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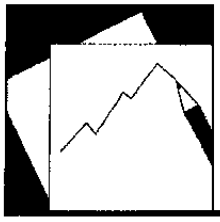

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Dollarization of Liabilities: Beyond the Usual Suspects

Adolfo Barajas and R. Armando Morales

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Dollarization of Liabilities: Beyond the Usual Suspects

Prepared by Adolfo Barajas and R. Armando Morales[1]

Authorized for distribution by Enzo Croce and Patricia Brenner

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Abstract

Dollarization of liabilities (DL) has emerged as a key factor in explaining the vulnerability of emerging markets to financial and currency crises. "Usual suspects" of causing DL comprise "fatalistic" determinants such as a long history of unsound macroeconomic policies and development and institutional factors, aided by moral hazard opportunities related to government guarantees. This paper assesses empirically the relevance of these factors relative to alternative explanations. Based on a sample of Latin American countries, we find that ongoing central bank intervention in the foreign exchange market, relative market power of borrowers, and financial penetration are at least as important in explaining DL.

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Authors' E-Mail Addresses: abarajas@imf.org, amorales@imf.org.

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I. INTRODUCTION

Dollarization of liabilities (DL) has recently received increasing attention in the literature analyzing the vulnerabilties faced by emerging economies. It is now recognized that by exposing the balance sheets of both the public and private sectors to large swings in the exchange rate, DL can be a contributing factor to exchange and financial crises. In particular, Goldstein and Turner (1996) include the degree of DL among the indicators that signal greater likelihood of banking crises. Although the occurrence of banking crises leading to currency crises is more frequent than the reverse (Kaminsky and Reinhart, 1999), DL facilitates credit expansion during credit booms, the latter being a predominant early warning indicator of impending banking crises. Tornell and Westermann (2002) construct a model that illlustrates how a foreign currency mismatch in the private sector caused by DL could have sizable real effects at times of crises. Small enterprises (mostly nontradable activities) are affected more severely through credit channel effects (leading to sizable output declines) if they are heavily indebted in foreign currency, particularly after a credit boom. Finally, it is apparent that increased globalization of financial markets and liberalization of domestic financial systems can lead DL to expand significantly within a short period of time in emerging economies.

For a long time, the issue of DL was not addressed separately from the broader issue of asset dollarization (deposits and currency) and currency substitution. Asset dollarization is generally seen as being caused primarily by a history of macroeconomic mismanagement that had failed to provide credible stabilization, and its consequences are mostly related to the loss of effectiveness of monetary policy (Savastano, 1996).

DL became an area of concern in relation to the increasing government contingent liabilities associated with large borrowing in foreign currency under a fixed exchange rate regime. Recently, this argumentation was expanded to explain why many countries prefer not to let their exchange rates float (Calvo and Reinhart, 2000). Policymakers would favor a relatively stable exchange rate for prolonged periods because of concerns about corporate and financial institutions being more vulnerable to large swings in the exchange rate, the larger the discrepancy between large liabilities denominated in foreign currency in the balance sheets of private agents relative to the financing requirements of foreign-exchange generating activities (Krugman, 1999; Eichengreen and Hausmann, 1999). In turn, DL amplifies the potential downturns in economic activity (Caballero and Krishnamurthy, 2002), increasing the cost of exchange rate volatility for policymakers. Countries would tend to be biased toward maintaining exchange rate stability until they become financially integrated, macroeconomically stable, and gain the ability to hedge their exchange rate risk exposure (Poirson, 2001).

What causes dollarization of liabilities? Is DL the unavoidable result of a long history of low credibility in monetary policy? New models have been developed to explain the emergence of DL in developing economies. Some emphasize the supply side, relating DL with the broader issues of financial sector development and completeness (Caballero and Krishnamurthy, 2002; Hausmann and others, 1999). Other models emphasize the demand

side, with perverse incentives related to moral-hazard opportunities leading borrowers to increase exposure to foreign currency liabilities while banks rely on bailout expectations to facilitate corresponding loanable resources (Dooley, 1997; Burnside, Rebelo and Eichembaum, 1999). Other approaches analyze DL in the context of a general portfolio model, with factors such as capital inflows, regulatory wedges, risk and market power differentials to explain discrepancies between asset and liability dollarization (Ize and Levy-Yeyati, 1998; Catao and Terrones, 2000). In general, DL is characterized in most models as a "fatalistic" result of past policies in combination with moral hazard incentives related to bailout expectations.

This empirical paper assesses the role of "fatalistic" factors. We investigate whether DL basically follows the evolution of the dollarization of deposits—that is, asset dollarization—with additional effects related to development factors and conventional moral hazard explanations (based on bailout expectations). We also assess the role of ongoing monetary policy in the context of large availability of cross-border financing in recent decades. In particular, we measure the impact of central bank intervention in the foreign exchange market (providing exchange rate guarantees), and of market power of firms in the sense that broader corporate access to foreign bank financing may strengthen the bargaining power of borrowers against banks. We find that these complementary variables have a significant role in explaining DL, in addition to past policies reflected in overall financial dollarization. Bailout expectations may play a role, but results are not entirely consistent. Development and other structural factors measured by conventional proxy variables do not seem to play a role. By contrast, financial development generally encourages DL, perhaps because financial development reflects greater financial integration with the rest of the world.

In contrast with the case of dollarization of assets, empirical evidence to assess explanatory factors is scant to date. To our knowledge, only Arteta (2002) has an empirical paper in which he assesses the role of the exchange rate regime in the foreign exchange position of domestic banks for a sample of 90 countries, finding that floating regimes entail larger currency mismatches. Our paper differs in that we incorporate other possible factors explaining DL, including not only domestic bank operations but also borrowing from overseas banks as reported to the BIS. Our paper uses a newly constructed banking sector database for a sample of countries in Latin America, where this practice has become widespread.

The paper is organized as follows: Section II comprises an overview of competing explanations of DL, including a discussion of why DL is more relevant in emerging markets and why DL could become a problem. Section III describes the behavior of DL in the sample, investigating the patterns of the evolution of its level and variability over time, similarities across the region and a comparative analysis with respect to asset dollarization within each country. Section IV shows panel data estimations, including a discussion of expected signs of alternative effects. Section V concludes and discusses policy implications.

II. Relevant Variables Explaining DL

A. Why is DL More Relevant in Emerging Markets?

Banks' domestic lending in foreign currency has not been a matter of concern for developed economies. As their currencies are accepted worldwide (for example, the U.S. dollar, the euro, the yen, and the pound sterling), they are less vulnerable to currency crisis. Currency crises are much more frequent (and more acute) in countries where the only source of currency demand is domestic.[2] In developed economies, banks' lending in foreign currency to corporations is significant, but is negligible at the retail level. In developing economies, it would appear that DL is more widespread and frequent at the retail level.

In economies with currencies accepted only domestically, economic factors that undermine credibility in the domestic currency will condition the assessment of risks, affecting in turn the choice of the currency of financing. It is possible that, under certain conditions, agents may resort to foreign currency financing at least for some period, regardless of the limited hedging possibilities in their financial markets. Therefore, DL could be readdressed as an issue of borrowing in a currency accepted internationally by agents whose revenue is largely denominated in a currency only accepted domestically.

Therefore, in these economies the perception of economic agents about the monetary authorities' intention regarding interest rate and exchange rate policy should play a crucial role in the decision to choose the currency of denomination of loans. In particular, if the monetary authorities reveal a strong preference to keep the exchange rate stable over keeping interest rates low, this may result in prolonged periods in which borrowing in domestic currency becomes more expensive. If borrowers have sufficient market power (for example, because prime customers increase their access to foreign financing), they may induce domestic banks to expand their foreign currency lending.

Complementary factors observed in emerging markets also play a role. For instance, the degree of financial development may affect the possibility of stabilizing arbitrage. Deficient banking supervision may overlook the buildup of problem loans arising from foreign currency lending. By emphasizing the "weak currency" dimension, we postulate that credibility in the currency constitutes the main driving factor.

B. What Causes DL? Overview of Main Competing Explanations

What causes DL? Formal explanations could be classified in three broad groups: Financial-development; macro-related; and banking-related explanations, which we describe below:

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[2] The Asian crisis showed that this is true also for currencies accepted by a bloc of countries.

Financial development explanations

For this group, problems related to a low degree of financial market development and completeness result in a larger borrowers' demand for foreign currency loans in developing economies:

- Caballero and Krishnamurthy (2000) show how the tendency for agents to assume foreign currency debts arises out of a lack of domestic financial development. A firm's decision to borrow in domestic currency is characterized as a purchase of a "put option" to pay the same amount of debt expressed in domestic currency in the event of a bad state of the world (that is, a sharp devaluation). The option premium paid by the firm is reflected in the interest rate differential between borrowing in domestic currency relative to foreign currency. An undervaluation of premium results from domestic financial constraints, which explains why there is a preference for borrowing in foreign exchange. The extent of this borrowing would depend on the degree of financial development.

- Hausmann and others (1999) emphasize the role of incompleteness in financial markets, associated with the "original sin" of most emerging markets, or the inability to borrow from foreign investors in domestic currency or, in general, to borrow long term in domestic currency. At the aggregate level, firms lack the possibility to fully hedge their currency exposure or alternatively to match the maturity structure of their assets and liabilities in their own currency (financial markets are incomplete). The authors show that original sin is also a good predictor of how countries manage the exchange rate. Therefore, to the extent that some long-term borrowing is needed in an economy, borrowing in foreign currency depends on how the (unavoidable) currency risk is allocated between banks and firms.

Macro-related explanations

Macro-related explanations rely on imperfections in the market resulting from moral hazard opportunities or lack of credibility affecting borrowers' decisions:

- Dooley (1997) and Burnside, Rebelo, and Eichenbaum (1999) show that fixing the exchange rate offers free insurance to firms that borrow in dollars, creating moral hazard opportunities. Implicit insurance also results from governments willing to provide bailouts to domestic financial institutions in distress. Burnside and others show that in the absence of government insurance, it is optimal for banks to hedge exchange risk in forward markets. The presence of government insurance eliminates the incentives to hedge the risk of a devaluation, encouraging banks to magnify their exchange exposure as they reap additional returns in the event of a devaluation but are bailed out if movements in the exchange rate erode the quality of loans.

- Jeanne (2002) shows that the lack of domestic monetary credibility induces domestic firms to borrow in foreign currency, when there is a deadweight loss in the event of default. In contrast with the moral hazard theories, firms minimize the risk of default conditional on monetary credibility.

Banking-related explanations

Banking-related explanations use a bank's optimization framework, with distortions and wedges explaining why assets and liabilities in foreign currency may eventually diverge:

- Ize and Levy-Yeyati (1998) devise a model of asset substitution based on a capital assets portfolio model (CAPM) formulation, with currency choice determined on both sides of a bank's balance sheet. Profit maximization under perfect competition and costless intermediation leads banks to choose a minimum variance portfolio (MVP) which defines the degree of dollarization on the loan and deposit side. The MVP, and thus dollarization, depends on the relative volatilities of inflation and real depreciation. An increase in the variance of exchange rate depreciation reduces dollarization as it limits the hedging benefits of dollar assets. Discrepancies between loan and deposit dollarization result from capital inflows and cost wedges introduced by monetary policy or taxation and regulation.

- Catao and Terrones (2000) also use a bank profit-maximization framework, and introduce imperfect competition, nonzero intermediation costs, and credit risk as additional wedge variables. In their model, foreign currency loans are more attractive to banks the higher the devaluation risk, the lower the foreign interest rate, the greater the availability of tradable collateral, and the lower the monopoly power over borrowers in the nontradable sector. While the sign and magnitude of effects is not always univocally determined, dollarization generally depends on the initial level of dollarization, credit market structure, the share of performing loans, and the marginal cost of intermediation. A discrepancy may arise between deposits and loans in foreign currency as a result of differences in the wedge variables across currencies.

C. When is DL "a Problem"?

At first glance, it is not clear why DL should be regarded as a problem, even when it becomes larger in magnitude than what is demanded by hedged borrowers. If all risks are appropriately priced into interest rates, there should be no reason to be concerned about "excess" borrowing in foreign currency, hedged or unhedged. Although the timing and magnitude of exchange rate fluctuations is hard to anticipate even in well-developed foreign exchange markets, conventional exchange rate uncertainty itself should not lead to a bias in favor or against DL. Deviations from optimal borrowing levels in any currency should be compensated over time.

However, there is a problem if one-sided decisions start to accumulate because the assessment of risks is inadequate. If risks are not fully internalized by economic agents,

exchange rate risk may be misperceived by agents and the related credit risk may be underestimated by banks.[3] Even if rational expectations ultimately prevail in the long run, there may be prolonged periods when "betting for currency stability" would imply excessive exposure to foreign currency borrowing. In the extreme, "this distortion may lead to a significant allocation of lending to borrowers whose activities appear profitable only because of the apparent low cost of credit."[4] In this paper, we are particularly interested in investigating whether policy contributes to an environment of inadequate assessment of risks.

D. What Variables Lead to Excessive Risk Taking Through DL?

Explanations that incorporate risk mispricing as an element in the motivation to increase DL are basically of a "fatalistic" nature (Caballero and Krishnamurthy) or based on bailout expectations (Dooley, Burnside, and others). Other explanations either do not incorporate risk mispricing (Hausmann, Jeanne), or are based on an equilibrium between assets and liabilities in foreign currency for the same level of risk (Ize and Levy-Yeyati) or do not show a univocal explanation for excessive risk-taking (Catao and Terrones).

Our empirical approach incorporates variables related to a "fatalistic" explanation of DL as a problem, and proxy variables measuring bailout expectations. Complementarily, we are interested in testing if ongoing monetary policy (through ongoing central bank intervention in the foreign exchange market) plays a role, and in assessing the significance of factors such as market power and access to foreign financing, which are also related to overall financial policy.

Fatalistic hypotheses

Financial dollarization in general results from prolonged uncertainty as a consequence of macroeconomic mismanagement. A more extreme variation of this view is that most of the related problems associated with DL are to be blamed on past policies. The corresponding null hypothesis for the purposes of this paper is that current policy does not play a role in DL. This would be consistent with a "fatalistic" explanation of DL, and it would be complementary to the role of other structural factors that ultimately are also the result of inappropriate past policies.

Many developing economies show a large share of foreign currency deposits over total deposits. For banks, this results in a dilemma about either to on-lend these resources in foreign currency to keep their foreign exchange position balanced, or to on-lend these resources in domestic currency when there are not sufficient borrowers that have a foreign-

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[3] Developing economies may be particularly prone to this problem, as hedging opportunities are less available than in developed economies.

[4] See Delgado, Fernando, and others, 2000.

currency denominated revenue stream. Experience shows that generally banks increase foreign currency loans because they provide the highest-yield alternative to keeping their position close to balance. Thus, both dollarization of assets and liabilities increase, reflecting past policy mismanagement.

Structural factors that are complementary to this fatalistic explanation are financial development (consistent with Caballero and Krishnamurthy), as increasing financial development should be associated with declining DL. Likewise, the degree of openness of the economy should be positively related to DL. If these factors prove to be sufficient in explaining DL, then we would conclude that there is no induced mispricing that needs to be corrected with compensatory policies, and that DL related problems could be addressed simply through policies aimed at promoting financial development and greater openness.

The role of bailout expectations

The expectation of a government bailout would encourage banks to increase their risk-taking.[5] In principle, moral hazard variables will affect DL depending on which type of risk banks perceive as being more likely protected by a government guarantee. If exchange risk is dominant, banks will tend to reduce DL, and thus assume greater exchange risk. On the other hand, if credit risk is dominant, then banks will tend to increase DL, transferring the exchange risk to their borrowers and thus assuming greater credit risk. Banks normally opt for the second alternative because they fear more the event of an exchange rate depreciation, and because they expect the government to bail out banks as long as borrowers are also benefited.

The role of central bank policy

In the short term, there is a two-way interaction between central bank policies and DL. The central bank provides an implicit exchange rate guarantee, and therefore the degree of central bank intervention to defend the exchange rate should affect the level of DL. This entails a narrower moral hazard behavior, as it relies on banks and borrowers responding to an exchange rate guarantee (not necessarily entailing bailout expectations). It may also simply reflect short-run cost-benefit considerations. While central bank exchange rate policy is commonly seen as being held captive by DL (implying a reverse causality), this should most likely reflect in a long run relationship, as central banks cannot change the exchange rate regime frequently.

A related hypothesis would be that the central bank financial policy facilitates access to international financial markets. The expanded availability of foreign currency loans to domestic borrowers in emerging economies would result also from increased global liquidity and liberalization of domestic financial systems. Therefore, in situations of normal liquidity,

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[5] This explanation is consistent with Broda and Levi-Yeyati, 2000.

integration of small economies to international financial markets should result in increasing operations in foreign exchange, including borrowing by domestic agents. This hypothesis goes in the opposite direction of Caballero-Krishnamurthy.

Market power-related variables

Bank profit maximization behavior should result in lower DL as spreads in domestic currency lending are generally higher than in foreign currency. However, the fact that banks favor DL may also have to do with their relative market power against corporate borrowers. Certain prime borrowers have direct access to foreign financing, which may lead banks to grant foreign currency loans in order to keep them as customers. We would expect this effect to be greater in countries where private sector access to foreign borrowing is quantitatively significant.

III. Recent Evolution of DL in Latin America

Our database encompasses a sample of 14 Latin American and Caribbean countries for which we obtained information on deposit and loan dollarization in the domestic banking system during recent years. As Table 1 shows, the sample period varies widely from country to country, with some countries such as Bolivia and Chile having data as far back as the late 1980s and up until 2001, and others, such as Haiti, having data for only a few years in the late 1990s. For almost all countries and variables, the basic dollarization data was monthly, from which we derived the quarterly and annual series used in the estimations. The following sections describe the most important variables used in our analysis.

A. Dollarization Indicators

To assess the degree of DL occurring through the domestic banking system, we first constructed dollarization indicators on both the deposit and loan side, defining *fcdep* as the ratio of foreign currency deposits (*FCDEP)* to total deposits, and *fccred* as the ratio of foreign currency credit (*FCCRED*) to total credit to the private sector.

Based on information from Table 1, the following characteristics stand out with regard to the dollarization of commercial bank operations in these countries. First, there is significant variation in the average degree of dollarization. Taking *fcdep*, for example, it ranges from a low of 4–5 percent in Mexico and El Salvador, to a high of over 90 percent in Bolivia. Second, countries also differ widely in the variability of dollarization over time. Taking two countries with roughly the same sample period, Uruguay and Peru, the latter not only had a considerably higher average degree of dollarization, but exhibited over three times the variability in *fcdep* (a standard deviation of 22 versus about 7 percentage points). Third, dollarization of deposits and loans, although similar for each country, are not always fully aligned (in several cases because of regulations). In countries such as Peru and the Dominican Republic, the average level and variability of dollarization are very similar, and the correlation between the two is very high. At the other extreme, countries such as Mexico and Paraguay tend to have a much higher degree (16 and 20 percentage points higher,

Table 1. Summary Statistics for Dollarization of Bank Deposits and Credit

Country	Period Available	Number of obs.	Dollarization of bank deposits *fcdep* Mean	*fcdep* Standard dev.	Dollarization of bank loans *fccred* Mean	*fccred* Standard dev.	*fcdep & fccred* Differences in mean	Differences in std. dev.	Correl.	Most recent observation fcdep Level	fcdep 2-year change	fccred Level	fccred 2-year change
Argentina	1990:01 - 2001:02	134	55.04	7.35	58.66	5.07	-3.62	2.27	0.53	65.30	3.92	62.58	-0.98
Bolivia	1989:01 - 2001:02	146	90.58	3.98	96.54	0.58	-5.96	3.40	0.64	93.01	1.43	96.66	0.54
Chile	1989:01 - 2001:03	146	8.84	3.95	18.82	4.35	-9.99	-0.40	0.82	8.00	1.55	13.77	-0.14
Costa Rica	1987:01 - 2001:09	177	37.36	6.20	16.14	14.17	21.22	-7.98	0.81	49.04	3.06	49.83	15.83
Dominican Republic	1996:01 - 2000:12	60	11.23	7.43	11.64	7.07	-0.40	0.36	0.99	23.96	9.50	24.32	10.42
El Salvador	1997:12 - 2000:12	37	5.34	1.82	6.93	6.59	-1.59	-4.77	0.80	8.16	0.48	14.56	0.38
Haiti	1996:09 - 1999:09	37	27.95	2.63	26.45	6.78	1.49	-4.15	0.92	31.55	4.31	39.46	17.45
Honduras	1996:12 - 2001:02	51	28.97	1.62	25.60	1.92	3.36	-0.30	-0.48	28.70	0.18	23.84	-4.19
Jamaica	1996:03 - 2001:01	59	25.40	1.96	20.36	2.15	5.04	-0.19	-0.27	28.33	3.52	20.46	1.13
Mexico	1997:01 - 2000:12	48	4.23	0.38	24.10	2.12	-19.87	-1.74	-0.74	4.94	0.95	19.65	-5.67
Nicaragua	1995:01 - 2001:12	84	62.31	5.82	70.43	13.70	-8.11	-7.88	0.95	69.88	2.24	81.89	1.90
Paraguay	1988:12 - 2001:02	147	46.53	13.33	30.60	15.95	15.92	-2.62	0.87	65.30	2.08	50.75	-12.47
Peru	1986:12 - 2001:02	171	62.14	22.02	62.36	20.81	-0.22	1.21	0.96	76.84	-1.09	81.77	3.84
Uruguay	1985:01 - 2001:02	194	86.01	6.61	83.09	3.30	2.92	3.31	0.88	91.94	3.26	87.32	-1.36
Average			37.08	5.70	38.39	7.11	-1.31	-1.41	0.46	43.00	2.10	44.46	0.05
Total observations		1,539											

Sources: IMF, *International Financial Statistics*; and various central bank websites.

respectively) of dollarization on the loan than on the deposit side. Other countries, El Salvador and Haiti, have similar average levels of loan and deposit dollarization, but the latter tends be more volatile. Generally, although for most countries in our sample there appears to be a positive correlation between both types of dollarization, three countries surprisingly show negative correlation in the sample period (Honduras, Jamaica, and Mexico).[6]

We also observe an increase in both types of dollarization in recent years. In the final two columns of Table 1, we compute the absolute change in the dollarization indicators over the final twelve months of each sample period. All countries except Peru have increased deposit dollarization in recent years, and most countries have increased loan dollarization as well. Furthermore, with the exception of a few countries, notably Paraguay, loan dollarization appears to be proceeding more rapidly than on the deposit side.

As shown in Table 2, we obtain an estimate of the evolution of the foreign exchange net lending position of the banking system for each country (*fep*), by subtracting foreign exchange deposits from foreign exchange loans relative to broad money or the total banking system liabilities to the private sector (*LIABPS*):[7]

$$fep = \frac{fep}{LIABPS} = \frac{FCCRED - FCDEP}{LIABPS}$$

Thus, a negative value for *fep* indicates that banks are maintaining a negative lending position in foreign currency, which would presumably make them vulnerable to unanticipated devaluations. If banks exhibit a positive value for *fep*, the corresponding transfer of the exchange rate risk to their borrowers would impact the quality of the loan portfolio in the event of exchange rate depreciation.

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[6] Dollarization of assets and liabilities in Mexico is subject to restrictions in the sample period.

[7] We defined this variable according to the banking system aggregate we used for the dollarization and net foreign asset indicators. In most cases, since we used the broad banking system (Deposit Money Banks + Other Banking Institutions, or DMB + OBI), we defined *LIABPS* as the banking survey liabilities to the private sector. In those cases where we used DMB only, the relevant *LIABPS* was taken from the monetary survey.

Table 2. Foreign Exchange Position of Commercial Banks

Country		of obs.	Average	Max.	Min.	Std. Dev.	Average	Max.	Min.	Std. Dev	*nfa* and *fep*
Argentina	1990:01 - 2001:02	134	8.82	90.68	-14.41	14.91	-17.85	-2.07	-186.96	24.23	-0.92
Bolivia	1990:01 - 2001:02	134	19.28	34.91	-0.88	7.18	-2.54	11.02	-12.82	6.27	-0.32
Chile	1989:01 - 2001:02	146	13.79	20.94	6.49	3.22	-4.38	13.63	-17.23	8.35	-0.89
Costa Rica	1987:01 - 2001:09	177	-25.54	-10.22	-39.31	6.25	3.49	9.18	-3.21	2.75	-0.76
Dominican Republic	1996:01 - 2000:12	60	2.02	4.95	-0.08	1.35	-0.58	4.30	-5.31	2.50	-0.93
El Salvador	1989:01 - 2000:12	132	0.50	11.45	-6.03	3.96	-0.90	6.28	-6.03	3.22	-0.89
Haiti	1996:09 - 1999:09	37	-9.98	-8.33	-13.94	1.13	9.91	12.88	7.92	1.14	-0.78
Honduras	1996:12 - 2000:12	50	-3.82	2.08	-10.00	3.33	13.01	19.65	7.45	3.74	-0.42
Jamaica	1995:06 - 2001:01	59	-12.44	-4.56	-18.55	4.18	6.69	12.37	2.04	3.04	-0.85
Mexico	1997:01 - 2000:12	48	23.37	30.30	18.65	2.61	2.85	5.01	0.47	1.24	-0.12
Nicaragua	1995:01 - 2001:12	84	-35.73	-24.97	-43.57	4.80	8.08	20.03	-0.10	5.29	-0.55
Paraguay	1988:12 - 2001:02	147	-9.10	0.60	-19.80	5.70	9.91	19.76	1.82	4.35	-0.81
Peru	1988:12 - 2001:02	171	-1.30	19.59	-20.15	10.93	3.39	20.49	-15.24	8.16	-0.93
Uruguay	1985:01 - 2001:02	192	-24.99	-2.53	-48.98	12.22	30.95	66.76	-2.60	19.53	-0.80
Total observations		1,571									

Sources: IMF, *International Financial Statistics*; and various central bank websites.

The foreign exchange net lending position indicator *fep* varies even more widely across countries in the region than the relative dollarization indicators. In some countries, it is negative and quite large, indicating a substantial currency mismatch in the banking system; for example, in Nicaragua it averages over a third of broad money, and in Uruguay and Costa Rica it averages about a quarter of broad money.[8] In other countries *fep* is positive; for example, banks in Mexico and Bolivia on average tend to have a positive position of one quarter and one fifth of broad money, respectively. Finally, in some countries banks maintain a relatively small position on average; for example, in El Salvador, less than 1 percent of broad money.

Beyond its average level, we also observe that the foreign exchange net lending position showed a great deal of variability. In many cases, standard deviations were substantially larger in absolute value than the average level, therefore implying that the position had changed signs several times throughout the sample period, a fact that can also be observed from the minimum and maximum values. For example, throughout the 1996–2000 period, banks in Argentina on average had a position of about 9 percent, but with a standard deviation of about 15 percent of broad money. The maximum value was almost 91 percent, and the minimum value was -14 percent. However, as one would expect, for countries with the highest average positions (in absolute value), the sign did not change throughout the sample. For example, Haitian banks always maintained a positive *fep*, which fluctuated between 18 and 28 percent of broad money; Uruguayan banks maintained a negative position ranging between 3 and 49 percent.

How do these positions relate to the banks' holdings of short-term foreign assets? In Table 2 we also show *nfa*, or commercial banks' net foreign assets (short-term assets minus short-term liabilities) relative to broad money. Two basic patterns emerge. First, for most countries in our sample there appears to be an *offsetting* relationship, where a negative (positive) position is offset by a positive (negative) amount of net foreign assets. Banks generally aim at setting their overall position closer to zero, because of risk management or prudential considerations. This relationship is shown by average levels of *fep* and *nfa* of the opposite sign. In Paraguay, the negative average position in deposits and loans of 9 percent is almost perfectly offset by holdings of net foreign assets of 10 percent of broad money, while in Bolivia a positive *fep* of 19 percent is only partially offset by a negative *nfa* position of less than 3 percent. There are also countries where the *nfa* position *overcompensates* on average, that is, it is larger than needed to offset the mismatch in foreign currency loans and deposits. One example is Peru, where banks have maintained a negative foreign position of just over 1 percent, but hold almost 3 ½ percent of broad money in net foreign assets. A general observation concerning the degree of compensation is that dollarized economies tend to aim at having larger total foreign exchange assets over liabilities, benefiting in the event of an exchange rate depreciation.

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[8] In the case of Costa Rica, this is partly explained by unreported offshore operations by local banks.

For a smaller segment in our sample there is a pattern of *reinforcing*, whereby net foreign assets held by banks reinforce the mismatch in foreign currency deposits and loans, and is indicated by opposite signs of *fep* and *nfa*. An example is Haiti, where there is an average positive position of 23 percent, reinforced by net foreign asset holdings of close to 10 percent. Another example is Mexico, where the positive position of 23 percent is reinforced by net foreign asset holdings of almost 3 percent. In both cases, the same observation applies: banks are highly insured against the risk of devaluation; in fact their balance sheets would benefit directly from a devaluation, owing to their strong net asset position.[9]

We also defined an indicator of net (short-term) foreign exchange position, *np*, as the sum of the foreign exchange net lending position and net foreign assets, where a positive (negative) value represents a net asset (liability) position in foreign currency. The *np* indicator measures to what extent the banking system's balance sheets would be adversely affected by a short-term devaluation:

$$np = fep + nfa = \frac{FEP + NFA}{LIABPS}$$

In Table 3 we show summary statistics for the net position indicator, and compare it to the size of *long-term* foreign liabilities (*lfl*) on bank balance sheets. Some countries show a negative position, but it is either negligible (El Salvador, Haiti) or responds to ad hoc factors, such as sizable offshore bank operations (Costa Rica), exchange-rate-indexed loans in domestic currency (Nicaragua), or a stronger commitment to an exchange rate peg (Argentina). The net position of banks also varied significantly over time, and changes in sign were not infrequent. Comparing the net position with *lfl*, which can be interpreted as an indicator of access by the banking system to international capital markets, the relationship between the two is not always clear. For example, Honduran and Uruguayan banks appear to have relatively ample access to international capital, yet they still maintain a strong net position (about 9 and 6 percent, respectively). Also, in some cases such as Argentina, it is clear that *lfl* does not adequately reflect access to international capital markets.

[9] These conclusions are preliminary, as some variables are being left out in our analysis, such as offshore operations.

Table 3. Commercial Banks: Net Position in Foreign Currency and Long-term Foreign Liabilities

Country	Period Available	Number of obs.	Foreign Exchange Position and Net Foreign Assets of Commercial Banks (*as a percentage of banks' liabilities to the private sector*)							
			nfa + fep: Net position				Long-term Foreign Liabilities			
			Average	Max.	Min.	Std. Dev.	Average	Max.	Min.	Std. Dev
Argentina	1990:01 - 2001:02	134	-9.03	2.60	-96.28	12.00	0.00	0.00	0.00	0.00
Bolivia	1990:01 - 2001:02	134	16.74	33.64	-9.44	7.87	5.08	6.60	3.24	0.79
Chile	1989:01 - 2001:02	146	9.40	22.50	1.59	5.67	5.84	26.12	1.70	5.11
Costa Rica	1987:01 - 2001:09	177	-22.05	-13.26	-33.84	4.53	1.69	3.58	0.43	0.69
Dominican Republic	1996:01 - 2000:12	60	1.43	4.22	-0.58	1.33	0.33	0.43	0.02	0.06
El Salvador	1989:01 - 2000:12	132	-0.40	6.75	-5.60	1.85	1.27	3.94	0.00	1.44
Haiti	1996:09 - 1999:09	37	-0.06	1.33	-1.98	0.75	0.00	0.00	0.00	0.00
Honduras	1996:12 - 2000:12	50	9.18	12.60	0.14	3.83	11.52	15.52	8.12	1.97
Jamaica	1995:06 - 2001:01	59	-5.74	-1.41	-9.67	2.25	0.00	0.00	0.00	0.00
Mexico	1997:01 - 2000:12	48	26.22	33.41	22.48	2.75	3.53	5.19	1.43	1.23
Nicaragua	1995:01 - 2001:10	82	-27.64	-18.32	-38.12	4.80	1.18	3.46	0.44	0.67
Paraguay	1988:12 - 2001:02	147	0.81	8.63	-5.07	3.33	1.86	3.34	0.48	0.88
Peru	1988:12 - 2001:02	171	2.09	11.62	-8.49	4.58	1.40	3.75	0.06	1.12
Uruguay	1985:01 - 2001:02	192	5.96	22.12	-26.17	12.25	32.86	51.54	3.33	13.45
	Total observations	1,569								

Source: IMF, *International Financial Statistics*; and various central bank websites.

B. Interest Rate Indicators

We also collected data on the relevant interest rates on deposits and loans in foreign and domestic currency, which we summarize in the form of "relative intermediation spreads" in each currency (*sprddc* and *sprdfc*), which we define below:

$$sprddc = \left[\frac{1+il_{dc}}{1+id_{dc}}\right]-1$$

$$sprdfc = \left[\frac{1+il_{fc}}{1+id_{fc}}\right]-1$$, where il_{dc} and il_{fc} are lending interest

rates in domestic and foreign currency, respectively, and id_{dc} and id_{fc} are deposit interest rates in domestic and foreign currency, respectively. It can be shown that, if competitiveness, credit risks, and marginal costs of bank intermediation are the same across currencies, then the relative spread as defined above should be equal across currencies as well. Therefore, divergences in these relative spreads should be the result of one or more of the following: (1) Differences in market power across currencies. Here we would expect that market power in domestic currency operations would tend to be greater, as customers who borrow in foreign currency may have alternative international sources of finance; (2) Differences in marginal transaction costs. Here, it seems likely that marginal costs (excluding taxes) would tend to be similar across currencies; (3) Differential taxes on intermediation. To the extent that certain countries tax foreign exchange operations, we would expect a higher relative spread in foreign currency to arise; (4) Differences in credit risk. On the one hand, banks would tend to charge an additional premium to borrowers who are particularly vulnerable to foreign exchange risk. To the extent that banks are lending in foreign currency to sectors that receive revenue in domestic currency, the foreign exchange spread would tend to be higher. On the other hand, banks may choose only the prime customers for foreign currency loans, in which case the credit risk premium would be lower and thus the intermediation spread would be lower in foreign currency; and (5) Finally, there may be differences in maturity. If loans have different average maturities across currencies, then the foreign exchange risk attached would differ, thus leading to differences in the relative intermediation spreads.

The relative spreads in domestic and foreign currencies for our sample of countries are shown in Table 4. Although some caution should be taken in comparing the spreads across countries—owing to the different definitions and coverage of the interest rate variables[10]—two general characteristics are observable. First, for almost all countries, the

[10] In particular, one major difference arises in the case of Nicaragua, where throughout the sample period lending and deposit rates are essentially expressed in dollar terms, since "value maintenance" assured that interest rates were adjusted ex post by changes in the exchange rate.

relative spread in domestic currency is significantly higher than in foreign currency, thus reflecting a combination of the factors mentioned above. This may also be viewed as an implicit subsidy paid by customers of domestic currency intermediation services to customers operating in foreign currency. In particular, Peruvian and Bolivian banks appear to be charging a much higher relative spread on average—up to five times as high in the case of Peru (47 versus 10 percentage points)[11]—in domestic currency. Second, in three countries, Argentina, Chile, and El Salvador, the relative spreads are relatively small and are roughly equal across currencies, thus reflecting a high degree of homogeneity and competitiveness in banking activities. In fact, in Chile the relative spread in foreign currency is slightly *higher* on average than in domestic currency, perhaps reflecting the existence of taxes on foreign currency operations.

Table 4. Interest Rates and Intermediation Spreads in Domestic and Foreign Currency

Percentage spread of lending over deposit rates

Country	Period Available	Number of obs.	Relative Intermediation Spreads = $[(1+il)/(1+id)]$ -1			
			Domestic Currency		Foreign Currency	
			Average	Std. Dev	Average	Std. Dev
Argentina	1993:04 - 2000:12	95	2.64	1.00	2.45	0.78
Bolivia	1996:01 - 2001:02	63	24.85	8.58	7.04	0.55
Chile	1989:01 - 2001:02	146	2.54	0.43	2.77	1.00
Costa Rica	1996:02 - 2001:09	68	12.44	1.09	6.29	0.23
Dominican Republic	1996:01 - 2000:12	60	7.53	0.97	5.13	1.16
El Salvador	1995:01 - 2000:12	72	4.08	0.42	3.57	0.71
Haiti	1997:08 - 1999:11	28	11.49	3.06	7.43	0.84
Honduras	1998:12 - 2000:12	25	9.19	0.44	3.98	1.20
Jamaica	1997:12 - 1999:12	25	16.23	2.05	5.67	0.41
Mexico	1996:04 - 2001:02	59	4.85	1.73	2.09	0.76
Nicaragua	1996:04 - 2001:02	88	6.59	1.88	7.26	0.64
Paraguay	1988:12 - 2001:02	137	21.72	6.67	8.19	0.99
Peru	1991:07 - 2001:02	116	47.12	56.85	10.09	0.93
Uruguay	1993:12 - 2000:09 (Q)	28	13.73	4.20	3.50	0.66
Total observations		1,010				

Sources: IMF, *International Financial Statistics*; and various central bank websites

[11] These figures are definitely skewed upward as a result of the hyperinflation years of the early 1990s, where nominal interest rates and spreads became extremely high and volatile. Taking only the 1995–2001 period, the average domestic currency relative spread falls to 20 percent and its standard deviation falls to 2 percentage points, while the foreign currency counterpart falls only slightly, to just under 10 percent.

C. Exchange Rate Intervention

One hypothesis we are interested in testing is whether the exchange rate regime influences the degree to which DL arises in an economy. For this purpose we constructed an indicator of exchange rate intervention, similar to the one proposed by Levy-Yeyati and Sturzenegger (2000a, 2000b), and used more recently by Poirson (2001) and Tanner (2001). It involves comparing the degree of exchange rate variability relative to that of international reserves; a country with high (low) exchange rate variability and low (high) variability in international reserves is said to be a "floater" ("pegger") of the exchange rate. The exchange rate intervention index, *INTERV*, is defined as follows:

$$INTERV = \frac{\left(\frac{\partial NIR}{RM}\right)^2}{\left(\frac{\partial ER}{ER}\right)^2 + \left(\frac{\partial NIR}{RM}\right)^2}$$

, where *NIR* = net international reserves, *RM* = reserve money, and *ER* = the nominal exchange rate. Thus, a pure floating regime would have an *INTERV* of zero, while a hard peg would have a value of unity for *INTERV*. For our purposes, this indicator has two distinct advantages over a strictly formal or legal definition of the exchange rate regime as can be obtained from the *Annual Report on Exchange Arrangements and Exchange Restrictions*. First, it gives a clearer definition of what countries are actually doing, which, as Levy-Yeyati and Sturzenegger show, often does not coincide with the legal definition of their regime. Second, unlike the legal definition, *INTERV* also captures more changes in the degree of intervention over time, an element we would also like to account for in our panel data estimations.

For the 14 countries in our sample, summary statistics for the intervention index are shown in Table 5 for three separate sub periods: the late 1980s, the early-to-mid 1990s, and the late 1990s. We also include for comparison purposes three other large Latin American economies: Brazil, Colombia, and Venezuela. Several patterns emerge for different groups of countries. First, some countries have moved from fairly flexible regimes to hard pegs. The clearest example is Argentina, with the establishment of its currency board in 1991,[12] but to a lesser degree, Uruguay appears to have been gradually increasing its management of the exchange rate; *INTERV* increased from 0.32 in the second half of the 1980s to 0.63 in the late 1990s. Second, some countries have abandoned hard pegs or moved toward greater exchange rate flexibility. The clearest example of a move from fixed to floating regime is Haiti, which moved from a hard peg in the late eighties to a relatively flexible regime in the late 1990s; in fact with an average value of *INTERV* of under 0.5, the most flexible regime in our sample.

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[12] The *IFS* exchange rate value for Argentina registers very small changes around 1.000 during 1991 to 1995, therefore *INTERV* is not strictly equal to unity in this period although it is clear that a hard peg was in place.

To a lesser degree, Jamaica has gradually increased its exchange rate flexibility. Third, some countries have maintained a similar level of intervention throughout the past 15 years, either highly managed (Bolivia and El Salvador) or relatively flexible (Chile). Finally, some countries appeared to change their exchange rate policy significantly during the early 1990s, only to return to their previous regime in the late 1990s. The clearest case is Mexico, where exchange rate intervention became stronger during the early 1990s leading up to the crisis, whereupon greater flexibility was reintroduced, at levels similar to those observed in the late 1980s.

Thus, exchange rate regimes were varied across countries and also over time, with different behaviors arising in the different countries. Perhaps if we were to include other countries or a longer time series, then it may be possible to discern a more general pattern, such as the well-known "hollowing of the middle" phenomenon (Mussa and others, 2000). However, for this sample period and set of countries there appears to be no clear general trend.

Table 5. Foreign Exchange Intervention

Variability of international reserves relative to total variability in exchange market pressure

	Period Available	Period Averages		
		interv		
Country		1985-1990	1991-1995	1996-2001
Argentina	1985:1 - 2001:4	0.49	0.94	1.00
Brazil	1985:1 - 2000:4	0.53	0.73	0.80
Bolivia	1985:1 - 2001:4	0.85	0.84	0.88
Chile	1985:1 - 2001:4	0.51	0.52	0.51
Colombia	1987:3 - 2001:4	0.68	0.80	0.66
Costa Rica	1985:1 - 2001:4	0.75	0.70	0.78
Dominican Republic	1985:1 - 2001:3	0.73	0.83	0.66
El Salvador	1985:1 - 2001:4	0.95	0.93	1.00
Haiti	1985:1 - 2000:4	1.00	0.54	0.54
Honduras	1985:1 - 2001:4	0.92	0.84	0.91
Jamaica	1985:1 - 2001:4	0.89	0.71	0.71
Mexico	1985:1 - 2001:4	0.71	0.90	0.76
Nicaragua	1992:1 - 2001:3		0.95	0.91
Paraguay	1985:1 - 2001:4	0.89	0.79	0.86
Peru	1985:1 - 2001:4	0.62	0.77	0.80
Uruguay	1985:1 - 2001:4	0.32	0.42	0.66
Venezuela	1985:1 - 2000:5	0.94	0.82	0.91

Sources: IMF, International Financial Statistics.

IV. Panel Estimation of DL in Latin America

A. Methodological Considerations

Definition

For the purpose of this paper, DL from the point of view of the nonfinancial private sector is defined as loans denominated in foreign currency by resident financial institutions to resident borrowers. This measure is partial as it excludes external borrowing and offshore lending by domestic banks. We will analyze the determinants of gross and net DL (net of foreign currency deposits). Applying a definition proposed by Savastano (1996), we also analyze a broader concept of DL, including borrowing by the nonbank sector from foreign BIS-reporting institutions. Note that this measure is also partial, as it does not incorporate offshore activities by domestic banks nor other types of private borrowing from abroad, such as trade or suppliers' credit, which may be important in some individual countries.

Methodology and variables used

Methodology

Foreign currency loans and deposits are to some extent driven by the same macroeconomic factors. However, bank decisions and regulations such as reserve requirements and foreign exchange position limits, among other variables, would prevent a one to one relationship between foreign currency loans and deposits. We use three approaches to deal with this specification problem: One, we make the corresponding foreign currency loan index dependent on a foreign currency deposit index and other factors:[13]

$$FC\ Loan\ index = a_0 + b_0\ FC\ Deposit\ index + c_0\ X$$

Where X are other exogenous variables. In this formulation, the implicit assumption is that the factors affecting both foreign currency deposits and loans are summarized in the correlation between the loan and deposit indices (reflected in the coefficient *b*). The value of *b* should be in principle close to one for the share of both loans and deposits on the banks totals (or equivalent for alternative denominators such as GDP). A more general representation would be:

$$FC\ Loan\ index = f(Y, X)$$

$$FC\ Deposit\ index = f(Y)$$

Variables *X* would comprise exogenous variables that affect only foreign currency loans. This is a strong assumption, but we expect this to be a reasonable simplification as the

[13] Specific indices used are reported in the following subsection.

selected independent variables are those more closely related to bank lending-corporate borrowing decisions. Alternatively, our second approach sets the foreign currency net lending position (lending minus deposits) directly as the dependent variable.

$$FC\ Net\ Lending = a_1 + c_1 X$$

The implicit assumption is that the corresponding *FC Loan Index* should be roughly equivalent to the *FC Deposit Index*, except for constant factors and the impact of exogenous variables X on the FC Loan Index. This alternative specification still makes it unnecessary to model the common factors affecting both foreign currency loans and deposits.

We make one attempt to incorporate common factors in our last approach.

$$FC\ Loans = a_2 + d_2 Y(-1) + c_2 X$$

Where Y encompasses instrumental variables that affect both dollarization of loans and deposits. The significance of a_0, a_1, a_2, b_0, c_0, c_1, c_2 and d_2 would shed light on the implications of the different specifications along with the impact of the corresponding exogenous variables.

Variables used

We used panel data estimations to analyze the determinants of foreign currency lending by domestic banks (*FCCRED*), the foreign exchange net lending position of banks, (*FEP*), total foreign currency bank borrowing by the nonbank sector (*TTLFCB*) and, finally, a summary measure of the foreign currency net lending position of the nonbank sector (*TTLFCNP*). Our approach was to approximate a reduced form equation that would incorporate both supply and demand factors. We estimated the equations first with quarterly and then with annual data. While quarterly data had the advantage of giving a greater number of observations, annual data permitted us to include a measure of trade openness as an explanatory variable.

We sought to test the effect of various explanatory variables: foreign currency deposits; the relative size of intermediation spreads; the degree of foreign exchange intervention; the level of financial development; the generosity of the deposit insurance system; the degree of openness of the economy (for annual data); the size of foreign borrowing by the nonbank sector; and (in some cases) the size of this borrowing relative to the total for the Latin American region. These variables are discussed and defined below. Our basic regression equations for foreign currency credit and the foreign exchange position of banks were of the following form:

$$FCCRED = f(FCDEP, DIFFSPRD, INTERV, FIN, COVGE, FL, OPEN) \quad (1)$$

$$FEP = f(DIFFSPRD, INTERV, FIN, COVGE, FL, OPEN) \quad (2)$$

Two variables express structural characteristics of the economy. The variable *FIN* measures the degree of financial development on the banking side. Following Levine (1997), we used private sector credit as a percentage of GDP, which has proved to be a good measure of the level of banking development, and has performed well as an explanatory variable in growth equations.[14] The variable *OPEN*, used solely in the regressions with annual data, was defined as total exports plus imports as a percentage of GDP. These structural variables are summarized in Table 6, which shows the degree of cross-country as well as time variability during the 1995–2000 period. Average financial development in terms of GDP ranged from a low of 15 percent in Haiti to a high of 64 percent for Chile, and average openness also varied considerably, from 17 percent in Argentina to 90 percent in Nicaragua.[15]

We also included *FL* as an explanatory variable, which measures corporate borrowing from overseas banks, as reported to the BIS. We scaled this variable by broad money and by GDP, to obtain *fllps* and *fly*, respectively. Table 7 shows summary statistics for this variable, as well as for deposits held abroad by domestic residents, and also shows the share of each country in the total for Latin America. According to these figures, residents in several countries borrow fairly large amounts from banks abroad, around 14–15 percent of GDP in Costa Rica and Nicaragua, and over 19 percent in Chile, and in the 4–10 percent range for most of the remaining countries. Furthermore, for each country they tend to be larger than the corresponding figures for deposits held abroad. Finally, three countries, Chile, Mexico, and Argentina, together receive about half of the financing available to Latin America and hold about a third of the deposits abroad for the region.

We used the average of *INTERV* over the previous 12 months to reflect exchange market intervention.[16] This variable has as a limitation that it does not incorporate the impact of interest rate policy aimed at limiting exchange rate volatility. However, if found significant it will reinforce the argument that central bank intervention in the foreign exchange market plays a role in dollarization of liabilities even when measured only partially. Another potential problem with the use of this variable is the endogeneity problem that results from exchange rate management depending in turn on DL.[17] However, this endogeneity problem

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[14] In earlier regressions for quarterly data we also used a second indicator of banking system development, private sector credit as a percentage of banking system liabilities to the private sector. Given the variability of the denominator, this variable did not perform as well as *FIN* in predicting dollarization of liabilities.

[15] It was not possible to find adequate measures of other structural variables, such as indicators of exchange controls or prudential regulation.

[16] We also used a second measure, which averaged *INTERV* over the previous 36 months, with similar results.

[17] See Poirson (2001).

Table 6. Financial Sector Development and Degree of Openness

(as a percentage of GDP)

Country	Period Available	Number of obs.	Financial Development: Credit to the private sector		Openness: Exports + Imports			
					Goods		Goods and nonfactor services	
			Average	Std. Dev.	Average	Std. Dev.	Average	Std. Dev.
Argentina	1995-2001	6	22.26	2.04	17.34	1.16	21.92	1.37
Bolivia	1995-2001	6	57.45	6.03	33.93	1.38	41.89	1.39
Chile	1995-2001	6	63.90	5.49	47.25	3.42	57.46	2.18
Costa Rica	1995-2001	7	18.57	5.94	73.11	7.92	90.40	9.83
Dominican Republic	1995-2000	6	30.67	4.66	75.92	2.16	99.93	2.01
El Salvador	1995-2000	6	37.62	5.38	52.05	3.79	62.60	4.89
Haiti	1995-2001	7	15.02	1.17	23.53	2.82	38.62	4.17
Honduras	1995-2000	6	35.06	7.31	81.43	5.11	97.51	4.94
Jamaica	1995-2000	6	29.00	2.80	64.61	8.37	108.78	9.98
Mexico	1995-2001	6	18.35	5.80	55.81	2.35	62.46	1.86
Nicaragua	1995-2001	6	42.31	6.30	90.48	1.43	114.89	1.41
Paraguay	1995-2001	7	25.71	1.34	81.53	10.12	95.18	10.46
Peru	1995-2000	6	24.19	4.21	25.33	0.92	32.12	1.31
Uruguay	1995-2000	6	38.19	12.10	27.45	1.53	38.12	1.50
Total observations		88						

Sources: IMF, *International Financial Statistics*; and various central bank websites.

Table 7. Summary of Registered Foreign Currency Positions by Domestic Residents

(1995-2001, except when otherwise indicated)

	Foreign Borrowing		Deposits Abroad		Foreign Currency Positions by Domestic Banks[1]	
	Percentage of GDP	Percentage of Total Latin	Percentage of GDP	Percentage of Total Latin	Lending	Deposits
					Percentage of GDP	
Country	*fborry*	America	*fdepy*	America	*fccredy*	*fcdepy*
Argentina	7.83	14.87	6.07	14.33	13.16	13.85
Bolivia	3.39	0.18	2.72	0.17	43.86	36.03
Chile	20.25	9.06	7.01	3.88	10.09	3.77
Costa Rica	14.63	1.30	15.02	1.62	6.04	12.23
Dominican Republic	2.92	0.34	3.46	0.46	3.18	2.46
El Salvador	3.03	0.25	2.43	0.24	5.35	3.17
Haiti	1.49	0.03	3.90	0.10	3.99	7.25
Honduras	4.55	0.15	4.36	0.18	7.81	9.44
Jamaica	7.47	0.34	7.84	0.44	3.51	9.02
Mexico	9.90	25.92	5.77	19.82	3.60	1.12
Nicaragua	15.46	0.22	9.80	0.18	16.90	37.38
Paraguay	7.34	0.38	5.86	0.40	10.02	12.50
Peru	6.85	2.48	4.94	2.21	19.32	16.18
Uruguay	9.95	1.29	17.04	2.74	20.47	29.75

Sources: Bank for International Settlements; IMF, *International Financial Statistics*; and individual central banks.

[1] Sample period reaches only February 2001 for Peru, Bolivia, Chile, Paraguay, Honduras; March 2001 for Argentina, Uruguay; December 2000 for Dominican Republic, El Salvador; January 2001 for Jamaica; September 2001 for Costa Rica; the period is 1996-99 for Haiti and 1997-2000 for Mexico.

is expected to be less important in quarterly and even in annual periods. It may be more of an issue for medium-term averages (the exchange rate regime is not expected to be modified frequently).

Finally, we include the coverage ratio of the deposit insurance scheme *covge*, defined as the maximum coverage divided by per capita income.[18] It is a "quasi"—dummy variable; it takes a value of zero in countries and periods in which there is no explicit deposit insurance scheme, and takes a single value (the maximum coverage) when an explicit scheme is in place. We included it as a proxy for moral hazard in the banking system, expressing the degree to which bankers perceive that a bailout could occur. This is consistent with recent studies in which cross-country regressions show that deposit insurance coverage was a

[18] This was obtained from the World Bank database on deposit insurance systems around the world.

significant predictor of banking crises, and had a negative impact on market discipline (Demirguc-Kunt and Detragiache, 1999; Demirguc-Kunt and Kane, 2002). One caveat is that there is only one instance of time variation in *COVGE* in the sample period, when Jamaica adopted an explicit deposit insurance scheme in 1998. Therefore, OLS results should indicate the main variability in deposit insurance coverage, across countries, while in the other estimations, *COVGE* may partly reflect the transition from an implicit to an explicit scheme in this case.[19]

By adding foreign currency loans by domestic banks (*FCCRED*) to loans by banks abroad to nonbank residents (*FL*), we obtained a measure of total foreign currency borrowing by the nonbank sector, or *TTLFCB*, for which our regression equation was of the form:

$$TTLFCB = FL + FCCRED = f(DIFFSPRD, INTERV, FIN, COVGE, OPEN, FLLAM) \quad (3)$$

where *FLLAM* was each country's corporate borrowing from overseas banks relative to the total for Latin America.

Finally, we computed an overall net lending position of the nonbank sector (*TTLFCNP*) by subtracting its total foreign currency deposit (asset) position (*TTLFCD*) from its total foreign currency borrowing (liability) position, and estimated a regression equation, as shown below.

$$TTLFCD = FD + FCDEP, TTFCNP = TTLFCB - TTLFCD$$
$$TTLFCNP = f(DIFFSPRD, INTERV, FIN, COVGE, OPEN, FLLAM) \quad (4)$$

For most variables, the expected sign of their impact was relatively clear. We expect the percentage of foreign currency deposits (*fcdep*) to be positively related to foreign currency lending. We also expected borrowing abroad (*FL*) to compete with foreign currency lending by domestic banks, thus its impact on *FCCRED* and the *FEP* would be negative. To the extent that the Caballero and Krishnamurthy (2002) argument holds, we would also expect financial development indicators (*FIN*) to be negatively related to foreign currency lending and to total foreign currency borrowing by the nonbank sector. Financial development would tend to reduce the need for domestic agents to borrow abroad, thus reducing their liability dollarization. For central bank intervention in the foreign exchange market, a positive sign would reflect that economic agents believe that foreign exchange intervention provides insurance against exchange risk, which is not adequately priced in the market.

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[19] We also undertook estimations using an alternative indicator, COVGE1, a dummy variable taking a value of one when a country had a high level of deposit insurance coverage (greater than three times the GDP, roughly the world average), and zero otherwise. The results were similar to those obtained with COVGE.

Intermediation spreads, as we discussed above, tend to reflect a variety of factors, some related to market power and profitability and others related to costs of intermediation (in a broad sense). To the extent that a higher intermediation spread in foreign (domestic) currency reflects greater profitability in this currency, we would expect the supply of foreign currency lending to increase. The opposite is true if the spread reflects primarily cost or risk factors. Also, larger spreads—whatever their cause—would also tend to drive down demand for credit in the respective currency if borrowers have sufficient market power.

The expected sign of the impact of deposit insurance is positive as banks move away from foreign exchange risk and toward credit risk (whereby the foreign exchange risk is transferred to the borrower). As the generosity of deposit insurance increases, banks may tend to perceive an increase in the probability of bailout, so they may increase their risk-taking in both domestic and foreign currency.

B. Results

We present the results of OLS and fixed-effects (FE) estimations in Tables 8–12. Tables 8–9 present the results for quarterly data, while Tables 10–11 present the results for annual data. Equations 1–3 and 13–15 present the estimation results for *fccred*, the share of foreign currency lending in total loans by domestic banks. In equations 7–9 and 19–21 we scaled total foreign currency borrowing by the nonbank sector *TTLFCB* by GDP. Equations 4–6 and 16–18 show the results for *FEP*, the foreign exchange net lending position of banks, scaled by GDP. Equations 10–12 and 22–24 show the results for the net liability position of the nonbank sector by GDP.

Finally, Table 12 (equations 25–30) show the impact on alternative measures of foreign currency lending of factors affecting both loans and dollarizations, using the Ize and Levy-Yeyati (1998) dollarization index for ten-year moving averages (*DOLINDEX*).[20] Equations 25–26, 28–29 show *DOLINDEX* directly as an explanatory variable, and equations 27 and 30 show the results of a two-stage least square exercise where foreign currency deposits are related to *DOLINDEX* and lagged explanatory variables.

The main findings are the following:

- **Foreign currency loans are generally related to foreign currency deposits with a correlation lower than one.** Equations 1–3 and 13–15 show that the expected result that dollarization of deposits is highly significant with a coefficient lower than one as

[20] For inflation = *INF* and the bilateral real effective exchange rate with the U.S. = *REERUS*, *DOLINDEX* is defined as:

[VAR(INF)+COV(INF, REERUS)]/[VAR(INF)+VAR(REERUS)+2 COV(INF, REERUS)].

regulations (reserve requirements and foreign exchange position limits) prevent banks from lending the total amount received as foreign currency deposits. There are however two instances when dollarization of deposits are not significant (equations 20 and 21), when annual data for borrowing from domestic banks and from banks overseas are added together. This is probably the result of depositors and borrowers allocating deposits and borrowing demands to different institutions overseas. This result may also be affected by accounting problems.[21] However, for quarterly data, foreign currency deposits are significant at the 99 percent confidence level for this specification despite these problems.

- **Explanatory variables show differences in significance depending on the corresponding specifications**. Central bank intervention appears more significant when net lending is the dependent variable, while private sector credit over GDP is more significant when gross lending is the dependent variable. In general, variables other than deposits have an overall positive impact on DL: OLS equations 1, 4, 13, 16, 19, and 22 show a negative constant, which implies that as a group all other tested variables explain a positive impact on DL, for both gross and net lending.

- **"Fatalistic" explanations of DL related to the null hypothesis of zero impact of policy on DL are not confirmed by the results**, beyond the reported general association between foreign currency loans and deposits. Private sector over GDP is generally significant in the equations explaining gross foreign currency lending (1–3, 7–9, 13–15, and 19–21) with a positive sign reflecting a positive impact of financial penetration on DL. A possible explanation could be that certain factors associated with financial development, for example greater access to international capital, may exert a greater impact than the Caballero and Krishnamurthy (2002) underdevelopment factors. It may also be that the period of analysis coincided with increasing financial globalization that prevented any development-conditioning factors from prevailing. Moreover, a reverse causality problem may result from dollarization leading to financial integration. However, this could be true at the initial stages of financial liberalization, while in the sample period, at least the largest countries in the sample had already consolidated their process of financial reform. Another surprising result is that the degree of openness of the economy, when significant, shows a negative effect on DL[22] One explanation may be that in periods of increasing credit, nontradeable activities are the ones resorting to foreign currency borrowing more intensively.[23] Additionally, there may be some impact of suppliers'

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[21] There may be double counting for lending by branches operating domestically.

[22] This result holds with either measure of openness: exports/GDP (reported) or exports plus imports/GDP.

[23] Tornell (2002).

credit substituting banking credit (not measured in the regressions). However, the main conclusion would be that openness would not have the expected positive correlation with DL.

- **Bailout expectations as proxied by the deposit insurance coverage exhibits a positive sign in two-stage least squares and OLS estimations.** However, a clear-cut change in sign results when going from OLS to country-effects formulations. This may indicate that the cross-country impact of bailout expectations is stronger than the impact over time; i.e., countries with higher coverage would tend to embark on more DL. But as it is not a pure measure of bailout expectations, the negative sign over time for OLS formulations could indicate that as a measure of past crises episodes, COVGE may reflect more risk aversion over time of countries with higher depositors' protection. Also, the de facto absence of time variability could also be reflected in a negative impact of deposit insurance in FE equations.[24]

- **Economic agents seem to follow policy signals to assess risk in their decisions concerning DL.** Central bank intervention has a significant positive impact on DL, especially when explaining net foreign currency lending. Firms 'get away' with borrowing more in foreign currency when they perceive that the central bank will defend the exchange rate. For quarterly data, heavy intervention of the central bank in the foreign exchange market (*INTERV* equal to 1) may lead to a difference between foreign currency loans and deposits of 5–6 percent of GDP (equations 5–6) twice as much if foreign banks are included (equations 11 and 12). For annual data, the latter impact loses significance (although not by much). However, the impact for domestic banks is about one percent of GDP larger than for quarterly data. The results generally improve when COVGE is removed in FE regressions.

- **Market power exerted by borrowers is reflected in a positive impact of relative domestic-foreign currency interest rate spreads on DL in the very short term.** For quarterly data, relatively greater spreads in domestic currency induce borrowers to increase their dollar-denominated liabilities (equations 2–4, 8–10). Borrowers' market power is also reflected in a strong substitution effect between borrowing domestically and borrowing from overseas in foreign currency (equations 2–4, 14–16), especially for gross lending. Banks' concerns about losing market share to foreign banks may explain increasing borrowers' market power.

- **Access to overseas bank lending plays an important role as well.** Countries with a greater share of Latin America's access to overseas bank loans tend to borrow more overall in foreign currency and have a larger net foreign currency position.

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[24] Because of this puzzling result, equations 3, 6, 9, 12, 15, 18, 21, 24, 27, and 30 report results excluding deposit insurance coverage as an explanatory variable.

- **A two-stage least-squares estimation for annual data on gross lending confirms the expected positive and highly significant coefficient for foreign currency deposits and some surprising results reinforcing our conclusions** (Table 12): For domestic banks, central bank intervention also becomes significant for gross lending (equation 27). Also, for domestic and foreign banks, the spread differential becomes significant also for annual data (equation 30). For the Two-Stage estimations, we use *DOLINDEX* affecting foreign currency deposits in combination with lagged explanatory variables as instruments. Other variables maintain their significance: Financial penetration and openness show the same signs as in other equations, while the share in the total borrowers' access to overseas bank financing maintains its sign and significance. Table 12 also shows weak results of incorporating the Ize-Levy dollarization index as an outright explanatory variable for annual data. When introduced directly instead of foreign currency deposits, the coefficient is only positive and significant for OLS specifications. Surprisingly, it eliminates the significance of deposit insurance coverage for OLS estimations.

C. Sensitivity Analysis

We tested the sensitivity of the results to changes in the sample of countries by re-estimating each of the annual OLS equations and excluding one country at a time,[25] and in Table 13 we list the coefficients whose statistical significance changed as well as the countries responsible for these changes. In general, the results of regressions explaining the percentage of foreign currency loans in the domestic banking system (*fccred*) are fairly robust. The sign and significance of most of the explanatory variables are not affected by excluding individual countries from the sample. The exceptions are exports, which appear to be relatively sensitive to the country sample, and overseas loans (*flgdp*), whose significance increases when Chile is excluded from the sample. In general, the variables that show the most robust results, namely foreign currency deposits, central bank intervention, private sector credit and substitution of foreign currency borrowing from domestic banks by foreign financing maintain their overall robustness.

Chile tends to increase the estimated effect of financial development while reducing the effect of relative spreads, exchange rate intervention, and degree of openness. This may be related to the fact that Chile has the highest level of financial development and overseas lending, the lowest differential between domestic and foreign intermediation spreads, and among the lowest rates of exchange rate intervention. Uruguay and Nicaragua, on the other hand, seem to weaken the effect of exchange rate intervention and differential spreads.

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[25] We excluded Haiti and Honduras altogether, because they show relatively few annual observations.

Finally, the explanatory power of deposit insurance coverage, while robust in estimations for domestic banks (*fccred* and *fepy*), is not very robust to changes in the sample of countries, as its significance drops as a result of any of four countries being excluded from the regression for *ttlfcby*. The negative impact of exports on total foreign currency loans also appears to be quite sensitive to the sample; its significance drops once any of seven countries is excluded, but rises considerably if Uruguay or Costa Rica is excluded.

V. Conclusions and Policy Implications

This empirical work conducted in this paper highlights different issues related to formal explanations of DL and to "conventional wisdom" among economists dealing with this subject. It also raises a number of questions that would merit further discussion. Because of the complexity of the subject, this paper addresses DL along different dimensions: First, it attempts to differentiate factors affecting DL in the very short term (using quarterly data) and in the medium term (based on annual data). Second, it uses different levels of aggregation, from domestic banks' foreign currency lending to a broader concept comprising foreign banks lending to domestic nonbank entities. Third, it measures the impact on DL for different definitions: From overall foreign currency lending (explained fundamentally by total deposits, for most specifications), to a more strict definition of "net lending" (foreign currency loans minus deposits).

In our descriptive analysis, we found great variety in the behavior of DL in the different Latin American countries in our sample. Foreign currency lending by domestic banks differed widely across countries and over time, and appeared to be increasing in recent years. Although it tended to be positively correlated with dollarization of bank deposits, there was rarely a perfect matching between the two, thus a nonzero "foreign exchange net lending position" resulted for almost all countries and periods. We then compared this position to net foreign asset holdings of banks, and found that although most countries exhibited an offsetting behavior between the two, this offset was also imperfect, with a bias to keep an overall excess of assets over liabilities in foreign currency. We looked at relative intermediation spreads, which were generally higher in domestic currency operations, but also varied widely across countries. Finally, we showed information on foreign borrowing and deposits held abroad by domestic nonbank agents, both of which in several cases were quite substantial in terms of GDP, rivaling and sometimes surpassing foreign currency borrowing and deposits of the domestic banking system.

In the econometric analysis, the specification appears to matter. Central bank intervention and market power reflected in the domestic-foreign currency spread differential do a better job for net DL, whereas financial development and access to international financial markets are important for gross aggregates. One main question addressed in this paper is: Does policy introduce biases in the decisions of banks and firms leading to an increase in DL? The general answer is yes: Central bank intervention in the foreign exchange market plays a crucial role explaining DL. Moreover, there is evidence of market power by borrowers as firms press for less costly foreign currency borrowing in the short run. Related to this, market power by borrowers is consistent with evidence of a substitution effect, with firms borrowing

abroad as a result of improved access to international financial markets, reducing in turn domestic borrowing in foreign currency.

More "fatalistic" views of DL show mixed results: First, DL is definitely associated with asset dollarization. Second, financial development and liberalization appear to be generally associated with an increase of DL. An element of unavoidability results from the increase in access to foreign financing by firms, as domestic banks tend to respond by increasing their own foreign currency lending. This behavior seems to indicate that domestic banks must compete presumably for prime customers, and must therefore offer the same terms offered by foreign banks, including foreign currency financing. Two implications are worth mentioning: Regulatory limits on DL would tend to shift demand for foreign currency borrowing abroad; and, especially in countries showing asset dollarization, excessive limitations may undermine the quality of the loan portfolio of domestic banks.

Bailout expectations may not be appropriately captured by deposit insurance coverage. These moral hazard motivations seem to be reflected in OLS regressions, including two-stage least squares estimations. However, the significance of this variable declines substantially once country effects are introduced, with its corresponding impact turning negative and significant. The failure of this variable to be reflected in fixed effect specifications may indicate that a more appropriate proxy variable may be necessary.[26]

What are the implications for bank regulation? If DL were not a result of distortions created by policy, potential bank losses could be covered by capital requirements on the intrinsic credit risk. The appropriate incorporation of credit risk into the capital requirement would be the first step towards an appropriate supervisory framework.[27] However, if DL is encouraged by policy, there is an expected loss that has to be internalized by economic agents. This has two implications: First, supervisory authorities may need to compensate additional expected losses through additional provisioning if DL shows an increase coincidental with biases introduced by the policy mix. They should also assess the capability of banks to determine the repayment capacity of foreign currency borrowers for different exchange rate scenarios, and this should in turn result in specific provisions. If there is uncertainty about the capability

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[26] One alternative explanation may be that deposit insurance coverage summarizes past experiences of bank bailouts. If this were the case, the negative sign would show that in countries where sizable bailouts have already taken place, moral hazard incentives diminish along time. Another explanation, although affecting only one observation in the sample, could be that the one time variation captured by the regression—the adoption of deposit insurance in Jamaica in 1998—may have actually corresponded to a reduction in moral hazard, to the extent that a limited explicit scheme replaced a previous unlimited implicit scheme. This type of phenomenon was observed in one study of the adoption of deposit insurance in the EU (Gropp and Vesala, 2000).

[27] See Baliño and others, 1999.

of banks to conduct such assessment properly, or if monitoring this risk proves too cumbersome for supervisory authorities, general provisions would be justified in the event of policy-induced DL of some significance. Second, monetary authorities should incorporate an assessment of the potential impact of their policies on the risk profile of banks' borrowers when embarking in so-called 'fear of floating' policies. By not doing this, monetary authorities would be unduly shifting part of the burden of inadequate monetary policy decisions to supervisory authorities.

Some results merit further study and analysis. First, it would be useful to extend our analysis to other regions. Second, the most appropriate incorporation of bailout expectations could be further explored. Third, the evidence of a negative impact of openness on DL remains a puzzle, but it may be capturing a positive relation between increased DL and increased unhedged borrowing by producers of nontradable goods and services. Fourth, a more appropriate assessment of structural factors would comprise the role of exchange controls and the quality of supervision and hedging capabilities, variables that go beyond the short-term framework used in this paper.

Table 8. Panel Data Regression Results - Quarterly Data for Domestic Banks

Dependent variable	*fccred*: Share of Foreign Currency Lending over Total Lending			*fep:* Foreign Currency Lending minus Foreign Currency Deposits over GDP.		
	(1)	(2)	(3)	(4)	(5)	(6)
Estimation method	OLS	FE	FE	OLS	FE	FE
Explanatory variables						
fcdep: Foreign currency deposits 1/	0.965	0.891	0.884			
	(66.80) **	(15.06) **	(14.76) **			
Spread differential 2/	-0.249	0.375	0.395	0.232	0.043	0.052
	(3.56) **	(5.47) **	(5.72) **	(3.59) **	(1.04)	(1.26)
Central bank intervention index 3/	6.641	1.821	2.198	-3.781	5.213	6.495
	(3.68) **	(1.42)	(1.70) *	(1.46)	(1.76) *	(2.22) **
Private sector credit/GDP	0.318	0.330	0.324	0.245	-0.032	-0.043
	(11.18) **	(7.02) **	(6.80) **	(8.23) **	(1.06)	(1.40)
Deposit insurance coverage	1.413	-2.336		1.104	-1.201	
	(11.34) **	(2.72) **		(8.50) **	(2.23) **	
Borrowing from overseas banks 4/	-0.035	-0.258	-0.244	-0.324	0.007	0.016
	(0.46)	(3.08) **	(2.88) **	(3.84) **	(0.14)	(0.31)
Constant	-14.224			-8.422		
	(6.61) **			(3.07) **		
Number of observations	265	265	265	265	265	265
Adjusted R-squared	0.958	0.988	0.988	0.322	0.934	0.933
F-statistic	1,009.10 **	1,174.67 **	1,208.10 **	26.04 **	207.76 **	216.21 **

Note: t-ratios in parentheses; * = significant at 10 %, ** = significant at 5%.

1/ Share of total deposits.

2/ Domestic currency over foreign currency (effective spread).

3/ Variability of international reserves relative to total variability in reserves plus exchange rates; defined in the text.

4/ From BIS banks, as a percentage of GDP.

Table 9. Panel Data Regression Results - Quarterly Data for Domestic and Foreign Banks

Dependent variable	Total Foreign Currency Lending over GDP			Total Foreign Currency Lending minus Foreign Currency Deposits over GDP.		
	(7)	(8)	(9)	(10)	(11)	(12)
Estimation method	OLS	FE	FE	OLS	FE	FE
Explanatory variables						
fcdep: Foreign currency deposits 1/	0.525	0.430	0.431			
	(22.53) **	(9.26) **	(9.09) **			
Spread differential 2/	0.428	0.089	0.106	0.249	-0.029	-0.012
	(8.71) **	(1.70) *	(2.00) **	(3.20) **	(0.44)	(0.18)
Central bank intervention index 3/	2.895	-0.553	1.839	-1.935	11.510	13.797
	(1.52)	(0.15)	(0.48)	(0.64)	(2.48) **	(2.99) **
Private sector credit/GDP	0.467	0.403	0.384	0.386	0.076	0.059
	(20.66) **	(8.76) **	(8.24) **	(10.79) **	(1.60)	(1.24)
Deposit insurance coverage	0.499	-2.291		0.945	-2.218	
	(4.35) **	(3.44) **		(5.21) **	(2.62) **	
Borrowing from overseas banks/ total for Latin America 4/	0.444	0.915	0.939	0.569	0.775	0.799
	(7.95) **	(4.33) **	(4.36) **	(6.36) **	(2.90) **	(2.96) **
Constant	-13.907			-18.016		
	(7.46) **			(6.04) **		
Number of observations	265	265	265	265	265	265
Adjusted R-squared	0.836	0.958	0.956	0.414	0.907	0.905
F-statistic	224.92 **	318.07 **	320.96 **	38.29 **	144.14 **	148.67 **

Note: t-ratios in parentheses; * = significant at 10 %, ** = significant at 5%.

1/ Share of total deposits.
2/ Domestic currency over foreign currency (effective spread).
3/ Variability of international reserves relative to total variability in reserves plus exchange rates; defined in the text.
4/ From BIS banks.

Table 10. Panel Data Regression Results - Annual Data for Domestic Banks

Dependent variable	*fccred*: Share of Foreign Currency Lending over Total Lending			*fep:* Foreign Currency Lending minus Foreign Currency Deposits over GDP.		
	(13)	(14)	(15)	(16)	(17)	(18)
Estimation method	OLS	FE	FE	OLS	FE	FE
Explanatory variables						
fcdep: Foreign currency deposits 1/	0.917	0.934	0.940			
	(28.218) **	(7.143) **	(7.285) **			
Spread differential 2/	-0.084	0.211	0.215	0.093	-0.072	-0.063
	(0.573)	(1.480)	(1.490)	(0.848)	(0.919)	(0.817)
Central bank intervention index 3/	12.662	3.215	5.250	-0.434	6.867	7.401
	(3.002) **	(0.661)	(1.102)	(0.116)	(2.395) **	(2.660) **
Private sector credit/GDP	0.274	0.276	0.202	0.258	-0.083	-0.090
	(5.277) **	(2.791) **	(1.901) *	(5.233) **	(1.612)	(1.788) *
Deposit insurance coverage	1.206	-3.654		0.894	-0.904	
	(5.206) **	(1.939) *		(4.091) **	(0.812)	
Exports/GDP	-0.183	0.010	0.131	-0.057	0.073	0.092
	(2.126) **	(0.056)	(1.390)	(0.863)	(0.756)	(0.973)
Borrowing from overseas banks 4/	0.103	-0.565	-0.428	-0.349	0.084	0.097
	(0.702)	(3.703) **	(2.583) **	(2.594) **	(0.940)	(1.104)
Constant	-12.900			-7.848		
	(2.667) **			(1.724) *		
Number of observations	72	72	72	72	72	72
Adjusted R-squared	0.963	0.987	0.987	0.338	0.912	0.912
F-statistic	265.28	276.31	285.25	7.03	39.60	42.04

Note: t-ratios in parentheses; * = significant at 10 %, ** = significant at 5%.

1/ Share of total deposits.
2/ Domestic currency over foreign currency (effective spread).
3/ Variability of international reserves relative to total variability in reserves plus exchange rates; defined in the text.
4/ From BIS banks, as a percentage of GDP.

Table 11. Panel Data Regression Results - Annual Data for Domestic and Foreign Banks

Dependent variable	Total Foreign Currency Lending over GDP			Total Foreign Currency Lending minus Foreign Currency Deposits over GDP		
	(19)	(20)	(21)	(22)	(23)	(24)
Estimation method	OLS	FE	FE	OLS	FE	FE
Explanatory variables						
fcdep : Foreign currency deposits 1/	0.526	-0.020	-0.020			
	(9.09) **	(0.19)	(0.19)			
Spread differential 2/	0.313	0.103	0.133	0.027	-0.291	-0.261
	(2.82) **	(0.90)	(1.12)	(0.18)	(1.59)	(1.42)
Central bank intervention index 3/	5.905	-1.717	0.311	2.102	10.560	12.603
	(1.69) *	(0.42)	(0.08)	(0.43)	(1.60)	(1.94) *
Private sector credit/GDP	0.479	0.573	0.546	0.403	-0.070	-0.098
	(10.15) **	(5.85) **	(5.36) **	(6.13) **	(0.56)	(0.78)
Deposit insurance coverage	0.421	-3.604		0.836	-3.624	
	(1.73) *	(2.43) **		(2.47) **	(1.44)	
Exports/GDP	-0.132	-0.281	-0.214	0.047	-0.053	0.015
	(1.96) *	(2.13) **	(1.59)	(0.52)	(0.24)	(0.07)
Borrowing from overseas banks/	0.368	1.059	1.145	0.459	1.743	1.829
total for Latin America 4/	(3.08) **	(1.79) *	(1.85) *	(2.72) **	(1.75) *	(1.82) *
Constant	-11.780			-19.544		
	(2.72) **			(3.25) **		
Number of observations	72	72	72	72	72	72
Adjusted R-squared	0.813	0.952	0.948	0.403	0.782	0.777
F-statistic	45.15 **	71.76 **	68.77 **	8.99 **	14.37 **	14.76 **

Note: t-ratios in parentheses; * = significant at 10 %, ** = significant at 5%.

1/ Share of total deposits.
2/ Domestic currency over foreign currency (effective spread).
3/ Variability of international reserves relative to total variability in reserves plus exchange rates; defined in the text.
4/ From BIS banks.

Table 12. Panel Data Regression Results - Annual Data for Gross Total Lending

Dependent variable	*fccred*: Share of Foreign Currency Lending over Total Lending			Total Foreign Currency Lending over GDP		
	(25)	(26)	(27)	(28)	(29)	(30)
Estimation method	OLS	FE	2SLS	OLS	FE	2SLS
Explanatory variables						
Dolindex 1/	0.429	-0.003		0.134	-0.002	
	(4.66) **	(0.05)		(3.91) **	(0.06)	
Foreign currency deposits 2/			0.915			0.705
			(27.93) **			(9.88) **
Spread differential 3/	2.457	0.642	-0.074	0.751	0.128	0.232
	(6.77) **	(3.33) **	(0.51)	(5.11) **	(1.12)	(2.15) **
Central bank intervention index 4/	55.036	8.710	12.943	13.378	-0.984	-1.763
	(4.42) **	(1.26)	(3.07) **	(2.55) **	(0.12)	(0.50)
Private sector credit/GDP	0.511	0.583	0.271	0.625	0.541	0.398
	(2.89) **	(4.52) **	(5.23) **	(9.62) **	(6.47) **	(8.47) **
Deposit insurance coverage	-0.227		1.207	-0.304		0.176
	(0.31)		(5.22) **	(0.92)		(0.78)
Exports/GDP	-1.104	-0.279	-0.189	-0.189	-0.216	-0.073
	(4.47) **	(1.19)	(2.18) **	(2.03) **	(1.57)	(1.12)
Borrowing from overseas banks 5/	0.224	-0.496	0.120			
	(0.47)	(2.27) **	(0.86)			
Borrowing from overseas banks/ Total for Latin America 5/				0.383	1.141	0.483
				(2.32) **	(1.82) *	(4.20) **
Constant	-31.808		-13.061	-20.044		-2.798
	(1.84) *		(2.71) **	(2.72) **		(0.70)
Number of observations	72	72	72	72	72	72
Adjusted R-squared	0.629	0.973	0.963	0.653	0.948	0.832
F-statistic	18.22 **	133.91 **	266.24 **	20.11 **	68.72 **	51.23 **

Note: t-ratios in parentheses; * = significant at 10 %, ** = significant at 5%.

1/ Ize and Levy-Yeyati dollarization index; defined in the text.

2/ Share of total deposits in regressions explaining *fccred*, as a percentage of GDP in regressions explaining total foreign currency lending.

3/ Domestic currency over foreign currency (effective spread).

4/ Variability of international reserves relative to total variability in reserves plus exchange rates; defined in the text.

5/ From BIS banks.

Table 13. Robustness Tests of Coefficient Significance to Exclusion of Individual Countries from the Sample

Panel Data OLS Regression Results - Annual Data

	Differential spread 1/	Exchange intervention index 2/	Financial development 3/	Deposit insurance coverage 4/	Exports/ GDP	Loans from overseas banks (percent of GDP)	Loans from overseas banks (percent of Latin American total)
	diffsprd	*interv*	*findev*	*covge*	*export*	*flgdp*	*fllam*
Dependent variable: fccred							
Percentage of foreign currency loans in the domestic banking system							
Full sample result					(-)	n.s.	
Weakening of results by excluding a given country							
New results					n.s.		
Countries excluded					Haiti, Honduras, Dominican Republic, El Salvador, Costa Rica		
Strengthening of results by excluding a given country							
New results						(+)	
Countries excluded						Chile	
Dependent variable: fepy							
Domestic banking system foreign currency loans minus deposits, as a percentage of GDP.							
Full sample result	n.s.	n.s.	(+)		n.s.	(-)	
Weakening of results by excluding a given country							
New results			n.s.			n.s.	
Countries excluded			Chile			Bolivia El Salvador Nicaragua	
Strengthening of results by excluding a given country							
New results	(+)	(+)			(-)		
Countries excluded	Chile Nicaragua	Chile Nicaragua			Chile Uruguay		
Dependent variable: ttlfcby							
Total foreign currency borrowing from domestic and overseas banks, as a percentage of GDP							
Full sample result	(+)	(+)		(+)	(-)		(+)
Weakening of results by excluding a given country							
New results	n.s.	n.s.		n.s.	n.s.		n.s.
Countries excluded	Bolivia	Uruguay		Peru Bolivia El Salvador	Peru Haiti Honduras Bolivia Domican Rep. El Salvador		Chile
Strengthening of results by excluding a given country							
New results		(++)					
Countries excluded		El Salvador Chile					
Dependent variable: ttlfcnpy							
Total foreign currency loans minus deposits, as a percentage of GDP.							
Full sample result	n.s.	n.s.	(+)	(+)			
Weakening of results by excluding a given country							
New results			n.s.	n.s.			
Countries excluded			Chile	Peru Uruguay			
Strengthening of results by excluding a given country							
New results	(+)	(+)					
Countries excluded	Chile	Chile					

Note: This table reports only coefficients whose significance changed when the sample excluded one country at a time.
(+) and '(-) indicate the sign of the coefficient and significance of 10% or less, "n.s." indicates lack of significance at 10%, and (++) indicates a sizable increase in significance with respect to the full sample estimation.

1/ Domestic currency over foreign currency (effective spread).
2/ Variability of international reserves relative to total variability in reserves plus exchange rates; defined in the text..
3/ Private sector credit/GDP.
4/ Maximum coverage in relation to per capita GDP.

REFERENCES

Arteta, Carlos, 2002, "Exchange Rate Regimes and Financial Dollarization: Does Flexibility Reduce Bank Currency Mismatches?," draft paper presented at the Seventh Annual Meeting of the Latin American and Caribbean Economic Association.

Baliño, Tomás J.T., Adam Bennet, and Eduardo Borensztein, 1999, *Monetary Policy in Dollarized Economies,* IMF Occasional Paper No. 171 (Washington: International Monetary Fund).

Broda, Christian, and Eduardo Levy-Yeyati, 2000, "Safety Nets and Endogenous Financial Dollarization" (unpublished).

Burnside, C. M. Eichenbaum and S. Rebelo, 1999, "Hedging and Financial Fragility in Fixed Exchange Rate Regimes" (unpublished).

Caballero, Ricardo and Arvind Krishnamurthy, 2002, "Financial Development and Underinsurance" (March) draft for forthcoming Journal of Finance.

Calvo, Guillermo and Carmen Reinhart, "Fear of Floating," NBER Working Paper No. 7993. (Cambridge, Massachussetts: National Bureau of Economic Research).

Catao, Luis and Marco Terrones, "Determinants of Dollarization: The Banking Side," IMF Working Paper 00/146 (Washington: International Monetary Fund).

Delgado, Fernando L., Daniel S. Kanda, Greta Micthell Casselle, and R. Armando Morales, 2000, *"Banks' Domestic Lending in Foreign Currency,"* MAE Operational Paper OP/00/4 (Washington: International Monetary Fund).

Demirguc-Kunt, Asli, and Enrica Detragiache, 1999, "Does Deposit Insurance Increase Banking System Stability?: An Empirical Investigation," World Bank Policy Research Working Paper No. 2247 (Washington: World Bank).

_____ and Edward Kane, 2002, "Deposit Insurance Around the Globe: Where Does it Work?," *Journal of Economic Perspectives*, Vol. 16, No. 2, pp. 175-95.

Dooley, Michael, 1997, "A Model of Crises in Emerging Markets," NBER Working Paper No. 6300 (Cambridge, Massachussetts: National Bureau of Economic Research).

Eichengreen, Barry, and Ricardo Haussman, 1999, "Exchange Rates and Financial Fragility," NBER Working Paper N° 7418 (Cambridge, Massachusetts: National Bureau of Economic Research).

Goldstein, Morris, and Philip Turner, 1996, "Banking Crises in Emerging Economies: Origins and Policy Options," BIS Economic Papers, No. 46 (October).

Hausmann, Ricardo, Ugo Panizza, and Ernensto Stein, 2001, "Why Do Countries Float the Way They Float," *Journal of Development Economics*, Vol. 66, No. 2, pp. 387–414.

Levine, Ross, 1997, "Financial Development and Economic Growth: Views and Agenda," *Journal of Economic Literature*, Vol. 35 (June), pp. 688–726.

Ize, Alain, and Eduardo Levy-Yeyati, 1998, "Dollarization of Financial Intermediation: Causes and Policy Implications," IMF Working Paper No. 98/28 (Washington: International Monetary Fund).

Jeanne, Olivier, 2002, "Why Do Emerging Economies Borrow in Foreign Currency," work in progress.

Kaminsky, Graciela, and Carmen Reinhart, 1999, "The Twin Crises: The Causes of Banking and Balance-of-Payments Problems," *American Economic Review* Vol. 89, No. 3, pp. 473–500.

Levi-Yeyati, Eduardo, and Federico Sturzenegger, 2000, "Classifying Exchange Rate Regime: Deeds vs. Words," (unpublished; Buenos Aires: Universidad Torcuato di Tella).

Poirson, Helene, 2001, "How Do Countries Choose Their Exchange Rate Regime?" IMF Working Paper No. 01/46 (Washington: International Monetary Fund).

Savastano, Miguel, 1996, "Dollarization in Latin America-Recent Evidence and Some Policy Issues," *The Macroeconomics of International Currencies*, edited by P. Mizen and E. Pentecost (Brookfield, Vermont: Edward Elgars).

Tanner, Evan, 2000, "Exchange Market Pressure and Monetary Policy: Asia and Latin America in the 1990s," IMF *Staff Papers*, International Monetary Fund, Vol. 47, Nº 3, pp. 311–333.

Tornell, Aaron, and Frank Westermann, 2002, "The Credit Channel and Currency Mismatch in Middle Income Countries," (unpublished).