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Corporate Dollar Debt and Depreciations: All's Well that Ends Well?

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Abstract

This paper explores the effect of depreciations on investment when firms hold foreign currency debt. The paper employs a novel database of stocks of foreign currency bonds issued by seven thousand firms from emerging economies in 2000-2015. The results indicate that currency depreciations exert a significant negative effect on balance sheets. A depreciation of 10 percent is associated with a ratio of capital expenditures to assets of between 0.3 and 0.6 percentage points less for firms with outstanding stocks of foreign currency bonds in the year following the depreciation. This result is robust to different inference techniques and to controlling for a large number of potential confounders.

Keywords: Fixed investment, Bond issuance, Currency mismatch, Balance sheets
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1 Introduction

What are the real effects of currency depreciations? The theoretical answer from standard open economy models is that depreciations should be expansionary, thanks to the increased competitiveness of domestic exporters.[1] In contrast, in models with financial frictions, currency depreciations may be contractionary in the presence of not-fully-hedged foreign currency liabilities.[2] These two opposing forces make it challenging to identify the effect of depreciations. The problem is already complicated because the currency composition of a firm's liabilities likely depends on its operational hedges. This paper uses a novel dataset for a large sample of firms from 15 emerging economies that contains proxies for both the currency composition of their liabilities and their operational hedges to uncover the effect of currency depreciations on firm investment (measured by the ratio of capital expenditures to assets).

The paper provides evidence that currency depreciations significantly reduce capital expenditure when firms hold foreign currency liabilities. The latter is proxied by the stocks of bonds denominated in foreign currency. A depreciation of 10% is associated with a ratio of capital expenditures to assets of between 0.3 and 0.4 percentage points less in the year of the depreciation for firms with previous outstanding stocks of foreign currency bonds vis-à-vis their peers with no such exposure. This negative effect extends to the following year, with investment rates of between 0.5 and 0.6 percentage points less. Given that the average ratio of capital expenditures to assets in the estimating sample is 5.6%, this effect is economically significant. These findings are robust to different identification strategies and inference techniques, as well as controlling for potential confounders including firms' operational hedge in terms of being exporters.

This paper is related to a growing literature on the effects of currency depreciations on macroeconomic outcomes and firm performance. Much of this literature was triggered by the financial

[1]The argument is that the depreciation increases an exporter's competitiveness and raises its marginal profitability of capital, and so exporters have a natural hedge when they hold liabilities denominated in foreign currency. This competitiveness effect should outweigh any deterioration in the firm's balance sheet from unhedged foreign currency exposures. The increase in the marginal profitability of capital stimulates the investment of export-oriented firms, making the depreciation expansionary. See e.g., seminal papers by Fleming (1962) and Mundell (1963).

[2]In these models, firms borrow in foreign currency and the firm's cost of finance depends negatively on its net worth. Frictions exist so that firms cannot borrow more than a fraction of their net worth, as in Bernanke and Gertler (1989) and Bernanke, Gertler and Gilchrist (1999). Because a depreciation increases the debt burden of a firm holding foreign currency debt, it also leads to a deterioration of its balance sheet and an increase in the cost of external finance. A depreciation, thus, ultimately constrains investment and is contractionary. The effect on output feeds back to the exchange rate, further amplifying the shock. This *balance sheet* channel is invoked in the currency crises models of Aghion, Bacchetta and Banerjee (2000, 2001, 2004), Céspedes, Chang and Velasco (2004), Krugman (1999) and Schneider and Tornell (2004). Caballero and Krishnamurthy (2001, 2003) motivate a similar balance sheet effect but by making the firm's debt capacity constrained by its collateral, which in turn depends on the exchange rate.

crises of South East Asian countries in the late 1990s. New models based on firms' balance sheet mismatches helped explain the currency crises suffered by these countries in the absence of large government deficits or fixed exchange rates regimes (see papers cited in footnote 2). In turn, these theoretical explanations of the South East Asian crises triggered empirical papers studying the *balance sheet effects* of firms holding foreign-currency liabilities.

One strand of this literature is country-case studies that individually focus on a given country with available data. The papers that use richer data in terms of operational and financial hedges and currency composition of assets tend to find negative balance sheet effects. However, it is difficult to generalize from country-specific studies because the results critically depend on the granularity and richness of the data, the particular country context, time period and type of firm analysed. A robust, negative and significant balance sheet effect from a depreciation is found in the cases of Argentina (Galiani, Levy-Yeyati and Schargrodsky, 2003), Chile (Cowan, Hansen and Herrera, 2005), Colombia (Barajas, Restrepo, Steiner, Medellín and Pabón, 2016), Hungary (Endrész and Harasztosi, 2014), Mexico (Aguiar, 2005; Martínez and Werner, 2002; Pratap, Lobato and Somuano, 2003), South Korea (Gilchrist and Sim, 2007; Kim, 2016; Kim, Tesar and Zhang, 2015), and Turkey (Kesriyeli, Özmen and Yiğit, 2011, although using sector-level data). No balance sheet effect is found for Brazil (Bonomo, Martins and Pinto, 2003), Chile (Alvarez and Hansen, 2017; Benavente, Johnson and Morande, 2003), Colombia (Echeverry, Fergusson, Steiner and Aguilar, 2003), and Peru (Carranza, Cayo and Galdón-Sánchez, 2003). Note that 14 out of these 16 studies refer to the cases of six Latin American countries or to South Korea. Except for Barajas *et al.* (2016), Endrész and Harasztosi (2014) and Alvarez and Hansen (2017), all studies use data for the 1990s, a period with financial crises in Latin America and South Korea.[3]

There is scant cross-country evidence on how depreciations affect firm investment. The study of Bleakley and Cowan (2008) is the only cross-country study I was able to find using firm-level data on investment and the currency composition of liabilities.[4] They find no balance sheet effects in

[3]Two studies deviate methodologically from the typical approach of obtaining reduced-form estimates of the balance sheet effect taking into account the currency composition of debt and proxies for foreign currency revenue (e.g., export status) and access to foreign capital (e.g., foreign listing; foreign ownership). Pratap and Urrutia (2004) calibrate to Mexican data a partial equilibrium model that includes both a competitiveness and a balance sheet effect for exporting firms, and find that the balance sheet effect dominated during the depreciation after the 1994 crisis. Carranza, Galdón-Sánchez and Gómez-Biscarri (2011) study the implications for aggregate investment of a model in which firms in the tradeable sector (i.e., exporters) may benefit from depreciations. They find that large enough depreciations may be contractionary as the balance sheet effect in the non-tradeable sector dominates any beneficial effect of the depreciation. They further provide *prima facie* evidence of a large-depreciation effect using aggregate country panel data.

[4]The recent study of Kalemli-Ozcan, Kamil and Villegas-Sanchez (2016) explores firm investment after currency crises, but focuses on the narrower question of the differences between foreign-owned exporters vs. domestic exporters. Another related study is the paper by Avdjiev, Bruno, Koch and Shin (2019), which explores the link of firm investment

their sample of up to 480 listed firms in five Latin American countries in the period 1991-1999. They rationalize this by arguing that firms match the currency composition of their liabilities with their ex-ante sensitivity of revenues to shifts in the exchange rate. Thus, firms that export or operate in tradeable sectors are the ones that hold foreign currency liabilities, in which case the competitiveness effect outweighs any deterioration in their balance sheets from the depreciation. They provide evidence that firms financed by foreign currency debt perform better than their counterparts after a depreciation in terms of earnings and investment. As pointed out by Galindo, Panizza and Schiantarelli (2003) when commenting the working paper version of Bleakley and Cowan (2008), these results should be taken with a grain of salt because half of the sample comprises Brazilian firms. Furthermore, and as the authors recognise, their data do not allow operational or financial hedges to be controlled for.

This paper contributes to this literature in four ways. First, it assembles a novel firm-level database on foreign currency debt based on data on the issuance of corporate bonds for the universe of listed firms in 15 emerging economies in the period 2000-2015. In the absence of firm-level data on currency composition of liabilities for a large number of countries, I take advantage of the recent trend across emerging economies of firms increasingly relying on bond markets (Ayala, Nedeljkovic and Saborowski, 2017; Bruno and Shin, 2017; Caballero, Fernández and Park, 2019; Shin, 2014) and compute stocks of bonded debt at the firm level. Although the availability of data restricts the analysis to listed firms, the coverage is an improvement over the existing literature.[5]

Second, inference on the balance sheet effect is for depreciations in the absence of currency or banking crises in the countries of analysis. This is in contrast to most existing papers that use sample periods that include financial crises. The sample used in this paper spans the period 2000-2015, which does not include major crises in emerging economies, apart from the spillovers of the global crisis of 2008-2009. This is important because the mechanism at play may be very different from a balance sheet effect when a large devaluation takes place simultaneously with a banking crisis or when the country faces a sudden stop. For example, Kalemli-Ozcan *et al.* (2016) find that a banking crisis during a currency crisis negatively affects the investment performance of domestic exporters that hold unhedged foreign currency debt, as compared with that of similarly exposed foreign-

and currency depreciations using an industry-level proxy for external financial needs.

[5]The study by Serena and Sousa (2017) also follows the approach of proxying the stocks of foreign currency debt with stocks of foreign currency bonds, but focuses on 1,000 issuing firms. They find that, for these issuers, conditional on the amount of bonds issued in foreign currency, a depreciation is correlated with a reduction in investment. A recent paper by Bruno and Shin (2020) explores how depreciations affect firms' stock returns when firms have issued bonds in U.S. dollars and use the proceeds to increase their cash holdings. They touch on the effects of depreciations and find that larger cash balances are correlated with lower capital expenditures for firms that have issued bonds in U.S. dollars.

owned exporters, while the performance of both types of firm is indistinguishable when only a large devaluation takes place. Similarly, Bleakley and Cowan (2010) find an indistinguishable investment response during sudden stops for firms with relatively higher exposures to short-term debt.

Third, the dataset enables a research design that exploits a set of fixed effects absorbing any country, sector, time, country×time, country×sector, and sector×time factor that may drive firm investment. In the benchmark model, the balance sheet effect is identified using the cross-sectional variation of firm investment within country×sector×time cells, comparing investment by firms with and without outstanding stocks of foreign currency bonds within each cell. I also employ a second identification strategy based on a difference-in-differences design using the market's taper tantrum of 2013 and the ensuing depreciation of emerging market currencies as a semi-natural experiment. In both frameworks I use data on firms' balance sheets, income, and cash flow statements to control for time-varying firm specific factors that may affect investment decisions. Regardless of the framework, the results point to a negative and statistically significant balance sheet effect.

Fourth, I explore the hypothesis put forward by Bleakley and Cowan (2008) of whether firms match their foreign currency liabilities with export activities or financial hedges. I approach this from four different angles. First, I use a triple difference-in-differences (3DiD) design to directly test the matching hypothesis in the panel data. I compare whether exporters that are exposed to foreign currency debt exhibit higher investment rates following a currency depreciation relative to non-exporters with similar exposures. The results indicate that firms do not match their foreign currency liabilities with export activities in the way predicted by the matching hypothesis. In addition, the 3DiD regressions provide further evidence of a negative balance sheet effect for non-exporters. Second, I show that depreciations are not positively correlated with proxies of profitability for firms with larger stocks of foreign currency debt—opposite to the results obtained by Bleakley and Cowan (2008). Third, I run the baseline model without controlling for sectors' sensitivity to exchange rate movements and find no discernible difference of the estimated balance sheet effects with those from the baseline model. This suggests that firms do not match their foreign currency liabilities as predicted by the matching hypothesis. Lastly, I use detailed firm-level data on foreign currency liabilities, exports, and derivatives for three emerging economies to document that (i) a non-trivial mass of firms with foreign currency debt are non-exporters; (ii) firms with foreign currency debt do not match their exposures with financial derivatives; (iii) and the ones that use derivatives do not cover their exposures in any meaningful way that would isolate the firm from detrimental changes in the exchange rate.

The results from panel regressions, the difference-in-differences analysis exploiting the market's taper tantrum of 2013, and the triple difference-in-differences panel regressions comparing exporters and non-exporters provide strong evidence of a negative balance sheet effect of depreciations when firms hold foreign currency liabilities. The contrast with Bleakley and Cowan (2008), the only existing paper using a cross-section of countries, is intriguing. Beyond the small sample size and high concentration of Brazilian firms in Bleakley and Cowan (2008), the different results may be due to the different time periods of analysis. On one hand, the context and sources of foreign-currency financing by emerging markets corporations have significantly changed between the 1990s period studied by Bleakley and Cowan and the more recent period analyzed in this paper. The recent period was characterized by a large differential in interest rates between emerging and advanced economies, with a larger share of total debt issued through domestic and international debt capital markets in detriment to more traditional bank loans.[6] Similarly, Bleakley and Cowan study a sample period marked by currency and banking crises in Latin America. As shown by Kalemli-Ozcan *et al.* (2016), it was the illiquidity of banks that ended up affecting firm investment in Argentina, Brazil, and Mexico in the crises of the 1990s rather than the large devaluations.[7] The different results may also be due to the fact that Bleakley and Cowan did not use data on firms' operational hedges. The current paper, by using proxies for firm export activities and access to foreign financing via foreign listings and foreign investors, obtains results in a cross-country setting that are closer to the data-rich country-case studies in the literature.

2 Corporate Dollar Debt and Depreciations

2.1 Identification Based on Regression Analysis of Panel Data 2000-2015

To estimate the balance sheet effects of currency depreciations on firms' investment I follow the usual approach of the literature, typified by Bleakley and Cowan (2008). In this framework, differences across firms on their capital expenditures rates following a currency depreciation are modeled as a function of the change in the exchange rate and the firm's lagged foreign currency debt.

[6]Related to this, Bruno and Shin (2017) show that firms in emerging economies issued USD bonds when the carry trade was favorable in the 2001-2013 period and used the proceeds to disproportionately accumulate more cash and cash equivalents, suggesting a carry trade motive in issuing foreign currency debt.

[7]Despite the fact that the period of analysis of the current paper was affected by the Global Financial Crisis of 2008/2009 and external financial conditions may have been as affected for some countries as in the crises of the 1990s, the key differentiation is the health of the domestic financial system. Conversely, the results of this paper based on normal times should not be taken as indicative of firms' outcomes during times of crises.

I estimate variations of the following model:

$$y_{i,s,c,t} = \alpha + \theta \text{FXB}_{i,s,c,t-1} + \beta \left(\text{FXB}_{i,s,c,t-1} \times \Delta e_{c,t} \right) + \boldsymbol{\Gamma}' \boldsymbol{X}_{i,s,c,t-1} + \psi_{c,s,t} + \varepsilon_{i,s,c,t} \quad (1)$$

where $y_{i,s,c,t}$ is the capital expenditure of firm i of sector s in country c at year t. Equation 1 includes as determinants of current capital expenditures: the lagged stock of foreign currency debt, $\text{FXB}_{i,s,c,t-1}$, proxied by the outstanding stock of bonds in hard currencies as defined in the Data Appendix; the interaction of $\text{FXB}_{i,s,c,t-1}$ with the annual (log) change in the average exchange rate of country c against the U.S. dollar, $\Delta e_{c,t}$; and a vector of lagged firm-specific time-varying covariates, $\boldsymbol{X}_{i,s,c,t-1}$. The model also includes fixed effects $\psi_{c,s,t}$ for country×sector×time.[8] The only determinants of capital expenditures that are not absorbed by these fixed effects are firm-level specific, which are controlled for in vector $\boldsymbol{X}$ (the main effect of $\Delta e_{c,s,t}$ is absorbed by the $\psi_{c,s,t}$ fixed effect).

Model 1 is akin to a difference-in-differences model. It estimates the effect of depreciations on current capital expenditures by conditioning the effect of the depreciation to depend on the firm's exposure to foreign currency bonds in the previous year. The coefficient of interest is β, and I will refer to this coefficient as *the balance sheet effect*. This coefficient captures the cross-sectional difference within country×sector×time cells in investment of firms with different degrees of exposure to foreign currency debt following a depreciation, conditional on controls $\boldsymbol{X}$. As discussed in the Introduction, the balance sheet effect is negative if the deleterious effects of foreign currency debt dominate the beneficial effects during years in which the domestic currency depreciates. All the firm-level covariates in equation 1 are lagged one period to allay concerns about endogeneity.

The model is estimated using balance sheet data for the unbalanced panel of listed firms described in the Data Appendix. The benchmark model is estimated by ordinary least squares. The baseline results report three sets of standard errors: (i) cluster-robust standard errors at the country-time level, allowing for heteroskedasticity and intragroup correlation within country-time groups; (ii) cluster-robust standard errors at the firm level, allowing for serial correlation of errors within firms across time as suggested by Bertrand, Duflo and Mullainathan (2004); and (iii) standard errors adjusting for two-way clustering in these two dimensions. In all cases, standard errors are obtained using the covariance estimator of Cameron, Gelbach and Miller (2011). The models

[8] In the baseline results I classify firms into sectors according to firms' business classification among eight industries: Basic Materials, Consumer Cyclicals, Consumer Non-Cyclicals, Energy, Health care, Industrials, Technology, Telecommunication Services. The results are qualitatively unchanged if I classify firms according to economic sectors of Commodity, Tradeables, and Non-Tradeables.

are run using the STATA code `REGHDFE` of Correia (2017).

In the baseline model, $\Delta e_{c,t}$ is computed as the log change in the real bilateral exchange rate vis-à-vis the U.S. dollar. This is the nominal exchange rate adjusted by the CPI inflation of the country and of the U.S. Using the real bilateral exchange rate allows to account for the appreciation of domestic assets, and any effect that a depreciation may have on the firm's cost structure via pass-through inflation (alternative estimations are done with the nominal exchange rate).

I first estimate model 1 not including firm-level covariates, and then I include in vector $\boldsymbol{X}_{i,s,c,t-1}$ firms' time-varying variables to control for factors that may be correlated with the investment rate, such as leverage, profitability, tangible assets, interest expense, size, the percentage of foreign ownership, and an indicator whether the firm has exported in the last five years. And I also include a time-invariant indicator that takes the value of one if the firm is listed abroad, zero otherwise. All firm-level, time-varying covariates in equation 1 are scaled by total assets. Ratios and dummy variables enter the equation with no transformation.

Model 1 has a causal interpretation for β under the identifying assumption that, conditional on the lagged level of exposure to foreign currency debt and controls (both covariates and fixed effects), firms within country×sector×time cells do not differ in any other dimensions that are correlated to their rates of capital expenditures ($E_t[\varepsilon_t|\text{FXB}_{t-1}, \boldsymbol{X}_{t-1}, \psi_{c,s,t}] = 0$). In other words, after controlling for covariates and fixed effects, the only meaningful difference between firms in a given country×sector×time cell is the difference in their level of exposure to foreign currency bonds. Another way of thinking about this identifying assumption is that, conditional on controls, FXB can be taken as if randomly assigned. Of course, the stock of foreign currency bonds was not randomly assigned, which is the reason why I control in $\boldsymbol{X}_{t-1}$ for covariates that may be associated with both capital expenditures and foreign currency debt. Failing to control for these factors will lead to an omitted variables bias in the estimated balance sheet effect. In robustness tests, I will report results based on randomization inference techniques, in which inference is done after randomizing the exposure to foreign currency bonds. The results are robust to these checks.

The baseline model does not include firm fixed effects because the question I am interested in exploring is whether firms that have a larger exposure to foreign currency debt have lower investment rates than their peers, which is what is captured by the balance sheet effect in model 1. If the model included firm fixed effects, the identification of the balance sheet effect would come from the within-firm variation in capital expenditures, which answers the different question whether firms with larger foreign currency exposures reduce year-on-year their investment rates more compared to firms less exposed. In other words, I am interested in comparing the *cross-sectional* differences in firms' investment rates within country×sector×time cells, given a currency depreciation and different levels of foreign currency debt among firms, rather than the *change* in investment rates among firms with different degrees of exposures to foreign currency debt. Because the focus is on the cross-sectional differences among firms' investment rates, the controls in vector $\boldsymbol{X}$ also emphasize the determinants of possible differences across firms, rather than the factors driving the dynamics of firms' investment decisions (such as in Hayashi, 1982). A second reason why the preferred baseline model does not include firm-level fixed effects is that within-firm variation in the stock of foreign currency bonds is substantially smaller than the cross-section variation across firms, not only because the typical maturity of these bonds is between 4 and 7 years, but also because there is a relatively small number of issuers in the emerging economies in the sample. Notwithstanding these caveats, in robustness checks I show that the baseline results hold when including firm-level fixed effects, or when saturating the model additionally adding country×year and sector×year fixed effects.

2.1.1 Baseline Results of Regression Analysis of Panel Data 2000-2015

Table 1 presents the baseline results after estimating model 1, for both current and one-year ahead capital expenditures. Columns 1 and 5 present OLS regressions for t and $t+1$ capital expenditures, respectively, including only the lagged level of the stock of foreign currency bonds, its interaction with the change in the exchange rate, and the full set of fixed effects. The table reports the estimated coefficient for the covariate, and a set of three intragroup-robust standard errors is reported below the coefficient: first at the country-time level, then at the firm level, and then two-way clustering for both levels.

The results indicate a negative balance sheet effect of foreign currency debt on firm capital expenditures for both the current and following years. However, the results are stronger, and always statistically significant at the 1% level, for one-year ahead investment. This may be because it takes some time for the effect of a currency depreciation to end up affecting the firm's investment plans. For example, firms may take time deciding whether the effect of the depreciation is temporary or more permanent. Similarly, investment decisions take time, as firms decide how to adjust to new financial and demand conditions.

Controlling for total firm leverage is important, as the investment response of highly leveraged firms may be different when facing a depreciation (see e.g., Céspedes *et al.*, 2004). To control for this, in columns 2 and 6 the model is estimated including the overall level of leverage, proxied by the ratio of liabilities to assets. This variable enters the model by itself and is interacted with the change in the exchange rate to allow for differences in investment behavior of more leveraged firms in years following a currency depreciation. Both the magnitude and statistical significance of the balance sheet effect are similar to the baseline specification. The other estimated coefficients are in line with expectations from theory and common sense. Higher foreign currency liabilities in the previous year are positively associated with current capital expenditures given no change in the exchange rate (this is the θ coefficient in model 1), while higher levels of leverage are associated with lower levels of firm investment.[9]

In columns 3-4 and 7-8 I estimate the same specifications but this time defining the variable for exposure to foreign currency bonds as a dummy indicator that equals one if the ratio of foreign currency bonds to assets is above the 25^{th} percentile of its distribution. While using a dummy indicator may reduce variation in the levels of exposure to foreign currency debt, it offers a more straightforward interpretation of the magnitude of the balance sheet effect. Since Δe_t is in log changes, the magnitude of the balance sheet effect indicates that a depreciation of 10% is associated with a ratio of capital expenditures to assets in year t about 0.4 percentage points lower for firms with exposure to outstanding stocks of foreign currency bonds compared to firms with no such stocks. The effect the following year is much stronger, with a 10% currency depreciation in year t being associated with an average investment rate in year $t+1$ about 0.6 percentage points lower for firms with exposure to foreign currency bonds.[10] As discussed later in Section 3, because firms that issue foreign currency bonds also tend to acquire bank loans in foreign currency, the true size of their foreign currency debt may be underestimated in the baseline results, and hence the estimated coefficient may be biased upwards.[11]

These baseline results indicate that firms with larger stocks of foreign currency debt invest less following a depreciation of the domestic currency. This is in contrast with the findings of Bleakley and Cowan (2008), which found no balance sheet effects during the late 1990s in their sample of Latin American firms. As discussed in the Introduction, the different results may be due to the

[9]The effect of leverage is given by the linear combination of the two coefficients, the main effect and the interaction with Δe_t, which is not reported in the table. The results are similar if, instead of measuring leverage by the ratio of liabilities to assets, it is proxied by the ratio of debt to equity. Results are available upon request.

[10]As a reference, the average ratio of capital expenditures to assets in the working sample is 5.6%. In unreported results, I found that the magnitude of the effect is similar if the exposure variable is defined using other percentiles of the distribution, such as 20 or 30.

[11]However, to the extent that stocks of foreign currency bonds are positively correlated with foreign currency assets or other operational and financial hedges, the estimated coefficient may be biased downwards, as the true balance sheet exposure to foreign currency movements is overstated by the stocks of foreign currency bonds.

Table 1: Baseline results

This table reports a set of firm-level OLS regressions in which the dependent variable is the ratio of capital expenditures to assets. In columns 1-4 the dependent variable is defined for year t and in columns 5-8 for year $t+1$. In columns 1 and 4, the explanatory variables are the lagged stock of foreign currency bonds scaled by assets (FXB_{t-1}), interacted with the log change of the exchange rate against the U.S. dollar. Columns 2 and 6 add firm leverage, proxied by the ratio of liabilities to assets, interacted with the change in the exchange rate. Columns 3-4 and 7-8 replicate columns 1-2 and 5-6 but using as explanatory variable FXB_{t-1} defined as a dummy indicator that equals one if the ratio of foreign currency bonds to assets is above the 25^{th} percentile of its distribution. All regressions include a constant; although it is not reported. All firm-level covariates enter with their values set at time $t-1$. All regressions include country×sector×time fixed effects. Three sets of intragroup-robust standard errors are reported in parenthesis: first at the country-time level, then at the firm level, and then two-way clustering for both levels. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

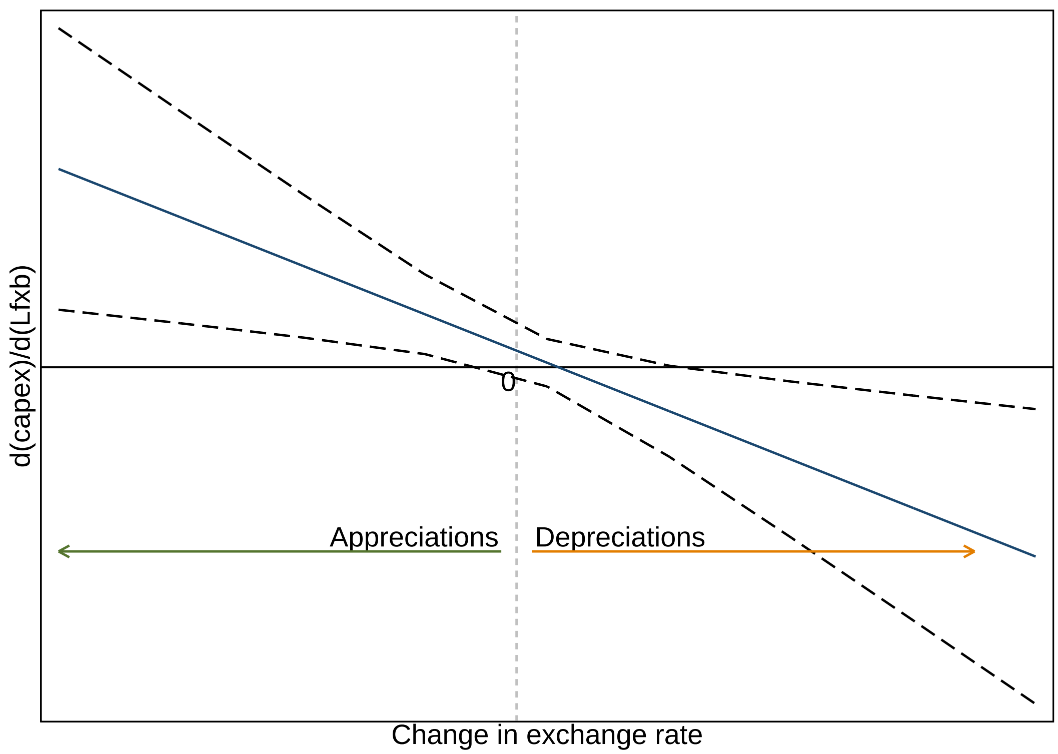
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Capex_t$				$Capex_{t+1}$			
	Scaled by assets		I[FXB=1,0]		Scaled by assets		I[FXB=1,0]	
$FXB_{t-1} \times \triangle e_t$	-0.249	-0.244	-0.044	-0.043	-0.326	-0.322	-0.062	-0.060
	(0.133)*	(0.133)*	(0.032)	(0.032)	(0.119)***	(0.118)***	(0.024)***	(0.024)**
	(0.092)***	(0.092)***	(0.019)**	(0.019)**	(0.092)***	(0.091)***	(0.018)***	(0.018)***
	(0.140)*	(0.139)*	(0.032)	(0.032)	(0.122)***	(0.121)***	(0.023)***	(0.023)***
FXB_{t-1}	0.040	0.042	0.008	0.009	0.023	0.024	0.005	0.005
	(0.020)**	(0.020)**	(0.004)**	(0.004)**	(0.013)*	(0.013)*	(0.003)*	(0.003)**
	(0.014)***	(0.014)***	(0.003)***	(0.003)***	(0.013)*	(0.013)*	(0.003)*	(0.003)*
	(0.023)*	(0.023)*	(0.005)*	(0.005)*	(0.017)	(0.017)	(0.003)	(0.003)
$Leverage_{t-1} \times \triangle e_t$		-0.012		-0.012		-0.011		-0.012
		(0.012)		(0.012)		(0.009)		(0.009)
		(0.008)		(0.008)		(0.005)**		(0.005)**
		(0.013)		(0.013)		(0.008)		(0.008)
$Leverage_{t-1}$		-0.006		-0.006		-0.005		-0.005
		(0.001)***		(0.001)***		(0.001)***		(0.001)***
		(0.001)***		(0.001)***		(0.001)***		(0.001)***
		(0.002)***		(0.002)***		(0.001)***		(0.001)***
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	72,419	72,407	72,419	72,407	65,514	65,502	65,514	65,502
Adj./Pseudo R^2	0.088	0.089	0.088	0.089	0.084	0.085	0.084	0.085

different samples of analysis or to methodological differences, with the current study using a much richer set of fixed effects.

As a further exploration on how a larger exposure to foreign currency debt is associated to lower firm investment conditional on a currency depreciation, Figure 1 presents the results of how the marginal effect of FXB on one-year ahead capital expenditures varies along different levels of currency depreciation. The effect is only present when there are *large* currency depreciations. The estimated marginal effects are zero for small depreciations. Indeed, during currency appreciations the estimated marginal effects are positive, which makes sense as these are periods in which the burden of foreign currency debt shrinks.

Figure 1: Marginal Effect of Stocks of Foreign Currency Debt on One-Year Ahead Capital Expenditures

This figure plots how the sensitivity of the relationship between stocks of foreign currency bonds and one-year ahead firm capital expenditures to changes in the exchange rate. The plot uses the model of Column 5 of Table 1. The solid line plots the main effect and the dashed lines are 95% confidence intervals, based on two-way intragroup correlation-robust standard errors at the country-time and at the firm levels.



2.1.2 Possible omitted variables

Because firms financed by foreign currency bonds may differ from firms with no such debt along dimensions other than the currency composition of their debt, failing to control for these factors will lead to omitted-variables bias in the estimated balance sheet effect. Therefore, I estimate the model including a vector $\boldsymbol{X}_{t-1}$ of plausible omitted covariates. The possible bias can only stem from omitted firm-specific variables, as the set of fixed effects in the regressions absorbs all the effects of country-, year-, and sector-specific shocks that may affect firms' investment, such as credit conditions, monetary policies, sector tradeability, global shocks, and fluctuations in commodity prices. Besides the inclusion of leverage as in Table 1, in these regressions I include proxies for:

An additional measure of leverage: An alternative measure of leverage used in the corporate finance literature is the ratio of debt to equity. I compute this measure as the ratio of total debt to total equity, with the latter calculated as the sum of common and preferred stocks.

Maturity of debt: The adjustment of investment plans that a firm may be forced to do when facing a depreciation may depend on the maturity of its debt. For example, if a firm with a given level of foreign currency debt is frequently rolling over its debt, it will suffer comparatively more following a currency depreciation than a firm with a longer maturity structure. To control for this, I include in the model the ratio of short term debt to total debt.

Firm performance/profitability: The past performance of the firm may be a key determinant of how the firm adapts to a depreciating currency. Firms with better performance may have a higher capacity to generate internal funds, which is expected to have a positive effect on investment. I control for two proxies of firm performance: the ratio of earnings before interest and taxes (EBIT) to total assets, and the operating profit margin, which is measured as the ratio of operating income to sales.

Interest expense: A firm with exposure to foreign currency debt may adapt to more challenging financial conditions following a currency depreciation depending on how heavy is the burden to serve its debt. Firms already dedicating a big chunk of their earnings to debt service may reduce investment more heavily if the currency depreciation means a larger interest expense. To control for this, I introduce in the regression the ratio of earnings (EBIT) to interest expense on debt (this ratio is also known as the interest coverage ratio).

Cash and short term investments: Firms' cash holdings may determine how they adjust to a currency depreciation along different margins. As shown by Bruno and Shin (2017), firms from emerging economies that issue bonds in hard currencies tend to have larger amounts of cash, and following issuance tend to keep a non-negligible portion of the proceeds as cash and short-term investments. Facing a depreciation, firms with larger piles of cash may adjust differently than firms with lower holdings of cash, with the ones also with larger stocks of foreign currency debt using their cash at hand to reduce their liabilities. Accordingly, the regression includes the lagged ratio of cash and short-term investments to total assets.

Fixed/Tangible assets: A key determinant of the level of firm capital expenditures, which is measured as funds used to acquire fixed assets, may be the importance of tangible or fixed assets in the balance sheet (which in turn are measured as the value of property, plant, and equipment). Not only firms with higher ratios of fixed assets to total assets may systematically exhibit a higher level of investment, but they may also respond differently to a currency depreciation. Therefore, I control for the ratio of tangible or fixed assets to total assets.

Size: Larger firms may have better access to finance, and hence react differently to a currency depreciation. I control for a size variable that normalizes the size of a firm in a given country to vary from 0 to 1, based on the firm's market capitalization as of end of 2012.

Operational hedges: Firms facing a depreciation may adjust differently depending on how exposed they are to foreign markets. Exporters will enjoy a competitiveness gain, at least to the extent costlier imports do not offset the gains from a depreciated currency. Similarly, firms with access to foreign capital may adjust differently. To control for these dimensions, I include three controls in the regression: The percentage of foreign ownership of the firm stocks, and dummy indicators that take the value of one if the firm is an exporter and if the firm has a foreign listing.

Table 2 presents the results of estimating the benchmark OLS model including all these potential omitted variables. The table presents the results dividing the variables in two groups (i) firm strength and performance, including proxies for leverage, debt maturity, performance, profitability, interest expense, cash holdings, size, and importance of tangible assets; and (ii) operational hedges, including foreign ownership, exporter status, and foreign listing. The variables enter in the models by themselves and interacted with the change in the exchange rate, so that the models are flexible and allow for differences in investment behavior of firms in years following a currency depreciation along the dimensions captured by the variables. To reduce clutter, the table only shows coefficients only for the β coefficient, which is the coefficient of interest. Columns 1-4 present the results for capital expenditures at t and columns 5-8 at $t+1$. In both cases, the results are presented both with the stocks of foreign currency bonds scaled by assets and using an indicator variable taking the value of one if the ratio of foreign currency bonds to assets is above the 25^{th} percentile of its distribution. As in the baseline results, the table shows results with three different levels of clustering of the errors (country-time, firm, and two-way).

The results show a negative balance sheet effect, although of a somewhat smaller magnitude than in the baseline results, and statistically significant at the 1% or 5% levels mainly for one-year ahead investment. Based on column 8, the results indicate that a currency depreciation of 10% is associated with a ratio of capital expenditures to assets the following year about 0.5 percentage points lower for firms with outstanding stocks of foreign currency bonds.

Table 2: Controlling for potential omitted variables

This table reports a set of firm-level regressions in which the dependent variable is the ratio of capital expenditures to assets and the explanatory variable of interest is the lagged stock of foreign currency bonds (FXB_{t-1}) interacted with the log change of the exchange rate against the U.S. dollar. In columns 1-4 the dependent variable is capital expenditures at year t and in columns 5-8 it is for year $t+1$. In columns 1-2 and 5-6, FXB_{t-1} is measured by the stock of foreign currency bonds scaled by assets, while in columns 3-4 and 6-7 it is a dummy indicator that takes the value of one if FXB$\geq 25^{th}$ percentile. Odd-numbered columns additionally introduce controls for firm strength and performance, including proxies for leverage, debt maturity, performance, profitability, interest expense, cash holdings, size, and importance of tangible assets. Even-numbered columns add controls for firms' operational hedges, including foreign ownership, exporter status, and foreign listing. All regressions include a constant and the interaction of the covariates with the change in the exchange rate; although these are not reported. All firm-level covariates enter with their values set at time $t-1$. All regressions include country×sector×time fixed effects. Three sets of intragroup-robust standard errors are reported in parenthesis: first at the country-time level, then at the firm level, and then two-way clustering for both levels. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Capex_t$				$Capex_{t+1}$			
	Scaled by assets		I[FXB=1,0]		Scaled by assets		I[FXB=1,0]	
$FXB_{t-1} \times \triangle e_t$	-0.184	-0.179	-0.028	-0.027	-0.270	-0.268	-0.047	-0.047
	(0.136)	(0.140)	(0.033)	(0.033)	(0.116)**	(0.119)**	(0.024)**	(0.024)**
	(0.089)**	(0.088)**	(0.018)	(0.018)	(0.090)***	(0.090)***	(0.018)***	(0.018)***
	(0.140)	(0.144)	(0.033)	(0.034)	(0.119)**	(0.121)**	(0.023)**	(0.023)**
Included controls in $\mathbf{X}_{t-1}$:								
Firm strength and performance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Operational hedges	No	Yes	No	Yes	No	Yes	No	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	61,830	61,830	61,830	61,830	55,980	55,980	55,980	55,980
Adj./Pseudo R^2	0.179	0.180	0.179	0.180	0.157	0.157	0.157	0.157

2.2 Identification Based on Difference-in-Differences: Market's Taper Tantrum of 2013 as a Natural Experiment

The evidence presented so far on the negative balance sheet effect of currency depreciations is based on estimating a regression on a panel of firms for the period 2000-2015. In the absence of external variation on the exposure to foreign currency bonds, identification assumes that, conditional on the variables controlled for in the model, firms do not differ in any other dimensions that are correlated to their level of capital expenditures and stocks of foreign currency bonds. As noted above, we do not know the right covariates that we need to control for. Hence, an alternative identification strategy may add credibility to the finding of a negative balance sheet effect.

In this section, I exploit the currency depreciations that took place in emerging markets during 2013-2014, mostly as a response to a surprise announcement on monetary policy in the U.S., to study the balance sheet effect in a difference-in-differences (DD) framework. I use the sharp depreciations that took place in some countries as a natural experiment to compare the capital expenditures during 2012 with those of 2014 of firms with outstanding stocks of foreign currency bonds as of end-of-December 2012 and firms with no such stocks.[12]

As shown in Figure OA.1 in the Online Appendix, exchange rates in many of the countries studied in this section depreciated quite sharply during 2013 and 2014. The changes in the exchange rates vary in their intensity, with countries such as Brazil, Colombia and South Africa with accumulated depreciations of over 30% between 2012 and 2014, and countries with milder depreciations, such as Mexico and The Philippines. Most countries observed sharp currency depreciations after May 2013, when the chairman of the U.S. Federal Reserve signaled the possibility of a rise in U.S. interest rates. Financial markets across the world reacted sharply to this announcement, and a posterior announcement in September 2014, and the end result was depreciating currencies in most emerging markets, particularly of commodity exporters. Developments in currency markets were not only the response to the possibility of tightening U.S. monetary policy, but also reflected other global factors at play, particularly a concurrent fall in commodity prices. Importantly, the reaction of exchange rates in emerging economies to the tapering event was sharp and surprised financial markets. According to Eichengreen and Gupta (2015) the extent by which exchange rates reacted in each country was related more to the depth of its financial market and how integrated to global financial markets, rather than country fundamentals.

In most countries, the currency depreciations during 2013-2014 were accompanied by changes in firm-level capital expenditures in which the typical firm with exposure to foreign currency bonds in 2012 reduced its capital expenditures in 2014 *relatively* more than the typical firm with no such exposure. Figure 2 plots these differences in differences in capital expenditures between the two groups of firms within each country, sorting the countries by the degree of the real currency depreciation between 2012 and 2014. The plot shows the difference in differences for the median firm, the average firm, and by comparing each firm with exposure to foreign currency debt in 2012 with its closest four matches.[13] The figure makes evident a larger difference-in-differences effect in capi-

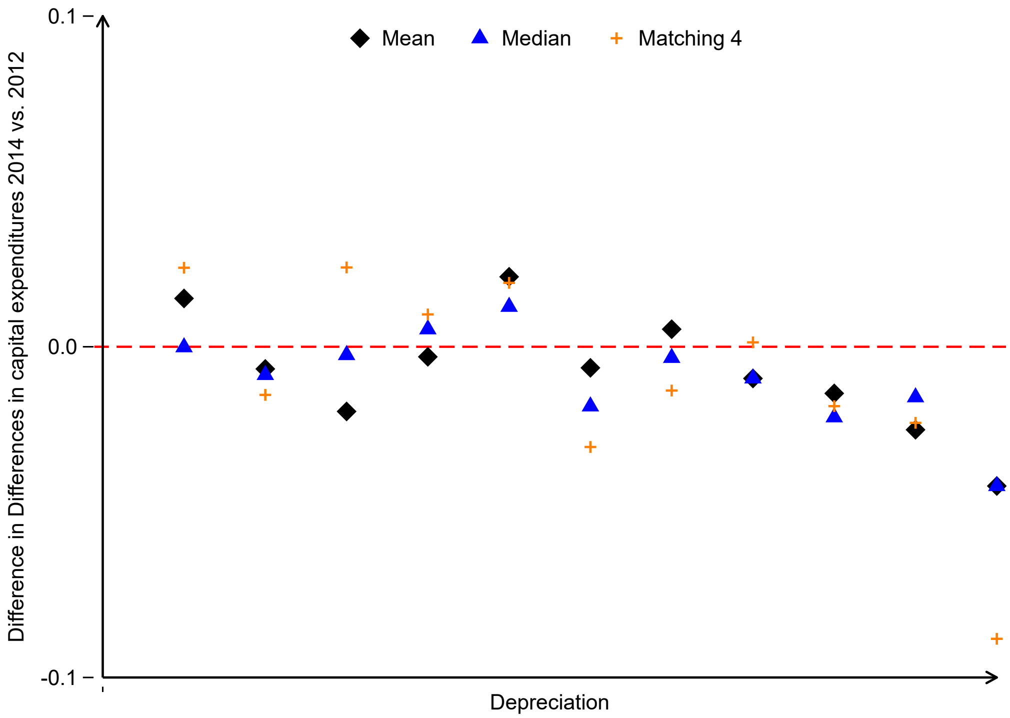
[12]I included as exposed firms all firms with outstanding foreign currency bonds as of Dec-31-2012 and firms that issued bonds denominated in foreign currency during the first five months of 2013, period in which most currencies were stable. This results in a sample of exposed firms from 11 countries. Note the difference with the 15 economies studied in Section 2.1. This is because no firm from India, Israel, Malaysia, or Thailand in my working sample reports outstanding stocks of foreign currency bonds as of Dec-31-2012. Since the comparisons in this section are done within countries, I focus on the sample of countries that have both groups of firms (exposed and non-exposed to foreign currency bonds).

[13]This is implemented using the matching estimator of Abadie, Drukker, Herr and Imbens (2004) and Abadie and Imbens (2006), which performs matching with replacement and is based on the nearest-neighbor (Mahalanobis) metric. I

tal expenditures in the countries that experienced larger depreciations. This is *prima facie* evidence of a negative balance sheet effect of financing by foreign currency bonds in 2012, just before the currency depreciated as response to external events.

Figure 2: Average Changes in Capital Expenditures 2014 vs. 2012

This figure shows the difference in average changes in capital expenditures between 2012 and 2014 for firms exposed to foreign currency bonds as of end of 2012 and firms that had no such bonds.



The analysis above motivates a more formal difference-in-differences analysis for the 2014-2012 difference in capital expenditures between the two groups of firms, taking into account the intensity of the depreciation between 2012 and 2014. The advantage of the difference-in-differences estimator is that it will provide an unbiased estimate of the balance sheet effect by controlling for any permanent difference between firms exposed to foreign currency debt and those non-exposed, and any common trend affecting both groups of firms. To this end, I estimate variations of the following DD model in the two cross-sections of 2012 and 2014:

$$y_{i,s,c,t} = \alpha + \psi_i + \gamma T_t + \delta \left(T_t \times \text{FXB}_i^{12} \right) + \xi_{i,s,c,t} \tag{2}$$

match firms within each country based on size and leverage as of year 2012, and implement the bias correction suggested in Abadie and Imbens (2011).

where $y_{i,s,c,t}$ is the level of capital expenditures of firm i from sector s and country c in $t = \{2012, 2014\}$, T_t is a dummy indicator that takes the value of one if the observation is in 2014 and zero for 2012, and FXB_i^{12} is a dummy indicator that takes the value of one if the firm had outstanding stocks of foreign currency bonds at the end of 2012. ψ_i is a firm-level fixed effect that absorbs any time-invariant firm characteristic, including the main effect of FXB_i^{12}. Controlling for T_t controls for trends common to both groups of firms between 2012-2014. The variation that remains is the change in capital expenditures experienced by firms exposed to foreign currency bonds in 2012 relative to the change in capital expenditures experienced by non-exposed firms. This variation is captured by δ, which is the DD estimate and the coefficient of interest.

I also estimate the DD model allowing for the intensity of the depreciation between 2012-2014, by estimating:

$$\begin{aligned} y_{i,s,c,t} =& \alpha + \psi_i + \gamma T_t + \tilde{\delta}\left(T_t \times \text{FXB}_i^{12}\right) + \phi\left(T_t \times \Delta e_c^{14-12}\right) \\ & + \varphi \Delta e_c^{14-12} + \lambda\left(T_t \times \text{FXB}_i^{12} \times \Delta e_c^{14-12}\right) + \varepsilon_{i,s,c,t} \end{aligned} \tag{3}$$

where Δe_c^{14-12} is the depreciation of the real bilateral exchange rate of country c against the U.S. dollar between 2012 and 2014. In this specification the coefficient of interest is λ, which tells us how the balance sheet effect is affected by the intensity of the depreciation.[14]

In expanded models of 2 and 3 I also control for the interactions of T_t with both country and sector fixed effects, and their interaction, to allow for more flexible specifications in which countries and sectors reacted differently in the post period. In alternative models I also include a vector $\boldsymbol{X}_i^{12}$ of firm-level controls of pre-determined variables, which may increase precision of the DD estimate. I include proxies for leverage, size, profitability, cash holdings, tangible assets, export status, and the stock of foreign currency bonds maturing in 2013-2014 scaled by 2012 assets.[15]

The results of estimating these DD models indicate strong negative balance sheet effects of the depreciations between 2013-2014. Table 3 reports the results. Column 1 starts by estimating equation 2, the bare bones model with no fixed effects and no intensity of the depreciation. Column 2 adds the full set of country, sector, and country×sector fixed effects interacted with T_t. Column

[14]Identification of δ in equation 2 and of λ in equation 3 hinges on a common trends assumption between firms exposed to foreign currency bonds in 2012 and non-exposed firms (Imbens and Wooldridge, 2009). Figure OA.8 in the Online Appendix explores this assumption graphically, showing average capital expenditures scaled by assets for the two groups. Similar trends for both groups are evident until 2012 and following 2013 the trends diverge. This suggests that the two groups of firms would likely have shared the same trends in firm investment in the absence of the sharp depreciations of 2013-2014.

[15]The set of controls is guided by the findings in section 2.1.1 and the robustness tests in section 5.

3 adds the vector of pre-determined firm-level controls $\boldsymbol{X}_i^{12}$. Columns 4-6 estimate equation 3, interacting the balance sheet effect with the intensity of the depreciation. In the models of columns 1-6 the exposure of foreign currency bonds in 2012 (FXB_i^{12}) is defined as a dummy variable that takes the value of one if there are any outstanding bonds at end of 2012. Columns 7-9 replicate columns 4-6 but defining the exposure to foreign currency bonds as a dummy indicator that equals one if the ratio of foreign currency bonds to assets at the end of 2012 was above the 25^{th} percentile. The results from column 6 suggest that a 10% depreciation in 2013-2014 was associated with capital expenditures about 9% lower for firms with outstanding stocks of foreign currency bonds at the end of 2012. Results from column 9 indicate that the larger the stocks of foreign currency bonds, relative to 2012 assets, the larger the deleterious effect of the currency depreciation.

Table 3: Difference in differences estimate, 2012 pre, 2014 post

This table reports difference in differences regressions in which the dependent variable is the ratio of capital expenditures to assets. In columns 1-6, the exposure proxy for foreign currency bonds, FXB, is a dummy indicator that takes the value of 1 if the firm had any outstanding bond at the end of 2012; in columns 7-9 it is a dummy indicator that takes the value of one if the outstanding stocks scaled by 2012 assets were above the 25^{th} percentile. Columns 1-3 estimate equation 2, with the exposure variable interacted with a dummy T that takes the value of 1 for year 2014. Models in columns 4-9 estimate equation 3, adding the interaction with the change in the real exchange rate between 2012-2014. The models are estimated introducing the fixed effects described in the table, and alternatively adding $\boldsymbol{X}_i^{12}$ a set of pre-determined firm-level controls for leverage, profitability, cash holdings, tangible assets, size, export status, and the stock of foreign currency bonds maturing in 2013-2014 scaled by 2012 assets. All regressions include a constant; although it is not reported. Intragroup correlation-robust standard errors at the sector level are reported in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	I[FXB=1] if FXB>0						I[FXB=1] if FXB$\geq 25^{th}$ percentile		
$T \times$ FXB	-0.005	-0.004	-0.008						
	(0.002)**	(0.000)***	(0.003)***						
$T \times$ FXB $\times \Delta e$				-0.165	-0.103	-0.089	-0.240	-0.202	-0.159
				(0.046)***	(0.061)*	(0.039)**	(0.049)***	(0.058)***	(0.050)***
Fixed effects interacted with T?									
Country-Sector FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Sector FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Country FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Including $\boldsymbol{X}_i^{12}$?	No	No	Yes	No	No	Yes	No	No	Yes
Obs	2,699	2,699	2,674	2,699	2,699	2,674	2,695	2,695	2,670
Adj. R^2	0.001	0.036	0.069	0.004	0.036	0.069	0.004	0.037	0.069

As a robustness check of these findings, I replicate the analysis but for years 2012 and 2010. Figure OA.9 in the Online Appendix replicates Figure 2, and Table OA.7 in the Online Appendix replicates Table 3. The results of these placebo tests, showing non-significant differences in the changes in firm investment during the two periods, strongly indicate that the results of the DD analysis above are not a fluke of the data, and indeed reflect the effects of the depreciations that took place in 2013.

3 Do firms match and/or hedge their foreign currency debt?

The finding of a negative balance sheet effect of currency depreciations documented in this paper contradicts the results of Bleakley and Cowan (2008), who find no significant balance sheet effect in a sample of five Latin American countries in the crises of the late 1990s. The authors rationalize their findings by proposing that firms match their foreign currency liabilities with foreign currency revenues and when faced with a currency depreciation the competitiveness effect dominates the negative effect of higher foreign currency debt in their balance sheets. In this section I explore this hypothesis in four different ways. First, I use a triple difference-in-differences strategy to study whether exporters that are exposed to foreign currency debt exhibit higher investment rates following a currency depreciation relative to non-exporters with similar exposures, as it would be expected if firms actually hedge their foreign currency exposures. Second, I explore how currency depreciations impact current and future earnings of firms with foreign currency debt exposures. Third, I run the baseline model without controlling for sectors' sensitivity to exchange rate movements and compare the estimated balance sheet effects with those obtained from the baseline model. Fourth, using additional microdata for three emerging economies I explore the usage of financial derivatives in these economies.

3.1 Bringing the Matching Hypothesis to the data: Performance of Exporters vs. Non-Exporters and Foreign Currency Debt

If the hypothesis that firms effectively match or hedge their foreign currency liabilities is true, it also must be true that following a currency depreciation exporters with foreign currency exposure *increase* their investment relative to non-exporters with foreign currency debt. This hypothesis can be tested by estimating the following triple difference-in-differences model:

$$\begin{aligned} y_{i,s,c,t} = &\alpha + \delta_0 \text{FXB}_{i,s,c,t-1} + \delta_1 \text{EXP}_{i,s,c,t-1} + \delta_2 \left(\text{FXB}_{i,s,c,t-1} \times \text{EXP}_{i,s,c,t-1}\right) \\ &+ \delta_3 \left(\text{FXB}_{i,s,c,t-1} \times \Delta e_{c,t}\right) + \delta_4 \left(\text{EXP}_{i,s,c,t-1} \times \Delta e_{c,t}\right) \\ &+ \delta_5 \left(\text{FXB}_{i,s,c,t-1} \times \Delta e_{c,t} \times \text{EXP}_{i,s,c,t-1}\right) \\ &+ \psi_{i,s,c,t} + \zeta_{i,s,c,t} \end{aligned} \tag{4}$$

which is the expanded model of equation 1 adding the interactions of all variables with a dummy indicator that takes the value of one if the firm is an exporter as of time $t-1$ ($\text{EXP}_{i,s,c,t-1}$). As before, a firm is classified as exporter if it has recorded positive exports in the last five years (including period t). The coefficient of interest is δ_5, which captures the investment of exporters with exposures to foreign currency debt relative to those non-exporters with exposures to foreign currency debt. If firms matched their currency liabilities effectively with income streams that benefit from a depreciation, δ_5 must be unambiguously positive as exporters with matched currency exposures should increase their capital expenditures relative to non-exporters with matched currency exposures. On the other hand, because for non-exporters with exposure to foreign currency debt the balance sheet effect is expected to dominate following a depreciation, δ_3 should be negative. Similarly, for exporters with no exposure to foreign currency debt the competitiveness effect following the depreciation should dominate, hence δ_4 should be positive. The regression includes country$\times$sector$\times$year fixed effects that absorb all non-firm specific factors that affect firm investment, including the main effect of $\Delta e_{c,t}$.

The results of estimating the triple difference-in-differences model of equation 4 are presented in Table 4. Columns 1-4 show results of estimating equation 4 for current capital expenditures, and columns 5-8 for one-year-ahead capital expenditures. The table shows results for models with FXB scaled by assets, or as a dummy variable when the stock of foreign currency bonds is above the 25^{th} percentile of its distribution. The table also shows results for estimating the model defining a depreciation as a dummy variable that takes the value of one if the bilateral real exchange rate vis-à-vis the U.S. dollar depreciated more than 10%.[16] The sign of δ_3 is consistently as expected, negative, and statistically significant for one-year-ahead investment. This is further evidence of a balance sheet effect.[17] The sign of δ_4 is also always positive as expected, although only statistically significant for large depreciations (10% and above). Interestingly, in no occasion δ_5 is estimated positive and statistically significant, which indicates that we cannot reject the hypothesis that firms do not match, at least effectively, their foreign currency exposures.

3.2 Depreciations and Earnings

Bleakley and Cowan (2008) partially based their argument about matching of liabilities with income streams on regressions of earnings, following a similar model as in equation 1 but with oper-

[16]The table reports three sets of standard errors. Robust to heteroskedasticity and intragroup correlation within country-time and across firms, within firms and across time, and two-way clustering in these two dimensions.

[17]The size of the estimated balance sheet effect (δ_3) halves compared to the baseline results in Table 1, but it is still negative and statistically significant. The different in magnitude from the triple difference-in-difference estimate comes from the comparison of exporters with foreign currency debt vis-à-vis non-exporters with foreign currency debt. Given that exporters would enjoy some competitiveness gains from the depreciation, it makes sense for this effect to be smaller than the average effect from the baseline results.

Table 4: Triple Difference-in-Differences

This table reports a set of firm-level regressions in which the dependent variable is either current investment ($CAPEX_t$) or one-year-ahead investment ($CAPEX_{t+1}$). The explanatory variables include the lagged stock of foreign currency bonds (FXB_{t-1}), a dummy indicator for export status as (EXP_{t-1}), and their interactions between them and the change of the real bilateral exchange rate against the U.S. dollar (Δe_t). In columns 1-2 and 5-6, FXB_{t-1} is measured by the stock of foreign currency bonds scaled by assets, while in columns 3-4 and 7-8 it is a dummy indicator that takes the value of one if FXB$\geq$ 25^{th} percentile. In even columns the change in the exchange rate is measured as the log change, while in odds columns it is a dummy indicator that takes the value of 1 if the change in the exchange rate is above 10%. All regressions include a constant; although it is not reported. All regressions include country×sector×time fixed effects. Three sets of intragroup-robust standard errors are reported in parenthesis: first at the country-time level, then at the firm level, and then two-way clustering for both levels. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Capex_t$				$Capex_{t+1}$			
	Scaled by assets		I[FXB=1, 0]		Scaled by assets		I[FXB=1, 0]	
	$\triangle e$	I[$\triangle e$=1, 0]	$\triangle e$	I[$\triangle e$=1, 0]	$\triangle e$	I[$\triangle e$=1, 0]	$\triangle e$	I[$\triangle e$=1, 0]
$FXB_{t-1} \times \triangle e_t$	-0.112	-0.029	-0.030	-0.008	-0.192	-0.064	-0.032	-0.010
	(0.138)	(0.033)	(0.027)	(0.005)*	(0.077)**	(0.019)***	(0.020)	(0.004)**
	(0.217)	(0.043)	(0.037)	(0.007)	(0.150)	(0.031)**	(0.031)	(0.006)
	(0.182)	(0.037)	(0.034)	(0.006)	(0.104)*	(0.023)***	(0.024)	(0.005)*
$EXP_{t-1} \times \triangle e_t$	0.005	0.006	0.004	0.006	0.006	0.007	0.005	0.006
	(0.012)	(0.003)**	(0.012)	(0.003)**	(0.012)	(0.003)**	(0.012)	(0.003)**
	(0.008)	(0.002)***	(0.008)	(0.002)***	(0.008)	(0.002)***	(0.008)	(0.002)***
	(0.012)	(0.003)**	(0.012)	(0.003)**	(0.012)	(0.003)**	(0.012)	(0.003)**
$FXB_{t-1} \times \triangle e_t \times EXP_{t-1}$	-0.205	-0.040	-0.011	-0.003	-0.190	0.000	-0.033	0.001
	(0.213)	(0.048)	(0.048)	(0.009)	(0.169)	(0.037)	(0.039)	(0.008)
	(0.222)	(0.047)	(0.040)	(0.009)	(0.181)	(0.042)	(0.036)	(0.009)
	(0.235)	(0.051)	(0.050)	(0.010)	(0.181)	(0.041)	(0.039)	(0.009)
Obs	72,419	72,419	72,419	72,419	65,514	65,514	65,514	65,514
Adj./Pseudo R^2	0.088	0.088	0.088	0.088	0.084	0.084	0.085	0.085

ating income as dependent variable. These authors find a positive statistically significant effect of holding foreign currency debt on earnings. In Table OA.2 in the Online Appendix I replicate this analysis and fail to find any evidence that firms holding foreign currency debt exhibit larger earnings or higher margins of profitability after a currency depreciation. I use as proxy of operating income EBIT, which captures the firm's operating income after all operating expenses have been paid (barred interest and taxes). As many firms have costs that may also be affected by the currency depreciation, this captures the net effect on the firms' operating income of a depreciated currency. The results indicate that there is no effect of depreciations on earnings or operating margin (only in a couple of specifications I find a positive, statically significant effect of currency depreciations on earnings). I also run models with operating margin as dependent variable and neither find any significant effect.[18]

I would argue that the lack of effect of currency depreciations on firms' earnings may be due to three factors. On the one hand, there is a large number of firms that have exposure to foreign currency debt but do not export; about 30% of the firm-year observations in the baseline sample. On the other hand, a currency depreciation of the bilateral exchange rate with the U.S. dollar does not necessarily translates into a gain in competitiveness for the firms of a given country. For this to take effect we would have to take into account the real depreciation of the relevant real effective exchange rate where the firm exports its products, as well as the firm's cost structure. It is also important to consider what happens with the exchange rates of the firms that compete with the firm in its export markets; as any gains from a bilateral depreciation may be offset when currencies from other emerging economies that compete in destination markets depreciate against the U.S. dollar simultaneously (see e.g., Figure OA.1 in the Online Appendix for years 2013-2014). Finally, for commodity exporters, one also needs to consider that commodity prices are highly negatively correlated with the U.S. dollar. When the greenback appreciates against a commodity exporter its export prices may fall even more, possibly offsetting gains from the bilateral depreciation (see e.g., Chen, Rogoff and Rossi, 2010, and Ferraro, Rogoff and Rossi, 2015). Given these factors that attenuate the expansionary effects of a currency depreciation, it is indeed not surprising to find that, on average, firm investment is negatively affected for firms exposed to foreign currency debt even if many are exporters.

3.3 Baseline Regression Without Controlling for Sectors' Sensitivity to Exchange Rate

Given that the matching hypothesis implies differences in firm investment across sectors—with firms in tradeable sectors matching their presumably larger foreign currency liability exposures—an alternative test of this hypothesis can be done by comparing the estimates from the baseline model, including country×sector×time fixed effects, with those of a model without controls for sectors' sensitivity to exchange rate movements. Table OA.3 in the Online Appendix shows the estimates obtained with a model only including country×time fixed effects, which absorb the direct effect of changes in the exchange rate but not the effect due to heterogeneity across sectors. The estimates are very close to those of the baseline model in Table 1. Thus, in the estimating sample

[18] In Table OA.2 in the Online Appendix I run regressions for EBIT and operating margin with and without firm-level controls, and estimate models with foreign currency bonds scaled by assets and as a dummy indicator that takes the value of one if the ratio of foreign currency bonds to assets is above the 25^{th} percentile of its distribution. I also run regressions defining a depreciation as a dummy variable that takes the value of one if the bilateral real exchange rate vis-à-vis the U.S. dollar has depreciated more than 10%.

there seems to be no evidence of matching of foreign currency liabilities, as there is no difference in firms' investment behaviour due to sectors' sensitivity to changes in the exchange rate (at least to the extent that this sensitivity is captured by time-invariant differences across sectors).

3.4 Use of Financial Derivatives

Firms not only can hedge their currency exposures by matching them with income streams, but also by using financial derivatives. The available data from Worldscope on usage of derivatives is very limited for the sample used in this paper. To shed some light on this, I resort to data on the currency composition of liabilities and the usage of financial derivatives for Brazil, Chile and Colombia, collected by Valle, Toneto, Cicogna and Tarantin (2017), Alvarez and Hansen (2017), and Barajas *et al.*, 2016. These country-specific data indicate that firms in emerging economies do not hedge their exposure to foreign currency debt with financial derivatives, such as currency forwards and currency swaps.

Panel A of Table 5 presents for each country with available data the conditional probability of a non-financial firm reporting holding currency derivatives in its balance sheet in a year that also reports holding foreign currency debt (because data for Colombia are available for a large number of firms, the statistics are presented for three groups: full sample, medium and large firms, and listed firms).[19] About a third of listed Chilean firms holding foreign currency debt do not hold any derivative position, and only twenty percent of Colombian firms with foreign currency debt report holding a derivative (all the 85 Brazilian firms that hold foreign currency liabilities also hold derivatives).

Importantly, even though a significant number of firms report having a derivative position in a given year, not all have a *long* net derivative position that actually hedges the currency exposure from its debt. For the case of Brazil, which refers to the largest 100 listed firms in that country, only 44% of firms report a long net derivative position conditional on having debt denominated in foreign currency, and this is despite all firms reporting usage of some form of currency derivative.

[19] The universe of firms in each country is different, as well as the sample period. Data reported in Table 5 refer to the sample of firms in each country with available data on the currency composition of liabilities. In all cases, derivatives usage refers to currency derivatives (futures, forwards, or swaps). For Brazil, Valle *et al.* (2017) collected data for the largest 100 non-financial listed firms and sourced the balance sheet data from Economatica; data on the usage of financial derivatives was hand collected from notes to the annual reports; data reported in Table 5 are for years 2013-2014. In the case of Chile, Alvarez and Hansen (2017) collected data on the universe of non-financial listed firms from the country regulator; data available on the usage of derivatives is a dummy indicator for the use of currency derivatives (no data are available on the long or short derivative position); available data for period 2009-2014. For Colombia, Barajas *et al.* (2016) collected data for the universe of non-financial firms that are mandated by the regulator to report annual balance sheets; data on the usage of currency derivatives was sourced from the central bank; data available for years 2005-2013. Please see the specific papers for more detail on these data-sets.

In Colombia, the other country with available data on the net derivative position, only 31% of the largest firms actually hedge their foreign currency debt. For both Brazil and Colombian firms, the statistics are based on a dummy indicator for a net long derivative position, and it is not clear whether the firms actually hedge 100% of their exposure. In the case of Chile, 70% of the firms report holding derivatives, but it is not known whether they have a net long or short position. In any case, if hedging behavior of U.S. firms is any guidance, research by Guay and Kothari (2003) suggests that firms hedge a very small portion of their actual exposure.[20]

These data also help put in context the extent of widespread dollarization of firms' balance sheet in these countries. A great majority of firms hold foreign currency liabilities in some form, either through bank loans or bonds issued in domestic and international markets. For example, 85% of the 100 largest listed firms in Brazil report liabilities denominated in foreign currency in a given year, with a similar high percentage of firms with dollarized debt in Chile (77%). Data for Colombia, the only country with available data for smaller, non-listed firms, suggest that even smaller firms hold foreign currency debt. The effective usage of financial derivatives, or of export activities, to hedge such exposures may be very limited for small, non-listed firms with less access to financial markets and lack of know how. These data also corroborate that a significant number of non-exporter firms hold foreign currency liabilities (over half of Chilean and Colombian firms). Finally, the data also indicate that foreign currency debt makes up about 15% of all liabilities, a non-negligible exposure, especially when considering the large fluctuations in the exchange rates and the low coverage from financial hedges.

In sum, the data on exports from the 15 emerging economies used throughout the paper, and the country data for Brazil, Chile, and Colombia, strongly suggest that firms do not match their exposure to foreign currency debt with income streams via exports, nor using financial derivatives. This result also aligns with the finding of Bruno and Shin (2020) that firms that exploit favorable global financing conditions to issue U.S. dollar bonds and build cash balances are also those whose share price is most vulnerable to local currency depreciation. This is inconsistent with firms effectively matching those foreign currency liabilities.

[20]The statistics reported in Table 5 on the usage of financial derivatives for three Latin American countries are in line with the few papers that have studied this topic. The statistics reported in Allayannis, Lel and Miller (2012) indicate a proportion of 31% of firms using financial derivatives in the 12 emerging countries of their sample that intersect with the sample in this paper. Similarly, Bartram, Brown and Fehle (2009) documents that only about 44% of firms in Asia and 52% in Latin America report usage of currency derivatives. Gatopoulos and Loubergé (2013) report a similar low proportion of firms that use currency derivatives for five Latin American economies, despite significant levels of liability dollarization. All of these papers, however, report data for years 2000-2002.

Table 5: Summary Statistics on the Usage of Financial Derivatives and Foreign Currency Debt in Brazil, Chile, and Colombia

This table reports statistics on the usage of financial derivatives and foreign currency debt in three emerging countries. The universe of firms in each country and the sample period are shown in the table. In all cases the statistics refer to non-financial corporations with available data on the currency composition of their liabilities. In all cases, derivatives usage refers to any currency derivative, including futures, forwards, and swaps. Data for Brazil are from Valle *et al.* (2017), data for Chile are from Alvarez and Hansen (2017), and data for Colombia are from Barajas *et al.* (2016).

	(1)	(2)	(3)	(4)	(5)
	Brazil	Chile	Colombia all firms	Colombia med. & large	Colombia listed
Panel A. Statistics for full sample					
Number of firms	100	217	39,873	563	60
Percentage of firms with FX debt	85	77.0	17.5	52.0	45
FX debt to total liabilities	16.3	18.3	3.3	11.0	12.5
Prob(derivatives=1 | FX debt=1)	100	70.1	18.8	37.2	52.9
Prob(net forward long =1 | FX debt=1)	43.8	n.a.	22.7	30.7	43.1
Prob(exporter=1 | FX debt=1)	100	43.1	49.0	72.9	72.5
Panel B. Statistics for firms with stocks of foreign currency bonds (FXB)					
Number of firms with FX bonds	52	17	9	9	1
FX bonds to total FX debt	28.0	11.8	0.09	1.5	0.2
Prob(FX loans=1 | FX bonds=1)	83.0	71.7	78.0	82.1	100
FX debt to total liabilities if FX bonds =1 (%)	26.7	38.6	51.8	51.0	43.0
Years in sample	2003-2014	2009-2014	2005-2013	2005-2013	2005-2013

4 Balance sheet effects or tighter international financing conditions?

Since the proxy for foreign currency debt used in this paper is the stock of foreign currency bonds, a concern is that the results could be confounded by changes in firms' international financing conditions. This is because the stock of foreign currency bonds may be a proxy for exposure to changes in international capital markets financing. Thus, the estimated coefficient on the interaction term in the baseline results may be capturing the differential effect of tighter financing conditions on those firms that access global capital markets instead of a true balance sheet effect.

To rule this out, it is desirable to introduce an additional covariate in the baseline regression capturing changes in firms' financing conditions from international capital markets. Ideally, this proxy is firm specific, but such data is not available for the large number of firms studied in this paper. As a second best alternative, I include in the regression the interaction between the stock of foreign currency bonds and a country-level measure of changes in international financing conditions. For the sample of emerging economies and time period studied in this paper, the best available proxy is the sovereign spreads computed by J.P. Morgan (EMBI).[21]

Table 6 shows the results of introducing the interaction of foreign currency bonds and the log change in EMBI spreads, $\text{FXB}_{i,s,c,t-1} \times \triangle\text{EMBI}_{c,t}$, in the baseline regressions. The table shows results for regressions alternatively including and not including covariates for firm performance and operational hedges. The results on the balance sheet effect are robust to controlling for this proxy of changes in firms' international financing conditions. Interestingly, the size of the estimated coefficient including this interaction is very close to the one estimated without this covariate (reported at the bottom of the table). This suggests that the balance sheet effect documented in this paper may operate via a different mechanism than the tightening of firms' international financing conditions; although, further research on the mechanisms at play is needed.

Table 6: Controlling for changes in external financing conditions

This table reports a set of firm-level regressions in which the dependent variable is the ratio of capital expenditures to assets and the explanatory variable of interest is the lagged stock of foreign currency bonds (FXB_{t-1}) interacted with the log change of the exchange rate against the U.S. dollar. In columns 1-4 the dependent variable is capital expenditures at year t and in columns 5-8 it is for year $t+1$. In columns 1-2 and 5-6, FXB_{t-1} is measured by the stock of foreign currency bonds scaled by assets, while in columns 3-4 and 6-7 it is a dummy indicator that takes the value of one if FXB$\geq 25^{th}$ percentile. Odd-numbered columns additionally introduce controls for firm strength and performance and operational hedges. All regressions additionally include the interaction of FXB_{t-1} with the log change in EMBI spread for the country. All regressions include a constant and the interaction of the covariates with the change in the exchange rate; although these are not reported. All firm-level covariates enter with their values set at time $t-1$. All regressions include country×sector×time fixed effects. Three sets of intragroup-robust standard errors are reported in parenthesis: first at the country-time level, then at the firm level, and then two-way clustering for both levels. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Capex_t				Capex_{t+1}			
	Scaled by assets		I[FXB=1,0]		Scaled by assets		I[FXB=1,0]	
$\text{FXB}_{t-1} \times \triangle e_t$	-0.217	-0.135	-0.042	-0.013	-0.235	-0.193	-0.051	-0.035
	(0.106)**	(0.099)	(0.024)*	(0.021)	(0.075)***	(0.070)***	(0.021)**	(0.019)*
	(0.129)*	(0.126)	(0.028)	(0.028)	(0.108)**	(0.103)*	(0.024)**	(0.024)
	(0.122)*	(0.113)	(0.028)	(0.025)	(0.090)**	(0.084)**	(0.022)**	(0.021)*
$\text{FXB}_{t-1} \times \triangle\text{EMBI}_t$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls for firm strength and performance	No	Yes	No	Yes	No	Yes	No	Yes
Obs	28,515	24,041	28,515	24,041	25,960	21,855	25,960	21,855
Adj./Pseudo R^2	0.082	0.189	0.082	0.189	0.081	0.173	0.081	0.173
Estimated $\text{FXB}_{t-1} \times \triangle e_t$ coeff. without $\text{FXB}_{t-1} \times \triangle\text{EMBI}_t$	-0.150	-0.111	-0.031	-0.013	-0.230	-0.200	-0.047	-0.033

[21] Data availability reduces the sample to only 11 countries for which the J.P. Morgan EMBI spread is available for period 2000-20015: Brazil, Chile, Colombia, Indonesia, Malaysia, Mexico, Peru, Philippines, Poland, South Africa, and Turkey (although, data for Indonesia starts in 2004).

5 Sensitivity and Robustness checks

5.1 Alternative Estimators: Including Firm-Level Fixed Effects and Tobit Regression

In Table 7 I explore whether the baseline results are robust to including firm-level fixed effects, or by saturating the model additionally including country×year and sector×year fixed effects. As in the baseline results, the balance sheet effect is stronger and has a higher statistical significance for one-year ahead investment. In the saturated model with time-varying firm-specific covariates (column 8), the estimated balance sheet effect is somewhat smaller than in the baseline, but statistical significant at the 5% level for one-year ahead investment. As stated before, the preferred baseline model does not include firm fixed effects because identification of the balance sheet effect in such a model comes from the within firm variation of stocks of foreign currency debt in a small number of firms. In the baseline model with country×sector×year identification comes from the variation across firms within each country×sector×year cell. Notwithstanding, it is comforting to see that the baseline results hold when introducing firm fixed effects, and hence modelling the only source of variation not captured in the baseline specification: firm-specific time-invariant heterogeneity.[22]

In Table OA.4 in the Online Appendix I replicate Table 1 but using a Tobit estimator instead of OLS. This is motivated by the fact that a firm that would like to adjust its capital expenditures on the face of a depreciation cannot invest less than zero. The Tobit allows estimating the model taking into account this feature of the data. The baseline results hold both in magnitude and statistical significance.

5.2 Alternative Definitions of the Dependent Variable or of Key Covariates

In Table 8 I evaluate the robustness of the baseline results to including the lagged dependent variable, and whether the results are driven by the definition or normalization of capital expenditures or the use of the nominal exchange rate instead of the bilateral real exchange rate. I start by including lagged capital expenditures as an explanatory variable. It is well known that the best predictor of firm capital investment is its immediate previous level, which may be due to potential adjustment costs that a firm may face when changing its level of capital expenditure (Eberly, Rebelo and Vincent, 2012). This is not an ideal variable to include in the baseline model because of the bad control problem discussed by Angrist and Pischke (2009), as it may attenuate the estimate of the variable of interest because lagged capital expenditures are partially determined by lagged stocks

[22] This implies that the baseline results are robust to firm-level differences related to the ability of some firms to issue bonds, which may be a concern given that by construction of the data used in the paper firms with higher stocks of foreign currency liabilities are firms that issue bonds.

Table 7: Baseline results with firm-level fixed effects

This table reports a set of firm-level OLS regressions in which the dependent variable is the ratio of capital expenditures to assets. In columns 1-4 the dependent variable is defined for year t and in columns 5-8 for year $t+1$. In odd columns, the explanatory variables are the lagged stock of foreign currency bonds scaled by assets (FXB_{t-1}) interacted with the log change of the exchange rate against the U.S. dollar. Even columns add time-varying firm-level controls for firm strength and performance. All models include firm fixed effects, and country×year and sector×year fixed effects are included in columns 3-4 and 7-8. All regressions include a constant; although it is not reported. All firm-level covariates enter with their values set at time $t-1$. Three sets of intragroup-robust standard errors are reported in parenthesis: first at the country-time level, then at the firm level, and then two-way clustering for both levels. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Capex_t$				$Capex_{t+1}$			
$FXB_{t-1} \times \triangle e_t$	-0.261	-0.081	-0.052	-0.031	-0.401	-0.174	-0.159	-0.133
	(0.178)	(0.111)	(0.112)	(0.100)	(0.156)**	(0.095)*	(0.096)*	(0.080)
	(0.075)***	(0.080)	(0.071)	(0.077)	(0.075)***	(0.070)**	(0.070)**	(0.072)*
	(0.173)	(0.113)	(0.111)	(0.103)	(0.153)***	(0.095)*	(0.095)*	(0.083)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Year FE	No	No	Yes	Yes	No	No	Yes	Yes
Sector-Year FE	No	No	Yes	Yes	No	No	Yes	Yes
Controls for firm strength and performance	No	Yes	No	Yes	No	Yes	No	Yes
Obs	72,476	61,801	72,476	61,801	65,510	55,922	65,510	55,922
Adj./Pseudo R^2	0.320	0.351	0.371	0.398	0.333	0.361	0.379	0.407

of foreign currency debt. Nonetheless, in this section I show that the baseline results are robust to including it. The results are presented in columns 1 and 5 of Table 8. The inclusion of lagged firm investment greatly reduces the estimated balance sheet effect. However, it is still statistically significant at conventional levels for firm investment at time $t+1$, regardless of the clustering of the errors.

In the benchmark results I normalized capital expenditures by the average assets of the past and current year (this, following practice in corporate finance literature of normalizing a flow variable from the cash flow statement by the average of a stock variable from the past two end-of-year financial statements). Columns 2 and 5 show that the results are not driven by this normalization and remain if capital expenditures are normalized by lagged assets.

The baseline results are based on the level of capital expenditures as reported in firms' financial statements. However, firms may adapt to challenging conditions by also selling assets and hence finding an optional level of investment that may be below their current capital expenditures. Columns 3 and 7 show that the balance sheet effect is also found when adjusting investment by the disposal of fixed assets. Note that the number of observations drops substantially, as not all firms report this item in Worldscope, the source of the firm balance sheet data used in the paper.

Columns 4 and 8 of Table 8 show the baseline results also hold when using the change in the nominal exchange rate vis-à-vis the U.S. dollar, instead of the change in the real bilateral exchange rate. This is not surprising, given the relatively low levels of inflation in most of the countries during the sample period.

Table OA.5 in the Online Appendix replicate these robustness checks including controls for firm strength and performance and operational hedges—and the interaction of all covariates with Δe. The results for capital expenditures at time $t+1$ hold in all cases, both in magnitude and statistical significance, while the results for investment at time t lose statistical significance.

Table 8: Robustness Checks

This table reports a set of firm-level regressions in which the dependent variable is the ratio of capital expenditures to assets at time t for columns 1-4 and at time $t+1$ for columns 4-8. In all cases, the explanatory variable of interest is the lagged stock of foreign currency bonds (FXB_{t-1}) interacted with the log change of the exchange rate against the U.S. dollar. FXB_{t-1} is measured by the stock of foreign currency bonds scaled by assets. All regressions include a constant; although it is not reported. All firm-level covariates enter with their values set at time $t-1$. All regressions include country×sector×time fixed effects. Three sets of intragroup-robust standard errors are reported in parenthesis: first at the country-time level, then at the firm level, and then two-way clustering for both levels. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Capex_t$				$Capex_{t+1}$			
	Include $Capex_{t-1}$	Normalize by $assets_{t-1}$	Adjust by asset disposals	NER	Include $Capex_{t-1}$	Normalize by $assets_{t-1}$	Adjust by asset disposals	NER
$FXB_{t-1} \times \triangle e_t$	-0.093	-0.412	-0.228	-0.148	-0.215	-0.643	-0.351	-0.245
	(0.094)	(0.234)*	(0.140)	(0.127)	(0.061)***	(0.235)***	(0.153)**	(0.114)**
	(0.056)*	(0.201)**	(0.096)**	(0.081)*	(0.065)***	(0.244)***	(0.099)***	(0.082)***
	(0.091)	(0.243)*	(0.146)	(0.131)	(0.056)***	(0.254)**	(0.152)**	(0.115)**
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	64,676	72,434	57,511	72,419	64,675	65,526	52,721	65,514
Adj./Pseudo R^2	0.335	0.097	0.089	0.088	0.335	0.094	0.084	0.084

5.3 Heterogeneity Across Geographic Regions and Over Time

Figures OA.2 and OA.3 in the Online Appendix explore the heterogeneity of the balance sheet effect across different geographical regions, by running the benchmark models of columns 1 and 4 of Table 1 interacting $FXB_{t-1} \times \Delta e_t$ with a dummy for region. The figures show the estimated coefficient from the model and a 95% interval around the estimate computed with two-way clustering of the standard errors at country-time and firm levels. Countries are classified into Latin America (LAC), Asia (ASIA), and Eastern Europe, Middle East and Africa (EMEA).[23] As a reference, the

[23]LAC countries includes Brazil, Chile, Colombia, Mexico, and Peru. ASIA includes India, Indonesia, Malaysia, Philippines, South Korea, and Thailand. EMEA includes Israel, Poland, South Africa, and Turkey.

figure shows the estimated effect for the full sample of emerging economies. The results indicate that both Latin American and Asian firms reduce their levels of investment relatively more after a currency depreciation, and more strongly so in the year following the depreciation. Firms from EMEA countries holding foreign currency debt do not seem to have a differential behavior after a currency depreciation. This may be the result of lower currency volatility, at least compared with the volatility experienced by Latin American and Asian countries. Alternatively, it may be due to the fact that most of the foreign currency debt of EMEA firms is denominated in currencies other than the U.S. dollar and fluctuations in the exchange rate against the U.S. dollar do not capture the relevant currency changes.

In Figures OA.4 and OA.5 in the Online Appendix I explore how the estimated balance sheet effect varies across time. Starting in year 2005, the model is estimated by adding one more year to the sample. The figure shows the estimated coefficient from the baseline models of columns 1 and 4 of Table 1 and 90% and 95% confidence bands around the estimate computed with two-way clustering of the standard errors at country-time and firm levels. There is some indicative evidence that the depreciations after the global financial crises of 2008/2009 had somewhat more deleterious effects on investment, particularly towards the end of the sample period. Although the estimated balance sheet effects for investment at time t are negative for all periods estimated in the figure, it is statistically significant at conventional levels only until when including 2015. For firm investment in time $t+1$, the balance sheet effect is always negative and statistically significant.

Finally, Table OA.6 in the Online Appendix shows that the baseline results are also robust to maintaining the sample fixed.

5.4 Controlling Covariate Proliferation with a Machine-Learning Estimator

In section 2.1.2 I showed that the balance sheet effect is robust to including a large set of firm-level controls, allaying concerns of omitted variables bias. A challenge in any empirical work, however, is that we do not know with any certainty the exact functional form of the data generating process of the dependent variable and hence we do not know what is the small number of variables we need to control for. The regressions in Table 2 included a total of 26 covariates, not exactly a parsimonious model. If we consider other potential controls additional to interactions with Δe_t, such as non-linearities in the covariates and time trends, the model would include a much larger number of variables. In this subsection, I employ machine learning techniques to explore whether the baseline results hold when considering a large number of covariates and use these techniques to reduce the number of controls to the variables that do contain information on the behavior of firm investment.

Specifically, I employ the Double-Step LASSO technique proposed by Belloni, Chernozhukov, Hansen and Kozbur (2016), which is an application to panel data of the method developed in Belloni, Chen, Chernozhukov and Hansen (2012) and Belloni, Chernozhukov and Hansen, 2014. This technique assumes approximate sparsity of the high-dimensional linear model that may explain firm investment in the data (a model including a very large number of possible covariates). This assumption means that there is a small number of covariates among all possible variables with estimated coefficients different from zero. The procedure estimates the parameters of sparse high-dimensional linear models after applying variable selection techniques. The variable selection method proposed by Belloni et al. is based on the Least Absolute Shrinkage and Selection Operator (LASSO) technique, which estimates the coefficient of linear models by minimizing the sum of the squared residuals and imposing a penalty term that penalizes the size of the model through the sum of absolute values of the coefficients.

The Double-Step LASSO estimator of Belloni et al. works in two steps. In the first step, it applies LASSO to determine which variables can be dropped from the model explaining the dependent variable, based solely on their predictive power of this variable. In a second step, LASSO is applied in a model for the explanatory variable of interest, using the same variables as in the model for the dependent variable. Inference then is obtained from regressing the dependent variable on the union of the variables selected in each step. This way the Double-Step LASSO technique makes sure it uses variables that are important for either of the two predictive relationships and hence guard against omitted-variables bias. In this paper, this boils down to select a set of variables that are useful for predicting firm investment and a set of variables that are useful for predicting stocks of foreign currency bonds, and then estimate the balance sheet effect by OLS regression of capital expenditures on the union of the variables selected for predicting capital expenditures and stocks of foreign currency bonds. Belloni *et al.* (2016), provide formal conditions under which their procedure lead to valid inference in panel data, even allowing for selection mistakes, and provide simulation evidence that their procedure works across a wide variety of linear models, including applications akin to this paper with continuous covariates and a clustered covariance structure. Belloni *et al.* (2016) show that accommodating this structure requires partialing out the fixed effects and applying the LASSO variable selection procedure on the partialed-out data at each step. I refer the reader to the cited papers for a more detailed treatment of the Double-Step LASSO technique.

Table 9 shows the results of applying this technique, for both current and one-year-ahead firm investment. As a reference, columns 1 and 4 show the baseline results when including in the model the full list of covariates and their interactions with Δe and fixed effects for country×sector×year (for a total of 26 covariates and 1,840 fixed effects). The table shows results for the model using clustered standard errors at the firm level.[24] The estimated balance sheet effect of columns 1 and 4 may be taken as causal under the assumption that all potential confounding factors not captured in $\boldsymbol{X}$ are captured by any of the fixed effects included in the model, which absorb all non-firm-specific factors. While the set of covariates seems quite complete, it produces valid causal estimates of the balance sheet effect only if time-varying firm-specific factors that are correlated to both firm investment and foreign currency debt are captured by this set of covariates, something of which I cannot be certain.

Columns 2 and 5 consider the generalization of model 1 and expands $\boldsymbol{X}$ to include not only the levels of the twelve possible confounding variables and their interactions with Δe, but also the squares of the covariates; lineal, quadratic and cubic trends; the interaction of each variable with FXB_{t-1}; the interaction of all variables in pairs; and each of these pairs interacted with Δe. This is a high-dimensional model with 149 covariates plus the fixed effects (for a total of 1,989 parameters to be estimated). The balance sheet effects based on the high-dimensional model is estimated imprecisely for firm investment at t, including large positive and negative values. For one-year ahead investment the balance sheet effect in this model is negative and statistically significant at the 5% level, and quite similar in magnitude to the baseline result.

Columns 3 and 6 report the estimated balance sheet effect based on the Double-Step LASSO method.[25] The selected variables indicate the importance of fixed assets and the interactions of this variable with earnings and cash holdings, as well as non-linear effects of short-term debt and the interactions of earnings with devaluation and operating margin.[26] The balance sheet effect is

[24]As explained in Belloni *et al.* (2016), in the context of variable selection in high dimensional models, failing to account for within-individual correlation may result in substantial understatement of sampling variability. This could lead to selecting too many variables, many of which have no true association to the outcome of interest. The presence of spuriously selected variables may have a substantial negative impact on the resulting estimator, as the spuriously selected variables are, by construction, the most strongly correlated to the noise within the sample. Because of this, I present results after estimating the models with clustered standard errors at the firm level, which yield parsimonious models. As expected from the results of Belloni *et al.* (2016), the models with other clustering select too many variables.

[25]This is specifically implemented by adapting the code of Belloni *et al.* (2016). I would like to thank the authors for sharing their STATA code.

[26]Nine variables are selected in the equation for capital expenditures at t: fixed assets, fixed assets×EBIT, fixed assets×cash, short-term debt^2, EBIT×Δe, and EBIT×operating margin. The variable selection for capital expenditures at $t+1$ yields the same variables, except for EBIT×operating margin. Three variables are selected in the equation for

estimated more precisely, although the effect is estimated to be somewhat smaller. The baseline results for investment at $t+1$ hold to estimating the balance sheet effect with this technique, with an estimated balance sheet effect significant at the 5% level. Overall, these results indicate that the bias from omitted variables may be small in the benchmark model, as the magnitude of the coefficient is in the same ballpark.

Table 9: Allowing for More Covariates. Estimation of High-Dimensional Model

This table reports a set of firm-level regressions in which the dependent variable is the ratio of capital expenditures to assets at time t for columns 1-3 and at time $t+1$ for columns 4-6. In columns 1 and 4 the explanatory variables include the stock of foreign currency bonds scaled by assets at time $t-1$ (FXB), interacted with the log change of the exchange rate against the U.S. dollar, and lagged covariates of: leverage, ratio of debt to equity, operating margin, earnings, tangible assets, ratio of earnings to interest expense, foreign ownership, a proxy for size based on sales, and dummy indicators if the firm exports or if it has foreign listings. All firm-level variables are interacted with the change in the exchange rate Δe. Models in columns 2 and 5 include not only the levels of these twelve variables and their interactions with Δe, but also the squares of the covariates, the interactions of the covariates with lineal, quadratic and cubic trends, the interaction of each variable with FXB_{t-1}, the interaction of all variables in pairs, and each of these pairs interacted with Δe. Regressions in columns 1-2 and 4-5 include country×sector×year and a constant. Models in columns 3 and 6 implement the Double Step-LASSO estimator of Belloni *et al.* (2016); the selected variables in each case are detailed in footnote 26. All firm-level covariates enter with their values set at time $t-1$. In all regressions, clustered-robust standard errors at the firm level are reported in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)
	Capex$_t$			Capex$_{t+1}$		
	Model with $\mathbf{X}_{t-1}$;$\mathbf{X}_{t-1} \times \triangle e_t$	All covariates; all interactions	Double-Step Lasso	Model with $\mathbf{X}_{t-1}$;$\mathbf{X}_{t-1} \times \triangle e_t$	All covariates; all interactions	Double-Step Lasso
FXB$_{t-1} \times \triangle e_t$	-0.179	-0.141	-0.125	-0.268	-0.233	-0.219
	(0.088)**	(0.086)	(0.090)	(0.090)***	(0.095)**	(0.102)**
Covariates	26	149	9	26	149	8
Obs	61,830	61,830	62,202	55,980	55,980	56,619
Adj./Pseudo R^2	0.180	0.214	0.203	0.157	0.189	0.171

5.5 A Placebo Test: Randomization Inference

The results based on high-dimensional techniques and different estimators add credibility to the estimated balance sheet effect found in the baseline regressions. However, as discussed in Section 2.1, model 1 has a causal interpretation of the balance sheet effect only under the assumption that $E_t[\varepsilon_t|\text{FXB}_{t-1}, \boldsymbol{X}_{t-1}, \psi_*] = 0$. An intuitive way of thinking about this assumption is that, conditional on controls, FXB can be taken as randomly assigned. As discussed above, the stock of foreign currency bonds was not randomly assigned (reason why it is important to control for po-

foreign currency bonds: short-term debt×Δe, foreign listing×Δe, and size×leverage×Δe. The models in columns 3 and 6 are estimated by including all these covariates, for a total of nine covariates in the model for investment at t and eight covariates for investment at $t+1$ (the models are estimated after partialing out country×sector×year fixed effects).

tential omitted variables). In this subsection, however, I tackle the problem of the non-randomized foreign currency debt from a perspective other than the omitted variables bias, and instead report results based on randomization inference techniques.

Randomization inference techniques are widely used in statistics (e.g., Rosenbaum, 1996) and have been proposed in economics more recently (e.g., Bertrand *et al.* 2004; MacKinnon and Webb, 2016b; Conley and Taber, 2011). The idea is to compare the observed test statistic $\hat{T}$ obtained from model 1, say the estimated β coefficient, with the empirical distribution of test statistic T_j^* for $j = 1 \ldots S$ placebo regressions after randomizing the stocks of foreign currency bonds. To compute each of the T_j^*, I will use the actual observed stocks of foreign currency bonds and randomly assign among observations of the estimating sample. If $\hat{T}$ is in the tails of the empirical distribution of T_j^*, then this is evidence *against* the null hypothesis of no balance sheet effect.

To probe the validity of the balance sheet effect in the baseline model, I performed two randomization tests. First, I run regressions for current capital expenditures after randomly assigning each time stocks of foreign currency bonds and obtaining the estimated β coefficients in the baseline model with only two covariates (same model as in column 1 of Table 1). A second, similar test for regressions of one-year-ahead capital expenditures. In both cases I run 3,000 placebo regressions. Figures OA.6 and OA.7 in the Online Appendix present the results of these two tests and show the empirical distribution of the estimated $\hat{\beta}_j^*$ coefficients, along with reference lines for the 0.5^{th}, 2.5^{th}, and 5^{th} percentiles, which correspond to confidence levels of 1%, 5%, and 10% to reject the null of $\hat{\beta} = 0$. In both cases, the $\hat{\beta}_j^*$ are centered around zero and the benchmark $\hat{\beta}$ lies in the tail of the distribution, with the baseline balance sheet effect significant at the 1% level.

These tests, coupled with the results on omitted variable bias presented in sections 2.1.2 and 5.4 suggest that the estimated balance sheet effect found in the baseline model is not driven by spurious correlation or by plausible omitted variables bias.[27]

6 Concluding remarks

This paper provides evidence that a currency depreciation significantly reduces firm investment when firms hold foreign currency debt, and particularly so in the year following the depreciation.

[27] Unreported randomization inference tests indicate similar results for the models with all covariates. Results available upon request. For a recent discussion of randomization techniques see MacKinnon and Webb (2016a). They note that randomization tests are valid only when the distribution of the test statistic is invariant to the realization of the re-randomizations across permutations of assigned treatments, which follows naturally when treatment is randomly assigned at the individual level (instead of the group level). This technique, however, has some limitations worth recognizing. In particular, the simple randomization of stocks of foreign currency bonds does not account for the clustered structure of the data.

A depreciation of 10% is associated with a ratio of capital expenditures to assets of between 0.3 and 0.6 percentage points less for firms with previous outstanding stocks of foreign currency bonds vis-à-vis their peers with no such exposure. This result is robust to a set of robustness and sensitivity checks, and it is found using different inference techniques. The results also indicate that the balance sheet effect may operate via a different mechanism than the tightening of firms' international financing conditions. The paper further documents that firms in emerging economies do not seem to match their exposure from foreign currency debt with income streams from exports or financial hedges. Indeed, currency depreciations are found to be associated with contractionary effects on firm investment and have little effect on earnings or profitability.

These results point to some interesting avenues for future research. To start, it is not clear what is the mechanism driving the lower investment rates. Potential mechanisms that can explain lower investment after a depreciation when firms hold foreign currency debt include: (i) difficulty in accessing external finance because the deterioration in firms' net worth, as suggested by models with financial frictions, and (ii) hoarding or diversion of cash because managers' heightened concerns about looming higher debt burdens and their desire to ensure adequate liquidity for debt service. Of course, these do not have to be exclusive, and may interact with each other or with other possible mechanisms. The results by Kalemli-Ozcan *et al.* (2016) comparing foreign-owned and domestic exporters suggest that it is access to external finance that hinders firm investment after crises, rather than firm insolvency. However, it is unclear if this would be the mechanism hindering investment during non-crisis periods. On the other hand, given that about 80% of bonds in the working sample of this paper are bullet bonds, increased interest payments in domestic currency would not increase for many firms due to their stocks of foreign currency bonds. Nonetheless, there may be other factors that may affect the interest burden that firms face after the depreciation (keep in mind that the proxy used in this paper underestimates the true size of foreign currency debt). With the data at hand, it is not possible to disentangle these effects, and this is left for future research.

Similarly, despite the real costs to firms implied by currency volatility, little is known about risk management practices or about the underlying motivations for firms to hold unmatched or unhedged foreign currency liabilities. The study by Bruno and Shin (2017) is a first attempt at exploring this. Their finding, that foreign-currency borrowing by emerging markets firms is more pronounced during periods when the dollar carry trade is more favorable, suggests a financial motive, rather than precautionary borrowing in anticipation of future financing or investment needs. It is also important to quantify what the macroeconomic effects might be in terms of aggregate investment and the economic growth of firms holding large unhedged/unmatched foreign currency exposures, given the widespread foreign-currency indebtedness of firms in emerging economies and the observed currency volatility.[28]

One key policy implication of the results documented in this paper is the need to fill the gaps in publicly available data on corporate currency mismatches. The lack of good information here hinders supervisors and financial stability authorities from properly gauging risks in the economy. Corporate balance sheet reporting standards should be revised to (i) embrace the currency dimension; (ii) include liabilities for which the reporting firm bears the ultimate risk, even on debt issued offshore; and (iii) include detailed information on derivative positions.

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[28] Alfaro, Asis, Chari and Panizza (2019) find that idiosyncratic shocks to the sales growth of large firms are positively and significantly correlated with GDP growth in a sample of emerging economies. Therefore, the aggregate investment effects of idiosyncratic shocks may be large, particularly for firms with foreign currency liabilities, which tend to be the larger firms.

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Data Appendix

DA.1 Sample selection

I collected balance sheet and bond issuance data for the period 2000-2015 on the universe of non-financial, non-utilities, active, listed firms headquartered in the largest 24 emerging economies.[29] Because I am interested in studying the investment behavior of firms following a currency depreciation, I focus on firms headquartered in a given country because subsidiaries of firms headquartered in another country may have a different behavior thanks to their parent's decisions, and hence a comparison with domestically-owned firms may not be appropriate.[30] Data on balance sheet items were sourced from Thomson Reuters' Worldscope, and data on bond issuance were collected via a Thomson Reuters' Eikon Premium terminal.

I kept in the sample only firms headquartered in countries that did not have a sovereign default episode or international sanctions during the sample period. I also excluded countries with less than 15 bond issuers during the period. These two filters are meant to prevent the results being driven by the behavior of firms in countries with no access to international capital markets, or from countries with precarious development of bond markets. I also dropped China, so that the results are not driven by the behavior of state-owned enterprises with top-down mandates on investment targets and privileged access to finance (Song, Storesletten and Zilibotti, 2011). To assure a set of firms with high-quality balance sheet data, I also excluded from the analysis firms that had stocks of bonds issued by the firm itself larger than 100% of reported total liabilities in annual balance sheet reports. After applying these filters, I am left with an unbalanced panel composed of 6,917 firms from the 15 emerging economies listed in Table DA.1 below.[31]

DA.2 Computing stocks of outstanding foreign currency bonds

For each listed firm in the working sample I retrieved all fixed-income securities, bonds hereafter, that are associated with the firm in the Thomson Reuters securities database. The bonds may have been issued by the firm itself or through domestic or foreign subsidiaries. This is important as many firms issue bonds through subsidiaries, and as such the match must be done based on the bond's ultimate parent (see e.g., Shin, 2014; Turner, 2014). I do not restrict the data by instrument type, issuance date, or maturity at issuance. I double check the association of the firm with the security based on identifiers available in Thomson Reuters, and keep only the securities for which I am able to verify an accurate association. The bonds database contains a total of 29,078 securities associated with 1,717 unique firms headquartered in the 15 countries of the final sample (a larger number of issuers appear in the database, as many firms issue through subsidiaries).

Securities classified as bonds, notes, or commercial paper make up 86% of the sample. About 89% of the securities were issued after year 1999, although the earliest bond in the sample is for year 1974. About 12% of the securities in the database have maturities of less than one year, while the average maturity at issuance is four years. About 80% of the bonds are bullet bonds.

For each bond in the database I compute its outstanding value as of end of each year by adjusting the bond's face value for amortizations and any other reported change in its amount outstanding. These adjustments may include early repayments, call options exercised, defaults, cancellations, conversions, liquidations, repurchases, and any other reported change in bond status. Bonds face values are reported in the original currency of issuance, so I convert these values to the currency in which the firm's balance sheet is reported using exchange rates as of December 31st of each year (sourced from Thomson Reuters Datastream). I use nominal exchange rates against the U.S. dollar, and based on these compute cross-exchange rates for bonds issued in currencies other than the local currency or the U.S. dollar.

I classify the bonds into foreign currency and domestic currency based on the bond currency and the domestic currency of the country where the firm is headquartered. Bonds denominated in foreign currencies are further classified into hard currencies and other currencies, with hard-currency bonds being securities denominated in any of the follow-

[29]The headquarter of a firm is identified by the domicile reported in Worldscope and the currency used to report its balance sheet. Only firms that report in the domestic currency of the country and are classified as having its domicile there are considered as headquartered in a particular country. Firms operating in the Financials and Utilities sectors are identified based on Thomson-Reuters Business Classification system. The 24 economies are: Argentina, Brazil, Bulgaria, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, Jamaica, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand, Turkey, and Vietnam.

[30]For example, Desai, Foley and Forbes (2008) find that U.S. multinational affiliates increase sales, assets, and investment significantly more than local firms during depreciations because they have the ability to circumvent financial constraints by accessing parent equity when local firms are most constrained. This filter eliminates from the sample subsidiaries of multinationals that may be listed in an emerging country (e.g., Ford Motors in Brazil).

[31]Besides the elimination of China for the reason stated in the text, these filters result in the elimination from the estimating sample of Argentina and Russia because of default and sanctions; and of Bulgaria, Czech Republic, Hungary, Jamaica, Romania, and Vietnam because these countries have less than 15 bond issuers during the estimating period.

ing five currencies: USD, EUR, GBP, JPY, CHF. I then compute the total of outstanding bonds by category of currency for each firm and year in the sample.

As shown in Figure OA.10 in the Online Appendix, the bond stocks computed for this paper replicate the stylized facts on the bond market reported elsewhere in the literature using aggregate data from the Bank of International Settlements. On one hand, after the Global Financial Crisis of 2008/2009 non-financial firms from emerging economies sharply increased their issuance of bonds denominated in hard currencies (Panel A of Figure OA.10), with a substantial portion of this via subsidiaries outside their country of residence (Panel B of Figure OA.10).[32] Figure OA.10 decomposes the stocks computed for the firms in the baseline sample into hard currencies and other currencies (the latter includes local currency), as well as into bonds issued through offshore subsidiaries and bonds issued in their country of domicile or residence.[33] Figure OA.11 in the Online Appendix shows the evolution of the stocks by region. About 50% of all the stocks belong to firms in the six Asian countries in the sample, while about 36% to firms in the five Latin American countries.

Given that foreign currency debt is proxied by the stock of foreign currency bonds, it is illustrative to explore the validity and implications of this. Based on detailed micro data on the currency composition of liabilities of firms from Brazil, Chile and Colombia, Panel B of Table 5 in Section 3 shows that the conditional probability of a firm holding foreign currency bank loans given that it also has bonds denominated in foreign currency. This conditional probability is above 70% in all cases. More importantly, the share of foreign currency debt on total liabilities for firms that hold foreign currency bonds is much higher than that for the average firm. These two observations give credibility to the approach of using stocks of bonds as a proxy for total debt in foreign currency. Notwithstanding, because the true size of foreign currency debt is most likely underestimated by using this proxy, the results from the regression analysis may be biased upwards.

DA.3 Exchange rates

I collected data on daily nominal exchange rates vis-à-vis the U.S. dollar from Thomson Reuters' Datastream. I converted the data into monthly and annual averages and computed real bilateral exchange rates after discounting the change in the consumer price index for the country and that of the U.S., also sourced from Datastream.

DA.4 Balance sheet data

The set of firm-level controls used in the analysis includes proxies for firm strength and performance (leverage, debt maturity, earnings, profitability, interest expense, cash holdings, size, and importance of tangible assets) and operational hedges (foreign ownership, exporter status, and foreign listing). Data on balance sheets were sourced from Thomson Reuters's Worldscope. All variables are taken from restated annual balance sheet reports, which are reported in local currency. To reduce the effect of outliers and measurement error, I follow standard practice in the corporate finance literature and winsorize each variable by country-year with cutoffs at 2^{nd} and 98^{th} percentiles. I also follow practice in corporate finance in normalizing flow variables by the average of stock variables from the prior and current years' end-of-year financial statements (see e.g., Welch and Wessels, 2000). Thus, variables such as capital expenditures and earnings are normalized by the average of end-of-year assets for the last two years. Robustness checks show that the results are not sensitive to this normalization. A detailed description of all variables used in the paper, along with their specific mnemonics from Worldscope, is presented in Table DA.2 below. Table OA.1 in the Online Appendix presents summary statistics of the firm level controls for the baseline sample.

[32]For a discussion of these stylized facts see, for example, Shin (2014) and Ayala *et al.* (2017) and Caballero *et al.* (2019).

[33]Note that the totals shown in the figures were obtained after aggregating the outstanding stock of bonds converted to U.S. dollars for each firm in the baseline sample. The data used in the analytical sections of the paper are for the stocks of bonds converted into domestic currency.

Table DA.1: Baseline sample

Region	Country	N. of firms
ASIA	India	2,045
ASIA	Indonesia	343
ASIA	Korea	1,598
ASIA	Malaysia	728
ASIA	Philippines	139
ASIA	Thailand	455
EMEA	Israel	256
EMEA	Poland	383
EMEA	South Africa	220
EMEA	Turkey	246
LAC	Brazil	199
LAC	Chile	128
LAC	Colombia	38
LAC	Mexico	91
LAC	Peru	83
Total		6,952

Table DA.2: Data sources and definitions for firm balance sheet data

- **Capital expenditures:** Capital expenditures represent the funds used to acquire fixed assets other than those associated with acquisitions. Item from the cash flow statement. (Worldscope code: 04601).
- **Disposal of fixed assets:** This variable is the amount a company received from the sale of property, plant and equipment (Worldscope code: 04351).
- **Total assets:** Total assets are defined as the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. Item from the financial statement (Worldscope code: 02999).
- **Fixed assets:** Fixed assets are the gross property, plant and equipment less accumulated reserves for depreciation, depletion and amortization (Worldscope code: 02501).
- **Total liabilities:** The total liabilities represents all short and long term obligations expected to be satisfied by the company. Item from the financial statement (Worldscope code: 03351).
- **Total Debt:** Total debt denotes all interest bearing and capitalized obligations, it is the sum of long and short term debt. Item from the financial statement (Worldscope code: 03255).
- **Leverage:** Ratio of total liabilities to total assets.
- **EBIT:** represents the earnings of a company before interest and taxes. Item from the income statement (Worldscope code: 18191).
- **Cash and short term investments:** The cash express the sum of cash and short term investments. Item from the financial statement (Worldscope code: 02001).
- **Debt maturity:** Ratio of short-term debt to total debt.
- **Short Term Debt:** The short term debt represents that portion of debt payable within one year including current portion of long term debt and sinking fund requirements of preferred stock or debentures. Item from the financial statement (Worldscope code: 03051).
- **Debt to equity:** Ratio of total debt to total equity.
- **Total equity:** It is the sum of common equity and preferred stocks.
- **Common equity:** This variable is defined as common shareholder's investment in a company. Item from the financial statement (Worldscope code: 03501).
- **Preferred stocks:** represents a claim prior to the common shareholders on the earnings of a company and on the assets in the event of liquidation. Item from the financial statement (Worldscope code: 03451).
- **Operating Margin:** The operating profit margin represents the ratio of Operating Income to Revenues. Item from the income statement (Worldscope code: 08316).
- **Interest Expense on Debt:** The interest expense on debt is the service charge for the use of capital before the reduction for interest capitalized. Item from the income statement (Worldscope code: 01251).
- **Size:** Normalization of firm size in a given country, based on a min-max normalization using the market capitalization as of end of 2012.
- **Market Capitalization:** The market capitalization represents the closing price of the company's stock at 31 December for U.S. Corporations (Worldscope code: 08001).
- **Exporter status:** This is a dummy indicator that takes the value of 1 if the firm has reports any export in the last five years, including the current year (Worldscope codes for total exports: 07161. Worldscope codes for geographical segments: 19601, 19611, 19621, 19631,19641, 19651, 19661, 19671,19681, 19691).
- **Foreign listing:** This is a dummy indicator that takes the value of 1 if the firms is listed in a foreign stock exchange or if it has an American Depository Receipts (Worldscope code: 05427 and 11496).
- **Foreign ownership:** Percentage of foreign ownership of the firm stocks (Worldscope/Datastream code: NOSHFR)

Online Appendix [NOT TO PRINT]: Additional Tables and Figures

Table OA.1: Summary statistics for main variables of interest

Variable	**N**	**Mean**	**Std. Dev.**	**Min**	**Max**
Capital expenditures (ratio to assets) t	72,518	0.06	0.071	0	0.6
Capital expenditures to assets $t+1$	64,769	0.06	0.068	0	0.6
Foreign currency bonds to assets $t-1$	72,518	0.005	0.035	0	2.2
Leverage (ratio to assets) $t-1$	72,506	0.51	0.44	-0.004	35.6
Debt to equity $t-1$	72,440	0.77	1.64	-34.2	114
Short-term debt (ratio to assets) $t-1$	64,355	0.58	0.32	0	1
EBIT (ratio to assets) $t-1$	71,118	0.07	0.15	-8.5	1.04
Operating margin $t-1$	71,496	-0.005	1.47	-102.1	9.05
Interest expense (ratio to EBIT) $t-1$	67,332	99.10	4434.3	-3,800.8	1,133,708.6
Cash holdings (ratio to assets) $t-1$	72,443	0.12	0.14	0	1
Tangible assets (ratio to assets)$t-1$	72,346	0.35	0.22	-0.21	1
Size (normalization from 0 to 1)	71,918	0.02	0.079	0	1
Foreign ownership (%) $t-1$	72,518	5.076	12.44	0	100
Export status (dummy)	72,518	0.62	0.49	0	1
Foreign listing (dummy)	72,518	0.07	0.25	0	1
(log) Change in real exchange rate t	72,518	-0.01	0.081	-0.38	0.25

Table OA.2: Regressions for Earnings and Operating Margin

This table reports a set of firm-level regressions in which the dependent variable is either EBIT or operating margin, and the explanatory variable of interest is the lagged stock of foreign currency bonds (FXB_{t-1}) interacted with the change of the real bilateral exchange rate against the U.S. dollar. In columns 1-2 and 5-6, FXB_{t-1} is measured by the stock of foreign currency bonds scaled by assets, while in columns 3-4 and 7-8 it is a dummy indicator that takes the value of one if FXB$\geq 25^{th}$ percentile. In even columns the change in the exchange rate is measured as the log change, while in odds columns it is a dummy indicator that takes the value of 1 if the change in the exchange rate is above 10%. For each dependent variable there are panels estimating the regressions with no additional covariates, and with additional covariates (which include proxies for leverage, debt maturity, performance, profitability, interest expense, cash holdings, size, importance of tangible assets, foreign ownership, exporter status, and foreign listing, and all their interactions with the change in the exchange rate). All regressions include a constant, although it is not reported. All firm-level covariates enter with their values set at time $t-1$. All regressions include country×sector×time fixed effects. Two-way intragroup correlation-robust standard errors at the country-time and at the firm levels are reported in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable at t				Dependent Variable at $t+1$			
	Scaled by assets		I[FXB=1, 0]		Scaled by assets		I[FXB=1, 0]	
	$\triangle e$	I[$\triangle e$=1, 0]	$\triangle e$	I[$\triangle e$=1, 0]	$\triangle e$	I[$\triangle e$=1, 0]	$\triangle e$	I[$\triangle e$=1, 0]
Dependent variable: EBIT; regressions with no covariates								
$FXB_{t-1} \times \triangle e_t$	-0.337	-0.046	-0.103	-0.019	-0.232	0.043	-0.052	0.002
	(0.225)	(0.049)	(0.055)*	(0.012)	(0.226)	(0.047)	(0.052)	(0.014)
Obs	72,939	72,939	72,939	72,939	65,989	65,989	65,989	65,989
Adj./Pseudo R^2	0.145	0.145	0.145	0.145	0.146	0.146	0.146	0.146
Dependent variable: EBIT; regressions with covariates and all interactions with $\triangle e_t$								
$FXB_{t-1} \times \triangle e_t$	-0.163	0.023	-0.065	-0.007	-0.080	0.094	-0.018	0.011
	(0.142)	(0.038)	(0.032)**	(0.008)	(0.218)	(0.058)	(0.034)	(0.011)
Obs	62,731	62,731	62,731	62,731	56,677	56,677	56,677	56,677
Adj./Pseudo R^2	0.408	0.408	0.408	0.408	0.280	0.280	0.281	0.281
Dependent variable: Operating Margin; regressions with no covariates								
$FXB_{t-1} \times \triangle e_t$	-0.709	0.060	-0.109	0.031	0.362	1.027	-0.088	0.084
	(0.945)	(0.212)	(0.322)	(0.076)	(2.506)	(1.003)	(0.561)	(0.157)
Obs	73,293	73,293	73,293	73,293	66,596	66,596	66,596	66,596
Adj./Pseudo R^2	0.141	0.141	0.141	0.141	0.134	0.134	0.134	0.134
Dependent variable: Operating Margin; regressions with covariates and all interactions with $\triangle e_t$								
$FXB_{t-1} \times \triangle e_t$	-0.253	-0.017	-0.038	0.013	-2.073	-0.472	-0.301	-0.050
	(0.690)	(0.192)	(0.174)	(0.040)	(1.365)	(0.512)	(0.186)	(0.054)
Obs	62,937	62,937	62,937	62,937	57,195	57,195	57,195	57,195
Adj./Pseudo R^2	0.321	0.321	0.321	0.321	0.278	0.278	0.278	0.278
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table OA.3: Baseline regression without controlling for sectors' sensitivity to exchange rate

This table reports a set of firm-level regressions in which the dependent variable is the ratio of capital expenditures to assets in t (columns 1-4) and in $t+1$ (columns 5-8). In columns 1-3-5-7 the explanatory variables are the lagged stock of foreign currency bonds scaled by assets (FXB_{t-1}), interacted with the log change of the exchange rate against the U.S. dollar. Columns 2-4-6-8 add firm leverage, proxied by the ratio of liabilities to assets, interacted with the log change in the exchange rate. Columns 3-4-7-8 replicate columns 1-2-5-6 but using as explanatory variable FXB_{t-1} defined as a dummy indicator that equals one if the ratio of foreign currency bonds to assets is above the 25^{th} percentile of its distribution. All regressions include a constant; although it is not reported. All firm-level covariates enter with their values set at time $t-1$. All regressions include country×time fixed effects. Intragroup correlation-robust standard errors at the country-year and firm levels are reported in parenthesis. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Capex_t$				$Capex_{t+1}$			
	Scaled by assets		I[FXB=1,0]		Scaled by assets		I[FXB=1,0]	
$FXB_{t-1} \times \triangle e_t$	-0.248	-0.244	-0.038	-0.036	-0.333	-0.330	-0.062	-0.061
	(0.123)**	(0.122)**	(0.030)	(0.030)	(0.109)***	(0.108)***	(0.023)***	(0.022)***
	(0.091)***	(0.090)***	(0.018)**	(0.018)*	(0.087)***	(0.087)***	(0.017)***	(0.017)***
	(0.128)*	(0.128)*	(0.030)	(0.030)	(0.112)***	(0.111)***	(0.022)***	(0.021)***
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls for leverage	No	Yes	No	Yes	No	Yes	No	Yes
Obs	72,518	72,506	72,518	72,506	65,605	65,593	65,605	65,593
Adj./Pseudo R^2	0.073	0.074	0.073	0.074	0.068	0.069	0.068	0.069

Table OA.4: Tobit

This table reports a set of firm-level regressions in which the dependent variable is the ratio of capital expenditures to assets in t (columns 1-4) and in $t+1$ (columns 5-8). In columns 1-3-5-7 the explanatory variables are the lagged stock of foreign currency bonds scaled by assets (FXB_{t-1}), interacted with the log change of the exchange rate against the U.S. dollar. Columns 2-4-6-8 add firm leverage, proxied by the ratio of liabilities to assets, interacted with the log change in the exchange rate. All Models are estimated using the Tobit framework. Columns 3-4-7-8 replicate columns 1-2-5-6 but using as explanatory variable FXB_{t-1} defined as a dummy indicator that equals one if the ratio of foreign currency bonds to assets is above the 25^{th} percentile of its distribution. All regressions include a constant; although it is not reported. All firm-level covariates enter with their values set at time $t-1$. All regressions include country×sector×time fixed effects. Intragroup correlation-robust standard errors at the country-year and firm levels are reported in parenthesis. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Capex_t$				$Capex_{t+1}$			
	Scaled by assets		I[FXB=1,0]		Scaled by assets		I[FXB=1,0]	
$FXB_{t-1} \times \triangle e_t$	-0.259	-0.256	-0.046	-0.044	-0.347	-0.343	-0.065	-0.064
	(0.134)*	(0.134)*	(0.032)	(0.032)	(0.120)***	(0.120)***	(0.024)***	(0.024)***
	(0.092)***	(0.091)***	(0.019)**	(0.019)**	(0.093)***	(0.092)***	(0.018)***	(0.018)***
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls for leverage	No	Yes	No	Yes	No	Yes	No	Yes
Obs	72,518	72,506	72,518	72,506	65,605	65,593	65,605	65,593
Adj./Pseudo R^2	-0.049	-0.049	-0.049	-0.049	-0.046	-0.046	-0.046	-0.046

Table OA.5: Robustness with controls

This table replicates the robustness tests reported in Table 8 in the paper, but adding time-varying firm-level covariates for firm performance and strength and operational hedges interacted with the change in the exchange rate. The dependent variable is the ratio of capital expenditures to assets in both t and $t+1$. The explanatory variable of interest is the lagged stock of foreign currency bonds (FXB_{t-1}) interacted with the log change of the exchange rate against the U.S. dollar. In columns 1-8, FXB_{t-1} is measured by the stock of foreign currency bonds scaled by assets. All regressions include a constant; although it is not reported, country×sector×time fixed effects. Intragroup correlation-robust standard errors at the country-year, firm and double clustered (with country-time and firm) are reported in parenthesis. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Capex_t$				$Capex_{t+1}$			
	Include $Capex_{t-1}$	Normalize by $assets_{t-1}$	Adjust by asset disposals	NER	Include $Capex_{t-1}$	Normalize by $assets_{t-1}$	Adjust by asset disposals	NER
$FXB_{t-1} \times \triangle e_t$	-0.073	-0.214	-0.141	-0.126	-0.192	-0.395	-0.292	-0.245
	(0.094)	(0.188)	(0.145)	(0.126)	(0.062)***	(0.158)**	(0.148)**	(0.113)**
	(0.059)	(0.125)*	(0.090)	(0.078)	(0.068)***	(0.152)***	(0.094)***	(0.083)***
	(0.091)	(0.193)	(0.148)	(0.128)	(0.057)***	(0.170)**	(0.145)**	(0.115)**
Included controls in $\mathbf{X}_{t-1}$:								
Firm strength and performance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Operational hedges	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	55,718	61,836	49,769	61,830	55,379	55,985	45,700	55,980
Adj./Pseudo R^2	0.358	0.165	0.184	0.180	0.356	0.145	0.160	0.157

Table OA.6: Keeping the sample constant

This table replicates the baseline results but keeping the sample constant. The dependent variable is the ratio of capital expenditures to assets and the explanatory variable of interest is the lagged stock of foreign currency bonds (FXB_{t-1}) interacted with the log change of the exchange rate against the U.S. dollar. In columns 1-4 the dependent variable is capital expenditures at year t and in columns 5-8 it is for year $t+1$. In columns 1-2 and 5-6, FXB_{t-1} is measured by the stock of foreign currency bonds scaled by assets, while in columns 3-4 and 6-7 it is a dummy indicator that takes the value of one if FXB$\geq 25^{th}$ percentile. Odd-numbered columns additionally introduce time-varying firm-level controls for firm strength and performance and operational hedges interacted with the change in the exchange rate. All regressions include a constant and the interaction of the covariates with the change in the exchange rate; although these are not reported. All firm-level covariates enter with their values set at time $t-1$. All regressions include country×sector×time fixed effects. Three sets of intragroup-robust standard errors are reported in parenthesis: first at the country-time level, then at the firm level, and then two-way clustering for both levels. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$Capex_t$				$Capex_{t+1}$			
	Scaled by assets		I[FXB=1,0]		Scaled by assets		I[FXB=1,0]	
$FXB_{t-1} \times \triangle e_t$	-0.222	-0.190	-0.035	-0.024	-0.314	-0.279	-0.059	-0.048
	(0.180)	(0.182)	(0.038)	(0.037)	(0.123)**	(0.118)**	(0.025)**	(0.024)**
	(0.130)*	(0.122)	(0.022)	(0.020)	(0.099)***	(0.091)***	(0.019)***	(0.018)***
	(0.194)	(0.191)	(0.038)	(0.037)	(0.129)**	(0.122)**	(0.024)**	(0.023)**
Included controls in $\mathbf{X}_{t-1}$:								
Firm strength and performance	No	Yes	No	Yes	No	Yes	No	Yes
Operational hedges	No	Yes	No	Yes	No	Yes	No	Yes
Country-Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	55,379	55,379	55,379	55,379	55,379	55,379	55,379	55,379
Adj./Pseudo R^2	0.088	0.177	0.088	0.177	0.085	0.156	0.085	0.156

Table OA.7: Placebo Difference in Differences Regressions, 2010 pre, 2012 post

This table reports placebo difference in differences regressions in which the dependent variable is the ratio of capital expenditures to assets. It replicates Table 3 but defining the pre period as 2010 and the post period as 2012. In columns 1-6, the exposure proxy for foreign currency bonds, FXB, is a dummy indicator that takes the value of 1 if the firm had any outstanding bond at the end of 2010; in columns 7-9 it is a dummy indicator that takes the value of one if the outstanding stocks scaled by 2010 assets were above the 25^{th} percentile. Columns 1-3 estimate equation 2, with the exposure variable interacted with a dummy T that takes the value of 1 for year 2012. Models in columns 4-9 estimate equation 3, adding the interaction with the change in the real exchange rate between 2010-2012. The models are estimated introducing the fixed effects described in the table, and alternatively adding $\boldsymbol{X}_i^{12}$ a set of pre-determined firm-level controls for leverage, profitability, cash holdings, tangible assets, and size. All regressions include a constant; although it is not reported. Intragroup correlation-robust standard errors are reported in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	I[FXB=1] if FXB>0						I[FXB=1] if FXB$\geq 25^{th}$ percentile		
$T \times$ FXB	0.007	0.002	0.004						
	(0.004)**	(0.004)	(0.004)						
$T \times$ FXB $\times \Delta e$				0.013	0.027	0.020	-0.072	-0.031	-0.022
				(0.042)	(0.037)	(0.019)	(0.037)*	(0.063)	(0.050)
Fixed effects interacted with T?									
Country-Sector FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Sector FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Country FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Including $\boldsymbol{X}_i^{12}$?	No	No	Yes	No	No	Yes	No	No	Yes
Obs	2,699	2,699	2,655	2,699	2,699	2,655	2,652	2,652	2,608
Adj. R^2	0.001	0.035	0.061	0.004	0.035	0.061	0.004	0.035	0.060

Figure OA.1: Daily Exchange Rates 2012-2014 in 11 Emerging Economies (units of domestic currency per U.S. dollar)

This figure plots daily exchange rates from Jan-1-2012 to Dec-31-2014. The plots show the deviations from the exchange rate normalized to Dec-31-2012. The vertical axis shows the percentage change in the exchange rate with respect to the base date. All plots have the same scale.

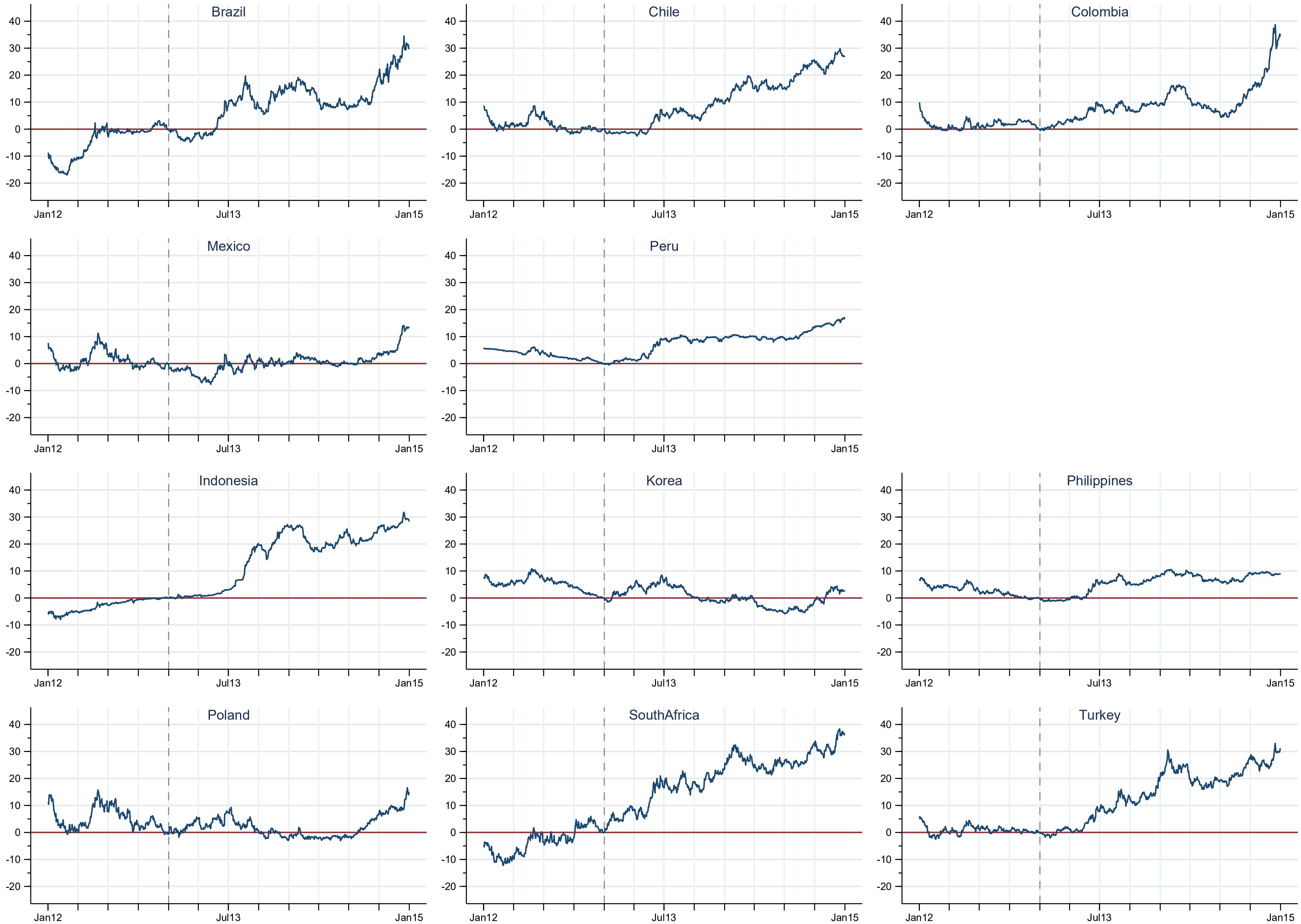


Figure OA.2: Estimated Balance Sheet Effects by Region. Regressions for $CAPEX_t$

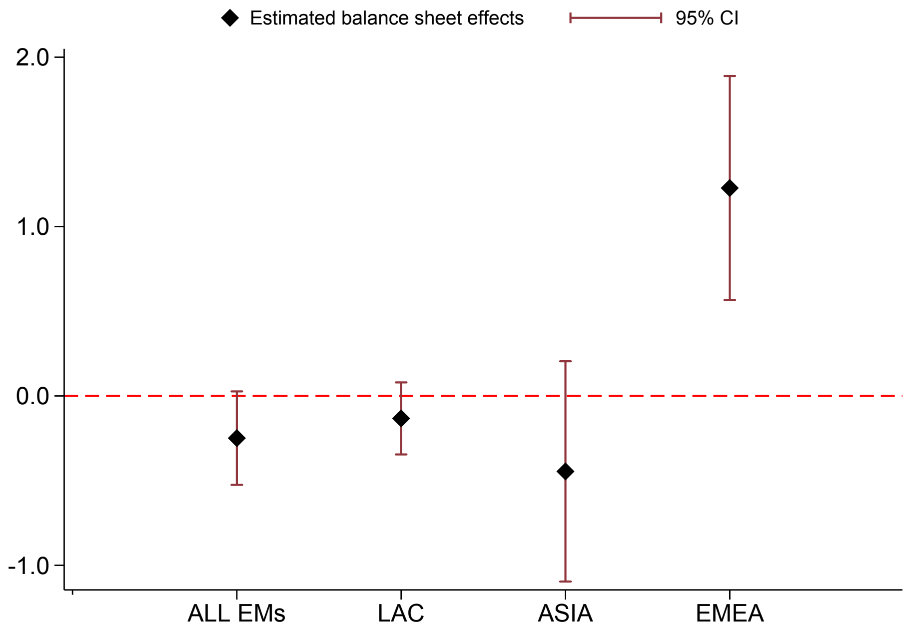


Figure OA.3: Estimated Balance Sheet Effects by Region. Regressions for $CAPEX_{t+1}$

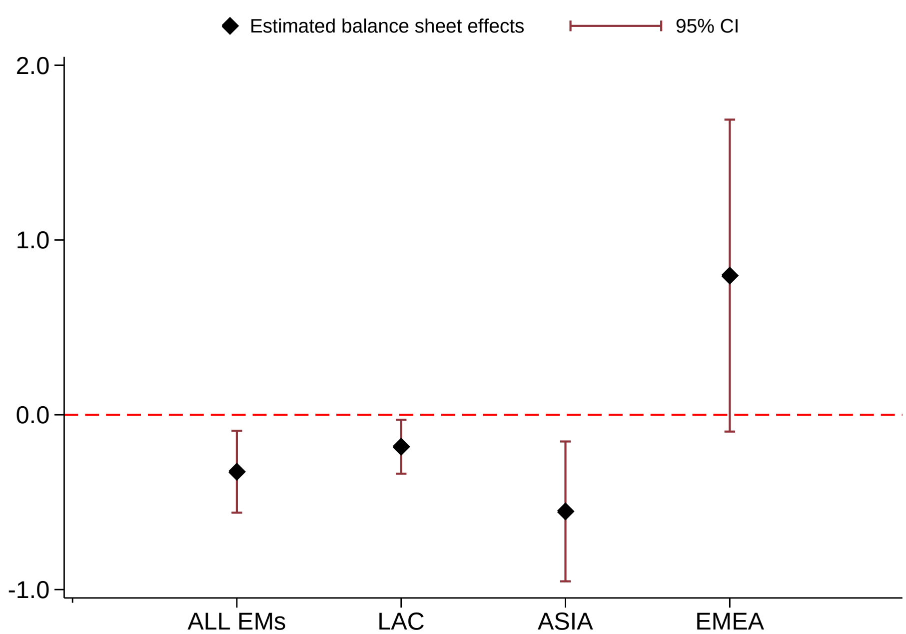


Figure OA.4: Estimated Balance Sheet Effects Adding Years into the Regression. Regressions for CAPEX$_t$

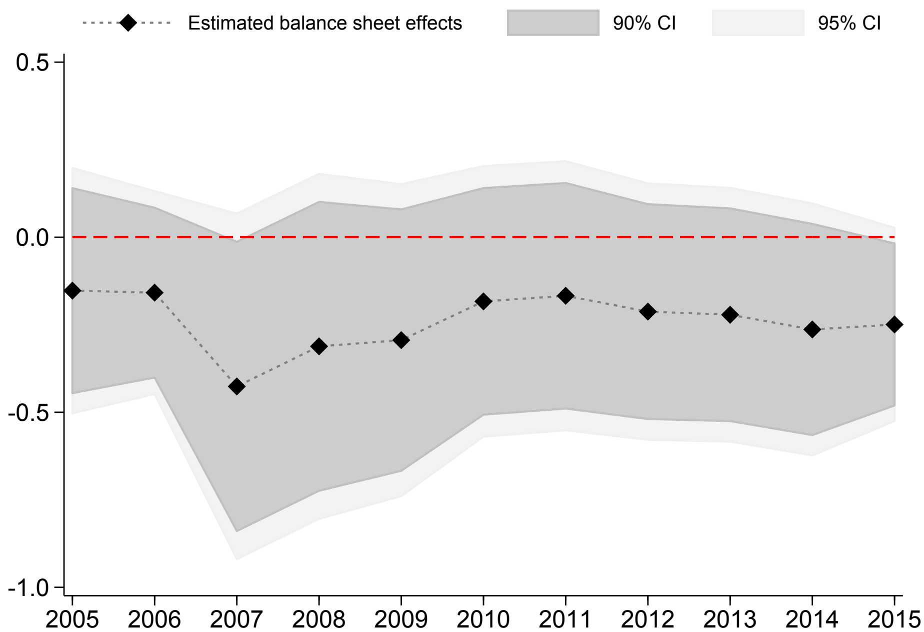


Figure OA.5: Estimated Balance Sheet Effects Adding Years into the Regression. Regressions for CAPEX$_{+1}$

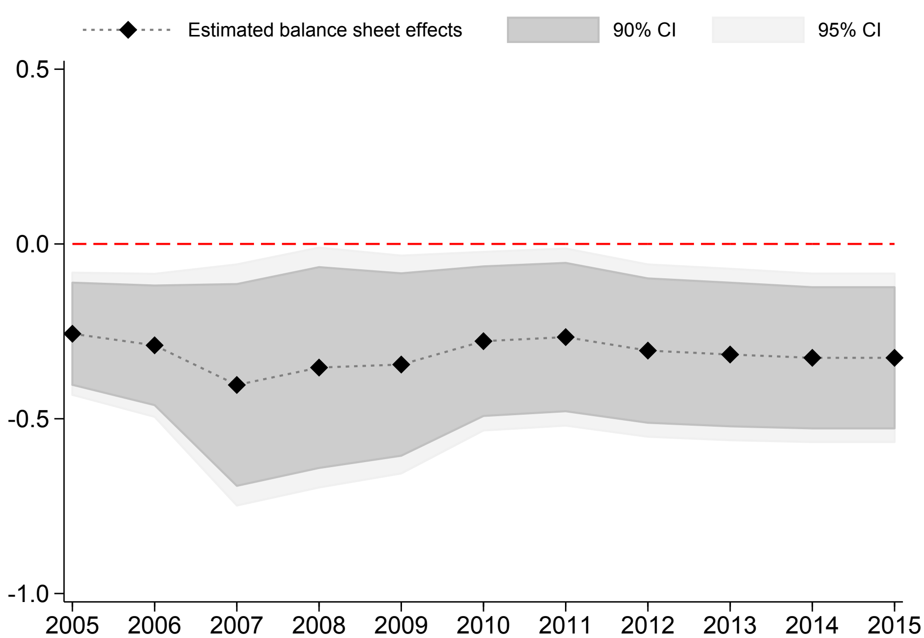


Figure OA.6: Placebo Regressions for Randomization Inference. Regressions for CAPEX$_t$ on FXB$_{t-1}$ (no covariates))

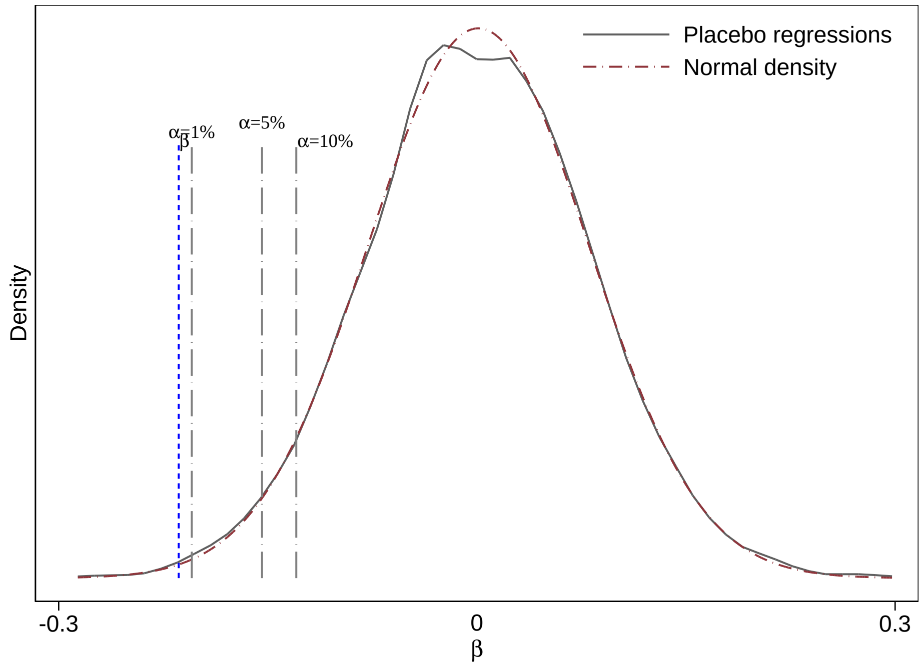


Figure OA.7: Placebo Regressions for Randomization Inference. Regressions for CAPEX$_{t+1}$ on FXB$_{t-1}$ (no covariates)

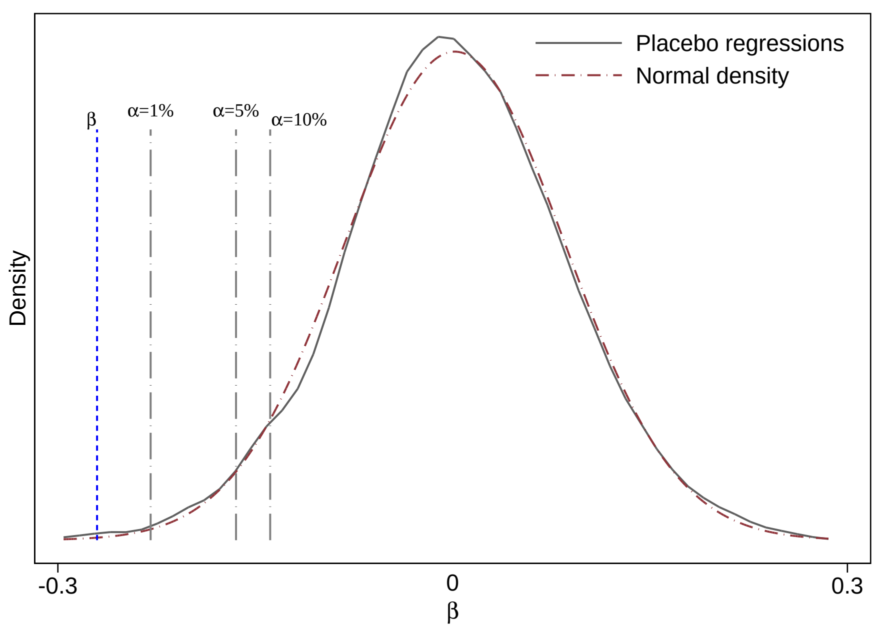


Figure OA.8: Trends in capital expenditures by group of firms 2010-2015

This figure presents trends in capital expenditures scaled by assets of firms exposed to foreign currency bonds as of end of 2012 and non-exposed firms for the period 2010-2015 in a sample of 11 emerging economies. The trend for each group is obtained after taking means of capital expenditures within countries by group, and then averaging across countries.

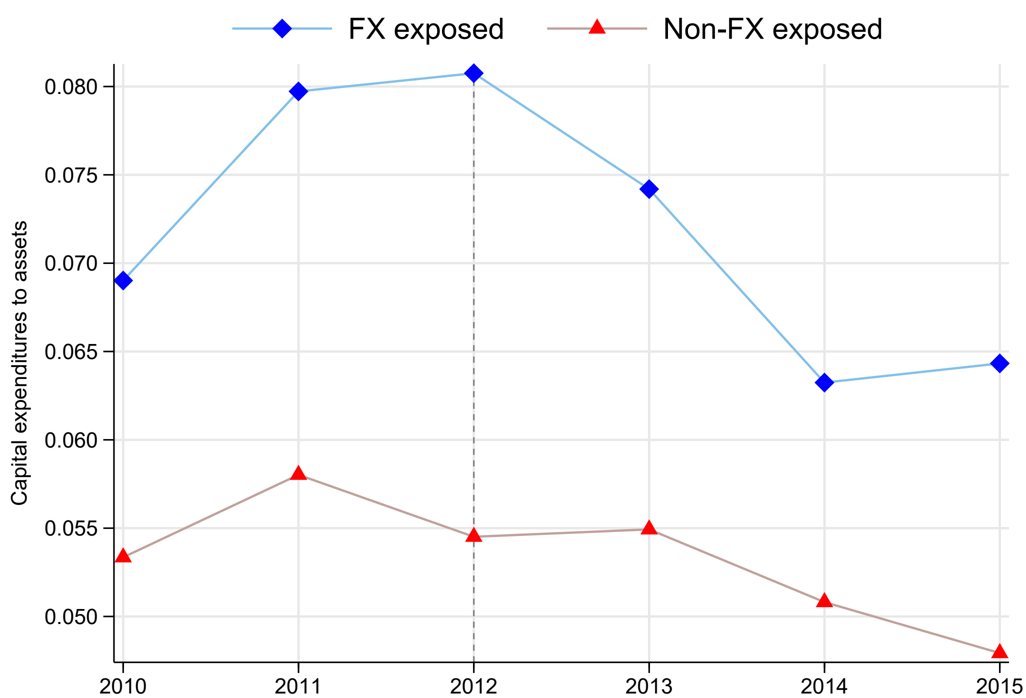


Figure OA.9: Average Changes in Capital Expenditures 2012 vs. 2010

This figure shows the difference in average changes in capital expenditures between 2010 and 2012 for firms and between firms exposed to foreign currency bonds.

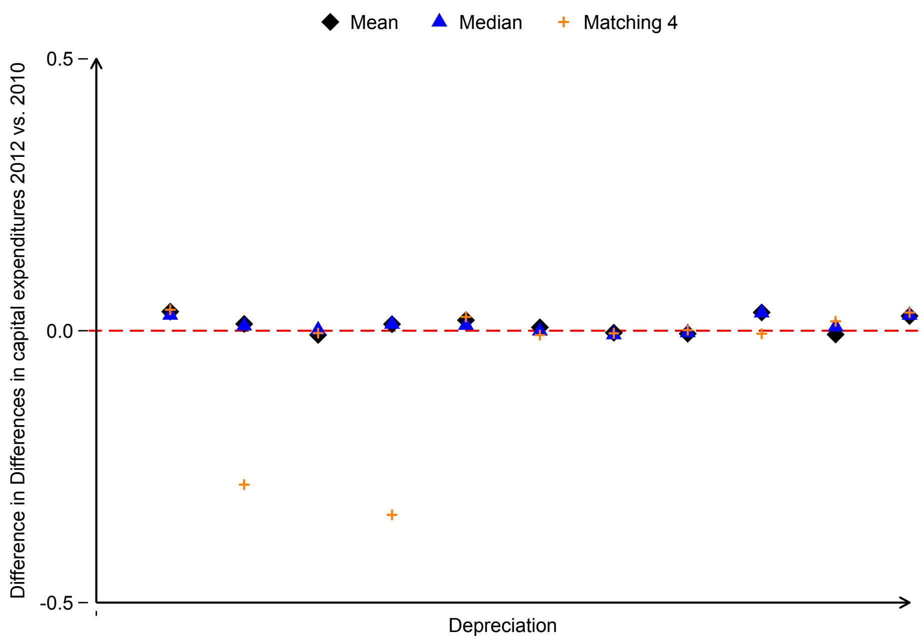
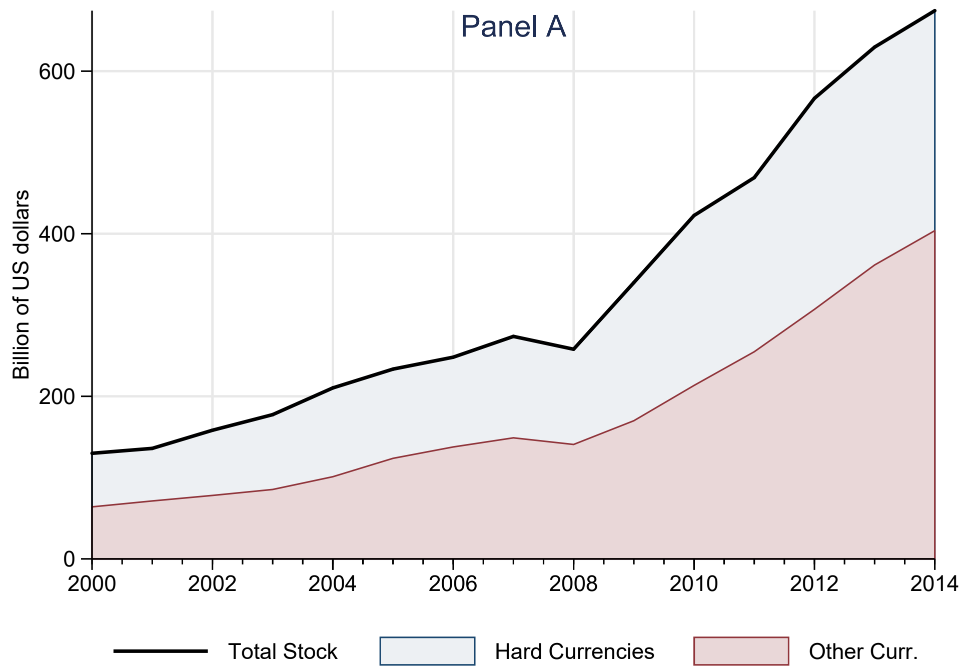


Figure OA.10: Stocks of Foreign Currency Bonds

These figures plot the total of outstanding stock of bonds computed for the firms in the baseline sample of the paper. Panel A decomposes the total stocks into bonds denominated in foreign currency and bonds denominated in other currencies. Panel B decomposes the stocks into bonds issued by the firm from its country of residence and bonds issued through offshore subsidiaries. Both figures show aggregations of all bonds converted to U.S. dollars.



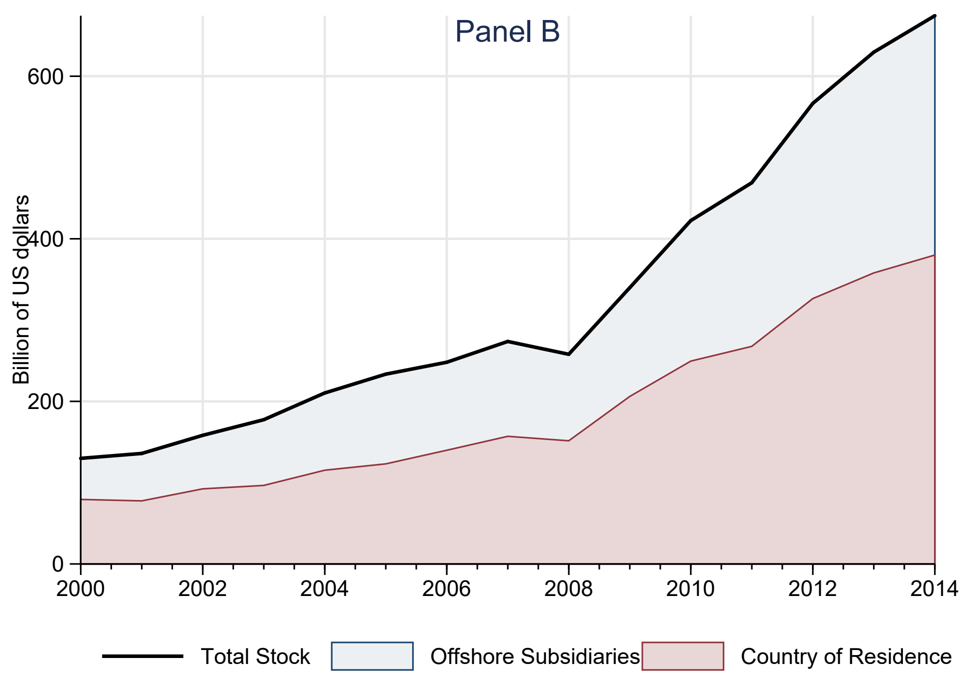
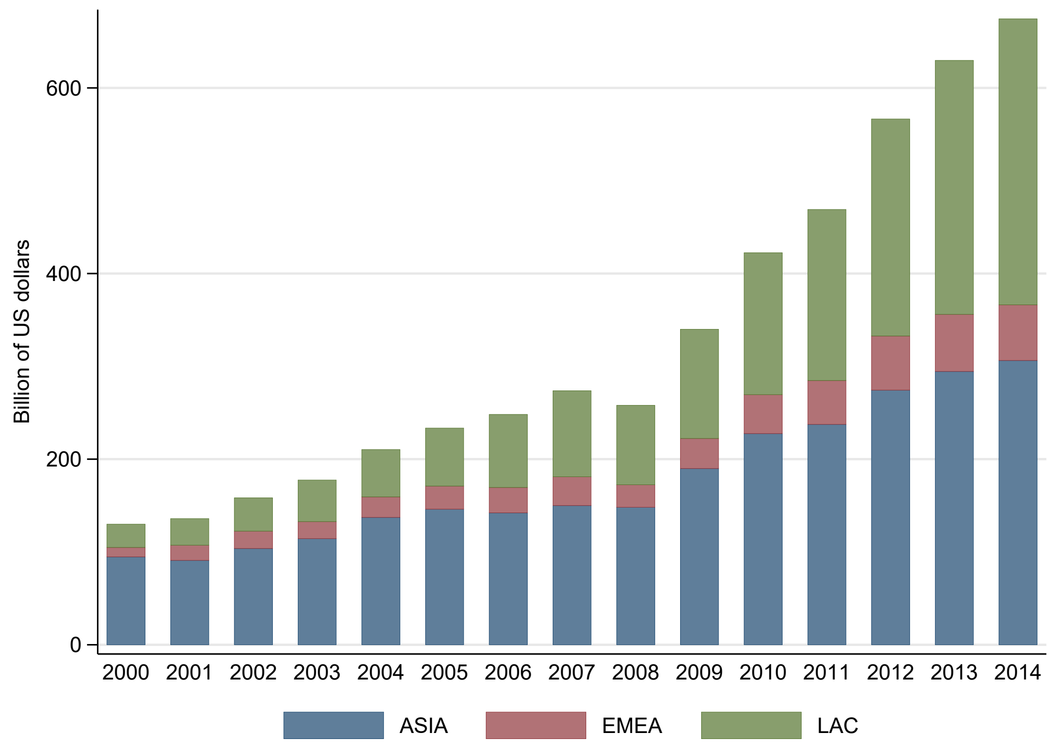


Figure OA.11: Stocks of Foreign Currency Bonds by Region



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