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‘The Cost of Foreign-currency Lending’

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The cost of foreign-currency lending

Abstract

Lending to corporates in foreign currencies can expose banks to substantial currency risk. Using global syndicated loan data, we find that a one-standard-deviation increase in exchange rate volatility increases loan spreads somewhere in the range between 5.5 and 16.1 basis points for loans made in a currency different from the lenders'. This implies excess interest of approximately 1 to 3 USD million for loans of average size and duration. We also show that this finding is mostly attributed to credit constraints and deviations from perfect competition in international lending markets, and that borrowers can lower the extra cost by forming strong lending relationships with their banks.

Keywords: Global syndicated loans; Foreign-currency lending; Exchange rate risk; Bank market power; Relationship lending.

JEL classification: G21; F31; F33; F34.

1. Introduction

Banks' cross-border claims toward the nonbanking sector have increased considerably in recent decades, amounting to USD 13.1 trillion as of September 2017 (BIS, 2018). About 20% (USD 2.6 trillion) of these claims are in foreign currencies, and this market is expanding substantially toward emerging market economies. These facts naturally raise questions about the role that exchange rate risk plays in international bank lending and, specifically, on the pricing of loans in foreign currency. Are large banks able to buffer exchange rate risk when lending in a different currency (e.g., via hedging), or do they pass this risk to their borrowers in the form of higher cost of loans? How different is this cost across borrowing firms with different characteristics, riskiness, and lending relationships with the banks? These are the questions addressed in this paper.

There are two sides to exchange rate risk in cross-border lending: foreign firms borrowing in the lender's currency – henceforth foreign-currency borrowing – which implies exchange rate risk for the borrower (demand-side risk), and lending to foreign firms in the borrower's currency – henceforth foreign-currency lending – which implies exchange rate risk for the lender (supply-side risk). Such foreign-currency lending has significantly increased over the last three decades, despite the credit market freeze during the global financial crisis. Syndicated foreign-currency lending reported in Dealscan reached about USD one trillion in 2015 and has surpassed syndicated foreign-currency borrowing since 2000 (Figure 1). In this paper, we examine whether and how banks price exchange rate risk in foreign-currency lending. Despite the existence of a substantial literature on cross-border foreign-currency borrowing (e.g., Francis and Hunter, 2012; Brown, Kirschenmann and Ongena, 2014; Di Giovanni, Kalemli-Ozcan, Ulu and Baskaya, 2017; Hardy, 2018; Niepmann and Schmidt-Eisenlohr, 2021), the effect of exchange rate risk on foreign-currency lending has not received much attention. This paper fills this gap.

[Insert Figure 1 about here]

In a world of perfect and complete markets, currency volatility should not affect lending rates: foreign-currency and domestic-currency loans should be equivalently priced, as banks should be able to hedge their foreign exchange risk exposure and/or share risk both across loans and across different banks in the syndicate. Any deviation from this setting, could lead to differential pricing of loans based on their currency of denomination. Although such imperfections should theoretically be arbitraged away in a relatively short horizon, in practice they may persist, which could generate systematic price differences between foreign- and domestic-currency loans. Similarly, firms should be able to borrow in the cheapest currency and use the derivatives market to gain exposure to the desired currency; this should ultimately lead to convergence of prices between loans of different currency denominations. However, firms may not always be able to do so, especially if banks have high market power (especially relevant when firms are first-time borrowers) or firms face financial constraints. In this context, banks might price exchange rate risk in foreign-currency lending.

A price cap by banks on foreign currency loans due to foreign exchange risk creates a competitive disadvantage for affected borrowers compared to firms that can access the domestic credit market. The higher cost of credit can have significant implications for the profitability, investments, and international competitiveness of firms borrowing from foreign banks in domestic currency, especially given that in our data these firms appear on average to be less risky (they are more profitable and have less leverage) than firms borrowing in the bank's currency.

Our empirical analysis focuses on the causal effect of exchange rate risk on the cost of credit and other corporate loan characteristics. We use data from the global syndicated loan market. These data are ideal for our setting because (i) they are at the loan-level, which is helpful to achieve

adequate identification of causal effects, (ii) include bank loans to several countries, (iii) provide information about several loan characteristics, and (iv) can be matched with the exchange-rate conditions prior to loan origination.

The data set covers the period 1988-2016, although most loans originate from 1994 onward, and includes more than 43,000 loan deals. Our main outcome variable is the all-in spread drawn (AISD), which includes the loan spread over LIBOR plus any facility fee. The main explanatory variable is a measure of exchange rate risk, based on the realized volatility of the bilateral exchange rate between the borrower's and the lender's (the lead lenders of the syndicate) countries over a one-month, three-month, or six-month period. Alternatively, we also use forward-looking measures of exchange rate risk (i.e., measures based on forward, rather than spot, rates).

We draw causal inferences from several approaches. First, we compare the differential effect of exchange rate risk on the cost of credit between foreign currency loans and domestic currency loans. In principle, exchange rate risk should have a strong effect only on foreign currency loans, and any effect on domestic currency loans should reflect macroeconomic and sociopolitical risk, and ideally be captured by relevant control variables (e.g., Delis, Hasan and Ongena, 2020). Similar approaches using syndicated loans are those of Gande and Saunders (2012) and Berg, Saunders, Steffen and Streitz (2016).

We employ a number of controls in our regression analysis to isolate the effect of exchange rate risk. The fielding of "bank times year" fixed effects control for the equivalent time-varying supply-side (bank-year) forces. Importantly, these include the changing domestic macroeconomic environment of the banks. Further, and quite important, we examine more stringent models of triple interaction terms, hypothesizing that the effect of exchange rate risk on loan spreads is

stronger in periods of exchange-rate crises, for floating exchange rate regimes, and in the presence of considerable capital account restrictions.

We find that the effect of exchange rate risk on AISD is both statistically and economically significant. For example, a one-standard-deviation increase in our baseline measure of exchange rate risk based on the three-month volatility of the exchange rate yields an AISD that is between 5.5 and 16.1 basis points higher for loans made in a currency different from the lender's compared to those made in the lender's currency. Economically, this is a large effect, indicating a 2.8%−8.2% higher AISD compared to the average in our sample, highlighting a substantial cost to borrowing firms vis-à-vis international competitors that (can) borrow in their bank's currency.

The importance of this cost can also be seen by calculating the extra interest payments for these firms. For the average loan size and maturity, an AISD that is 5.5−16.1 basis points higher corresponds to approximately USD 0.96−2.84 million in higher interest expense over the loan's duration. Thus, we can infer that foreign exchange risk implies substantially higher cost of credit for firms borrowing in a currency different than their lenders' compared to firms borrowing in their banks' domestic currency.

Several sensitivity tests show that these baseline findings are robust. The most important of these tests are the following three. First, we contrast types of loans with different exposure to exchange rate risk. We initially show that foreign banks charge a higher spread than domestic banks when lending in the borrower's domestic currency. Furthermore, banks lending to foreign firms in a third currency and therefore facing exchange rate risk charge more than banks lending to foreign firms in domestic currency and therefore facing no exchange rate risk. In either case, we demonstrate the importance of exchange rate volatility for foreign-currency loan pricing. Second, we use specifications with different control variables to show that the results are not driven by a

"bad controls problem." Third, the results are robust when using a Heckman-type model, which considers the probability of a firm borrowing in a currency different than the lenders' currency to account for relevant selection issues (Dass and Massa, 2011).

We then conduct additional analyses to understand the reasons behind costly foreign-currency lending and the associated deviations from perfect lending markets, where banks can hedge against exchange rate risk. First, we consider variation in liquidity of hedging instruments in the foreign exchange market, measured using bid-ask spread data for forward rates across currencies and time. Even though we find evidence that our liquidity measures directly affect the cost of credit, the relation between exchange rate risk and the cost of credit remains intact (i.e., liquidity does not cause heterogeneity in that relation). Next, we turn to measures of credit constraints and bank market power. We find that almost all of the identified effect comes from borrowers' countries within the 75^{th} percentile of lending rates (i.e., those facing more expensive lending and thus more constraints). Moreover, the banks lending to these markets are those with high market power (measured by the Lerner index).

Overall, these findings raise the issue of potential heterogeneity of the results, where certain firms obtain foreign currency loans at significantly lower spreads compared to other firms. We consider two potential strategies. The first involves firms formulating repeated lending relationships with their lead lender(s). We provide evidence that firms with at least one more loan with the same lead arranger in the last five years prior to the current loan are exposed to significantly lower cost of credit due to exchange rate risk, compared to firms for which the current loan is the first with the specific lead lender. This extra credit cost further decreases with the magnitude of this lending relationship. We thus contend that establishing a relationship with the lender is key to mitigate the increased cost of credit due to exchange rate risk. The second strategy

relates to the lead banks' actions and involves a structure of the syndicate that includes more banks and spreads out banks' loan shares across the syndicate members. We find that such practices also largely offset the effect of exchange rate risk in loan pricing equations.

Related literature

Our paper interconnects to four main strands of literature. First, there is an important literature on foreign currency loans and their risks. On the one hand, this literature notes the importance of foreign currency loans and the types of firms accessing this market, such as large, well-established and profitable, with an international focus for their operations (Allayannis, Brown and Klapper, 2003; Brown and De Haas, 2012). On this line, the differential loan pricing between foreign-currency loans and domestic-currency loans should in theory be eliminated under uncovered interest rate parity, i.e., if agents are risk neutral and form rational expectations, implying that they are indifferent with respect to the currency of denomination. In that case, interest rate differentials across countries are exactly offset by expected future changes in exchange rates (Bekaert, 1996; Menkhoff, Sarno, Schmeling and Schrimpf, 2012). If agents are risk averse and thus uncovered interest rate parity does not hold, however, banks should treat differently foreign-currency loans from those in domestic currency. Note that our paper does not intend to contribute to the literature on the validity of uncovered interest rate parity; we simply note that, given that uncovered interest parity is known to be rejected in the data and a risk premium exists in foreign exchange markets (Engel, 2014), one would expect a differential in loan prices to exist because banks will not be indifferent to the currency of denomination of their loans.

Second, our paper is related to the literature on how market imperfections (e.g., credit constraints and deviations from bank competition in the borrower's country) affect the currency

risk-cost of credit nexus. Our premise is that fewer credit constraints and more competitive banking markets should reduce the exchange rate risk premiums charged by foreign banks, unless these banks possess market power in the provision of specific services that firms require access to (Degryse and Ongena, 2005). Further, domestic credit constraints or lack of banking-sector competition usually imply higher lending rates in the firm's country that might also push these firms to establish relationships with foreign lenders (Sapienza, 2002; Beck, Demirgüç-Kunt and Maksimovic, 2004; Delis, Kokas and Ongena, 2017). Moreover, through a close bank–firm relationship, the bank can produce informational rents that can capitalize in the future depending on the source of competition (Sharpe, 1990; Rajan, 1992; Boot and Thakor, 2000; Jiménez and Saurina, 2004).

Third, our paper relates to studies on firms (not banks) facing exchange rate risks in their loans. This literature includes Francis and Hunter (2012), Bergbrant, Francis and Hunter (2016), Salomao and Varela (2018), and Niepmann and Schmidt-Eisenlohr (2021). There are parallels between our paper and (mostly) Salomao and Varela. Specifically, in equilibrium the most productive and efficient firms are the ones accessing the international lending market. Further, the ability of banks to screen efficiently the good firms is essential for loan pricing. Finally, the cost of credit is higher: in our study, this is because banks charge a foreign currency premium, whereas in Salomao and Varela (2018) this is because foreign firms face a higher risk of default by themselves being subject to exchange rate risk.

Several other studies relate to our research, mainly focusing on cross-border lending. Among them, De Haas and Van Horen (2012, 2013) examine the sharp contraction in cross-border credit after the Lehman Brothers collapse. They show that banks reduced credit more to markets that were geographically distant, where they had less lending experience and where they did not

have a subsidiary or a network of domestic co-lenders. Moreover, the reduction was greater for banks that had to write down sub-prime assets, refinance large amounts of long-term debt, and experienced declines in their market-to-book ratio.

Outline of the paper

The rest of the paper proceeds as follows. Section 2 discusses the data set and the empirical specification. Section 3 presents and discusses the main empirical results, showing the impact of exchange rate risk on the cost of credit. Section 4 shows the importance of bank-firm relationships and the syndicate's structure as a remedy for the increased cost of credit. Section 5 concludes the paper. An Internet Appendix provides several additional summary statistics and further analyses.

2. Data and empirical model

The main data source is Dealscan, which includes the most comprehensive loan-deal information available on global syndicated loan markets. Our data set covers the period 1988-2016 but loan coverage for most countries starts in 1993-1994. We drop all loans for which there is no conventional pricing (i.e., there is no spread) and this eliminates all types of Islamic finance and very specialized credit lines. Dealscan includes loan facilities for multiple participant banks, and we use the information at the loan facility level (the unit of our analysis).

We match the loans with bank-specific information from Compustat; however, in most of the analysis we use bank × year fixed effects that render bank-year characteristics redundant. In a third round of data collection, we match the resulting data set with macroeconomic (country-year) variables from several freely available sources. We provide variable definitions and sources in Table A1 of the Appendix and basic summary statistics for the most important variables of our

study in Table 1 (where the number of observations corresponds to our preferred empirical specification). Table A2 reports summary statistics for the rest of the variables used in sensitivity tests.

Empirical identification. To examine whether a firm faces higher cost of credit on its foreign-currency loans relative to what it would face on its non-foreign-currency loans, we use a regression approach very similar to Gande and Saunders (2012), and Berg, Saunders, Steffen and Streitz (2016):[1]

$$= \ _0 \qquad +_1+_2-+$$

$$_3 \qquad \times-+_4+ \qquad (1)$$

where measures the cost of loan facility *l* originated at time *t*. The most widely used measure is the all-in spread drawn (*AISD*), denoting the spread over LIBOR, although a recent literature (e.g., Berg, Saunders, Steffen and Streitz, 2016) also highlights the importance of fees and the all-in spread undrawn (*AISU*). The vector $_0$ denotes different types of fixed effects, described later. *Controls* is a vector of control variables of dimension *k*, and *u* is a stochastic disturbance.

[Insert Table 1 about here]

Forex risk, for each loan facility, is the realized volatility of the bilateral exchange rate between the lender's country currency and the currency of the loan:

[1] Gande and Saunders (2012) examine a model where the loan amount (or leverage) of firms is regressed on the interaction term between traded syndicated loans (vs. non-traded loans) and the pre- and post-loan trade periods. Berg, Saunders, Steffen and Streitz (2016) use a similar interaction terms model to examine the differential responses of spreads and other variables in Europe vs. the U.S. due to foreign lending and other institutional characteristics.

Essentially, this risk measure refers to the bilateral exchange rate between the lender country *a* and the loan currency *b*, *i* days before the loan facility start date, with being the average exchange rate over the *N*-day period. *Forex risk* takes the value zero for loans in which the lead bank and the firm are from a country using the same currency (domestic loans in domestic currency). The variable takes a positive value when lead banks lend to foreign firms in the firm's currency (foreign-currency lending as per our definition) and when domestic firms borrow from lead banks in the banks' currency (foreign-currency borrowing as per our definition). It further takes a positive value when lead banks lend to domestic or foreign firms in a third currency (i.e., a currency different than that of the lender's and the borrower's). For third-currency loans, our risk measure refers to the bilateral exchange rate between the lender's currency and the currency of the loan.[2]

Ultimately, we distinguish between five different loan types based on their currency of denomination: i) domestic loans where banks lend to domestic firms in domestic currency; ii) foreign-currency lending where banks lend to foreign firms in the firm's currency; iii) foreign-currency borrowing where firms borrow from foreign banks in the bank's currency; iv) third-currency loans where banks lend to foreign firms in a third currency; and v) third-currency loans where banks lend to domestic firms in a third currency. Our baseline specification includes loans classified as domestic loans, foreign-currency lending and foreign-currency borrowing. As third-currency loans bear both firm-side and bank-side risk, we prefer to exclude them from our baseline

[2] For example, if a British bank lends to a Chinese (or a British) firm in US dollars, *Forex risk* measures the volatility between the Pound sterling and the US dollar.

specification to keep separate foreign-currency lending from firm-side risk; we nevertheless include them in sensitivity analysis.

We identify the lender's currency as the one in which the lender is located. In the event where a loan is provided by the parent bank's foreign affiliate or subsidiary, the lender's country is set as the country of the affiliate/subsidiary. Similarly, for firms, we identify the borrower's currency as the currency of the country in which the borrowing firm is located.[3] We compute realized volatility for one-month, three-month, and six-month periods preceding the origination date of the loan. For most of our analysis, we use three-month *Forex risk*, assuming that banks look at the volatility of exchange rates over three months prior to the loan origination date. We show that our results are robust to this choice in sensitivity analysis.

In turn, *Foreign-currency lending* equals one if the loan facility is originated in a currency different from the lender's currency (i.e., in the borrower's country currency), and zero otherwise. Essentially, our identification method aims at comparing two states: foreign-currency lending compared to the rest, and loans with no foreign exchange risk (for the merits of this approach see, e.g., Gande and Saunders 2012; Berg, Saunders, Steffen and Streitz 2016). Differently phrased, we obtain identification from the fact that foreign exchange risk affects the cost of loans made in a currency different from the lender's currency compared to loans made in the lender's currency (whether loans with zero *Forex risk* or positive *Forex risk* under foreign-currency borrowing). The key coefficient of interest is β_3, which shows the differential effect of *Forex risk* on the cost of credit between loans granted in the same and different currencies than the currency of the lender.

[3] For example, although Citibank (the parent bank) is headquartered in the US, for loans provided by Citibank International Plc, we set the lender's country and its currency as the UK and pound sterling, respectively. In sensitivity tests, we further control for cases of cross-border loans where the lending bank (borrowing firm) has an affiliate or subsidiary in the borrower's country (lender's country).

We expect that β_3 is positive if foreign exchange risk matters in foreign-currency lending and thus increases the cost of credit for borrowing firms.

Moreover, the coefficient β_1 shows how a one-point increase in *Forex risk* affects the cost of credit for loans where *Foreign-currency lending* equals zero. This coefficient can be negative when banks lend to low-risk and profitable firms, which is often the case in the global syndicated loan market. It is also reasonable that the coefficient can be positive if the extra risk passed by the lender to the borrower is substantial enough to impact the credit risk of the banks. However, if the model is well-identified, the interaction term and the control variables should explain (most of) the effect of *Forex risk* on the cost of credit (i.e., β_1 should be statistically insignificant or weakly significant). This is because the effect of foreign exchange risk on the cost of loans made in the lender's currency should be minimal or zero, especially when controlling for other forms of macroeconomic risk.

Controls and fixed effects. We include several control variables and fixed effects. Following the relevant literature (e.g., Ivashina, 2009; Hasan, Hoi, Wu and Zhang, 2017; Kim, 2019; Delis, Hasan and Ongena, 2020), we control for loan characteristics such as the log of the loan amount, loan maturity (in months), the number of lenders in the syndicate, dummies for performance-pricing provisions and/or collateral, and the total number of covenants. At the bank-level, we use the log of total assets (*Bank size*), the ratio of net income to total assets (*Bank ROA*) and the ratio of non-performing loans to total loans (*Bank NPLs*). However, in most specifications we use bank × year fixed effects that make these variables redundant. Similarly, our firm controls include the log of total assets (*Firm size*), the ratio of net income to total assets (*Firm ROA*) and the ratio of total debt to total assets (*Firm debt*). For exact definitions of these variables, see Table A1; for summary statistics, see Table 1.

Our simplest set of fixed effects includes those at the year-, bank-, firm-, lender's country-and borrower's country-level. We also use loan type and loan purpose fixed effects. The former are important as loan facilities include credit lines and term loans, which have fundamental differences in their contractual arrangements and pricing (Berg, Saunders and Steffen, 2016). Importantly, we use bank × year fixed effects. This allows us to control for time-varying supply (bank)-side explanations of our findings (such as changes in banks' financial soundness, corporate governance, etc.). The regression still yields results on the main coefficients of interest because there are multiple loan facilities from the same bank within years and *Forex risk* is identified within years (on a daily basis).

We further isolate alternative explanations, mainly stemming from time-varying differences in loan currency denominations through the use of currency × borrower's country × year fixed effects. These differences, which affect interest rate spreads across loans and occur regardless of which banks extend the loans, are mostly fueled by the firms' (demand-side) exposure to exchange rate risk (as opposed to the loan's exposure that we examine in this study) or the borrower's country macroeconomic environment. By including them along with bank × year fixed effects, we only obtain identification from multiple loans in the same currency being issued to a specific country in a short period of time, and from multiple loans issued by the same bank. This implies that our results are immune to changing bank and firm investment opportunities, as well as the macroeconomic environment in the lender's and borrower's countries.

In even more stringent specifications, we employ industry × year fixed effects to absorb any residual demand-side forces stemming from within-year developments common to all firms in the same industry. Moreover, through the inclusion of bank × currency fixed effects we control for banks' access to foreign-currency funding. If banks have affiliates in the borrowers' countries,

they may obtain cheaper and less risky funding in foreign currency, thereby affecting their willingness to lend in foreign currency and consequently the pricing terms.

Key summary statistics. The number of loan facilities in our baseline specification is 43,128. These loans are drawn from firms operating in 52 countries. Table A3 reports the number of loans, and means and standard deviations of *Forex risk* by borrower's country. Table A4 replicates Table A3 for loans in the foreign-currency lending and foreign-currency borrowing groups. As shown in Table A4, the total number of loans in the foreign-currency lending group is 5,601 and constitute 13.0% of the full sample. The relevant number of countries is 31. The total number of loans in the foreign-currency borrowing group is 1,478. Moreover, in Table A5, we report the number of banks, along with the number and volume of loans by lender's country.

In Panels A and B of Table 2 we report summary statistics for key loan features and foreign exchange risk measures for foreign-currency lending vs. all other loans in our sample; Panel C reports their differences. We find that, on average, *AISD* is 46 basis points higher for foreign-currency lending compared to the rest of the loans. This difference is statistically significant at the 1% level. In addition, foreign-currency lending is more likely to be secured with collateral and has a longer maturity. In contrast, lenders attach fewer provisions and covenants on these loans. It is evident that the two types of loans exhibit notable differences, particularly considering the average values for *AISD* and *Forex risk*. Given this, proper identification rests on the comparison of two different states: loans classified as foreign-currency lending, where the lender is exposed to foreign exchange risk, and other types of lending (loans classified as foreign-currency borrowing and domestic loans), where the lender is not directly – if at all – exposed to foreign exchange risk.

3. The effect of exchange rate risk on the cost of credit

3.1. Baseline results

Table 3 reports our baseline results. We cluster standard errors by bank (the dimension of *Forex risk*) and also by quarter to avoid within-year correlations in the data driving our inferences. In line with the discussion in Section 2, the different specifications include different fixed effects. In column (1), we include the simplest set of fixed effects, namely year, bank, firm, lender's country, and borrower's country effects. In column (2), we add currency × borrower's country × year fixed effects to control for time-varying differences in loan currency denominations and borrower's countries fundamentals that affect loan spreads irrespective of the lending bank's characteristics. In all subsequent specifications, we introduce bank × year fixed effects to further control for the operation of the loan supply channel. We initially replicate specification (1) by replacing bank fixed effects with bank × year effects (column 3). Specification (4) is even more demanding, as it further includes currency × borrower's country × year effects along with loan type and loan purpose effects. Subsequently, we replicate specification (4) by replacing currency × borrower's country × year effects with industry × year effects (column 5) and bank × currency effects (column 6). At the end of each table, we report the numbers of banks and firms in each specification.

[Insert Table 3 about here]

Across all specifications, the coefficient on *Forex risk* is statistically insignificant, which suggests that foreign exchange risk is weakly – if at all – related to *AISD* unless the loan bears some exchange rate risk (also in line with our discussion in Section 2). Also, the coefficient on *Foreign-currency lending* is negative and statistically insignificant in all specifications. This

suggests that when there is no foreign exchange risk, foreign-currency loans go to firms facing a similar average *AISD* (i.e., firms with similar risk profiles).[4]

We use column (3) as our baseline specification, as the results are qualitatively equivalent – if not conservative – to those from more stringent specifications. Depending on the specification used, the main coefficient of interest 3 shows that a one-standard-deviation increase in *Forex risk*

(equal to 0.24 for foreign-currency loans) increases *AISD* by a minimum of 5.5 and a maximum of 16.1 basis points (=22.72 × 0.24 and 66.98 × 0.24 respectively) for foreign-currency loans, compared to those made in the lender's domestic currency. Economically, this effect points to an increase of 2.8%−8.2% (=5.5 bps ÷ 195.2 bps and 16.1 bps ÷ 195.2 bps respectively) for the average loan in our sample. Given that the average loan size is $441 million, banks facing exchange rate risk in their loans charge, on average, between USD 0.24 and 0.71 million (=$441,000,000 × 5.5 bps and $441,000,000 × 16.1 bps respectively) per year excess interest compared to banks lending in their own currency. Considering that the average time to maturity is 4.0 years, this represents approximately USD 0.96−2.84 million in extra interest payments over the loan's duration.[5] Therefore, we can infer that foreign exchange risk substantially raises the cost of loans for firms borrowing in their domestic currencies compared to firms borrowing in the lead bank's currency.

Let us illustrate the implication of this estimate for a country. Take, for example, Australia. The average *Forex risk* for loans denominated in Australian dollars is 0.61 (approximately one and a half times the average *Forex risk* for all loans to Australian firms regardless of their currency

[4] To illustrate the importance of exchange rate risk vis-à-vis the rest of the explanatory variables, we also report standardized coefficients in Table A8 of the Appendix.

[5] Assuming four annual payments and LIBOR as the discount rate, the increase in interest expense equals USD 0.87−2.57 million for an average 12-month LIBOR rate of 4.2% during our sample period (for similar calculations, see Ivashina and Sun, 2011).

denomination; see Appendix Tables A3 and A4). When *Forex risk* is above its mean value, the average *AISD* on Australian dollar-denominated loans is 213.2 basis points. This is 51.2% higher compared to an average *AISD* of 152.9 basis points when *Forex risk* is below its mean. Looking at specific subperiods, the average *Forex risk* for loans where an Australian firm is the borrower was 0.55 in 2013-2014, and the average *AISD* on loans to Australian firms denominated in Australian dollars was 168.0 bps. However, during 2015-2016, a period marked by a rise in the volatility of the Australian dollar, the corresponding mean value for *Forex risk* was 0.64, while the average *AISD* surged to 257.5 bps. Similar examples exist for other countries, among them countries with historically high currency volatility, such as emerging market countries.

In Tables A6 and A7 of the Appendix we further distinguish between loans with different exposure to exchange rate risk. We find that foreign banks charge a higher spread compared to domestic ones when lending in the borrower's currency. Moreover, we document that loans to foreign firms in a third currency (thereby assuming exchange rate risk) are priced higher than equivalent loans in the bank's domestic currency (thereby assuming no exchange rate risk); we provide a detailed discussion of these estimates in Section A.1 of the Appendix.

The effect of the control variables in Table 3 (and in Appendix Tables A6-A7) is generally in line with our expectations and the recent literature on the determinants of loan spreads (e.g., Ferreira and Matos, 2012; Delis, Hasan and Ongena, 2020). Specifically, a higher loan amount and more syndicate members go hand-in-hand with the formation of the syndicate (Ivashina, 2009), together implying lower spreads. Loans with longer maturities impose a lengthier commitment for the syndicate members and thus carry a higher spread. Performance-pricing provisions tie the spread to the firm's financial condition, and thus their strong negative effect on *AISD* is intuitive.

The role of covenants and collateral is different and their effect is positive, as using such instruments implies riskier loans (Demiroglu and James, 2010).[6]

Next, we sequentially exclude loan-level control variables from our specifications. These tests address whether (i) these variables yield a "bad controls" problem and (ii) any subgroup of variables exerts a disproportionate impact on the results. In specification (1) of Table A10, we omit all loan-level variables; and in (2), we only include variables of a quantitative nature, namely *Loan amount* and *Maturity*. In subsequent specifications, we only include variables with mainly qualitative information on the loan. These variables pertain to loan securitization, such as an indicator for collateral or the loan-to-value ratio (loan amount divided by total firm assets) and the number of lenders (columns 3 and 4), or the existence of performance-pricing provisions and the number of general covenants attached to the loan (column 5). The coefficient on *Forex risk* × *Foreign-currency lending* confirms the higher cost of credit for foreign-currency lending.

3.2. Selection issues in foreign-currency lending

An endogeneity problem different from the ones discussed so far arises due to possible selection in the firms' decision to apply for foreign-currency lending. We do not expect this problem to be severe in our context, because firms that had a better financing alternative would use it. Nonetheless, to remedy a similar selection problem when using syndicated loans, Dass and Massa (2011) use Heckman's (1979) method to determine the probability of using the syndicated loan market in the first stage of their model. Our approach in this section follows this method. In the

[6] In Appendix Table A9 we consider alternative foreign exchange risk measures. In columns (1) and (2), we use the one- and six-months versions of our forex risk measure, respectively. Subsequently, we employ measures constructed by using the forward bilateral exchange rates; we report coefficients for the 3-month volatility of the 3-month (column 3) and 6-month (column 4) forward rate between the lender's and the borrower's country (definitions in Table A1).
Especially using forward rates might be important because the pricing of loan contracts is forward looking. In all specifications and regardless of the forex risk measure employed, the interaction term has a positive and sizable effect on *AISD*.

first stage, we use a probit model for the entire sample of loan facilities in DealScan to estimate the determinants of the firm's decision to use foreign-currency lending. Subsequently, in the second stage, we run the regression on the subsample of foreign-currency loan facilities.[7]

We assume that the firm's decision to borrow from foreign banks in domestic currency is a function of the main determinants of the decision to borrow more generally. These determinants include: a set of loan- and firm-level characteristics, and loan type, loan purpose, year, bank, firm, and country dummies (Dass and Massa, 2011). Finally, we include the number of loans a given bank makes in a given year (*Bank loans*), the number of loans for a given country-pair in a given year (*Country-pair loans*), and the total number of loans in a given year (*Total loans*).

We report first- and second-stage results in Appendix Table A11 (Panels A and B, respectively). Focusing on probit estimates (Panel A), we observe that the higher the return on assets and the size of the firm, the less likely foreign-currency lending is. Unsurprisingly, firms decide to use this market if they require longer-maturity loans. However, these loans increasingly require collateral, performance provisions and covenants; these act as risk-mitigating factors, therefore easing lenders' concerns to bear foreign exchange risk by extending credit in foreign currency. Moreover, the addition of more lenders in the syndicate is associated with a lower probability of foreign-currency lending. Considering that the lead bank forms a more concentrated syndicate when the borrower requires more intense monitoring (see Sufi, 2007; Ivashina, 2009), lenders may be reluctant to assume exposure to foreign exchange risk. Finally, we observe a negative relationship between country-pair loans and foreign-currency lending, since greater lender's country exposure to borrower's country firms increases banks' reluctance to engage in

[7] Under this method, we cannot use fixed effects and resort to the use of dummies as indicated in the lower part of each stage of the model. This strictly follows Dass and Massa (2011). Moreover, the double-clustering option is also not available (we resort to single clustering by bank).

foreign-currency lending. Turning to the second-stage estimates, we observe that the effect of *Forex risk* on *AISD* is relatively similar to the baseline estimates.

3.3. Identification from currency crises and exchange rate arrangements

An additional strategy to identify the effect of exchange rate risk is to look into crisis episodes and especially those that are arguably unexpected. In crisis times, the increase in risk aversion will cause banks to favor domestic-currency lending over foreign-currency lending. Therefore, (bank) holders of foreign currency debt will demand a high interest rate in anticipation of a currency crisis and the potential currency depreciation; this foreign currency risk aversion is expected to be further observed and possibly magnified after the crisis' eruption and especially following a depreciation spiral (Krugman, Rogoff, Fischer and McDonough, 1999; Aghion, Bacchetta and Banerjee, 2001).

To examine this contingency, we consider certain currency crisis episodes. We focus on four major episodes, namely the UK's departure from the Exchange Rate Mechanism (ERM) of the European Monetary System in 1992, the Mexican peso crisis of 1994, the Asian crisis of 1997, and the Russian default of 1998. In total, 2,609 loan facilities were granted during the course of these episodes, with 62 of them being cases of foreign-currency lending. If even after disentangling the effect of these exchange rate shocks, banks continue to charge more on their foreign currency loans, this should be attributed to the strategic decision of banks to offer a higher interest rate as compensation for exchange rate risk and not to the shock-induced fall in lending supply. We introduce these exogenous shocks into our model and conduct a triple-differences regression, as in Gande and Saunders (2012), by interacting the crisis dummies with *Forex risk* × *Foreign-currency lending*. The results, reported in Table 4, essentially provide an even more stringent identification method, implying that in periods of exchange rate crises our results must be stronger.

[Insert Table 4 about here]

When considering all four episodes (column 1), it is evident that crisis periods are associated with higher spreads for foreign loans denominated in the borrower's country currency: the coefficient on *Forex risk* × *Foreign-currency lending* × *Currency crisis* is positive and statistically significant. This additional interest rate burden amounts to approximately 76.3 bps (=317.93 × 0.24 × 1.00) following a one-standard-deviation increase in our forex risk measure. Importantly, this burden is independent of the higher spread charged on foreign currency loans relative to domestic currency ones during non-crisis periods. The latter is reflected on the coefficient on *Forex risk* × *Foreign-currency lending*, which remains statistically significant and within the range suggested by the baseline estimates. Since the period leading to the 1992 crisis was characterized by growing speculation about the sterling's withdrawal from the ERM and a series of central bank interventions in the currency markets to support the falling currency that might have caused investors to anticipate the crisis, we re-estimate specification (1) by excluding this event. The estimates in column (2) confirm the stronger results during crisis periods.

We subsequently examine the effect stemming from individual crisis episodes. In the build-up to the Mexican peso crisis, banks extended 1,026 syndicated loan facilities; 20 of those were denominated in the borrower's country currency. According to the coefficient on our triple interaction (column 3), these facilities carried a 56.8 bps higher spread than other types of lending. This is approximately six times the size of the spread charged during normal times (coefficient on the double interaction term). Similar results are observed for the Asian crisis in column (4), where we obtain identification from 965 loan facilities (29 cases of foreign-currency lending) granted during this particular episode. Again, this exchange rate shock translates into an almost 113 bps increase for loans denominated in the borrower's country currency.

We further examine the role of the exchange rate regime on the results, hypothesizing that in borrowers' countries with fixed exchange rate arrangements the effect of exchange rate risk is smaller. In column (5) of Table 4, we contrast fixed exchange rate regimes (combining the strict definition of a fixed exchange rate with less restrictive ones, such as narrow crawling pegs and bands) against floating exchange rate regimes (Ilzetzki, Reinhart and Rogoff, 2017). Differentiating between exchange rate arrangements does not change our inferences about the effect of foreign exchange risk on foreign currency loans: a one-standard-deviation increase in the exchange rate risk measure raises spreads by 15.6 basis points, (coefficient on *Forex risk* × *Foreign-currency lending*). However, this effect is contained in the presence of fixed exchange rate arrangements. The coefficient on *Forex risk* × *Foreign-currency lending* × *Fixed* suggests that firms operating in currency unions, or in countries with some flexible form of pegged arrangements are able to avoid the extra cost compared to firms in countries with floating exchange rates. We obtain even stronger results when we exclude narrow crawling pegs and bands from our definition of fixed exchange rate arrangement (column 6).

3.4. Identification from capital account restrictions

An additional factor that can play an important role in the pricing of foreign-currency loans is the regulatory environment on capital mobility. Imperfect capital mobility can impede or severely limit the private sector's ability to borrow from international markets. We thus expect that any such policy, especially the strongest forms of capital controls, will increase the effect of *Forex risk* on the cost of credit. Similar to the analysis on currency crises, we create a triple interaction term between our binary indicator for capital account restrictions (*Capital controls*, defined in Table A1) and *Forex risk* × *Foreign-currency lending*.

We report results in Table 5. Estimates on the triple interaction term in column (1) show an additional cost of 7.7 bps (=32.02 × 0.24 × 1.00) due to *Forex risk* for firms in countries with higher capital controls. This increase is over and above the generic increase in foreign-currency loan spreads due to exchange rate volatility. Subsequently, we restrict our capital controls measure to excessive restrictions, reflected by changes above the 90th percentile (i.e., within the top 10^{th} percentile) of the sample (column 2); again, we observe a strong increase in spreads.

[Insert Table 5 about here]

3.5. Additional results

The baseline results are also robust to several additional tests, the results of which we report and discuss in Section A.2 of the Appendix. Specifically, we control for the simultaneous setting of the price and non-price loan terms at the time of the loan origination and also examine the role of loan fees through the all-in spread undrawn (*AISU*). Subsequently, we distinguish between certain loan- and lender-types and further control more explicitly for monetary conditions and interest-rate differentials. Moreover, we contrast different lender's country- and borrower's country-blocs and currency denominations (e.g., U.S. vs. Eurozone, developed vs. developing economies, U.S. and non-U.S. borrowers, USD vs. non-USD denominated loans). Finally, we estimate specifications with different standard error clustering and different weights based on loans between specific bank-firm and country-pairs.

4. Understanding our results

The results in the previous section show that currency denomination constitutes an important determinant of foreign-currency loan pricing. In this section, we analyze why foreign exchange

risk is priced by banks, essentially showing deviations from complete markets in international lending. Specifically, we examine heterogeneous loan pricing in foreign currency lending when banks possess market power, when banks and firms establish lending relationships, and when the syndicate structure is less concentrated.

4.1. Currency hedging

We first consider that the cost of hedging should be related to the cost of trading in a suitable currency derivative contract. Therefore, differentials in loan prices should be higher for currencies that have higher trading costs, i.e., lower liquidity. We consider the bid-ask spread on forward contracts as a proxy of the trading cost of such hedging of currency risk. Specifically, we control in equation (1) for the quoted bid-ask spread, using either the bilateral 3- or 6-month forward exchange rate, and also interact it with *Foreign-currency lending*. In essence, we assume that the cost of hedging a currency is proportional to its liquidity, as measured by the bid-ask spread.

The results (column 1 of Table 6) show that the coefficient on the bid-ask spread is positive and statistically significant, implying a higher cost of credit for all loans when foreign exchange markets are less liquid. However, the estimate on the interaction term *Bid-ask spread* × *Foreign-currency lending* is statistically insignificant, failing to reveal a heterogeneous effect when the loan facility is granted in the borrower's country currency. Using the triple interaction *Forex risk* × *Foreign-currency lending*× *Bid-ask spread* (along with all relevant main effects and double interactions) or measures based on the quoted spread (as in e.g., Goyenko and Ukhov, 2009) and the volatility of the bid-ask spread, again yields insignificant coefficient estimates. We conclude that differences in liquidity across currencies in the foreign exchange market, which usually

translate into higher hedging costs, are associated with higher cost of credit but this is irrespective of the loan currency denomination or the effect of exchange rate risk on the cost of credit.

[Insert Table 6 about here]

We further employ an alternative proxy for hedging costs, namely deviations from covered interest rate parity (CIP). When CIP is violated, foreign currency funding becomes more expensive and lending in foreign currency less attractive. If our estimates simply capture the presence of these deviations, the coefficient on *Forex risk* × *Foreign-currency lending* should be absorbed by its interaction with our hedging proxy. We examine this premise in specification (2), where we consider the deviation between the borrower's country government 10-year bond yield and the equivalent US government bond yield (see Du and Schreger, 2016; Du, Im and Schreger, 2018). The results reveal that larger CIP deviations are associated with higher loan spreads for all loans.[8] However, the aggravating effect of *Forex risk* on *AISD* for cases of foreign-currency lending occurs independently of the presence of these deviations.

4.2. Credit constraints and bank market power

Next, we consider the possibility that the firms' decision to resort to international financing is related to credit constraints in the domestic loan market and related deviations from competition in the international lending market. We expect that the effect of exchange rate risk is higher when borrowers face higher domestic credit constraints. To test this hypothesis, we introduce the triple interaction term between measures of credit constraints and *Forex risk* × *Foreign-currency lending* (along with all relevant main effects and double interactions).

[8] We find no differential effect of CIP deviations for loans denominated in the borrower's country, as the coefficient on *CIP deviation* × *Foreign-currency lending* is not statistically significant (not reported here).

The literature typically measures credit constraints using the ratio of credit provided by banks over GDP (e.g., Beck, Demirgüç-Kunt and Levine, 2010; Manova, 2012). Our focus here, however, is mostly on loan pricing and not so much on credit availability, which usually exists for large firms participating in the syndicated loan market. Thus, we first measure credit constraints with a variable reflecting the average annual lending rate (country-year average *AISD*) in the borrower's country. We find that the triple interaction is positive but marginally statistically insignificant. Then, we examine whether our results come from firms facing significantly higher lending rates. We thus generate a dummy equal to one if countries fall within the 75^{th} percentile of (high) lending rates and zero otherwise. The results in column (3) of Table 6 show that the double interaction term *Forex risk* × *Foreign-currency lending* decreases in explanatory power and its effect is partially absorbed by the triple interaction term *Forex risk* × *Foreign-currency lending* × *High lending rate*. This suggests that the effect of exchange rate risk on *AISD* is stronger in countries with particularly high lending rates.

Naturally, this finding points to low banking market competition in lending as a candidate to affect the relation between exchange rate risk and the cost of credit. To examine the role of competition, we generate a bank-year measure of market power using the approach of Delis, Kokas and Ongena (2017). The merit of this approach (thoroughly discussed in the Internet Appendix) is that it provides a Lerner index for each bank-year via the estimation of a non-parametric (fully flexible) functional form of the cost function. Then, similar to the rest of the specifications in Table 6, we use a triple interaction term including the Lerner index. The results (column 4) show that a one-standard-deviation increase in the Lerner index implies an approximately 1.7 basis points

(=47.7 × 0.24 × 0.15) or a 20% further increase in the cost of credit. Thus, the effect of exchange rate risk on the cost of credit is indeed stronger when lenders possess higher market power.[9]

4.3. Relationship lending and loan structure

The results thus far highlight an important competitive disadvantage of firms borrowing in a currency different than their lender's currency, which persists in a number of sensitivity tests and is stronger for firms in developed countries but with relatively low levels of credit provided by banks, as well as when lenders have higher market power. As suggested in Section 1, the higher average loan spreads of foreign currency loans gives rise to questions about heterogeneity of the results due to relationship lending and syndicate structure.

Previous lending between the lead bank and the firm implies that the bank gains important information about the specific borrowing firm (e.g., its ability to repay and its business model) as well as about the impact the exchange rate had on the value of the loan repayments in the lender's currency. This, *ceteris paribus*, lowers the respective informational asymmetry, and one may expect that the bank is more willing to share some of the exchange rate risk with a borrowing firm that is a "repeat borrower" rather than transfer all of the exchange rate risk. To test this hypothesis, we introduce a triple interaction between *Relationship lending* (i.e., a dummy equal to one if the lead bank and the firm have at least one other loan in the last five years, see e.g., Bharath, Dahiya, Saunders and Srinivasan, 2009) and *Forex risk* × *Foreign-currency lending*.

[9] In a similar fashion to the analysis of Table 6, we consider the role of other country and firm characteristics on the relation between exchange rate risk and the cost of credit. For example, we consider the borrower country's reliance on foreign-currency lending measured as the number of foreign loans in domestic currency to the total number of loans in that country. Further, we consider countries with high vs. low interest rates. Even though these characteristics affect the cost of credit directly, they do not cause significant heterogeneity in the impact of exchange rate risk.

Results reported in the first column of Table 7 reveal that the existence of a prior lending relationship enables the borrower to recover approximately 57% of the higher cost due to exchange rate risk. We additionally construct measures reflecting the intensity and size of this relationship (*Relationship lending number* and *Relationship lending amount* respectively; for full definitions, see Table A1). Columns 2-3 indicate that the firm's loan spread recovery increases with the strength of the bank-firm relationship.

[Insert Table 7 about here]

The second strategy aiming to mitigate the effect of exchange rate risk on the cost of credit concerns the structure of the syndicate. By forming a dispersed syndicate and retaining a smaller share of the loan, the lead arranger can minimize, if not eliminate, the potential adverse selection and subsequent moral hazard concerns about the borrowing firm's solvency risk (Sufi, 2007; Ivashina, 2009). To explore this mechanism we interact *Forex risk* × *Foreign-currency lending* with several loan characteristics reflecting the size and structure of the syndicate, and report the results in Table 8. Estimates in column (1) suggest that an increase in the number of lenders in the syndicate provides a positive signal about the firm's creditworthiness. Specifically, including 9 additional lenders in the syndicate (i.e., raising *Number of lenders* by approximately one standard deviation) enables the borrowing firm to recuperate approximately 3.9 basis points (or 40%) on its foreign currency loan spread (coefficient on triple interaction term); moreover, column (2) reveals that this is mainly driven by the addition of lead banks.

[Insert Table 8 about here]

In the next two specifications we consider the potential certification effect exerted by the lead bank's loan share (column 3) and the degree of the syndicate's concentration (column 4). Either specification confirms the beneficial effect of spreading out the loan share across the

syndicate. According to column (3), decreasing *Bank share* by one standard deviation, decreases *AISD* by approximately 12.1 basis points (triple interaction term). This is further reflected in the syndicate's structure: decreasing the syndicate's Herfindalh index (i.e., forming a less concentrated syndicate) results in an additional fall in *AISD* equal to 11.5 basis points (coefficient on *Forex risk* × *Foreign-currency lending Forex risk* × *Herfindahl*).

4.4. Summing up

Overall, the results in this section suggest that the international lending market is not a perfectly competitive market. It is rather characterized by heterogeneous loan spreads depending on the loan currency denomination and borrower credit constraints, even after controlling for loan contract terms and the operation of the loan supply and loan demand channels. In short, imperfect competition in international lending markets results in different syndicated loan spreads when lenders are exposed to exchange rate risk.

5. Conclusions

The market for international lending in the borrower's currency is large and growing. These cross-border loans imply considerable exchange rate risk for banks lending in a currency that is not their own (foreign-currency lending). This study is the first to measure how this bank-side risk of foreign-currency lending affects lending terms, and particularly the cost of credit, in a broad cross-section of firms.

Using global loan-level data from the syndicated loan market, we show that lenders place a significant cost on borrowers in foreign-currency lending. Our baseline specification suggests that a one-standard-deviation increase in exchange rate risk increases loan spreads somewhere in

the range between 5.5 and 16.1 basis points for foreign-currency loans. These results are robust to several changes in the baseline specification and alternative estimation methods. We calculate this additional cost of foreign-currency lending for the average loan size and maturity to be in the range from USD 0.96 to 2.84 million. Thus, firms with no better financing alternatives have a significant competitive disadvantage compared to firms borrowing in their banks' currency due to foreign exchange risk.

With the aim to identify the factors affecting the relation between exchange rate risk and the cost of credit, we show the key role played by lending constraints and bank market power. Specifically, we find that almost all of the effect of the exchange rate risk on the cost of credit comes from borrowers' countries experiencing credit constraints in the form of high lending rates. Further, the banks removing these constraints are those with higher market power.

Is there a remedy against this excessive cost of credit and the associated competitive disadvantage of the affected firms? Among the remedies considered here, repeated lending with the same bank (formation of relationship lending) and lead banks forming a more dispersed loan syndicate yield significantly lower cost of credit. Therefore, a key implication is that affected firms should form long-lasting bank relationships and, with prudent behavior, raise credit from larger loan syndicates. From a policy perspective, central banks and regulators should aim to develop the local credit markets to alleviate credit constraints and increase banking competition from domestic counterparts. This might include: alleviating barriers to entry; allowing the formation of larger banks through M&As in countries with smaller local banks; increase regulatory requirements with respect to the transparency of financial statements; and monitor the bank lending activities through credit registers and efficient supervision, which increases capital requirements and bank liquidity and lowers nonperforming loans.

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Figure 1. Aggregate syndicated loan volume

The figure reports the annual aggregate volumes for foreign currency-denominated loans in the currency of the borrower (foreign-currency lending), foreign currency-denominated loans in the currency of the lender (foreign-currency borrowing) and domestic loans. Values for foreign-currency lending and foreign-currency borrowing are depicted on the left Y-axis and values for domestic loans are depicted on the right Y-axis. All values are in billion USD.

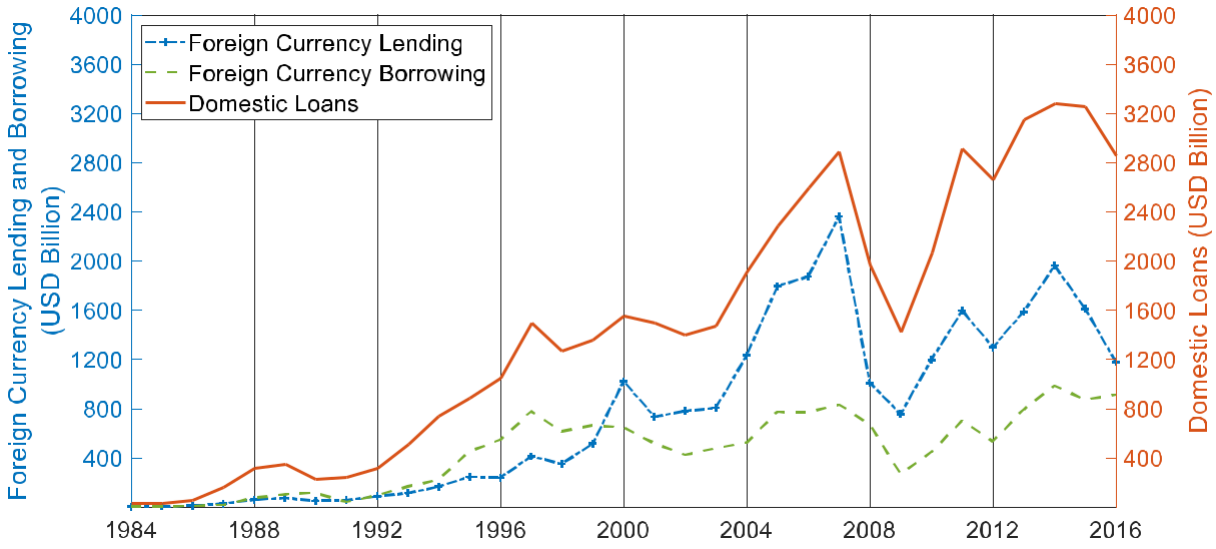

Table 1. Summary statistics

The table reports summary statistics (number of observations, mean, standard deviation, minimum and maximum values) for all variables used in the estimations of the main text. All variables are defined in Table A1.

	Obs.	Mean	Std. dev.	Min.	Max.
AISD	43,128	195.22	137.72	0.88	1,655.00
Forex risk	43,128	0.09	0.22	0.00	6.39
Bid-ask spread	35,357	0.00	0.20	-25.96	2.34
Loan amount	43,128	18.81	1.65	10.60	24.62
Maturity	43,128	47.59	24.50	0.00	515.00
Collateral	43,128	0.49	0.50	0.00	1.00
Number of lenders	43,128	8.78	9.00	1.00	290.00
Number of leads	43,128	2.02	2.35	1.00	44.00
Performance provisions	43,128	0.40	0.49	0.00	1.00
General covenants	43,128	1.35	1.52	0.00	7.00
Bank share	43,128	32.09	31.59	0.00	100.00
Herfindahl	43,128	3,083.41	3,191.18	0.00	10,000.00
Relationship lending	43,128	0.37	0.48	0.00	1.00
Relationship lending number	43,128	0.24	0.37	0.00	1.00
Relationship lending amount	43,128	0.25	0.38	0.00	1.00
Bank size	43,128	13.10	1.34	6.05	15.14
Bank ROA	43,128	0.88	0.53	-3.83	3.84
Bank NPLs	43,128	0.98	1.16	0.00	8.88
Lerner index	43,128	0.27	0.15	0.00	0.70
Firm size	43,128	7.55	2.17	2.29	24.29
Firm ROA	43,128	7.26	3.59	-31.47	30.81
Firm debt	43,128	37.01	26.15	0.00	211.00
GDP growth	43,128	0.07	0.81	-12.68	23.68
GDP per capita	43,128	-434.35	6,396.91	-55,013.27	66,633.97
CIP deviation	42,354	-1.22	16.83	-550.60	883.78
High lending rate	43,128	0.28	0.45	0.00	1.00
Currency crisis	43,128	0.06	0.23	0.00	1.00
Fixed-crawling	43,120	0.05	0.23	0.00	1.00
Fixed	43,120	0.05	0.21	0.00	1.00
Capital controls	43,128	0.12	0.32	0.00	1.00
Capital controls 90th	43,128	0.03	0.16	0.00	1.00

Table 2. Summary statistics for foreign-currency lending vs. other lending

The table reports summary statistics for key price and non-price loan terms and measures of exchange rate risk. All variables are defined in Table A1. Panel A includes observations for other lending, which includes domestic loans and foreign-currency borrowing (i.e., loans granted in the currency of the lender's country, which is different than the borrower's country). Panel B includes observations for foreign-currency lending (i.e., loans granted in the currency of the borrower's country, which is different than the lender's country). Panel C reports results from the mean-comparison test for differences in the mean and standard error between observations in Panel A and Panel B. The*** mark denotes statistical significance at 1% level.

	Obs.	Mean	Std. dev.	Min.	Max.
		Panel A: Other lending			
AISD	37,527	189.31	131.82	0.88	1,655.00
Forex risk	37,527	0.02	0.13	0.00	5.39
Loan amount	37,527	18.72	1.66	10.60	24.62
Maturity	37,527	46.33	24.20	0.00	515.00
Collateral	37,527	0.48	0.50	0.00	1.00
Number of lenders	37,527	8.60	8.86	1.00	176.00
Performance provisions	37,527	0.42	0.49	0.00	1.00
General covenants	37,527	1.41	1.53	0.00	7.00
		Panel B: Foreign-currency lending			
AISD	5,601	234.82	166.79	1.00	1,225.00
Forex risk	5,601	0.52	0.24	0.00	6.39
Loan amount	5,601	19.40	1.43	11.07	23.85
Maturity	5,601	56.05	24.81	1.00	515.00
Collateral	5,601	0.54	0.50	0.00	1.00
Number of lenders	5,601	9.95	9.78	1.00	290.00
Performance provisions	5,601	0.29	0.45	0.00	1.00
General covenants	5,601	0.92	1.34	0.00	6.00

Panel C: Mean-comparison test for the mean and standard error

	Mean	Std. error
AISD	-45.51***	2.33
Forex risk	-0.50***	0.00
Loan amount	-0.68***	0.02
Maturity	-9.73***	0.35
Collateral	-0.05***	0.01
Number of lenders	-1.35***	0.14
Performance provisions	0.13***	0.01
General covenants	0.49***	0.02

Table 3. Baseline results: The differential effect of forex risk on foreign-currency lending

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. Each specification includes a different set of fixed effects, as given in the penultimate part of the table. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Forex risk	7.456	-4.580	-0.439	-29.217	-1.670	-2.581
	[0.923]	[-0.204]	[-0.070]	[-1.649]	[-0.205]	[-0.343]
Foreign-currency lending	-1.572	-5.754	-10.682	-12.679	-13.893	
	[-0.226]	[-0.616]	[-1.058]	[-1.073]	[-1.562]	
Forex risk × Foreign-currency lending	22.724**	39.171***	38.186**	66.975***	40.077***	44.294**
	[2.473]	[2.844]	[2.472]	[2.832]	[2.815]	[2.588]
Loan amount	-16.787***	-16.517***	-16.278***	-15.610***	-15.341***	-15.869***
	[-15.472]	[-14.766]	[-15.284]	[-19.153]	[-19.166]	[-18.730]
Maturity	0.341***	0.356***	0.373***	0.062	0.056	0.052
	[6.183]	[6.064]	[6.015]	[0.673]	[0.627]	[0.585]
Collateral	58.242***	57.993***	55.185***	42.567***	41.742***	42.726***
	[19.178]	[19.051]	[19.747]	[12.987]	[12.351]	[13.256]
Number of lenders	-0.730***	-0.757***	-0.717***	-0.424***	-0.427***	-0.395***
	[-4.291]	[-3.825]	[-4.349]	[-3.864]	[-4.042]	[-3.672]
Performance provisions	-38.016***	-38.057***	-35.858***	-25.784***	-25.167***	-25.758***
	[-12.642]	[-12.610]	[-12.588]	[-9.719]	[-10.287]	[-10.117]
General covenants	2.376**	2.307*	2.369*	1.728*	1.916**	1.757*
	[2.044]	[1.858]	[1.936]	[1.757]	[2.101]	[1.838]
Bank size	-13.323**	-13.867**				
	[-2.063]	[-2.096]				
Bank ROA	-12.772***	-13.482**				
	[-2.708]	[-2.282]				
Bank NPLs	1.270	0.794				
	[1.556]	[0.917]				
Firm size	-6.031***	-6.851***	-5.844***	-9.689***	-8.911***	-8.628***
	[-3.510]	[-3.699]	[-3.383]	[-7.702]	[-6.918]	[-6.910]
Firm ROA	-0.196	-0.204	-0.113	-0.140	-0.073	-0.113
	[-0.557]	[-0.569]	[-0.362]	[-0.510]	[-0.307]	[-0.417]
Firm debt	1.278	1.278	1.132	0.917	0.840	0.900
	[1.627]	[1.624]	[1.638]	[1.481]	[1.519]	[1.462]
GDP growth	-4.204***		-5.036***		-5.590***	-5.506***
	[-3.918]		[-3.612]		[-3.724]	[-3.218]
GDP per capita	0.001		0.002**		0.002**	0.002***
	[1.484]		[2.052]		[2.524]	[2.948]
Observations	43,741	43,497	43,128	42,886	42,785	43,049
Adj. R-squared	0.596	0.598	0.622	0.672	0.674	0.673
Year effects	Y	N	N	N	N	N
Bank effects	Y	Y	N	N	N	N
Bank × year effects	N	N	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	N	Y	N	Y	Y
Currency × borrower's country × year effects	N	Y	N	Y	N	N
Industry × year effects	N	N	N	N	Y	N
Bank × currency effects	N	N	N	N	N	Y
Loan type and purpose effects	N	N	N	Y	Y	Y
Number of banks	466	464	378	377	376	376
Number of firms	6,444	6,400	6,368	6,326	6,314	6,354

Table 4. Currency crises and exchange rate arrangements

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we interact *Forex risk* × *Foreign-currency lending* with *Currency crisis*, i.e., a binary variable equal to one for periods of currency crises, otherwise zero. These periods include the pound sterling's withdrawal from the Exchange Rate Mechanism (ERM), the Mexican peso crisis, the Asian financial crisis, and the Russian ruble crisis. In specification (2), we re-estimate specification (1), but we exclude from *Currency crisis* the period of pound sterling's withdrawal from the ERM. In specification (3), we interact *Forex risk* × *Foreign-currency lending* with *Mexican peso crisis*, i.e., a binary variable equal to one for the periods of the Mexican peso crisis, otherwise zero. In specification (4), we interact *Forex risk* × *Foreign-currency lending* with *Asian crisis*, i.e., a binary variable equal to one for the periods of the Asian financial crisis, otherwise zero. In specification (5), we interact *Forex risk* × *Foreign-currency lending* with *Fixed*, i.e., a binary variable equal to one if the borrower's country has adopted a fixed exchange rate arrangement (including narrow crawling pegs/bands) and zero if it has adopted a floating exchange rate arrangement (e.g., wide crawling pegs/bands, managed floating, freely floating). In specification (6), we interact *Forex risk* × *Foreign-currency lending* with *Fixed (strict)*, i.e., a binary variable equal to one if the borrower's country has adopted a fixed exchange rate arrangement (excluding narro w crawling pegs/bands) and zero if it has adopted a floating exchange rate arrangement (e.g., narrow and wide crawling pegs/bands, managed floating, freely floating). All specifications with triple interaction further include all relevant main effects and double interactions. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Forex risk	0.016	0.045	-0.682	-0.086	-0.498	0.937
	[0.003]	[0.007]	[-0.109]	[-0.014]	[-0.060]	[0.102]
Foreign-currency lending	-10.185	-10.053	-10.422	-10.549	-19.534	-20.800
	[-1.010]	[-1.000]	[-1.032]	[-1.044]	[-1.156]	[-1.251]
Forex risk × Foreign-currency lending	37.164**	37.041**	38.237**	37.615**	65.179***	65.997***
	[2.396]	[2.392]	[2.458]	[2.435]	[2.693]	[2.788]
Forex risk × Foreign-currency lending × Currency crisis	317.925**	387.419**				
	[2.239]	[2.587]				
Forex risk × Foreign-currency lending × Mexican peso crisis			236.740**			
			[2.356]			
Forex risk × Foreign-currency lending × Asian crisis				471.262*		
				[1.817]		
Forex risk × Foreign-currency lending × Fixed					-63.334**	
					[-2.271]	
Forex risk × Foreign-currency lending × Fixed (strict)						-60.510**
						[-2.171]
Observations	43,128	43,128	43,128	43,128	43,120	43,120
Adj. R-squared	0.622	0.622	0.622	0.622	0.622	0.622
Full interactions and main terms	Y	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y	Y
Number of banks	378	378	378	378	378	378
Number of firms	6,368	6,368	6,368	6,368	6,368	6,368

Table 5. Capital controls

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we interact *Forex risk* × *Foreign-currency lending* with *Capital controls*, i.e., a binary variable equal to one if the borrower's country has experienced an increase in the capital controls restriction index located above the 50th percentile of the sample mean, otherwise zero. In specification (2), we interact *Forex risk* × *Foreign-currency lending* with *Capital controls 90th*, i.e., a binary variable equal to one if the borrower's country has experienced an increase in the capital controls restriction index located above the 90th percentile of the sample mean, otherwise zero. All specifications with triple interaction further include all relevant main effects and double interactions. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
Forex risk	-0.158	-0.549
	[-0.025]	[-0.077]
Foreign-currency lending	-12.089	-10.773
	[-1.180]	[-1.117]
Forex risk × Foreign-currency lending	38.416**	39.207**
	[2.469]	[2.445]
Forex risk × Foreign-currency lending × Capital controls	32.024*	
	[1.756]	
Forex risk × Foreign-currency lending × Capital controls 90th		33.276*
		[1.914]
Observations	43,128	43,128
Adj. R-squared	0.622	0.624
Full interactions and main terms	Y	Y
Full set of controls	Y	Y
Number of banks	378	378
Number of firms	6,368	6,368

Table 6. Results heterogeneity due to country characteristics and bank market power

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we interact *Forex risk* × *Foreign-currency lending* with *Bid-ask spread*, i.e., the quoted bid-ask spread of the bilateral 6-month forward exchange rate between the lender's country and the borrower's country. In specification (2), we interact *Forex risk* × *Foreign-currency lending* with *CIP deviation*, i.e., the CIP deviation between the borrower's country 10-year government bond yield and the equivalent US government bond. In specification (3), we interact *Forex risk* × *Foreign-currency lending* with *High lending rate*, i.e., a binary variable equal to one if the lending rate in the borrower country is within the 75th percentile of the lending rate in our sample, otherwise zero. In specification (4), we interact *Forex risk* × *Foreign-currency lending* with *Lerner index*, i.e., the Lerner index of the lender. All specifications with triple interaction further include all relevant main effects and double interactions. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Forex risk	-19.232*	-14.430	-1.290	0.599
	[-1.668]	[-1.448]	[-0.215]	[0.101]
Foreign-currency lending	-4.400	1.106	-6.963	-2.079
	[-0.398]	[0.125]	[-0.728]	[-0.308]
Forex risk × Foreign-currency lending	40.233**	55.319***	14.290*	35.630**
	[2.110]	[3.227]	[1.918]	[2.331]
Bid-ask spread	0.655*			
	[1.980]			
CIP deviation		0.086*		
		[1.760]		
Forex risk × Foreign-currency lending × Bid-ask spread	0.767			
	[0.095]			
Forex risk × Foreign-currency lending × CIP deviation		-0.648		
		[-1.185]		
Forex risk × Foreign-currency lending × High lending rate			50.601***	
			[3.121]	
Forex risk × Foreign-currency lending × Lerner index				47.676**
				[2.107]
Observations	35,357	42,354	43,128	43,125
Adj. R-squared	0.624	0.620	0.622	0.622
Full interactions and main terms	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y
Number of banks	314	375	378	378
Number of firms	5,359	6,200	6,368	6,368

Table 7. Results heterogeneity due to lending relationships

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we interact *Forex risk* × *Foreign-currency lending* with *Relationship lending*, i.e., a binary variable equal to 1 for a prior lending relationship between the lender and the borrower during the previous 5-year period, otherwise zero. In specification (2), we interact *Forex risk* × *Foreign-currency lending* with *Relationship lending number*, i.e., the ratio of the number of prior loans between the lender and the borrower during the previous 5-year period to the total number of loans received by the borrower during the same period. In specification (3), we interact *Forex risk* × *Foreign-currency lending* with *Relationship lending amount*, i.e., the ratio of the amount of prior loans between the lender and the borrower during the previous 5-year period to the total amount of loans received by the borrower during the same period. All specifications with triple interaction further include all relevant main effects and double interactions. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Forex risk	-0.519	-0.618	-0.584
	[-0.081]	[-0.097]	[-0.091]
Foreign-currency lending	-10.025	-10.067	-10.192
	[-0.963]	[-0.986]	[-1.001]
Forex risk × Foreign-currency lending	43.581***	43.270***	43.453***
	[2.837]	[2.775]	[2.781]
Forex risk × Foreign-currency lending × Relationship lending	-24.910***		
	[-3.423]		
Forex risk × Foreign-currency lending × Relationship lending number		-42.870***	
		[-3.295]	
Forex risk × Foreign-currency lending × Relationship lending amount			-40.946***
			[-3.618]
Observations	43,128	43,128	43,128
Adj. R-squared	0.622	0.622	0.622
Full interactions and main terms	Y	Y	Y
Full set of controls	Y	Y	Y
Number of banks	378	378	378
Number of firms	6,368	6,368	6,368

Table 8. Results heterogeneity due to syndicate structure

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we interact *Forex risk × Foreign-currency lending* with *Number of lender*s. In specification (1), we interact *Forex risk × Foreign-currency lending* with *Number of leads*. In specification (3), we interact *Forex risk × Foreign-currency lending* with *Bank share*. In specification (4), we interact *Forex risk × Foreign-currency lending* with *Herfindahl*. All specifications with triple interaction further include all relevant main effects and double interactions. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Forex risk	-0.975	-1.785	-1.383	-0.928
	[-0.158]	[-0.292]	[-0.222]	[-0.148]
Foreign-currency lending	0.289	-1.811	0.642	0.024
	[0.039]	[-0.285]	[0.095]	[0.004]
Forex risk × Foreign-currency lending	41.452***	28.175**	54.211***	53.031***
	[2.922]	[2.033]	[3.803]	[3.708]
Forex risk × Foreign-currency lending × Number of lenders	-1.821**			
	[-2.230]			
Forex risk × Foreign-currency lending × Number of leads		-6.899***		
		[-4.480]		
Forex risk × Foreign-currency lending × Bank share			1.590***	
			[6.400]	
Forex risk × Foreign-currency lending × Herfindahl				0.015***
				[6.500]
Observations	43,128	43,128	43,128	43,128
Adj. R-squared	0.622	0.622	0.624	0.624
Full interactions and main terms	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y
Number of banks	378	378	378	378
Number of firms	6,368	6,368	6,368	6,368

Internet Appendix
The cost of foreign-currency lending

Abstract

This appendix includes additional information on the sample and additional empirical results. The first section includes information on the construction of the sample and additional summary statistics. The second section includes the discussion from the examination of the effect of forex risk on loans with different forex risk exposure and further reports (i) standardized coefficients of our baseline results, (ii) results from alternative foreign exchange rate risk measures, (iii) alternative sets of loan controls and (iv) estimates from Heckman regressions. The third section includes the discussion of several additional sensitivity tests and robustness checks. The appendix concludes with the description of the methodology for the calculation of the Lerner index.

Table A1. Variable definitions and sources

Variable	Description	Source
A. Dependent variables in main specifications		
AISD	All-in spread drawn, defined as the sum of the spread over LIBOR plus any facility fee.	DealScan
AISU	All-in spread undrawn, defined as the sum of the facility fee and the commitment fee.	DealScan
B. Main explanatory variables: Exchange rate risk		
Forex risk	The standard deviation of the daily (percentage) change in the bilateral exchange rate between the country of the lender and the country of the borrower. The standard deviation is computed for the 3 months preceding the loan facility's origination date.	Datastream
Forex risk 1M	The standard deviation of the daily (percentage) change in the bilateral exchange rate between the country of the lender and the country of the borrower. The standard deviation is computed for the 1 month preceding the loan facility's origination date.	Datastream
Forex risk 6M	The standard deviation of the daily (percentage) change in the bilateral exchange rate between the country of the lender and the country of the borrower. The standard deviation is computed for the 6 months preceding the loan facility's origination date.	Datastream
Forward rate 3M	The standard deviation of the daily (percentage) change in the bilateral 3-month forward exchange rate between the country of the lender and the country of the borrower. The standard deviation is computed for the 3 months preceding the loan facility's origination date.	Datastream
Forward rate 6M	The standard deviation of the daily (percentage) change in the bilateral 6-month forward exchange rate between the country of the lender and the country of the borrower. The standard deviation is computed for the 3 months preceding the loan facility's origination date.	Datastream
Bid-ask spread	The quoted bid-ask spread for the bilateral 6-month forward exchange rate between the country of the lender and the country of the borrower. The bid-ask spread is computed as $(\quad - \quad)/\left(\frac{\quad + \quad}{\quad}\right)$, where is the offered rate and is the bid rate in the 6-month forward contract.	Datastream
C. Explanatory variables: Loan characteristics		
Foreign-currency lending	A binary variable equal to one if the loan facility is granted in the currency of the borrower's country, which is different than the lender's country, otherwise zero.	DealScan
Loan amount	Log of the loan facility amount in USD. For non-USD denominated loans, the conversion to USD is performed by using each currency's bilateral exchange rate against the USD on the date that the loan facility becomes active.	DealScan
Maturity	Loan duration in months.	DealScan
Collateral	A binary variable equal to one if the loan is secured with collateral, otherwise zero.	DealScan
Number of lenders	The number of banks involved in the syndicated loan.	DealScan
Number of leads	The number of lead banks involved in the syndicated loan.	DealScan
Performance provisions	A binary variable equal to one if the loan has performance pricing provisions, otherwise zero.	DealScan
General covenants	The total number of covenants in the loan contract.	DealScan
Bank share	The bank's share of the loan.	DealScan
Herfindahl	The syndicate's Herfindahl index, calculated as the sum of the squared individual shares in the loan. It ranges from 0 to 10,000, with 10,000 being the Herfindahl when a lender holds 100% of the loan.	DealScan

Loan-to-value ratio	The ratio of the loan facility amount to total firm assets.	DealScan; Compustat
Loan type	A series of binary variables indicating loan type (e.g., term loans, revolvers, etc.).	DealScan
Loan purpose	A series of binary variables indicating loan purpose (e.g., corporate purpose, debt repay, etc.).	DealScan
Institutional loan	A binary variable equal to one if the loan facility is a non-amortizing term loan (Term Loan B or higher), otherwise zero.	DealScan
Term Loan B	A binary variable equal to one if the loan facility is a non-amortizing term loan (Term Loan B or higher), otherwise zero.	DealScan
Institutional lender	A binary variable equal to one if the lender is an institutional investor and zero if the lender is a bank.	DealScan
Relationship lending	A binary variable equal to one for a prior loan facility between the lender and the borrower in the 5-year period before the loan facility's origination year, otherwise zero.	DealScan
Relationship lending number	The ratio of the number of prior loan facilities between the lender and the borrower in the 5-year period before the loan facility's origination year to the total number of loans received by the borrower during the same period.	DealScan
Relationship lending amount	The ratio of the amount of prior loan facilities between the lender and the borrower in the 5-year period before the loan facility's origination year to the total amount of loans received by the borrower during the same period.	DealScan

D. Explanatory variables: Lender characteristics

Bank size	The log of total bank assets.	Compustat
Bank ROA	The return on total bank assets (%).	Compustat
Bank NPLs	The ratio of non-performing loans to total loans (%).	Compustat
Lerner index	The Lerner index of the bank, which equals (p-mc/p), where p is the average lending rate given by each bank in each year and mc is the marginal cost of producing bank output (also at the bank-year). We proxy the lending rate from the ratio of interest income to total commercial loans and we estimate the marginal cost from the non-parametric estimation of a cost function. We provide more details at the end of this Appendix.	Bankscope; own estimations

E. *Explanatory variables: Borrower characteristics*

Firm size	The log of total firm assets.	Compustat
Firm ROA	The return on total firm assets (%).	Compustat
Firm debt	The ratio of total debt to total assets (%).	Compustat
Firm equity	The log of firm common equity.	Compustat
Firm leverage	The ratio of total debt to common equity (%).	Compustat

F. Explanatory variables: Currency crises, exchange rate arrangements and capital controls restrictions

Currency crisis	A binary variable equal to one for a currency crisis in the 6-month period preceding the loan facility's origination date, otherwise zero. Episodes that constitute a currency crisis are the pound sterling's withdrawal from the Exchange Rate Mechanism, the Mexican peso crisis, the Asian financial crisis, and the Russian ruble crisis.	Own estimations
Fixed	A binary variable equal to one if the exchange rate arrangement in the borrower's country is fixed (including narrow crawling pegs/bands) and zero if it has adopted a floating exchange rate arrangement (e.g., wide crawling pegs/bands, managed floating, freely floating). The *Fixed (strict)* is the equivalent binary variable excluding narrow crawling pegs/bands from the fixed exchange rate arrangement and including them in the floating exchange rate arrangement classification (Ilzetzki, Reinhart and Rogoff, 2017). The classification of Ilzetzki, Reinhart and Rogoff (2017) is based on an algorithm that examines the extent of the percentage	Ilzetzki, Reinhart and Rogoff (2017)

	changes of the domestic currency against the anchor or reference currency, i.e., whether the official announcement (the de jure regime) matches up with actual exchange rate management (the de facto regime). If a country has (virtually) no change in the exchange rate for four months or longer, it is classified as a de facto peg (fixed). If a country fluctuates within a certain limit, then depending on the extent of the fluctuation it is classified as a crawling peg/band. Last, countries that do not fall into any of these less flexible arrangements are classified as freely or managed floating exchange rates.	
Capital controls	A binary variable equal to one if the borrower's country has experienced an increase in the capital controls restriction index located above the 50th percentile of the sample mean, otherwise zero. The *Capital controls 90th* is the equivalent and binary variable representing an increase in the capital controls restrictions index located above the 90th percentile of the sample.	Benigno, Chen, Otrok, Rebucci Young (2014)

G. Explanatory variables: Borrower's country characteristics

CIP deviation	The CIP deviation (in bps) between the borrower's country 10-year government bond yield and the equivalent US government bond. The deviation from CIP is measured by using the cross-currency basis, the difference between the dollar interest rate in the cash market and the implied dollar rate (sometimes referred to as the synthetic dollar interest rate) in the foreign exchange swap market (Du and Schreger, 2016; Du, Im and Schreger, 2018).	Du and Schreger (2016); Du, Im and Schreger (2018)
High lending rate	A binary variable equal to one if the lending rate in the borrower's country is within the 75th percentile of the lending rate in our sample, otherwise zero.	Dealscan

H. Explanatory variables: Differences between the lender and borrower countries

GDP per capita	The difference in annual GDP per capita in constant prices between the lender's and the borrower's countries.	WDI
GDP growth	The difference in annual GDP growth rate (%) between the lender's and the borrower's countries.	WDI
Interest rate differential	The difference in the quarterly interbank rate between the lender's and the borrower's countries. The adjusted rate (*Interest rate differential adj*) is the *Interest rate differential* adjusted for the Eurozone participant countries, i.e., when national interbank rates for the Eurozone countries are replaced by the EONIA.	Datastream
Shadow rate	The monthly shadow short rate in the Eurozone, Japan, the UK, and the U.S. (Krippner, 2016). The 3M rate is the equivalent quarterly rate.	Krippner (2016)

Table A2. Summary statistics for variables employed in the estimations of the Appendix

The table reports summary statistics (number of observations, mean, standard deviation, minimum and maximum values) for all variables used in the estimations of the Internet Appendix. All variables are defined in Table A1.

	Obs.	Mean	Std. dev.	Min.	Max.
AISU	22,972	28.93	22.53	0.38	750.00
Forex risk 1M	43,128	0.09	0.22	0.00	4.93
Forex risk 6M	43,128	0.09	0.22	0.00	5.24
Forward rate 3M	36,279	0.09	0.22	0.00	4.03
Forward rate 6M	36,279	0.09	0.22	0.00	4.14
Shadow rate	30,673	1.37	3.17	-7.38	6.55
Shadow rate 3M	30,661	1.38	3.17	-7.03	6.54
Interest rate differential	42,807	-0.03	1.21	-69.04	33.35
Interest rate differential adj	42,873	-0.04	1.21	-69.04	33.35

Table A3. Number of loans and mean and standard deviation of Forex risk by borrower's country

The table reports the number of observations (loan facilities), and the mean and standard deviation of *Forex risk* by borrower's country for all types of loans (i.e., all currency denominations) and excluding third-currency loans.

Country	Obs.	Mean of Forex risk	Std. dev. of Forex risk
Argentina	35	0.39	0.93
Australia	246	0.42	0.32
Austria	9	0.57	0.46
Bahamas	2	0.00	0.00
Belgium	54	0.37	0.27
Brazil	49	0.84	0.42
Canada	663	0.24	0.28
Chile	32	0.57	0.20
China	17	0.07	0.03
Colombia	8	0.54	0.20
Czech Republic	4	0.62	0.15
Denmark	10	0.22	0.27
Finland	20	0.48	0.22
France	574	0.22	0.27
Germany	339	0.24	0.28
Ghana	2	0.34	0.00
Greece	18	0.41	0.21
Hong Kong	262	0.41	0.23
Hungary	9	0.43	0.20
Iceland	4	0.61	0.09
India	16	0.41	0.18
Ireland	77	0.39	0.24
Israel	8	0.35	0.10
Italy	114	0.33	0.25
Japan	274	0.13	0.25
Kazakhstan	3	0.25	0.07
Luxembourg	61	0.41	0.25
Mexico	143	0.63	0.29
Netherlands	243	0.38	0.26
New Zealand	25	0.47	0.15
Norway	32	0.59	0.21
Peru	5	0.22	0.12
Philippines	8	0.51	0.42
Poland	5	0.62	0.11
Portugal	23	1.24	2.07
Romania	4	0.52	0.30
Russia	22	0.69	0.88
Saudi Arabia	2	0.35	0.00
Singapore	60	0.18	0.18
Slovak Republic	2	0.77	0.10

Slovenia	2	0.00	0.00
South Africa	10	1.09	0.30
South Korea	43	0.53	0.29
Spain	203	0.27	0.29
Sweden	58	0.44	0.20
Switzerland	105	0.57	0.32
Thailand	7	0.28	0.12
Turkey	74	0.78	0.58
Ukraine	3	0.35	0.08
United Kingdom	1,029	0.17	0.24
United States of America	38,108	0.06	0.18
Venezuela	2	2.02	2.68
Total	43,128		

Table A4. Number of loans and mean and standard deviation of Forex risk by borrower's country for foreign-currency lending and foreign-currency borrowing

The table reports the number of observations (loan facilities), and the mean and standard deviation of *Forex risk* by borrower's country. We consider only borrower countries to which there is foreign-currency lending (banks lend to firms in these countries in the borrower countries' domestic currencies) and borrower countries to which there is foreign-currency borrowing (firms in these countries borrow from banks in the lender countries' domestic currencies).

	Foreign-currency lending			Foreign-currency borrowing		
Country	Obs.	Mean of Forex risk	Std. dev. of Forex risk	Obs.	Mean of Forex risk	Std. dev. of Forex risk
Argentina				35	0.39	0.93
Australia	117	0.61	0.17	49	0.64	0.15
Austria	7	0.74	0.38			
Bahamas				2	0.00	0.00
Belgium	38	0.52	0.15			
Brazil				49	0.84	0.42
Canada	63	0.51	0.15	270	0.47	0.21
Chile				32	0.57	0.20
China	1	0.07	0.00	16	0.07	0.03
Colombia				8	0.54	0.20
Czech Republic	4	0.62	0.15			
Denmark				10	0.22	0.27
Finland	15	0.52	0.16	3	0.62	0.11
France	222	0.49	0.16	29	0.62	0.16
Germany	154	0.45	0.22	20	0.57	0.16
Ghana				2	0.34	0.00
Greece	7	0.52	0.19	9	0.41	0.12
Hong Kong	252	0.42	0.23	10	0.19	0.32
Hungary				9	0.43	0.20
Iceland				4	0.61	0.09
India				16	0.41	0.18
Ireland	14	0.39	0.07	47	0.52	0.15
Israel				8	0.35	0.10
Italy	65	0.46	0.14	14	0.57	0.17
Japan	28	0.56	0.11	31	0.62	0.14
Kazakhstan				3	0.25	0.07
Luxembourg	27	0.48	0.18	23	0.53	0.15
Mexico	7	0.59	0.17	136	0.63	0.29
Netherlands	102	0.45	0.18	83	0.57	0.13
New Zealand	17	0.47	0.14	8	0.48	0.17
Norway	20	0.54	0.20	12	0.67	0.21
Peru				5	0.22	0.12
Philippines	1	0.50	0.00	7	0.51	0.45
Poland	2	0.57	0.18	3	0.66	0.07
Portugal	16	1.75	2.31	1	0.56	0.00
Romania				4	0.52	0.30
Russia				22	0.69	0.88
Saudi Arabia	2	0.35	0.00			

Singapore	26	0.34	0.11	8	0.27	0.07
Slovakia				2	0.77	0.10
South Africa				10	1.09	0.30
South Korea	6	0.63	0.08	29	0.65	0.16
Spain	88	0.52	0.21	21	0.42	0.17
Sweden	36	0.41	0.14	22	0.48	0.26
Switzerland	8	0.31	0.19	89	0.64	0.28
Thailand	2	0.40	0.20	5	0.24	0.06
Turkey				74	0.78	0.58
Ukraine				3	0.35	0.08
United Kingdom	224	0.46	0.16	147	0.47	0.14
United States of America	4,030	0.54	0.20	86	0.54	0.23
Venezuela				2	2.02	2.68
Total	5,601			1,478		

Table A5. Number of lenders and loans by lender's country

The table reports the number of banks and the number and volume of loan facilities by lender's country for all types of loans (i.e., all currency denominations) and excluding third-currency loans.

Country	Number of lenders	Number of loans	Volume of loans (USD million)
Australia	8	107	26,400
Brazil	1	3	158
Canada	23	1,629	765,000
France	5	1,043	680,000
Germany	4	1,117	1,010,000
Japan	7	345	112,000
Luxembourg	1	3	488
Netherlands	3	106	49,900
Russia	1	15	15,800
Singapore	2	75	15,800
South Korea	1	8	231
Spain	2	43	7,950
Switzerland	4	744	493,000
United Kingdom	15	2,106	1,440,000
United States of America	301	35,784	14,400,000
Total	378	43,128	19,016,727

A.1. The effect of forex risk on loans with different forex risk exposure

In this section, we explore the importance of foreign exchange volatility for foreign-currency loan pricing by contrasting types of loans with different exposure to exchange rate risk. We initially explore whether exchange rate risk causes domestic banks to charge a different spread than foreign banks when lending in the borrower's domestic currency. To examine this, we estimate the following model for the subsample of loans denominated in the currency of the borrower (granted from both domestic and foreign banks):

$$=_0+_1 \quad +_2 \quad + \quad (.1)$$

In equation (A.1), *Forex risk* takes the value zero for domestic loans (i.e., loans from domestic banks to domestic firms in domestic currency); this indicates that the coefficient on *Forex risk* captures any different spread charged by foreign banks relative to domestic banks due to the presence of exchange rate risk. If exchange rate risk does matter, these loans should come at a higher spread when granted from foreign banks, i.e., the coefficient on *Forex risk* should be positive and statistically significant. We adopt the same set of fixed effects as in Table 3, and replace currency × borrower's country × year fixed effects with borrower's country × year fixed effects where relevant. According to results in Table A6, foreign banks charge a higher spread compared to domestic ones when lending in the borrower's currency; this spread ranges between 4.7 and 9.8 basis points (=19.43 × 0.24 and 40.79 × 0.24 respectively) following a one-standard-deviation increase in our *Forex Risk* measure.

We subsequently compare differences in the pricing of loans between banks lending to foreign firms in their own domestic currency (thereby assuming no exchange rate risk) and banks lending to foreign firms in a third currency (thereby assuming exchange rate risk). To this end, we

estimate equation (A.1) for the subsample of loans classified as foreign-currency borrowing and loans denominated in a third currency.[10] Moreover, we set the *Forex Risk* measure equal to zero when a bank lends in domestic currency; this implies that the coefficient on *Forex risk* reflects the different spread – if any – charged by banks when lending to foreign currency (a third currency in particular) relative to lending in domestic currency due to exchange rate risk.

We present results in Table A7, where we adopt the same set of fixed effects as in Table 3. These results reveal that loans to foreign firms in a third currency are priced higher than equivalent loans in the bank's domestic currency. Estimates across all specifications are between 5.0 and 6.1 basis points (=27.81 × 0.18 and 33.85 × 0.18 respectively) for a one-standard-deviation increase in *Forex risk*.[11]

[10] We only include third-currency loans granted from lenders headquartered in different countries than the borrowers and exclude loans in a third currency between banks and firms in the same country. Results are almost qualitatively and quantitatively similar when third currency loans between domestic banks and firms are added in the subsample.
[11] The standard deviation of *Forex risk* for the third-currency loans in our sample is equal to 0.18.

Table A6. The effect of forex risk: foreign vs domestic loans

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. Each specification includes a different set of fixed effects, as given in the penultimate part of the table. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. Across all specifications estimates are derived from a subsample of loan facilities denominated in the currency of the borrower (granted from both domestic and foreign lenders) and excluding third - currency loans. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Forex risk	25.521***	36.713***	22.602***	32.605***	19.426***	40.786**
	[3.539]	[4.226]	[3.764]	[3.178]	[2.969]	[2.109]
Loan amount	-16.971***	-16.549***	-16.309***	-15.524***	-15.253***	-15.695***
	[-14.924]	[-14.013]	[-14.884]	[-17.174]	[-18.594]	[-18.127]
Maturity	0.335***	0.337***	0.364***	0.030	0.041	0.038
	[5.696]	[5.752]	[5.692]	[0.322]	[0.437]	[0.411]
Collateral	58.553***	58.054***	55.358***	42.588***	41.744***	42.728***
	[18.667]	[19.664]	[19.051]	[13.276]	[11.933]	[12.879]
Number of lenders	-0.736***	-0.715***	-0.709***	-0.381***	-0.422***	-0.382***
	[-4.052]	[-3.802]	[-4.054]	[-3.547]	[-4.043]	[-3.615]
Performance provisions	-38.257***	-38.434***	-36.340***	-26.220***	-25.451***	-26.159***
	[-12.621]	[-12.947]	[-12.596]	[-10.015]	[-10.049]	[-10.154]
General covenants	2.394**	2.275*	2.470**	1.721*	1.965**	1.801*
	[2.033]	[1.843]	[2.025]	[1.762]	[2.187]	[1.886]
Bank size	-13.046**	-13.263**				
	[-2.051]	[-2.014]				
Bank ROA	-14.586***	-13.938**				
	[-3.202]	[-2.633]				
Bank NPLs	1.222	0.990				
	[1.530]	[1.103]				
Firm size	-6.676***	-6.961***	-6.686***	-9.552***	-9.960***	-9.418***
	[-3.752]	[-3.818]	[-3.937]	[-7.764]	[-7.966]	[-7.636]
Firm ROA	-0.204	-0.196	-0.144	-0.173	-0.092	-0.128
	[-0.548]	[-0.574]	[-0.458]	[-0.655]	[-0.397]	[-0.471]
Firm debt	1.264	1.273	1.118	0.892	0.799	0.863
	[1.654]	[1.645]	[1.648]	[1.485]	[1.439]	[1.431]
GDP growth	-4.421***		-6.282**		-8.238***	-8.152***
	[-3.094]		[-2.167]		[-3.787]	[-2.784]
GDP per capita	0.001		0.002		0.002*	0.002***
	[0.527]		[1.412]		[1.947]	[2.879]
Observations	42,179	42,123	41,581	41,518	41,275	41,520
Adj. R-squared	0.594	0.598	0.621	0.673	0.674	0.672
Year effects	Y	N	N	N	N	N
Bank effects	Y	Y	N	N	N	N
Bank × year effects	N	N	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	N	Y	N	Y	Y
Borrower's country × year effects	N	Y	N	Y	N	N
Industry × year effects	N	N	N	N	Y	N
Bank × currency effects	N	N	N	N	N	Y
Loan type and purpose effects	N	N	N	Y	Y	Y
Number of banks	462	461	374	373	372	373
Number of firms	6,195	6,183	6,122	6,109	6,072	6,108

Table A7. The effect of forex risk: third-currency loans vs foreign-currency borrowing

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. Each specification includes a different set of fixed effects, as given in the penultimate part of the table. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. Across all specifications estimates are derived from a subsample of loans classified as foreign-currency borrowing (i.e., loan facilities granted in the currency of the lender's country, which is different than the borrower's country) and including third-currency loans granted from lenders headquartered in different countries than the borrowers. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Forex risk	27.813***	29.335**	33.845**	29.320*	28.789**	33.559*
	[3.130]	[2.205]	[2.507]	[1.886]	[2.099]	[1.836]
Loan amount	-6.789***	-3.190	-8.231***	-7.401**	-9.215***	-11.031***
	[-3.314]	[-1.360]	[-3.215]	[-2.047]	[-3.034]	[-3.170]
Maturity	0.269*	0.305*	0.488***	0.571***	0.595***	0.529***
	[1.823]	[1.941]	[3.444]	[3.309]	[4.956]	[3.850]
Collateral	8.199	-4.552	-6.175	-8.712	0.709	2.063
	[0.681]	[-0.341]	[-0.392]	[-0.630]	[0.051]	[0.142]
Number of lenders	-0.288	-0.393	0.050	-0.045	0.182	0.453*
	[-1.145]	[-1.570]	[0.155]	[-0.124]	[0.544]	[1.788]
Performance provisions	-11.838	-8.866	-4.142	-14.436	-9.397	0.230
	[-1.556]	[-1.329]	[-0.580]	[-1.169]	[-1.088]	[0.025]
General covenants	4.565	2.922	5.932	8.343	1.011	-0.227
	[0.623]	[0.391]	[0.838]	[1.098]	[0.173]	[-0.032]
Bank size	-21.260**	-35.950***				
	[-2.284]	[-3.200]				
Bank ROA	-1.462	9.027				
	[-0.080]	[0.457]				
Bank NPLs	-0.354	0.254				
	[-0.227]	[0.127]				
Firm size	0.160	-1.013	-0.037	2.660	2.563	2.095
	[0.100]	[-0.321]	[-0.016]	[0.358]	[1.139]	[0.961]
Firm ROA	0.163	0.187	-0.394	-0.780	-2.037*	-0.677
	[0.242]	[0.143]	[-0.530]	[-0.487]	[-1.824]	[-1.038]
Firm debt	64.614	47.014	59.079	16.679	43.245	34.071
	[1.422]	[0.803]	[0.888]	[0.551]	[1.167]	[0.559]
GDP growth	-1.686*		-0.677		0.626	-0.180
	[-1.717]		[-0.480]		[0.342]	[-0.116]
GDP per capita	0.001		0.001		-0.000	-0.000
	[0.936]		[0.713]		[-0.221]	[-0.028]
Observations	3,050	2,733	2,845	2,500	2,763	2,770
Adj. R-squared	0.703	0.743	0.737	0.822	0.799	0.775
Year effects	Y	N	N	N	N	N
Bank effects	Y	Y	N	N	N	N
Bank × year effects	N	N	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	N	Y	N	Y	Y
Currency × borrower's country × year effects	N	Y	N	Y	N	N
Industry × year effects	N	N	N	N	Y	N
Bank × currency effects	N	N	N	N	N	Y
Loan type and purpose effects	N	N	N	Y	Y	Y
Number of banks	139	129	96	93	93	93
Number of firms	667	598	632	557	617	618

Table A8. Standardized coefficients of baseline results

The table reports standardized coefficients and t-statistics [in brackets] for the baseline results reported in Table 3. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. Each specification includes a different set of fixed effects, as given in the penultimate part of the table. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Forex risk	0.022	0.004	0.012	-0.036	0.010	0.010
	[1.357]	[0.106]	[0.901]	[-1.208]	[0.661]	[0.673]
Foreign-currency lending	0.008	0.006	-0.005	0.003	-0.012	
	[0.628]	[0.250]	[-0.343]	[0.118]	[-0.833]	
Forex risk × Foreign-currency lending	0.017**	0.029**	0.028**	0.049***	0.030***	0.033**
	[2.210]	[2.600]	[2.442]	[2.810]	[2.781]	[2.588]
Loan amount	-0.171***	-0.169***	-0.166***	-0.159***	-0.157***	-0.162***
	[-15.453]	[-14.748]	[-15.284]	[-18.924]	[-19.131]	[-18.710]
Maturity	0.093***	0.097***	0.102***	0.017	0.015	0.014
	[6.194]	[6.051]	[6.017]	[0.664]	[0.627]	[0.585]
Collateral	0.169***	0.168***	0.160***	0.123***	0.121***	0.124***
	[19.248]	[19.034]	[19.696]	[13.049]	[12.348]	[13.216]
Number of lenders	-0.040***	-0.042***	-0.039***	-0.023***	-0.023***	-0.022***
	[-4.292]	[-4.024]	[-4.350]	[-3.819]	[-4.041]	[-3.664]
Performance provisions	-0.066***	-0.066***	-0.062***	-0.045***	-0.044***	-0.045***
	[-12.683]	[-12.634]	[-12.597]	[-9.896]	[-10.292]	[-10.069]
General covenants	0.013**	0.013*	0.013*	0.010*	0.011**	0.010*
	[2.047]	[1.880]	[1.937]	[1.772]	[2.101]	[1.838]
Bank size	-0.113**	-0.118**				
	[-2.063]	[-2.096]				
Bank ROA	-0.384***	-0.405**				
	[-2.783]	[-2.388]				
Bank NPLs	0.020	0.013				
	[1.577]	[0.931]				
Firm size	-0.104***	-0.118***	-0.101***	-0.168***	-0.153***	-0.148***
	[-3.509]	[-3.704]	[-3.381]	[-7.616]	[-6.912]	[-6.902]
Firm ROA	-0.005	-0.006	-0.003	-0.004	-0.002	-0.003
	[-0.561]	[-0.577]	[-0.363]	[-0.474]	[-0.312]	[-0.420]
Firm debt	0.059	0.059	0.053	0.043	0.039	0.042
	[1.648]	[1.644]	[1.633]	[1.473]	[1.515]	[1.462]
GDP growth	-0.061***		-0.073***	-0.077*	-0.081***	-0.079***
	[-3.974]		[-3.567]	[-1.692]	[-3.725]	[-3.221]
GDP per capita	0.119		0.182**	0.167**	0.177**	0.171***
	[1.485]		[2.052]	[2.177]	[2.524]	[2.948]
Observations	43,741	43,497	43,128	42,886	42,785	43,049
Adj. R-squared	0.596	0.598	0.622	0.672	0.674	0.673
Year effects	Y	N	N	N	N	N
Bank effects	Y	Y	N	N	N	N
Bank × year effects	N	N	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	N	Y	N	Y	Y
Currency × borrower's country × year effects	N	Y	N	Y	N	N
Industry × year effects	N	N	N	N	Y	N
Loan type and purpose effects	N	N	N	N	N	Y
Bank × currency	N	N	N	Y	Y	Y
Number of banks	466	464	378	377	376	376
Number of firms	6,444	6,400	6,368	6,326	6,314	6,354

Table A9. Alternative exchange rate risk measures

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. Specification (1) includes the 1-month volatility of the spot exchange rate between the lender's and the borrower's country (Forex risk 1M). Specification (2) includes the 6-month volatility of the spot exchange rate between the lender's and the borrower's country (Forex risk 6M). Specifications (3) and (4) include the 3-month volatility of the 3-month and 6-month respectively forward exchange rate between the lender's and the borrower's country. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Forex risk 1M	-5.194			
	[-0.774]			
Forex risk 6M		7.328		
		[0.939]		
Forward rate 3M			-14.739*	
			[-1.814]	
Forward rate 6M				-13.634*
				[-1.718]
Foreign-currency lending	-7.751	-16.656*	-14.449	-14.469
	[-0.967]	[-1.838]	[-1.071]	[-1.062]
Forex risk 1M × Foreign-currency lending	37.158***			
	[3.342]			
Forex risk 6M × Foreign-currency lending		42.412**		
		[2.604]		
Forward rate 3M × Foreign-currency lending			59.407**	
			[2.641]	
Forward rate 6M × Foreign-currency lending				58.666**
				[2.557]
Loan amount	-16.274***	-16.269***	-15.474***	-15.475***
	[-15.250]	[-15.317]	[-13.349]	[-13.351]
Maturity	0.372***	0.372***	0.451***	0.451***
	[5.959]	[6.000]	[6.116]	[6.117]
Collateral	55.178***	55.171***	52.209***	52.211***
	[19.746]	[19.823]	[18.933]	[18.933]
Number of lenders	-0.714***	-0.716***	-0.851***	-0.851***
	[-4.342]	[-4.314]	[-4.736]	[-4.735]
Performance provisions	-35.871***	-35.880***	-36.974***	-36.975***
	[-12.581]	[-12.601]	[-11.422]	[-11.423]
General covenants	2.386*	2.374*	2.797**	2.796**
	[1.952]	[1.944]	[2.155]	[2.155]
Firm size	-5.788***	-5.911***	-4.666**	-4.649**
	[-3.364]	[-3.452]	[-2.103]	[-2.091]
Firm ROA	-0.101	-0.119	-0.152	-0.153
	[-0.327]	[-0.383]	[-0.565]	[-0.568]
Firm debt	1.137	1.121	0.927*	0.927*
	[1.624]	[1.622]	[1.682]	[1.683]
GDP growth	-5.166***	-4.962***	-3.528*	-3.534*
	[-3.644]	[-3.614]	[-1.715]	[-1.721]
GDP per capita	0.002**	0.002**	0.002**	0.002**
	[2.105]	[2.000]	[2.088]	[2.085]
Observations	43,128	43,128	36,279	36,279
Adj. R-squared	0.622	0.622	0.622	0.622
Number of banks	378	378	316	316
Number of firms	6,368	6,368	5,383	5,383

Table A10. Different loan controls

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. Different specifications include different loan controls to show that the estimates on the term *Forex risk × Foreign-currency lending* are not overly sensitive to the loan controls used. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Forex risk	8.910	2.460	4.589	6.538	7.465
	[1.067]	[0.337]	[0.675]	[0.847]	[0.929]
Foreign-currency lending	-4.578	-6.899	-9.272	-3.320	-3.344
	[-0.375]	[-0.621]	[-0.857]	[-0.282]	[-0.278]
Forex risk × Foreign-currency lending	22.558**	32.576**	32.228**	25.211**	22.314**
	[2.227]	[2.314]	[2.415]	[2.409]	[2.244]
Loan amount		-20.826***			
		[-15.769]			
Maturity		0.452***			
		[6.815]			
Collateral			57.573***		
			[15.134]		
Loan-to-value ratio				-212.572*	
				[-1.915]	
Number of lenders			-1.520***	-1.503***	
			[-5.146]	[-4.735]	
Performance provisions					-42.378***
					[-13.350]
General covenants					6.295***
					[4.676]
Firm size	-18.407***	-8.846***	-12.073***	-15.492***	-17.705***
	[-10.447]	[-5.523]	[-6.185]	[-8.474]	[-9.782]
Firm ROA	0.006	-0.108	-0.012	0.169	-0.019
	[0.017]	[-0.294]	[-0.038]	[0.436]	[-0.055]
Firm debt	1.032	1.137	1.103	0.816	1.017
	[1.217]	[1.331]	[1.566]	[0.861]	[1.242]
GDP growth	-6.090***	-5.282***	-5.415***	-5.496***	-6.153***
	[-4.423]	[-3.647]	[-4.067]	[-4.173]	[-4.690]
GDP per capita	0.003**	0.002**	0.002**	0.002**	0.003**
	[2.281]	[2.049]	[2.289]	[2.202]	[2.209]
Observations	42,896	42,896	42,896	42,896	42,896
Adj. R-squared	0.577	0.596	0.602	0.583	0.59
Number of banks	378	378	378	378	378
Number of firms	6,368	6,368	6,368	6,368	6,368

Table A11. Heckman sample-selection model

The table reports coefficients and t-statistics [in brackets] from Heckman's (1979) sample-selection model. The dependent variable is in the second line of each panel and all variables are defined in Table A1. Estimation method is maximum likelihood. The lower part of the table in panel B denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In the first stage (panel A), we use a probit model on the entire sample of loan facilities in DealScan (all currency denominations) to estimate the determinants of the firm's decision to use foreign-currency lending. The lower part of the table in panel A denotes the type of dummies used in each specification. In the second stage (panel B), we run the regression on the subsample of loans classified as foreign-currency lending. In Panel B, standard errors are clustered by bank. All specifications in Panel B include year, bank, firm, lender's country and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

Panel A: The foreign currency loan-taking decision by the firm

	(1) Foreign-currency lending	(2) Foreign-currency lending	(3) Foreign-currency lending
Firm size	-0.091***	-0.021	-0.090***
	[-5.926]	[-1.220]	[-6.098]
Firm ROA	-0.037***	-0.233	-0.320*
	[-3.316]	[-1.159]	[-1.734]
Firm debt	0.001	0.000	
	[0.833]	[0.229]	
Firm equity		-0.080***	
		[-3.918]	
Firm leverage			0.007***
			[4.847]
Loan amount	0.013	0.024	0.016
	[0.844]	[1.409]	[0.998]
Maturity	0.001	0.001*	0.001
	[1.570]	[1.743]	[1.413]
Collateral	0.520***	0.457***	0.474***
	[7.496]	[6.297]	[6.328]
Number of lenders	-0.012***	-0.012***	-0.012***
	[-4.560]	[-4.677]	[-4.671]
Performance provisions	0.418***	0.447***	0.456***
	[7.767]	[8.609]	[8.453]
General covenants	0.179***	0.176***	0.171***
	[7.389]	[7.144]	[6.826]
Bank size	-0.031	0.020	0.031
	[-0.314]	[0.232]	[0.366]
Bank ROA	0.189	0.252*	0.242
	[1.308]	[1.684]	[1.608]
Bank NPLs	-0.013	-0.026	-0.027
	[-0.635]	[-0.903]	[-0.951]
Bank loans	2.397	2.926	2.694
	[0.562]	[0.680]	[0.632]
Country-pair loans	-21.572***	-20.548***	-20.468***
	[-9.919]	[-8.983]	[-9.014]
Total loans			0.000
			[1.171]
Observations	116,515	110,382	110,312
Year dummies	Y	Y	Y
Bank dummies	N	Y	Y
Firm dummies	Y	Y	Y
Lender's country dummies	N	Y	Y
Borrower's country dummies	Y	Y	Y

Loan type dummies	N	N	Y
Loan purpose dummies	N	N	Y

Panel B: The effect of Forex risk on foreign-currency loan spreads

	(1) AISD	(2) AISD	(3) AISD
Forex risk	69.661**	66.688**	67.261**
	[2.521]	[2.428]	[2.444]
Loan amount	-15.279***	-14.842***	-14.672***
	[-4.275]	[-4.338]	[-4.189]
Maturity	0.573***	0.578***	0.576***
	[3.717]	[3.626]	[3.647]
Collateral	106.311***	107.829***	108.621***
	[11.567]	[13.897]	[12.620]
Number of lenders	-1.179***	-1.106***	-1.153***
	[-2.962]	[-2.640]	[-2.744]
Performance provisions	-50.890***	-44.483***	-43.512***
	[-7.212]	[-6.199]	[-5.901]
General covenants	-7.389**	-7.401**	-7.128**
	[-2.345]	[-2.567]	[-2.568]
Bank size	6.472	7.101	6.991
	[0.872]	[0.987]	[0.975]
Bank ROA	-8.715	-7.379	-7.069
	[-0.729]	[-0.548]	[-0.528]
Bank NPLs	-0.435	0.366	0.170
	[-0.355]	[0.303]	[0.147]
Firm size	-7.382***	-7.806***	-8.130***
	[-3.806]	[-3.935]	[-3.832]
Firm ROA	13.766***	-131.474***	-131.791***
	[3.053]	[-3.286]	[-3.209]
Firm debt	35.751***	54.292***	56.327***
	[3.028]	[3.862]	[4.154]
GDP growth	-9.470***	-9.226***	-9.325***
	[-5.465]	[-4.493]	[-4.552]
GDP per capita	-0.000	-0.000	-0.000
	[-0.218]	[-0.139]	[-0.131]
Observations	5,601	5,106	5,115
Number of banks	96	95	95
Number of firms	1,947	1,842	1,839

A.2. Additional results

This section includes the discussion of additional results and robustness checks. Our first exercise concerns the estimation of a seemingly unrelated regression (SUR) model that accounts for the simultaneous setting of the price and non-price loan terms by the lending banks at the time of the loan origination (Gropp, Gruendl and Guettler, 2014). In this setting we estimate a system of regressions where, in addition to *Forex risk* and *AISD*, a number of different loan terms, namely *Loan amount*, *Maturity*, *Collateral*, and *Number of lenders* are regressed on the same set of regressors in our baseline equation (including the *AISD*). Results in Table A12 confirm the robustness of our baseline OLS estimates; in fact, the results of our baseline models appear to be relatively conservative compared to those under the SUR framework.[12]

An extension of our analysis relates to the role of loan fees. Berg, Saunders and Steffen (2016) show that commitment plus facility fees, defined as the all-in spread undrawn (*AISU*), is larger for high-volatility firms. Thus, we might expect that higher volatility in bilateral exchange rates raises the cost of foreign currency-denominated loans through higher fees. Data on fees are generally more limited in the global DealScan data, more so because several loans outside the U.S. are term loans that do not include several types of fees. Nonetheless, in Table A13 we replicate Table 3 with *AISU* as the dependent variable. We do not detect a statistically significant effect of *Forex risk* × *Foreign-currency lending* or of any main term on *AISU*. Thus, it seems that the interaction of forex risk with the choice of currency denomination is only priced in spreads.

Subsequently, we control for pipeline risk, namely the risk faced by lenders that they must retain larger shares in loans for which investors are willing to participate less than expected (Bruche, Malherbe and Meisenzahl, 2020). In fact, certain term loan facilities are structured

[12] For expositional purposes, we only report estimates from the regressions where the dependent variable is *AISD*. The estimates from the other equations in the model are available on request.

specifically to appeal to institutional investors rather than banks: within a loan package, the lending syndicates for Term Loan B, C, and higher usually include nonbank lenders (Nadauld and Weisbach, 2012; Lim, Minton and Weisbach, 2014). Importantly, these loans often feature weak covenants, longer maturities, and very low amortization, that would require high capital requirements if banks were to hold them. Thus, to compensate for pipeline risk, we expect banks to charge a premium on these loans in excess of the higher spread attributed to exchange rate risk.[13]

In Table A14 we examine how these institutional details coexist with exchange rate risk in the determination of syndicated loan spreads, by interacting *Forex risk* × *Foreign-currency lending* with different loan and lender types. In column (1), we consider only non-amortizing loans (Term Loan B or higher), while in column (2) we restrict our definition of institutional loans even further to include only Term Loan Bs; column (3) differentiates between bank and nonbank creditors. Across all specifications, the coefficients on the triple interaction terms suggest that foreign-currency loans carry a higher spread when structured specifically for institutional lenders. These differences are independent of the effect of exchange rate risk reflected in the coefficients on *Forex risk* × *Foreign-currency lending*, which is in line with our baseline estimates.

Further, we control more explicitly for monetary conditions. This is important for two interrelated reasons. First, exchange rate volatility might capture changes in monetary policy, i.e. reflecting omitted variable bias. Second, the risk-taking channel of monetary policy predicts a positive relation between expansionary monetary policy and bank risk-taking.[14] If low interest rates entice banks to take more risk and there are systematic risk differences in international vs. domestic

[13] In addition, the loan portfolios of nonbank institutional investors are less diversified than most bank loan portfolios. This in turn causes certain institutional investors, e.g., insurance companies, to reach for yield and therefore are more likely to demand higher interest rates compared to commercial banks (Becker and Ivashina, 2015).

[14] Evidence on the risk-taking channel of monetary policy is provided by, among others, Altunbas, Gambacorta and Marquéz-Ibáñez (2014), Jiménez, Ongena, Peydró and Saurina (2014) and Delis, Hasan and Mylonidis (2017).

lending unrelated to exchange rate risk, the interaction term *Forex risk* × *Foreign-currency lending* might simply capture such risk differences induced by monetary shocks.

We examine the role of this mechanism in Table A15, by using a subsample consisting of the U.S., the Eurozone, Japan, and the UK. In these countries, we can better identify the stance of monetary policy, especially using measures encompassing nonstandard monetary policy post-crisis. To this end, we use the shadow short rate (one- and three-month averages), which provides an accurate description of monetary policy stance when interest rates are near the zero lower bound, compared to the actual short rate (Krippner, 2016; Von Borstel, Eickmeier and Krippner, 2016). Estimates in columns 1-2 show that *Forex risk* × *Foreign-currency lending* does not lose in explanatory power: the magnitude is in fact stronger than in Table 3. The coefficients on each of the triple interactions with the monetary policy measures are negative and significant, supporting the positive relation between expansionary monetary policy and bank loan rates (i.e., an operative risk-taking channel).

However, it could still be the case that results differ based on the interest-rate differential between the bank's and the borrower's countries. In columns 3-4 of Table A15, we introduce the triple interaction term *Forex risk* × *Foreign-currency lending* × *Interest rate differential* (defined as the difference between the quarterly interbank rate in the lender's and borrower's countries – see Table A1). We find that the significant double interaction term is not different between countries with high and low interest rate differential.

We further examine our results heterogeneity due to specific features of our sample. We initially test for potential differences in the effect of *Forex risk* on loans granted by U.S. and Eurozone lenders. Average spreads for syndicated loans are approximately 30 basis points smaller in Europe (Carey and Nini, 2007). However, this difference in pricing is not confirmed when considering *AISU* (Berg, Saunders, Steffen and Streitz, 2016). In Table A16, we interact our double

interaction term with two binary variables representing loans granted by U.S. lenders (column 1) and Eurozone lenders (column 2). Our double interaction term remains statistically significant at conventional levels across both specifications. In contrast, triple interactions are not statistically significant, suggesting no differential effect for U.S. versus Eurozone lenders.

Considering the US dollar's reserve currency status and its role for global financial conditions and for the volume of cross-border bank lending (see Bruno and Shin, 2015; Avdjiev, Du, Koch and Shin, 2019), we subsequently distinguish between USD-denominated and non-USD-denominated loans (column 3); we find no evidence that banks price forex risk differently when lending in USD. Our next specifications test for pricing differences in loans to borrowers from certain country-blocs, by looking at loans to U.S. borrowers (column 4) and borrowers from developing countries (column 5). We observe no differences when moving to different country-blocs. Finally, considering the massive monetary policy interventions and capital flows during the global financial crisis, we investigate any differential effect exerted by the crisis. Estimates from column (6) show that our estimates are consistent across different time periods.

To ensure that our inferences are not sensitive to the type of standard error clustering (also given the multilevel nature of our data), we also cluster by bank and year, loan facility and quarter, firm and quarter, lender's country and borrower's country and quarter, and bank and firm and quarter (see Table A17). We note that the results are also robust to the clustering by lender's country and bank and quarter or by borrower's country and firm and quarter (available on request).

So far, we assumed that all loans enter the model with equal weights. Normally, the fixed effects in Table 3 provide a safeguard against cross-country variation. We nevertheless acknowledge that the empirical specification might leave the analysis open to the critique that countries receiving more or fewer loans might affect our results disproportionately. To this end, we re-estimate our preferred specification using weighted least squares and several different

weights based on the country-year number of loans. The results in Table A18 are similar to the baseline.

We conduct several additional sensitivity tests, the results of which are available on request. First, we estimate regressions where we control for the presence of a bank's (firm's) subsidiary in the firm's (bank's) country. When foreign-currency loans are considered, to the extent that the bank (firm) can lend (borrow) through its subsidiary, these loans carry no exchange rate risk. In addition, through its subsidiary each parent entity minimizes the information asymmetry with regards to the counterparty's operations and the counterparty's country fundamentals. We thus classify such loans as domestic loans; estimates from this exercise confirm the positive impact of exchange rate volatility on foreign-currency loan spreads.

Second, we exclude all loans other than term and revolver loans, which are the most conventional corporate loan deals. In alternative specifications, we exclude loans for leveraged buyouts (LBOs) or mergers and acquisitions (M&As) because these can lower the cost of credit by reducing the asymmetric information between the bank and the borrowing firm (Ivashina and Kovner, 2011). In principle, the loan type and loan purpose fixed effects used in the previous analysis should capture such discrepancies in loan pricing. Again, the results from these exercises are similar to the baseline.

Third, we control for differences in the macroeconomic, financial, and institutional environment between the lender's and borrower's countries. Specifically, we include macroeconomic and institutional country-pair controls (GDP growth, prevalence of democratic institutions, rule of law, protection of property rights, protection of creditor rights, quality of bureaucracy, etc.), the introduction of the euro, characteristics of different financial sectors (bank vs. market systems, differences in banking regulations), etc. These variables should correlate strongly with the lender's country and the borrower's country fixed effects or the bank × year

effects in the specifications of Table 3, to the extent that these variables change slowly over time. We do not use all indicators at once, because they tend to have high pairwise correlations. Again, the results are similar to the baseline.

Table A12. Seemingly unrelated regressions

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. The estimation method is FGLS. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firm*s*) entering each specification. Different specifications include a system of regression equations to control for the simultaneous determination of loan terms in each loan facility (only the estimates from the regression where the dependent variable is *AISD* are reported). In each regression, the set of regressors is the same as in the regression for *AISD* (including *AISD* and excluding the variable that acts as regress and in the respective equation). In specification (1), two regression equations are estimated, where the dependent variable is *AISD* and *Loan amount* respectively. In specification (2), three regression equations are estimated, where the dependent variable is *AISD*, *Loan amount* and *Maturity* respectively. In specification (3), four regression equations are estimated, where the dependent variable is *AISD*, *Loan amount*, *Maturity* and *Collateral* respectively. In specification (4), five regression equations are estimated, where the dependent variable is *AISD*, *Loan amount*, *Maturity* and *Collateral* and *Number of lenders* respectively. The *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Forex risk	12.505**	11.981**	10.594**	12.151**
	[2.568]	[2.461]	[2.176]	[2.495]
Foreign-currency lending	3.156	-2.171	-11.718***	-12.368***
	[0.849]	[-0.584]	[-3.152]	[-3.327]
Forex risk × Foreign-currency lending	72.542***	76.921***	77.805***	76.531***
	[9.132]	[9.683]	[9.794]	[9.634]
Loan amount	-21.455***	-22.408***	-19.128***	-16.158***
	[-43.967]	[-45.923]	[-39.231]	[-33.156]
Maturity	0.494***	0.903***	0.555***	0.556***
	[21.113]	[38.748]	[23.917]	[23.970]
Collateral	103.286***	98.162***	175.024***	174.898***
	[82.225]	[78.162]	[149.002]	[148.895]
Number of lenders	-0.497***	-0.539***	-0.411***	-1.365***
	[-6.876]	[-7.456]	[-5.692]	[-18.945]
Performance provisions	-50.684***	-51.568***	-46.639***	-44.915***
	[-38.211]	[-38.877]	[-35.169]	[-33.871]
General covenants	2.801***	3.014***	-4.092***	-3.689***
	[6.224]	[6.698]	[-9.130]	[-8.232]
Firm size	0.179	0.421	3.665***	3.838***
	[0.489]	[1.148]	[10.003]	[10.475]
Firm ROA	0.880**	0.715**	0.389	0.397
	[2.467]	[2.004]	[1.092]	[1.112]
Firm debt	4.110***	3.896***	3.250***	3.277***
	[8.873]	[8.409]	[7.015]	[7.074]
GDP growth	-7.714***	-7.742***	-7.675***	-7.597***
	[-11.285]	[-11.326]	[-11.229]	[-11.115]
GDP per capita	0.000***	0.000***	0.000***	0.000***
	[3.725]	[3.909]	[3.572]	[2.973]
Observations	43,128	43,128	43,128	43,128
R-squared	0.318	0.312	0.266	0.267
Number of banks	378	378	378	378
Number of firms	6,368	6,368	6,368	6,368

Table A13. Results for AISU

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISU* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Forex risk	-0.605	-5.701	-1.676	-3.717	-1.282	0.712
	[-0.339]	[-1.081]	[-0.957]	[-0.547]	[-0.707]	[0.280]
Foreign-currency lending	-1.795	-0.531	0.216	2.030	1.723	
	[-0.725]	[-0.230]	[0.067]	[0.519]	[0.547]	
Forex risk × Foreign-currency lending	1.866	6.308	-1.719	-0.195	-3.436	-4.449
	[0.420]	[0.928]	[-0.293]	[-0.020]	[-0.623]	[-0.628]
AISD	0.135***	0.134***	0.138***	0.134***	0.135***	0.135***
	[18.108]	[17.696]	[19.489]	[19.392]	[19.638]	[19.999]
Loan amount	-0.267	-0.232	-0.235	-0.211	-0.186	-0.228
	[-1.306]	[-1.133]	[-0.967]	[-0.856]	[-0.813]	[-0.922]
Maturity	0.076***	0.076***	0.069***	0.029**	0.027**	0.029**
	[10.522]	[10.978]	[11.244]	[2.525]	[2.315]	[2.385]
Collateral	2.155***	2.149***	1.773***	1.850***	1.758***	1.828***
	[5.440]	[5.776]	[4.076]	[4.662]	[3.662]	[4.304]
Number of lenders	-0.040*	-0.043*	-0.023	-0.026	-0.022	-0.024
	[-1.885]	[-1.983]	[-1.222]	[-1.320]	[-0.995]	[-1.232]
Performance provisions	-0.670**	-0.724***	-0.772**	-0.797***	-0.697**	-0.785***
	[-2.469]	[-2.746]	[-2.430]	[-2.991]	[-2.023]	[-2.729]
General covenants	0.283**	0.261**	0.320**	0.242*	0.273*	0.274**
	[2.188]	[2.015]	[2.401]	[1.857]	[1.956]	[2.065]
Bank size	-0.565	-0.577				
	[-0.628]	[-0.640]				
Bank ROA	-2.309***	-2.444***				
	[-3.488]	[-3.460]				
Bank NPLs	-0.248	-0.288				
	[-1.226]	[-1.516]				
Firm size	0.404	0.406	0.061	0.027	0.032	0.045
	[1.271]	[1.255]	[0.206]	[0.092]	[0.104]	[0.153]
Firm ROA	-2.043	-1.796	-2.629	-1.953	-2.725	-2.170
	[-0.929]	[-0.788]	[-1.058]	[-0.739]	[-1.224]	[-0.839]
Firm debt	0.485	0.570	0.833	1.034	0.771	0.971
	[0.419]	[0.475]	[0.677]	[0.867]	[0.705]	[0.827]
GDP growth	0.422*		0.374		0.262	0.287
	[1.837]		[1.437]		[1.094]	[0.943]
GDP per capita	0.000		0.000		-0.000	-0.000
	[1.164]		[0.302]		[-0.642]	[-0.023]
Observations	23,721	23,612	22,972	22,847	22,837	22,928
Adj. R-squared	0.670	0.672	0.697	0.707	0.709	0.705
Year effects	Y	N	N	N	N	N
Bank effects	Y	Y	N	N	N	N
Bank × year effects	N	N	Y	Y	Y	Y
Firm effects	Y	Y	Y	Y	Y	Y
Lender's country effects	Y	Y	Y	Y	Y	Y
Borrower's country effects	Y	N	Y	N	Y	Y
Currency × borrower's country × year effects	N	Y	N	Y	N	N
Industry × year effects	N	N	N	N	Y	N
Loan type and purpose effects	N	N	N	N	N	Y
Bank × currency effects	N	N	N	Y	Y	Y
Number of banks	399	395	279	277	277	277
Number of firms	4,380	4,354	4,246	4,219	4,219	4,234

Table A14. Results heterogeneity due to investor types

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we interact *Forex risk* × *Foreign-currency lending* with *Institutional term loan*, i.e., a binary variable equal to one if the loan facility is a non-amortizing term loan (Term Loan B or higher), otherwise zero. In specification (2), we interact *Forex risk* × *Foreign-currency lending* with *Term loan B*, i.e., a binary variable equal to one if the loan facility is a Term Loan B, otherwise zero. In specification (3), we interact *Forex risk* × *Foreign-currency lending* with *Institutional lender*, i.e., a binary variable equal to one if the lender is an institutional investor and zero if the lender is a bank. All specifications with triple interaction further include all relevant main effects and double interactions. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Forex risk	-5.819	-0.815	-0.120
	[-0.884]	[-0.130]	[-0.019]
Foreign-currency lending	-5.964	-12.316	-10.074
	[-0.462]	[-1.166]	[-0.991]
Forex risk × Foreign-currency lending	56.912***	35.841**	34.570**
	[2.801]	[2.429]	[2.152]
Forex risk × Foreign-currency lending × Institutional term loan	29.972*		
	[1.841]		
Forex risk × Foreign-currency lending × Term Loan B		34.334**	
		[2.191]	
Forex risk × Foreign-currency lending × Institutional lender			22.279***
			[2.882]
Observations	43,128	43,128	41,637
Adj. R-squared	0.642	0.622	0.619
Full interactions and main terms	Y	Y	Y
Full set of controls	Y	Y	Y
Number of banks	378	378	306
Number of firms	6,368	6,368	6,211

Table A15. Monetary conditions and interest rate differential

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specifications (1) and (2), we interact *Forex risk* × *Different currency* with *Shadow rate* and *Shadow rate 3M*, i.e., the monthly and quarterly respectively shadow short rate in the lender's country. In specification (3), we interact *Forex risk* × *Foreign-currency lending* with *Interbank differential*, i.e., the difference in the quarterly interbank rate between the lender's country and the borrower's country. In specification (4), we interact *Forex risk* × *Foreign-currency lending* with *Interbank differential adj*, i.e., the *Interest rate differential* adjusted for Eurozone participant countries. In the adjusted rate, the national interbank rates for the Eurozone countries are replaced by the EONIA. All specifications with triple interaction further include all relevant main effects and double interactions. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Forex risk	-2.647	-2.976	-11.951	-15.358
	[-0.450]	[-0.474]	[-1.096]	[-1.574]
Foreign-currency lending	-16.451***	-18.017***	-3.348	-3.791
	[-4.718]	[-5.410]	[-0.404]	[-0.436]
Forex risk × Foreign-currency lending	75.660***	80.182***	46.275**	53.429***
	[8.313]	[8.018]	[2.597]	[2.881]
Forex risk × Foreign-currency lending × Shadow rate	-17.136***			
	[-3.466]			
Forex risk × Foreign-currency lending × Shadow rate 3M		-17.531***		
		[-3.702]		
Forex risk × Foreign-currency lending × Interest rate differential			2.634	
			[0.350]	
Forex risk × Foreign-currency lending × Interest rate differential adj				-1.883
				[-0.225]
Observations	30,673	30,661	42,807	42,807
Adj. R-squared	0.631	0.631	0.623	0.622
Full interactions and main terms	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y
Number of banks	230	229	376	376
Number of firms	4,732	4,729	6,311	6,311

Table A16. Results heterogeneity due to sample features

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is OLS with standard errors clustered by bank *and* quarter. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we interact *Forex risk* × *Different currency* with *USA*, i.e., a dummy variable equal to one for all U.S. lenders, otherwise zero. In specification (2), we interact *Forex risk* × *Different currency* with *EMU*, i.e., a dummy variable equal to one for all Eurozone lenders, otherwise zero. In specification (3), we interact *Forex risk* × *Different currency* with *non-USD loan*, i.e., a dummy variable equal to one for non-USD denominated loan facilities, otherwise zero. In specification (4), we interact *Forex risk* × *Different currency* with *U.S. borrower*, i.e., a dummy variable equal to one for all U.S. borrowers, otherwise zero. In specification (5), we interact *Forex risk* × *Different currency* with *Developing*, i.e., a dummy variable equal to one for all developing country borrowers, otherwise zero. In specification (6), we interact *Forex risk* × *Different currency* with *Crisis*, i.e., a dummy variable equal to one for the financial crisis period, i.e., the period 2008-2009, otherwise zero. All specifications with triple interaction further include all relevant main effects and double interactions. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Forex risk	-1.411	-0.356	5.405	-7.043	-1.118	-0.441
	[-0.216]	[-0.057]	[0.833]	[-1.108]	[-0.176]	[-0.070]
Foreign-currency lending	-10.796	-11.823	-9.654	-4.824	-12.599	-9.920
	[-1.064]	[-1.119]	[-0.412]	[-0.862]	[-1.229]	[-1.037]
Forex risk × Foreign-currency lending	44.834**	36.470**	59.398**	33.826**	42.413***	36.011**
	[2.362]	[2.491]	[2.225]	[2.210]	[2.721]	[2.592]
Forex risk × Foreign-currency lending × USA	-14.300					
	[-0.632]					
Forex risk × Foreign-currency lending × EMU		10.928				
		[0.611]				
Forex risk × Foreign-currency lending × non-USD loan			-32.347			
			[-0.977]			
Forex risk × Foreign-currency lending × U.S. borrower				52.503		
				[1.367]		
Forex risk × Foreign-currency lending × Developing					18.768	
					[0.537]	
Forex risk × Foreign-currency lending × Crisis						8.576
						[0.315]
Observations	43,128	43,128	43,128	43,128	43,128	43,128
Adj. R-squared	0.622	0.622	0.622	0.622	0.622	0.622
Full interactions and main terms	Y	Y	Y	Y	Y	Y
Full set of controls	Y	Y	Y	Y	Y	Y
Number of banks	378	378	378	378	378	378
Number of firms	6,368	6,368	6,368	6,368	6,368	6,368

Table A17. Different clustering of standard errors

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table 1. Estimation method is OLS. The penultimate part of the table denotes the type of fixed effects used in each specification and the type of standard error clustering (LC&BC&Q refers to Lender's country *and* Borrower's country *and* Quarter, and B&F&Q refers to Bank *and* Firm *and* Quarter). The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Forex risk	-0.439	-0.439	-0.439	-0.439	-0.439
	[-0.066]	[-0.067]	[-0.059]	[-0.046]	[-0.067]
Foreign-currency lending	-10.682	-10.682	-10.682	-10.682**	-10.682
	[-1.098]	[-1.185]	[-1.124]	[-2.469]	[-1.057]
Forex risk × Foreign-currency lending	38.186**	38.186**	38.186**	38.186**	38.186**
	[2.595]	[2.499]	[2.369]	[2.863]	[2.415]
Loan amount	-16.278***	-16.278***	-16.278***	-16.278***	-16.278***
	[-15.046]	[-21.144]	[-17.875]	[-34.361]	[-14.961]
Maturity	0.373***	0.373***	0.373***	0.373***	0.373***
	[5.488]	[8.870]	[7.926]	[3.987]	[6.083]
Collateral	55.185***	55.185***	55.185***	55.185***	55.185***
	[22.019]	[28.553]	[23.657]	[31.340]	[19.679]
Number of lenders	-0.717***	-0.717***	-0.717***	-0.717***	-0.717***
	[-3.545]	[-5.974]	[-5.886]	[-4.934]	[-4.571]
Performance provisions	-35.858***	-35.858***	-35.858***	-35.858***	-35.858***
	[-10.018]	[-18.749]	[-18.156]	[-35.752]	[-13.234]
General covenants	2.369	2.369***	2.369***	2.369**	2.369**
	[1.560]	[2.919]	[2.805]	[2.939]	[2.031]
Firm size	-5.844***	-5.844***	-5.844***	-5.844***	-5.844***
	[-3.292]	[-3.936]	[-3.123]	[-5.665]	[-3.029]
Firm ROA	-0.113	-0.113	-0.113	-0.113	-0.113
	[-0.338]	[-0.300]	[-0.661]	[-0.663]	[-0.621]
Firm debt	1.132	1.132	1.132	1.132***	1.132
	[1.566]	[1.381]	[1.276]	[3.081]	[1.297]
GDP growth	-5.036***	-5.036***	-5.036***	-5.036**	-5.036***
	[-2.765]	[-4.005]	[-3.531]	[-2.935]	[-3.595]
GDP per capita	0.002**	0.002***	0.002*	0.002***	0.002*
	[2.127]	[2.952]	[1.946]	[8.148]	[1.883]
Observations	43,128	43,128	43,128	43,128	43,128
Adj. R-squared	0.621	0.622	0.621	0.621	0.621
Clustering	Bank&Year	Loan&Quarter	Firm&Quarter	LC&BC&Q	B&F&Q
Number of banks	378	378	378	378	378
Number of firms	6,368	6,368	6,368	6,368	6,368

Table A18. Weighted least squares

The table reports coefficients and t-statistics [in brackets]. Dependent variable is *AISD* and all variables are defined in Table A1. Estimation method is weighted least squares with standard errors clustered by bank *and* quarter. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we weight by the number of loans between the bank and the firm in a given year to the total number of loans extended in that year. In specification (2), we weight by the number of loans between the bank and the borrower's country in a given year to the total number of loans extended in that year. In specification (3), all lender countries for a given year are assigned the same weight and that weight is divided by the number of loans by lenders in this country. The sum of the loan-specific weights for each country is equal to the country-specific weight for that year. In specification (4), all lender countries for a given quarter are assigned the same weight and that weight is divided by the number of loans by lenders in this country. The sum of the loan-specific weights for each country is equal to the country-specific weight for that quarter. All specifications include bank × year, firm, lender's country, and borrower's country fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Forex risk	1.366	-4.531	-0.439	-0.434
	[0.209]	[-0.630]	[-0.070]	[-0.069]
Foreign-currency lending	-12.143	-14.648	-10.682	-10.624
	[-1.199]	[-1.503]	[-1.058]	[-1.057]
Forex risk × Foreign-currency lending	38.829**	41.719***	38.186**	38.059**
	[2.490]	[2.768]	[2.472]	[2.480]
Loan amount	-15.095***	-16.282***	-16.278***	-16.276***
	[-14.572]	[-15.266]	[-15.284]	[-15.283]
Maturity	0.346***	0.373***	0.373***	0.373***
	[5.553]	[6.031]	[6.015]	[6.016]
Collateral	52.650***	55.133***	55.185***	55.195***
	[19.810]	[19.653]	[19.747]	[19.730]
Number of lenders	-0.796***	-0.716***	-0.717***	-0.716***
	[-4.819]	[-4.330]	[-4.349]	[-4.344]
Performance provisions	-35.476***	-35.875***	-35.858***	-35.855***
	[-12.837]	[-12.401]	[-12.588]	[-12.592]
General covenants	2.259*	2.374*	2.369*	2.363*
	[1.855]	[1.910]	[1.936]	[1.930]
Firm size	-6.957***	-5.895***	-5.844***	-5.850***
	[-3.886]	[-3.426]	[-3.383]	[-3.387]
Firm ROA	-0.116	-0.116	-0.113	-0.113
	[-0.394]	[-0.338]	[-0.362]	[-0.361]
Firm debt	1.040	1.130	1.132	1.132
	[1.649]	[1.438]	[1.638]	[1.628]
GDP growth	-5.170***	-4.594***	-5.036***	-5.038***
	[-3.659]	[-3.123]	[-3.612]	[-3.609]
GDP per capita	0.002**	0.002*	0.002**	0.002**
	[2.161]	[1.986]	[2.052]	[2.053]
Observations	43,128	43,128	43,128	43,128
Adj. R-squared	0.625	0.622	0.622	0.622
Number of banks	378	378	378	378
Number of firms	6,368	6,368	6,368	6,368

Estimation of the Lerner index

In this section, we estimate the Lerner index at the bank-year level, by heavily relying on Delis, Kokas and Ongena (2017). The Lerner index of market power is defined as $-$ ___, where p is the average lending rate given by each bank in each year and mc is the marginal cost of producing bank output (also at the bank-year). We proxy the lending rate from the ratio of interest income to total commercial loans (information from Compustat). Subsequently, we estimate marginal cost from a simple cost function of the form:

$$=_1+_2 \quad +_3 \ +_4 \quad +_5 \quad + \quad \text{(A.1)},$$

where C is the total cost of the bank i at time t, measured by the deflated total interest expenses and total noninterest expenses; Q is the total output of each bank, measured by the deflated total earning assets (or simply total assets in robustness tests); w^l is the price of labor, measured by the ratio of personnel expenses to total assets; w^k is the price of physical capital, measured by the ratio of overheads minus personnel expenses to fixed assets; and w^d is the price of intermediation funds, measured by the ratio of total interest expenses to total customer deposits. We collect data from Bloomberg.

We estimate equation (A.1) using a local linear regression with a uniform kernel and derive the marginal cost from the derivative of the equation with respect to Q. The advantage of the non-parametric approach is its flexibility compared to parametric functional forms (e.g., the translog) and this can lead to substantial improvement in the precision of the estimates. However, we also use a translog specification and a parametric regression with the same outputs and input prices and our end results remain very similar**.**