How Do Exchange Rate Regimes Affect Firms' Incentives to Hedge Exchange Rate Risk?

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Abstract

Using detailed, micro-level data on the currency composition of firm's balance sheets in seven Latin American countries between 1992 and 2005, I investigate the effect of exchange rate regimes on firm's incentives to hedge currency risk. Employing panel data analysis and event study methods, I find that more exchange rate flexibility is associated with lower levels of unhedged foreign currency debt at the firm-level. In particular, following the adoption of a floating exchange rate regime, firms reduce their negative exposure to local currency depreciation by hedging a higher share of their dollar liabilities with "natural" foreign currency buffers (export revenues and assets denominated in foreign currency). The effect of floating regimes in reducing currency mismatches is more pronounced in firms more exposed to devaluation risk. These results have important policy implications for financial stability, as emerging markets attempt to reduce the corporate sector's vulnerability to exchange rate fluctuations.

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I. MOTIVATION

How does the exchange rate regime affect firms' incentives to hedge their exposure to currency risk? This question has been at the center of the debate over optimal exchange rate regimes in emerging markets since the financial crises of the 1990s exposed the perils of unhedged foreign currency debt. For many emerging market firms with a large currency mismatch between foreign-currency denominated debt and incomes in local currency, episodes of sharp devaluations abruptly reduced their ability to repay foreign currency debt and damaged their balance sheets (and those of their bank creditors), plunging economies into recession.[2]

Economists are sharply divided over the role of the exchange rate regime in contributing to currency mismatches in firms' balance sheets. Views here fall into two camps. Proponents of flexible exchange rate regimes argue that fixed or pegged exchange rate regimes were the main driver behind the large buildup of unhedged foreign currency borrowing preceding the Asian and Latin American crisis. Within this view, one strand suggests that the commitment from the authorities to defend a peg provided an implicit guarantee that led to moral hazard by the private sector and encouraged risky behavior (see Burnside, Eichenbaum, and Rebelo, 2001, Schneider and Tornell, 2004 and Goldstein, 2002). According to this line of reasoning, firms borrowed in dollars to take advantage of the lower *ex ante* dollar interest rates, and expected the government to insure them from any potential loss in the event of a large devaluation.[3] In the words of Corden (2005), fixed or soft-pegged regimes provided an "an invitation to gamble" at the government's expense. A second variant of this argument suggests that because of limited exchange rate volatility under pegged regimes, firms underestimated the possibility of large exchange rate movements (i.e. a crisis), and took on excessive foreign exchange risk. The fact that fixed/pegged exchange rates have played a role in every recent financial crises since 1994, and that firms relied extensively on foreign currency financing in the years leading up to the crises, is often used as strong evidence for this view.

Other authors, however, have claimed that the problem of un-hedged foreign currency liabilities in the corporate sector has deeper roots than the exchange rate regime (Eichengreen and Hausmann, 1999, Eichengreen, Hausmann and Panizza, 2003). This view, known as "original sin", suggests that at the root of currency mismatches lies the fundamental inability

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[2] Liability dollarization is cited as one of the factors that deepen output collapses during crises in emerging market economies, which in turn have persistent effects on economic growth (Calvo, et al., 2006; Cerra and Saxena, 2008). Balance sheet problems are at the heart of many theoretical explanations for the severity of the 1997 Asian financial crisis and have been analyzed in new micro-founded open-economy models (e.g., Céspedes, Chang and Velasco (2004)).

[3] This was the message of well-known papers by Obstfeld and Rogoff (1995) and Fischer (2001). Private firms and banks may have interpreted relatively stable or fixed exchange rate regimes as a government's promise to protect private borrower from currency risk, either by selling currency at a fixed rate, by providing a financial hedge (like in the case of Brazil) or an effective bailout in the event of a currency crisis (as it finally happened in Argentina).

of emerging markets to borrow abroad in their own currency. Inevitably, this leads to an accumulation of foreign-currency denominated debt which firms are simply unable to hedge, even if they have the foresight or prudence to match the currency structure of their assets and liabilities. According to this view, because currency choice is not the result of a market equilibrium but of financial market incompleteness, monetary or exchange rate policies are powerless to reduce these vulnerabilities related to foreign exchange exposures.

This debate clearly has considerable relevance for economic policy, as several countries are moving to more flexible exchange rate regimes.[4] Proponents of flexible exchange rate regimes suggest that such regimes reduce currency mismatch vulnerabilities. Under floating exchange rates, economic agents must cope with high frequency volatility, and sending a signal that and that that it takes a foreign exchange currency position at its own peril. This provides an incentive to hedge against these risks, thus reducing their susceptibility to financial distress when the currency moves.[5]

Eichengreen and Hausmann (1999) and Eichengreen, Hausmann and Panizza (2003), however, dispute the claim that moving to a more flexible currency regime reduces firms' exposure to currency risk. They argue instead that the higher exchange rate volatility associated with floating rates leads to higher costs of hedging foreign currency risk. This, in turn, discourages hedging and thus exacerbates currency mismatches. McKinnon and Pill (1999) develop a similar argument. Because the domestic interest rate risk premium is a direct function of the stability of the currency, exchange rate flexibility will increase domestic interest rates, thus increasing incentives to borrow in foreign currency. These authors thus argue that adopting a floating rate regime will not necessarily reduce currency mismatches.[6]

Although the relationship between the choice of exchange rate regime and firms' currency mismatches has generated contrasting theoretical predictions, and remains a key question among macroeconomists and policy makers, systematic empirical testing has been sparse. To examine this question, I assemble a new dataset with firm-level accounting information for 2200 firms across seven Latin American countries, between 1992 and 2005. A unique feature of this database is that presents detailed information on three key dimensions of companies' exposure to exchange rate risk: the currency composition of assets

[4] It is specially relevant today for Central and Eastern Europe, where the growing exposure of the private sector to currency risk has been highlighted as having potentially significant implications for financial stability (see Rosenberg and Tirpak, 2008).

[5] Thus, while large changes in exchange rates can occur when currencies are floating as well as when a peg collapses, the output costs are likely to be smaller in the first case (Mishkin 2001). An influential early statement of the connection between floating rates and hedging by the private sector is Goldstein (1998).

[6] In a similar vein, Calvo (2005) also suggests that the policy of allowing the exchange rate to undergo large fluctuations to discourage foreign-exchange-denominated borrowing is likely to result in a highly volatile *real* exchange rate, which may have negative effects on trade and output (see Calvo and Reinhart (2000b)).

and liabilities, the share of exports in total sales and the share of short term debt in total foreign-currency denominated debt.

The empirical analysis in this paper yields three key findings. First, results consistently indicate that the adoption of a flexible exchange rate regime has a negative impact on companies' foreign currency-denominated borrowing, three years after the regime was adopted. This result provides support for the view that floating exchange rate regimes reduce liability dollarization, and is consistent with previous country-level evidence for Mexico from Martinez and Werner (2002) and recent evidence for Chile by Cowan, Hansen and Herrera (2005). These findings are robust after controlling for survivorship bias and valuation effects brought about by fluctuations in the value of the domestic currency.

Second, the adoption of a floating exchange rate regime has an economically significant impact in the extent to which firms' match the currency composition of assets and income flows, with liabilities. Using a precise measure of accounting currency exposure that considers the currency composition of asset and liability stocks and the exchange rate sensitivity of income flows, we find significant changes in the level of companies' currency exposure following periods of increased exchange rate volatility. One possible interpretation of these results is due to the effect of higher exchange rate variance on the relative risk of domestic and foreign debt. This being the case, floating exchange rate regimes would reduce exposure, by eliminating implicit exchange rate insurance and forcing firms to correctly internalize exchange rate risk.

Finally, empirical evidence also indicates that the most dramatic changes in the density of firms' currency imbalances occurs in the lower tail of the distribution representing downside risk. More generally, results provide support for the view that floating exchange rate regimes can reduce financial vulnerability in the medium-term in emerging markets.

This paper contributes to the existing empirical literature in two ways. First of all, we assemble a new database, which allows building a more comprehensive measure of currency exposure. The unique feature of the dataset is that it provides detailed and comparable information on the level and maturity of foreign currency-denominated debt contracted by Latin American firms. Second, this study contributes to the existing empirical and policy literature by investigating the effects of exchange rate regimes on debt composition choices across a broad set of countries and periods.

Second, and from a methodological point of view, this study departs from the extant literature by exploiting the information contained in the *entire* cross-sectional distribution of currency mismatches of the corporate sector. One advantage of our estimation procedure is that it yields a visually clear representation of where the in the distribution of dollar debt the exchange rate regime exerts the biggest impact.

II. DATA SET AND BASIC STYLIZED FACTS

This section describes the data I use and unearths a new set of stylized facts on the evolution of firms' liability dollarization and balance sheet currency exposures around exchange rate regime switches.

II.1. The Firm-Level Dataset

The empirical analysis in this paper draws on a new database with annual accounting information for over 2,200 non-financial companies in seven Latin American countries, spanning the period 1992 to 2005.[7] The countries covered are: Argentina, Brazil, Chile, Colombia, Mexico, Peru and Uruguay. A major difference between this dataset and the ones used in prior cross-country work is that it contains detailed information on three key drivers of exchange rate exposure at the firm-level: the currency composition of assets and liabilities, the share of foreign currency revenues in total sales, and firms' access to international debt and equity markets.[8]

The data for this paper was assembled from three different sources. Balance sheet, income statement, cash flow, and general company information was obtained from annual financial statements drawn from local stock markets or regulatory agencies in each country. I complemented and cross-checked these sources with data obtained from commercial providers Economatica and Bloomberg.[9] Data on foreign currency liabilities and assets was hand-collected from the financial explanatory notes of firms' balance sheets. These include all assets or liabilities outstanding which are denominated in—or indexed to—foreign currency, issued domestically or abroad.[10]

[7] I restricted the sample to non-financial companies. Given that currency mismatches are limited by banking regulation, the capital structure of banks and other financial companies is not comparable with that of non-financial firms.

[8] The most widely used firm-level dataset in cross-country studies, Worldscope, has no information on the currency denomination of either assets or debt, and very sparse coverage of firm's foreign currency revenues (see, for example, Desai, Foley and Forbes, forthcoming).

[9] As discussed in Kamil (2008), I have been especially careful in making sure that variable definitions are comparable across economies and consistent across time. Further details on the data construction and variable definitions are provided in the Data Appendix.

[10] Information on the exact currency composition of foreign-currency denominated debt or assets for all countries is not available. For countries for which I do have a detailed breakdown of currency denomination (Chile and Peru), I find that, on average, 95 percent is denominated in dollars. Thus, I assume throughout that all foreign currency debt is denominated or indexed to the US dollar. In what follows, when I refer to the term dollarization, I specifically mean the degree to which debts or assets are denominated in foreign currency.

I augmented this dataset with information on firms' involvement in international trade. I used the countries' customs office records to match information on exports for each firm in the sample using their fiscal code identifier and/or name. The firm's export to sales ratio captures the degree to which a company is well-positioned to capitalize on exchange rate depreciation.[11] The third major source of firm-level data captures firms' access to international capital markets. I obtained firm-level issuance data on private bonds and syndicated loans from Dealogic Bondware and Loanware. For access to equity markets, I used Bank of New York data to identify those firms whose shares listed in a foreign stock exchange in the form of American Depositary Receipts (ADRs).

Most of the sample consists of publicly-traded companies, except for the case of Argentina, where roughly half of the firms are not publicly traded. Focusing mostly on publicly listed firms has the obvious disadvantage that since many small firms are typically not quoted in the stock market, they are underrepresented in the dataset. Focusing mainly on corporations listed in stock markets, however, has the advantage that financial statistics are more reliable and comprehensive than for private firms. Moreover, relative to other available databases, the coverage of small and medium-sized publicly traded firms is superior, thus providing ample cross-firm variation in sizes to capture scale effects.[12]

Table 1 shows the number of firm observations per country and year that have non-missing data on foreign-currency debt. The size of the sample changes as new firms enter and exit the sample. Attrition is mostly due to the fact that nonpublic firms are in the sample only in years they are issuing corporate bonds, or public firms that are privatized, merged or acquired and are subsequently delisted. Few firms drop from the sample because of bankruptcy. For Argentina and Uruguay, the data used in the analysis extends only till 2001. In the case of Argentina, most debt contracts were rewritten through *pesification* in 2002 at the time of the crises (see Calomiris, 2007). I decided to exclude post-2001 years as these contractual changes may have distorted estimations. For Uruguay, there is no data available for the post-crisis period.

Table 1

[11] A comprehensive measure of the exchange rate sensitivity of net income flows to the exchange rate should also allow for the fraction of intermediate inputs imported by the firm. Unfortunately, data to construct these measures was unavailable. I discuss these shortcomings in the robustness section.

[12] The database covers all firms that are listed—or have been listed— in the six countries' stock exchanges, rather than just the most liquid or with the biggest market capitalization, as has been common in other cross-country studies (see, for example, Allayanis, Brown and Klapper, 2003).

Table 2 and Figure 1 report descriptive statistics for the variables used in the analysis. Inspection of Table 2 reveals significant cross-country variation in the currency denomination of corporate borrowing. The average share of foreign currency debt during this period ranged from 6 percent in the case of Colombia, for example, to well above 63 percent in the cases of Argentina and Peru. Figure 1, in turn, shows the cross-sectional distribution of foreign currency ratios within each country for the whole sample. Again, differences across countries are striking. The data for Argentina and Peru is consistent with the fact that the dollarization of debt has been pervasive in all productive sectors. For several countries in the sample, however, is highly skewed the cross-sectional distribution of dollar debt ratios is highly clustered around zero and decidedly non-normal. In addition, and as shown in Table 2, a common pattern in firm capital structures across Latin America is the relatively low dollarization of assets (compared to liabilities). Finally, the average share of exports over sales for firms in the sample show less variation across countries: it ranges from 6% in Colombia to 25% in Uruguay.

Table 2

Figure 1

II.2. Exchange Rate Regimes

To measure the choice of exchange rate regime I rely on the *de facto* annual classification produced by the International Monetary Fund. As described by Bubula and Otker-Robe (2002), this classification combines market exchange rates, reserves data, and other quantitative information with the existence of formal or informal commitments to exchange rate paths assessed by IMF economists in the course of bilateral surveillance. Based on this classification, I construct a binary variable that takes the value of 0 for fixed, pegged or crawling exchange rate regimes, and 1 for independently floating regimes.[13] During the sample period, we observe five regime switches from fixed or pegged to floating regimes: Mexico (1994) and Brazil, Chile, Colombia and Peru in 1999 and Argentina .[14]

[13] In their paper, Bubula and Otker-Robe (2003) classify regimes into 13 categories. I code as 0 the following regimes: hard pegs (1-3), adjustable parities (4-6), crawls (7-10) and tightly managed floats (11). An alternative *de facto* classification of exchange rate regimes is Reinhart and Rogoff's 'natural' classification. There exist still further alternatives, notably those of Ghosh, Gulde and Wolf (2003), Levy-Yeyati and Sturzenegger (2003, 2007) and Shambaugh (2004).

[14] Ideally, one would like to analyze what happens with currency mismatches when countries switch from flexible to fixed regimes. For Argentina and Brazil, adoption of pegged regimes happened in 1991 but firm-level data is not available for those years.

Because this binary variable may mask the heterogeneity of exchange rate policies across countries and time, I also construct a "Freedom to Float" index as in Calvo and Reinhart (2002). The index is defined as the ratio of the variance of percentage changes in the exchange rate to the sum of variances of the percentage change in foreign exchange reserves and the change in interest rate. This variable quantifies the extent to which central bank chooses not to stabilize the exchange rate for a given level of pressure on its currency: a higher number indicates that the exchange rate is relatively more volatile than the policy instruments, thus indicating a more flexible exchange rate policy (more nominal exchange rate flexibility).[15] Table 3 provides a description of the different exchange rate arrangements for each country during the sample period, and calculates measures of effective exchange rate flexibility as in Calvo and Reinhart (2002).

II.3. A first glance at the data

Before turning to the regression results, I present graphical evidence of trends in the raw data. Figure 2 plots the time series for the firms' average share of dollar liabilities in total liabilities for each country in the sample.[16] In each panel, the vertical line represents the year of exchange rate regime changes. The dark shaded area in each figure corresponds to a period of fixed, pegged or crawling exchange rate regimes, while the light-shaded area represents years of managed or independently floating exchange rates.

Several important trends are visible in the data. One aspect that is apparent in the figures is that dollarization ratios were increasing rapidly in the years running up to the exchange rate crisis for the different countries in the sample. This occurs for Mexico (before the switch in 1994), in Brazil, Chile, Peru and (less so for) Colombia before 1999, and Argentina and Uruguay in 2001. Another eye-catching aspect is the marked decline that occurs in the average share of foreign currency liabilities in later years. With the exception of Brazil and Colombia, the reversal in dollarization tends to happen approximately around the time of regime switches.[17] As a result, corporations in Latin America have become

[15] This variable quantifies the extent to which central bank chooses not to stabilize the exchange rate for a given level of pressure on its currency. As a fourth alternative, we compute freedom to float, (FF) defined as the ratio of volatility of nominal effective exchange rate (and alternatively the nominal exchange rate vis-à-vis the US dollar) to the volatility of reserves (Eichengreen et al., 2003). Therefore, a higher number implies higher volatility of exchange rate relative to the reserves (i.e., more nominal exchange rate flexibility).

[16] To control for changes in sample composition and missing observations, we regress firm-level dollarization ratios on a complete set of firm and year intercepts. The graphs plot the estimated time dummies from these country-level regressions.

[17] In the case of Argentina, the sharp decrease in average dollarization is mostly explained by the mandatory redenomination of domestic dollar debt contracts to pesos (*pesification*) that occurred in 2002, at the time of the crises (see Calomiris, 2007). I discuss the implications for the estimation results in the next section.

significantly less dependent on foreign currency financing: the average share of foreign-currency denominated liabilities in Latin America dropped from 35% in 1998 to 19% in 2005. Excluding the case of Argentina, Mexico and Peru are the countries where dollarization of corporate liabilities have decreased the fastest, compared with their peak levels during the 1990s.[18]

The stock of foreign currency debt, however, may not be a good indicator of the potential for exchange-rate induced financial distress of a firm. A firm may have natural hedges in the form of foreign currency cash flows that buffer the dollar risk arising from its debt portfolio. Thus, Figure 3 depicts a more precise measure of currency exposure, defined as the ratio of dollar debt over exports. This ratio also controls for mechanical valuation effects where a depreciation tends to increase the share of dollars in the portfolios, even in the absence of new net flows of dollar credit.[19] As the graphs illustrate, the average share of dollar liabilities as a fraction of exports tends to decrease soon after the exchange rate regime is liberalized. Some countries exhibit trends prior to the regime change (e.g. Peru), but even in those cases there is a pronounced downward movement in the aftermath of the regime change. The effective balance sheet foreign currency exposure of a firm, however, may be smaller than suggested by foreign-currency debt levels alone. Overall, the data suggests that —accompanying the sustained decrease in dollarization levels— firms have been covering a higher share of their dollar debt with foreign currency earnings, especially since the on-set of more flexible regimes.

It is tempting to conclude from this descriptive evidence that switching to a flexible regime has led both to a decrease in foreign currency borrowing and a reduction in foreign exchange open positions in the corporate sector. However, one must be cautious in interpreting this as a causal link, due to the possible presence of omitted factors correlated both with currency exposure at the firm level and regime switching. The rest of the paper is devoted to exploiting the panel structure of the data-set, which helps eliminate the potential confounding effects that unmeasured firm characteristics and common shocks across Latin American countries may have.

[18] See Kamil (2008) for more detailed analysis on the evolution of corporate financial indicators in Latin America. Rennhack and Nozaki (2005) review trends in financial dollarization in Latin America's banking system during the last two decades.

[19] This can be relevant, for example, in the case of Brazil, where the currency crisis of 2002 resulted in a 53% depreciation of the real vis-a-vis the dollar.

III. EMPIRICAL STRATEGY: PANEL DATA ANALYSIS

I take two estimation approaches to establish the impact of exchange rate regime on firms' balance sheet currency mismatches: panel analysis and event study. Below I describe the first empirical strategy and present results from the panel regressions.

III.1 Empirical specification

The empirical strategy is based on estimating a pooled cross-section model of the main determinants of firms' foreign currency borrowing in Argentina, Brazil, Chile, Colombia, Mexico, Peru and Uruguay, between 1992 and 2005. I use a generalized difference-in-difference-in-difference (DDD) approach to test for the differential impact of floating exchange rate regimes on foreign currency borrowing, across firms with differing abilities to generate foreign currency revenues. For these purposes, I interact a country-level measure of exchange rate flexibility ($FLEX_{ct}$) with a firm-level measure of export orientation, and estimate the following specification:

$$\begin{aligned} DOLL_{ijct} &= \alpha_0 + \alpha_1 FLEX_{ct} + \alpha_2 EXPtoS_{ijct} + \alpha_3 \left[EXPtoS_{ijct} * FLEX_{ct} \right] \\ &\quad + \mathbf{x}_{ijct-1}\boldsymbol{\beta} + \phi_j + \gamma_c + \lambda_t + \varepsilon_{ijct} \end{aligned} \qquad (1)$$

Equation 1 represents a reduced form equation which models $DOLL_{ijct}$, the proportion of total liabilities denominated or indexed to a foreign currency (typically the dollar) of firm *i* in sector *j*, in country *c* in year *t*. Thus, $DOLL_{ijct}$ is between 0 and 1. *FLEX* is a binary variable that varies across countries and time, and takes on the value of 1 in all years where a country has a floating exchange rate regime (including the transition year). *EXPtoS* is the ratio of exports (foreign currency revenues) to sales of each firm in the sample. The estimating equation also controls for a vector of firm-specific, time-varying covariates lagged one period, $\mathbf{x}_{ijt-1}$, which includes size and access to international capital markets. Unobservable determinants are captured by ε_{ijct} and are assumed to be possibly term assumed to be possibly heteroskedastic and equicorrelated within firms (Petersen (2007)).

I also allow for sector, country and year fixed effects represented by ϕ_j, γ_c, λ_t, respectively. The time fixed effects account for regional changes that affect all countries and firms equally. The high degree of commonality observed in the time series behavior of dollarization levels across countries described in the previous section suggest that regional factors may be partially driving the behavior of each series. The country fixed effects, in turn, account for country-specific characteristics that might affect foreign currency borrowing for all firms within a country that do not change during the sample period — such as restrictions on dollar lending by the domestic banking system in Brazil, Colombia and Mexico.[20] Finally, I group firms into 8 categories based on their primary industry classification, and include these dummies in the model. Industry fixed effects control for systematic differences across economic sectors that might jointly determine dollarization levels and export intensities—like production technologies, product market conditions and/or industry-specific investment opportunities.

I also include a set of variables to control for other firm-specific influences on debt dollarization. To capture firm size, I sort firms in each country and year into thirds based on total assets. Separate dummies are used for large-sized (top-third) and medium-sized (middle-third) firms (small-sized firms being the excluded category).[21] To account for firms' access to international financing, I construct a binary dummy that takes the value of 1 starting in the year that a firm issued debt, bonds, or equity in international capital markets.

In equation (1), α_2 denotes the extent to which the average firm in the sample matched—under fix or pegged regimes—the currency denomination of their liabilities with the currency composition of income flows (the share of foreign currency revenues in total sales). This provides a measure of operational (or *natural*) currency risk hedging: by matching the exchange rate sensitivities of their income statement and balance sheet, firms are in effect hedging some of the exchange rate risk to which they are exposed by holding dollar debt.

The central empirical question addressed in this paper is whether this degree of *currency matching* in firms' balance sheets is—economically and statistically—different during periods of floating regimes. The key parameter of interest is then α_3, which measures how much tighter is the match between income streams with the currency composition of liabilities under floating regimes. If following the introduction of flexible regimes, firms' dollar debt holdings become more sensitive to the availability of foreign currency revenues (compared to countries that keep their exchange rate pegged during the same period), then α_3 should be positive.[22]

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[20] Fixed effects for both years and countries means that the aggregate impact of the switch to a more flexible regime on firm-level dollarization is identified purely from the within-country variation over time.

[21] Thus, we do not restrict a given firm to maintain the same status during the whole sample. I obtain similar results (not reported) when size is defined as the logarithm of total assets.

[22] This interpretation is similar to the average effect of the "treatment" on the treated, where differences in exports to sales ratios allows for heterogeneity in treatment response.

(continued)

In this panel analysis, the identification of α_3 comes from the combination of cross-sectional and time-series variation in exchange rate regimes across countries, and cross-firm variation in dependence on foreign currency earnings. In this approach, the control group in each year includes those countries in the sample that have either not yet liberalized or never liberalize their exchange rate regimes during the sample period. Focusing on α_3, rather than on the level effect captured α_1, underscores the notion that what matters for financial vulnerability is not the level of dollarization per se, but the way it is distributed across the economy among firms with differing abilities to earn dollar-denominated revenues.

III. 2 Evidence from Panel Estimates

Table 4 shows the basic estimation results for variations on equation (1). Given that observations for the dependent variable are censored by zero and one, I use Tobit regressions to estimate the model. In the specification in column 1, the firm-level foreign currency borrowing ratio is regressed only on the FLEX dummy. The specification is akin to the standard difference-in-difference (DD) method, relying on changes in country policies over time to identify the effects on *average* firm-level dollarization. I find a significant negative effect of the floating-regimes dummy, which in principle suggests that switching to more flexible exchange rate arrangements reduces liability dollarization by 10% for the average firm in the sample, compared with the pegged periods. However, this coefficient, as I show below, is highly unstable in both sign and statistical significance.

The rest of Table 4 exploits the variation in export intensity across firms to identify the effect of the exchange rate regime on firms' balance sheet currency mismatches. Each successive column includes additional controls, beginning with country and sector-fixed effects in Column 3, time fixed effects in column 4, while Column 5 adds firm-level covariates to the specification. The estimated value for α_3 is positive, statistically significant and stable across alternative specifications. Evaluated at the sample means of the data, the point estimate in Column 5 indicates that firms on average increase the degree of currency matching by almost 40%, compared with pegged regimes. In other words, following the adoption of more flexible exchange rate regimes, there is evidence that firms reduce their vulnerability to sudden shifts in the exchange rate by using more systematically their operating income in foreign currency to offset their dollar debt exposure.

A concern with the baseline specification is that the interaction term might be picking up time-varying country effects that are due to factors other than the regime change. For example, firms' decision to borrow in foreign currency may be positively related to slow moving country-level determinants, such as interest rate differentials between local and foreign currency, the strengthening of the domestic currency in real terms, or the degree of real dollarization (i.e, how extended is dollar-pricing in the domestic economy).[23] To address this concern, I also include a set of country-specific linear time trends to the baseline specification, which are useful for separating the effect of the exchange rate regime from the influence of long-running trends in dollarization in particular countries. As shown in Column 6, the central result is not sensitive to this specification: under floating regimes, firms have tended to limit the impact of exchange rate movements on the company's financial position by correlating more strongly the currency denomination of liabilities and income flows.

Given that the source of variation to identify the coefficient α_3 differs substantially across columns, the robustness of the estimated coefficient provides reassuring evidence that this effect is not driven by an omitted variable bias. This contrasts sharply with the estimated value for α_1 — which is highly unstable and flips signs across specifications — and suggests possible reverse causality going from average dollarization to exchange rate regimes.[24]

Estimates of the other covariates in the regression appear generally reasonable and consistent with past research. First, the results suggest that even during periods of fixed or pegged regimes, firms whose income is positively correlated with the exchange rate have a higher fraction for foreign currency-denominated liabilities (α_2 is positive and statistically significant in all specifications). This result confirms the findings in Bleakley and Cowan (forthcoming), who study firm's investment response to balance sheet effects using a sample of 450 companies in five Latin American countries between 1991 and 1999. My results provide evidence that under flexible regimes, firms match more systematically the currency denomination of their liabilities with the exchange-rate sensitivity of their revenues, suggesting that flexible exchange rate regimes may have encouraged firms to insulate themselves from balance sheet risks arising from exchange rate fluctuations.[25]

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[23] A failure of uncovered interest parity (leading to lower *ex-ante* dollar financing expressed in the same currency) would tilt corporate borrowing towards foreign currency (Jeanne, 2000 and Calvo, 2001). In addition, the real exchange appreciation that typically occurred during the crawling peg regimes reduced the real burden of the outstanding foreign currency debt, providing firms with additional incentives to take on foreign currency debt. Finally, the probability of a firm taking a foreign currency loan should be naturally related to the degree of *real* dollarization (the extent of dollar-linked pricing) in the country (Ize and Levy-Yeyati, 2003).

[24] This is the so-called "fear of floating" phenomenon (Calvo and Reinhart, 2002), i.e., authorities' tendency to stabilize the exchange rate in countries with high liability dollarization fearing the contractionary effects of currency depreciations.

[25] There are three main differences between the analysis in this paper and that performed by Bleakly and Cowan. First, I use a more comprehensive dataset, covering a wider sample of firms and including the highly dollarized countries of Peru and Uruguay . Second, my period extends and thus I am able to see how firms' debt currency choices varies after the switch from a flexible regime. Finally, Bleakly and Cowan use sectoral indicators to proxy for binary indicator. My results are unchanged when I use a continuous measure from Romalis (2004) instead, which is available in the 4-digit US SIC classification. Because of differences in industry classification, I am able to match this measure to 17 of my 27 3-digit ISIC sectors.

(continued)

Second, the results of the model also points to the theoretically sensible finding that bigger firms and firms with access to international capital markets hold more foreign currency debt as a fraction of their liabilities. These coefficients have the predicted signs and are statistically significant at standard confidence levels. The relation between firm size and the use of dollar debt is monotonic, increasing from smaller to medium and to larger firms, consistent with evidence for East Asian firms by Allayannis, Brown and Klapper (2003). Overall, the model explains 56% of the variance in the dispersion of foreign currency borrowing ratios across countries and years.[26]

I next investigate whether the results in Table 4 are robust to using an alternative measure of exchange rate regimes that captures exchange rate flexibility. Table 5 confirms that the central results remain unaffected. Again, the table includes a large number of specifications in order to show that the estimates for α_3 are not particularly sensitive to the inclusion of different regressors. The results indicate that following the adoption of floating regimes, firms with low export revenues experienced larger declines in dollar debt relative to firms selling to international markets.

In macroeconomic terms, the results suggest that flexible regimes lead to a reallocation of dollar liabilities towards firms with more "natural" hedges. One can use the estimates in Table 5 to quantify the effect of exchange rate flexibility in redistributing dollar debt across firms with differing abilities to bear exchange rate risk. On the basis of the estimated coefficients, I compute the difference in dollarization levels between firms with a high dependence on foreign currency earnings (95th percentile of the distribution in the sample) and a firm with low export orientation (5th percentile of the same distribution) in a country with the highest average index of flexibility compared to the country with the lowest index, as follows:

$$\hat{\alpha}_3\left[\left(EXPtoS_{95th}-EXPtoS_{5th}\right)\left(FLEX_{95th}-FLEX_{5th}\right)\right] \qquad (2)$$

The coefficient estimate on the interaction term in column 6 of Table 5 suggests that the difference in dollarization levels between high and low export-oriented firms in Chile (the country that attains the maximum level of exchange rate flexibility in the sample) is 14% higher than the difference in average dollar debt shares between the same firms in Argentina (in the bottom 5th-percentile in terms of flexibility).[27] As a comparison, the difference across countries in the average dollarization among firms in these two extremes of the distribution is

[26] Although not reported, country dummies are individually significant at conventional confidence intervals in all specifications, with firms in Argentina, Uruguay, and Peru holding the highest levels of dollar debt, and firms in Colombia and Brazil holding the lowest levels of dollar debt.

[27] 0.14 = 0.11* [(0.66-0)*(1.97-0)].

approximately 28.6 %. This suggests that the effect of currency regime flexibility accounts for approximately 50% of the mean difference.

III. 2 Robustness Tests

The evidence from the switchers panel regressions is presented in Table 6 for the full specification with country-time dummies. , where Columns 1 and 1' denote the use of flexible-regime dummies and an exchange rate flexibility measures, respectively. Regardless of the choice of measure, I find a significant positive effect, which suggests that in countries with more flexible regimes, dollar debt tends to be disproportionately held in sectors more reliant on export revenues.[28]

Another concern with the baseline specification is that an important fraction of the firms had zero dollar debt in every year, suggesting that the dynamics governing their financial decisions could be very different from the rest of the firms in the sample. In order to consider this possibility, I only included firms which had positive dollar debt in at least one year throughout the sample. As results in Table 6 show, dropping these firms does little to alter the main result in the paper: in countries with more exchange rate flexibility, firms with no foreign currency revenues hold disproportionately less foreign currency debt than firms which rely mainly on foreign currency income, compared to the relative dollar debt holdings between exporter/non-exporter firms in pegged regimes.

It is also possible that non-random entry or exit may affect the results. For example, if those firms that went bankrupt or were merged or acquired after regime switches, were those with higher currency exposure and thus a higher level of financial vulnerability, then we would tend to observe an artificial reduction in the average foreign currency exposure due to changes in the composition of the sample. To allay concerns about survivorship bias, the specifications presented in the last two columns of Table 6 have been performed using a balanced panel of firms that were present every year in the sample. These analyses generate results very similar to those presented above. Interestingly, while the average degree of currency matching estimated during the pegged periods (α_2) is significantly higher than in the baseline results, the percentage change in currency matching is very similar (between 30% and 35%, depending on whether we use dummy flex or intensity). In terms of economic magnitude, the point estimates in Column x of x imply that following the adoption of a floating exchange rate regime, liability dollarization ratios of firms that sell primarily to the domestic market (in the bottom 5th-percentile by exports to sales ratio) drop 8 percentage points compared with highly export-oriented firms in the 95th-percentile of the distribution (-.081=0.12*(0.0)-0.12*0.58).

[28] From the results reported in Panel A of Table 1 we note that industry growth in real value added and growth in the average size of establishments increase significantly on average following a stock market liberalization .

IV. RESULTS: EVENT STUDY TECHNIQUES

Specification

In this section I experiment with a different approach to identifying the effect of exchange rate regimes on firm's balance sheet currency exposures: examining the variation in firm-level dollarization immediately before and after a country's switch to a flexible exchange rate regime. To do so, I estimate the following specification:

$$\begin{aligned} DOLL_{ijct} &= \alpha_0 + \eta_i + \alpha_1 FLEX_{ct} + \alpha_2 EXPtoS_{ijct} + \alpha_3 \left[EXPtoS_{ijct} * FLEX_{ct} \right] \\ &\quad + \mathbf{x}_{ijct-1}\boldsymbol{\beta} + \phi_j + \gamma_c + \varepsilon_{ijct} \end{aligned} \qquad (3)$$

This specification is more flexible than (1) in that it accommodates a firm-specific term η_i, which also captures any variation in initial conditions at the firm-level at the time of the switch to a floating regime.[29] Letting t=0 (t=1) denotes before (after) the exchange rate event, then α_3 can be recovered by first differencing (3) and estimating the following specification:

$$\begin{aligned} \Delta DOLL_{ijct} &= DOLL_{ijc1} - DOLL_{ijc0} = \alpha_1 \Delta FLEX_{ct} + \alpha_2 \Delta EXPtoS_{ijct} + \alpha_3 \Delta \left[EXPtoS_{ijct} * FLEX_{ct} \right] \\ &\quad + \Delta \mathbf{x}_{ijct-1}\boldsymbol{\beta} + \Delta\varepsilon_{ijct} \end{aligned} \qquad (4)$$

This event study approach isolates the independent effect of exchange rate liberalizations purely from the within-country changes in dollarization. Note that the α_0 term has dropped out of the regression, as well as country and sector fixed effects. First differencing also removes unobserved heterogeneity across firms, such as differences in technologies, market power, and/or managerial behavior, and thus provides a cleaner estimates of the causal impact of exchange rate regimes on dollarization.[30]

I estimate the specification in (4) with the post-flexible regime dummy, so that $\Delta FLEX_{ct} = FLEX_{c1} - FLEX_{c0} = 1 - 0 = 1$ for all countries, and (4) reduces to:

$$\Delta DOLL_{ijct} = DOLL_{ijc1} - DOLL_{ijc0} = \alpha_1 + \alpha_2 \Delta EXPtoS_{ijct} + \alpha_3 EXPtoS_{ijc1} + \Delta \mathbf{x}_{ijct-1}\boldsymbol{\beta} + \Delta\varepsilon_{ijct}$$

[29] Note that is not possible to include fixed effects in a Tobit specification, as there does not exist a sufficient statistic allowing the fixed effects to be conditioned out of the likelihood (see Wooldridge).

[30] The fixed effect estimator will exclude the possibility that the results presented so far are a consequence of an omitted endogenous time-invariant characteristic of the firm.

This way, the differential impact of exchange rate regimes across firms with different export to sales ratio is estimated by the coefficient on export intensity, α_2. Eq. (1) thus asks how exporters' dollar debt levels changed after the move to flexible regimes relative to non-exporters, conditional on all the unobserved static characteristics of the firms.

Unlike the panel analysis, the event study approach uses only one observation per country-firm: the change in foreign currency debt (and its determinants) around the regime change event. It thus require taking a stance on the horizon over which the effects are expected to be realized. I first measure $\Delta DOLL_{ijct}$ as the difference in average dollarization between (*t-1*,*t-3*) and (*t+1*,*t+3*) around a liberalization event in year *t*.
Likewise, $\Delta EXPtoS$ is computed as the difference between the average export ratio between $t-3$ and $t-1$, and the average ratio between $t+1$ and $t+3$. Averaging ensures that the results are not influence by temporary movements in dollar debt ratios and exports. I focus on the sample of countries that switched to flex within the sample, so averages are well defined.

Baseline Results

As Table 7 illustrates, the effects of moving to flexible exchange rate regimes obtain even in this econometrically demanding set-up.[31] Cross-sectional changes in dollarization after countries switch to flexible regimes are significantly correlated with the ability of firms to produce foreign currency earnings or hold dollar assets. These differences are statistically significant, or too large to have easily occurred by chance.

Two additional concerns merit further discussion. The first potential concern with the estimation has to do with the fact that export intensity can be itself endogenous to the exchange rate regime, as currency reforms are typically accompanied by steep increases in the nominal exchange rates which leads to gains in competitiveness. In this case, we would be violating the identification restriction that the exchange rate regimes can only have an independent effect on the dependent variable. This issue becomes even more relevant if we consider that the signing of the North American Free Trade Agreement (NAFTA) in 1994 might have changed the financing opportunities for exporting firms as it was perceived that they had a higher growth potential (see Werner and Martinez).[32] Under these circumstances, exporting firms might get higher financing in the post-crisis period not because it implied a lower exchange rate risk but because the growth potential they had.

[31] Differencing will typically raise the noise-to-signal ratio and tend to reduce the significance of a number of independent variables because standard error become larger.

[32] Finally, I note that a surprisingly large share, 40%, of pre-crisis domestic exporters did not continue exporting following the crisis. Although this phenomenon requires further investigation, liquidity constraints, an overall decline in the regional economy, may explain it. [place holders]. A similar result is obtained in ...[place holder].

V. A Closer Look at the Data: Exploiting the Information in Entire Cross-Sectional Distribution of Dollar Debt Ratios

In Sections III and IV I investigated the effects of exchange rate regimes in foreign currency borrowing solely through the effect of various covariates on the *conditional mean* of firm-level dollarization levels. Although important in itself, reaching conclusions on the basis only of the first moment of the (unconditional or conditional) distribution is problematic since it ignores changes in the remainder of the distribution of foreign currency borrowing and currency mismatches. This is especially important, for example, in the case of policymakers who may be especially interested in reducing the number of firms facing the down-side of exchange rate risk or, in the words of Stulz (1996), "the elimination of costly lower tail outcomes."

A. Conditional Quantile Estimates

In this section I exploit the information contained in the *entire* cross-sectional distribution of liability dollarization ratios of the corporate sector, by looking at conditional quantile estimates of the effect of the exchange rate regime on firm's debt currency choices. The first three panels in Figure 4 plot the estimated effects of the export to sales ratio, the flexible regime dummy and the interaction effect on debt dollarization, at different deciles of the conditional distribution of the dependent variable. Results were obtained by applying the methodology of censored quantile regressions described in Chernozhukov and Hong (2001).[33]

Because the conditional quantile regression is a linear model on the covariates, the estimated coefficient on exports to sales measures the degree of currency matching in the sample during the pegged regime (that is, when the dummy Flex=0). The Figure suggests that the degree of currency matching decreases almost monotonically as we move up the conditional distribution of dollarization, indicating that firms with higher conditional levels of dollar debt (that is, after accounting for firm-specific and sectoral determinants) are more exposed to exchange rate risk.

The last figure in the Panel calculates the percentage increase in the degree of currency matching at any given decile of the distribution, by dividing the value of the decile-specific interaction effect over the corresponding value for the estimated parameter on export to sales ratio. This last result implies a very interesting observation: as countries switch to flexible regimes , the reduction in the degree of foreign exchange rate exposure in firms'

[33] The Tobit estimator of the mean regression model is concerned with the dependence of the conditional mean of the dollarization ratio of debt on a given set of covariates. The quantile regression estimator tackles this issue at each quantile of the *conditional* distribution of the dependent variable. The central special case is the median regression estimator that minimizes the sum of absolute errors. Taken together, the ensemble of estimated conditional quantile functions offers a much more complete view of the effect of covariates on the location, scale and shape of the distribution of the response variable. An additional advantage of quantile regression estimates is that the method is robust to departures from normality and homoscedasticity, thus alleviating some of the concerns regarding results obtained with Tobit models.

balance sheet becomes more important as we consider firms in the highest deciles of the dollarization distribution. Interestingly, the differential effect is stronger where the theory plausibly suggests the costs of exposure to devaluation risk are likely to be larger. These differential effect lends additional credibility to the hypothesis that following the adoption of a floating exchange rate regime, the private sector becomes more aware of exchange rate risk.

VI. Conclusions and Policy Implications

Many observers have signaled out fixed or pegged exchange rate regimes as the main culprit behind the large buildup of un-hedged foreign currency debt leading up to recent currency crisis. According to this argument, the perception of assured exchange rate stability has induced firms in those countries to borrow too much and/or underestimating future currency risk.

The goal of this paper is to understand the way exchange rate regimes affect firms' decisions to borrow in foreign currency and the associated currency imbalances in firms' balance sheets. For these purposes, we construct a new firm-level dataset on the currency composition of firms' assets and liabilities for 2,200 companies across seven Latin American countries, between 1992 and 2005.

The key result in the paper is that the adoption of a floating exchange rate regime leads to a higher degree of *currency matching* in firm's balance sheets, relative to pegged regimes. In other words, firms match more firmly the currency composition of liabilities and income streams, thus reducing their exposure to exchange rate fluctuations. At a macroeconomic level, this means that foreign currency liabilities get redistributed in the economy towards borrowers better able to bear exchange rate risk. This result is robust to different estimation strategies, alternative definitions of exchange rate regimes and different measures of currency exposure at the firm-level. To our knowledge, no other study has yet examined the effect of exchange rate regimes on corporate financial policies and financial vulnerability across countries and across time.

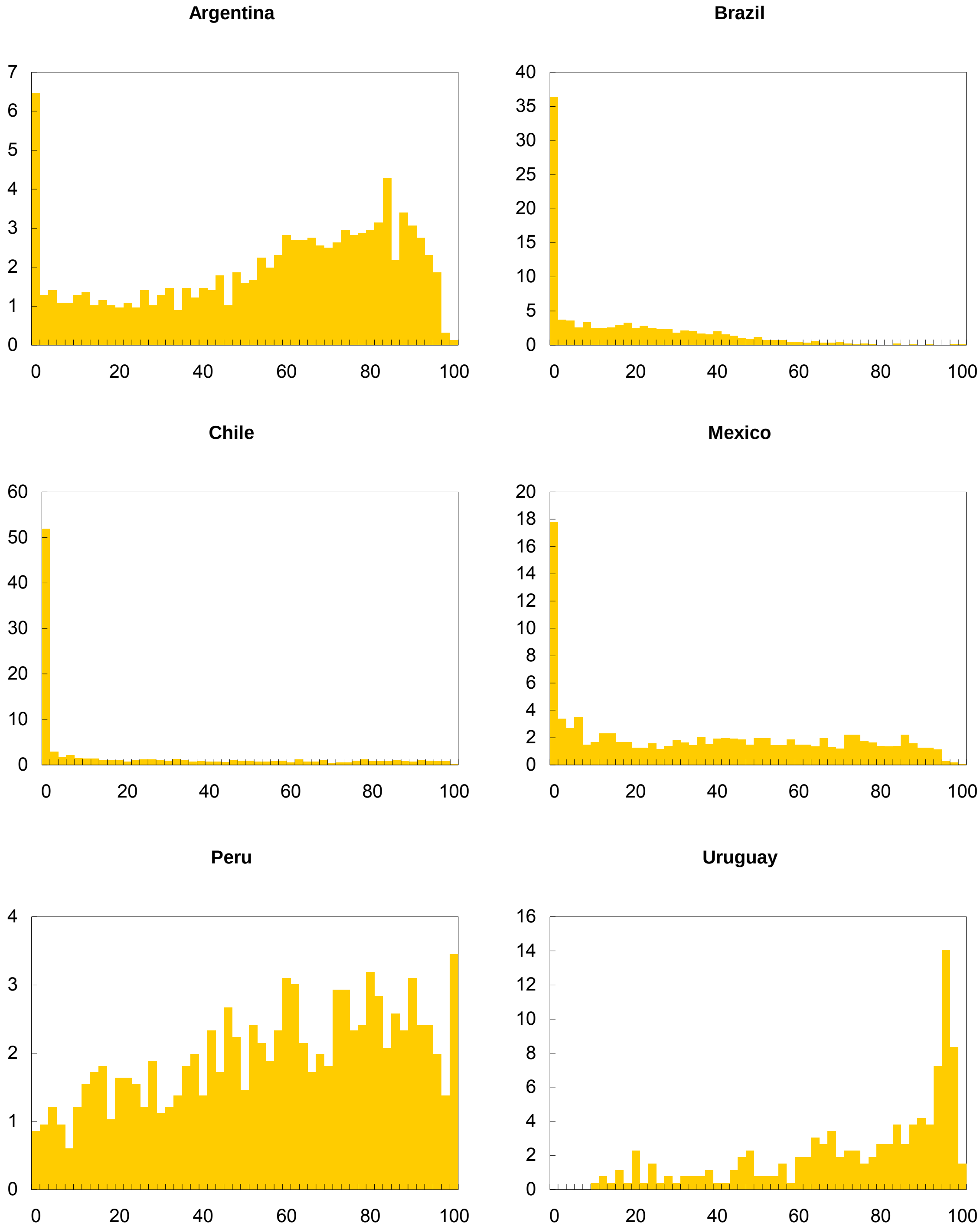
Results presented in the paper provide support for the view that floating exchange rate regimes reduce liability dollarization. These results are also consistent with the hypothesis that fixed exchange rate regimes bias corporate borrowing towards foreign currency denominated debt. Controlling for firm-specific and sectoral variables, the adoption of a floating regime is associated to a reduction in firm-level balance sheet mismatches. One possible interpretation of these results is that floating exchange rate regimes forces firms to correctly internalize exchange rate risk, by eliminating implicit guarantees characterizing fixed or pegged exchange rate regimes.

From a policy perspective, these findings suggest that policymakers in highly dollarized economies should consider moving to a flexible exchange rate regime as part of a long-term de-dollarization strategy. Taken together, available evidence also suggests that the adoption of flexible exchange rate regimes could reduce in the medium term the financial vulnerability of emerging market economies. A gradual shift to a more flexible exchange rate policy would also make the risks of foreign currency lending more apparent. Such a policy would, however, need to be introduced gradually to avoid the risk of abrupt changes in real exchange rates triggering bankruptcies.

Although this study sheds new light on the relationship of exchange rate regimes and corporate financial policies, other dimensions of a firm's exchange rate risk-management practices still require further scrutiny. In particular, a complete analysis of the financial vulnerability to exchange rate fluctuations at the corporate level requires information on *off-balance sheet positions*, which can substantially alter the overall risk exposure of a firm. This issue is particularly important in light of the significant growth in foreign exchange rate derivative trading in recent years. As seen above, the dollar-indebted firms tended to be larger and access international financial markets. It seems possible, therefore, that they might have been savvy about anticipating exchange rate movements and perhaps experienced with the use of financial derivatives. Such instruments could have been used to hedge away balance- sheet risk.

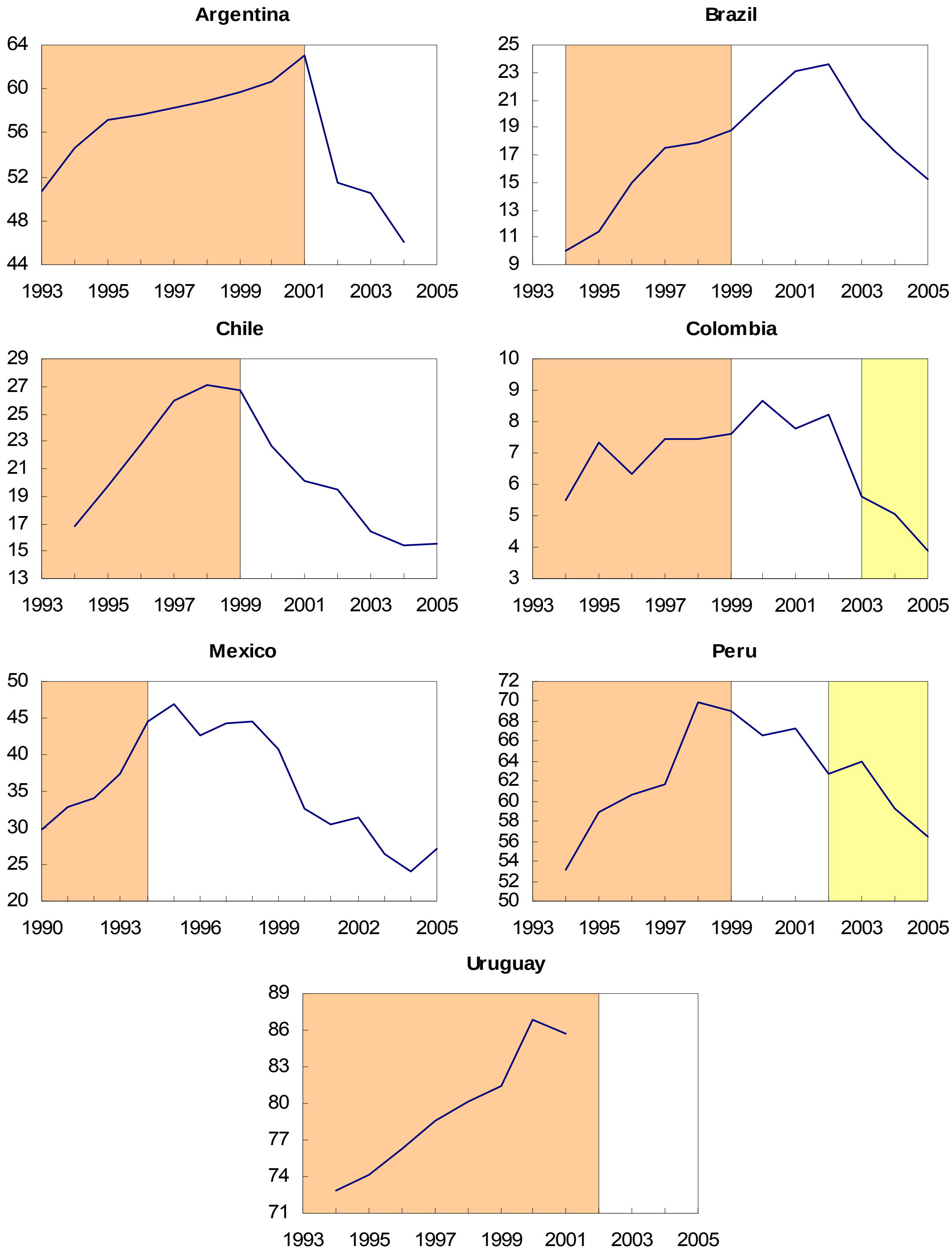
Finally, although this paper concentrates on exposure to exchange rate fluctuations, this is by no means the only aggregate shock that impacts firm's capital structure decisions. Alternatively, changes in firms' financial structures could be driven by rising external capital costs that coincide with periods of depreciation. It would therefore be informative to see how changing credit conditions (domestic and foreign) have differential effects on firms with different financial structures.

Figure 1. Distribution of Firm-Level Dollarization within Countries 1/



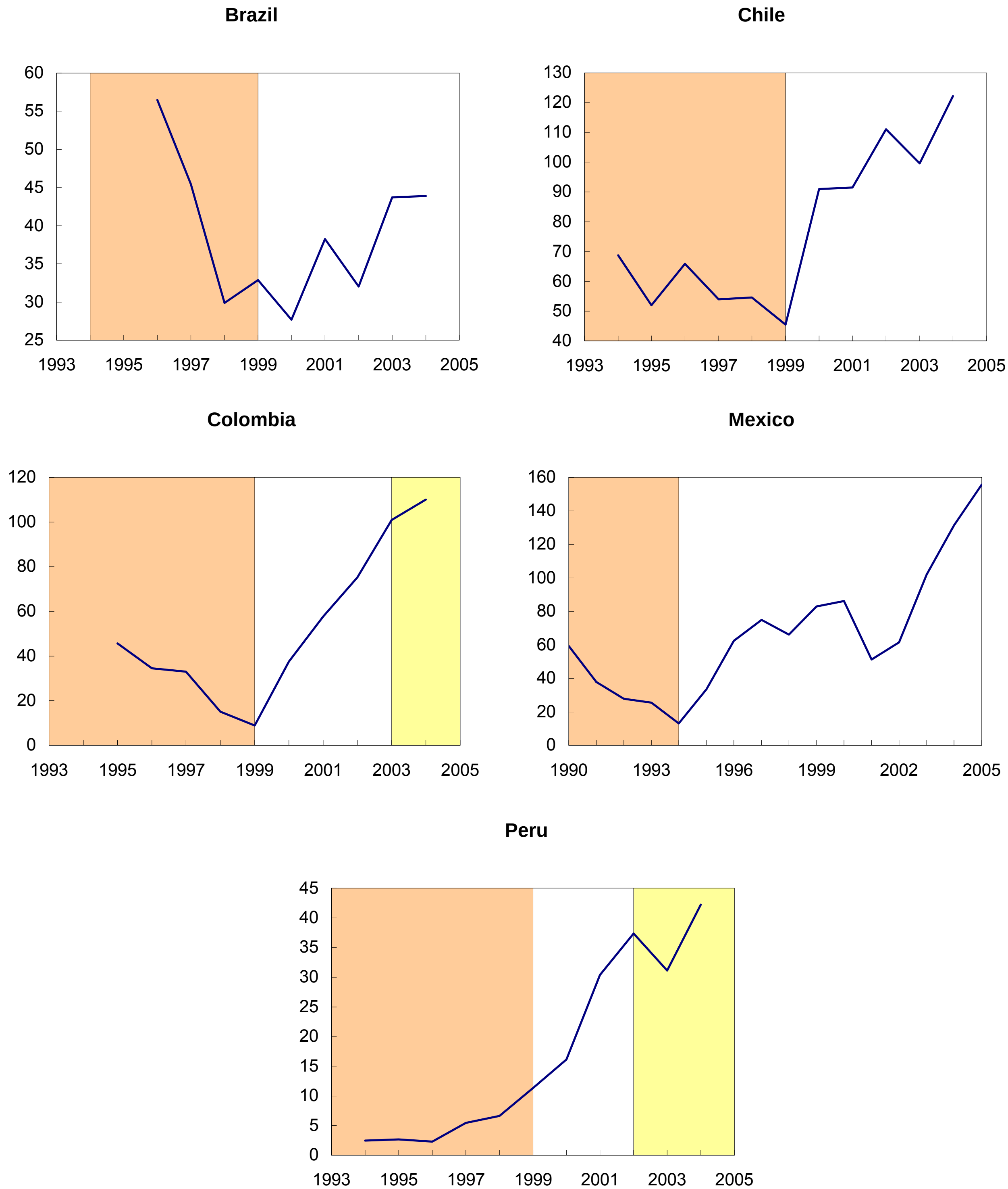
Source: Author's calculations based on data described in the Appendix.
1/ The figures above plot histograms liability dollarization ratios for the pooled sample of firm-year observations within each country. The x-axis represent the different levels of firms' liability dollarization (in %). The y-axis measures the fraction of firm-year observations at each level of dollarization (in %).

Figure 2. Dollarization of Liabilities of the Corporate Sector in Latin America
(In percent, annual average across firms)



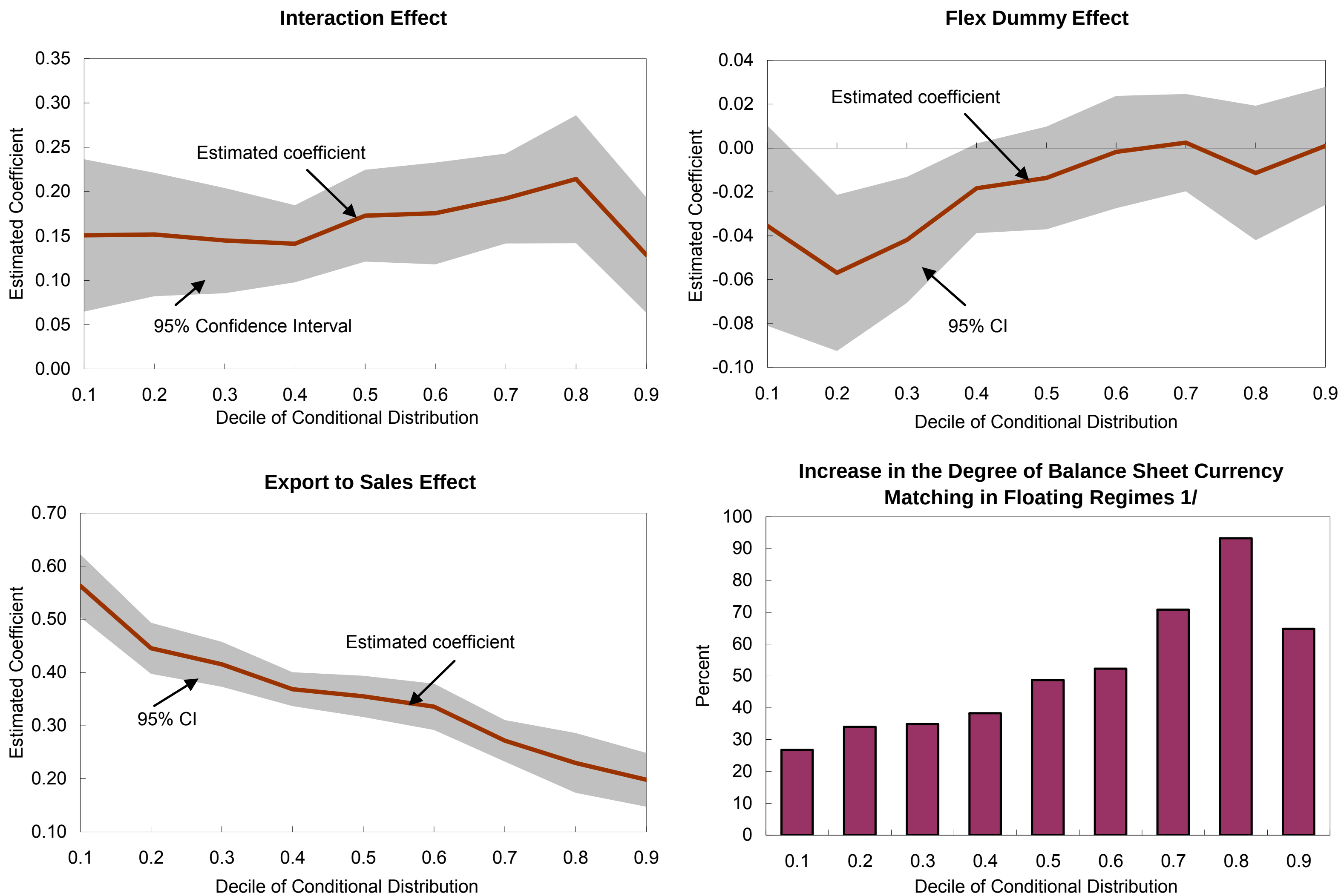
Source: Author's calculations based on data described in the Appendix.
1/ Shaded areas represent different exchange rate regimes: Darker area is fixed or pegged; lighter area is managed floating and white area is independently floating. See Appendix for details.
2/ To control for changes in sample composition, we regress firm-level dollarization ratios on a complete set of firm and year intercepts. The graphs plot estimated time dummies from these country-level regressions.

Figure 3. Coverage of Short-Term Exchange Rate Exposure
(Exports as a percentage of end-of period short term dollar liabilities, annual medians) 2/



Source: Author's calculations based on data described in the Appendix.
1/ Shaded areas represent different alternative exchange rate regimes.
2/ For the case of Chile, foreign currency revenues include short-term dollar assets.

Figure 4. Censored Quantile Estimates



Source: Author's calculations based on methodology described in Appendix.
1/ Percentage increase with respect to pegged regime period, at every decile of the conditional distribution of liability dollarization.

Table 1. Number of Firms Observations

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	**Total**
Panel A. Number of Firms by Country 1/															
Argentina			107	126	143	150	160	169	105	101					**1061**
Brazil		43	62	130	190	218	227	242	235	241	209	172	158	119	**2246**
Chile				186	199	203	206	203	183	184	179	181	165	151	**2040**
Colombia				134	220	238	227	223	188	199	210	217	190	78	**2124**
Mexico	211	210	201	177	163	154	155	138	113	113	115	109	110	91	**2060**
Peru				120	124	138	131	119	115	109	79	84	65		**1084**
Uruguay				10	12	19	19	21	20	18					**119**
Total	**211**	**253**	**370**	**883**	**1051**	**1120**	**1125**	**1115**	**959**	**965**	**792**	**763**	**688**	**439**	**10,734**
Panel B. Number of Firms by Economic Sector 1/															
Agriculture	2	2	5	43	44	47	45	44	39	41	35	34	25	22	**428**
Mining	5	7	10	39	41	41	38	38	35	37	28	29	24	13	**385**
Manufacturing	136	153	223	466	579	604	605	583	503	508	420	408	361	174	**5723**
Utilities		6	26	77	91	97	110	116	105	106	73	72	66	53	**998**
Construction	8	15	22	30	36	38	36	40	36	36	27	25	27	21	**397**
Commerce	34	37	45	68	76	82	83	80	64	65	56	50	44	41	**825**
Transport & Comm.	7	11	19	55	65	85	88	99	80	74	57	50	49	42	**781**
Services	2	2	3	53	58	60	56	55	47	50	48	55	45	38	**572**
Miscellaneous	17	20	17	52	61	66	64	60	50	48	48	40	47	35	**625**
Total	**211**	**253**	**370**	**883**	**1051**	**1120**	**1125**	**1115**	**959**	**965**	**792**	**763**	**688**	**439**	**10,734**

1/ Indicates the number of firms containing consistent balance sheet and income statement data.

Table 2. Descriptive Statistics for Full Sample 1/

Variable	Argentina	Brazil	Chile	Colombia	Mexico	Peru	Uruguay
Dollarization of Liabilities (%)	57.6	17.4	22.4	6.9	37.8	62.1	77.4
Total Assets (millions of dollars)	180	536	78	10	204	40	22
Leverage (%)	50.0	65.6	41.7	40.2	50.3	48.1	59.1
Short Term Maturity of Debt (%)	70.6	55.9	55.7	70.7	59.7	69.6	74.3
Exports to Sales (%)	9.5	11.7	8.8	6.1	14.3	17.9	25.2
Access to International Capital Markets (in %: Yes=1, No=0)	23.3	26.0	15.0	42.3	31.1	7.3	0.0

Source: Own calculations based on data described in the Appendix.

1/ Average values across firms in each country, except for Total Assets, which is the within-country median.

Table 3. Exchange Rate Regimes and Measures of Exchange Rate Flexibility Within Regimes

Country	Period	De Facto Regime (Coarse Classification, IMF)	Fear of Floating Indicator 3/	*De Facto Flexibility* Index 4/
Argentina	1994-2001	Currency Board Arrangement	0.00	0.00
	2002-2005	Managed Floating	0.28	0.96
Brazil 1/	1994-1998	Crawling Peg	0.01	0.09
	1999-2005	Independently Floating	0.97	0.52
Chile	1994-1998	Crawling Band	0.12	0.08
	1999-2005	Independently Floating	0.45	0.25
Colombia	1994-1998	Crawling Band	0.18	0.48
	1999-2003	Independently Floating	0.14	0.61
	2004-2005	Managed Floating	0.24	0.30
Mexico 2/	1990-1994	Crawling Band / Crawling Peg	0.00	0.06
	1995-2005	Independently Floating	0.08	0.32
Peru	1994-1998	Managed Floating	0.02	0.06
	1999-2001	Independently Floating	0.05	0.09
	2002-2005	Managed Floating	0.07	0.06
Uruguay	1994-2001	Crawling Band	0.01	0.17
	2002-2004	Independently Floating	0.05	0.09
	2005	Managed Floating	0.17	0.12

Sources: Author's calculations based on classification described in Bubula and Otker-Robe (2002). and updated by IMF staff through mid-2006.

1/ Crawling peg for Brazil starting from July 1994.
2/ Crawling band/crawling peg for Mexico ends in November 1994. Independent floating beginning in December 1994.
3/ Calculated using Calvo and Reinhart 's (2002) measure of fear of floating. A higher value denotes more flexibility.
4/ Calculated using measure of *de facto* exchange rate flexibility described in Poirson (2001).

Table 4. The Effects of Exchange Rate Regimes on Currency Matching: Basic Results
(Tobit Model for the Determinants of Foreign Currency Borrowing)

	Dependent Variable: Foreign Currency Debt ratio					
	(1)	(2)	(3)	(4)	(5)	(6)
Main Effects						
α_1 (Flexible Regime Dummy) (t)	-0.10 ***	-0.13 ***	-0.02 *	0.00	0.00	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.04)
α_2 (Exports to Sales ratio) (t)		0.53 ***	0.40 ***	0.40 ***	0.31 ***	0.31 ***
		(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Interaction Effect						
(Export to Sales) x (Flex Regime) (t)		**0.10** **	**0.09** ***	**0.09** ***	**0.12** ***	**0.12** ***
		(0.04)	**(0.03)**	**(0.03)**	**(0.03)**	**(0.04)**
Firm-Level Controls						
β_1 (Medium Size dummy) (t-1)					0.10 ***	0.10 ***
					(0.02)	(0.02)
β_2 (Big Size Dummy) (t-1)					0.15 ***	0.16 ***
					(0.02)	(0.02)
β_3 (Access to Intl. Capital Markets) (t-1)					0.18 ***	0.17 ***
					(0.02)	(0.02)
Country-Level Control						
Dummy for Crisis Year					0.04 ***	0.02
					(0.01)	(0.02)
Fixed Effects						
Dummy for Country and Economic Sector			Y	Y	Y	Y
Dummy for Years				Y	Y	Y
Country x Year						Y
Diagnostics						
Number of Observations	13641	11927	11927	11927	10463	10463
McFadden's Adjusted R2	0.012	0.109	0.431	0.431	0.564	57.4
Non-Corner Observations (in %)	74.0	76.3	76.5	76.5	76.5	76.5

Source: Author's calculations.

This table reports the pooled Tobit estimates of equation (1) in the text, for the period 1992-2005. Coefficient estimates denote marginal effects on dependent variable, evaluated at mean values of independent variables. For dummy variables, they represent the effect of discrete changes from 0 to 1. The explanatory variables are (row-wise): The number of observations varies because of data availability. The key independent variable is the interaction term, and the marginal effect is calculated as in Appendix 1. A constant is also included but not reported. Standard errors adjusted for clustering by firm are reported in parentheses. Asterisks denote significance of coefficients, with ***, ** and * indicating significance at the 1%, 5% and 10% level, respectively. For detailed sources and descriptions, see Section 2.

Table 5. Determinants of Debt Dollarization in Latin America
(Tobit Model for the Determinants of Foreign Currency Borrowing)

	(1)	(2)	(3)	(4)	(5)	(6)
Main Effects						
β_1 (Freedom of Float Index) (t)	-0.22 *** (0.01)	-0.22 *** (0.01)	-0.03 *** (0.01)	-0.01 (0.01)	-0.01 (0.01)	0.03 (0.04)
β_0 (Exports to Sales ratio) (t)		0.55 *** (0.03)	0.43 *** (0.03)	0.43 *** (0.03)	0.35 *** (0.03)	0.35 *** (0.03)
Interaction Effect						
(Export to Sales) x (Freedom of Float) (t)		**0.04** **(0.05)**	**0.08** * **(0.04)**	**0.08** * **(0.04)**	**0.11** *** **(0.04)**	**0.11** *** **(0.04)**
Firm-Level Controls						
β_2 (Medium Size dummy) (t-1)					0.10 *** (0.02)	0.10 *** (0.02)
β_2 (Big Size Dummy) (t-1)					0.15 *** (0.02)	0.15 *** (0.02)
β_2 (Access to Intl. Capital Markets) (t-1)					0.18 *** (0.02)	0.18 *** (0.02)
Country-Level Control						
Dummy for Crisis Year						0.03 (0.02)
Fixed Effects						
Country and Economic Sector			Y	Y	Y	Y
Year				Y	Y	Y
Country x Year						Y
Diagnostics						
Number of Observations	13641	11903	11903	11903	10463	10463
McFadden's Adjusted R2	0.046	0.143	0.431	0.443	0.562	0.563
Non-Corner Observations (in %)	74.1	76.5	76.5	76.5	76.5	77.1

Source: Author's calculations.

This table reports the pooled Tobit estimates of equation (1) in the text, for the period 1992-2004. Coefficient estimates denote marginal effects on dependent variable, evaluated at mean values of independent variables. For dummy variables, they represent the effect of discrete changes from 0 to 1. The explanatory variables are (row-wise): The number of observations varies because of data availability. The key independent variable is the interaction term, and the marginal effect is calculated as in Appendix 1. A constant and a full set of country, year and economic sector-specific dummy variables are also included but not reported. Standard errors adjusted for clustering by firm are reported in parentheses. Asterisks denote significance of coefficients, with ***, ** and * indicating significance at the 1%, 5% and 10% level, respectively. For detailed sources and descriptions, see Section 2.

Table 6. The Effects of Exchange Rate Regimes on Currency Matching: Robustness Tests
(Tobit Model for the Determinants of Foreign Currency Borrowing)

	Dependent Variable: Foreign Currency Debt ratio					
	Only Switchers		Firms with Dollar Debt		Balanced Panel	
	(1)	(1')	(2)	(2')	(3)	(3')
Main Effects						
α_1 (Flexible Regime Indicator) (t)	-0.14 ***	-0.09 ***	-0.03	0.05	-0.04 **	-0.06
	(0.03)	(0.03)	(0.05)	(0.04)	(0.02)	(0.05)
α_2 (Exports to Sales ratio) (t)	0.33 ***	0.36 ***	0.28 ***	0.32 ***	0.47 ***	0.50 ***
	(0.04)	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)
Interaction Effect						
(Export to Sales) x (Flex Regime) (t)	**0.08** **	**0.07** *	**0.10** ***	**0.07** *	**0.14** **	**0.17** **
	(0.03)	**(0.04)**	**(0.03)**	**(0.04)**	**(0.06)**	**(0.07)**
Firm-Level Controls						
β_1 (Medium Size dummy) (t-1)	0.10 ***	0.10 ***	0.04 **	0.04 **	0.12 ***	0.12 ***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
β_2 (Big Size Dummy) (t-1)	0.16 ***	0.16 ***	0.08 ***	0.08 ***	0.16 ***	0.16 ***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)
β_3 (Access to Intl. Capital Markets) (t-1)	0.18 ***	0.18 ***	0.14 ***	0.14 ***	0.17 ***	0.17 ***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)
Country-Level Control						
Dummy for Crisis Year	0.10 ***	0.05 **	0.03	0.02	0.07 ***	0.02
	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)	(0.03)
Fixed Effects						
Dummy for Country and Economic Sector	Y	Y	Y	Y	Y	Y
Dummy for Years	Y	Y	Y	Y	Y	Y
Country x Year	Y	Y	Y	Y	Y	Y
Diagnostics						
Number of Observations	9111	9111	9026	9026	3855	3855
McFadden's Adjusted R2	0.532	0.532	0.607	0.606	0.579	0.579
Non-Corner Observations (in %)	74	74	89	89	76	76

Source: Author's calculations.

This table reports the pooled Tobit estimates of equation (1) in the text, for the period 1992-2005. Coefficient estimates denote marginal effects on dependent variable, evaluated at mean values of independent variables. For dummy variables, they represent the effect of discrete changes from 0 to 1. The explanatory variables are (row-wise): The number of observations varies because of data availability. The key independent variable is the interaction term, and the marginal effect is calculated as in Appendix 1. A constant is also included but not reported. Standard errors adjusted for clustering by firm are reported in parentheses. Asterisks denote significance of coefficients, with ***, ** and * indicating significance at the 1%, 5% and 10% level, respectively. For detailed sources and descriptions, see Section 2.

Table 7. The Effects of Exchange Rate Regimes on Currency Matching: Event Study
(OLS Model for the Determinants of Changes in Foreign Currency Borrowing)

	Dependent Variable: Change in Foreign Currency Debt ratio			
	Between [t+3] and [t-3]		Between [t+5] and [t-5]	
	(1)	(1')	(2)	(2')
α_1 Constant	-0.02 **	-0.04 ***	0.15 **	0.17 **
	(0.01)	(0.01)	(0.06)	(0.09)
α_1 (Change in Export to Sales ratio)	**0.15** ***	**0.16** **	**0.15** **	**0.17** **
	(0.06)	**(0.08)**	**(0.06)**	**(0.09)**
α_1 (Change in Dollar Asset ratio)		**0.19** **		**0.27** ***
		(0.08)		**(0.06)**
α_1 (Change in Medium Size Dummy)	0.01	-0.02	-0.01	-0.05
	(0.03)	(0.04)	(0.03)	(0.04)
α_1 (Change in Size Big Dummy)	-0.02	-0.04	-0.01	0.00
	(0.04)	(0.08)	(0.04)	(0.06)
β_3 (Change in Access to Intl. Capital Markets dummy)	0.10 ***	0.13 ***	0.10 ***	0.10 ***
	(0.02)	(0.04)	(0.02)	(0.04)
β_2 (Dummy for Mexico)	0.04 **	0.04	0.02	0.00
	(0.02)	(0.03)	(0.02)	(0.02)
β_1 (Exports to Sale ratio in t+3)	0.01	0.02		
	(0.03)	(0.04)		
β_1 (Exports to Sale ratio in t+5)			-0.01 **	0.00
			(0.01)	(0.04)
Diagnostics				
Number of Observations	812	438	812	440
Adjusted R2	0.04	0.09	0.04	0.09

Source: Author's calculations.

Data Appendix

In this appendix I describe the firm-level data used in more detail, and the sources employed to construct them. We use data reported on a calendar year basis, rather than fiscal year.

While firms in many cases report both consolidated and unconsolidated financial statements, this paper uses unconsolidated figures to the extent possible, to reduce variations arising from changes in subsidiaries' ownership and to work with comparable accounting data. Balance sheet data for Argentina, Chile, Colombia, Peru, and Uruguay comes from non-consolidated financial statements, while financial information for Brazilian and Mexican firms comes from consolidated statements. We use firm's consolidated financial statements instead of controlling firms' statements because many publicly held firms in Brazil are holding firms with no operating income. By consolidating the data we are also analyzing firms that are not publicly held, but were directly or indirectly controlled by firms in our sample. Diversified holding firms with stakes in financial firms or without operating revenues.

I restrict the sample to non-financial companies. Excluded were commercial banks, brokerage firms, insurance companies and mutual funds.

For the purpose of the empirical implementation, we modified the original accounting data in three ways:

(i) I convert all data to real 1996 U.S. dollars using December-to-December changes in the country's consumer price index and the exchange rate for December 31, 1999.

(ii) We drop all firm/year observations if the accounting data are not self-consistent. In particular, we drop observations if dollar liabilities (assets) exceed total liabilities (assets) or if accounting variables do not accord with sign conventions.

(iii) We compute the change in total assets and construct a Z-score using the sample mean and standard deviation for each country/year. We drop firm/year observations that have absolute value of Z>5. These controls for outliers (either because of inadequate accounting, typing errors or extreme values)

Due to data errors and scaling problems, for each accounting variable I study a truncated sample that excludes 0.5% of the observations at each tail. This procedure excludes approximately 8% of the observations. Data errors are a concern because companies do not file with the Companies House electronically. It is very likely that there are undetected data entry errors, especially in view of the large size and limited circulation of the database. Scaling problems arise from near-zero observations in total assets. [19] Since a priori it is plausible to assume that the characteristics distributions for private and public firms are different, I trim extreme values separately for each of these groups. All values are inflation-adjusted to 2003 pounds using the U.K. consumer price index.

Definition of Variables

Total assets. Sum of total current assets, long-term receivables, investment in unconsolidated subsidiaries, other investments, net property, plant and equipment, and other assets (Balance Sheet).

Total liabilities. Book value of total liabilities (Balance Sheet).

Foreign currency liabilities. Liabilities denominated or indexed to a foreign currency (in dollars or in other non-domestic currencies), issued domestically or abroad. These include bank loans, commercial debt, trade credit and foreign securities. Consistent with accounting standards in each country, items that are in foreign currency at the end of the quarter are converted to domestic currency at the contemporaneous exchange rate. (Balance Sheet Notes).

Short-term foreign currency liabilities. Foreign currency liabilities coming due in the upcoming fiscal year. This measure includes foreign currency denominated debt issued at short maturities as well as long term issues whose terminal date falls in the next year (Balance Sheet Notes).

Foreign currency assets. Assets denominated or indexed to a foreign currency. These include cash, government issues indexed to the dollar, bank deposits abroad and overseas client credits. Converted into local currency using end of period exchange rate (Balance Sheet Notes).

Exports. Total sales in foreign markets. (Income Statement, when available or Customs data in each country). Dollar export values were converted into domestic currency using the year's average exchange rate. Most financial statements do not report import spending.

Sales. Gross sales and other operating revenues from main activities (Income Statement).

Asset Tangibility. Total assets minus current assets standardized by total assets.

Leverage. Total liabilities as a share of total assets in the balance sheet.

Size Dummies. To capture firm size, we sort the sample of firms into thirds based on the book value of firm's total assets each year. Separate dummies are used for large-sized (top-third) and medium-sized (middle-third) firms. Small-sized firms is the excluded category.

Industry Dummies. Is the industry in which the firm has its main operations, according to the one-digit ISIC rev 2 classification (International Standard Industrial Classification of All Economic Activities). Dummy variables are set to a value of 1 if the first digit of

Access. A dummy variable that takes on a value of one starting the year the firms accessed international equity markets (by cross-listing shares in foreign stock markets) and/or tapped foreign credit markets (by issuing bonds or taking loans abroad).

Sources

Balance sheet information was mostly collected from annual reports and corporate filings obtained from local stock markets, regulatory agencies and/or trade chambers in each country[34]. Where appropriate, I complemented and cross-checked these sources with data

[34] Data for Argentina and Peru builds upon a firm-level dataset compiled by the Research Department of the Inter-American Development Bank, as indicated above.

obtained from Economatica and Bloomberg. For access to equity markets, we used Bank of New York data to identify those firms whose shares listed in a foreign stock exchange in the form of American Depositary Receipts (ADRs). Firm-level issuance data on private bonds and syndicated loans was extracted from Dealogic Bondware and Loanware. Firms' main sector of operations was identified using Economatica and Lexis Nexis.

The country-specific sources are as follows:

Argentina. Balance sheet information up to 2001 comes from Galiani, Levy-Yeyati and Schargrodsky (2003), and from financial statements compiled from the Buenos Aires Stock Exchange. From 2002 onwards, data is from Economatica. Data on exports is matched using customs data from ExiNet (NOSIS).

Brazil. Data is compiled from corporate filings submitted to BOVESPA, and complemented with data from Economatica and Bloomberg for 2003-2005. Export data comes from Notes to Financial Statements, Bloomberg and LAFIS. Securities and Exchanges Commission of Brazil (CVM).

Chile. Balance sheet information is obtained from the Ficha Estadistica Codificada Uniforme (FECUS) database and notes to financial statements obtained from the SuperValores of Chile. Data on exports comes from ProChile, matched using the RUT.

Colombia. Balance sheet information and export data obtained from SuperFinanciera de Colombia.

Mexico. Balance sheet information and export data obtained from Mexican Stock Exchange.

Peru. Balance sheet information comes from Comision Nacional de Valores (CONASEV) and is partially based on Carranza, Cayo, and Galdón-Sanchez (2003). Data on exports comes from COMEXPERU.

Uruguay. Balance sheet information was compiled from the Bolsa de Valores de Montevideo and Auditoria General de la Nacion. Export data obtained from ExiNet (NOSIS).

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