Monetary Policy and the Currency of Corporate Debt

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Abstract

In a large international sample, firms adjust the currency structure of their debt away from (toward) currencies where monetary policy rates rise (fall). I provide insight into why this theoretically unprofitable behavior is observed–namely, that nonfinancial firms have higher discount rates than large financial firms and that falling foreign interest rates makes one type of hedging less costly. I also find that firms adjust the currency structure of their debt more when they have better access to foreign capital markets and more financial flexibility. Evidence suggests that monetary loosening in one country may stimulate corporate investment in other countries.

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How do globally-connected firms respond when monetary policy shocks differ across countries? For a sample of such firms, I estimate the impact of relative changes in monetary policy rates on changes in the currency structure of the firms' debt. I also estimate the impact of foreign policy-rate changes on firm investment.

I find that these globally-connected firms respond to policy shocks by rebalancing the currency of their debt toward the currency where rates fall, and that this result is not explained by factors at the level of the home country, the foreign currency, or the firm's industry. The main finding is also not explained by the location of firms' foreign subsidiaries. A 1% decrease in the foreign interest rate, relative to the home rate, leads a firm to increase its use of the foreign currency by 0.3% of total firm debt, or about 1% of debt denominated in that currency. Importantly, firms substitute by reducing debt denominated in their domestic currencies so that total firm leverage is unchanged. A back-of-the-envelope calculation estimates that firms' response to changes in nominal interest rates can explain around 4% of gross issuance of foreign-currency debt. Monetary shocks in one country also influence the investment of firms in other countries. My results have implications for monetary policy, for the study of firms' debt structure, and for the opportunities and consequences of multinational firms.

Existing studies propose that monetary policy actions in one country spill over to other countries through the behavior of global banks and portfolio managers—credit suppliers—that operate in multiple countries (e.g., see Cetorelli and Goldberg (2012), Bruno and Shin (2015a,b), Falagiarda, McQuade, and Tirpak (2015), and Brauning and Ivashina (2017a,b)). The possibility of spillovers through nonfinancial firms—credit demanders—that also operate in multiple countries has received little attention. The results show that policy shocks in one country lead firms to reallocate their demand for credit across countries, suggesting spillover effects on credit pricing. I also find evidence of a spillover effect on firm-level investment. After controlling for firms' foreign subsidiaries and for their investment opportunities, monetary loosening in one country positively affects investment for foreign firms that have access to debt markets in the loosening country.

I use monetary policy rates as my measure of interest rates, as I am interested in the policy implications. Using policy rates is also helpful for two other reasons. First, my data cover a large number of countries and include both bond and bank debt, and policy rates provide a single, observable rate for each country. Second, using policy rates helps identify the impact of interest rates, because policy rates are plausibly set without central bankers considering the particular foreign currency choices available to individual firms. I take the view that central bank authorities influence interest rates, and that monetary policy affects firms' borrowing costs.[1]

In theory, firms should not change the currency structure of their debts in response to nominal interest rate changes. This is because increasing debt in one currency and simultaneously reducing debt in another currency, if profitable in expectation, is an arbitrage. If there is no arbitrage in currency markets, there is no reason for the firm to manage its currency structure solely because of interest rates. However, both empirical evidence and survey responses (Graham and Harvey (2001)) show that firms do respond in practice. The second goal of this paper is to understand what might explain such behavior. I analyze five potential explanations, finding evidence against three and in favor of two.

My third goal is to relate changes in the currency structure of corporate debt to characteristics of firms, debt components, and countries/currencies. Which types of firms rebalance

[1] Hanson and Stein (2015) argue that monetary policy affects real interest rates in the long term as well as in the short term. Nonfinancial firms borrow at longer-term rates rather than overnight, and to the extent that the pass-through from short rates to long rates is less than 1, my results understate the true effect.

their currency structure the most in response to interest rate shocks? Do firms rebalance the currency structure of all types of debt or only some? Do characteristics of the home country or the foreign currency matter? I observe more active currency rebalancing when foreign banks are relatively healthy, when the firms' domestic banks are relatively weak, for firms with more foreign subsidiaries, and among firms with greater historical reliance on debt denominated in a particular foreign currency. These results demonstrate that changes in firms' currency structure are predictable, and the results also help connect the corporate financing decisions to monetary policy and to frictions in financial markets. Firms also rebalance more when they have low leverage, high cash balances, and are relatively unconstrained according to a widely-used measure (the size-age index). I interpret this as a relationship between firms' currency structure adjustments and their financial flexibility.

Bank debt in the form of term loans appears more prone to rebalancing than revolving bank loans or debt obtained in capital markets. This result reinforces the importance of banks in the transmission of monetary policy (Gertler and Gilchrist (1993, 1994), and Kashyap and Stein (1995)), and also sheds some light on firms' motivation for responding to nominal interest rate differentials in the first place. Section IV discusses the importance of both longer maturity debt and differences between nonfinancial firms' and banks' discount rates.

Firms' propensity to rebalance the currency structure of their debt also depends on country and currency characteristics. I observe more rebalancing involving floating-rate currencies and firms in the countries that are least subject to capital controls. I do not find that results are stronger or weaker for emerging-market firms. Rebalancing is considerably weaker for emerging-market currencies, but results do not suggest a unique role for the U.S. dollar.

Finally, this paper shows that monetary policy shocks in one country affect the investment rates of foreign firms borrowing in the associated debt markets. After a central bank decreases its policy rate, firms based in other countries have higher asset growth in the next period—especially those firms most likely to have the best access to debt markets in the loosening country. This result is quantitatively unchanged even for a subsample of firms with no subsidiaries in the loosening country, suggesting that at least some of the incremental investment occurs outside the loosening country.

Understanding firms' potential to link credit demand across countries is important, because such links have the potential to amplify spillovers occurring due to supply-side links. For example, Figure 1 illustrates credit supply and demand for two hypothetical countries with partially segmented capital markets. The initial equilibrium point is (A on the left graph, A on the right). If supply curves across countries are positively linked through global lenders, as in the literature, then a shock that reduces credit supply in Country 1 also reduces credit supply in Country 2 and the equilibrium moves from (A,A) to (B,B). Credit prices in both countries rise and lending quantities in both countries decrease. Now suppose that the price of credit increases more for Country 1 than for Country 2 (i.e., a change in interest-rate differential, which is the focus of this paper) and that borrowers react by shifting some credit demand to Country 2. The final equilibrium point is (B,C), meaning that the shock in Country 1 has an amplified effect on the price of credit in Country 2, and a muted effect on the quantity of credit in Country 2.

[Place Figure 1 about here]

I. Related Literature

This paper connects the literatures on monetary policy, corporate debt choices, and multinational firms. On cross-country policy transmission, Cetorelli and Goldberg (2012) find that global banks respond to liquidity shocks in one country by shifting capital from their branches in other countries. Bruno and Shin (2015a) find that U.S. monetary shocks affect foreign banks' funding costs, and Bruno and Shin (2015b) find that after monetary shocks, local (i.e., non-US) banks increase their U.S. dollar borrowing from global banks. Falagiarda et al. (2015) show that after 2007, low yields in the Euro Area place downward pressure on yields in the Czech Republic, Romania, and Poland, as asset managers rebalance their portfolios away from Euro-denominated bonds and toward these countries' bonds. I complement this work by showing that nonfinancial firms, too, can transmit the effects of monetary policy across national borders.

The dynamics of firms' capital structure (e.g. Miller (1977), Lemmon, Roberts, and Zender (2008), DeAngelo and Roll (2015)) and of their debt structure (e.g. Barclay and Smith (1995), Johnson (1997)) are long-standing targets of corporate finance research. I extend this work by examining the currency structure of debt and by relating it to monetary policy, investment, and debt maturity in an international setting. Papers related to mine include Keloharju and Niskanen (2001) and Kedia and Mozumdar (2003), who find that firms borrow in foreign currency to hedge operating exposure; and Keloharju and Niskanen (2001), Allayannis, Brown, and Klapper (2003), and McBrady and Schill (2007), who find a negative correlation between the levels of foreign interest rates and foreign-currency debt issuance. Henderson, Jegadeesh, and Weisbach (2006) study whether aggregate debt issuance at the country level is influenced by market-timing motives. They present strong evidence that equity issues peak when equity prices are temporarily high, but their evidence on market timing in bond issuance is only marginally significant. Jang (2017) shows that multinational firms are more likely than purely domestic firms to issue both bonds and bank debt in foreign markets. I find a strong response of debt currency structure to interest rates, and I am also able to compare the sensitivity of bank and bond debt in a single sample. An additional feature of my data is that I observe changes in the outstanding stock of debt (net issuance), rather than gross issuance only. With the exception of Allayannis et al. (2003), whose study is mostly cross-sectional, this literature studies gross issuance data and so cannot rule out the possibility that changes in interest rates simply motivate firms to refinance without actually changing their currency structure. If the only effect of interest rates is that firms refinance debt, the global allocation of credit demand need not change and no monetary policy spillovers need occur.

This paper also contributes to the study of multinational firms. I consider my sample firms to be "multinational," either because they have foreign subsidiaries or because they raise capital in foreign financial markets (or both). Bodnar, Tang, and Weintrop (2003), Creal, Robinson, Rogers, and Zechman (2014), and Jang (2017) find that multinational diversification brings important benefits, while Denis, Denis, and Yost (2002) argue that it destroys firm value. My results suggest that benefits to multinational diversification also include greater choice of financing currency and exposure to foreign monetary stimulus. Cravino and Levchenko (2017), Boehm, Flaaen, and Pandalai-Nayar (2019), and Bena, Dinc, and Erel (2019) highlight the capacity of multinational firms to propagate real shocks and business cycles across countries, and my paper also indicates their capacity to propagate monetary shocks. There is one other paper to my knowledge that relates firms' international operations directly to monetary policy. Hawkins and Macaluso (1977) show that when monetary conditions are tight in the U.K., Germany, France, and Japan, subsidiaries of U.S.

firms located in these countries receive more equity from parents and invest at a higher rate than control firms. They conclude that firms with foreign parents are able to moderate the effects of local monetary policy.

The papers closest to this one are McBrady, Mortal, and Schill (2010), Bruno and Shin (2017), and Liao (2019), and I contribute to the literature in a few ways. McBrady et al. (2010) show that firms issue debt in foreign currencies in response to cross-country yield differences, especially firms that are large and have investment-grade ratings. Bruno and Shin (2017) show that non-US firms' dollar borrowing resembles a carry trade: emerging-market firms issue more dollar-denominated bonds in periods when the dollar carry-trade is profitable, and they retain more of the proceeds as cash. They find that this carry-trade-like behavior is stronger among firms with higher existing cash balances, which they interpret as meaning cash-rich firms are more tolerant of risk. I also find that cash-rich firms more readily adjust the currency structure of their debt, which I relate to firms' ability to issue new debt and/or repay existing debts. Liao (2019) studies the breakdown in covered interest parity (CIP) post-2008, and he finds that variation in the "corporate basis," or cross-country differences in CIP-adjusted borrowing costs, influence corporate borrowing behavior. In contrast, my results are driven by the pre-2008 period when CIP deviations were close to zero. Interestingly, we both estimate that a one-standard deviation change in the corporate basis (Liao) and/or a one-standard deviation change in cross-country monetary policy rate differential (this paper) are responsible for about 4% of corporate debt issuance.

My paper distinguishes itself from these papers first by analyzing how the currency-rebalancing behavior I document correlates with certain characteristics of the debt components and of the firms. This analysis provides novel insight on the motivations behind such behavior. The second difference between my paper and these related papers is that I show that firms reallocate demand across currencies. Not only do firms borrow more in foreign currencies where monetary policy rates fall (relatively), but they compensate by borrowing less in their home currencies. Thus, monetary policy shocks in one country have the potential to influence demand for borrowing in other countries' currencies. Finally, I connect changes in interest rates to changes in corporate investment rates.

II. Data and Sample

A. Sample Firms

I select a sample of firms most likely to face decisions about the currency structure of their debt. Sample firms must be publicly-traded nonfinancial companies,[2] and must have borrowed in a foreign currency at some time in the past. For each firm in the main sample, I only track foreign currencies that have accounted for at least 10% of the firm's debt in any previous period going back to the first year data are available. Once a currency passes this 10% threshold, I continue to track its share of firm debt, even in years when this share is zero. Later, I relax this threshold. I also drop firms with annual asset growth greater than 100% or less than -50%, since they are likely to be involved in significant merger activity that may mechanically change their currency structure. I exclude a small number of firms with negative capital expenditures, or with book leverage less than 0 or greater than 1, or in countries that joined the Euro in 2003 or later. I next drop countries and currencies that are represented by only a very small number of firms meeting the sample criteria. Finally, since my primary explanatory variable is the policy-rate differential, I drop currencies whose

[2] Financials have SIC codes 6000-6999 or level-1 Global Industry Classification Standard (GICS) code "Financials" if SIC is missing. Utilities have SIC codes 4900-4949 or GICS "Utilities" if SIC is missing. Government entities have SIC codes 9000-9799.

central banks do not target any policy rate (e.g., Singapore dollars).

The final sample includes 6,931 firms in 43 countries with foreign-currency debts denominated in 47 currencies.[3] Due to data limitations, my sample covers the years 2002-2017. As of 2017, the sample firms have a combined market capitalization of \$19.2 trillion USD, or about 24% of global market cap using World Bank data. The multi-currency requirement excludes a higher fraction of firms from countries like the U.S. and Japan, where foreign-currency borrowing is less common, than from countries like South Korea and the United Kingdom where it is more common. When I later relax the 10% threshold, this selection bias gradually disappears but results remain statistically significant.

My dependent variable is the (fiscal) year-over-year change in a currency's share of total firm debt. I adjust for the timing of currency conversion by holding exchange rates fixed in my calculation of the change in a currency's share of total firm-level debt. Data on debt currency and firm characteristics are from Capital IQ. The Capital IQ team collects this information manually by reviewing more than 1,000 documents per day, including legal filings, press announcements, and company websites. Details include the amount of debt outstanding, the currency of issuance, the issuing firm's reporting currency (usually its domestic currency), and the debt category. Four categories—outstanding balances on revolving credit facilities, commercial paper, term loans, and bonds and notes—account for more than 86% of all debt obligations in the database, and I limit my analysis to the sum of debt across these four types. An additional 5% of debt components are capital leases, another 7% are described as "other borrowings," and most of the remaining 1% are trust preferred debt. The data also contain information about debt components' maturity, interest-rate type (fixed vs. floating)

[3] The small number of currencies is potentially problematic for regressions that cluster by currency, since Cameron and Miller (2015) suggest avoiding tests with fewer than 50 clusters. However, Cameron, Gelbach, and Miller (2008) find that a bootstrapped-t procedure can support valid inference even with as few as 5 clusters. In Internet Appendix B, I show that the results in this paper are robust to the bootstrap.

and level, whether the debt is convertible or callable or secured, etc., but many of these fields are not well populated.

Table 1 displays summary statistics for the financial characteristics (Panel A) and debt currency structure (Panel B) of the sample firms. The average firm raises 63% of its debt in its home currency. However, there is wide variability in this percentage across countries. Only 40% of Canadian firms' debt is denominated in Canadian dollars, while firms in Korea and Taiwan raise approximately 85% of their debt in their home currencies. The U.S. dollar is by far the most common foreign currency. Among firms with any dollar debt, dollars account for 54% of Canadian firms' debt, 41% of British firms' debt, and 25% of the debt of the average non-U.S. firm. Euros are a distant second, at 12% for British firms and 4% for the average non-Euro firm. Chinese Yuan is the most important foreign currency not shown, and is frequently used by firms in other East Asian countries.

[**Place Table 1 about here**]

B. Monetary Policy Rates

I calculate annual changes in the policy rates of my sample firms' foreign and home currencies over each firm's fiscal year. I obtain these rates from the International Monetary Fund (IMF), the Bank for International Settlements (BIS), and a variety of other sources. In all cases, I have selected rates (a) for which historical values are available, (b) which move sharply with actions taken by the monetary authority, and (c) which are comparable in maturity across countries (i.e., maturity less than two weeks, typically overnight). For countries that have no policy rate—Singapore, Croatia, and Sri Lanka—I drop the currency from my sample but keep firms located in the country that have debts in other currencies. See Internet Appendix

A for detailed descriptions of policy rates and data sources.

Table 2 shows summary statistics for annual changes both in policy rates and in currency shares of total firm debt. The mean absolute value of the annual change in rate differential is approximately 1.0% (100 basis points). The values in Panel B show that the currency structure of firms' debt is quite volatile. The average increase in a foreign currency's share of total debt is 15%, and the average decrease is 18%. The currency share does not change for 43% of observations, but most of these are trivial cases where the currency share remains constant at 0%. My paper builds on the corporate debt structure literature by explaining some of this volatility as a function of monetary policy shocks and firm and country characteristics.

[**Place Table 2 about here**]

C. Other Variables

I hypothesize that market frictions lead to variation in firms' access to foreign credit markets, and that this variation also affects the magnitude of firms' currency structure rebalancing. I focus on frictions due to the (under)capitalization of the banking system and on frictions related to information asymmetry between firms and lenders. Country-level data on bank capitalization are widely available post-crisis but mostly unavailable before, so I use bank profitability as an alternative measure before 2009. Bruno and Shin (2015b) argue that more profitable banks are also better capitalized, and they find that these banks lend more and that bank ROA is an important determinant of aggregate cross-border capital flows. For both bank capitalization and profitability, the intuition is that better capitalized banks are more responsive to demand for credit denominated in their domestic currency, so that corporate borrowing in that currency is more sensitive to changes in interest-rate differential. Better capitalized foreign banks make firms more likely to borrow abroad and better capitalized home banks make firms less likely to borrow abroad, which dampens firms' sensitivity to interest-rate changes. The literature on distance and bank lending predicts that firms first borrow from nearby lenders if they can (Petersen and Rajan (2002), Degryse and Ongena (2005), Agarwal and Hauswald (2010)).

At the firm level, I use two proxies for a firm's access to foreign debt markets. The first is the percentage of total firm subsidiaries located in the foreign country. Jang (2017) finds that having a subsidiary presence reduces the credit spreads firms must pay to foreign lenders, since foreign assets and operations reduce information asymmetry. The second proxy is the firm's historical use of the foreign currency, under the assumption that a greater use of foreign currency indicates stronger lending relationships with foreign lenders, or that it otherwise reveals an ability to access markets for debt in the foreign currency. This assumption is still valid for firms that borrow foreign currency from a domestic bank, as long as the domestic bank ultimately borrows from a foreign bank.

I also hypothesize that firms with greater financial flexibility adjust their debt structure more when interest rates change. Unconstrained firms and firms with higher cash balances, lower leverage, and higher interest coverage should be better able to adjust their debt structure by issuing new debt or by repurchasing existing debt that is available for call or purchase. Details on the construction of all variables are in Appendix A.

III. Benchmark Results

A. *Change in debt share and change in interest rates*

This paper's basic empirical model is a first-difference specification, with a foreign currency's change in share of firm debt on the left, and the change in the foreign policy rate relative to the firm's home policy rate on the right. I predict a negative relationship. In equations,

$$\Delta\left(\frac{d_{i,f,t}}{d_{i,h,t}+\sum_f d_{i,f,t}}\right)=\beta\Delta(r_t^f-r_t^h)+\varepsilon_{i,f,t}, \tag{1}$$

where i indicates the firm, h indicates the home currency, and f indicates a foreign currency. I then add lagged firm characteristics that are potentially important for explaining changes in debt: leverage, Tobin's Q, sales growth, and the size-age index of Hadlock and Pierce (2010) as an estimate of financial constraint. The regressions also include several variable plausibly linked to firms' exchange-rate expectations: the lagged level of the exchange rate, the contemporaneous and lagged appreciation of the foreign currency against the home currency, and the lagged 12-month volatility of the exchange rate. The lagged level captures managers' expectations of future exchange rates if they believe exchange rates are a martingale. McBrady and Schill (2007) find that exchange-rate appreciation is a determinant of currency choice, possibly because managers extrapolate recent trends. The contemporaneous and lagged appreciations control for either this possibility, or the possibility that managers believe exchange rates are mean-reverting (see Ca' Zorzi, Muck, and Rubaszek (2016)). The volatility of the exchange rate makes foreign-currency exposure more risky and/or makes hedging this risk more costly.

I also add fixed effects to Equation 1 for (home country*time) and (foreign currency*time), to capture aggregate supply and demand of credit in the home and foreign currencies. The resulting tests allow for variation along two dimensions. First, they compare two firms based in the same country, but that have historically borrowed in different foreign currencies and so are differently exposed to monetary shocks. Second, the tests compare two firms borrowing in the same foreign currency, but with different exposures to shocks because they are located in different countries. Alternatively, I use a set of macro controls to explicitly account for conditions in the home or foreign country. These controls are the level of GDP, the contemporaneous real GDP growth, the real growth forecast as of the beginning of the year, and the profitability of the country's banking system.

To the extent that changes in policy rates coincide with investment opportunities more for some industries than for others, the fixed effects described above might fail to capture firms' demand for credit. On the one hand, firms in industries expecting a foreign recession might retrench, cutting both foreign borrowing and investment. On the other hand, firms suffering from the effects of a recession might increase their foreign borrowing to make up for low cash flows. In unreported specifications, I interact each of the home*time and foreign*time fixed effects with the firm's two-digit SIC industry to more closely capture the firm's operating conditions, but the results are qualitatively unchanged.

Table 3 shows the results from estimating Equation 1. Column 1 includes fixed effects at the home-country*time level and controls for foreign conditions explicitly with GDP and bank ROA controls. Column 2 includes foreign-currency*time fixed effects and explicit macro controls for the home country, and column 3 uses both sets of fixed effects and no macro controls. I add the exchange-rate controls in columns 4-6 and the firm characteristics in columns 7-9.

The coefficient on the change in interest-rate differential is negative and statistically significant in all specifications. The exchange-rate controls are always insignificant, indicating that firms tilt their currency structure toward currencies where interest rates fall, but that this is not a systematic response to exchange-rate dynamics. For the remainder of the paper, I refer to the specification in column 9—with both fixed effects and all exchange-rate and firm-level controls—as the benchmark result.

[**Place Table 3 about here**]

The benchmark point estimate of -0.298 implies that a 1% increase in the foreign interest rate, relative to the home rate, leads a firm to reduce its fraction of foreign-currency debt by 0.298% of total debt, or about 1% of debt in the currency since the average total currency share is about 37%. Likewise, the point estimate of -0.718 in column 2 translates to about 1.9% of currency-specific debt. The mean maturity of debt for my sample firms is about 4 years, meaning firms must roll over 25% of debt each year in order to maintain their capital structure. If the foreign policy rate falls 100 basis points relative to the home rate, the benchmark result indicates that a firm rolls over 25% of its foreign currency debt and also borrows another 1%. This back-of-the-envelope calculation estimates the economic magnitude of the benchmark result at roughly 1% / 25% = 4% of net debt issuance.

If a firm borrows more in a foreign currency when rates fall but does not change the amount borrowed at home, the foreign currency's share of debt will rise mechanically—firm leverage simply increases, and there is not necessarily any channel whereby increases in demand for foreign-currency debt affect the firm's demand for home-currency debt. In Table 4, I test whether changes in policy-rate differentials affect total firm debt, or just the composition of debt. In the first two columns, I estimate changes in book leverage as a function of policy-rate changes, and I find zero effect. In the third column, I reformulate the benchmark test as a levels regression and add firm fixed effects. The negative coefficient here is consistent with Table 3, but the reformulation allows me to decompose the ratio on the left-hand side using logs. The final two columns estimate changes in the numerator (foreign-currency debt) and denominator (total debt), respectively. I find that relative changes in policy rates do affect foreign-currency debt, but not total debt. Therefore, I interpret the benchmark result as evidence of a reallocation of credit demand across countries, or across currencies.

[**Place Table 4 about here**]

IV. Why Do Firms Respond At All?

In the absence of arbitrage, firms should be indifferent to debts denominated in different currencies. The market will set prices that guarantee zero profits on a hedged currency position, and expected currency appreciation will guarantee zero expected profits on an unhedged currency position. However, Graham and Harvey (2001) find that nearly half (44%) of surveyed CFOs cite lower interest rates abroad as an important consideration in determining where to raise financing. I consider five potential reasons for this seeming discrepancy. The evidence disfavors the first three reasons (naïve managers, post-crisis dislocations in currency markets, and carry trade). I find that the evidence best fit the fourth reason, which is a difference between the discount rate used by the nonfinancial firms in my sample and the discount rate used by marginal currency traders.

A. *Naïve Managers*

The first potential reason why firms may respond to interest rate changes is if naïve managers pay more attention to interest rates than to hedging costs, the market's exchange-rate expectations, and arguments of interest parity. However, my sample includes only publicly-traded, relatively large firms, which are likely to have sophisticated financial managers. Furthermore, even within my sample, results are strongest for the largest firms (see Table 5). If managers of larger firms do tend to be more sophisicated than those at smaller firms, the simple explanation that managers are naïve is implausible.

[**Place Table 5 about here**]

B. *Post-Crisis Breakdown of Covered Interest Parity*

Another potential explanation may be that currency markets became more segmented in the post-crisis period as constrained banks were less able or less willing to intermediate them. Borio, McCauley, McGuire, and Sushko (2016) suggest that constraints on bank intermediation at least partially explain violations of covered interest parity. Liao (2019) argues that country-level corporate bond spreads diverged after the crisis, making arbitrage profits available to firms that were in a position to issue foreign debt. However, my results are economically and statistically important only before the crisis. Table 6 shows the benchmark results for several sample periods. The main coefficient is negative and statistically significant for the years 2002-2008, and it is about four times as large as in the full sample (column 1 of Table 3). The coefficient is not statistically significant for the years 2009-2016, and is also smaller in magnitude than the benchmark result. This table also shows that the benchmark result is not entirely due to the 2008-2009 crisis years. Row three drops 2008 and 2009 and re-estimates the benchmark test. The result is similar in magnitude to the benchmark result, and statistically significant at the 10% level. A large part of the variation in my independent variable (change in policy-rate differential) is in these years, so excluding 2008-2009 results in a loss of power. In row four, I keep 2008-2009 and exclude the two other years with the highest variation in the dependent variable, and the result is no longer statistically significant. My results depend on the presence of variation in the independent variable, but they are not unique to the 2008-2009 financial crisis or to the post-crisis years. The remaining rows of Table 6 exclude all years in the sample one at a time.

[**Place Table 6 about here**]

C. Carry Trade

A third possibility is that firms do not expect future movements in exchange rates to offset low rates—i.e., uncovered interest parity (UIP), or the no-arbitrage condition for unhedged currency positions, does not hold (see Tryon (1979), Fama (1984), Engel (1996), and Farhi and Gabaix (2015)), so firms engage in a carry trade. This explanation predicts that firms with the greatest capacity to take on risk—firms with low leverage, strong cash flow, and large cash balances—should be the most sensitive to changes in interest rates, as in Bruno and Shin (2017), and I do find some evidence consistent with this idea. However, while UIP is consistently rejected in short-horizon studies, Chinn and Quayyum (2012) find that the long-horizon evidence is much friendlier to UIP. Furthermore, Lustig, Stathopoulos, and Verdelhan (2019) find that the term structure of carry trade premia is downward sloping. If sophisticated firms are conducting a carry trade, than they ought to focus on the currency structure of short-term debt as the short leg of the trade and hold cash and liquid securities as the long leg. I find contrary evidence: my sample firms tend to adjust the currency structure of long-term debt around relative policy-rate changes, and they also do not systematically change their cash holdings.

Table 7 shows descriptive statistics (Panel A) and empirical results (Panel B) for each of the four debt types in my data. Of the four types, Term Loans and Bonds & Notes tend to have the longest maturities. Term Loans are longer-term bank debt, while Bonds & Notes are a mix of bonds and bank debt. I separate the benchmark dependent variable into the currency share within each debt type. Then, in Panel B, I estimate how the currency mix of each type responds to the policy-rate changes. Row one repeats the benchmark test in for the full sample (column 1) and then for each debt type (columns 2-6). Row two shows the results of similar tests that include only years 2002-2008, since that is the period where my benchmark result occurs (see Table 6). The only (marginally) significant results in row one of Panel B are for the debt in the bonds & notes category. In row two, the coefficients for term loans and bonds & notes are both negative and larger in magnitude than the full-sample benchmark results, and the coefficient for the longest-maturity category (bonds & notes, last column) is economically large and highly statistically significant. A carry trade uses short-term debt as the short leg of the trade, while firms in my sample adjust the currency structure of only their long-term debt categories in response to changes in interest rates.

[**Place Table 7 about here**]

A carry trade also uses short-term liquid assets as the long leg of the trade. I test the sensitivity of my sample firms' cash holdings to interest rate differentials by putting cash on the left-hand side. Table 8 shows the results. In column 1, I define cash as the ratio of cash and liquid securities to assets, and the dependent variable is the annual change in this ratio.

In column 2, the dependent variable is the change in cash and liquid securities, scaled by lagged assets. Both dependent variables are multiplied by 100 to express the change in cash as percentage points of firm assets. Relative changes in policy rate do not predict changes in my sample firms' cash or short-term securities.

[**Place Table 8 about here**]

D. Different Discount Rates

The next candidate explanation, and the one that best fits my data, is that firms' discount rate is higher that of the marginal trader that sets prices in currency markets—likely a large, global financial institution with very low cost of debt. A firm with a higher cost of capital than this marginal trader gives relatively more weight to interest-rate savings near term, and relatively less weight on any expected exchange-rate losses in the future. Thus, they perceive a benefit where the marginal trader only sees a fair deal, and they are willing to borrow in low-rate currencies even if both covered and uncovered interest parity hold in expectation. In other words, large banks and the firms in my sample have different interest parity conditions so that only the banks—and not the nonfinancial firms—face no arbitrage.

[**Place Figure 2 about here**]

Figure 2 illustrates this situation with an example of a bank (discount rate 5%) and a firm (discount rate 10%) that both have the ability to borrow in a low-rate foreign currency. The white bars represent the nominal savings that either the bank of the firm could realize by borrowing in the low-rate foreign currency versus the high-rate domestic currency. The green bars represent the bank's discounted cash flows, and the large negative bar at maturity is the loss the bank expects to realize due to exchange-rate movements.[4] Interest parity holds for the bank in this example, so its NPV from borrowing in the foreign currency is zero. The firm trades in the same markets, and so it faces the same nominal savings and the same nominal loss at debt maturity as the bank. However, because of its higher discount rate, the firm overweights the near-term savings and underweights the future loss relative to the bank, thus realizing NPV>0. The intuition is that any two traders with different discount rates also have different interest parity conditions. If they trade in the same currency and/or derivatives markets, then only one of them at best can be at interest parity.

The preceding reasoning leads to the following predictions: (a) nonfinancial firms' currency structure is less sensitive to interest-rate movements after 2008, when banks are relatively constrained and so have higher discount rates than they did before 2008; (b) the currency structure of long-term debt should be more responsive to changes in interest rates than that of short-term debt, since more time to maturity allows the firm's higher discount rate to produce more positive NPV; and (c) firms with higher costs of capital should adjust their currency structure more. I find evidence in support of all three of these predictions. Tables 6 and 7 provide support for the first two predictions. Table 9 shows the results for subsamples defined by average cost of debt. For each firm, I calculate the cost of debt as $interest\, expense_t / (0.5 * debt_{t-1} + 0.5 * debt_t)$. I then take the average of this variable from the beginning of my sample period to time t. The coefficient is negative and statistically significant for observations with above-median cost of debt, it is insignificant for observations with below-median cost of debt, and the coefficient is statistically different between the two groups.

[4]For simplicity, this example assumes unhedged currency positions. If the positions were hedged, the green bars would be contractually locked in, but the example would otherwise be unchanged.

[Place Table 9 about here]

E. Operational Hedging

A final potential explanation for the benchmark result is that firms have natural currency exposure, perhaps through foreign operations or foreign sales, that is too costly to hedge with derivatives, versus the textbook firm that has zero net exposure at the time it decides which currency to borrow. An alternative way of hedging is to issue foreign-currency debt (see Geczy, Minton, and Schrand (1997)). As foreign interest rates fall, the cost of this "operational hedging" also falls, in which case it may not be surprising to observe firms do more of it.

Capital IQ provides a current snapshot of firms' subsidiary ownership along with subsidiary country locations. This snapshot is regularly updated, but it is possible to reconstruct the historical snapshot using Capital IQ's extensive database of M&A transactions. Starting with more than one million parent-subsidiary relationships in the network as of early 2018 and more than 500,000 M&A transactions, I construct the subsidiary network of each firm at a quarterly frequency back to the first quarter of 2002. Most of these subsidiaries are private, so I know location and ownership but not assets or revenues. I use subsidiary counts as the measure of firms' operating exposure, and I compare the percentage of a firm's subsidiaries that are located in a specific foreign country to the percentage of firm debt denominated in the foreign currency.

When the percentage of foreign subsidiaries is higher than the percentage of foreign debt, the firm is more likely to have some natural exposure that has not been hedged using foreign-currency debt. Table 10 splits the sample into two subsamples based on whether the firm-year-currency observation has a fraction of foreign-currency debt that is smaller or larger than the fraction of foreign subsidiaries. I find that firms with relatively little foreign-currency debt and relatively many foreign operations are more likely to rebalance toward foreign-currency debt when foreign rates fall.

[Place Table 10 about here]

V. Market Access and Financial Flexibility

Currency tradeoffs in response to interest-rate changes should be stronger when the currency structure is easier to adjust. Frictions may include potential lenders' [under]capitalization, or contracting frictions related to information asymmetry or legal jurisdiction. These frictions can lead to variation in firms' ability to access foreign capital markets, and I call these "market access" factors in this paper. Other factors that may affect firms' ability to adjust their currency structure include cash balances or credit quality, which may affect the firms' ability to issue new debt or retire old debt. I call these factors "financial flexibility." I interact several variables related to these factors with changes in the policy-rate differentials, and I find systematic variation in the strength of firms' response to monetary policy shocks.

I measure market access factors with the profitability of the home and foreign banking systems, the location of firms' foreign subsidiaries, and the size-age index of Hadlock and Pierce (2010). Data on country-level bank profitability are from the World Bank,[5] and Bruno and Shin (2015b) also use this variable as a proxy for bank capitalization in order to explain the global movement of capital. Direct data on bank capitalization are widely available with widespread coverage starting in 2009, but I do not use these data since my benchmark results

[5]See Beck, Demirguc-Kunt, and Levine (2000), Beck, Demirguc-Kunt, and Levine (2010), and Cihak, Demirguc-Kunt, Feyen, and Levine (2012)

are only observed during 2002-2008. Intuitively, more profitable banks are better capitalized and better able to respond to changes in credit demand. When foreign banks are strong, I predict that the foreign currency share will be more responsive to changes in policy rates, resulting in a negative interaction coefficient. When home banks are strong, I predict the opposite.

The second market access factor I consider is the location of firms' foreign subsidiaries. Jang (2017) finds that firms with foreign subsidiaries are more likely to borrow in those countries. One possibility is that foreign subsidiary operations physically close to lenders and that this helps resolve information asymmetry. An extension to this possibility is that lending relationships associated with foreign subsidiaries facilitate borrowing. Berger and Udell (1995) find that borrowers with existing lender relationships pay lower rates and provide less collateral. Another possibility is that foreign (from the firm's perspective) lenders prefer to navigate their own domestic legal system in case of default, and so see local subsidiary assets as safer collateral. I measure the total fraction of firm subsidiaries located in the foreign country using the Capital IQ relationships data described earlier. For firms with no subsidiaries anywhere, the fraction equals 0%.

The final market access factor in this paper is the size-age index as a measure of financial constraint. By definition, relatively constrained firms have difficulty accessing, or cannot access, external capital markets. Hadlock and Pierce (2010) compare several alternative measures of financial constraint and find that firm size (assets) and firm age are the most useful predictors of financial constraint. The size-age index is a nonlinear function of these two variables (see Appendix A).

Table 11 shows the coefficients that result from interacting the change in policy-rate differential with the market access factors. In Panel A, I control for country- and currency-level macro factors using fixed effects as in the benchmark test. However, in these pooled regressions, some cross-sectional variation may be due to differences in the firms' home countries or foreign currencies used, in addition to cross-sectional variation due to differences across firms in market access. Therefore, I also consider tests that hold firm-currency constant and only allow time-series variation in the market access factors. Panel B uses firm*currency and time fixed effects, and controls for macro factors directly with the GDP controls described earlier (level, real growth, and the lagged real growth forecast).

[**Place Table 11 about here**]

More-profitable home banks weaken the sensitivity of firms' foreign borrowing to policy-rate changes, but I do not find any marginal effect for foreign banks profitability. Firms with more subsidiaries located in the foreign country are more sensitive to changes in policy rate differentials, especially in the time series. The sample firms most likely to be financially constrained adjust their currency structure less when policy-rate differentials change.

I also use firms' prior borrowing history as another estimate of firm-specific debt market access. The main sample, as described earlier, only includes firm-currency pairs that have previously passed a threshold of 10% of total firm debt. I now relax this threshold and re-estimate the benchmark model using thresholds ranging from 0% to 25%. Figure 3 plots the main regression coefficients and 95% confidence intervals under the alternate thresholds. With no threshold applied (the left-most point), the coefficient is negative but not significantly different from zero at the 95% level (but it is at the 90% level). At all thresholds above 0%, however, the point estimates are negative and significant at the 5% level, and their magnitude is increasing in the size of the threshold.

It is perhaps easiest to understand this figure in terms of fixed costs to foreign-currency borrowing. There may be fixed costs to building relationships with foreign lenders, or educating management and staff on how to properly measure exchange risk, hedge it, and account for its hedging.[6] I interpret this figure as evidence that firms adjust their currency structure more in response to interest rate changes when they have paid these fixed costs. The large difference between the point estimates at the 0% and 1% thresholds especially suggests additional frictions for first-time borrowers.

[Place Figure 3 about here]

I next interact the change in policy-rate differential with three financial flexibility factors related to the ease with which a firm may adjust its currency structure by adding new debt or retiring old debt. Other things equal, firms with higher cash balances, lower leverage, and higher interest coverage have greater capacity to issue new debt, and firms with high cash balances have greater capacity to pay off old debt.

The results in Table 12 are consistent in both the cross section (Panel A) and the time series (Panel B). The sensitivity of firms' currency structure debt to changes in policy rates is greater when firms hold higher cash balances, have lower leverage, and have higher interest coverage, though the coefficients on interest coverage are economically small. Bruno and Shin (2017) point out another possible interpretation of the coefficient on cash holdings. In their paper, firms take on exchange-rate risk by issuing foreign-currency debt, and a higher cash buffer allows them to take on more risk. Conversely, high cash balances may indicate current or expected financial constraint (see Opler, Pinkowitz, Stulz, and Williamson (1999) and Almeida, Campello, and Weisbach (2004)). In my setting, the greater interest-rate sensitivity of cash-rich firms suggests that the effects of cash as financial flexibility or as a

[6] As recently as 2013, Dybvig, Liang, and Marshall (2013) write that "Hedge accounting is a relatively new and technical area, and the accounting profession is only starting to address the important issues involved."

risk buffer dominate the effect of cash as a proxy for financial constraint.

[Place Table 12 about here]

Overall, this section illustrates that the benchmark result varies systematically both over the cross-section and in the time series. Firms adjust their currency structure more strongly in response to cross-country differences in monetary policy shocks when their home-country banks are less financially healthy, when the firms are likely to have existing relationships with foreign lenders, when the firms are relatively unconstrained, and when they have high cash holdings and low leverage.

VI. Which Countries, Currencies, Pairs?

This section explores the empirical question of which home countries, which foreign currencies, and which home-foreign pairs contribute the most to the benchmark result. In Table 13, I interact the change in policy-rate differential with dummy variables for each of the ten most frequent foreign currencies (Panel A), the ten most frequent home countries (Panel B), and the ten most frequent home-foreign pairs (Panel C). Firms borrowing Hong Kong dollars, Swiss Francs, and Australian dollars are particularly responsive to interest rates in those countries. Firms borrowing Chinese Yuan and Malaysian Ringgit are much less responsive, which may be related to capital controls. U.S. dollars are unique in their high frequency in my sample, but I do not find that sample firms' dollar debt is more or less sensitive to policy rates than debt in the average currency.

In Panel B, no particular home country stands out as hosting firms that are sensitive to interest rates, other than Singapore. Firms based in Singapore borrow relatively frequently in Chinese Yuan and Malaysian Ringgit, possibly explaining these firms' lack of interest-rate sensitivity. In panel C, firms in India and Hong Kong are more sensitive to U.S. rates than the average currency pair, and Taiwanese and Korean firms are less sensitive.

[Place Table 13 about here]

Table 14 tests the importance of variation across countries and across currencies in economic development, capital controls, and exchange-rate controls. I define firms as "emerging" or "developed" following the country classification in the IMF's October 2018 World Economic Outlook. For my sample firms' home countries, the IMF's classification did not change over the sample period. I find that emerging-market firms are no more responsive to interest rates than firms in developed markets, contrary to McBrady et al. (2010) and Bruno and Shin (2017). One explanation for this contrast may be that emerging-market firms make up less than 4% of the sample of McBrady et al. (2010), whereas emerging-market firms make up nearly 35% of my sample. Another possible explanation is that I select firms with a history of foreign-currency borrowing and consider multiple currencies, while Bruno and Shin (2017) do not select on this criterion and look only at dollar borrowing. I do find that the result disappears for firms that borrow in (foreign) emerging-market currencies.

I measure capital controls with the financial openness index of Chinn and Ito (2006). The index ranges from 1 for completely open to zero for completely closed. I take the negative (log) value of this index so that a high value indicates greater capital controls. Capital controls in the foreign country appear quite important. A change in a foreign currency's openness index from 0 to 1 would reduce the main coefficient from -0.368 to -0.087. Lastly, I obtain data on exchange-rate pegs from the IMF for years 2012-2017 and by hand for years 2002-2011. Among my sample observations, 72% have a floating home currency and 90% have a floating foreign currency. The benchmark result is somewhat weaker for currencies with exchange rates, and it effectively disappears for firms whose home exchange rates are pegged.

Emerging status, capital controls, and exchange-rate controls are correlated. Emerging-market countries have an average Chinn-Ito index of 0.37 (out of 1), while developed markets have an average index value of 0.94. Also, the correlation of the "emerging" dummy and the "pegged exchange-rate" dummy is 0.2 for home countries and 0.7 for foreign currencies.

[Place Table 14 about here]

VII. Real Effects

This paper so far documents that firms respond to differences across countries in interest-rate changes by adjusting their currency structure toward nominal interest rates, and it sheds light on why firms might or might not do so. This section shows that relative declines in foreign policy rates have real effects, providing a boost to firm investment for the firms most able to access foreign debt markets.

If a firm benefits from rebalancing its debt toward the low-rate currency, I expect investment and foreign policy rates to be negatively related. I further predict that this relationship is especially strong for firms with greater access to foreign debt markets. In section V, I find that prior borrowing history and foreign subsidiary presence are important determinants of firms' currency-rebalancing behavior. I proxy for market access with two variables: *prior*, which is the historical maximum share of firm debt that has ever been denominated in that currency, and *ln(subs)*, or the log fraction of subsidiaries located in the foreign country. I normalize both *prior* and *ln(subs)* for ease of interpretation, and indicate the normalized variables with a tilde, and I interact these proxies with all independent variables used in the benchmark model.

I reduce the sample to one observation per firm-year by selecting each firm's primary foreign currency. Investment is defined as change in book assets, scaled by lagged book assets. Since investment may require time to plan and to build, I estimate the impact of changes in foreign policy rates on firm investment in the next period. The linear model is

$$I_{i,t+1} = \alpha + \beta_1 \Delta r^f_{i,t} + \beta_2 \left(\Delta r^f_{i,t} * A_{i,t} \right) + \sum_j \left[\delta_j X_j + \phi_j \left(X_j * A_{i,t} \right) \right] + \varepsilon_{i,t}, \qquad (2)$$

where the market access proxy $A \in \{\widetilde{prior}_{i,t-1}, ln(\widetilde{subs_{t-1}})\}$. Investment $I_{i,t+1}$ is the % change in book assets. The control variables in X_j include all of the controls from the benchmark test (firm characteristics + exchange-rate variables), plus home-country*time fixed effects and the foreign GDP variables. With only one observation per firm-year, both sets of fixed effects as in the benchmark test soak up all variation. The key prediction in Equation (2) is that $\beta_2 < 0$—i.e., for firms with the greatest ability to borrow in foreign markets (e.g., large $prior_{i,t}$), the relationship between foreign policy rates and future firm investment is the most negative.

[Place Table 15 about here]

Column 1 of Table 15 shows a negative and highly significant coefficient on the interaction of Δr^f and $\widetilde{prior}$. In other words, the average sample firm increases investment by 0.23% of assets in the year after rates in its primary foreign currency fall 100 basis points, and investment increases another 0.33% of assets if the firm's measure of market access is one standard deviation above the mean. Average investment in the panel is around 5% of assets. The interaction with $ln(\widetilde{subs_{t-1}})$ in column 2 is also negative, but not statistically significant. In column three, I repeat the test in column 1 with a subsample of firms that do not have any majority-owned subsidiaries in the foreign country. The statistical significance disappears,[7] but the coefficient magnitudes are similar to those in column 1. Since firms with no subsidiaries in the country are much less likely to make marginal investments in the country, these results suggest that the incremental investment indicated by column 1 is not made, at least not entirely, in the country where rates fall.

I conclude from this section that foreign monetary policy actions influence my sample firms' investment, and that monetary loosening in one country can increase investment in other countries.

VIII. Conclusion

Firms respond to relative decreases in the monetary policy rate for one currency by increasing their demand for credit in that currency and decreasing their demand for credit in other currencies. Declines in foreign interest rates also have real effects for the firms most likely to be able to borrow in those markets.

I proposed two novel arguments for why rational firms change their target currency structure in response to nominal interest-rate changes. Namely, (i) firms discount cash flows differently than the large financial institutions that set market prices, and so they effectually have their interest parity conditions systematically violated, even at long horizons; and (ii) firms with natural exposure may trade off the costs and benefits of hedging with derivatives versus hedging with foreign-currency debt. I also show that the evidence contradicts other potential arguments: (i) managers are näive; (ii) this is an artifact of the post-crisis break-

[7] I lose many observations in this test, while retaining a large number of fixed effects, so attenuation bias is a potential concern here.

down of covered interest parity, and (iii) managers of nonfinancial firms are conducting a carry trade.

The policy spillovers implied by these results complicate the efforts of policy "exporting" central banks, who can only stimulate their domestic economies by pouring water into a leaky sieve, and they also complicate the efforts of policy "importers," who must account for the effects of foreign central bank action on domestic borrowing and investment. I show that corporate currency structure rebalancing varies with the health of the firm's home banking system, with firm financial condition, and with the extent of cross-country ties through multinational firms. I also show that firms are more likely to rebalance toward or away from developed-market currencies with relatively few capital controls. In addition to supply-driven monetary policy spillovers through globally-connected banks, researchers and policy-makers should consider the potential for demand-driven spillovers through nonfinancial firms.

The results in this paper are also important for firms weighing the costs and benefits of foreign expansion and diversified capital sources. Globally-connected firms have more options in choosing the currency structure of their debt, and I find that they respond to monetary policy shocks by rebalancing their debts toward the falling-rate currency, especially when they are most able to do so. I observe real effects on firm investment for the best-connected firms.

As financial markets and supply chains around the world continue to integrate, economic questions surrounding multinational firms will only become more important. The cross-country ties created by nonfinancial firms are relevant not only for individual firms, but will increasingly influence the larger economy. Understanding these ties in greater depth is a worthwhile research agenda going forward.

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Figure 1: Illustration of Credit Supply and Demand in Two Countries

The pair of points (A on the left, A on the right) represents the initial equilibrium price and quantity of credit supplied in the two countries. After Country 1 raises interest rates, the supply of credit in Country 1 contracts and the global banking system transmits the tightening by contracting the credit supply curve in Country 2. Point (B,C) represents the new equilibrium. When firms reallocate credit demand toward Country 2, the demand curve shifts out in Country 2 and the final equilibrium point is (B,C). In this illustration, supply-curve links through nonfinancial firms (borrowers) magnifies the spillover of Country 1's monetary policy shock on the price of credit in Country 2 and dampens the spillover on the quantity of credit in Country 2.

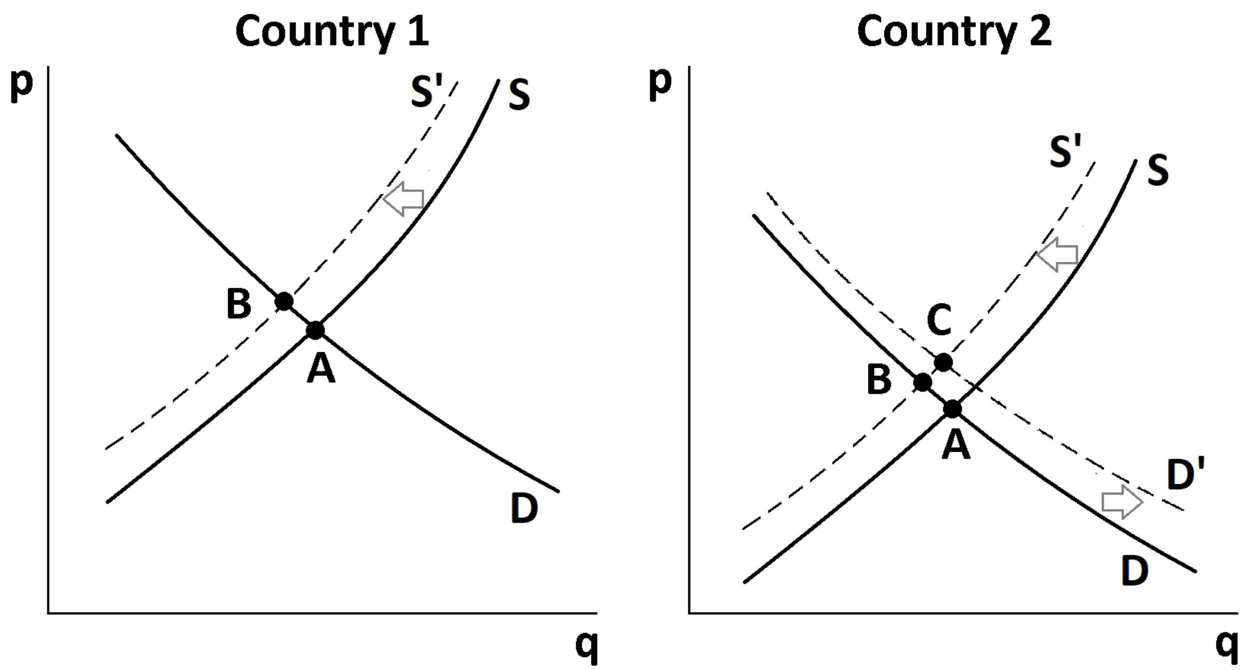

Figure 2: Illustration of Discount Rates and Interest Parity

This figure illustrates two borrowers who both have the opportunity to borrow in a low-rate foreign currency, but who use different discount rates. The illustrated debt is a six-year bond with semiannual interest payments with principal due at maturity, but the principal can be amortized without loss of generality. The silver bars indicate the nominal savings on each interest payment. The first borrower is a bank that uses a 5% discount rate, and the green bars indicate the present value of the bank's cash flows. In the illustration, interest parity (the no-arbitrage condition) is satisfied for the bank, and the discounted loss the bank incurs upon repayment of principal exactly offsets the discounted savings, for a NPV of zero on borrowing in the low-rate foreign currency. The illustration assumes that the currency exposure associated with the foreign-currency debt is unhedged, so that the final-period loss is based on expected exchange-rate movements. If the currency exposure is hedged, then the final-period loss would be known in advance based on forward prices, but the illustration would otherwise be unchanged. The second borrower is a nonfinancial firm that uses a higher discount rate of 10% but faces the same nominal cash flows since it trades in the same debt, currency, and forward markets as the bank. The brown bars indicate the present value of the firm's cash flows. Since the firm discounts future cash flows more than the bank (for whom interest parity holds), the firm realizes positive NPV.

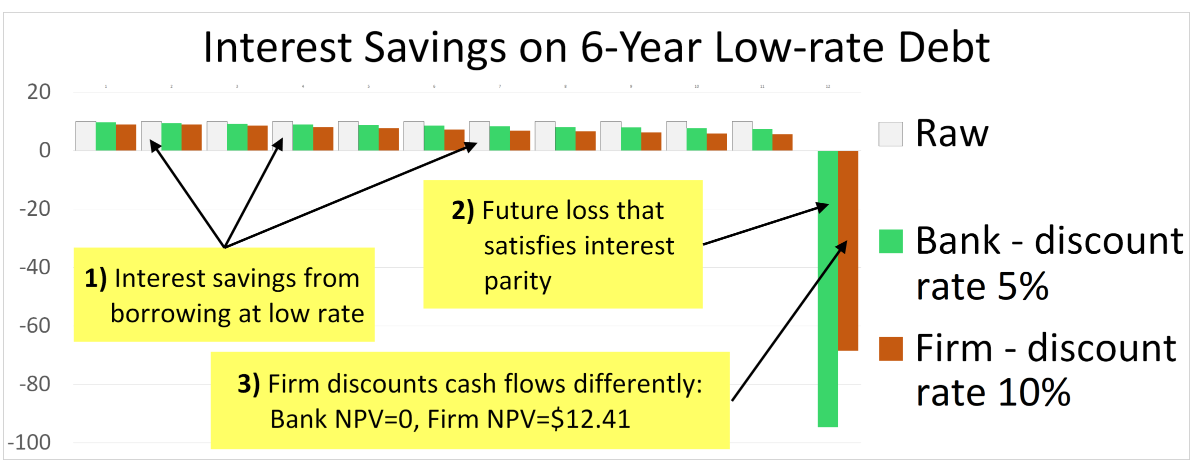

Figure 3: Change in Currency Mix by Prior Borrowing History

In the main analysis, I restrict the sample to firm-currency pairs where the currency has accounted for at least 10% of total firm debt in any previous year. Here, I relax this 10% threshold and re-estimate the benchmark test (Table 3, column 9) with alternative samples where the threshold varies from 0% (no threshold) to 25% at 1% increments. The dots are the point estimates, the shaded area is the 95% confidence interval, and the solid line is the number (thousands) of observations included in the estimation.

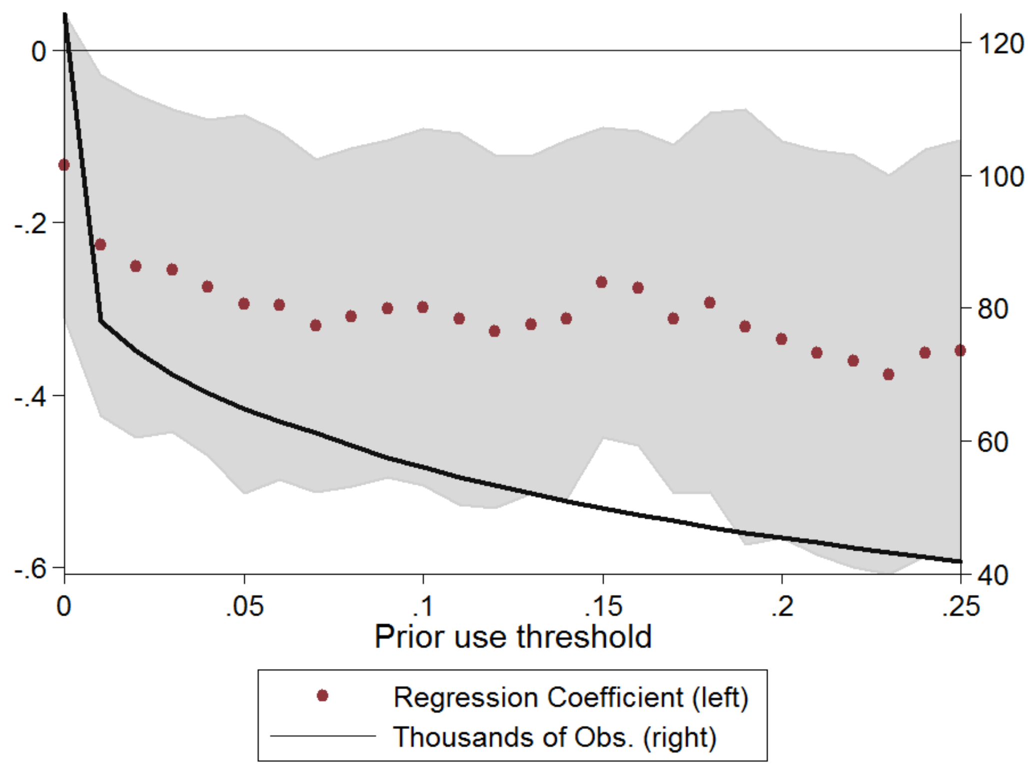

Table 1: Characteristics and Foreign Debt of Sample Firms

Panel A describes characteristics of the sample firm, with details of the sample construction in the text. I define leverage as (long-term debt + current portion of long-term debt + short-term debt) / total debt, and Tobin's Q as (stock market capitalization + long-term debt + current portion of long-term debt + short-term debt) / book value of assets. Panel B describes the sample firms' use of their home currency, and of U.S. dollars and Euros (the two most frequent foreign currencies). $N > 0$ is the number of observations where the currency share of firm debt is greater than zero, and the conditional mean is the mean of all positive shares. Each panel shows statistics for the ten most frequent home countries separately.

Panel A: Firm Characteristics, by Country

Country	**Obs.**	**Firms**	**Assets ($bn)**		**Leverage**		**Tobin's Q**		**Sales Growth**	
			mean	*med.*	*mean*	*med.*	*mean*	*med.*	*mean*	*med.*
South Korea	5,100	765	2.00	0.20	27.8%	27.1%	0.90	0.72	9.8%	4.1%
China	4,013	700	2.50	0.49	24.3%	22.9%	1.55	1.15	20.0%	12.3%
United Kingdom	3,871	408	7.57	1.43	24.2%	23.1%	1.26	1.06	9.8%	4.3%
Hong Kong	3,842	476	1.90	0.36	22.5%	20.3%	1.03	0.76	17.3%	7.8%
United States	3,630	449	8.48	1.81	23.5%	21.4%	1.43	1.17	10.2%	6.3%
Euro Area	3,580	382	13.53	2.76	26.7%	25.2%	1.09	0.91	7.0%	3.2%
Taiwan	3,463	392	1.65	0.30	24.0%	22.5%	0.98	0.82	5.9%	1.7%
Canada	3,056	448	3.64	0.70	26.2%	24.1%	1.10	0.92	18.0%	7.7%
Singapore	2,915	269	1.09	0.16	22.1%	19.8%	0.86	0.70	12.2%	6.2%
India	2,691	357	1.60	0.29	38.9%	39.2%	1.11	0.80	12.2%	6.2%
All 43	56,154	6,931	4.27	0.47	26.5%	24.7%	1.11	0.87	11.1%	5.2%

Panel B: Firms' Currency of Debt, by Country

Country	**Curr/Firm-Yr**		**Share Home**		**Share U.S. Dollar**		**Share Euro**	
	All	*N > 0*	*N > 0*	*Cond. mean*	*N > 0*	*Cond. mean*	*N > 0*	*Cond. mean*
South Korea	3.0	1.6	4,055	85.5%	1,498	10.8%	148	0.4%
China	2.5	1.5	2,750	67.0%	1,576	23.5%	196	1.2%
United Kingdom	3.1	1.8	1,934	43.5%	1,687	41.5%	853	12.5%
Hong Kong	2.7	1.5	1,617	42.8%	1,028	22.9%	65	0.4%
United States	2.9	1.7	2,829	80.3%			937	8.2%
Euro Area	3.7	2.1	2,205	58.7%	1,729	33.7%		
Taiwan	2.9	1.6	2,849	84.7%	1,150	12.4%	106	0.3%
Canada	2.4	1.7	1,706	40.4%	1,969	54.4%	207	2.3%
Singapore	3.4	1.8	1,264	49.0%	795	26.1%	81	0.4%
India	2.5	1.6	2,396	81.0%	1,169	16.3%	151	1.5%
All 43	3.0	1.8	36,768	63.1%	21,029	25.3%	6,105	4.2%

Table 2: Changes in Policy Rates and Foreign Currency Shares

This table summarizes annual changes in policy rate differentials and in foreign currencies' shares of total firm debt. The rate differential is the policy rate set by the foreign currency's central bank, minus the rate set by the central bank in the firm's home country. I separately report statistics for the ten currency pairs (home country & foreign currency) that appear most frequently in the data, as well as for all currency pairs together.

Home Country	**Foreign Currency**	**Δ Policy Rate Differential**					**Δ Share of Debt**				
		Increase		Decrease		No Change	Increase		Decrease		No Change
		N. Obs.	*Mean*	*N. Obs.*	*Mean*	*N. Obs.*	*N. Obs.*	*Mean*	*N. Obs.*	*Mean*	*N. Obs.*
South Korea	U.S. Dollar	2,334	0.7%	1,098	-1.3%	8	666	13.1%	1,110	-20.3%	1,664
China	U.S. Dollar	1,753	0.8%	1,072	-1.6%	0	612	20.0%	867	-23.5%	1,346
Taiwan	U.S. Dollar	1,116	0.8%	476	-1.8%	982	487	14.0%	840	-16.6%	1,247
Canada	U.S. Dollar	997	0.8%	589	-1.0%	835	724	17.4%	738	-19.6%	959
Euro Area	U.S. Dollar	1,548	0.6%	359	-1.6%	374	594	11.4%	804	-13.3%	883
United Kingdom	U.S. Dollar	847	0.9%	338	-1.1%	938	648	16.6%	704	-18.8%	771
India	U.S. Dollar	1,178	0.9%	791	-1.4%	156	445	14.4%	897	-15.2%	783
Hong Kong	Chinese Yuan	705	1.5%	1,033	-0.9%	0	342	23.6%	391	-29.2%	1,005
United States	Euro	315	1.6%	1,137	-0.6%	256	411	11.1%	580	-14.2%	717
Hong Kong	U.S. Dollar	109	1.1%	7	-0.2%	1,483	301	22.0%	461	-25.3%	837
All home-foreign pairs		27,344	1.0%	20,641	-1.2%	8,169	13,062	15.0%	18,865	-17.6%	24,227

Table 3: Relationship Between Policy Shocks and Currency Shares of Debt

This table shows the basic relationship between changes in policy-rate differentials and changes in foreign currencies' share of debt. The dependent variable is the year-over-year change in the currency's share of total firm debt, and the main explanatory variable is the year-over-year change in the policy-rate differential between the funding currency and the firm's home country. Details of the sample construction are in the text, and all variables are defined in Appendix A. Exchange rate ("FX") controls include the lagged exchange rate of the foreign currency vs. the home currency, the contemporaneous and lagged appreciation of the foreign currency, and the lagged 12-month volatility of the exchange rate (coefficient of variation over months t-24 to t-12). GDP controls (not shown) include the level, observed real growth, and beginning-of-year expected real growth. Column 1 includes fixed effects for the firm's home country*time, and controls for the foreign macroeconomic environment (including the credit supply) using GDP controls and foreign bank profitability (ROA). Column 2 includes foreign-currency*time fixed effects and controls for the home environment using GDP and bank ROA. Column 3 uses both sets of fixed effects and no explicit macro controls. Columns 4-6 add exchange-rate controls, and columns 7-9 add firm characteristics. The final column, with all controls and both sets of fixed effects, is the benchmark test. Standard errors are clustered by firm and by currency.

	1	2	3	4	5	6	7	8	9
$\Delta(r^f - r^h)$	-0.277***	-0.062***	-0.263***	-0.276***	-0.112***	-0.299***	-0.264***	-0.116***	-0.298***
	(-2.958)	(-4.733)	(-2.848)	(-2.853)	(-5.383)	(-2.947)	(-2.607)	(-4.725)	(-2.931)
FX: value				-0.000	0.000	-0.000	-0.000	0.000	0.000
				(-1.175)	(0.873)	(-0.283)	(-1.163)	(0.226)	(0.030)
FX: appreciation				0.201	-11.231	0.676	0.255	-12.448	0.667
				(0.667)	(0.667)	(-0.786)	(0.667)	(0.667)	(-0.786)
FX: app. (t-1)				-1.020	-0.474	2.315	-1.108	-0.521	2.177
				(-0.709)	(-0.681)	(0.604)	(-0.785)	(-0.828)	(0.574)
FX: volatility				4.845	-0.645	3.351	4.071	-5.297***	1.651
				(1.157)	(-0.332)	(0.506)	(0.963)	(-2.664)	(0.253)
Leverage							4.641***	4.321***	4.704***
							(8.615)	(7.920)	(8.359)
Tobin's Q							-0.159*	-0.125	-0.170**
							(-1.944)	(-1.386)	(-2.044)
Sales growth							-0.541***	-0.335	-0.468***
							(-3.088)	(-1.641)	(-3.049)
Size-Age Index							-0.842***	-0.859***	-0.845***
							(-25.368)	(-24.070)	(-25.776)
FE: h(i)*yr	x		x	x		x	x		x
FE: f*yr		x	x		x	x		x	x
GDP controls	foreign	home	none	foreign	home	none	foreign	home	none
Bank ROA	foreign	home	none	foreign	home	none	foreign	home	none
N. Observations	56,154	56,154	56,154	56,154	56,154	56,154	56,154	56,154	56,154
R-squared	2.95%	1.69%	3.73%	2.95%	1.72%	3.73%	3.18%	1.94%	3.97%

Table 4: Numerator vs. Denominator of Δ Share

This table explores whether Δshare is driven by changes in the amount of foreign-currency debt, or more mechanically by changes in total firm debt. The first pair of columns estimates changes in book leverage as a function of changes in policy-rate differentials. ΔLeverage is defined as the simple change in book leverage in column 1 or as the change in book debt scaled by lagged assets in column 2. Column 3 reformulates the benchmark specification (Table 3, column 9) in levels instead of differences, adding firm fixed effects. This formulation allows a log decomposition of the currency share that is the basis for the left-hand side of the benchmark test. Columns four and five decompose the log of currency share into the log(numerator) and the log(denominator). Standard errors are clustered by firm and by currency.

	LHS = Δ Leverage		**Decomposition of Foreign Currency Share** Share $= \frac{d_{i,f,t}}{d_{i,h,t}+\sum_f d_{i,f,t}} = \frac{num}{denom}$		
	$\Delta_t \left(\frac{D}{A}\right)$	$\frac{\Delta_t D}{A_{t-1}}$	ln(share)	ln(num)	ln($denom$)
$\Delta(r^f - r^h)$	-0.045	0.108			
	(-0.631)	(1.118)			
$r^f - r^h$			-0.083***	-0.086**	-0.004
			(-2.951)	(-2.525)	(-0.318)
Controls	firm, FX		firm, FX		
Fixed effects	home*time, foreign*time		home*time, foreign*time, firm		
N. Observations	56,154	56,154	56,154	56,154	56,154
R-squared	8.63%	9.72%	60.13%	72.20%	94.29%

Table 5: Results by Firm Size

This table splits the sample by the median of firm size, which is defined as book assets. I re-estimate the benchmark test (Table 3, column 9) for each subsample.

	Assets $\geq$ median	**Assets $<$ median**
$\Delta(r^f - r^h)$	-0.544*	-0.004
	(-1.692)	(-0.018)
Controls	firm, FX	
Fixed effects	home*time, foreign*time	
N. Observations	28,077	28,077
R-squared	5.43%	5.58%

Table 6: Results by Time Period

This table re-estimates the benchmark result for several subsamples by time. The first two rows split the sample at 2008 into a pre-crisis and post-crisis period. Row three drops both years 2008 and 2009. The next row drops 2003-2004, which are the other two years with the largest variation in the independent variable (changes in policy-rate differentials across currencies). The remaining rows drop each year from 2002 to 2017 in turn.

Subsample Years	β	t	R^2	**N. Obs.**
2002-2008	-1.191**	(-2.310)	5.07%	12,333
2009-2017	-0.118	(-0.869)	2.33%	43,821
All years except:				
2008-2009	-0.226*	(-1.764)	3.95%	48,913
2003-2004	-0.136	(-1.394)	3.55%	53,962
2002	-0.299***	(-2.885)	3.86%	55,621
2003	-0.218**	(-2.260)	3.90%	55,182
2004	-0.222**	(-2.155)	3.64%	54,934
2005	-0.298***	(-2.915)	3.98%	54,595
2006	-0.306**	(-2.263)	3.82%	54,104
2007	-0.412***	(-3.200)	3.87%	53,506
2008	-0.154*	(-1.814)	3.82%	52,803
2009	-0.408***	(-2.824)	4.10%	52,264
2010	-0.312***	(-3.314)	4.09%	52,069
2011	-0.269*	(-1.902)	4.06%	51,758
2012	-0.275***	(-2.626)	4.07%	51,546
2013	-0.265**	(-2.457)	4.04%	51,163
2014	-0.236**	(-2.533)	4.07%	50,841
2015	-0.302***	(-2.701)	4.04%	50,438
2016	-0.378***	(-4.049)	4.09%	50,358
2017	-0.435***	(-3.337)	4.03%	51,128

Table 7: Debt Type

This table compares the contributions of various types of debt to the main results. Classification of debt components is per Capital IQ. Panel A describes summary statistics of the sample firms' debt components. Panel B estimates the impact of changes in policy rates on the currency of debt of various types, by replacing Δshare from the benchmark test with Δshare_p, which is the change in the amount of debt of type p as a fraction of total firm debt. For each firm-year-currency, $\sum_p \Delta share_p = \Delta share$. Panel B also shows the results for the 2002-2008 period, which drives the benchmark result. All regressions use the same controls and fixed effects as in the benchmark test.

Panel A: Components of Sample Firms' Debt

	all types	**comm. paper**	**rev. credit**	**term loans**	**bonds/notes**
Total # components	389,662	4,790	81,424	207,605	95,843
Mean # per firm-year	8.86	1.50	3.05	5.55	4.64
Median # per firm-year	6.00	1.00	2.00	3.00	2.00
Mean size (in USD)	102.59	200.20	36.20	55.47	256.16
Median size (in USD)	6.69	17.21	2.35	4.32	82.96
# with nonmissing maturity	274,977	2,786	50,506	136,603	85,082
Mean maturity	3.98	2.16	2.76	3.33	5.81
Median maturity	2.50	1.50	2.00	2.16	3.59
# with rate type "na"	111,024	2,019	27,370	68,180	13,455
# with variable rate	113,790	583	32,341	71,456	9,410
# with fixed rate	158,579	2,173	21,121	65,015	70,270
# with zero rate	6,269	15	592	2,954	2,708
# with nonmissing rate	241,455	3,374	43,804	114,701	79,576
Mean rate	5.46	2.50	5.56	5.65	5.25
Median rate	5.00	1.49	4.77	5.00	5.13

Panel B: Contributions of Various Debt Types to Benchmark Result

		all types	**comm. paper**	**rev. credit**	**term loans**	**bonds/notes**
Full Sample	coefficient	-0.298***	-0.003	-0.065	0.031	-0.262
56,154 obs.	(t-statistic)	(-2.829)	(-0.437)	(-0.492)	(0.396)	(-1.577)
2002-2008		-1.191**	-0.019	0.112	-0.356	-0.928***
12,333 obs.		(-2.310)	(-0.933)	(0.508)	(-0.711)	(-3.908)

Table 8: Δr and Cash

In a standard carry trade, an trader issues short-term debt in a low-rate currency (the short leg of the trade), holds cash or short-term securities in a high-rate currency (the long leg of the trade), and bets that exchange rates do not move too much against the trade. The tests shown in this table estimate the relationship between changes in policy-rate differentials and changes in firm cash holdings. "Cash" is defined as cash and liquid securities as a percentage of book assets.

	$\boldsymbol{\Delta_t \left(\frac{C}{A}\right) * 100}$	$\boldsymbol{\frac{\Delta_t C}{A_{t-1}} * 100}$
$\Delta(r^f - r^h)$	0.031	-0.008
	(0.499)	(-0.100)
Controls	firm, FX	
Fixed effects	home*time, foreign*time	
N. Observations	56,154	56,154
R-squared	3.80%	5.05%

Table 9: Results by Firm Debt Cost

This table splits the sample by the median of firms' average historical cost of external debt, which is defined as interest expense divided by lagged book debt and averaged over all prior years in the sample. I re-estimate the benchmark test (Table 3, column 9) for each subsample. Under the assumption that a firm's total cost of capital is increasing in its cost of debt, the firms with the highest debt costs are also those that use the highest discount rates.

	Firm avg. debt cost	
	$\geq$ median	**$<$ median**
$\Delta(r^f - r^h)$	-0.366*	-0.284
	(-1.712)	(-1.177)
Controls	firm, FX	
Fixed effects	home*time, foreign*time	
N. Observations	31,326	24,819
R-squared	6.00%	5.38%

Table 10: Results by Hedging Motives

This table splits the sample into two subsamples based on whether the share of firm debt denominated in the foreign currency is less than or greater than the share of firm subsidiaries located in the associated foreign country. A share of debt less than the share of subsidiaries suggests firms with greater operational currency exposure. Firms with existing exposure due to foreign operations may choose to hedge by issuing foreign-currency debt, and a potential explanation of my benchmark results is that when the costs of this type of hedging (foreign interest rates) fall, firms engage in more of it.

	% Debt < % Subs	**% Debt ≥ % Subs**
$\Delta(r^f - r^h)$	-0.910*	-0.135
	(-1.917)	(-0.615)
Controls	firm, FX	
Fixed effects	home*time, foreign*time	
N. Observations	14,470	41,684
R-squared	9.66%	5.30%

Table 11: Market Access

This table interacts the change in policy-rate differential with measures of capital market access. Panel A examines cross-sectional variation, and uses home*time and foreign*time fixed effects as in the benchmark regression. Panel B examines time-series variation, with firm*currency and time fixed effects. *Bank ROA* is lagged return on assets at the country level. *% subs* is the percentage of a firm's total subsidiaries located in the foreign country. *size-age index* is based on Hadlock and Pierce (2010) and lagged one period FX and firm controls are the same as in the benchmark test, and standard errors are clustered by firm and by currency.

Panel A: Cross-Sectional Variation

Interaction variable:	**Bank ROA (h)**	**Bank ROA (f)**	**ln(1+%subs)**	**Size-Age Index**
$\Delta r = \Delta(r^f - r^h)$	-0.475***	-0.320***	-0.246**	-0.309***
	(-2.778)	(-3.630)	(-2.409)	(-2.960)
Δr X variable	0.319**	0.087	-0.012	0.095*
	(2.430)	(0.721)	(-0.435)	(1.808)
Predicted interaction sign	+	-	-	+
Controls	firm, FX			
Fixed Effects	home*time, foreign*time			
N. Observations	55,102	56,084	55,965	56,154
R-squared	4.02%	3.97%	3.96%	3.97%

Panel B: Time-Series Variation

Interaction variable:	**Bank ROA (h)**	**Bank ROA (f)**	**ln(1+%subs)**	**Size-Age Index**
$\Delta r = \Delta(r^f - r^h)$	-0.170***	-0.115***	-0.134***	-0.111***
	(-5.131)	(-3.602)	(-5.211)	(-4.414)
Δr X variable	0.118**	0.095	-0.065***	0.081**
	(2.400)	(0.533)	(-3.645)	(2.322)
Predicted interaction sign	+	-	-	+
Controls	firm, FX, GDP (h), GDP (f)			
Fixed Effects	firm*currency, time			
N. Observations	55,102	56,084	55,965	56,154
R-squared	10.20%	10.01%	9.98%	10.00%

Table 12: Financial Flexibility

This table interacts the change in policy-rate differential with measures of firm financial flexibility. Panel A examines cross-sectional variation, and uses home*time and foreign*time fixed effects as in the benchmark regression. Panel B examines time-series variation, with firm*currency and time fixed effects. *Cash* is lagged cash over book assets. *Leverage* is lagged book leverage. *Interest Coverage* is the lagged ratio of pre-tax earnings (EBITDA) to interest expense. FX and firm controls are as in the benchmark test, and standard errors are clustered by firm and by currency.

Panel A: Cross-Sectional Variation

Interaction variable:	**Cash**	**Leverage**	**Int. Cov.**
$\Delta r = \Delta(r^f - r^h)$	-0.263***	-0.290***	-0.308***
	(-2.846)	(-2.754)	(-3.037)
Δr X variable	-1.138***	0.757***	-0.002**
	(-3.378)	(2.917)	(-2.617)
Predicted interaction sign	—	+	—
Controls	firm, FX		
Fixed effects	home*time, foreign*time		

Panel B: Time-Series Variation

Interaction variable:	**Cash**	**Leverage**	**Int. Cov.**
$\Delta r = \Delta(r^f - r^h)$	-0.123***	-0.125***	-0.123***
	(-5.412)	(-4.371)	(-4.852)
Δr X variable	-1.159***	0.952***	-0.002**
	(-2.607)	(3.188)	(-2.163)
Predicted interaction sign	—	+	—
Controls	firm, FX, GDP (h), GDP (f)		
Fixed effects	firm*currency, time		

Table 13: Home Countries, Foreign Currencies, and Country-Currency Pairs

This table interacts the change in policy-rate differential with dummy variables for each of the ten home countries (Panel A), the ten foreign currencies (Panel B), and the ten home-foreign pairs (Panel C) that appear most often in the data. The "frequency" column indicates the number of times that the country/currency/pair appears in the sample.

Panel A: Marginal contribution of common home countries

Home country	**interaction β**	**interaction t**	**frequency**
South Korea	0.447	(1.241)	5,100
China	0.054	(0.085)	4,013
United Kingdom	-0.596	(-0.979)	3,871
Hong Kong	0.467	(1.109)	3,842
United States	-0.680	(-1.381)	3,630
Euro Area	0.469	(1.223)	3,580
Taiwan	0.273	(1.489)	3,463
Canada	-0.590	(-1.172)	3,056
Singapore	1.171***	(3.667)	2,915
India	-0.805*	(-1.717)	2,691
		pct of sample:	64.4%

Panel B: Marginal contribution of common currencies

Foreign currency	**interaction β**	**interaction t**	**frequency**
U.S. Dollar	0.014	(0.110)	32,644
Euro	-0.041	(-0.450)	8,807
Chinese Yuan	0.533**	(1.992)	3,367
Japanese Yen	-0.015	(-0.202)	3,084
British Pound	-0.091	(-0.586)	1,750
Hong Kong Dollar	-1.330***	(-6.807)	858
Canadian Dollar	-0.220	(-0.983)	792
Australian Dollar	-0.614***	(-3.489)	772
Swiss Franc	-0.989***	(-5.929)	670
Malaysian Ringgit	0.120	(0.697)	456
		pct of sample:	94.7%

Panel C: Marginal contribution of common currency pairs

Home country	**Foreign currency**	**interaction β**	**interaction t**	**frequency**
South Korea	U.S. Dollar	0.809*	(1.762)	3,440
China	U.S. Dollar	0.483	(1.202)	2,825
Taiwan	U.S. Dollar	0.363*	(1.715)	2,574
Canada	U.S. Dollar	-0.339	(-0.612)	2,421
Euro Area	U.S. Dollar	0.547	(0.690)	2,281
United Kingdom	U.S. Dollar	0.878	(1.539)	2,123
India	U.S. Dollar	-0.616*	(-1.900)	2,125
Hong Kong	Chinese Yuan	0.320	(1.108)	1,738
United States	Euro	0.051	(0.094)	1,708
Hong Kong	U.S. Dollar	-8.617***	(-5.110)	1,599
			pct of sample:	40.7%

Table 14: Currency & country characteristics

This table explores patterns in the relationship between $\Delta share$ and $\Delta(r^f - r^h)$ along dimensions related to currency and country characteristics. The first characteristic is the country/currency classification as "emerging" or "developed", according to the 2018 IMF World Economic Outlook. The second characteristic is the intensity of capital controls, using data provided by Menzie Chinn and Hiro Ito (see Chinn and Ito (2006)). The final characteristic is whether the currency is floating vs. pegged. I use currency peg data from the IMF for years 2012-2017, and I hand-collect data on currency pegs for 2002-2011. Standard errors are clustered by firm and by currency.

	1	2	3	4	5	6
$\Delta r = \Delta(r^f - f^h)$	-0.215	-0.408***	-0.271**	-0.368***	-0.531***	-0.332***
	(-1.117)	(-3.925)	(-2.275)	(-3.718)	(-2.779)	(-2.646)
Δr X emerging (h)	-0.142					
	(-0.452)					
Δr X emerging (f)		0.473**				
		(2.369)				
Δr X capital controls (h)			-0.071			
			(-0.389)			
Δr X capital controls (f)				0.281***		
				(2.616)		
Δr X pegged (h)					0.471**	
					(2.334)	
Δr X pegged (f)						0.167
						(0.467)
Controls	firm, FX					
Fixed Effects	home*time, foreign*time					
N. Observations	56,154	56,154	56,154	56,154	56,154	56,154
R-squared	3.97%	3.97%	4.06%	3.99%	3.97%	3.97%

Table 15: Foreign Policy Rates and Firm Investment

The tests in this table estimate the relationship between firm investment and changes in foreign policy rates. Investment is defined as the change in book assets, scaled by beginning-of-period assets, and I lead this variable by one period to allow for time to plan or time to build. The two interaction terms are proxies for the firm's access to foreign capital markets, as used earlier in this paper. "Prior" is the foreign currency's largest historical share of total firm debt, from the beginning of the sample in 2002 until year t-1, and "ln(subs)" is the log of the fraction of firm subsidiaries located in the foreign country as of year t-1. Both interaction variables are normalized, as indicated by the tilde. The final column repeats the test in column 1 for a subsample of firms that had no subsidiaries in the foreign country as of the previous year. All specifications control for firm characteristics and exchange rates. Fixed effects are at the home-country*time level, and foreign market conditions are controlled using foreign GDP, real growth, expected real growth, and bank profitability. Standard errors are clustered by firm.

Dependent Variable: $\frac{\Delta A_{i,t+1}}{A_{i,t}}$

	All Firms		Firms w/out Subs
Δr_t^f	-0.235	-1.054	-0.522
	(-1.257)	(-1.627)	(-1.539)
Δr_t^f X $\widetilde{prior}_{\{2002,t-1\}}$	-0.332***		-0.260
	(-2.858)		(-1.472)
Δr_t^f X $ln(\widetilde{subs_{t-1}})$		-1.012	
		(-1.366)	
Controls	firm, FX, GDP (f), Bank ROA (f)		
Fixed Effects	home * time		
N. Observations	28,805	28,805	13,384
R-squared	22.49%	22.57%	26.27%

Appendix A. Variable Definitions

Variable Name	Notes
Bank capitalization	regulatory capital over risk-weighted assets, aggregated to the country level (source: IMF)
Bank ROA	average return on assets for banks in the foreign country, compiled by Thorsten Beck, Asli Demirguc-Kunt, Ross Eric Levine, Martin Cihak and Erik H.B. Feyen, and downloaded from the World Bank. See Beck et al. (2000), Beck et al. (2010), and Cihak et al. (2012). The authors rely on data from Bankscope and Orbis Bank Focus databases.
Capital controls	negative natural log of I_{CH}, which is the financial openness index of Chinn and Ito (2006)
Cash	(cash & equivalents) / assets
Change in currency share	year-over-year change in the share of a firm's debt payable in the currency in question
Change in interest-rate differential	annual change in the difference in monetary policy rates between the foreign and home country
Emerging country	country classification according to the 2018 IMF World Economic Outlook
Exchange rate	value of the foreign currency in units of the firm's home currency, using exchange rate data from the BIS and the U.S. Federal Reserve. For debts initially issued in pre-Euro currencies (Deutsche marks, etc.), I convert them to Euros at the fixed exchange rates published by the European Central Bank.
Exchange rate appreciation	annual change in the exchange rate

Exchange rate volatility	the standard deviation of the monthly exchange rate, over a 12-month period, divided by its mean (coefficient of variation)
GDP	nominal gross domestic product
GDP growth, expected	one-year-ahead expected real GDP growth, lagged by one year, using forecast data from the IMF
Interest coverage	EBITDA divided by interest expense
Investment, gross	capital expenditures divided by lagged assets
Investment, net	log asset growth
Leverage	book debt divided by assets
Pct. sales in foreign	fraction of total firm revenues made to customers in the foreign country (only available for U.S. firms)
Pct. subs	the fraction of total firm subsidiaries that is located in a foreign country set to zero for a firm with no subsidiaries in any country
Prior	For the firm and the currency in question, I calculate the maximum historical share of firm debt denominated in this currency, going back to the beginning of my data in 1999. In Table 15, I standardize this variable by subtracting its mean and dividing by its standard deviation ($\widetilde{prior}$).
Sales Growth	$(sales_t/sales_{t-1}) - 1$

Size-Age Index	Following Hadlock and Pierce (2010), $$SA = -0.737 * \widehat{size} + 0.043 * \widehat{size}^2 - 0.040 * \widehat{age},$$ where $\widehat{size}$ = log[min(assets,\$4.5 billion)] and $\widehat{age}$ = log[min(age, 45)]. Hadlock and Pierce (2010) use 37 years in their original formula instead of 45, but they define age as the number of years in Compustat with a non-missing stock price. I use "year founded" in the Capital IQ database, so my index should use a higher value for firm age if firms are founded before they are publicly listed. Ritter (2016) documents that U.S. firms going public are already 8 years old on average, so I use 37+8=45. When data on year founded is missing, I assume the firm is 1 year old when it first appears in my data.
Tobin's Q	(stock market capitalization + book debt) / book assets