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Corporate Dollar Debt and Deprectiations: Much Ado about Nothing?

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Abstract

Much has been written recently about the problems for emerging markets that might result from a mismatch between foreign-currency denominated liabilities and assets (or income flows) denominated in local currency. In particular, several models, developed in the aftermath of financial crises of the late 1990s, suggest that the expansion in the "peso" value of "dollar" liabilities resulting from a devaluation could, via a net-worth effect, offset the expansionary competitiveness effect. Assessing which effect dominates is ultimately an empirical matter. In this vein, we construct a new database with accounting information (including the currency composition of liabilities) for over 450 non-financial firms in five Latin American countries. We estimate, at the firm level, the reduced-form effect on investment of holding foreign-currency-denominated debt during an exchange-rate realignment. We consistently find that, contrary to the predicted sign of the net-worth effect, firms holding more dollar debt do not invest less than their counterparts in the aftermath of a depreciation. We show that this result is due to firms matching the currency denomination of their liabilities with the exchange rate sensitivity of their profits. Because of this matching, the negative balance sheet effects of a depreciation on firms holding dollar debt are offset by the larger competitiveness gains of these firms.

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The emerging-market financial crises of the late 1990s have challenged the old view of financial crises as having purely macroeconomic causes. None of the governments in these countries was turning to the printing press to cover budget deficits, the mechanism behind "first generation" models of crises. Moreover, there were no large output gaps that might have signaled a future need to devalue, as in "second generation" models. As a result, a new view has emerged in which the emphasis has shifted away from government-level and macro variables to firm-level financial variables and to the interaction of these variables with aggregate shocks.

Proponents of this view include Radelet and Sachs (1998) who argue that excessive reliance on short-term debt left emerging-market corporations vulnerable to "financial panic" as described by Diamond and Dybvig (1983). For McKinnon and Pill (1998), on the other hand, it was excessive foreign borrowing by domestic banks that led to the crisis after the government withdrew its implicit guarantees. A third group of studies identifies debt denominated in foreign currency as the key protagonist behind these crises. At center stage in these studies is the drop in "net worth" that results from the interaction of a depreciation and a currency mismatch between liabilities and income at the firm level. This deterioration in balance sheets, holding all else fixed, makes firms appear to be riskier investments. Accordingly, creditors require higher rates of return and/or limit the amount of new debt issued to these firms. This, in turn, causes a contraction of investment by dollar-indebted firms following a exchange rate depreciation. The key mechanism, therefore, is that a depreciation inflates the peso value of dollar debt and the resulting weakening of balance sheet positions prevents firms from investing and expanding.[1]

Despite the prominent role attributed to foreign-currency debt in recent financial crises, there is scarce empirical evidence documenting the detrimental effects of currency exposure on firm-level investment during these crises.[2] The present study addresses this question directly. We construct a new database with accounting information (including the currency composition of liabilities) for approximately 500 publicly traded non-financial firms in five Latin American countries: Argentina, Brazil, Chile, Colombia, and Mexico. These data cover most of the large economies of Latin America for the period 1990 to 1999, a period of substantial exchange rate volatility for many of these countries. In addition, there are firms in our sample that hold substantial amounts of foreign-currency debt. These elements constitute the two ingredients necessary for testing the proposed mechanism. Our choice of publicly listed firms is determined exclusively by the availability of data on the currency composition of debt. We concentrate on the non-financial sector of the economy, as it is here that investment decisions are ultimately carried out.[3]

Using this data set, we examine the behavior of firm investment. We investigate the response of fixed-capital investment to better understand how the proposed mechanisms might affect the productive capacity of the firm in the medium term. On the other hand, it has also been argued that falling net worth not only affects the supply of long-term credit for investment, but it also

[1] As it is common usage in the literature on foreign-currency assets and liabilities, we use the term "dollar debt" to refer to any liability denominated in a foreign currency. With similar aplomb, we refer to debt denominated in the domestic currency as "peso debt."

[2] Both Mitton (2002) and Lemmon and Lins (2003) find that firms in East Asia that were more leveraged (without regard to currency) saw steeper declines in their stock values following the large exchange-rate depreciations of the 1990s. Moreover, Allayannis, Brown and Klapper (2001) show that market capitalizations dropped more for East Asian firms holding larger shares of unhedged foreign-currency debt. On the other hand, Conesa-Labastida (1997) and Martinez and Werner (2002) examine determinants of the currency composition of debt in Mexican corporations, but do not consider its interaction with exchange-rate movements or the impact on corporate investment.

[3] However, we do allow aggregate capital-market outcomes (such as bank credit) to enter exogenously into the analysis of firm-level investment.

affects the availability of short-term working capital. A shortage of working capital reduces the firm's capacity to purchase intermediate goods and pay for variable factors of production, leading to a reduction in output. To explore this channel, we also examine the behavior of inventory investment.

Our specific empirical strategy is to assess whether firms with more dollar debt invest less in the aftermath of a depreciation. We do so by estimating reduced-form equations for inventory and fixed-capital investment. The proposed mechanism centers on the interaction of dollar indebtedness with shifts in the exchange rate, and so the key variable in our analysis is

$$(\text{Dollar Debt})_{i,t-1} \times (\Delta \ln \text{Exchange Rate})_t.$$

This interaction effect can be thought of as having two components: a balance sheet channel and a competitiveness channel. The latter refers to the potential income gains from a depreciation for exporting firms, or firms operating in tradeable sectors. The manner in which these effects combine depends on the manner in which dollar debt is distributed across firms. More specifically, the key determinant of the sign of the overall effect is how strongly related the currency-composition of debt is with the exchange rate sensitivity of profits at the firm level. If, on average, this relation is strongly positive, then we say that firms are "currency matching" their balance sheet with their income stream. If this is the case, then the sign of the interaction will be ambiguous, as those firms holding higher shares of dollarized debt are also those firms that see the largest increases in current and future profits following a depreciation. If not, a depreciation leads to a (relative) reduction in investment by dollar-indebted firms.

Our main empirical result is that we fail to find a significant, negative coefficient on this interaction: dollar-indebted firms do not invest less than their peso counterparts following a depreciation. Indeed, for many plausible specifications, we estimate a positive and statistically significant coefficient. We argue that this result is due to the degree to which firms match the currency composition of their debt with the elasticity of their income to the exchange rate. In the wake of a depreciation, the reduction of investment and output induced by the increase in indebtedness is more than offset by higher current and future earnings.

Accordingly, we find that, after a depreciation, earnings are higher in those firms holding more dollar debt. Lending additional support to this hypothesis, we find that, in our sample, dollarization of liabilities is higher in firms whose income we expect *ex ante* to be more positively correlated with the real exchange rate (firms with tradable products, for example). Furthermore, our estimates of the above interaction term drop substantially when we control for factors that proxy for the firms' changing profit opportunities. Therefore, the empirical finding essentially results from omitted variables – unobserved firm level characteristics associated with a higher elasticity of income to the exchange rate. We argue that this matching is the natural consequence of the risk aversion that firms will exhibit in the face of capital-market imperfections. By systematically 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.

The rest of the study is organized as follows. Section I contains a description of our sample and variables. In Section II, we discuss the impact of dollar indebtedness on investment behavior, and present our empirical strategy. In Section III, we present the main results of the study: relative to corporations indebted in pesos, firms holding dollar debt did not invest less following depreciations of the domestic currency. We also show that this finding is not sensitive to including a variety of

firm-level controls, using alternative estimators, or examining specific countries or episodes. We then turn our attention to each of the two channels affecting firm-level investment: competitiveness (Section IV) and net worth (Section V). Section VI contains a discussion of our results in light of complementary studies that have come to the fore in the past several years. Finally, section VII concludes.

I Database

I.A Description of Data

This section describes our sample and variables. Our data consist of firm-level accounting information for non-financial corporations in Argentina, Brazil, Colombia, Chile, and Mexico for the period 1990 to 1999. In addition, we have data describing the firms' main products, sectors in which they operate, ownership, and a history of the main corporate events. Our main source of information is the Bloomberg database on publicly traded firms. Additionally, some data for Brazilian firms and all data for Argentine firms come from a second dataset: Economática. Our choice of sources hinges on the availability of balance sheet data that include a decomposition of liabilities by currency of denomination.

For our estimates, we use a sample restricted to the non-financial firms for which foreign-currency liability data are available. Table (1) shows the number of observations in the final sample per country and year as well as descriptive statistics for the main variables we use. The size of the sample changes as new firms are listed and incorporated into the Bloomberg database. Bankrupt or de-listed firms are not removed from Bloomberg unless their ticker is adopted by another firm. To our knowledge, there are no firms that are censored from our dataset for this reason. The decline in the number of observations towards the end of the sample is due to changes in the reporting requirements for foreign-currency debt, and not a result of bankruptcies.

[Insert Table 1 here]

Our main dependent variables are two measures of investment. The first is *investment in fixed capital*, measured as net purchases of fixed assets. We opt not to use the change in net fixed assets as a measure of investment because accounting standards in most of the countries in our sample allow for revaluations of assets, making it impossible to separate investment from changes in the accounting valuation of capital goods. The second is *investment in inventories* defined as the change in the stock of inventories in a given period. Inventories include raw materials, works in progress, and finished goods. In addition to investment, we also look at the effects of dollar debt on two income variables: *net sales* and *earnings* from operating activities.

The central explanatory variable is *foreign currency debt* (D^*), the book value of foreign currency liabilities converted into the respective local currency. In all of the countries in our sample, accounting standards dictate that conversion of debt from foreign to local currency values be carried out using the exchange rate for the period in which the balance sheet is reported.[4]

[4] Accounting practices for Argentina, Brazil, and Mexico are described in Coopers and Lybrand (1993). Bavishi (1995) contains descriptions of accounting practices in the remaining countries.

To explore the relationship between investment and dollar debt we control for additional determinants of investment. Our main group of controls includes direct and indirect measures of income sales and operating costs. The first of these is *earnings*, defined as earnings before accrued interest, taxes, depreciation, and amortization (EBITDA). Cash flow measures used in the investment literature are usually net of interest expenses and taxes. However interest and tax payments are both dependent on the firm's capital structure. Since we wish to identify the effects of leverage (and, in particular, leverage in dollars) on investment, we follow Lang, Ofek and Stulz (1996) and use a measure of earnings that does not depend on the firm's debt choice. The second income-related control is a dummy variable that indicates whether the firm has *international operations*. Inclusion of this variable will allow us to explore the extent to which holding foreign assets affects the currency composition of debt and the subsequent response in the event of a depreciation.

Finally, we control for differences in firm ownership. *Parent* is a dummy variable that indicates whether the firm's controlling interest is another firm. This variable is motivated by studies of internal capital markets, in which ownership by a conglomerate affects the availability of internal funds for investment.[5]

We modify the original accounting data in four ways:

1. We inflate all data to 1999 values using December-to-December changes in the consumer price index (CPI), and convert them to U.S. dollars using the market exchange rate for December of 1999.[6]

2. In the event of a merger, spin-off, or split, we construct an artificial firm that contains all of the component firms for the entire sample period. When information on a component firm is not available, we drop the firm from the sample. Ownership changes are reported under corporate news in the Bloomberg database.

3. We drop all firm/year observations if the accounting data are not self-consistent. In particular, we drop observations if dollar liabilities exceed total liabilities or if accounting variables do not accord with sign conventions. This results in the deletion of 10 observations.

4. We compute the change in total assets and construct a z-score using the sample mean and standard deviation. We drop firm/year observations that have $|z| > 5$. Twelve observations are dropped because of this rule. Our results are not sensitive to this particular choice of the threshold.

Because we are interested in the effects of a devaluation on firms holding dollar debt we interact D^* with changes in real exchange rate, Δe. Our definition of e (nominal exchange rate against the U.S. dollar scaled by the local CPI) is consistent with the inflation adjustments described above.[7] It is straightforward to show that using e on inflation-adjusted values of debt is equivalent to using the nominal exchange rate on current values. Note that according to this definition, a devaluation

[5] We discuss the coding of this variable in Section III.B.1.

[6] We use consumer-price and exchange-rate data from the *International Financial Statistics* of the International Monetary Fund.

[7] In all the specifications we report, we measure Δe as the Dec-to-Dec log change in the real exchange rate. Although we do not report them, we obtain similar results if Δe is measured as the log difference between the exchange rate in December of the previous year and the average exchange rate in the current year, or as the average-to-average log change.

leads to a higher value of e. Also note, that because we do not have information on the exact currency composition of foreign debt, our assumption throughout is that all foreign currency debt is denominated in U.S. dollars. We believe this to be a reasonable approximation, as the volatility of the currencies in our sample usually dominates any exchange-rate movements among creditor currencies.

II Framework

II.A Dollar Debt and Balance Sheet Effects

At about the same time as Robert Mundell was receiving the Nobel prize for economics, a series of studies—inspired by the emerging-market crises of the late 1990s—seemed to be undercutting the central assumption of the Mundell-Fleming model: that a depreciation of the exchange rate has an expansionary effect for the macro-economy. This new view of depreciations is centered on the micro level and pays particular attention to the (changing) credit constraints facing firms during financial crises. The key assumption of this literature is that the cost of external funds is decreasing in firm net worth. The second ingredient in these models is that some fraction of debt be denominated in foreign currency. A depreciation, therefore, not only has the usual effects on aggregate demand but also deteriorates net worth by inflating the domestic-currency value of debt. Holding all else fixed, we expect that the higher indebtedness leads to an increase in the cost of external finance and to a reduction in investment. Krugman (1999a) presents a stylized version of this effect, while Aghion, Bacchetta, and Banerjee (2001) and Céspedes, Chang, and Velasco (2004) incorporate this mechanism into more fully articulated models.

The link described above between investment and net worth has been widely treated in a variety of venues, including macroeconomics and corporate finance. On the macro side of things, Bernanke and Gertler (1989) and later Bernanke, Gertler and Gilchrist (1998) develop closed economy "financial accelerator" models in which the premium on external credit is decreasing in net worth. In their models, shocks to firm productivity affect both marginal conditions (i.e., the first order conditions for investment) and firm net worth, and, therefore, bring about changes in output that are larger than those implied by the neoclassical benchmark. Additionally, an extensive empirical literature documents the effect of net worth on investment. Fazzari, Hubbard, and Petersen (1988), Hoshi, Kashyap, and Scharfstein (1991), and many others provide evidence that investment is related to the availability of internal funds (cash flow).[8] Lang, Ofek, and Stulz (1996) show that there is a negative relation between investment and firm leverage.[9]

Explanations of why firms choose to hold dollar debt in the first place typically include a failure of uncovered interest rate parity (UIP). Several explanations has been put forward for a lower *ex ante* dollar rate. One set of models posits that dollarized debt entitles the creditor to larger

[8] Hubbard (1997) carries out an exhaustive survey of the literature on capital market imperfections and investment.

[9] There is also substantial evidence for the role of net worth on firm-level investment in developing countries. Individual country studies include Gelos and Werner (1998) who look at the effect of cash flow and collateral (proxied by land values) on investment in Mexican manufacturing firms; Gallego and Loayza (2000) who look at the role of cash flows and debt overhang on publicly traded Chilean firms; and Harris, Schiantarelli, and Siregar (1994) who look at a sample of Indonesian firms. Laeven (2000) and Love (2003) carry out similar exercises on a panel of data from emerging economies.

payments in periods of default, lowering the required interest rate on dollar loans.[10] In another set of models (Jeanne 1999a, 1999b), foreign-currency debt lowers interest rates by reducing moral hazard and signaling problems. In Calvo (1999, 2001), the failure of uncovered interest parity can be attributed to the interaction of information asymmetries and regulatory restrictions on the banking sector and to the costs of forming devaluation expectations, which are then included in the price of peso debt.[11]

Finally, a series of authors argue that dollar debt is often the "safest" form of financing (or saving) in emerging markets. Eichengreen and Haussman (1999) stress that in the absence of a long-term local currency market firms are willing to take on exchange-rate risk to avoid the interest-rate risk inherent in short-term peso liabilities. Ize and Levy-Yeyati (2004) argue that a history of bad monetary policy in emerging markets causes investors to place a premium on peso debt, regardless of contemporary policy. In these economies investors favour dollar-denominated debt contracts because they provide partial insurance against unexpected inflation.

Following a movement in the exchange rate, three main mechanisms will affect the investment decision of a firm holding dollar debt:

1. The peso value of dollar debt will change, altering the value of total debt,
2. internal funds available for investment will be affected because of changes in current profits and
3. shifts in relative prices will change the marginal product of capital.

The first two mechanisms will immediately affect the firm's net worth, and, in the presence of financial frictions, will affect investment by altering the cost of capital. The third mechanism will affect demand for capital by altering current and future marginal returns on investment. The net result of these three effects on investment is ambiguous and will depend on the size of inherited dollar debt, the sensitivity of the risk premium on external funds to changes in firm leverage and the on the impact of the real exchange rate on current and future profits[12]. To simplify the discussion, we will refer to the effect of the exchange rate on dollar debt (the first mechanism mentioned above) as the *balance sheet effect*[13]. The next two mechanisms mentioned above are both part of what we will call the *competitiveness effect*, i.e., the effect of the exchange rate on current and future profits. Therefore, firm *net worth* will be affected by both the balance sheet effect and, via current profits, by the competitiveness effect.

If dollar debt is distributed randomly across the economy, then we would expect firms with higher levels of inherited dollar debt to have a lower (and possibly negative) elasticity of investment

[10] For Schneider and Tornell (2004), this takes place within the banking sector, where bailouts to dollar-indebted banks accompany devaluations. Chamon (2001), on the other hand, argues that when defaults are correlated with depreciations, holders of dollar debt benefit from the fact that they are entitled to a larger share of the liquidated assets.

[11] Regulatory constraints on currency mismatch encourage foreign banks to lend in their own currency, and, as a result, they charge a premium on peso rates. Similar regulatory constraints force domestic banks to match dollar deposits with dollar loans. Because of information advantages, these banks have incentives to place this debt domestically, leading to a lower equilibrium rate on dollar loans.

[12] For a formal articulation of this investment problem at the firm level, see Bleakley and Cowan (2002).

[13] Strictly speaking the firm's balance sheet will be affected by both the changing value of liabilities and the effect of current earnings on assets. We choose to ignore this second mechanism simply for expositional reasons, as most of the literature emphasizes the interaction between liabilities and the exchange rate.

to movements in the exchange rate. If, on the other hand, firms match income streams with the currency composition of liabilities, then those firms that we observe holding higher levels of dollarized liabilities will also be those firms whose profits respond most favorably to a depreciation. This being the case, it is uncertain whether firms holding dollar debt will invest relatively less than their counterparts following a depreciation, as the negative impact of increasing indebtedness will be offset by rising current and future profits.

II.B Law of Motion for Debt

The central empirical question of the present study is how the changing exchange rate interacts with inherited dollar-denominated liabilities on the firm's balance sheet to alter the firm's investment behavior. Therefore, the key explanatory variable in our analysis is the interaction of lagged dollar debt, $D^*_{i,t-1}$, with the log change in the real exchange rate, Δe_t.

A simple way to motivate this interaction term is to write down the law of motion for total debt, expressed in terms of inflation-adjusted pesos. We start by considering the movement of nominal balance sheet variables over time. Dollar debt, D^*_t, follows a simple law of motion:

$$D^*_t = D^*_{t-1}(1 + r^*_{t-1}) - DS^*_t + DN^*_t \tag{1}$$

where DS^*_t is the period-t debt service paid on dollar debt and DN^*_t is the net issuance of new debt in period t. We multiply by $S_t \frac{CPI_T}{CPI_t}$,where S_t is the nominal exchange rate, to obtain an equation in period-T pesos. We denote $\tilde{X}_t$ as the period-t value of variable X expressed in period-T pesos. If we assume that debt service exactly covers accrued interest charges each period, so that $DS^*_t = D^*_{t-1} r^*_{t-1}$, then the law of motion for dollar debt becomes

$$\tilde{D}^*_t = \tilde{D}^*_{t-1} \left(\frac{S_t}{S_{t-1}} \right) \left(\frac{CPI_{t-1}}{CPI_t} \right) + \tilde{DN}^*_t, \tag{2}$$

Similarly, for peso-denominated debt we have

$$D_t = D_{t-1}\theta_t(1 + r_{t-1}) - DS_t + DN_t, \tag{3}$$

where θ_t is a factor that allows for the indexation of domestic-currency debt. As before, we transform the equation into period-T units, and maintain the assumption that interest is paid completely each period[14]:

$$\tilde{D}_t = \tilde{D}_{t-1}\theta_t \left(\frac{CPI_{t-1}}{CPI_t} \right) + \tilde{DN}_t. \tag{4}$$

We parameterize the indexation of debt as follows: $\theta_t = \left(\frac{CPI_t}{CPI_{t-1}} \right)^{\alpha}$, $\alpha \epsilon [0, 1]$. This allows for the special cases of full indexation ($\alpha = 1$), and no indexation ($\alpha = 0$), as well as for intermediate values.

Defining total debt $\tilde{P}_t$ as $\tilde{P}_t = \tilde{D}_t + \tilde{D}^*_t$, and the real exchange rate E_t as $E_t = (S_t/CPI_t)$ we find that

$$\Delta \tilde{P}_t \approx \tilde{D}^*_{t-1} \Delta e_t + (\alpha - 1)\tilde{D}_{t-1} \Delta cpi_t + \left(\tilde{DN}_t + \tilde{DN}^*_t \right). \tag{5}$$

where all lowercase variables correspond to logs. The first term on the right-hand side is the one of

[14] We lift the assumption of full debt servicing in later sections.

interest. The real value of the firm's debt rises if it holds foreign-currency debt and the exchange rate goes up faster than the domestic-price level. This is, of course, a purely mechanical effect. The second term indicates that domestic-currency debt can be "inflated away," albeit at a slower pace if the debt is indexed to the local-price level. Moreover, by interacting $(\alpha - 1)\tilde{D}_{t-1}\Delta cpi_t$ with country dummies, we allow the average degree of debt indexation to vary across countries. Finally, it is clear that net issues of new debt will also change the firm's level of debt holdings. This latter term is endogenous, so we focus only on the autonomous component in our empirical work[15].

II.C Empirical Methodology

As argued above, the key explanatory variable in our analysis is the interaction of lagged dollar debt, $D^*_{i,t-1}$, with the change in the real exchange rate, Δe_t. This interaction corresponds to the differential effect of a depreciation on firms with varying levels of dollarized debt. We also argued above that predictions for the sign of this derivative are ambiguous, and will depend on the extent to which firms match the currency composition of their income with that of their liabilities. The estimated sign of this coefficient should indicate whether the large (negative) balance sheet effects of a depreciation on firms holding high levels of dollarized debt are offset by a larger (positive) competitiveness effect in these firms.

In addition to interaction effects, we also include lagged foreign-currency-denominated debt and country × year fixed effects. Including the main effect of dollar debt absorbs any pre-existing differences among firms with different levels of dollar indebtedness. Such differences might have prevailed in the absence of movements in the real exchange rate, e.g., if expanding firms were more likely to issue dollar debt than stagnant ones. The aggregate main effect, a fixed effect for country × year, captures the macroeconomic changes that may impact all firms in the economy without regard to the currency composition of their balance sheet.

The basic specification (for firm i in country j at year t) that results is

$$Y_{ijt} = \gamma(D^*_{i,j,t-1} \times \Delta e_{jt}) + \delta D^*_{i,j,t-1} + \phi_{jt} + \varepsilon_{ijt} \tag{7}$$

where Y_{ijt} is the firm-level outcome, typically investment. This empirical framework allows us to estimate the result of holding dollar debt during an exchange rate realignment. It bears mentioning that this is not measuring a *causal* effect, but instead the result of a combination of one causal factor—the effect from increases in the peso value of debt—and other changes in financial and capital-demand factors that happen to be correlated with the currency composition of the firm's debt. To equation (7), we also add additional firm and macroeconomic control variables. These are detailed below.

We estimate this equation using Ordinary Least Squares (OLS) on the accounting data described above. Note that investment is therefore modeled as a function of predetermined micro-level vari-

[15] Holding foreign-currency debt during an exchange rate realignment similarly affects the interest charges incurred by the firm. The firm's debt service in constant pesos is as follows:

$$\left(\tilde{DS}_t + \tilde{DS}^*_t\right) \approx r_t\tilde{D}_{t-1} + r_t(\alpha - 1)\Delta \log CPI_t\tilde{D}_{t-1} + r^*_t\tilde{D}^*_{t-1} + r^*_t\Delta \log\left(\frac{e_t}{CPI_t}\right)\tilde{D}^*_{t-1}. \tag{6}$$

The rD terms reflect the usual charges for interest. The remaining terms represent the "revaluation" effects that come from changing relative prices over time, as seen in equation 5 as well.

ables plus the contemporaneous (macro) change in the real exchange rate, which is exogenous to any particular firm.

III Investment

III.A Main Results

Firms in our sample that hold dollar debt do not invest less than peso-indebted firms in the period following a depreciation. To show this, we employ the empirical methodology detailed above, and pay particular attention to the estimated coefficient on the interaction of lagged dollar debt and the change in the exchange rate, $(D^* \times \Delta e)$. Systematically, we fail to find a significant negative coefficient: dollar-indebted firms do not invest relatively *less* following a depreciation. Indeed, we often find exactly the opposite: firms with dollar debt invest significantly *more* following a depreciation than peso indebted firms.

We focus on two types of investment: investment in fixed capital and investment in inventories. These are both important components of business-cycle fluctuations, but reflect very different types of investment activity and are likely to respond differently to crisis-induced shifts in credit and demand conditions. Investment in inventories is a relatively short-term affair. The ratio of inventory to sales in our sample is such that a product in the pipeline will typically be gone in under two months. Investing in the accumulation of inventories is likely to be sensitive to the availability of working capital, short-term financing that is often secured internally or through trade credit offered by input suppliers. On the other hand, investment in fixed capital plays out over a much longer horizon, and has to do with the long-term expansion of the productive capacity of the firm.

[Insert Table 2 here]

Table (2) presents estimates of the reduced-form effect on investment of holding dollar debt during a depreciation. Columns (1)-(5) contain the results for fixed-capital investment, whereas in Columns (6)-(10), we present estimates for inventory investment. We report the effect on current-year investment in Panel A, whereas Panel B contains results where investment for the following year is the dependent variable. (Note that all the micro-level variables are lagged one year, so "current year" means contemporaneous with the macro variable. For Panel B, the dependent variable is from period $t+1$ and the lagged dependent variable is therefore from period t.).

The regressions summarized in columns (1) and (6) include only the principal first-order effect and, of course, the interaction term: dollar debt times the change in the exchange rate. We do not obtain a negative coefficient estimate for the $(D^* \times \Delta e)$ coefficient in any of the four regressions. In fact, in three of the specifications we obtain positive point estimates that are significantly different from zero at conventional confidence levels. Following periods of real depreciation, investment by dollar-indebted firms is not significantly lower than the investment of their peso indebted counterparts.

This result is robust to the inclusion of a variety of additional controls. First, we add total debt to the specification. Next, we control for possible indexation of peso debt. Based on the law of motion of debt (equation 5) we add $\sum_j (1-\alpha)_j D_{i,t-1} \Delta cpi_{j,t}$ to the specification, in which $D_{i,t-1}$is

lagged peso debt (as before) and $cpi_{j,t}$ is the log of the local price level. Using country-specific $\alpha's$ allows the specification to accommodate different countries' use of indexed debt. In columns (4) and (9), we add the interaction of total debt with the change in the exchange rate to control for the differences in investment behavior of more highly leveraged firms in periods following a currency depreciation. None of these three changes leads to substantial changes in the estimated $(D^* \times \Delta e)$ coefficient, although in some specifications the estimated coefficient turns statistically insignificant. Finally, recognizing that firms may face substantial adjustment costs when changing their levels of fixed capital, columns (5) and (10) include the lagged dependent variable as an additional regressor. As expected, including the lagged dependent variable does lead to some changes in the estimated coefficients on the dollar-debt/exchange-rate interaction. In all cases, however, we fail to obtain a negative and significant coefficient estimate for $(D^* \times \Delta e)$.

To corroborate our results, we can compare our estimate of the effect of leverage reported in column (2), (4) and (5) with those from other studies that have estimated firm level investment in developing countries. Harris, Schiantarelli, and Siregar (1994) look at a sample of 520 listed and non-listed manufacturing firms in Indonesia for the period 1981 to 1988. For 1985 to 1988, the period in which the authors argue administrative control of credit was replaced by market assignment, they find that the coefficient on debt is between -0.025 and -0.018 for small firms (depending on the estimation technique) and actually positive for large firms. Gallego and Loayza (2000) carry out a similar exercise using 79 listed firms in Chile over the period 1985 to 1995. For the full sample, they find a coefficient on leverage of -0.038. Finally, Laeven (2000) using a panel of (mostly) listed firms in 13 developing countries for 1988 to 1998 finds a coefficient for debt that ranges between -0.014 and -0.057 for the full sample and between -0.03 and -0.13 for firms in countries in which financial liberalization has not take place. Hence, in most cases, existing studies have found coefficients similar in magnitude to our estimates. Larger coefficients have been found only in cases of severely regulated financial markets or administrative control of credit.

The findings reported in Table (2) are not what one would expect from a *naive* approach to balance sheet effects – an approach in which dollar debt is assumed to be randomly distributed across firms. On the one hand we obtain negative coefficient estimate for total debt, suggesting that balance sheet variables do affect investment as expected. On the other hand, we find either a negligible or a positive effect of holding dollar debt during a depreciation – suggesting that balance sheet effects do not play a role in determining firm investment. We argue in section IV that these apparently contradictory findings are the result of firms "matching" the currency composition of liabilities with the elasticity of their income to the exchange rate. Those firms holding more dollar debt are also those firms whose current and future income increase the most following a depreciation. Hence, for those firms that choose to hold dollar debt, the negative balance sheet effect of a depreciation is offset by the positive effect of the depreciation on current and future income.

III.B Robustness

Before exploring this "matching" hypothesis in more detail, we show in this subsection that the result we obtain in the previous section is robust to the inclusion of a series of additional controls, to alternative estimators, are not the result of focusing on realized depreciations versus unexpected depreciations nor of overweighting certain countries or episodes.

III.B.1 Omitted Variables

Dollar-indebted firms might differ from their peso-indebted counterparts along other dimensions than the currency composition of debt, so our first concern is that our results are driven by omitted variables[16]. For example, the firms that are able to issue debt in dollars may have better access to international or domestic capital markets or have a different maturity structure of debt, and as such can better cope with the credit crunches that tend to figure in the emerging-market crises. To address this, we start with the specifications presented in columns (5) and (10) of Table (2) and add plausible proxies for the supposed omitted variables. Each panel of Table (3) reports the coefficient on the $(D^* \times \Delta e)$ interaction and the estimated coefficients on the additional controls. In no case does the inclusion of these proxies result in a significant negative estimate of the relationship between investment and $(D^* \times \Delta e)$.

[Insert Table 3 here]

Access to Credit If firms holding dollar debt have differential access to international capital, and changes in the relative supply of domestic and foreign credit occur simultaneously with changes in the exchange rate, then our results may come from having omitted credit-market conditions in our estimates of investment. For example, in 1995, during the *tequila* crisis, Mexico suffered more-or-less simultaneous depreciation, capital flight, and collapse of the domestic banking system. In such an episode, the coefficient on $(D^* \times \Delta e)$ could well be capturing the asymmetric effects of contractions in domestic credit and international capital inflows.

To control for changing credit conditions, we estimate the investment regressions including an indicator of domestic credit (the change in the stock of private credit issued by domestic banks) and a measure of foreign credit inflows. In each case, we interact the macroeconomic variable with total leverage and the fraction of debt in foreign currency to allow for the differential effects of local and international credit supply on firms.

Note that we do not promote these variables as the definitive measure of shifting access to credit. Instead, we argue that they serve to determine whether the above estimates are contaminated by omitted-variable bias. If D^* is correlated with credit access, then including its interaction with aggregate credit variables absorbs the relevant part of the omitted variable. If D^* is not correlated with the omitted access variable, then there is no omitted variable bias to be concerned with. Consequently, this test is informative in either case.

Table (3) shows the investment results obtained after including aggregate credit variables. Panel A reports our basic specification, while panel (B) allows for the possibility of a differential effect of depreciations between firms of different size[17]. In panel (C), we introduce a measure of capital inflows, and, in panel D, a measure of domestic credit. We find that in most cases the coefficients on the interactions of currency composition of debt and total debt with the aggregate credit variables are not significantly different from zero. More to the point, the $(D^* \times \Delta e)$ interaction remains either positive or insignificant even after including this additional set of controls.

[16] By this we are refering to omitted variables besides the exchange rate sensitivity of profits, which we consider in section IV.

[17] We classify firms by size according to total assets. We obtain similar results (not reported) when firms are classified according to current assets.

Currency Mismatch versus Maturity Mismatch The impact of changing credit conditions will likely depend on the maturity structure of firm debt. Therefore, another credit-related hypothesis is that our results might be driven by having omitted the maturity structure of debt and its interaction with aggregate credit conditions. For example, if firms are frequently rolling over their debt, they will suffer more from a negative shock to the supply of credit. To control for possible differences in the maturity structure of debt between dollar and peso-indebted firms, we directly include measures of short-term debt in our investment regressions. Furthermore, paralleling the treatment of dollar debt, we interact short-term debt with a set of macroeconomic variables.

The results of including these interactions are displayed in Panels (E) and (F) of Table (3). We fail to find a differential effect of depreciations across debt maturity, as reported in Panel (E), although credit shocks do have a differential effect on contemporaneous inventory investment of firms with higher ratios of short term debt (Panel F). For both types of investment, we continue to obtain estimates of the coefficient on the interaction of dollar debt and the change in the exchange rate that are not significantly negative. Overall, the evidence of an omitted-variable bias stemming from the maturity structure of debt is not compelling.

Lagged Performance In this subsection, we argue that the observed investment response to $(D^* \times \Delta e)$ is not due to dollar-indebted firms being "high performing" and, therefore, being able to better adapt to the changing exchange rate. Specifically, we condition on lagged firm performance by including lags of earnings and their interaction with the change in the exchange rate. These results are displayed in Panel (G) of Table (3). Interestingly, the inclusion of these variables results in negligible changes (one standard error) in our estimate of the effect of $(D^* \times \Delta e)$.

Cross-Border Ownership and Information Disclosure It may be the case, therefore, that differences in the ownership of the firm bias our estimate of the $(D^* \times \Delta e)$ coefficient. To address this issue we construct two variables that proxy for foreign ownership[18]. The first of these variables indicates whether the firm has a parent company. The initial coding is drawn directly from the Bloomberg database using their coding scheme. In all cases, we review the online archives of company news to verify that these ownership relationships predate the firm's first appearance in our sample. This ensures that these indicators are predetermined variables rather than endogenous outcomes. The second measure of foreign ownership is a dummy variable that indicates whether, in the previous period, the firm's shares were listed in a foreign stock exchange in the form of American Depositary Receipts (ADRs). In addition to being a proxy for foreign ownership, a foreign listing may also have effects on information disclosure and liquidity of firm equity that may bias our results. This variable is constructed matching the firms in the Bank of New York database on ADRs with those in our sample. Finally, we code whether the firm's accountant is one of the American "Big Six" firms, which might improve a corporation's access to international capital markets.

The results of estimating our baseline equation with the ownership controls are reported in Panel (H) of Table (3). Once again, the effect of the additional control variables on our estimated coefficient on the $(D^* \times \Delta e)$ interaction is minimal. The positive and significant coefficients we

[18] A series of recent papers have emphasized the effects of ownership and information variables on the relative performance of firms in crisis periods. Mitton (2002) finds that firm level variables related to ownership and information disclosure had a strong impact on the relative performance (stock returns) of listed firms during the Asian crisis. Desai, Foley and Forbes (2004) find that subsidiaries of US multinationals outperform their locally owned couterparts in periods following large depreciations

obtain on the ADR dummy for $t+1$ fixed capital investment and on the "Bix Six" dummy for current fixed and next period inventory investment is in line with the results in Mitton (2002).

Relaxing the Assumption of Linearity A plausible hypothesis is that the response of investment to leverage is nonlinear, so that a given change in debt causes a larger change in investment in highly leveraged firms. To evaluate the effect of nonlinearity on our results, we estimate our basic investment specification allowing the $(D^* \times \Delta e)$ interaction term to vary across indebtedness. The results of this exercise are reported in Panel (I). Our main results remain unaffected by the additional terms.

Above, we treat depreciations and appreciations as having symmetrical effects. To evaluate the validity of the symmetry assumption, we generate a dummy variable that takes on the value of one if the currency has appreciated, and interact it with the exchange rate and with our $(D^* \times \Delta e)$ interaction coefficient. We are thus allowing both for the main effect and the interaction to be different in depreciations and appreciations. We report the results of this specification in Table (3) panels (I) and (J). Allowing for a depreciation to impact firm level investment differently from an appreciation does not affect our main conclusion; the coefficient on $(D^* \times \Delta e)$ is never significantly negative.

Alternative Exchange Rate Measures One could argue that the *balance sheet* and *competitiveness* effects of a devaluation pertain to different measures of the real exchange rate. In the case of the balance sheet effect, it is the change of the domestic currency vis-a-vis the price level that will render dollar debt more expensive (*expost*) than its peso equivalent. For the competitiveness effect, standard open economy models suggest that it is the change of foreign prices vis-a-vis the domestic price level that is important for firm profits and investment decisions. With this in mind we augment our basic specification to include international price-indices[19]. Adding this additional variable allows us to disentangle the direct impact of changing international prices from that of changes in the value of the domestic currency. The results are reported in the last panel of Table (3). As in previous panels, our main results are not altered by including these additional control variables.

III.B.2 Alternative Estimators

We estimate the effect of $(D^* \times \Delta e)$ on investment using numerous alternative estimators. These new results are reported in Table (4) and Figures (1) and (2) and described in this subsection. Although in some cases the choice of estimator does affect our point estimates, in no case do we find a significant negative effect of dollar debt on investment following a depreciation.

[Insert Table 4 here]

We begin with alternative computations for the standard errors using the ordinary least-squares (OLS) estimator. These estimates employ the specification from Table 2 Columns (5) and (10),

[19] The international prices are the weighted average of the consumer price indices of each country's 5 main trading partners during 1995 (the mid-point of our sample).

which include the interactions between dollar debt and total debt with changes in the exchange rate, the main effects of dollar and total debt, the $\sum_j (1-\alpha)_j D_{i,t-1}\Delta cpi_{j,t}$ terms and the lagged dependent variable. Each Panel displays only the estimates on $(D^* \times \Delta e)$. (Note that the point estimates do not change in Panels (A)-(D), only the standard errors.) Panel (A) contains the basic OLS standard errors, *i.e.*, assuming no heteroskedasticity and no intra-class correlation. Panel (B) reports Huber-White ("robust") standard errors that allow for heteroskedasticity. (These are the default throughout the present study.) Panel (C) corrects the errors for the presence of correlated disturbances across firms within each country × year cell. Finally, in computing the standard errors, the estimator in Panel (D) allows for fairly generic correlational structures within firms. As we read down the panels, the pattern of significance is essentially the same.

When we control more flexibly for the predetermined variables, very little changes in our estimates. Above, we use linear terms to control for the first-order effects of the lagged accounting variables (dollar debt and total debt). In Panel (E), we allow the effects of the predetermined accounting variables (dollar debt and total debt) to be highly flexible by including them as polynomials of order ten. In effect, we are parametrically matching firms based on their $t-1$ characteristics. The estimates are qualitatively similar using this technique.

Our baseline specification assumes that the error term is uncorrelated with the lagged dependent variable. This assumption is violated if there is an error term in the partial adjustment model for the *stock* of capital, not in the investment equation as we assume. In this case taking first differences to obtain the investment specification generates a mechanical correlation between I_{t-1} and $\Delta\varepsilon_t$ (the first difference of the error term). We carry out two exercises in this subsection to address this concern. First, in Panel (F) we instrument for I_{t-1} using twice lagged values of investment. Results remained virtually unchanged, with the exception of column (3), which reports the effect of dollar debt on contemporaneous inventory. Unlike previous specifications the estimated coefficient of $(D^* \times \Delta e)$ on period-t inventory investment is negative, although not significant at conventional confidence levels.

Next, we estimate our baseline specification constraining the coefficient of the lagged dependent variable (λ). We report the estimated coefficients on $(D^* \times \Delta e)$ obtained in this way in Figure (1). Over the stable range of values of λ ($\lambda \in [-1, 1]$) we obtain positive coefficient estimates in regressions for t and $t+1$ fixed capital and for $t+1$ inventory. For period t inventory investment, the estimated coefficient on $(D^* \times \Delta e)$ is negative for $\lambda > 0.25$, but these estimates are never significantly different from zero. We follow a similar approach to address the possible endogeneity of the main effect of dollar debt. As reported in Figure 2, the estimated coefficient on the dollar debt real exchange rate interaction remains positive for a reasonable range of parameter choices for the main effects of dollar debt.

Controlling for firm-level fixed effects does not generate estimates that favor the currency-mismatch hypothesis either. In Panel (H), we add firm-specific effects to the specifications. We combine the matching estimator with firm fixed effects in Panel (I). Although smaller coefficient estimates are obtained for all dependent variables except $t+1$ inventory investment, none of these coefficients is negative[20].

Finally, the addition of an autocorrelated error term yields substantially similar results. We allow for an autoregressive error of order one (AR(1)) at the firm level in the estimation of the

[20] In Appendix B we repeat the sensitivity anaylisis from the previous subsection using the estimators from panels F, G and H of table 4 presented in this subsection. Our main results remain unchanged.

fixed-effects model. These results are found in Panel (J). None of the estimates of $(D^* \times \Delta e)$ reported in this panel is significantly different from zero.

III.B.3 Unexpected Depreciations

Could our results be driven by the fact that many of the devaluation episodes in our sample were anticipated by firms and the financial market? If uncovered interest parity holds, then the expected component of a depreciation will be factored in to the domestic interest rates in the period running up to the exchange rate realignment. This being the case, firms will only find dollar debt to be more "expensive" *expost* if the realized depreciation exceeds the expected depreciation.

To see this more clearly, recall the expression for the law of motion of debt derived in section (II). Abstracting from new debt issued in the current period, and assuming that accrued interest is not paid off ($DS_t = DN_t = 0$) the current value of previous period dollar debt will be given by

$$\tilde{D}^*_t = \tilde{D}^*_{t-1}\left(\frac{S_t}{S_{t-1}}\right)\left(\frac{CPI_{t-1}}{CPI_t}\right)(1 + r^*_{t-1}).$$

If, in addition, if we assume that all domestic debt is issued in nominal terms, then the current value of peso denominated debt will be given by[21]

$$\tilde{D}_t = \tilde{D}_{t-1}\left(\frac{CPI_{t-1}}{CPI_t}\right)(1 + r_{t-1}).$$

Combining the previous two expressions, the exogenous component of total debt in period t inherited from period $t-1$ is approximately

$$\tilde{P}_t \approx \tilde{D}_{t-1}(1 + r_{t-1} - \Delta cpi_t) + \tilde{D}^*_{t-1}(1 + r^*_{t-1} + \Delta s_t - \Delta cpi_t)$$

where $(r_{t-1} - \Delta cpi_t)$ is the real *ex-post* interest rate on domestic currency debt and $(r^*_{t-1} + \Delta e_t - \Delta cpi_t)$ is the real *ex-post* rate on dollar denominated loans, and all lower case variables correspond to logs. Finally, if uncovered interest parity holds, so that

$$r_{t-1} = \mathrm{E}_{t-1}\{\Delta s_t\} + r^*_{t-1},$$

the law-of-motion becomes:

$$\tilde{P}_t \approx \tilde{D}_{t-1}(1 + \mathrm{E}_{t-1}\{\Delta s_t\} + r^*_{t-1} - \Delta cpi_t) + \tilde{D}^*_{t-1}(1 + \Delta s_t + r^*_{t-1} - \Delta cpi_t). \tag{8}$$

>From equation (8) is is clear that a unit of dollar debt will be more expensive than a unit of peso debt *ex-post* only if the realized nominal depreciation exceeds the unexpected nominal depreciation, i.e. if $\mathrm{E}_{t-1}\{\Delta s_t\} < \Delta s_t$.

We carry out two exercises in this subsection to address this concern. First, we repeat our estimations of investment for a specific devaluation episode that we believe had a large unexpected

[21] Assuming that all debt is issued in pesos is equivalent to assuming that arbitrage exists between the local nominal and indexed debt markets.

component: the *tequila* crisis in Mexico during 1994 and 1995. Second, we use peso and dollar interest rates to construct a measure of unexpected depreciation and estimate its effect on investment of dollar indebted firms.

The estimation results for the *tequila* crisis are reported in Table (5). Columns (1) through (3) and (7) through (9) of Table (5) include Mexican firms for all years in our sample (1990 to 1999). Columns (4) and (10) use a sample restricted to 1994 and 1995. In line with our full sample results, the estimated coefficient on the $(D^* \times \Delta e)$ interaction term is not negative in either sub-sample. Indeed for current capital expenditures and $t+1$ inventory investment the estimated coefficient is positive and significant. On the other hand, the estimated coefficient on the interaction between total debt and depreciation is negative for current and next period capital expenditures, and significantly so for current capital expenditures. Firms in Mexico holding higher *total* debt in times of depreciations invested relatively less. Furthermore, note that for fixed capital investment conditioning on total debt $\times\ \Delta e$ makes a large difference for the estimated coefficient of the $(D^* \times \Delta e)$ interaction.

[Insert Table 5 here]

The remaining columns report an alternative exercise that focuses on firm investment in either 1994 or 1995. Controlling for previous period total debt, we find that capital expenditures were not significantly lower for those firms holding more dollar debt in the previous period either in 1994 (column 5, panel A) or 1995 (column 6, panel A). Those firms holding more total debt in the previous period, however, did invest significantly less in both years. In turn, the results reported in columns (5) and (6) of panel B show that firms holding more dollar debt in 1993 did not invest less in 1995 and firms holding more dollar debt in 1994 did not invest less in 1996. As in panel A, what matters for future capital investment is not dollar debt but total debt. Results for inventory investment are mixed. However, in none of the specifications do we find a significant negative effect of dollar debt on investment in periods of depreciation. Overall, the results presented in Table (5) suggest that our results are not driven by a series of expected depreciation episodes.

A straight-forward transformation of equation (8) allows us to evaluate the effects on investment of unexpected depreciations directly. Rearranging equation (8), and bearing in mind that total debt $\tilde{P}_{t-1}$ is defined as $\tilde{P}_{t-1} = \tilde{D}_{t-1} + \tilde{D}^*_{t-1}$ and that the ex-post peso rate $\tilde{r}_{t-1}$ is defined as $\tilde{r}_{t-1} = r_{t-1} - \Delta cpi_t$, we get the following expression for total debt

$$\tilde{P}^T_t \approx \tilde{P}_{t-1}(1+\tilde{r}_{t-1}) + \tilde{D}^*_{t-1}\Delta s^u_t.$$

where Δs^u_t is the unexpected nominal depreciation: $\Delta s^u_t = \Delta s_t - \mathrm{E}_{t-1}\{\Delta s_t\}$. The intuition behind this expression is straightforward, controlling for the ex-post real interest rate on peso loans, dollar debt will lead to higher total liabilities if realized depreciation exceeds the expected depreciation.

The basic empirical specification that results is

$$I_{it} = \lambda(\tilde{P}_{it-1}\tilde{r}_{jt-1}) + \theta\tilde{P}_{it-1} + \gamma\left(\tilde{D}^*_{it-1}\Delta s^u_{jt}\right) + \beta\tilde{D}^*_{it-1} + \delta_{jt} + \varepsilon_{ijt} \tag{9}$$

where once again I_{ijt} is firm level investment, Δs^u_t is calculated as the difference between the expected depreciation rate implicit in dollar and peso rates and realized depreciation and δ_{jt} are country $\times$ year fixed effects. To equation (9) we also add additional variables, the most important of

which is the interaction between dollar debt and the realized change in the exchange rate ($D^* \times \Delta e$) Including this additional variable allows us to disentangle the effects of expected and unexpected changes in e[22].

Table (6) presents the results of estimating variants of equation (9) for fixed capital and inventory investment. As in previous specifications panel A reports the effects on current investment while panel B repeats these estimates for the following year investment. The regression summarized in columns (1) and (5) follows directly from equation (9) while columns (2) and (6) includes the ($D^* \times \Delta e$) interaction, and, of course, the corresponding main effects. In turn columns (3) and (7) includes an interaction between total leverage and the real exchange rate. Finally columns (4) and (8) include the lagged dependent variable.

[Insert Table 6 here]

What are the main results that emerge from table (6)? First, in all specifications the estimated coefficient on ($D^* \times \Delta e$) is positive, and in some specifications significant at conventional confidence levels. Second, the estimated coefficient on $\left(\tilde{D}^* \times \Delta s^u\right)$ is almost always not significant, and never negative and significant.

All in all, both sets of results presented in this section suggest that even when depreciations are unexpected, the competitiveness effect cancels out the balance sheet effect in our sample.

III.C Decompositions By Country

Results by country are found in Table (7). These estimates employ the specification from Table 2, Columns (5) and (10), although each cell only reports estimates of the effect of ($D^* \times \Delta e$) for the denoted country.

[Insert Table 7 here]

In no instance do we find a significantly negative relationship between investment and ($D^* \times \Delta e$). In the Argentine, Chilean and Colombian samples results are insignificantly different from zero, though generally positive. For Brazil, the coefficients on ($D^* \times \Delta e$) are significant and positive for contemporaneous investment, and positive but not significant for next period investment. For Mexico, the coefficient estimates are uniformly positive, and significantly different from zero for two of the four measures of investment.

[22] A brief comment on the data is merited here before we move on to discussing the empirical results. For Argentina, Brazil and Mexico $r^*_{j,t-1}$ is the total return on the portfolio of dollar-denominated bonds included in each country's EMBI index. For Colombia and Chile this index is not available for most of the sample so we use alternative measures. In the case of Chile we use the interest rate on 30-89 day dollar-denominated loans, published by the Central Bank of Chile. For Colombia, as dollar contracts are prohibited in the domestic financial system, and no series of returns on dollar denominated bonds placed in international capital markets where available, we use the average cross country EMBI index. In turn, r_{t-1} is the deposit rate in domestic currency. We use the deposit rate because series of lending rates where not available over the full sample period for most countries, however changes in deposit rates closely mirror changes in lending rates. A regresion of changes in the deposit rate against changes in the lending rate over the subset of our sample where both data where available has a R^2 of 0.85. The exact rates used are detailed in the appendix.

IV The Competitiveness Effect

In this section, we argue that our failure to find a negative effect of dollar debt on investment following a depreciation is due to differences across firms in the response of their current and future profits (the competitiveness effect). The larger balance sheet effects of a depreciation on firms holding dollar debt are offset by the larger competitiveness gains for these firms. This suggests that firms match the currency composition of their income with that of their liabilities, and by doing so hedge their exchange rate risk. We provide three pieces of evidence for this claim:

1. When contemporaneous sales and costs are taken into account, we find that the estimated coefficient on $(D^* \times \Delta e)$ is smaller than what was estimated above.
2. Firms that could be expected to benefit from a depreciation—firms that have tradable products, for example—are more likely to hold debt that is denominated in foreign currency.
3. Dollar-indebted firms experience a relative surge in profits following a depreciation (both in the year of and in the year after).

All three facts indicate positive currency matching of debt and income flows.

IV.A Controls for Competitiveness

Exchange rate movements change relative prices, often rather markedly. If firms are matching the currency composition of their debt and income, the surge in their liabilities may be accompanied by an increase in their profit opportunities and current earnings. We argue that this effect is a plausible explanation for our failure to find a negative effect of a devaluation on investment in firms holding dollar debt.

When contemporaneous earnings are taken into account, we find that the estimated coefficient on $(D^* \times \Delta e)$ is smaller than what was estimated above. This can be seen in panel (B) of Table (8), in which we augment the baseline regressions with contemporaneous measures of sales and production costs. Note, however that the idiosyncratic measures of sales and costs are endogenous, so we cannot be assured of consistent estimates of the effect of income on investment. In panel (C) we address this issue by instrumenting for sales and costs with interactions between 2 digit ISIC sector dummies and lagged export-to-asset ratios with changes in the real exchange rate. Once again we find that when contemporaneous profit measures are taken into account the estimated coefficient on $(D^* \times \Delta e)$ is smaller than our baseline estimate (reported in panel (A)).

IV.B Determinants of the Currency Composition of Debt

In this subsection we examine the firm level determinants of liability dollarization. To do so, we estimate the following equation on the full sample

$$\beta_{ijt} = v_j + \delta\alpha_{ijt} + X_{ijt}\Gamma + u_{ijt} \tag{10}$$

in which β_{ijt} is the ratio of dollar debt to total liabilities; v_j are country-specific intercepts; $X_{ijt}\Gamma$ are controls, including the natural logarithm of firm assets and a dummy variable indicating whether

the firm is a subsidiary of a larger company; and α_{ijt} corresponds to one of several proxies for the sensitivity of profits to the real exchange rate:

1. a dummy variable that takes on a value of one if the firm is in a tradable sector (agriculture, mining, or manufacturing);
2. the average elasticity of each sector's output to the real exchange rate;[23]
3. a dummy variable if the firm has foreign subsidiaries.

In each specification, proxies of exchange-rate sensitivity show a positive correlation with the fraction of debt issued in foreign currency. Columns (1) through (3) of table (9) show the main results for the full sample estimation. In all specifications, the estimates of δ are positive and significant: firms whose income we expect to be positively correlated with the exchange rate have a higher fraction of foreign-currency-denominated liabilities. The fraction of dollar-denominated liabilities is 5% higher in firms that belong to the tradable sectors (the average value of β_{ijt} is 24%). The sectorial elasticity of value added to the real exchange rate is also a significant predictor of the currency denomination of debt, and these two variables enter significantly when included jointly. Additionally, firm size is positive and significant in all specifications; larger firms hold a higher fraction of dollar debt. Although we do not report them individually, country dummies are also highly significant (at the 99% level of confidence) with firms in Argentina and Mexico holding the highest fractions of dollar debt in our sample. All in all, size and tradability (or sectorial elasticity of output to the real exchange rate) explain close to 45% of variance in β_{ijt}.[24]

[Insert Table 9 here]

Firms with international operations were also much more likely to issue their debt in dollars. The last column of Table (9) shows the results of estimating equation (10) for the remaining proxy of α_{ijt} on a sub-sample of firms.[25] As in the previous specifications, both the size variable and the tradable dummy are always positive and significant at the 99% confidence level. Column (5) includes the dummy variable for firms that have a parent company and the dummy variable for firms that own subsidiaries in foreign countries. Both of these variables are significant. The positive coefficient on the subsidiary variable is in line with the results discussed above. Income from the foreign subsidiary, in terms of domestic currency, is positively correlated with movements in the real exchange rate.

Our results in this section suggest that matching does take place among firms included in our sample. Firms with higher dollar debt are those firms whose earnings we expect to increase in the event of a depreciation.

[23] To construct this measure, we estimate $\Delta(\ln y_{jkt}) = \delta_0 + \delta_1 \Delta \ln(e_{jt}) + \delta_3 x_{jt} + \varepsilon_{jkt}$ for the period for each sector k in each country j. $\Delta(\ln y_{jkt})$ is the first difference of the log of sector k value added, $\Delta \ln(e_{jt})$ the first difference of the log of the real exchange rate and x_{jt} a vector of country-level controls that includes capital inflows and growth in private-sector bank credit.

[24] We obtain similar results when we estimate β using a tobit regression to take account for censoring of the LHS variable.

[25] Because of data availability, the sample used in specification E is smaller and excludes firms from Argentina and some of the firms from Brazil. To isolate the effects of changing the sample versus adding controls, we add column D which presents the results of our baseline estimation using an identical sample to E.

IV.C Relative Change in Profitability

In this subsection, we show that, after a depreciation, dollar-indebted firms see their sales and earnings rise substantially relative to their peso-indebted counterparts. These findings provide additional support for our proposition that firms holding more dollar debt are better poised to take profitable advantage of the depreciation and that this factor explains their increased investment.

To analyze sales and earnings, we employ the same empirical framework used above for investment. Table (10) presents estimates of the differential effect of exchange rate movements across firms with varying degrees of dollar indebtedness. The specification of these regressions parallel those of Table (2), column (4). We include our principal interaction effect ($D^* \times \Delta e$), all main effects, and dummies for each country/year cell. Columns (1) and (2) of Table (10) show that in periods in which the local currency depreciated, sales were higher in firms holding dollar than they were in firms holding peso debt.

[Insert Table 10 here]

Dollar-indebted firms also saw significantly higher earnings in the year *following* a depreciation. These results are displayed in Table (10), columns (3) through (6). For example, column (3) of Panel A indicates that a firm holding one additional dollar of foreign-currency debt received 36 cents in extra earnings in a year following a one-unit logarithmic change in the real exchange rate. Of course, as we document above, such a firm was likely to be investing more as well. Therefore, we see in columns (4) and (5) that a fraction of these higher profits is due to the differential investment behavior of the firms. Nevertheless, even after controlling for investment behavior, the rise in earnings in the subsequent year is still positive and significant.

Finally, as further support of the varying degree of competitiveness effects across levels of dollar debt, we demonstrate that this relative increase in future profitability occurs even after controlling for contemporaneous earnings. The positive *investment* responses observed above were also robust to the inclusion of contemporaneous profitability. Therefore, some aspect of the change in competitiveness must have been uncorrelated with period-t earnings. In column (6) of Table (10), we add contemporaneous earnings to the regression. The predictive power of our interaction term remains positive and statistically significant.

These results serve as further evidence that firms that choose to hold higher dollar debt experience relative increases in current profits (and therefore internal funds for investment) and in their marginal product of capital (MPK) following a depreciation. This bolsters our hypothesis that we fail to find a negative coefficient on ($D^* \times \Delta e$) because of a large differential competitiveness component.

V The Balance Sheet Effect

In this section, we evaluate the key ingredient required for a depreciation to be contractionary in the models discussed in section II: namely, the negative effect of a depreciation on the accounting net-worth of firms holding dollar debt. In particular, we address the following questions:

1. Did overall debt actually increase in those firms holding dollar debt during a depreciation? (Yes.)

2. Was this rise in debt fully offset by higher current earnings so that the balance sheets of firms holding dollar debt did not deteriorate? (Not likely.)

Holding dollar debt during a depreciation leads to an increased indebtedness of the firm (in domestic currency) [26]. This discards two possible explanations for the apparent absence of a net-worth effect on investment: that there was a limited effect on the balance sheet itself or that the data on dollar debt reported in Bloomberg and Economatica are so error ridden so as to not adequately measure subsequent balance sheet problems.

We estimate an equation for the predicted total debt and debt service of firm i in country j in year t. The interaction of $(D^* \times \Delta e)$ continues to be the term of interest. The theoretical prediction is that the real value of the firm's debt rises if it holds foreign-currency debt and the exchange rate goes up faster than the domestic-price level. To equation (7) above, we add $DN_{i,t}^T$, firm i's net issuance of new debt in period t. This simple framework provides a basis for predicting autonomous changes—i.e., those caused by the mechanical increase of dollar debt in local currency—in the financial obligations of a firm. We present estimates of this augmented specification in Table (11).

[Insert Table 11 here]

Firms holding foreign-currency denominated debt saw the value of their debt rise in the aftermath of a depreciation. As before, we focus on the estimated effect of the interaction of lagged dollar debt and the change in the real exchange rate. Columns (1) and (2) contain results for the regressions of total t-period debt on $(D^* \times \Delta e)$. In column (3) and (4), we present results for the effect on the change in debt. In all cases, holding dollar debt during a depreciation causes a near one-for-one rise in the real peso value of debt.

Comparing the first four columns of Table (11) suggests that excluding new debt from the analysis has no appreciable change on our estimates of the effect of the dollar debt/exchange rate interaction term. This is fortunate because data on issues of new debt are not available for many firms, especially for those from countries already poorly represented in the sample. To take maximal advantage of the cross-country nature of our data set, we exclude new-debt issues from the remainder of the analysis.

Holding foreign-currency debt during an exchange rate depreciation also increases the interest charges incurred by the firm. This result is displayed in column (5) of Table (11), in which the dependent variable is accrued interest charges. The $(D^* \times \Delta e)$ term is associated with a increase in interest charges, although this effect is not precisely determined. Reassuringly, the three debt variables displayed all have coefficients that are of the order of interest rates, and debt in local currency is associated with substantially higher interest payments on average.

[26] As seen above, the dollar-indebted firms tended to be larger and produce relatively tradable output. 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. Nevertheless, we show that exchange rate realignments did indeed have the supposed effect on firms' balance sheets: Firms holding dollar debt saw the real (peso) value of their debt rise substantially. If firms do in fact buy derivatives or substitute debt to offset the mechanical revaluation of their debt, they appear to do so to a limited degree.

Finally, in column (6), we sum the values for the change in debt and the accrued interest charges to produce a single statistic that describes how the firm's overall financial obligations have changed because of the interaction of dollar debt and the change in the exchange rate. Not surprisingly, the coefficient on the interaction is approximately equal to the sum on the individually estimated effects. Thus, for every extra dollar of debt held during a depreciation, firms experience a proportional increase in their financial obligations of about $1.28 per unit of log change in the real exchange rate.

The next stage, which incorporates the effect of a change in the exchange rate on current earnings, is relatively uncomplicated. Using the estimated coefficients from previous sections, we sum up the effects of a depreciation on debt and on earnings to find the impact of a depreciation on the firm's balance sheet. The components of this sum are displayed in Table (12). We find that holding dollar debt during a depreciation causes a decline in firm net worth which is not fully offset by higher current profits. This result is consistent with the larger relative drops in stock market capitalization in dollar indebted Asian firms, found by Allayannis et al (2001).

[Insert Table 12 here]

VI Discussion

VI.A Dollar Debt and Currency Mismatches

The main empirical question addressed in this paper is whether firms holding more dollar liabilities invest relatively less than their peso-indebted counterparts in periods following a depreciation. For our sample of Latin American firms, the answer is no. Using a broad set of specifications, estimation methods and measures of investment we fail to find a negative and significant effect of $(D^* \times \Delta e)$ on investment: firms holding dollar debt do not invest relatively less than their peso counterparts following a depreciation.

There are two possible explanations for this result. The first, is that changes in the local currency value of dollar debt have no effect on the investment decisions of firms in our sample. This would suggest either that leverage has no impact on investment, or that market participants believe that temporary changes in leverage due to depreciations have little bearing on the firms ability to repay its debt in future periods. The second explanation is that firms match the currency composition of their income with that of their debt, and by doing so hedge exchange rate risk. As a result of this matching, firms with high levels of dollar debt are also firms whose current earnings (and marginal product of capital) go up following a depreciation. These positive competitiveness effects offset the negative balance sheet effects of dollar debt.

The results in this paper support the second explanation. For a start we find evidence of currency matching. Firms whose income we expect a-priori to be correlated with the real exchange rate hold more dollar debt, and firms holding more dollar debt see larger relative increase in their current and future profits following a depreciation. In turn, the negative coefficient on total debt in most investment specifications and the fact that firms choose to match in the first place suggest that balance sheet effects do impact firm output and investment decisions. Note, however, that our estimates suggest that these balance sheet effects are small. The estimated coefficient on the effect of total debt on t-period fixed capital investment (-0.03) and the estimated effect of dollar debt on

total debt (approximately 1) imply that for a firm with a dollar debt to asset ratio of 50% a 50% real depreciation would result in a drop in investment of 0.75%, less than one-tenth of the sample average investment rate.

A series of recent empirical studies have also addressed the question of whether firms holding more dollar liabilities invest relatively less following a depreciation using a similar empirical specifications to the one used in this paper. Bonomo, Martins and Pinto (2003) look at a sample of publicly listed firms in Brazil over the period 1990-2002 and Benavente, Johnson and Morande (2003) study the investment response of a similar sample of firms in Chile over the 1994-2001 period. Neither of these obtain a robust, negative and significant coefficient on the interaction between dollar debt and the exchange rate. Echeverry, Fergusson, Steiner and Agular (2003) address the same question using a much larger sample of firms from Colombia. Drawing on data for close to 8000 listed and non-listed firms over the period 1994-2001 they also fail to find a negative and significant negative coefficient on the $(D^* \times \Delta e)$ interaction[27]. Pratap, Lobato and Somuano (2003), on the other hand, do find a negative and significant coefficient on the interaction between dollar debt and devaluations in publicly listed Mexican firms. We believe, however, that this result is likely driven by an omitted variable bias. In no specification do they control for the interaction between total debt and the real exchange rate. As reported in columns (1) and (2) of Table (5), omitting this variable results in a sizeable downward bias on the estimated coefficient of the $(D^* \times \Delta e)$ interaction. Finally, Luengnaruemitchai (2004) looks at the response of investment to a depreciation in non-financial firms in Asia, a regional where the balance sheet effect is believed to be prominent. He obtains results that are very similar to the ones reported in this paper: firms holding dollar debt invest at least as much as their counterparts following a depreciation.

A related, but distinct, empirical question is whether firms with larger *mismatches* between the currency composition of their liabilities and their income invest relatively less in periods following a depreciation[28]. This is equivalent to asking whether – all else constant – raising levels of dollar debt will make depreciations less expansionary. To answer this question requires detailed information on the income and cost structure of firms, as well as the currency denomination of their assets. With this detailed information it is possible to separate the negative balance sheet effects of a depreciation from its positive competitiveness effects on current earnings and the demand for capital. Because of the data requirements there are few empirical papers that address this question, two of them for Mexico and one for Chile. Aguiar (2002) and Pratap et al (2003) look at the investment behavior of publicly listed Mexican firms. Aguiar (2002) concentrates on the years around the tequila crisis, while Pratap et al (2003) analyses firm data from 1989 to 1999. Both control for differential competitiveness effects by including firm level data on exports interacted with the relevant macroeconomic variables. Both find that following a depreciation, firms with larger currency mismatches invest relatively less. Cowan, Hansen and Herrera (2005) go one step further and include, in addition to firm level exports, controls for the currency composition of assets and net derivative positions of Chilean corporations between 1994 and 2001. Interestingly, they confirm the results presented in this paper. Without adding additional competitiveness controls, firms holding dollar debt do not invest relatively less than peso indebted firms following a depreciation. On the other hand, once the currency composition of assets and incomes is accounted for, they find a significant

[27] There is also a recent study for Peruvian firms, by Carranza et al (2003). Problems with the empirical specification – in particular the omission of the main effects of the key interaction terms– makes the results of this study very difficult to interpret. In those specifications in which the main effects are included, they fail to find a negative and significant coefficient on the $(D^* \times \Delta e)$ interaction.

[28] Note that mismatches and dollar debt will be the same only if there is no matching – i.e. if firm debt is uncorrelated with the sensitivity of income to the exchange rate.

negative balance sheet effect of dollar denominated debt.

Finally, our "matching" is consistent with existing studies of currency exposure and derivative use by firms in emerging markets. Allayannis et al (2001) study the currency hedging practices of non-financial firms from eight East Asian countries over the period 1996-1998 and document that in firms in East Asia foreign cash incomes are a substitute for derivative hedging for dollar indebted firms. Cowan at al (2005) obtain similar results for a sample of Chilean non-financial firms.

VI.B Corporate versus Aggregate Investment

While the focus of the present study is the corporate sector, it is worth comparing the investment response of this sector to the full economy's in periods following large depreciations. On the one hand, large publicly listed firms are less likely to be credit constrained, so that balance sheet effects will have smaller bearing on their investment decisions. On the other hand (as shown in Table 9 for our sample) larger corporations take on higher shares of dollar debt, and are therefore more exposed to balance sheet effects following a depreciation.

With this in mind, in this section we explore whether our sample is not representative, so that the large collapse in investment alleged to occur following devaluations occurs only elsewhere in the economy, specifically in small unlisted firms. We find that this is not the case. Indeed, in most cases following large depreciations, the collapse in investment in our sample was actually larger than the fall in economy-wide private investment.

To construct comparable measures of investment for both our sample and the broader economy we focus on purchases of equipment and structures, which correspond to fixed-capital purchases from the cash-flow statement in our sample and to gross fixed-private-capital formation in the national accounts. Because the strategy we have employed so far of normalizing by lagged assets is not feasible for the aggregate data, we consider yearly logarithmic changes in the CPI-deflated levels of investment.

Table (13) shows the behavior of aggregate purchases of equipment and structures economy-wide and in our sample around the largest depreciation episode of each country. In all cases but one, the fall in economy-wide investment is larger than the fall in the aggregate capital expenditures of our sample. For Colombia, the high rate of growth in sample investment is likely to be due to the idiosyncratic effects that dominate the small number of firms in our sample (19 firms in 1999).

[Insert Table here]

VII Conclusions

The present study provides evidence on the effect of foreign-currency liabilities on firm-level investment in periods of exchange rate volatility. Our starting point is a concern—advanced recently by several authors—about problems stemming from the currency composition of debt among emerging-market corporations. A consequence of this dollarized debt is that a depreciation may lead to a deterioration of firm balance sheets (as a result of inflated domestic-currency values of debt) that could attenuate or even reverse the usual expansionary effects of the depreciation.

In this vein, we construct a new database of firm-level accounting information (including the currency composition of liabilities) for over 450 firms in five Latin American countries, and use it to estimate the reduced-form effect on investment of holding foreign-currency-denominated debt during an exchange rate realignment. In doing so, we believe that this study addresses a specific channel through which dollarized liabilities interact with exchange rate movements to affect investment by publicly traded firms.

We consistently find that firms holding dollar debt do not invest less than firms holding peso debt in the period following a depreciation. This finding is not what one would expect from a naive model that only considers the detrimental effect of the exchange rate on liabilities. This result is robust to the inclusion of a series of controls and alternative estimation methods.

We argue that this result is due to the degree to which firms match the currency composition of their debt with the elasticity of their income to the exchange rate. In the wake of a depreciation, the inflated peso value of dollar debt causes a deterioration in firm balance sheets that in turns induces a reduction in output and investment. However, in our sample, for firms holding higher levels of dollar debt this negative balance sheet effect is more than offset by higher current and future earnings caused by the competitiveness effect of the depreciation. Providing support for this hypothesis we find that, after a depreciation, earnings are higher in those firms holding more dollar debt. In addition, in our sample, dollarization of liabilities is higher in firms whose income we expect *ex ante* to be more positively correlated with the real exchange rate (firms with tradable products, for example).

What do our results imply for the literature on currency mismatches and contractionary depreciations? First, we show that firms holding dollar debt do see their balance sheets deteriorate during depreciations, and, moreover, that total liabilities do appear to influence investment decisions. Second, in our sample firms "match" the currency composition of income and liabilities, so that those firms holding more dollarized debt are also those firms whose income is most highly correlated with the real exchange rate. Third, as a result of matching, the ratio of dollarized debt is a poor measure of firm level currency mismatches. A more comprehensive measure must incorporate measures of the elasticity of firm profits to the real exchange rate. Sector controls and firm-level indicators of exposure, albeit imperfect, are a first step in this direction. Direct measurement of the idiosyncratic response of income to the exchange rate should also figure prominently in such analysis as suggested by recent empirical literature. This also suggests that care must be take when evaluating aggregate (economy-wide) currency mismatches, as dollar debt may provide a poor measure of exposure to exchange rate fluctuations. Fourth, understanding the microeconomic and macroeconomic variables that drive firms in particular, and private agents in general, to choose the currency composition of their debt is a key theoretical and empirical question. If firm level incentives where distorted in such a way that no "matching" takes place, then depreciations would indeed be more contractionary for dollar-indebted firms– as dollar debt translates into firm level mismatches that lead to reductions in investment and output.

References

Allayannis, G., Brown, G. and L. Klapper (2001). "Exchange Risk Management: Evidence from East Asia." Policy Research Working Paper # 2606, The World Bank.

Aghion, P., P. Bacchetta and A. Banerjee (2001). "Currency Crises and Monetary Policy in an Economy with Credit Constraints." *European Economic Review* 45(7): 1121-50.

Aguiar, M. (2002). "Investment, Devaluation, and Foreign Currency Exposure: The Case of Mexico". Mimeo, University of Chicago.

Arellano, M. and S. Bond. (1991). "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations." *The Review of Economic Studies* 58: 277-97.

Arteta, C. O. (2002). "Exchange Rate Regimes and Financial Dollarization: Does Flexibility Reduce Bank Currency Mismatches?" Unpublished manuscript, Department of Economics, University of California at Berkeley.

Bavishi, V. B. (1995). *International Accounting and Auditing Trends.* Princeton, NJ, Center for International Financial Analysis & Research.

Bank of New York (2002). *The Bank of New York's Complete DR Directory*, available at http://160.254.123.37/dr_directory.jsp.

Benavente, J. M., C. Johnson and F. Morándé (2003). "Debt Composition and Balance Sheet Effects of Exchange Rate Depreciations: a Firm-Level Analysis for Chile." *Emerging Markets Review* 4(4): 397-416.

Bernanke, B. and M. Gertler (1989). "Agency Costs, Net Worth, and Business Fluctuations." *American Economic Review* 79(1): 14-31.

Bernanke, B., M. Gertler, and S. Gilchrist (1998). "The Financial Accelerator in a Quantitative Business Cycle Framework." NBER Working Paper 6455.

Bleakley, H. and K. Cowan (2002) "Dollar Debt and Devaluations: Much Ado About Nothing?" Federal Reserve Bank of Boston, Working Paper #02-5, December.

Bonomo, M., B. Martins and R.Pinto (2003). "Debt Composition and Exchange Rate Balance Sheet Effect in Brazil: a Firm Level Analysis." *Emerging Markets Review* 4(4): 368-96.

Calvo, G. A. (1999). "On Dollarization." At http://www.bsos.umd.edu/econ/ciecpn5.pdf

Calvo, G. A. (2001)."Capital Markets and the Exchange Rate with Special Reference to the Dollarization Debate in Latin America." *Journal of Money, Credit, and Banking* 33(2): 312-34.

Carranza L.J., J.M. Cayo and J.E. Galdon-Sanchez (2003). "Exchange Rate Volatility and Economic Performance in Peru: a Firm Level Analysis." *Emerging Markets Review* 4(4): 472-96.

Céspedes, L. F., R. Chang and A. Velasco (2000). "Balance Sheets and Exchange Rate Policy." *The American Economic Review* 94(4): 1183-93

Chamon, M. (2001). "Why Can't Developing Countries Borrow from Abroad in their Currency." Unpublished manuscript, Department of Economics, Harvard University.

Claessens, S. and S. Djankov (2000). "Publicly Listed East Asian Corporates: Growth, Financing and Risks." In D. Dwor-Frecaut, F. Colaco and M. Hallward-Driemeier (eds.) *Asian Corporate Recovery: Findings From Firm Level Studies in Five Countries.* Washington DC: World Bank, 97-109.

Conesa-Labastida, A. (1997). *Essays on International Finance*, Doctoral Dissertation, Massachusetts Institute of Technology.

Coopers and Lybrand (1993). *International accounting summaries.* New York: Wiley, John & Sons, Incorporated.

Cowan, K. (2002). "Firm Level Determinants of Dollar Debt," in *Enquiries into the Behavior of Emerging Market Firms*, Doctoral Dissertarion, Massachusetts Institute of Technology.

Cowan, K., Hansen, E. and Herrera, L.O. (2005). "Currency Mismatches, Balance Sheet Effects and Hedging in Chilean Non-Financial Corporations". Inter-American Development Bank, Working Paper #521.

Desai, M., F. Foley and K. Forbes (2004). "Financial Constraints and Growth: Multinational and Local Firm Responses to Currency Crises". NBER Working Paper 10545.

Diamond, D. W. and P. H. Dybvig (1983). "Bank Runs, Deposit Insurance, and Liquidity." *Journal of Political Economy* 91(3): 401-19.

Dwor-Frecaut, D., F. Colaco, and M. Hallward-Driemeier (2000). "Asian Manufacturing Recovery: A Firm Level Analysis." In D. Dwor-Frecaut, F. Colaco and M. Hallward-Driemeier (eds.) *Asian Corporate Recovery: Findings From Firm Level Studies in Five Countries.* Washington DC: World Bank:1-17.

Eichengreen, B. and R. Hausmann (1999). "Exchange Rates and Financial Fragility." NBER Working Paper 7418.

Echeverry, J. C., L. Fergusson, R. Steiner and C. Aguilar (2003). "Dollar Debt in Colombian Firms: are Sinners Punished During Devaluations." *Emerging Markets Review* 4(4): 417-49.

Fazzari, S. M., R. G. Hubbard and B.Petersen (1988). "Financing Constraints and Corporate Investment." *Brookings Papers on Economic Activity* 0(1): 141-95.

Gallego, F. and N. Loayza (2000). "Financial Structure in Chile: Macroeconomic Developments and Microeconomic Effects." Central Bank of Chile Working Paper 75.

Gelos, G. and A. M. Werner (1998). "La Inversión Fija en el Sector Manufacturero Mexicano 1985-94: El Rol de Los Factores Financieros y El Impacto de Liberalización Financiera." Documento de Investigación No. 9805, Banco de México.

Harris, J. R., F. Schiantarelli, and M.G. Siregar (1994). "The Effect of Financial Liberalization on the Capital Structure and Investment Decisions of Indonesian Manufacturing Establishments." *World Bank Economic Review* 8(1): 17-47.

Hoshi, T., A. Kashyap, and D. Sharfstein (1991). "Corporate Structure, Liquidity, and Investment: Evidence from Japanese Industrial Groups." *Quarterly Journal of Economics* 106(1): 33-60.

Hubbard, R. G. (1997). "Capital-Market Imperfections and Investment." NBER Working Paper 62.

Ize, A., Levy-Yeyati (2004). "Dollarization of Financial Intermediation: Causes and Policy Implications." Ref

Jeanne, O. (1999a). "Foreign Currency Debt and Signaling." mimeo IMF.

Jeanne, O. (1999b). "Foreign Currency Debt, Moral Hazard, and Global Financial Architecture." mimeo IMF.

Krugman, P. (1999a). "Analytical Afterthoughts on the Asian Crisis."
At http://web.mit.edu/krugman/www.

Krugman, P. (1999b). "Balance Sheets, the Transfer Problem, and Financial Crises." *International Tax and Public Finance* 6(4): 459-72.

Laeven, L. (2000)."Does Financial Liberalization Relax Financing Constraints on Firms?" World Bank Working Paper 2467.

Lang, L., E. Ofek, and R.M. Stulz (1996). "Leverage, Investment, and Firm Growth." *Journal of Financial Economics* 40(1): 3-29.

Lemmon, M. and K. Lins (2003). "Ownership Structure, Corporate Governance, and Firm Value: Evidence from the East Asian Financial Crisis." *The Journal of Finance* LVIII(4): 1445–68.

Love, I. (2003). "Financial Development and Financing Constraints: International Evidence from the Structural Investment Model." *Review of Financial Studies* 16: 765-91.

Luengnaruemitchai, P. (2004). "The Asian Crises and the Mystery of the Missing Balance Sheet Effect". Mimeo, Department of Economics, University of California at Berkeley.

Martinez L. and A. Werner (2002). "The Exchange Rate Regime and the Currency Composition of Corporate Debt: The Mexican Experience." *Journal of Development Economics* 69(2): 315-34.

Mitton, T. (2002). "A Cross-Firm Analysis of the Impact of Corporate Governance on the East Asian Financial Crisis". *Journal of Financial Economics* 64(2): 215-41.

McKinnon, R. I. and H. Pill (1998). "The Overborrowing Syndrome: Are East Asian Economies Different?" In R. Glick (ed.), *Managing capital flows and exchange rates: Perspectives from the Pacific Basin.* Cambridge: Cambridge University Press, pp. 322-55.

Pratap S., I. Lobato and A. Somuano (2003). "Debt Composition and Balance Sheet Effects of Exchange Rate Volatility in Mexico: a Firm Level Analysis." *Emerging Markets Review* 4(4): 450-71.

Radelet, S. and J. D. Sachs (1998). "The East Asian Financial Crisis: Diagnosis, Remedies, Prospects." *Brookings Papers on Economic Activity* 1(1): 1-74.

Santomero, A. (1995). "Financial Risk Management: The Whys and Hows." *Financial Markets, Institutions and Instruments* 4(5):1–15.

Schneider, M. and A. Tornell (2004). "Balance Sheet Effects, Bailout Guarantees and Financial Crises." *Review of Economics Studies* 71(3): 883-913.

World Bank (2001). *Asian Corporate Recovery Conference*. Data at http://wbln0018.worldbank.org/eap/eap.nsf/.

Appendix A. Variables

Microeconomic Variables

The following is a description of the main firm-level variables used in the paper.

1. **D***, **Foreign debt:** debt denominated in a foreign currency converted into local currency. In all countries, accounting standards dictate that conversion of debt from foreign to local currency values be carried out using the exchange rate for the period in which the balance sheet is reported—in this case December. (Balance Sheet)
2. **Investment in fixed capital:** We combine purchases of fixed assets with disposal of fixed assets to construct our measure of fixed capital investment. Both of these variables are detailed in the cash flow statement. We opt not to use the change in net fixed assets as a measure of investment because accounting norms in most of the countries in our sample allow for revaluations of assets (Cash Statement)
3. We define **Investment in inventories** as the change in inventories in a given period. Inventories include raw materials, work in progress, and finished goods. (Balance Sheet)
4. **Net sales:** revenues from main operating activities. (Income Statement)
5. **Costs:** cost of sales. (Income Statement)
6. **Interest expense**: accrued interest on liabilities. (Income Statement)
7. **Earnings:** earnings before accrued interest, taxes, depreciation, and amortization (EBITDA). EBITDA = Operating Income + Depreciation and Amortization. (Cash Flow Statement)
8. **New debt:** measure of new debt issued, net of repayments on outstanding principal. This variable does not include changes in debt coming from accrued interest payments. (Cash Flow Statement)
9. **Sector** is the industry in which the firm has its main operations. We code firms according to the two-digit ISIC 2 classification. (Company Notes)
10. **Parent** is a dummy variable that indicates whether the firm's controlling interest is another firm. See text for coding. (Company Notes and Historical News)
11. **International Operations** is a dummy variable that indicates whether the firm has subsidiaries or direct operations in other countries. See text for coding. (Company Notes)
12. **ADR** is a dummy variable that takes on a value of one if the firm's shares were listed in a foreign stock exchange in the form of American Depositary Reciepts (ADRs) in the previous period. (Bank of New York (2002))

Macroeconomic Variables

This subsection contains a description of the macroeconomic variables used throughout the paper. The source of most data is the IMF International Financial Statistics. IFS codes are in **(bold)**, series names are in *italics*. The rest of the data are from the IADB's web site, www.iadb.org.

IFS Data

1. **Bank Credit** (as a percentage of nominal GDP). A measure of financial sector credit to the private sector, specifically *claims on the private sector held by deposit banks*, end of period. While a more comprehensive measure of private credit that includes other financial institutions exists in the IFS, fewer observations are available. In any case correlation between both series over the 1980-99 period is extremely high (>.99). Dollar values were converted to domestic currency using period average exchange rates as described below.
2. **Inflow of Credit** (as a percentage of nominal GDP). A measure of inflows of credit to private companies. It is the sum of two components of the capital account: *debt securities liabilities* **(78bnd)** and *other investment liabilities to other sectors* **(78bvd).** Dollar values were converted to domestic currency using period average exchange rates as described below.
3. **Capital Inflows** (as a percentage of nominal GDP). An aggregate measure of total net capital inflows, *Financial Account* **(78bjd).**
4. **Peso interest rate** (annual percentage). nominal interest rates on deposits in the financial sector. Deposit rates (**60l**) where used instead of lending rates as the latter was only available for a limited sample.
   (a) Argentina - *deposit rate* : rate on 30 to 59 day deposits in national currency.
   (b) Brazil - *deposit rate* : average rate offered by banks on certificates of deposits of 30 days or longer.
   (c) Chile - *deposit rate* : 30-89-day loans by financial institutions.
   (d) Colombia - *deposit rate:* weighted average rate paid on 90 day certificates of deposit.
   (e) Mexico - *deposit rate:* Weighted average payable to individuals on 60 day time deposits.
5. **Exchange rate** (e_t): Nominal exchange rate / CPI, end of period and period average.

Other sources

1. **Aggregate Output**. Real value added by sector and total nominal and real GDP. Sectors are defined according to the ISIC Revision 2. For Brazil, data for 1997 to 1998 are from the Brazilian Central Bank. Source: IADB and Brazilian Central Bank.
2. **Dollar interest rate.**

(a) For Argentina, Brazil and Mexico the dollar interest rate ($r^*_{j,t}$) is the total return on the portfolio of dollar-denominated bonds included in each country's EMBI index. Source: JP Morgan.

(b) Chile: annualized interest rate on 30-89 day dollar-denominated loans. Source: Central Bank of Chile.

(c) Colombia: as dollar contracts are prohibited in the domestic financial system, and no series of returns on dollar denominated bonds placed in international capital markets where available, we use the average cross country EMBI index. Source: JP Morgan

3. **The multilateral real exchange rate** used in section IV.A was built using the consumer price indices of each country's 5 main trading partners during 1995 (the mid-point of our sample), weigthed by trade. Trade weights are from the DOTS database (IMF) and correspond to the share of imports and exports of each partner in total exports and imports. Nominal exchange rate and cpi data are from the *IFS.*

Table 1
Sample Statistics

Panel A displays, per country and year, the number of firms in the sample that have nonmissing data on lagged foreign-currency debt. In Panel B, "Firm-level" variables are contemporaneous unless otherwise indicated. All accounting variables are converted to real (constant-peso) values and scaled by the lagged real value of total firm assets. Macroeconomic variables are from the current period (i.e., concurrent with the investment variables). The real exchange rate is defined as the nominal exchange rate divided by the domestic CPI. Panel C displays the mean, the standard deviation (in parentheses), and number of observations (in brackets). The accounting data are the pooled Bloomberg / Economatica sample, as described in the text. Macro data are drawn from various sources, principally International Financial Statistics. For detailed sources and descriptions, see Section 2 and Appendix A.

Panel A: Number of Firms in Sample Per Country and Year

	Year									
Country	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**Total**
Argentina		3	12	21	25	27	29	51	47	215
Brazil	54	87	101	116	153	237	243	242	256	1,489
Chile		11	18	56	73	86	95	69	2	410
Colombia				1	6	11	17	19	19	73
Mexico	26	35	43	66	73	85	96	105	108	637
Total	80	136	174	260	330	446	480	486	432	2,824

Panel B: Descriptive Statisitics

	Mean	**Std. Dev.**	**N**
Firm-Level Variables			
Lagged Dollar Debt	.104	(.152)	2824
Lagged Total Debt	.440	(.274)	2824
Lagged Short-Term Debt	.264	(.217)	2812
Fixed-Capital Investment	.071	(.099)	2824
Inventory Investment	.009	(.051)	2810
Earnings (EBITDA)	.106	(.101)	2802
Change in Total Debt	.065	(.197)	2824
Interest Accrued	.057	(.079)	2789
Macro Variables			
Δ Log Real Exchange Rat	.000	(.155)	2824
Inflow of Credit (% nominal GDP)	.024	(.026)	2749
Δ Log Bank Credi	.054	(.172)	2824
Δ Log Sectoral Value Adde	.031	(.049)	2808
Micro/Macro Interactions			
Dollar Debt x (Δ Log Real Exchange Rate	-.001	(.022)	2824
Total Debt x (Δ Log Real Exchange Rate	.005	(.059)	2824
Dollar Debt x (Inflow of Credit)	.000	(.004)	2749
Total Debt x (Inflow of Credit)	-.001	(.007)	2749
Dollar Debt x (Δ Log Bank Credit)	-.005	(.034)	2824
Total Debt x (Δ Log Bank Credit)	-.004	(.041)	2824

Panel C: Comparisons

Lagged Dollar Indebtedness:	**Below Median**		**Above Median**	
Exchange-Rate Movement:	**Appr.**	**Depr.**	**Appr.**	**Depr.**
Variables:				
Change in Total Debt	.082 (.171) [778]	.064 (.215) [634]	.048 (.186) [807]	.068 (.218) [605]
Interest Accrued	.047 (.071) [766]	.075 (.116) [627]	.044 (.045) [794]	.067 (.071) [602]
Earnings (EBITDA)	.118 (.112) [774]	.083 (.103) [624]	.114 (.096) [807]	.102 (.085) [597]
Fixed-Capital Investment	.075 (.092) [778]	.058 (.082) [634]	.072 (.084) [807]	.078 (.135) [605]
Inventory Investment	.016 (.067) [770]	.005 (.043) [630]	.006 (.041) [805]	.007 (.046) [605]

Table 2
Effect of Dollar Debt and Exchange Rate Movements on Investment

Each column reports the results of an OLS regression. The dependent variables are as indicated above each column. Estimates of the effect of the independent variables are listed in each row. Also included in each regression are indicator variables for each country-year cell. Huber-White standard errors are given in parentheses. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The number of observations varies because of data availability. Firm-level independent variables are once-lagged values. All accounting variables are scaled by the lag of total firm assets. Macroeconomic variables (real exchange rate and CPI) are from the current period. The real exchange rate is defined as as nominal exchange rate over domestic CPI. The accounting data are from the pooled Bloomberg/Economatica database, as described in the text. Macro data are drawn from the International Financial Statistics of the IMF. For detailed sources and descriptions, see Section 2.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
						Dependent Variables:				
Independent Variables and Regression Statistics	**Capital Expenditures**					**Inventory Investmen**				
					Panel A: Dependent Variables from the Current Year					
Interactions										
Dollar Debt x	0.285 *	0.264	0.285 *	0.257	0.185	0.191 ***	0.187 ***	0.172 ***	0.142 **	0.056
(Δ Log Real Exchange Rate)	(0.161)	(0.161)	(0.162)	(0.157)	(0.181)	(0.061)	(0.062)	(0.060)	(0.060)	(0.054)
Total Debt x				0.043	0.029				0.046 **	0.061 ***
(Δ Log Real Exchange Rate)				(0.057)	(0.061)				(0.020)	(0.023)
Controls:										
Dollar Debt	0.016	0.035 **	0.018	0.023	0.010	-0.025 ***	-0.022 **	-0.009	-0.003	-0.001
	(0.015)	(0.016)	(0.017)	(0.019)	(0.020)	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)
Total Debt		-0.030 ***	-0.024 **	-0.030 ***	-0.016		-0.005 *	-0.011 ***	-0.018 ***	-0.024 ***
		(0.009)	(0.009)	(0.010)	(0.011)		(0.003)	(0.004)	(0.005)	(0.006)
Lagged Dependent Variable					0.499 ***					0.036 ***
					(0.045)					(0.014)
Peso Debt x (Δ Log CPI)			Yes	Yes	Yes			Yes	Yes	Yes
Regression Statistics:										
N	2830	2830	2830	2830	2288	2994	2994	2994	2994	2295
R^2	0.04	0.05	0.05	0.05	0.15	0.06	0.06	0.06	0.07	0.07
					Panel B: Dependent Variables from the Following Year					
Interactions										
Dollar Debt x	0.244	0.235	0.240	0.292	0.212	0.217 ***	0.216 ***	0.217 ***	0.269 ***	0.270 ***
(Δ Log Real Exchange Rate)	(0.173)	(0.174)	(0.167)	(0.189)	(0.177)	(0.048)	(0.048)	(0.048)	(0.056)	(0.056)
Total Debt x				-0.079	-0.012				-0.079 *	-0.082
(Δ Log Real Exchange Rate)				(0.115)	(0.132)				(0.045)	(0.045)
Controls:										
Dollar Debt	-0.019	0.003	-0.004	-0.005	-0.010	-0.010	-0.009	-0.009	-0.011	-0.010
	(0.032)	(0.036)	(0.029)	(0.030)	(0.030)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)
Total Debt		-0.032 **	-0.030 **	-0.030 **	-0.011		-0.002	-0.001	0.000	0.000
		(0.014)	(0.013)	(0.013)	(0.014)		(0.004)	(0.005)	(0.005)	(0.005)
Lagged Dependent Variable					0.578 ***					0.023
					(0.104)					(0.050)
Peso Debt x (Δ Log CPI)			Yes	Yes	Yes			Yes	Yes	Yes
Regression Statistics:										
N	2092	2092	2092	2092	2037	2151	2151	2151	2151	2150
R^2	0.03	0.03	0.03	0.03	0.15	0.07	0.07	0.07	0.07	0.07

Table 3
Robustness Of Main Results

Each panel presents the results from a different estimator. The dependent variables are as indicated above each column. Estimates of the effect of dollar debt x changes in the real exchange rate and selected independent variables are reported in each panel . Independent variables in each regression are as in Table 2, Column 5, however reporting of the rest of the estimates is supressed. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The number of observations varies because of data availability.Firm-level independent variables are once-lagged values. All accounting variables are scaled by the lag of total firm assets. The macroeconomic variables are from the current period.

The real exchange rate is defined as as nominal exchange rate over domestic CPI. Net capital inflows are the net financial account. Bank credit is private sector loans by the domestic banking system. International prices are trade weighted averages of trading partner price levels in dollars. The accounting data are from the Bloomberg/Economatic database, as described in the text. Macro data are drawn from the International Financial Statistics of the IMF. For detailed sources and descriptions, see Section 2.

	(1)	(2)	(3)	(4)
	Dependent Variables:			
	Capital Expenditures		**Inventory Investment**	
Period for dependent variable:	(t)	(t+1)	(t)	(t+1)
Independent Variables:				
	Panel A : Basic Specification			
Dollar Debt x	0.185	0.212	0.056	0.270 ***
(Δ Log Real Exchange Rate)	(0.181)	(0.177)	(0.054)	(0.056)
	Panel B: Firm Size			
Dollar Debt x	0.206	0.092	0.034	0.231 ***
(Δ Log Real Exchange Rate)	(0.209)	(0.161)	(0.056)	(0.056)
Total Assets x	-0.005	0.030 **	0.005	0.010 **
(Δ Log Real Exchange Rate)	(0.010)	(0.015)	(0.005)	(0.005)
	Panel C: Interactions with Capital Flows			
Dollar Debt x	0.251	0.255	0.040	0.236 ***
(Δ Log Real Exchange Rate)	(0.184)	(0.245)	(0.066)	(0.064)
Total Debt x	-0.695	-0.685	0.551	0.454
Net Capital Inflows	(0.813)	(1.242)	(0.409)	(0.323)
Dollar Debt x	1.026	0.373	-0.191	-0.319
Net Capital Inflows	(0.918)	(1.721)	(0.503)	(0.417)
	Panel D: Interactions with Banking Sector			
Dollar Debt x	0.207	0.346	0.072	0.270 ***
(Δ Log Real Exchange Rate)	(0.192)	(0.268)	(0.053)	(0.062)
Total Debt x	-0.037	0.149	0.103 ***	0.052
Δ log Domestic Bank Credit	(0.068)	(0.148)	(0.035)	(0.038)
Dollar Debt x	-0.030	-0.292	-0.142 ***	-0.016
Δ log Domestic Bank Credit	(0.076)	(0.249)	(0.045)	(0.047)
	Panel E: Maturity vs Currency			
Dollar Debt x	0.234	0.165	0.054	0.253 ***
(Δ Log Real Exchange Rate)	(0.210)	(0.189)	(0.054)	(0.055)
Short Term Debt x	0.203	-0.194	-0.011	-0.063
(Δ Log Real Exchange Rate)	(0.185)	(0.225)	(0.045)	(0.081)
	Panel F: Maturity vs Currency II			
Dollar Debt x	0.199	0.198	0.030	0.256 ***
(Δ Log Real Exchange Rate)	(0.191)	(0.180)	(0.055)	(0.057)
Short Term Debt x	-0.093	0.010	0.093 **	0.046
Δ log Domestic Bank Credit	(0.061)	(0.090)	(0.039)	(0.041)
Short Term Debt x	-0.418	0.625	0.952 **	0.385
Net Capital Inflows	(0.797)	(0.862)	(0.476)	(0.299)

Note: Continued on next page.

Table 3 (Continued)
Robustness Of Main Results

	(1)	(2)	(3)	(4)
	Dependent Variables:			
	Capital Expenditures		**Inventory Investment**	
Period for dependent variable:	(t)	(t+1)	(t)	(t+1)
Independent Variables:				
	Panel G: Lagged Earnings			
Dollar Debt x	0.189	0.213	0.063	0.258 ***
(Δ Log Real Exchange Rate)	(0.179)	(0.175)	(0.051)	(0.056)
Lagged Earnings x	0.075	-0.094	0.116	-0.257 *
(Δ Log Real Exchange Rate)	(0.446)	(0.356)	(0.096)	(0.154)
	Panel H: Ownership & Information			
Dollar Debt x	0.142	0.216	0.032	0.258 ***
(Δ Log Real Exchange Rate)	(0.184)	(0.191)	(0.052)	(0.055)
I(Has Parent)	-0.013	0.167 **	-0.002	-0.005
(Δ Log Real Exchange Rate)	(0.089)	(0.080)	(0.020)	(0.025)
I(Has ADR)	-0.038	0.069 *	0.011	-0.020
(Δ Log Real Exchange Rate)	(0.036)	(0.039)	(0.014)	(0.020)
I(Auditor is Bix Six)	0.058 *	0.045	0.019	0.062 ***
(Δ Log Real Exchange Rate)	(0.033)	(0.037)	(0.013)	(0.020)
	Panel I: Non Linear effect of Debt			
Dollar Debt x	0.169	0.238	0.034	0.259 ***
(Δ Log Real Exchange Rate)	(0.144)	(0.180)	(0.058)	(0.062)
Total Debt x Dollar Debt x	0.063	-0.206	0.095	0.074
(Δ Log Real Exchange Rate)	(0.385)	(0.494)	(0.132)	(0.178)
	Panel J: Appreciation vs Depreciation			
Dollar Debt x	0.323	-0.142	0.051	0.183 **
(Δ Log Real Exchange Rate)	(0.313)	(0.191)	(0.079)	(0.085)
I(Appreciation) x Dollar Debt x	-0.331	0.804 *	0.018	0.200
(Δ Log Real Exchange Rate)	(0.419)	(0.424)	(0.163)	(0.163)
	Panel K: Controling for International Prices			
Dollar Debt x	0.175	0.232	0.044	0.248 ***
(Δ Log Real Exchange Rate)	(0.185)	(0.190)	(0.055)	(0.059)
Dollar Debt x	-0.167	0.539	-0.193	-0.569
(Δ Log Real Exchange Rate)	(0.286)	(0.682)	(0.211)	(0.504)

Table 4
Alternative Estimators

Each panel presents the results from a different estimator. The dependent variables are as indicated above each column. Estimates of the effect of dollar debt x changes in the real exchange rate are reported in each panel. Independent variables in each regression are as in Table 2, Column 5, however reporting of the rest of the estimates is supressed. The exceptions are panels G-I that exclude the lagged dependent variable, as in Table2, Column 4. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The number of observations varies because of data availability. Firm-level independent variables are once-lagged values. All accounting variables are scaled by the lag of total firm assets. The macroeconomic variables (real exchange and CPI) are from the current period. The accounting data are from the Bloomberg/Economatica database, as described in the text. Macro data are drawn from the International Financial Statistics of the IMF. For detailed sources and descriptions, see Section 2.

	(1)	(2)	(3)	(4)
	Dependent Variables:			
	Capital Expenditures		**Inventory Investment**	
Period for dependent variable:	(t)	(t+1)	(t)	(t+1)
Independent Variables:				
	Panel A: OLS, baseline, Gauss-Markov standard errors			
Dollar Debt x	0.185 *	0.212	0.056	0.270 ***
(Δ Log Real Exchange Rate)	(0.105)	(0.196)	(0.050)	(0.064)
	Panel B: OLS, baseline, Huber-White "robust" standard errors			
Dollar Debt x	0.185	0.212	0.056	0.270 ***
(Δ Log Real Exchange Rate)	(0.181)	(0.177)	(0.054)	(0.056)
	Panel C: OLS, baseline, errors clustered on country x year			
Dollar Debt x	0.185	0.212	0.056	0.270 ***
(Δ Log Real Exchange Rate)	(0.157)	(0.196)	(0.067)	(0.048)
	Panel D: OLS, errors clustered by firm			
Dollar Debt x	0.185	0.212	0.056	0.270 ***
(Δ Log Real Exchange Rate)	(0.184)	(0.183)	(0.056)	(0.060)
	Panel E: OLS, Matching estimator using 10th-order polynomials in the Debt Controls			
Dollar Debt x	0.185	0.176	0.068	0.264 ***
(Δ Log Real Exchange Rate)	(0.157)	(0.188)	(0.057)	(0.057)
	Panel F: IV estimator using twice lagged dependet variable as instrument for lagged dependent variable			
Dollar Debt x	0.204	0.206	-0.159	0.326 ***
(Δ Log Real Exchange Rate)	(0.203)	(0.182)	(0.281)	(0.091)
	Panel G: OLS, no LDV, Huber-White standard errors.			
Dollar Debt x	0.257	0.292	0.142 **	0.269 ***
(Δ Log Real Exchange Rate)	(0.157)	(0.189)	(0.060)	(0.056)
	Panel H: Firm fixed effects, Huber-White standard errors			
Dollar Debt x	0.043	0.042	0.057	0.285 ***
(Δ Log Real Exchange Rate)	(0.113)	(0.137)	(0.060)	(0.064)
	Panel I: Matching with firm fixed effects and Huber-White standard errors			
Dollar Debt x	0.090	0.067	0.084	0.284 ***
(Δ Log Real Exchange Rate)	(0.119)	(0.148)	(0.063)	(0.067)
	Panel J: Firm fixed effects, AR(1) error			
Dollar Debt x	0.014	0.104	-0.030	0.304 ***
(Δ Log Real Exchange Rate)	(0.109)	(0.166)	(0.048)	(0.071)
Estimated AR(1) Coefficient	0.174	0.165	0.008	-0.021

Table 5
Effects of Tequila Crisis in Mexican Firms

This table reports the OLS estimates for the sub-sample of Mexican firms. Columns 1,2 and 7,8 contain estimates of equation (7) in the text. Columns C and D report estimates of the indicated debt variables. Robust standard errors are reported in parentheses. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The dependent variable is investment in fixed capital. Firm-level independent variables are once-lagged values, except for contemporaneous earnings. All accounting variables are scaled by the lag of total firm assets. The real exchange rate is from the current period (i.e., concurrent with the LHS investment variable) and is defined as the nominal exchange rate divided by the domestic CPI. The accounting data are from the Bloomberg sample, as described in the text. Macro data are drawn from various sources, principally International Financial Statistics. For detailed sources and descriptions, see Section 2.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
						Dependent Variables:						
Independent Variables and Regression Statistics:	**Capital Expenditures**						**Inventory Investment**					
						Panel A: Dependent Variables from the Current Year						
Interactions												
Dollar Debt x	0.000	0.310 *	0.381 **	0.495 **			0.125	-0.002	0.029	-0.024		
(Δ Log Real Exchange Rate)	(0.141)	(0.176)	(0.188)	(0.240)			(0.102)	(0.107)	(0.123)	(0.170)		
Total Debt x		-0.495 *	-0.494 *	-0.587				0.200 **	0.205 *	0.300		
(Δ Log Real Exchange Rate)		(0.270)	(0.286)	(0.395)				(0.094)	(0.109)	(0.172)		
Dollar Debt x			1.847 *						0.758			
Net Capital Inflows			(1.029)						(1.069)			
Total Debt x			-0.003						0.154			
Net Capital Inflows			(1.032)						(1.050)			
Controls:												
Dollar Debt	0.067 ***	0.077 ***	0.083 ***	0.036	0.288 **	0.027	-0.055 **	-0.059 **	-0.056 **	-0.016	-0.028	-0.016
	(0.022)	(0.023)	(0.025)	(0.033)	(0.123)	(0.034)	(0.025)	(0.024)	(0.023)	(0.054)	(0.070)	(0.056)
Total Debt	-0.113 ***	-0.127 ***	-0.128 ***	-0.114 **	-0.414 **	-0.104 **	0.033 *	0.038 *	0.038 **	0.005	0.158 **	0.000
	(0.021)	(0.025)	(0.026)	(0.047)	(0.203)	(0.048)	(0.020)	(0.020)	(0.019)	(0.064)	(0.063)	(0.066)
Regression Statistics:												
N	635	635	635	139	66	73	674	674	674	144	69	75
R^2	0.10	0.12	0.12	0.16	0.08	0.09	0.07	0.08	0.08	0.19	0.12	0.00
						Panel B: Dependent Variables from the Following Year						
Interactions												
Dollar Debt x	0.096	0.296	0.438	0.140			0.227 ***	0.269 ***	0.220 ***	0.212 *		
(Δ Log Real Exchange Rate)	(0.169)	(0.220)	(0.305)	(0.172)			(0.058)	(0.080)	(0.085)	(0.111)		
Total Debt x		-0.319	-0.496 *	-0.377				-0.066	-0.013	-0.041		
(Δ Log Real Exchange Rate)		(0.221)	(0.286)	(0.299)				(0.082)	(0.085)	(0.106)		
Dollar Debt x			3.912						-1.335 *			
Net Capital Inflows			(2.912)						(0.732)			
Total Debt x			-4.885						1.453 **			
Net Capital Inflows			(3.377)						(0.738)			
Controls:												
Dollar Debt	-0.006	-0.003	0.006	0.052	0.124	0.050	-0.011	-0.010	-0.013	0.023	0.131 ***	0.019
	(0.085)	(0.084)	(0.079)	(0.049)	(0.075)	(0.051)	(0.016)	(0.016)	(0.016)	(0.032)	(0.048)	(0.033)
Total Debt	-0.083	-0.087	-0.096	-0.091	-0.284 **	-0.084	-0.013	-0.014	-0.011	-0.043 *	-0.064	-0.042
	(0.065)	(0.064)	(0.062)	(0.085)	(0.131)	(0.088)	(0.015)	(0.015)	(0.015)	(0.026)	(0.049)	(0.027)
Regression Statistics:												
N	528	528	528	125	57	68	539	539	539	126	58	68
R^2	0.04	0.04	0.05	0.12	0.14	0.02	0.11	0.11	0.12	0.07	0.11	0.02

Table 6
Effects of Expected and Unexpected Exchange Rate Movements

Each column reports the results of an OLS regression. The dependent variables are as indicated above each column. Estimates of the effect of the independent variables are listed in each row. Also included in each regression are indicator variables for each country-year cell. Huber-White standard errors are given in parentheses. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The number of observations varies because of data availability. Firm-level independent variables are once-lagged values. All accounting variables are scaled by the lag of total firm assets. Macroeconomic variables (real exchange rate and CPI) are from the current period. The real exchange rate is defined as as nominal exchange rate over domestic CPI. Unexpected depreciations are calculated as the difference between realized depreciations and the expected depreciation implicit in the difference between dollar and peso interest rates. Real peso interest rates are calculated as the nominal peso rate minus ex-post inflation. The accounting data are from the pooled Bloomberg/Economatica database, as described in the text. Macro data are drawn from the International Financial Statistics of the IMF. For detailed sources and descriptions, see Section 2.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Dependent Variables:				
Independent Variables and Regression Statistics:	**Capital Expenditures**				**Inventory Investment**			
				Panel A: Dependent Variables from the Current Year				
Interactions								
Dollar Debt x	0.002	-0.004	-0.003	-0.002	0.005 *	0.001	0.001	0.004
(Unexpected Δ Log Real Exchange Rate)	(0.007)	(0.007)	(0.007)	(0.007)	(0.003)	(0.003)	(0.003)	(0.003)
Total Debt x	-0.001	-0.001	0.001	0.001	-0.002	-0.002	-0.002	0.000
(Ex-post Real Peso Rate)	(0.004)	(0.004)	(0.004)	(0.004)	(0.001)	(0.001)	(0.001)	(0.002)
Dollar Debt x		0.266	0.233	0.159		0.182 ***	0.183 ***	0.072
(Δ Log Real Exchange Rate)		(0.173)	(0.168)	(0.193)		(0.068)	(0.070)	(0.056)
Controls								
Dollar Debt	0.042 **	0.043 **	0.048 ***	0.025	-0.024 **	-0.023 **	-0.024 **	-0.018 *
	(0.017)	(0.017)	(0.018)	(0.018)	(0.009)	(0.009)	(0.011)	(0.009)
Total Debt	-0.030 ***	-0.029 ***	-0.037 ***	-0.024 ***	-0.007 **	-0.006 **	-0.006	-0.014 ***
	(0.009)	(0.009)	(0.008)	(0.008)	(0.003)	(0.003)	(0.005)	(0.005)
Total Debt x			0.060	0.059			-0.002	0.025
(Δ Log Real Exchange Rate)			(0.050)	(0.054)			(0.022)	(0.021)
Lagged Dependent Variable				0.505 ***				0.035 **
				(0.045)				(0.014)
Regression Statistics:								
N	2727	2727	2727	2278	2835	2835	2835	2285
R^2	0.04	0.05	0.05	0.15	0.05	0.06	0.06	0.06
				Panel B: Dependent Variables from the Following Year				
Interactions								
Dollar Debt x	0.009	0.005	0.004	0.008	0.006 *	0.001	0.000	0.000
(Unexpected Δ Log Real Exchange Rate)	(0.010)	(0.012)	(0.012)	(0.014)	(0.003)	(0.004)	(0.004)	(0.004)
Total Debt x	0.003	0.003	0.002	0.005	0.002	0.002	0.001	0.001
(Ex-post Real Peso Rate)	(0.003)	(0.003)	(0.005)	(0.006)	(0.001)	(0.001)	(0.002)	(0.002)
Dollar Debt x		0.219	0.239	0.143		0.222 ***	0.251 ***	0.252 ***
(Δ Log Real Exchange Rate)		(0.194)	(0.243)	(0.220)		(0.052)	(0.060)	(0.060)
Controls	-0.002	0.002	0.001	-0.017	-0.012	-0.008	-0.009	-0.009
Dollar Debt	(0.036)	(0.035)	(0.036)	(0.038)	(0.009)	(0.009)	(0.009)	(0.009)
	-0.033 **	-0.033 **	-0.033 **	-0.010	-0.003	-0.002	-0.001	-0.001
Total Debt	(0.014)	(0.014)	(0.015)	(0.017)	(0.004)	(0.004)	(0.004)	(0.005)
			-0.033	0.067			-0.047	-0.050
Total Debt x			(0.181)	(0.174)			(0.052)	(0.052)
(Δ Log Real Exchange Rate)								
				0.578 ***				0.024
Lagged Dependent Variable				(0.101)				(0.051)
Regression Statistics:								
N	2071	2071	2071	2025	2118	2118	2118	2117
R^2	0.03	0.03	0.03	0.15	0.06	0.07	0.07	0.07

Table 7
Country Decompositions

Each panel presents the results for an individual country. The dependent variables are as indicated above each column. Estimates of the effect of dollar debt x changes in the real exchange rate are reported in each panel. Independent variables in each regression are as in Table 2, Column 5, however reporting of the rest of the estimates is supressed. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The number of observations varies because of data availability. Firm-level independent variables are once-lagged values. All accounting variables are scaled by the lag of total firm assets. The macroeconomic variables (real exchange and CPI) are from the current period. The accounting data are from the Bloomberg/Economatica database, as described in the text. Macro data are drawn from the International Financial Statistics of the IMF. For detailed sources and descriptions, see Section 2.

	(1)	(2)	(3)	(4)
	Dependent Variables:			
	Capital Expenditures		**Inventory Investment**	
Period for dependent variable	(t)	(t+1)	(t)	(t+1)
Independent Variables				
	Panel A: Argentina			
Dollar Debt x	2.961	22.902	0.705	-1.944
(Δ Log Real Exchange Rate)	(15.119)	(42.237)	(0.621)	(7.410)
	Panel B: Brazil			
Dollar Debt x	0.419 **	0.229	0.200 ***	0.157
(Δ Log Real Exchange Rate)	(0.175)	(0.343)	(0.074)	(0.122)
	Panel C: Chile			
Dollar Debt x	0.280	1.087	-0.436	0.565
(Δ Log Real Exchange Rate)	(1.734)	(2.167)	(0.817)	(0.613)
	Panel D: Colombia			
Dollar Debt x	2.045	5.880	0.052	0.696
(Δ Log Real Exchange Rate)	(1.604)	(5.820)	(0.554)	(0.967)
	Panel E: Mexico			
Dollar Debt x	0.317 **	0.305	0.057	0.309 ***
(Δ Log Real Exchange Rate)	(0.156)	(0.382)	(0.105)	(0.099)

Table 8
Controls for Competitiveness

This table reports the OLS estimates of equation (7) in the text. Robust (Huber-White) standard errors are reported in parentheses. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The number of observations varies because of data availability. The dependent variable is as indicated above. Firm-level independent variables are once-lagged values, except for contemporaneous sales and costs. Excluded instruments in Panel C consist of interactions of ISIC2 dummies and export-to-assets ratios with the change in the real exchange rate. (First-order effects of ISIC2 and exports are added in Panel C as included instruments.)

All accounting variables are scaled by the lag of total firm assets. Macroeconomic variables (real exchange rate, sectorial value added, and CPI) are from the current period (i.e., concurrent with the LHS investment variable). The real exchange rate is defined as the nominal exchange rate divided by the domestic CPI. The accounting data are the pooled Bloomberg / Economatica sample, as described in the text. Macro data are drawn from various sources. For detailed sources and descriptions, see Section 2.

	(1)	(2)	(3)	(4)
	Dependent Variables:			
	Capital Expenditures		**Inventory Investment**	
Period for dependent variable:	(t)	(t+1)	(t)	(t+1)
Independent Variables:				
	Panel A : Basic Specification			
Dollar Debt x	0.257 ***	0.292	0.142 ***	0.269 ***
(Δ Log Real Exchange Rate)	(0.098)	(0.203)	(0.049)	(0.064)
	Panel B: Control for Sales and Costs (OLS)			
Dollar Debt x	0.205 **	0.200	0.097 **	0.221 ***
(Δ Log Real Exchange Rate)	(0.097)	(0.198)	(0.047)	(0.061)
Contemporaneous Sales	0.129 ***	0.207 ***	0.113 ***	0.105 ***
	(0.021)	(0.035)	(0.010)	(0.011)
Contemporaneous Costs	-0.112 ***	-0.181 ***	-0.097 ***	-0.095 ***
	(0.022)	(0.036)	(0.011)	(0.011)
	Panel C: Control for Sales and Costs (IV)			
Dollar Debt x	0.217	0.136	0.019	0.236 ***
(Δ Log Real Exchange Rate)	(0.159)	(0.173)	(0.050)	(0.057)
Contemporaneous Sales	0.173 **	0.293 **	0.162 ***	0.168 ***
	(0.074)	(0.132)	(0.025)	(0.025)
Contemporaneous Costs	-0.162 **	-0.270 **	-0.163 ***	-0.168 ***
	(0.075)	(0.135)	(0.026)	(0.025)

Table 9
Determinants of Currency Composition of Debt

This table reports the OLS estimates of equation (10) in the text. Specification also includes (country x year) fixed effects. Standard errors adjusted for clustering by firm are reported in parentheses. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The dependent variable is the fraction of debt denominated in foreign currency. "Full sample" is pooled Bloomberg/Economatica data described in the text. "Sample with ownership data" consists of the Bloomberg sample with nonmissing ownership data. The elasticity of sectorial value added to the real exchange rate was computed using data from 1980 through 1999. The variable on international operations is an indicator constructed by searching in the Bloomberg company profile for references to foreign subsidiaries or other activities abroad. The indicator variable for whether the firm has a parent company was constructed by examining current ownership and the history of large share transactions. This variable is coded as one if firms had a parent company prior to their first appearance in the sample. For detailed sources and descriptions, see Section 2

	Full Sample			Sample with Ownership Data	
Independent Variables	(1)	(2)	(3)	(4)	(5)
Indicators of Sensitivity of Profits to the Real Exchange Rate					
Dummy for Tradeable Sector	0.054 ***		0.045 ***	0.065 ***	0.059 ***
	(0.008)		(0.008)	(0.008)	(0.008)
Elasticity of Own-Sector Value Added to Real Exchange Rate		0.448 ***	0.299 ***		
		(0.076)	(0.047)		
Dummy for International Operations					0.098 ***
					(0.016)
Controls					
Log Assets	0.047 ***	0.042 ***	0.044 ***	0.046 ***	0.043 ***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Dummy if Has Parent Company					-0.021 **
					(0.009)
Regression Statistics					
N	3419	3419	3421	3242	3242
R^2	0.43	0.43	0.43	0.40	0.41

Table 10
Effect of Dollar Debt and Exchange-Rate Movements on Firm Income

This table contains OLS estimates of equation (7) in the text. The dependent variables are as indicated above. Standard errors adjusted for clustering by (country x year) are reported in parentheses. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The dependent variables are as indicated above. Firm-level independent variables are once-lagged values, except as indicated. All accounting variables are scaled by the lag of total firm assets. "Sales" are the firm's sales revenue for the current year. "Earnings" are the firm's current-year earnings before interest, depreciation, and taxes (EBITDA). "Earnings (t+1)" are the firm's EBITDA for the succeeding year. Macroeconomic variables are from the current period. The real exchange rate is defined as the nominal exchange rate divided by the domestic CPI. The accounting data are the pooled Bloomberg/Economatica sample described in the text. Macro data are drawn from various sources, principally International Financial Statistics. For detailed sources and descriptions, see Section 2.

	Dependent Variables					
	Sales	**Earnings**	**Earnings (t+1)**			
Independent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Interaction Effect						
Dollar Debt x	2.616 ***	0.219 **	0.355 ***	0.350 ***	0.331 ***	0.248 ***
(Δ Log Real Exchange Rate)	(0.528)	(0.100)	(0.099)	(0.098)	(0.096)	(0.078)
Main Effects						
Total Debt	0.574 ***	-0.036 ***	-0.045 ***	-0.040 ***	-0.040 ***	-0.021 **
	(0.080)	(0.012)	(0.012)	(0.012)	(0.012)	(0.009)
Dollar Debt	-1.079 ***	-0.004	0.007	0.003	0.006	0.011
	(0.099)	(0.015)	(0.016)	(0.016)	(0.016)	(0.012)
Controls						
Total Debt x	-1.774 ***	-0.045	-0.100	-0.134	-0.141	0.017
(Δ Log Real Exchange Rate)	(0.301)	(0.082)	(0.109)	(0.112)	(0.112)	(0.061)
Fixed-Capital Investment				0.185 ***	0.173 ***	
(period t)				(0.025)	(0.025)	
Inventory Investment					0.126 ***	
(period t)					(0.041)	
Earnings (period t)						0.637 ***
						(0.022)
Regression Statistics						
N	2883	2807	2514	2368	2359	2359
R^2	0.093	0.107	0.096	0.116	0.121	0.121

Table 11
Dollar Debt and Exchange-Rate: Effect on Firm Liabilities

This table contains OLS estimates of equation (7) in the text. The dependent variables, various firm liabilities, are as indicated above. Specification also includes country fixed effects, D Log CPI, the interaction of the two with peso debt, and all relevent main effects. Standard errors adjusted for clustering by (country x year) are reported in parentheses. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The dependent variables are as indicated above. Firm-level independent variables are once-lagged values, except for new issues of debt. All accounting variables are scaled by the lag of total firm assets. Macroeconomic variables are from the current period. The real exchange rate is defined as the nominal exchange rate divided by the domestic CPI. The accounting data are the pooled Bloomberg/Economatica sample described in the text. Macro data are drawn from various sources, principally the International Financial Statistics of the IMF. For detailed sources and descriptions, see Section 2.

	Dependent Variables					
Independent Variables	**Debt Level** (1)	**Debt Level** (2)	**Change in Debt** (3)	**Change in Debt less New Issues** (4)	**Accrued Interest Charges** (5)	**Change in Debt plus Interest** (6)
Interaction Effect						
Dollar Debt x	1.118 ***	1.442 ***	1.118 ***	1.514 ***	0.159	1.280 ***
(Δ Log Real Exchange Rate)	(0.151)	(0.205)	(0.151)	(0.219)	(0.162)	(0.181)
Main Effects						
Peso Debt	1.055 ***	0.972 ***	0.055	-0.042	0.198 ***	0.252 ***
	(0.036)	(0.040)	(0.036)	(0.054)	(0.018)	(0.053)
Dollar Debt	0.870 ***	0.855 ***	-0.130 ***	-0.151 ***	0.111 ***	-0.019
	(0.033)	(0.028)	(0.033)	(0.032)	(0.016)	(0.040)
(Δ Log Real Exchange Rate)	0.038	0.013	0.038	0.005	0.042	0.082
	(0.088)	(0.090)	(0.088)	(0.089)	(0.027)	(0.088)
Controls						
Total Debt x	-0.440 ***	-1.039 ***	-0.440 ***	-1.217 ***	0.111 **	-0.332 **
(Δ Log Real Exchange Rate)	(0.118)	(0.136)	(0.118)	(0.203)	(0.052)	(0.166)
New Issues of Debt		0.684 ***				
		(0.144)				
Regression Statistics						
N	3003	2815	3003	2815	2918	2918
R^2	0.675	0.693	0.041	0.193	0.528	0.098

Table 12
Did Firm Net Worth Actually Decline?

Estimated Changes in Selected Dependent Variables

	Sign of Effect on Net Worth	Estimated Effect of (Dollar Debt times RER)	Source for Estimate
Current Period			
Debt	(-)	1.118	Table 11, Col. 3
Debt Service	(-)	0.159	Table 11, Col. 5
Earnings	(+)	0.219	Table 10, Col. 2
Subtotal		-1.058	
Future Periods			
Earnings (period t+1)	(+)	0.331	Table 10, Col. 5

Table 13
Sample and Aggregate Investment: Selected Episodes

Sample capital expediture is the weigthed % change of capital expenditures for a sample of firms from Bloomberg and Economatica. Gross Fixed Private Capital Formation is from National Account data, published in the WEO. For comparability, firm and aggregate data are deflated by end-of-period CPI. Depreciation is the annual % change of end of the end of period real exchange rate, defined as the nominal local currency/US dollar exchange rate over the domestic CPI.

	Annual % Change	
	Capital Expenditure Sample	Gross Fixed Private Capital Formation
Brazil 1999	-8%	0%
Chile 1999	-19%	-19%
Colombia 1999	68%	-36%
Mexico 1995	-33%	-25%

Appendix B

Each panel presents the results from a different estimator. The dependent variables are as indicated above each column. Estimates of the effect of dollar debt x changes in the real exchange rate and selected independent variables are reported in each panel . Independent variables in each regression are as in Table 4 panels F, G and H, however reporting of the rest of the estimates is supressed. A single asterisk denotes statistical significance at the 90% level of confidence; double, 95%; triple, 99%. The number of observations varies because of data availability. Firm-level independent variables are once-lagged values. All accounting variables are scaled by the lag of total firm assets. The macroeconomic variables (real exchange and CPI) are from the current period. The accounting data are from the Bloomberg/Economatic database, as described in the text. Macro data are drawn from the International Financial Statistics of the IMF. For detailed sources and descriptions, see Section 2.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	OLS w/o LDV				**IV for Lagged Dependent Var.**				**Firm Fixed Effects w/o LDV**			
	Dependent Variables:											
	Capital Expenditures		**Inventory Investment**		**Capital Expenditures**		**Inventory Investment**		**Capital Expenditures**		**Inventory Investment**	
Period for dependent var:	(t)	(t+1)	(t)	(t+1)	(t)	(t+1)	(t)	(t+1)	(t)	(t+1)	(t)	(t+1)
Independent Variables:												
					Panel A: Basic Specification							
Dollar Debt x	0.257	0.292	0.142 **	0.269 ***	0.204	0.206	-0.159	0.326 ***	0.043	0.042	0.057	0.285 ***
(Δ Log Real Exchange Rate)	(0.157)	(0.189)	(0.060)	(0.056)	(0.203)	(0.182)	(0.281)	(0.091)	(0.113)	(0.137)	(0.060)	(0.064)
					Panel B: Firm Size							
Dollar Debt x	0.255	0.188	0.128 *	0.230 ***	0.207	0.105	-0.129	0.273 ***	0.067	-0.097	0.050	0.249 ***
(Δ Log Real Exchange Rate)	(0.176)	(0.175)	(0.067)	(0.056)	(0.233)	(0.178)	(0.213)	(0.090)	(0.125)	(0.111)	(0.065)	(0.061)
Total Assets x	0.001	0.027 *	0.004	0.010 **	-0.001	0.024	-0.004	0.013	-0.008	0.019	0.001	0.006
(Δ Log Real Exchange Rate)	(0.009)	(0.014)	(0.005)	(0.005)	(0.011)	(0.017)	(0.017)	(0.009)	(0.008)	(0.013)	(0.005)	(0.006)
					Panel C: Interactions with Capital Flows							
Dollar Debt x	0.300 *	0.379	0.199 ***	0.235 ***	0.316	0.213	-0.155	0.317 ***	0.125	0.020	0.108	0.260 ***
(Δ Log Real Exchange Rate)	(0.155)	(0.270)	(0.077)	(0.064)	(0.204)	(0.229)	(0.226)	(0.119)	(0.124)	(0.132)	(0.076)	(0.072)
Total Debt x	-0.369	-0.972	-0.340	0.464	-1.395	-0.411	-0.229	0.028	-0.655	-0.487	-0.483	0.453
Net Capital Inflows	(0.690)	(1.165)	(0.381)	(0.321)	(1.222)	(1.332)	(1.282)	(0.783)	(0.670)	(0.790)	(0.382)	(0.343)
Dollar Debt x	0.716	0.897	0.903 *	-0.315	1.583	-0.182	-0.077	-0.131	1.342	-0.524	0.836	-0.193
Net Capital Inflows	(0.774)	(1.661)	(0.518)	(0.417)	(1.286)	(1.625)	(1.123)	(0.775)	(0.817)	(0.982)	(0.566)	(0.486)
					Panel D: Interactions with Banking Sector							
Dollar Debt x	0.293 *	0.400	0.168 ***	0.270 ***	0.246	0.330	-0.118	0.279 ***	0.056	0.034	0.088	0.267 ***
(Δ Log Real Exchange Rate)	(0.168)	(0.271)	(0.061)	(0.062)	(0.217)	(0.257)	(0.260)	(0.094)	(0.121)	(0.164)	(0.058)	(0.069)
Total Debt x	-0.036	0.112	0.116 ***	0.053	-0.104	0.156	0.084	-0.046	-0.006	-0.034	0.079 **	0.001
Δ log Domestic Bank Credit	(0.058)	(0.146)	(0.041)	(0.037)	(0.091)	(0.150)	(0.069)	(0.090)	(0.061)	(0.088)	(0.039)	(0.042)
Dollar Debt x	-0.074	-0.242	-0.175 ***	-0.018	0.005	-0.285	-0.216 **	0.101	-0.031	0.026	-0.149 ***	0.034
Δ log Domestic Bank Credit	(0.069)	(0.243)	(0.057)	(0.046)	(0.103)	(0.248)	(0.094)	(0.111)	(0.070)	(0.121)	(0.049)	(0.053)
					Panel E: Lagged Earnings							
Dollar Debt x	0.279 *	0.292	0.059	0.258 ***	0.220	0.212	-0.244	0.328 ***	0.024	0.034	-0.010	0.271 ***
(Δ Log Real Exchange Rate)	(0.168)	(0.184)	(0.048)	(0.056)	(0.202)	(0.181)	(0.682)	(0.126)	(0.120)	(0.138)	(0.051)	(0.065)
Lagged Earnings x	0.190	-0.162	0.116	-0.255 *	0.148	-0.020	-0.033	-0.317	-0.013	-0.239	0.011	-0.329
(Δ Log Real Exchange Rate)	(0.436)	(0.388)	(0.091)	(0.153)	(0.576)	(0.363)	(0.310)	(0.331)	(0.274)	(0.208)	(0.097)	(0.201)
					Panel F: Maturity vs Currency							
Dollar Debt x	0.292	0.234	0.132 *	0.252 ***	0.250	0.171	-0.105	0.294 ***	0.066	-0.032	0.058	0.272 ***
(Δ Log Real Exchange Rate)	(0.180)	(0.202)	(0.060)	(0.055)	(0.232)	(0.199)	(0.202)	(0.088)	(0.129)	(0.129)	(0.060)	(0.064)
Short Term Debt x	0.170	-0.207	-0.044	-0.064	0.170	-0.146	0.010	-0.140	0.075	-0.297	0.012	-0.040
(Δ Log Real Exchange Rate)	(0.169)	(0.195)	(0.040)	(0.080)	(0.190)	(0.263)	(0.074)	(0.127)	(0.146)	(0.183)	(0.043)	(0.088)

Note: Table continues on next page.

Appendix B (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	OLS w/o LDV				**IV for Lagged Dependent Var.**				**Firm Fixed Effects w/o LDV**			
	Dependent Variables:											
	Capital Expenditures		**Inventory Investment**		**Capital Expenditures**		**Inventory Investment**		**Capital Expenditures**		**Inventory Investment**	
Period for dependent var:	(t)	(t+1)	(t)	(t+1)	(t)	(t+1)	(t)	(t+1)	(t)	(t+1)	(t)	(t+1)
Independent Variables:												
					Panel G: Maturity vs Currency II							
Dollar Debt x	0.356 **	0.348	0.210 ***	0.229 ***	0.401	0.203	-0.086	0.264 **	0.181	-0.033	0.121	0.267 ***
(Δ Log Real Exchange Rate)	(0.179)	(0.301)	(0.073)	(0.065)	(0.227)	(0.267)	(0.157)	(0.109)	(0.142)	(0.135)	(0.077)	(0.073)
Total Debt x	-0.730	-1.738	-0.905	0.247	-2.096	-1.092	-0.903	0.573	-1.410	-1.355	-0.803	-0.061
Net Capital Inflows	(0.851)	(1.518)	(0.469)	(0.427)	(1.366)	(1.509)	(1.461)	(0.676)	(0.995)	(1.037)	(0.486)	(0.500)
Dollar Debt x	0.901	1.142	1.137 **	-0.230	2.088	0.066	0.241	-0.362	1.688 *	-0.385	0.959 *	-0.002
Δ log Domestic Bank Credit	(0.776)	(1.771)	(0.499)	(0.437)	(1.292)	(1.684)	(1.121)	(0.716)	(0.901)	(1.010)	(0.592)	(0.504)
Short Term Debt x	0.239	-0.095 *	0.032	-0.027	0.266	-0.043	0.135	-0.218	0.196	-0.167	0.050	0.030
(Δ Log Real Exchange Rate)	(0.176)	(0.222)	(0.073)	(0.093)	(0.194)	(0.276)	(0.137)	(0.146)	(0.167)	(0.187)	(0.068)	(0.101)
					Panel H: Ownership & Information							
Dollar Debt x	0.208	0.261	0.132 **	0.257 ***	0.159	0.216	-0.236	0.298 ***	0.012	0.032	0.057	0.272 ***
(Δ Log Real Exchange Rate)	(0.155)	(0.202)	(0.064)	(0.055)	(0.207)	(0.201)	(0.356)	(0.091)	(0.116)	(0.146)	(0.062)	(0.064)
I(Has Parent)	0.034	0.115	0.006	-0.006	0.020	0.203 **	-0.052	0.023	-0.032	0.060	0.000	0.002
(Δ Log Real Exchange Rate)	(0.078)	(0.085)	(0.017)	(0.025)	(0.097)	(0.097)	(0.083)	(0.041)	(0.058)	(0.068)	(0.019)	(0.029)
I(Has ADR)	-0.030	0.047	0.014	-0.018	-0.031	0.069	-0.034	-0.041	-0.048	0.003	0.018	-0.028
(Δ Log Real Exchange Rate)	(0.036)	(0.041)	(0.017)	(0.020)	(0.036)	(0.049)	(0.068)	(0.031)	(0.037)	(0.030)	(0.016)	(0.021)
I(Auditor is Bix Six)	0.065 *	0.083 **	0.010	0.062 ***	0.076 **	0.034	-0.046	0.065 **	0.046	0.067 *	-0.002	0.058 ***
(Δ Log Real Exchange Rate)	(0.035)	(0.039)	(0.013)	(0.020)	(0.037)	(0.053)	(0.093)	(0.029)	(0.034)	(0.036)	(0.014)	(0.022)