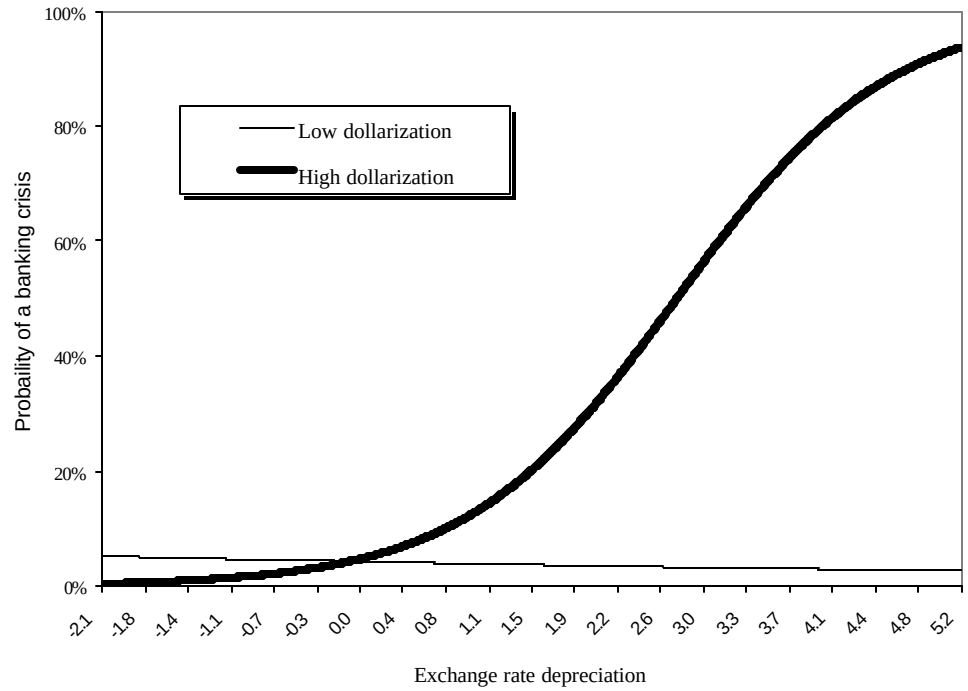
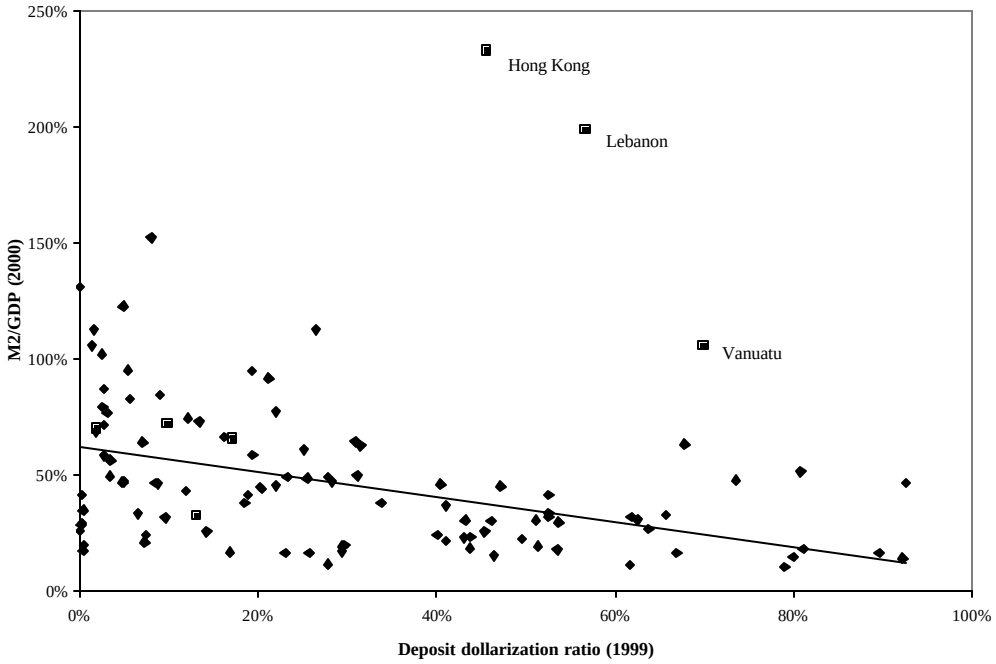


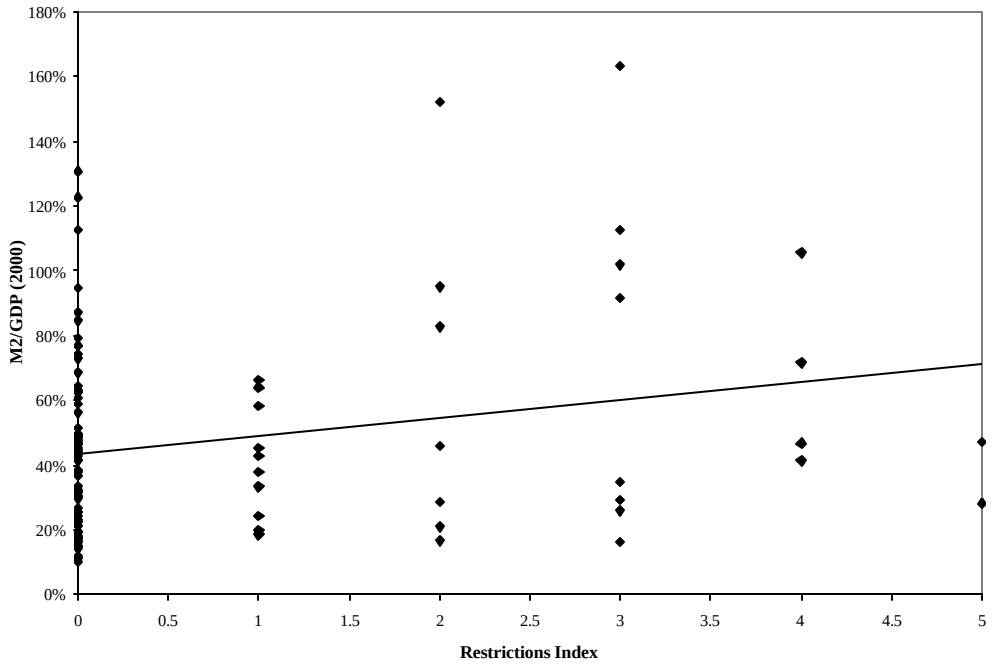
Figure 6. Probability of a banking crisis as a function of the exchange rate change

Panel A. **Financial depth and FD**



Note: Square markers represent offshore countries. The trendline represents the locus of the fitted values of a simple regression of the M2-to-GDP ratio by end-2000 on the deposit dollarisation ratio in 1999, excluding offshore observations. The regression cofficient is -0.55 with a t-statistic of -5.27. Obserrvations: 100.

Panel A. **Financial dept and dollar restrictions**



Notes: The trendline represents the locus of the fitted values of a simple regression of the M2-to-GDP ratio by end-2000 on the restrictions index. The regression cofficient is 0.056 with a t-statistic of 1.98. Observations: 105.

Figure 7. FD and financial depth

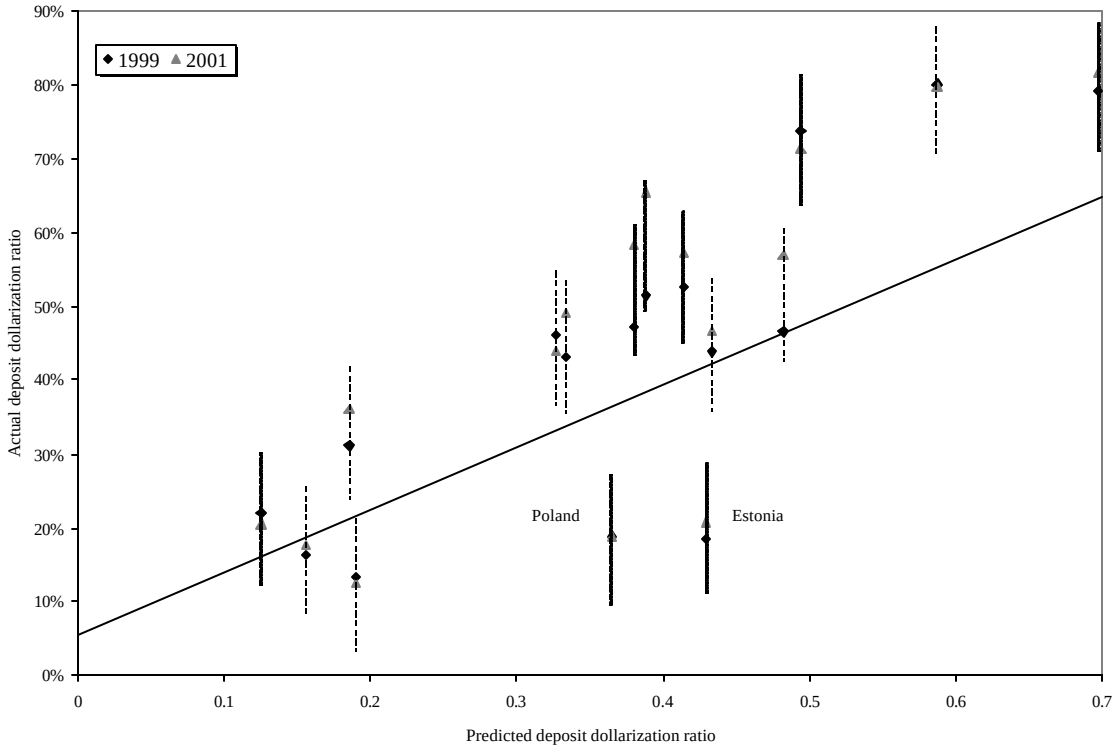


Figure 8. Is Eastern Europe Different?

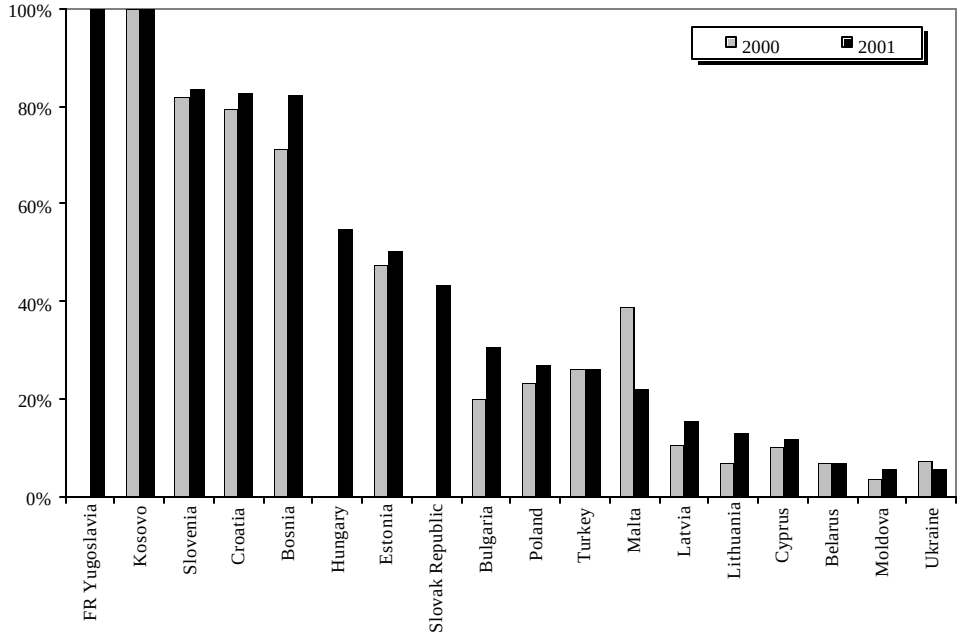


Figure 9. Euro- over foreign-currency deposits in Eastern Europe (2000-2001)

APPENDIX

Table A1. Variable definitions and sources

Variable	Definitions (sources)
Δp	Logarithmic difference of the CPI. (IMF's World Economic Outlook [WEO]).
Δer	Logarithmic difference of the nominal exchange rate (WEO).
Δrer	Δer-Δp
restrictions	Index of restrictiveness of rules on resident holdings of onshore foreign currency deposits as reported by the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAR), revised and expanded from De Nicoló et al. (2003), using their methodology.
sec	School enrolment, secondary (% gross) (The World Bank's World Development Indicators [WDI]).
Δm2	Logarithmic difference of M2 (IMF's International Financial Statistics [IFS]).
Δgdp	Logarithmic difference of real GDP (IFS).
crisis	Dummy variable equal to one for the first crisis year, zero for non-crisis years (Caprio and Klingebiel, 2003).
mvp	$(var(\Delta p) - cov(\Delta p, \Delta rer)) / (var(\Delta p) + var(\Delta rer) - 2cov(\Delta p, \Delta rer))$
M2/GDP	Ratio of M2 over GDP (IFS).
M2/reserves	Ratio of M2 over international reserves (IFS).
cash/assets	Reserves of deposit money banks over assets of deposit money banks (IFS).
private credit/gdp	Bank credit to the resident private sector over GDP (IFS).
gdppc	GDP per capita denominated in US dollars (WEO).
invgdp	Investment over GDP (WEO).
intrate	Nominal interest rate (IFS).
cpia	Country Policy and Institutional Assessment (The World Bank).
composite	Neighed average of Governance Indicators (Kaufmann, 1999).
dollar	Foreign currency deposits over total deposits in local deposit money banks (various sources).
dollar_bond	Foreign currency external bonded debt over GDP (BIS, WEO).
Δtt	Logarithmic difference of terms of trade (exports as a capacity to import; constant LCU; WDI).
FL / FA	Deposit money banks´ foreign liabilities over foreign assets (IFS).
capital flows / gdp	Capital account + financial account + net errors and omissions (IFS).
latam	Dummy variable for Latin American countries.
transition	Dummy variable for transition countries.
safrica	Dummy variable for Sub-Saharan African countries.
rer_cyc	Country–by–country correlation between Δgdp and Δrer.
jurepeg	Dummy variable for de jure exchange rate regime classification (Gosh Gulde and Wolf, 2003).
lysfix	Dummy variable for pegged exchange rate regimes (Levy Yeyati and Sturzenegger, forthcoming).
sudden stop	Dummy variable for sudden stops (Cavallo and Frankel, 2004).
currency crisis	Dummy variable for currency crises (Glick and Hutchinson, 2001).
size	Log of nominal GDP in US dollars
highdoll	Dummy variable for dollar_avg greater than 20%

Notes: x_avg and x_sd denote the country's mean and standard deviation of *x*. x_1 denotes the value of the variable *x* lagged one period.

Table A2. Deposit dollarisation data: countries and periods covered

Country	Dollariz.	Country	Dollariz.	Country	Dollariz.	Country	Dollariz.
Albania	1992-2001	Ecuador*	1990-2001	Lebanon	1993-2001	Sierra Leone	1993-1999
Angola	1995-2001	Egypt	1980-2001	Lithuania**	1993-2001	Slovak Republic**	1991-2001
Antigua and Barbuda*	1979-2001	El Salvador*	1982-2001	Macedonia, FYR**	1997-2001	Slovenia**	1991-2001
Argentina*	1986-2001	Estonia**	1991-2001	Malawi	1994-2001	South Africa	1991-2001
Armenia**	1992-2001	Ethiopia	1998-1999	Malaysia	1996-2001	Spain	1996-2001
Austria	1997-2001	Finland	1996-1999	Maldives	1981-1999	St. Kitts and Nevis*	1979-2001
Azerbaijan**	1992-2001	Georgia**	1992-2001	Malta	1975-1984	St. Lucia*	1979-1999
Bahamas, The	1975-2001	Ghana	1995-2000	Mauritius	1992-1999	St. Vincent & Grens.*	1979-2001
Bangladesh	1987-2001	Greece	1990-2001	Mexico*	1991-2001	Sudan	1992-1998
Bahrain	1984-1997	Grenada*	1979-1999	Moldova**	1994-2001	Suriname*	1975
Barbados*	1975-2001	Guatemala*	1995-2001	Mongolia**	1992-2001	Sweden	1994-2001
Belarus**	1992-2001	Guinea	1989-2001	Mozambique	1991-2001	Switzerland	1998-2001
Belize	1976-2001	Guinea-Bissau	1990-1996	Myanmar	1991-1999	Syrian Arab Republic	1975-1998
Bhutan	1993-2001	Haiti*	1994-2001	Netherlands	1990-2001	Tajikistan*	1996-2000
Bolivia*	1975-2001	Honduras*	1990-2001	Netherlands Antilles*	1975-2001	Tanzania	1993-2001
Bosnia and Herzeg.**	1996-2001	Hong Kong	1991-2001	New Zealand	1990-2001	Thailand	1982-2001
Bulgaria**	1991-2001	Hungary**	1989-2001	Nicaragua*	1990-2001	Trinidad and Tobago	1993-2001
Cape Verde	1995-1999	Iceland	1978-1999	Nigeria	1994-2001	Turkey	1986-2001
Cambodia	1993-2001	Indonesia	1992-2001	Norway	1996-2000	Turkmenistan**	1993-2000
Chile*	1976-2001	Israel	1981-2001	Oman	1975-1999	Tonga	1994-1999
China,P.R.: Mainland	1998-2001	Italy	1996-2000	Pakistan	1990-1998	Uzbekistan	1997-1999
Colombia*	1990-1999	Jamaica*	1992-2001	Papua New Guinea	1976-1999	Uganda	1992-2000
Comoros	1998-2001	Japan	1996-2001	Paraguay*	1988-2001	Ukraine**	1992-2001
Congo, Dem. Rep.	1975-2001	Jordan	1990-1999	Peru*	1975-2001	United Arab Emirates	1981-2001
Costa Rica*	1990-2001	Kazakhstan**	1998-2001	Philippines	1982-2001	United Kingdom	1990-2001
Croatia**	1993-2001	Kenya	1995-2001	Poland**	1985-2001	Uruguay*	1981-2001
Czech Republic**	1993-2001	Korea	1990-2001	Qatar	1993-1999	Vanuatu	1981-1999
Cyprus	1991-1999	Kuwait	1981-1999	Romania**	1990-2001	Venezuela*	1994-2001
Denmark	1991-2001	Kyrgyz Republic**	1995-2001	Russia**	1993-2001	Vietnam	1992-2001
Dominica*	1988-2001	Lao People's Dem. Rep.	1989-2001	Sao Tome & Principe	1995-2001	Yemen	1990-2001
Dominican Republic	1996-2001	Latvia**	1992-2001	Saudi Arabia	1975-2001	Zambia	1994-2001
						Zimbabwe	1993-1999

Note: (*) denotes Latin American countries and (**) denotes transition economies.

Table A3. Index of restrictions on holdings of foreign currency deposits by residents (as of beginning of 2000)

Country	Restrictions	Firms	Households	Prior approval	Country	Restrictions	Firms	Households	Prior approval
Albania	0	.	.	.	Ghana	0	.	.	.
Angola	0	.	.	.	Greece	0	.	.	.
Antigua and	2	1	.	1	Grenada	2	1	1	.
Argentina	0	.	.	.	Guatemala	5	2	2	1
Armenia	0	.	.	.	Guinea	0	.	.	.
Austria	0	.	.	.	Guinea-Bissau	1	.	.	1
Azerbaijan	0	.	.	.	Haití	1	1	.	.
Bahamas, The	1	.	.	1	Honduras	0	.	.	.
Bahrain	0	.	.	.	Hungary	1	1	.	.
Bangladesh	3	1	1	1	Iceland	0	.	.	.
Barbados	3	1	1	1	Indonesia	0	.	.	.
Belarus	0	.	.	.	Israel	0	.	.	.
Belice	1	.	.	1	Italy	0	.	.	.
Bhutan	5	2	2	1	Jamaica	0	.	.	.
Bolivia	0	.	.	.	Japan	0	.	.	.
Bosnia and	0	.	.	.	Jordan	0	.	.	.
Brazil	2	1	1	.	Kazakhstan	0	.	.	.
Bulgaria	0	.	.	.	Kenya	0	.	.	.
Cambodia	0	.	.	.	Korea	0	.	.	.
Cape Verde	1	.	.	1	Kuwait	0	.	.	.
Chile	0	.	.	.	Kyrgyz Republic	0	.	.	.
China: Mainland	2	1	.	1	Lao People's	0	.	.	.
China: Hong	0	.	.	.	Latvia	0	.	.	.
Colombia	3	1	2	.	Lebanon	0	.	.	.
Comoros	1	.	.	1	Lithuania	0	.	.	.
Congo, Dem.	0	.	.	.	Macedonia, FYR	0	.	.	.
Costa Rica	0	.	.	.	Malawi	2	1	1	.
Croatia	0	.	.	.	Malaysia	3	.	2	1
Cyprus	3	1	1	1	Maldives	0	.	.	.
Czech Republic	0	.	.	.	Malta	3	1	1	1
Denmark	0	.	.	.	Mauritius	0	.	.	.
Dominica	4	1	2	1	México	2	1	1	.
Ecuador	0	.	.	.	Moldova	0	.	.	.
Egypt	0	.	.	.	Mongolia	0	.	.	.
El Salvador	0	.	.	.	Mozambique	0	.	.	.
Estonia	0	.	.	.	Myanmar	3	1	1	1
Etiopía	4	1	2	1	Netherlands	0	.	.	.
Finland	0	.	.	.	Netherlands	0	.	.	.
Georgia	0	.	.	.	New Zealand	0	.	.	.

Table A4. Index of restrictions on holdings of foreign currency deposits by residents (as of beginning of 2000) (cont.)

Country	Index	Firms	Households	Prior approval	Country	Index	Firms	Households	Prior approval
Nicaragua	0	.	.	.	Suriname	0	.	.	.
Nigeria	1	.	.	1	Sweden	0	.	.	.
Norway	0	.	.	.	Switzerland	0	.	.	.
Oman	0	.	.	.	Syrian Arab Rep.	0	.	.	.
Papua New	1	1	.	.	Tajikistan	0	.	.	.
Paraguay	0	.	.	.	Tanzania	0	.	.	.
Peru	0	.	.	.	Thailand	4	1	2	1
Philippines	0	.	.	.	Tonga	4	2	2	.
Poland	0	.	.	.	Trinidad &	0	.	.	.
Qatar	0	.	.	.	Turkey	0	.	.	.
Romania	0	.	.	.	Turkmenistán	3	1	1	1
Russia	0	.	.	.	Uganda	0	.	.	.
Rwanda	3	1	1	1	Ukraine	1	.	.	1
Sao Tome	0	.	.	.	United Arab E.	0	.	.	.
Saudi Arabia	0	.	.	.	United Kingdom	0	.	.	.
Sierra Leone	0	.	.	.	Uruguay	0	.	.	.
Slovak Republic	1	.	.	1	Uzbekistán	0	.	.	.
Slovenia	0	.	.	.	Vanuatu	0	.	.	.
South Africa	0	.	.	.	Venezuela	0	.	.	.
Spain	0	.	.	.	Vietnam	2	1	1	.
St. Kitts and	3	1	1	1	Yemen	0	.	.	.
St. Lucia	0	.	.	.	Zambia	0	.	.	.
St. Vincent & G.	0	.	.	.	Zimbabwe	0	.	.	.
Sudan	0	.	.	.					

Source: IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions 2001*, based on De Nicoló et al. (2003).
Firms and Households equal 1 if only documented proceeds of exports or remittances can be lodged to the account; 2 if accounts are not permitted or are limited to a very narrow category of holder. Prior approval equals 1 if required.
The *restrictions index* is computed as the sum of the three columns.