Foreign Currency Debt and Network Externalities:
Matched Credit and Firm-to-Firm Registers' Evidence during a Foreign Exchange Rate Shock*

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Abstract

We show that a foreign exchange rate shock may have significant spillover effects through credit and production networks in an emerging market economy. Exploiting the sharp currency depreciation in the Turkish lira in mid-2018—driven by a largely exogenous geopolitical risk shock—and using several administrative databases, we show that firms with net open foreign-currency positions exert adverse spillover effects on bank lending conditions, and on other –even, e.g., exporter– firms through banks; and on firms that they are working with by inducing lower demand for or supply of intermediate inputs. For both channels, we observe adverse real consequences: Firms that are more strongly linked, directly or indirectly, to corporates with net open FX positions significantly lowered their employment and investment. A significant fraction of the observed drop in investment and employment during this period is due to these spillover effects. The results underline how firm networks may amplify the impact of adverse geopolitical shocks on domestic credit markets and economic activity.

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1. Introduction

Global geopolitical tensions have risen notably in the past few years (IMF, 2023, 2025), most recently against the backdrop of elevated trade tensions. Emerging market countries with high levels of foreign-currency debt may be particularly vulnerable to geopolitical tensions, especially if such tensions persist, as a deterioration in market sentiment could weigh on their currencies, triggering significant balance sheet adjustments for foreign-currency-indebted firms with implications for the broader economy. In this paper, we examine a particular episode–mid-2018–when diplomatic tensions between Türkiye and the United States escalated sharply, resulting in a substantial depreciation of the Turkish lira (about 81% at its peak) at a time when Turkish corporates were already highly indebted in foreign currency.[1] We show, using a well-identified empirical strategy, whether and how such shocks permeate through credit and production network of firms and create externalities.

Foreign-currency (FX) debt has long been at the center of discussions on macro-financial stability in emerging markets, dating back to at least the late 1990s East Asian crisis. The key premise of the extant literature–as discussed in more detail below– is that following sharp local currency depreciation, non-financial corporates holding unhedged FX debt face deteriorated balance sheets, and in turn, experience lower access to credit and more adverse real outcomes. Notwithstanding, however, is the fact that we know much less about potential spillovers from corporate foreign currency debt within an economy. In particular, do FX indebted firms exert significant negative spillovers on banks and other (even stronger) firms following a sharp currency depreciation? If so, what are the potential channels and how relevant are they? To our best knowledge, there has been no systematic evidence so far addressing these questions –especially based on nearly exhaustive, supervisory micro-level databases–, and importantly, that identifies the mechanisms behind.

Using rich micro-level databases from Türkiye and exploiting the sharp, largely unexpected, Turkish lira depreciation in mid-2018, we show that corporate foreign currency debt entails a risk that permeates the economy through domestic credit and production networks. It creates an adverse impact not only FX indebted firms, as shown in the extant literature previously, but also on banks, their lending terms, and firms that they are connected to through banks as well as supplier/customer relationships.

Türkiye offers an excellent laboratory ground to address this question. Türkiye had one of the highest levels of non-financial corporate sector foreign currency debt among

[1] President Donald J. Trump posted a series of tweets on August 10, 2018 and August 16, 2018, which resulted in significant depreciation in the Turkish lira. The president posted in the then-Twitter that "*I have just authorized a doubling of Tariffs on Steel and Aluminum with respect to Turkey as their currency, the Turkish Lira, slides rapidly downward against our very strong Dollar! Aluminum will now be 20% and Steel 50%. Our relations with Turkey are not good at this time!*" (August 10, 2018, 0747am EDT), "*Turkey has taken advantage of the United States for many years. They are now holding our wonderful Christian Pastor, who I must now ask to represent our Country as a great patriot hostage. We will pay nothing for the release of an innocent man, but we are cutting back on Turkey!*" (August 16, 2018, 0630pm EDT).

emerging markets (nearly 300 billion US dollars, or 34% in proportion to GDP in 2017), and experienced in mid-2018 a particularly sharp depreciation in the Turkish lira against the US dollar –which was 81% at its peak compared to end-2017. The US dollar value of Turkish lira has been rather stable or mildly decreasing in 2017, until triggered by the significant escalation of political tension between the US and Türkiye in 2018, particularly by a tweet by the U.S. President Trump in mid-2018 that sharply weakened the market sentiment for Turkish assets (Figure 2).

We study three supervisory micro-level databases each crucial for identification: (i) transaction-level bank-firm credit register –tracking all loans to firms by Turkish banks, with information on loan volume, interest rate, maturity, collateral coverage, and currency of denomination–; (ii) firm-to-firm sales –tracking the universe of firm-to-firm sales transactions for value-added tax (VAT) purposes; and (iii) complete financial statements for the universe of non-financial corporates. We thus have a large-scale network of firms (∼215K), where firms are connected through their relationship with banks and direct sales to or purchases from other firms.

We start with measuring ex-ante vulnerability of a firm to a local currency depreciation. We are able to overcome several data shortcomings in the literature: First, our data set covers the universe of non-financial corporates, not just publicly-listed firms for which balance sheet effects could potentially be less acute (Kim et al., 2015). Second, we use both FX debt and assets to measure vulnerability. For FX debt, we use bank FX loans, as non-financial firms in Türkiye almost exclusively depend on bank financing, and foreign currency (FX) bonds issued by non-financial corporates is less than 0.1% of total FX credit extended by banks.[2] We use export revenues as a proxy for FX assets, which is available for the universe of non-financial corporates. Third, we account for maturity of FX debt. In particular, we use volume of FX debt to be paid back within 12 months.[3] In sum, our firm-level vulnerability measure is foreign currency loan payments due within one year minus export revenues, normalized by total assets. We label this variable as *NOP* for brevity (standing for *N*et *O*pen FX *P*osition-to-assets ratio), and it is evaluated prior to the shock (December 2017) throughout the whole analyses.

Financial Linkages. We first study financial linkages, whereby firms are interconnected through banks (or the bank lending channel). The mechanism –as we discuss more in detail below– works through higher NOP firms being more likely to default on their loans after a currency depreciation, which in turn, weakens banks' overall capacity to supply credit.

[2] Moreover, equity or bond financing is a privilege to a very few firms, which makes Türkiye an ideal environment to study real effects of network externalities.

[3] A potential limitation is that we do not have data on firms' financial hedging (e.g., cross-currency swaps). Yet, we know from cross-country evidence that only a small fraction of EM non-financial corporates' FX debt is hedged via FX derivatives, and for those hedged, there might be maturity mismatches that render these hedges imperfect (Du and Schreger, 2016). Moreover, hedging may not fully cover the losses, especially during large depreciations.

In other words, high NOP firms put on negative externalities on other firms by exerting tighter credit supply conditions.

There could be many channels leading to tighter credit supply conditions following a sharp local currency depreciation, including, e.g., banks' open FX positions. By regulation, banks in Türkiye are not allowed to carry a large open FX position (cannot exceed 5% of their equity). Moreover, we rule out potential heterogeneity across banks in FX loans to households, as households in Türkiye are not allowed to borrow in FX (since July 2009, nearly a decade before our sample period starts). Finally, we control for banks' ex-ante reliance on foreign wholesale funding to account for potentially elevated foreign funding stress on banks during this period (and also, study whether foreign-owned banks differ in their lending conditions).

To this end, we define a bank-level variable, labeled ex-ante *exposure to risky FX borrowers*, calculated as the weighted average NOP of firms a bank was working with prior to the shock (December 2017). We then study for a given firm (an average firm in the economy), whether banks with higher ex-ante exposure to risky FX borrowers subsequently tighten their credit supply conditions more strongly (e.g., by lowering volume, increasing interest rate, lowering maturity, or increasing collateral coverage). We then study whether these results are binding at the firm-level, and lead to adverse real consequences (e.g., lower investment or employment).

A further identification challenge is that banks that ex-ante lend more to higher NOP firms are potentially also the ones that face lower demand for credit. Our use of a rich credit register –that provides not only volume but also price– offers a remedy, as we can exploit the fact that a tightening in credit supply implies a contraction in volume and an increase in loan rates, whereas lower demand implies a decrease in both. Moreover, we study firms that borrow in the same currency from multiple banks (by exploiting firm$\times$currency variation), to account for potential differences in change in demand for Turkish lira vs. FX loans.[4] Finally, we check whether or to what extent our baseline results are weakened once we control for *change* in bank-level non-performing loans and capital adequacy ratios –which essentially absorbs the mechanism.

Our results show that foreign currency debt creates significant network externalities due to financial linkages. Following the currency depreciation, banks that ex-ante lend more to risky FX borrowers tighten their loan terms significantly more (for a given firm in a given currency). Economically, banks with a one-standard-deviation higher exposure to risky FX borrowers reduce their supply of credit by nearly 20%, increase their loan rate by 6%,

[4]Note that demand for foreign currency credit may decline when local currency depreciates. Therefore, if banks with an ex-ante higher exposure to risky FX borrowers extend a greater share of foreign currency loans, then these banks may systematically extend lower credit even in the absence of a supply channel. A remedy is to exploit firm$\times$currency variation. As we show later, the correlation between bank exposure to risky FX borrowers and bank-level share of FX loans in total loans is weak (0.16), and not statistically significant. Moreover, our results are robust to exploiting bank-firm, instead of bank-firm-currency, variation.

lower maturity by 9%, and increase collateral coverage ratio by 10% more. These results hold at the bank-firm or firm-level, implying that firms cannot ameliorate the tightening in credit supply conditions by switching between currencies within a bank or from more to less exposed banks. Moreover, albeit milder, not only an average firm but 'healthy' firms too are affected adversely: firms with negative NOP (those with foreign currency earnings exceeding foreign currency liabilities), more profitable, larger or exporter firms experience tighter credit supply conditions.

We then explore the mechanism driving these results. First, higher NOP firms are more likely to default on a bank loan after the currency depreciation (firms with one-standard-deviation higher NOP are 0.3% to 0.5% more likely to default on their loans). Second, banks that ex-ante lend more to higher NOP firms experience higher non-performing loans and deteriorated capital adequacy ratios after the currency depreciation. Third, once we control for change in bank-level non-performing loans and capital adequacy ratios in our baseline regressions –key variables reflecting the mechanism–, the baseline effects dissipates, underlining that such a mechanism indeed plays a significant role for the tightening in credit supply conditions.

Moreover, the reduction in credit supply appears binding at the firm-level, and "financial linkages" with high NOP firms seem to exert more adverse real effects. In particular, we first verify that firm-level credit supply shocks (following Amity and Weinstein (2018)) is very strongly correlated with firm-level weighted average of bank exposure to risky FX borrowers. That is, firm-level contraction in credit supply is indeed driven strongly by their exposure to banks with higher exposure to risky FX borrowers. We then exploit within industry-city variation, and show that firms that ex-ante borrow more from such banks face binding financing constraints, and eventually, experience more adverse real outcomes.[5]

Real Linkages. Besides financial linkages, externalities may also emerge due to working with customers or suppliers with high NOP. To this effect, we exploit a comprehensive database that provides nearly the universe of sales/purchases transactions among all non-financial firms.[6] The data is collected for VAT purposes, and similar in structure to those in some other countries (Dhyne et al., 2015; Tintelnot et al., 2017; Huneeus, 2018). After we match this database with the credit registry and firm financial statements, we calculate weighted average ex-ante NOP of customers and suppliers for each firm, with weights proportional to the weight of each supplier in firm's total supplier purchases, or each customer in firm's total sales to customers.[7]

[5] Including sector×city fixed effects absorbs any variation common to firms within a given sector and city, and thereby helps mitigate other potential factors that may drive differential firm-level outcomes, e.g., change in sector-city level external or local demand conditions.

[6] Firms are obliged to report sales/purchases transactions above five thousand Turkish liras. The limit is fairly low, corresponding to about one thousand US dollars at the time.

[7] Throughout the paper, customers refer to buyer firms (e.g., not retail customers such as households). In calculating these weights, we use firm-to-firm sales/purchases during the whole year of 2017 (not particularly

We find that firms selling goods to higher NOP customers prior to the currency depreciation subsequently face more adverse real effects. Numerically, firms that on average and ex-ante work more with high NOP customers by one-standard-deviation subsequently experience lower sales, lower profits (and lower profit margins), lower investment and employment. Working more with higher NOP suppliers, in general, exerts milder effects. Corroborating the mechanism, firms working more with high NOP customers experience lower volume of inter-firm trade following the currency depreciation. Firms with higher own NOP or exposure to high NOP firms via banks (financial linkages) also imply strong and economically sizable reduction in trade credit.

Our results also imply that banks take second-round effects into account. In particular, tighter credit supply terms on firms implies adverse spillover effects on their customers or suppliers, which may adversely affect banks if those customers or suppliers are also bank's clients. This is more likely the case the more the firm is central. Taking centrality measure as total number of supplier and customer linkages a firm has, we find that banks with higher exposure to risky FX borrowers reduce their volume of credit and decrease loan maturity less strongly for more central firms –and ask for higher collateral coverage for compensation–, and less likely to terminate their existing relationships. Moreover, banks also seem to take into account credit risk of a firm owing to the firm's customers' or suppliers' NOPs. In short, these results *suggest* that banks' risk assessments may go beyond idiosyncratic (firm-level) credit risk, and account for inter-firm linkages to avoid second-round effects.

Our paper contributes to several strands of literature, most notably, on the financial and real effects of currency mismatches in EM non-financial corporate balance sheets. An early strand of literature, burgeoned after the East Asian crisis in the late 1990s, show contractionary effects of currency depreciations due to unhedged FX debt (Cespedes, Chang, and Velasco (2004), Aguiar (2005), Cowan, Hansen, and Herrera (2006), see Galindo, Panizza, and Schiantarelli (2003) and Chui, Kuruc, and Turner (2016) for a review).[8] Recent contributions, based on more granular data or different episodes, include Kim et al. (2015), Hardy (2018), and Bruno and Shin (2018). Kim et al. (2015) study the Korean case during 1997-1998 crisis. Using a large sample of Korean non-financial firms (listed and non-listed), they find that small firms with short-term net FX debt were more likely to go bankrupt, and those that survive, experienced larger declines in sales. Hardy (2018) study Mexico that experienced large peso depreciation during 2009-2010. Using detailed data on listed firms (including hedging) and controlling for firm-level credit supply shocks, he finds that firms with larger currency mismatches on their balance sheets experience lower access to credit following the currency depreciation, and in turn, had to reduce their capital investment.

December 2017), to avoid potential seasonality in inter-firm trade.

[8] For contrary evidence, that balance sheet effects may not exert contractionary depreciations, see Bleakley and Cowan (2008) (see also Galindo, Panizza, and Schiantarelli (2003) for a discussion).

This result appears to hold particularly for smaller firms. Bruno and Shin (2018) study listed firms in 18 EMs during 2014-2016 –a period characterized with weaker EM currencies against the US dollar. They find adverse impact of a local currency depreciation, driven not by accumulated foreign currency debt *per se*, but in combination with what firms do with the proceeds of the FX debt (US dollar bond issuance in particular). Firms that use the proceeds for liquid investments in local currency (e.g., increasing cash holdings) fare worst, and had to reduce their capital expenditures following weaker domestic currency.

Our main contribution is to show that unhedged FX debt is a risk that permeates the economy. While we confirm previous findings in the literature (that firms with higher net FX debt face more adverse financial and real economic outcomes after a local currency depreciation), we highlight two new channels that amplify such first-order effects. Surprisingly –given that FX indebtedness lies at the center of discussions on macro-financial stability in EMs–, there has been no systemic evidence in this regard. By using rich granular data and a nearly complete network of the universe of non-financial corporates, we show that risks due to unhedged FX debt spills over to other firms, indirectly though banks by causing tightening in overall credit supply conditions or directly through supplier/customer relationships. In this regard, our paper is also related to a newly emerging literature on how sudden deterioration in bank funding conditions propagate within domestic production networks (see, e.g., Alfaro et al., 2019; Costello, 2017; Dewachter et al., 2020). Our paper complements this strand of literature, by analyzing how balance sheet effects on borrowers propagate within the economy.

More relatedly, Galaasen, Jamilov, Juelsrud, and Rey (2020) show that banks pass on adverse idiosyncratic shocks to large 'granular' clients to other clients. In response to such shocks and lacking ability to insure their portfolio returns sufficiently, banks reduce their supply of credit, which eventually results in adverse real effects (lower investment and higher firm bankruptcies). Our paper differs on two grounds. First, in our case, the shock is not idiosyncratic but common that hit all clients –particularly the clients with higher open FX positions. Second, arising due to customer-supplier linkages across firms, we further document evidence that banks may factor in second-round effects.

From a theoretical standpoint, our paper puts under the spotlight an additional source of externality –that underscores the very importance of close monitoring of foreign currency borrowing/lending.[9] In particular, an atomistic firm holding unhedged FX debt (or a bank extending FX loans to such firms) may not take into account the fact that such risky FX loans create negative spillover effects within the economy when currency depreciates. While borrowing in FX may be optimal from an ex-ante private point of view (Korinek, 2010; Bianchi, 2011) –and particularly so during periods of low volatility in the foreign exchange

[9] Note that FX debt may also entail pecuniary externalities as in Korinek (2010), Bianchi (2011), Mendoza (2010). Moreover, non-financial corporates' unhedged FX debt may also spillover to the sovereign (Du and Schreger, 2016).

rate, favorable interest differentials, and expected currency appreciations– (see Bruno and Shin, 2017; for an empirical assessment), once triggered a large currency depreciation, this may ex-post lead to not only more adverse outcomes for FX indebted firms as shown in the previous literature, but also cause negative externalities: significant tightening in overall credit market conditions (via firm-bank relationships), significant drop in inter-firm trade (via supplier-customer relationships), and cascading adverse real effects. The externalities we identify are not systematically explored previously –due to lack of comprehensive and rich micro-level data crucial for identification–, and open up a new venue for advancing theory as well.

The paper proceeds as follows: Section 2 presents the data and empirical strategy; Section 3 presents empirical results, and Section 4 robustness analyses and further discussions. Section 5 concludes.

2. Data and Empirical Strategy

2.1. Data

We study several micro-level supervisory databases, each crucial for identification. The first database is the Credit Register (CR) of Türkiye, maintained and supervised by Credit Registry Bureau and the Banking Regulation and Supervision Agency (BRSA), the authority in charge of supervising the Turkish banking system. The CR provides extensive details on virtually all corporate loans granted by all banks operating in Türkiye. The CR, unlike many registers around the world, provides not only the volume but also the interest rate (which is instrumental for identification as we discuss below), as well as loan origination and termination dates, total collateral pledged, and the currency of denomination, for each loan extended by banks to firms in a given day. We first aggregate loans at the bank-firm-currency level for each month. We cover loans denominated in one of the three major currencies, Turkish lira, US dollar, or Euro, accounting for over 98% of total loans in terms of volume or number. We study the period December 2017-December 2018, which is about 6 months before and after the sharp Turkish lira depreciation in mid-2018.[10]

The second database provides complete financial statements of the universe of non-financial corporates in Türkiye (close to 215K firms), and is provided by Revenue Administration of Türkiye and TURKSTAT (Turkish Statistical Institute). The database does not include entrepreneurial firms. We exclude governmental bodies (public administration, defense, compulsory social security). To avoid misreporting or measurement errors, we winsorize firm variables at 1% from both sides.

[10] Using December values is also helpful to appropriately measure firms' net open FX positions –which includes firm-level exports and assets which are measured at each year end. For placebo tests –that we study in the next section, we consider a period with only mild changes in the foreign exchange rate, December 2016-June 2017.

We proxy the (ex-ante) vulnerability of a firm to a Turkish lira depreciation by its foreign currency debt with remaining maturity less than a year net of its total exports in the previous year, by merging firm financial statements with the CR. We then normalize this measure by firm total assets:

$$\text{NOP}_{f,t-1} = \frac{\text{FX Debt due within 1 year}_{f,t-1} - \text{Exports}_{f,t-1}}{\text{Total Assets}_{f,t-1}} \tag{1}$$

where "NOP" is standing for net open foreign-currency position of firm f. We then measure a bank's exposure to their clients' NOPs, named as "exposure to risky FX borrowers", as

$$\text{Exposure to Risky FX Borrowers}_{b,t-1} = \sum_{f \in b} \omega_{f,b,t-1} \text{NOP}_{f,t-1} \tag{2}$$

where b denotes bank, $f \in b$ is the set of firms in bank b's loan portfolio, $\omega_{f,b}$ is the share of firm f's outstanding credit at bank b in bank b's total non-financial corporate credits.[11] Exposure to Risky FX Borrowers, NOP and weights are measured ex-ante (December 2017), hence the subscript $t-1$. Note that FX debt is aggregated at the firm-level, in particular, it is firm's total FX loans due within one year aggregated from across all banks the firm is working with at $t-1$.[12]

The third database is firm-to-firm sales, maintained by the Turkish Ministry of Treasury and Finance. It is collected for value-added tax purposes, and covers all firm-to-firm sales above a modest threshold (5000 TRY –close to 1350 USD as of December 2017). Similar to the few countries for which this type of database is available, we have information on the volume of bilateral sales transactions, and unique identifiers for supplier and customer firms. We match all these databases by using unique firm tax identification number.

We exclude 2 banks that extend only non-cash loans (e.g., letters of guarantee) for which there is no information on the loan rate or maturity, 3 small banks for which exposure to risky FX borrowers are clear outliers, and Islamic banks as they comply with different business operations. In total, we have 34 banks in our sample, extending 90% of total banking sector credits and 87% of total banking sector FX credits during our sample period. We have complete financial statements for 215,709 firms (receiving a large share (85%) of total banking sector non-financial corporate FX loans), based on which we calculate firm NOPs and banks' exposure to risky FX borrowers. Moreover, an average firm works with 29 supplier and 43 customer firms.

[11] Note also that households in Türkiye are not allowed to borrow in foreign currency –a policy measure effective since July 2009. Household FX loans revolving from July 2009 constitute less than 0.1% of outstanding total FX loans in 2017.

[12] In this sense, our exposure measure is in fact multi-layered, even reflecting connectivity across banks (e.g., a bank's extending FX loans to a firm may feed into higher exposure for banks that lend to the same firm).

We further use supervisory databases on bank financial statements (with domestic and foreign-currency breakdown) and capital adequacy ratios (Tier-1 capital-to-risk-weighted assets ratios), provided by the BRSA. For non-financial firms, we also use sectoral data (based on NACE Rev.2 sectoral classifications) and city of location data, provided by TURKSTAT.[13]

2.2. Empirical Strategy

2.2.1. Financial Linkages

Identification. Figure 1 conceptualizes the identification strategy along the lines of Khwaja and Mian (2008), and highlights indirect financial linkages between firms.[14] Consider an "average firm" (black) that borrows from multiple banks ("Bank A" and "Bank B") prior to the shock, where banks differ in their exposures to risky FX borrowers. Assume Bank A ex-ante lend to firms with zero/negative net open foreign currency positions (green-colored or "healthy"), whereas Bank B ex-ante lend mainly to firms with positive net open foreign currency positions (red-colored or "risky"). For the average firm, we explore whether "Bank B" reduces its credit supply and tightens the loan terms (interest rate, maturity and collateral coverage) more strongly compared to "Bank A" following the currency depreciation. Moreover, healthy firms (firm #3) may experience negative spillovers as well (due to working with Bank B which also works with firms #4 and #5).

Our working hypothesis is that risky firms would find it harder to meet their loan obligations with banks, which may translate into banks' deteriorated capacity to lend to other firms. This requires establishing the steps below:

(i) firms with higher NOP are more likely to default on their loans;

(ii) banks that ex-ante lend more to higher NOP firms experience a greater increase in NPL ratio and a stronger reduction in capital adequacy ratio;

(iii) banks that ex-ante lend more to higher NOP firms are not systematically different in other dimensions than banks that ex-ante lend less; and

(iv) estimated effects dissipate during periods of relatively stable Turkish lira, or once we absorb key ingredients of the mechanism (change in bank NPL or capital adequacy ratios). As we report below, all these steps are verified.

Baseline Model. We estimate variants of the following baseline model:

[13] Although few, some firms may produce multiple products that do not fall in the same sectoral classification, or firms may operate in different cities. TURKSTAT provides the sectoral information based on sales (i.e., the sector classification of the major product(s) of a firm), and location is based on where the firm is registered at the Commerce Bureau.

[14] For ease of exposition, assume that (i) each of the linkages are equally important (reflecting equal outstanding credit balance), (ii) each firm is atomistic (price takers), and (iii) without loss of generality, risky firms are disproportionately concentrated in a certain bank ("Bank B"). We also assume in this conceptual diagram that loan currency of denomination are the same.

$$\Delta Y_{bfc,t} = \beta \text{ Exposure to Risky FX Borrowers}_{b,t-1} + \Theta \text{ Bank Controls}_{b,t-1} + \lambda\ X_{bf,t-1} + \mu_{f,c} + \varepsilon_{bfc,t} \tag{3}$$

where $\Delta Y_{bfc,t}$ is the log change in (i) volume, (ii) interest rate, (iii) maturity, or (iv) value of total collateral pledged-to-total volume (collateral coverage) ratio, for a loan denominated in currency c (Turkish lira, US dollar or Euro) extended to firm f by bank b. t stands for December 2018, and $t-1$ stands for December 2017.[15] In the next section, we also look at extensive margins (new lending and termination).

Exposure to Risky FX Borrowers is as defined in equation (2). $\mu_{f,c}$ denote firm×currency fixed effects, and allow us to focus on a given firm borrowing from multiple banks in the same currency. Including firm×currency fixed effects is mainly for identification, since change in demand for FX vs. Turkish lira loans may potentially differ after the Turkish lira depreciation, and banks with high vs. low exposure to risky FX borrowers may face different changes in demand for credit. That said, our results are strongly robust to including only firm fixed effects, and that we later verified that the supply channel is operational. We cluster standard errors at the firm level following Petersen (2009). X_{bf} is the share of credit extended by bank b to firm f in total bank b loans to non-financial corporates, and is aimed to reflect firm's bargaining power over the bank on loan terms. For identification, we restrict the sample to firms that borrow from at least two banks prior to the shock (December 2017), though the results are robust to including single-bank firms as well.

Bank Controls include standard bank characteristics used in the literature, capital adequacy ratio (Tier-1 capital-to-total risk-weighted assets), liquidity ratio (bank liquid assets to total assets), size (log of total assets), return on assets (pre-tax net profit-to-total assets), non-performing loans ratio (non-performing loans to total loans ratio), Herfindahl by industry (by how much a bank's loan portfolio is concentrated among different sectors).

We also control for share of FX-denominated loans of a bank's total corporate loan portfolio, since extending FX loans may in fact be a hedging strategy for banks and may potentially spur bank earnings following a local currency depreciation –assuming FX loan defaults are low. Moreover, we control for foreign funding ratio (non-core FX liabilities-to-total assets ratio) of banks, as banks that ex-ante rely more on foreign-currency wholesale funding may find it harder to roll over these loans when they suddenly become more costly.

Mechanism. To uncover the mechanism, we first study whether higher NOP firms are more likely to default on a bank loan in the future. In particular, we estimate the following firm-level regression

$$\mathcal{F}_{f,t} = \alpha_{\mathcal{F}} \text{ NOP}_{f,t-1} + \beta_{\mathcal{F}} \text{ W.Exposure}_{f,t-1} + \text{Controls}_{f,t-1} + \nu_{i,city} + \varepsilon_{f,t} \tag{4}$$

[15] Change in volume of Turkish lira loans are adjusted by the CPI (results are strongly robust to not adjusting for inflation). Foreign currency loans are expressed in foreign currency units (by using monthly average USD/TRY or EUR/TRY exchange rate) to avoid spurious increase in loan volume after the Turkish lira depreciation. We did not make inflation adjustment for foreign currency loans.

where $\mathcal{F}_{f,t}$ is an indicator variable that is equal to 1 if firm f has a non-performing loan at at least one bank within 12 months after December 2017, and 0 otherwise.[16] W.Exposure$_{f,t-1}$ is the weighted average of ex-ante Exposure to Risky FX Borrowers of banks that the firm f is working with at $t-1$. Controls$_f$ are firm size (log assets), leverage (total equity-to-total assets), and export status (taking a value 1 if the firm is an exporter, and 0 otherwise). $\nu_{i,city}$ denote industry×city fixed effects, where industry is defined at NACE Rev2 4-digit level.

We are interested in whether $\alpha_{\mathcal{F}} > 0$, i.e., whether higher NOP firms are more likely to default on a loan. As a follow-up, we then study whether banks that ex-ante lend more to risky FX borrowers subsequently have higher non-performing loans or lower capital adequacy ratios after the depreciation shock. Finally, we augment equation (3) by including change in bank NPL and change in bank capital adequacy ratios –the key variables reflecting the mechanism–, and assess whether there remain viable effects.

Real Effects. If banks that ex-ante lend more to higher NOP firms tighten their credit supply conditions more strongly following the Turkish lira depreciation, then one may expect firms attached to these banks to experience worse economic outcomes. This could happen to the extent firms are unable to switch to alternative sources of funding (e.g., by borrowing from less affected banks or lower NOP firms, or issuing bonds). Along these lines, we estimate the following firm-level regression:

$$\Delta X_{f,t} = \alpha_f \, \text{NOP}_{f,t-1} + \beta_f \, \text{W.Exposure}_{f,t-1} + \text{Controls}_{f,t-1} + \nu_{i,city} + \varepsilon_{f,t} \tag{5}$$

where $\Delta X_{f,t}$ denotes log change in total liabilities, domestic sales, profit, fixed assets, or number of employees of firm f, from December 2017 to December 2018.[17] Similar as above, we control for firm size, leverage and export status, and saturate the model with industry×city fixed effects. Our hypothesis boils down to whether $\beta_f < 0$, i.e., among firms operating within the same industry and city, whether firms that on average borrowed more from banks that lend more to higher NOP firms experience worse financial or real outcomes.

2.2.2. *Real Linkages*

Intuitively, firms working with customers or suppliers vulnerable to an adverse shock may experience more adverse economic outcomes following the shock (see, e.g., Barrot and Sauvagnat, 2016). In our setting, this potentially manifests itself through lower sales to higher NOP customers (due to lower demand) and/or lower purchases from higher NOP suppliers (due to lower supply of inputs).

We thus first match firm-to-firm sales database with firms' financial statements, and

[16] Loan payments overdue 90 days are defined as non-performing. The Credit Registry (CR) provides this information for each bank-firm-currency triple at a given day (e.g., which firm has 90 days past-due loan on which type of loan at which bank in which day).

[17] Here, we essentially focus on surviving firms. Our results are in fact stronger if we include firms that default (not reported for brevity).

calculate for each firm weighted average NOP of its customer and supplier firms.[18] We then augment equation (5) by including these NOP measures, and estimate:

$$\begin{aligned}\Delta X_{f,t} = {} & \alpha_{ff}\,\text{NOP}_{f,t-1} + \beta_{ff}\,\text{W.Exposure}_{f,t-1} + \\ & + \gamma_D\,\text{Customers' NOP}_{\Sigma j \in f,t-1} + \gamma_U\,\text{Suppliers' NOP}_{\Sigma k \in f,t-1} \\ & + \text{Controls}_{f,t-1} + \nu_{i,city} + \varepsilon_{f,t} \end{aligned} \tag{6}$$

where $\Delta X_{f,t}$ denote various firm-level outcomes, change in total liabilities, total domestic sales, profit, capital expenditures, and employment. Customers' $\text{NOP}_{\Sigma j \in f,t-1}$ is the weighted average NOP of firms that buy goods from firm f where each customer is indexed by j, and Suppliers' $\text{NOP}_{\Sigma k \in f,t-1}$ is the weighted average NOP of firms that sell inputs to firm f where each supplier is indexed by k. The set of outcome variables, $\Delta X_{f,t}$, and Controls are as in equation (5). As above, we saturate the model with industry×city fixed effects to facilitate comparison among firms operating within the same industry and city. In subsequent analyses, not reported for brevity, we also study whether suppliers' or customers' exposure to risky FX borrowers (which are calculated through the banks that they work with) have an impact, and verified its economic and statistical significance.

The working hypotheses are whether firms selling goods to higher NOP customers or receiving inputs from higher NOP suppliers prior to the shock subsequently experience more adverse financial or real outcomes following the Turkish lira depreciation (i.e., whether γ_D<0 and γ_U<0, respectively).

To shed light on the mechanism, we first study outcome variables based on firm-level trade credit. In particular, we study whether such firms experience lower trade receivables from customers or lower trade payables to suppliers. Second, we exploited within-supplier and within-customer variation using bilateral firm-level data.

2.2.3. Summary Statistics

Table 1 presents descriptive statistics of the variables. On average over our sample period (from December 2017 to December 2018), there has been a strong decline in loan volumes (-0.33, in log terms), an increase in loan rates, a decline in maturity of loans and collateral coverage ratios. Probability of a bank establishing a new lending relationship or terminating an existing relationship with a firm is both high and close to 37%.

Table 2 presents cross-correlations between key variables. The correlations suggest the following:

(i) Firms with higher NOPs are not economically different than those with lower NOPs in terms of size (total assets) or leverage. The cross-correlation between firm NOP and

[18] In calculating Customers' NOP and Suppliers' NOP, we take the whole year of 2017 (instead of December 2017) to avoid potential seasonality in firm-to-firm sales.

firm size or leverage ratio are small (less than 0.03). Moreover, higher NOP firms, are–not surprisingly–less likely to be an exporter firm.

(ii) Banks with higher exposure to risky FX borrowers appear to be not statistically significantly different than banks with lower exposure. The cross-correlation of bank exposure to risky FX borrowers with bank capital adequacy ratio, liquidity ratio, total assets, non-performing loans ratio, return-on-assets, foreign funding ratio, or FX loan share, are statistically insignificant at conventional values (p-values are higher than 0.10 in all cases), and small (ranging between 0.07 and 0.27). Still, we control for these bank variables in our loan level regressions to mitigate potential bias. Moreover, banks with higher exposure to risky FX borrowers, on average, hold less exporting and more leveraged firms in their loan portfolios.

(iii) Firms with higher NOP tend to work with higher NOP firms. The cross-correlation between firm NOP and its' customers/suppliers' NOP is 0.27 and statistically significant. Moreover, higher NOP firms seems to be less connected to other firms (firm NOP is negatively correlated with number of customer and/or supplier firms), yet, this appears to be a weak association (correlation ranging between 0.01 and 0.11).

Before presenting the results, we finally report some suggestive evidence on why some firms may prefer borrowing in foreign currency. As widely noted in the literature (Bruno and Shin, 2017), a potential reason for tendency to borrow in foreign currency is the interest rate differential (foreign currency loan rates being lower), even after controlling for exchange rate expectations. Since we do not have firm-level exchange rate expectations, we cannot identify this motive rigorously. Based on available data, however, we find consistent results. Figure 3 shows that that foreign currency loan rates are on average much lower than domestic-currency loans (by 10% points before mid-2018, and by 15% points after mid-2018). Moreover, foreign currency loans are of longer maturity (on average three times longer).

3. Empirical Results

3.1. Financial Linkages

We first explore whether firms with higher NOPs create adverse financial or real spillover effects on other firms *through financial linkages*. Table 3 presents the first set of baseline results, where we focus on loan volume. In subsequent tables (Tables 4 and 5), we study other loan terms (interest rate, maturity, and collateral coverage).

We start Table 3 by including all firms regardless of whether they have a single or multiple banking relationship (column (1)). In following columns, we focus on firms with multiple banking relationships, and successively saturate the model with firm, currency or firm$\times$currency fixed effects, for identification purposes.

The key result is that, for a given average firm, banks that ex-ante lend more to risky FX borrowers reduce their supply of credit more strongly in the aftermath. This result is robust

to including firm, currency, or firm×currency fixed effects, and remain economically and statistically significant. Our preferred specification, column (5), focuses on firms borrowing in the same currency from multiple banks.[19] Economically, banks with a one-standard-deviation higher ex-ante exposure to risky FX borrowers reduce their supply of credit by 19.2% more. Moreover, the estimated effect changes mildly across different specifications (from 15.8% to 19.2% in columns (2) and onwards), implying that our main variable of interest is fairly exogenous to the firm balance sheet channel (demand) or loan's currency of denomination. Moreover, Oster (2019) test indicates that omitted variable bias is less of an issue.[20]

We next study other loan dimensions, starting with the interest rate (Table 4). We find that banks that ex-ante lend more to firms with higher NOPs increase their loan rates more strongly for a given firm and currency –confirming that the contraction in credit supply we found above is driven primarily by supply rather than demand effects. Economically, banks with one-standard-deviation higher exposure to risky FX borrowers increase their loan rates by 6% more (column (5)). This result is not only statistically significant but also economically relevant. Given that the mean loan rate is 15.8% in our sample, the estimated effect corresponds to nearly 1 percentage points increase in the loan rate (at the mean). Moreover, banks with one-standard-deviation higher ex-ante exposure to risky FX borrowers provide 9% shorter maturity loans and asks for 9.9% higher collateral coverage (Table 5, columns (3) and (6)). Overall, our results point to a greater tightening in credit supply conditions by banks that ex-ante lend more to higher NOP firms. Moreover, as we present in the next section, these results hold at the bank-firm or firm-level, and carry over to the extensive margins of credit supply as well.

Mechanism. To uncover the mechanism, we next study whether firms with higher NOP are more likely to default on their loans after the currency depreciation, and at the bank-level, whether this leads to higher non-performing loans and lower capital adequacy ratios. If these are indeed the case, then one would expect our previous results to be weakened

[19] As we discussed in the previous section, focusing on within firm-currency variation mitigates potential bias due to possible differences in changes in demand for Turkish lira vs. foreign currency loans after the Turkish lira depreciation. A potential drawback could have been ending up with a limited number of firms that borrow in the same currency from multiple banks. Yet, this turns out to be not a major issue, since number of observations drop very mildly (column (5) vs. column (4)). Note also that the number of observations is lower once we include firm fixed effects (column (3) vs. (2)), due to the fact that firms that borrow in the same currency from a single bank (singleton observations) are dropped. The results are strongly robust to including singletons.

[20] Formally, Oster (2019) shows that coefficient stability across specifications can be a sufficiently good indicator of limited omitted variable bias, only if changes in the estimated coefficient are scaled by the change in the R-squared when further controls are included. We follow the standard parametrization proposed by Oster (2019) and set δ (the degree of self-selection into the treatment along unobservables as a multiple of the observed degree of self-selection along observables) equal to 1, and R_{max} (the R-squared from the hypothetical regression that entails zero omitted variable bias) equal to 1.3 times the regression R squared. We compare column (1) with our most saturated specification, column (5). The estimated bound for the treatment coefficient safely excludes zero.

(ideally nullified) once we control for *change in* bank non-performing loans and capital adequacy ratios in our baseline regressions.

We first estimate equation (4), that relates the probability of a firm defaulting on a bank loan within the following 12 months to its NOP, exposure to risky FX borrowers of banks that the firm is working with, and a set of firm controls (size, leverage and export status), all measured ex-ante. We undertake this exercise for two sets of firms. The first corresponds to the baseline table (the most saturated specification) which includes firms that borrow from the same bank in the same currency for both ex-ante and ex-post periods. We call this set as the Baseline Sample. The second set (Large Sample) corresponds to all firms that have at least one banking relationship in the ex-ante period (which, in addition to the Baseline Sample, includes single bank relationship firms, firms that switch currencies at a given bank, or firms that experience termination of their credit relationships). Table 6 presents the results.

We find that firms with ex-ante higher NOP are more likely to default on a bank loan after the currency depreciation. Economically, firms with higher ex-ante NOP are 0.3% to 0.5% more likely to default (while average probability of defaulting on a loan during this period is 6% (Large Sample) to 10% (Baseline Sample)). We find no significant effect on firm future loan default of working with exposed banks.[21]

Figure 5 confirms that banks with higher exposure to risky FX borrowers have their capacity to lend eroded. In particular, such banks experience a greater increase in their non-performing loans (NPL), and banks with higher NPL ratios have a stronger reduction in their capital adequacy ratio.

Finally, we re-estimated our baseline regressions at the bank-firm level and additionally control for change in non-performing loans and capital adequacy ratios of banks (Table 7).[22] For all loan dimensions (volume, interest rate, maturity and collateral ratio), we find much weaker results (particularly for interest rate and volume). The effect for a bank of ex-ante working more with higher NOP firms on loan supply is reduced from 19% to 5.7%, on interest rate from 5.9% to 2.3%, on maturity from 8.9% to 2.3%, and on collateral ratio from 10.7% to -2.2%. These findings further confirm that previous results are driven strongly by supply side effects.

[21] Consistent with earlier findings in the literature, we also find that foreign firms are less like to default on their loans following the sharp local currency depreciation (Table A.1). Possible channels proposed in the literature include better access to credit and higher productivity.

[22] There are two reasons why we would like to report our baseline results also at the bank-firm level (at the risk of a weaker identification due to losing information on loan currency denomination). First, firm is a unique entity that bears all the risks attached to its operations and banks evaluate the firm as a whole in deciding how much to supply credit. Second, a firm may fully switch from one currency type to another for a given bank, a possibility that the baseline analyses overlook. For each loan dimension (volume, interest rate, maturity and collateral ratio), we first report results from the baseline specification –to show that the results are robust at the bank-firm level–, and then, we additionally control for change in non-performing loans and capital adequacy ratios of banks.

It is not, however, a priori obvious whether the tightening in credit supply conditions is binding at the firm level, since firms in principle can switch from borrowing from banks strongly attached to higher NOP firms to banks weakly attached. One way to show whether firms are able to do so is to re-estimate our baseline regression (equation (3)) at the firm level, and check if results continue to hold.[23]

Robust to all loan dimensions and the sample of firms, we find that firms that borrow from banks with higher exposure to risky FX borrowers experience tighter credit terms (lower volume, higher interest rates, lower maturity, and higher collateral coverage) (Table 8). In general, we find somewhat smoother yet significant and sizeable effects at the firm level. For example, the reduction in firm-level credit is 5.3% stronger for firms attached to banks that ex-ante lend to risky FX borrowers, compared to the 19% reduction in credit supply that we identified at the bank-firm-currency or bank-firm level. We find smoother effects for maturity and collateral coverage as well, namely, 3.6% lower maturity loans and 7.3% higher collateral coverage at the firm-level, compared to 9% to 9% we find earlier. We find qualitatively similar results for the large sample of firms as well. Overall, an average firm in the economy seems to only partially compensate the tightening in credit supply triggered by high NOP firms.

Firms may also resort to non-bank funding, e.g., by borrowing from other firms, issuing bonds, or increasing payables to shareholders or employees, to compensate the binding reduction in bank credit supply (which should then be reflected in aggregate liabilities at the firm level). In Table 9, we show that firms fall short in doing so. In particular, firms with one-standard-deviation higher exposure to risky FX borrowers (i.e, firms with one-standard-deviation higher weighted average bank exposure to risky FX borrowers) experience total liabilities reduced by 0.9%. The resulting impact on real variables such as investment and employment through this particular channel appears small. In reaching these effects, we control for firm's own NOP (alongside firm size, leverage, and exports, and industry$\times$city fixed effects). As one would expect, direct effects are in general stronger. Firms with higher NOP experience lower liabilities (2.3%), lower sales (2.4%), lower profits (2.1%), lower investment (3.1%) and employment (0.7%).

3.2. Real Linkages: Does working with higher NOP customers/suppliers lead to adverse real effects?

We now augment our previous analyses by introducing NOP of customers or suppliers into the picture. We then explore potential mechanism behind the results.

Table 10 shows that firms working more with higher NOP customers or suppliers experience significantly worse financial or real outcomes, with downstream effects (working with higher NOP customers) being more robust and pronounced. Numerically, being more

[23] The regression equation would then be regressing (log) change in firm-level bank credits on weighted average of bank exposure to risky FX borrowers and weighted average of remaining bank characteristics (with weights proportional to the share of each bank in a firm's total bank loans).

exposed to higher NOP customers (having one-standard-deviation higher weighted average customers' NOP) induces 0.6% lower liabilities, around 1% lower sales, 1.9% lower profits, 2.3% lower investment, and 0.5% lower employment. The adverse spillover effect is particularly large for profits (and larger than the drop in sales), potentially indicating lower profit margins and lower demand by higher NOP customers. Downstream effects are in general stronger and statistically more robust than upstream effects. Moreover, customers' or suppliers' exposure to risky FX borrowers, that is, inter-firm linkages via banks, seem to also matter.

Table 11 takes a step forward, and shows that firms working more with higher NOP firms experience significant reduction in inter-firm trade (proxied by trade credit). In particular, we start with the effect on a firm of having higher NOP on trade credit, of being more exposed to higher NOP firms via banks (credit market externalities), and finally, of being more exposed to higher NOP customers and suppliers. A firm with 1-standard deviation higher NOP experiences 3% lower trade receivables, and 2.7% lower trade payables (columns (1) and (5)). Moreover, credit market externalities induce lower trade credit –0.7% lower trade receivables and 1.2% lower trade payables–. These results can be interpreted as reflecting how firms' own NOP or exposure to higher NOP firms via banks affect firm's demand for or supply of goods with other firms.

Moreover, firms working with higher NOP customers –those with one-standard-deviation higher weighted average customer NOPs– experience lower trade receivables from its customers (by 0.7%) and lower trade payables to its suppliers (by 1.8%) (columns (3) and (7)). In addition, working with higher NOP suppliers does not seem to induce a sizeable impact at conventional significance levels.

Our auxiliary analyses at the bilateral firm-level are broadly inline with these results, particularly highlighting demand side effects: firms face lower demand from ex-ante high NOP customers (Table 12; see also and 12 for supply side effects).

4. Robustness and Further Discussions

4.1. Extensive Margin

Baseline results carry over to the extensive margins of credit supply as well (Table 14). In particular, we re-estimate our baseline regression (equation 3) at the bank-firm level, and use New Lending and Termination indicator variables as dependent variables. New Lending takes a value 1 if a bank establishes a new lending relationship with a firm in December 2018 that it has not been working with in December 2017, and 0 otherwise. Termination takes a value 1 if a bank terminates its lending relationship with a firm in December 2018, and 0 otherwise.

Consistent with the our baseline results, banks that ex-ante lend more to firms with higher NOP are 11.3% less likely to establish a new lending relationship, and 8.2% more likely to terminate an existing relationships with a firm after the shock. Comparing these

with the average probability of new lending or termination during this period (which are about 37%), we find extensive margin playing a weaker role than the intensive margin of credit supply.

4.2. Firm Heterogeneity

We previously show that high NOP firms create credit market externalities, in that such firms' having greater difficulty in repaying loans and the resulting decrease in banks' capacity to lend lead to an overall tightening in credit supply conditions in the economy. In this section, we highlight that credit market externalities are borne by 'healthier' firms as well.

In particular, we define an indicator variable, "Healthy Firm", that is equal to 1 if a firm (i) has negative or zero NOP (i.e., has FX earnings greater than or equal to its FX liabilities), (ii) leverage ratio (total debt-to-total assets) lower than the median, (iii) profitability (net profits-to-total sales) higher than the median. We measure these as of December 2017 (before the shock). Intuitively, these firms should be able to withstand the shock better than an average firm, as their balance sheets appear more resilient to an adverse shock. For firms with negative NOP, this may even be more pronounced, as their balance sheets were even strengthened after a Turkish lira depreciation (ceteris paribus). Finally, we incorporate firm size and exports as additional sources of heterogeneity.

We then extend our baseline model (equation (3)), by including the interaction of banks' ex-ante Exposure to Risky FX Borrowers with one of these indicator variables one at a time (Table 15). Panel I shows that banks with higher exposure to risky FX borrowers tighten their credit supply conditions (lower volume, higher loan rates, lower maturity and higher collateral) for firms with negative/zero NOP as well. The panel further shows the differential effect: the reduction in bank lending and shortening of loan maturity is milder for negative/zero NOP firms compared to the rest of the firms.

The remaining panels point to a similar picture: less leveraged, more profitable, larger or exporting firms experience tightening in credit supply conditions. Compared to the rest of the firms, the relative degree of tightening they face is milder.[24] Consistent with these results, banks are more likely to terminate their existing relationship and less likely to start a new lending relationship. Compared to the rest of the firms, however, banks are less likely to terminate their existing credit relationships with negative/zero NOP, more profitable, larger, or exporting firms, and more likely to start a new lending relationship with larger firms.

4.3. Firm Centrality

Firms that are more central in production networks are more likely to have a supplier/customer relationship with bank's other client firms. Tighter conditions imposed by a

[24] The only exception is collateral coverage. Surprisingly, banks asks for higher collateral coverage from negative/zero NOP, more profitable, larger or exporting firms.

bank on a central firm could thus imply adverse spillover effects on other firms the bank is working with, and in turn, have greater potential to adversely affect the bank. Banks may in turn internalize their clients' degree of centrality in production networks and may be less willing to tighten its credit supply to such firms to avoid adverse second-round effects.

To test this hypothesis, we first define a variable, Number of Connected Firms, as the total number of unique customers and suppliers of a firm prior to the sharp depreciation in 2018. This is generally labeled as eigenvector centrality in the network literature. Our results are robust to using total number of customers or suppliers as separate variables (out-degree or in-degree connectedness), or using other definitions of centrality that reflect relative importance of node connections, e.g., PageRank (available upon request).

We re-estimate our baseline regression (equation (3)), by including an interaction term between bank ex-ante exposure to risky FX borrowers and firm's total number of connected firms. Table 16 presents the results. Panel I shows that banks tighten their lending conditions less strongly for central firms. Namely, we observe milder reduction in volume, milder increase in loan rate, and milder decline in loan maturity (columns (1) to (3)). For compensation, banks seem to increase their collateral coverage (column (4)). Moreover, banks appear to be less likely to terminate their relationships with central firms (column (5)), and curiously, more likely to establish a new lending relation (columns (6)). For the latter result, since there is no a priori reason for banks' willingness to start a new lending relationship with a central firm due to centrality per se, we suspect other firm characteristics are at play.

In Panel II, we additionally control for firm variables in the interaction (most importantly, firm size as larger firms are potentially more connected). Indeed, the correlation of number of connected firms and firm size (log total assets) is high (0.59), and statistically significant at .01 level. We further control for firm export ratio and leverage in the interaction.

Our previous results continue to hold, more specifically, regarding loan volume, maturity, collateral coverage, and termination margins (the interest rate and new lending margin lose their statistically and economic significance).

In short, the results confirm that central firms experience milder tightening in credit supply conditions. The channel seems to be not associated with central firms' some other characteristics (e.g., their being larger), confirming that banks take into account second-round effects.

Relatedly, if banks take into account second-round effects, it could also be the case that banks also consider their clients' suppliers' or customers' riskiness. Anecdotally, banks may use this soft information for better risk management. Table 17 confirms this intuition. In particular, we introduce the interaction of bank ex-ante exposure to risky FX borrowers with firm's customers' or suppliers' weighted average NOPs.

We find that banks set higher interest rates and higher collateral coverage ratios if the borrower firm is working with higher NOP customers and suppliers (columns (6) and (12)),

and shorter maturity loans if working with higher NOP suppliers (column (9)). For volume, we find similar results qualitatively (lower volume of lending), but this effect appears statistically significant when suppliers' or customers' NOP are included separately in the regressions (columns (1) and (2)), but not when both are included (column (3)).

4.4. Foreign Currency Loans

In Table 18, we study whether banks with high vs. low exposure to risky FX borrowers change their loan terms differentially for foreign compared to domestic currency loans. We in general find mixed results: banks with higher exposure to risky FX borrowers reduce their supply of credit, increase loan rates, and lower maturity of loans less strongly for FX compared to Turkish lira loans (columns (1) to (3)). This may reflect the fact that FX borrowers are in general stronger (e.g., larger, being exporter or more capitalized), as also often documented in the related literature. Yet, banks also ask for higher collateral coverage (column (4)), and are more likely to terminate their relationship with FX borrower firms (column (6)).

4.5. Foreign Banks

Exploring the behavior of foreign banks is an interesting question, given that the Turkish lira depreciation in 2018 does not have a viable international spillover effect on foreign banks' headquarters (i.e., the shock was not global) and they presumably have lower funding risk vis-a-vis domestic banks. Therefore, ceteris paribus, foreign banks' response may shed light on the role funding risks may play. Table 19 presents the results.

Foreign banks with higher exposure to risky FX borrowers tighten their credit supply conditions (lower volume, higher interest rate, lower maturity, and higher collateral coverage). However, compared to domestic banks, they reduce their supply of credit mildly and increase their loan rates at a smaller extent. Moreover, the reduction in probability of new lending or elevated levels of banks' terminating their lending relationship with firms is milder for foreign versus domestic banks.[25]

In sum, softer external funding constraints seem to smooth credit market externalities. But this is only partial and for quantity and price dimensions. Indeed, heightened credit risks force foreign banks to lend significantly lower maturity loans (by 15% lower compared to domestic banks), and ask for significantly higher collateral coverage (by 122% higher), potentially reflecting greater risk aversion.

4.6. Bank Heterogeneity

In this section, we explore whether differences across banks in terms of ex-ante levels of capital adequacy or reliance on foreign funding play an *additional* role. We know from

[25] We also explore whether foreign banks work systematically with healthier firms, e.g., negative/zero NOP, less leveraged, or exporting firms, compared to domestic banks. We find no significant difference between foreign vs. domestic banks in this regard (Table 2).

an extant literature that well-capitalized banks can better insulate their clients from adverse macroeconomic shocks (see, e.g., Jimenez et al., 2017; Gambacorta and Shin, 2018; BCBS, 2019; World Bank, 2019; and references therein). Moreover, due to facing elevated funding risks, banks with ex-ante higher reliance on foreign funding generally reduce their supply of credit more strongly after a sudden stop of capital inflows (Schnabl, 2012; Iyer et al., 2014; Morais et al., 2019). From this perspective, one may expect a bank having stronger capital or lower reliance on foreign funding helps smooth the effect of exposure to risky FX borrowers.

Along these lines, we augment the baseline model (equation (3)) by including the interaction of bank exposure to risky FX borrowers with bank capital adequacy ratio, or with bank foreign funding ratio. For completeness, we also consider other bank controls, including liquidity, size, share of FX-denominated loans in total loans, in interaction with bank exposure to risky FX borrowers (interaction terms are separately, one by one). Table 20 presents the results.

We find that for a given ex-ante exposure to risky FX borrowers, more capitalized banks cut back their lending less strongly and increase their loan rates at a smaller extent, implying that they are indeed able to smooth the effect of elevated credit risks due to high NOP firms. Concurrently, they ask for higher collateral coverage for compensation. We find no differential impact of being more vs. less capitalized on the effect of exposure to risky FX borrowers on loan maturity. Similar results carry over to the extensive margins of credit supply (higher likelihood of establishing a new lending relationship and lower likelihood of terminating an existing relationship with a firm, for more vs. less capitalized banks –and given exposure to risky FX borrowers).

Moreover, funding risks exacerbate the effect of exposure to risky FX borrowers on loan terms. For a given ex-ante exposure to risky FX borrowers, banks with ex-ante higher reliance on global liquidity reduces their lending and increase their loan rates and collateral coverage more strongly, while being less likely to establish new lending relationships.

4.7. Placebo Test

So far, we show comprehensive evidence that banks that ex-ante lend more to higher NOP firms tighten their credit supply conditions more strongly following the sharp Turkish lira depreciation, and uncover the associated mechanism behind. With these at hand, one then expects our baseline results to weaken if such balance sheet effects are weaker, e.g., during periods of relatively stable Turkish lira exchange rate. In this section, we show that this is indeed the case.

In particular, we focus on the first half of 2017 during which Turkish lira has been quite stable against USD or EUR (Figure 2). In particular, we take the ex-ante period ($t-1$) as December 2016, and the ex-post period (t) as January 2017, and calculate bank exposure to risky FX borrowers and firm NOPs for December 2016. We then estimate the baseline model (equation (3)) for this placebo period, and report economic impacts. Later, we successively

expand the end-period by one month, by taking t as February, March, ..., or June 2017, and report the economic impacts for each time interval (Figure 6). Figure 6 also presents our baseline estimates for ease of comparison.

As expected, we find close-to-zero difference in lending between banks that have high vs. low exposure to risky FX borrowers during the placebo period (Panel I). Moreover, while we do find higher interest rates and collateral coverages set by higher exposure banks (Panels II and IV), the magnitudes are much lower than our baseline estimates (green solid lines). Surprisingly, we also find that higher exposure banks seem to extend higher maturity loans (Panel III). Albeit small in magnitude, a potential reason why banks with higher exposure to risky FX borrowers set higher interest rates or collateral coverage despite virtually no change in the foreign exchange rate, might be due to banks' expectations about future movements in the exchange rate. Indeed, we find some supportive evidence in this regard: banks with higher exposure to risky FX borrowers in December 2016 expect higher exchange rate depreciation in the following 12 months (Figure 8).

In sum, during the placebo period, we find almost zero effect on lending volume and significantly milder effects on interest rate or collateral coverage, of banks' being more vs. less exposed to risky FX borrowers.

5. Conclusion

Using supervisory transaction-level databases from Türkiye and exploiting the sharp Turkish lira depreciation amid severe diplomatic tensions with the United States in mid-2018, we show that unhedged foreign currency debt entails a risk that permeates the economy, not only affecting firms holding unhedged foreign currency debt adversely, but also other firms connected to foreign currency indebted firms. We study and identify two channels: bank lending channel and customer/supplier relationships. Higher connectedness with foreign currency indebted firms imply experiencing tighter credit supply conditions, reduction in inter-firm trade, and more adverse real outcomes such as lower investment and employment.

In this paper, we identify how foreign currency borrowing by unhedged non-financial firms leads to systemic externalities. A depreciation shock that initially affects unhedged foreign currency borrowers may spillover to the hedged ones through credit markets and firm networks. When an unhedged borrower chooses which bank to borrow foreign currency credit from or which firms to have customer/supplier relationship, the borrower may not take into account the fact that its risky borrowing may adversely affect other borrowers through the bank lending channel and also other firms through the firm-to-firm network. Therefore, our results shed light on appropriate design of foreign-currency-related macroprudential policies to address such systemic externalities.

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Figures

FIGURE 1: A SIMPLE CREDIT NETWORK

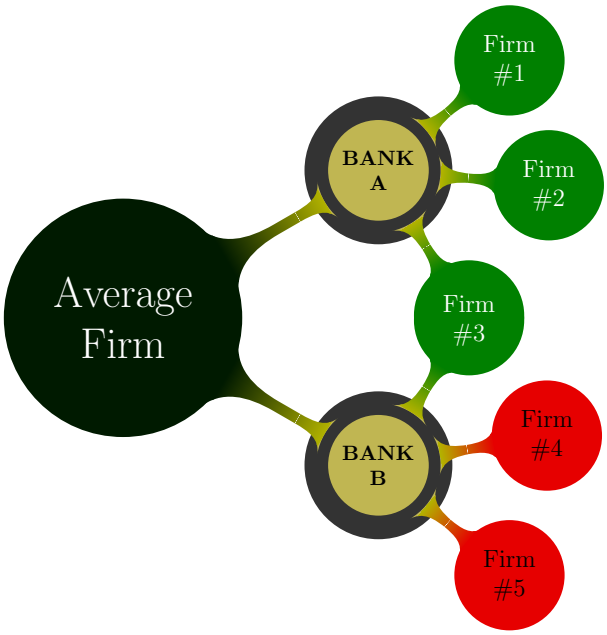
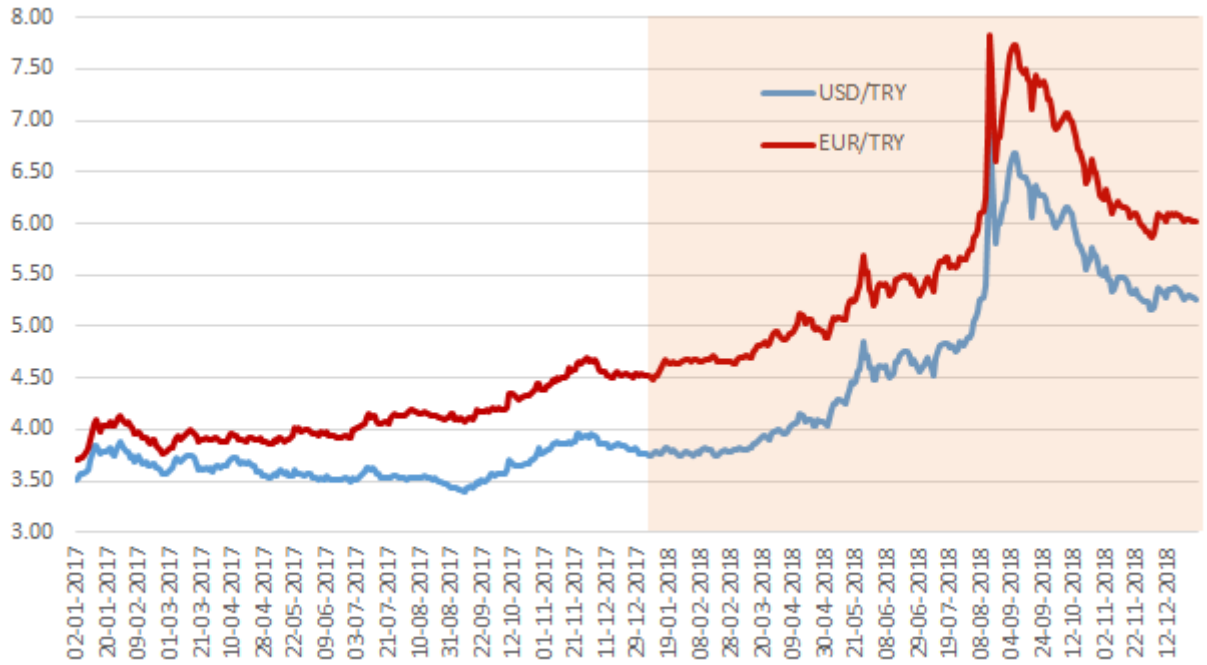


FIGURE 2: EVOLUTION OF TURKISH LIRA AGAINST US DOLLARS (USD) OR EUROS (EUR)



Notes. The graph shows the unit value of Turkish lira against US dollar (blue) or Euro (red bold). The shaded area corresponds to the period we study in empirical analyses. In particular, December 2017 corresponds to our ex-ante (pre-crisis) point, and December 2018 the ex-post (post-crisis) point.

Figure 3: Foreign- vs. Domestic-Currency Loans

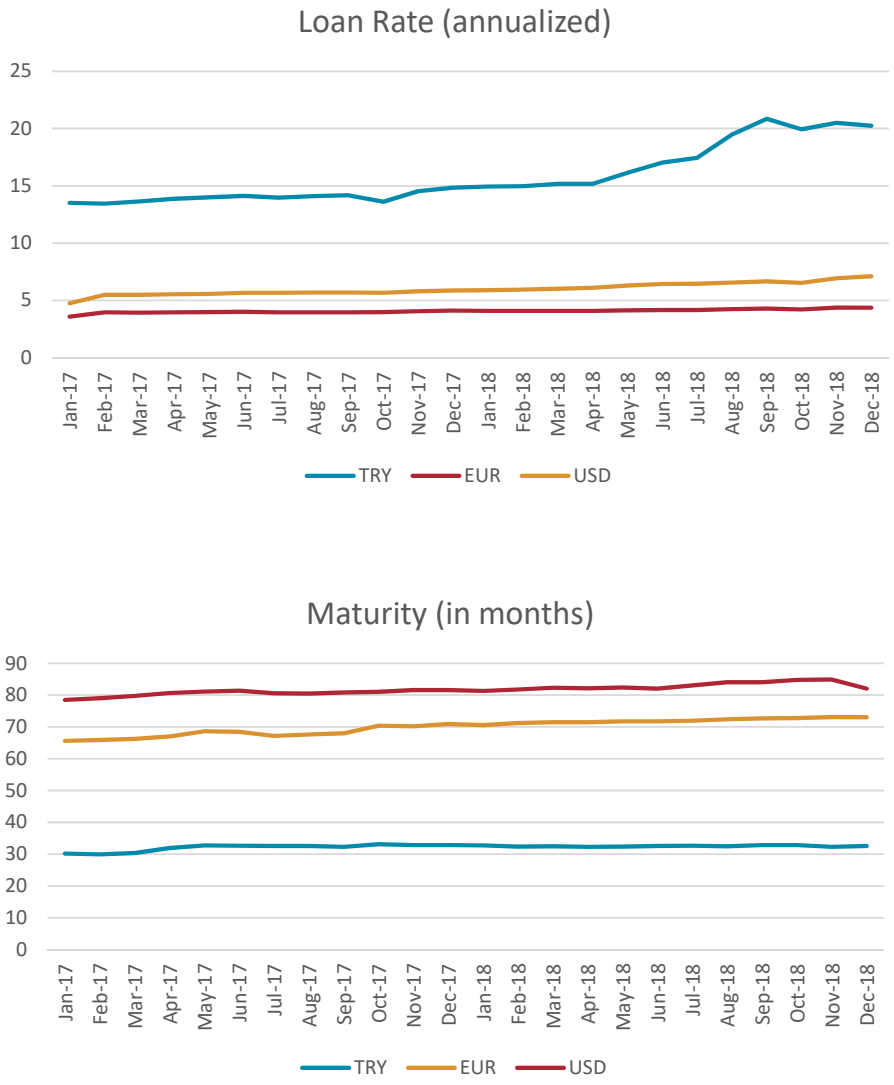
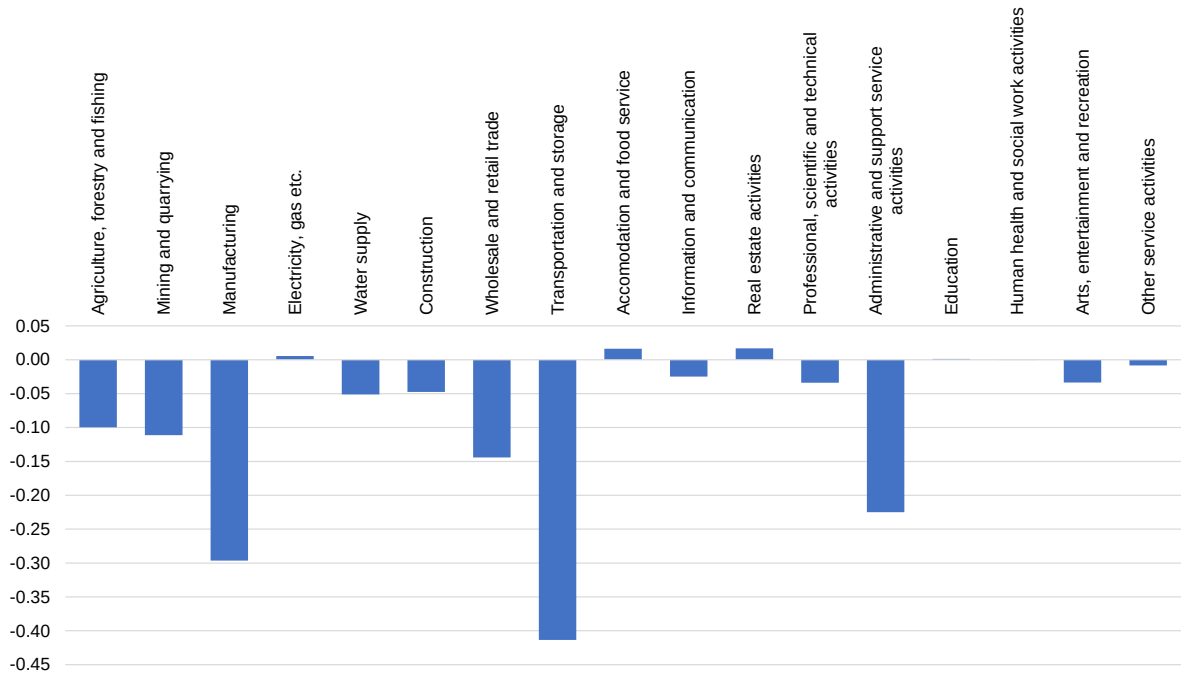
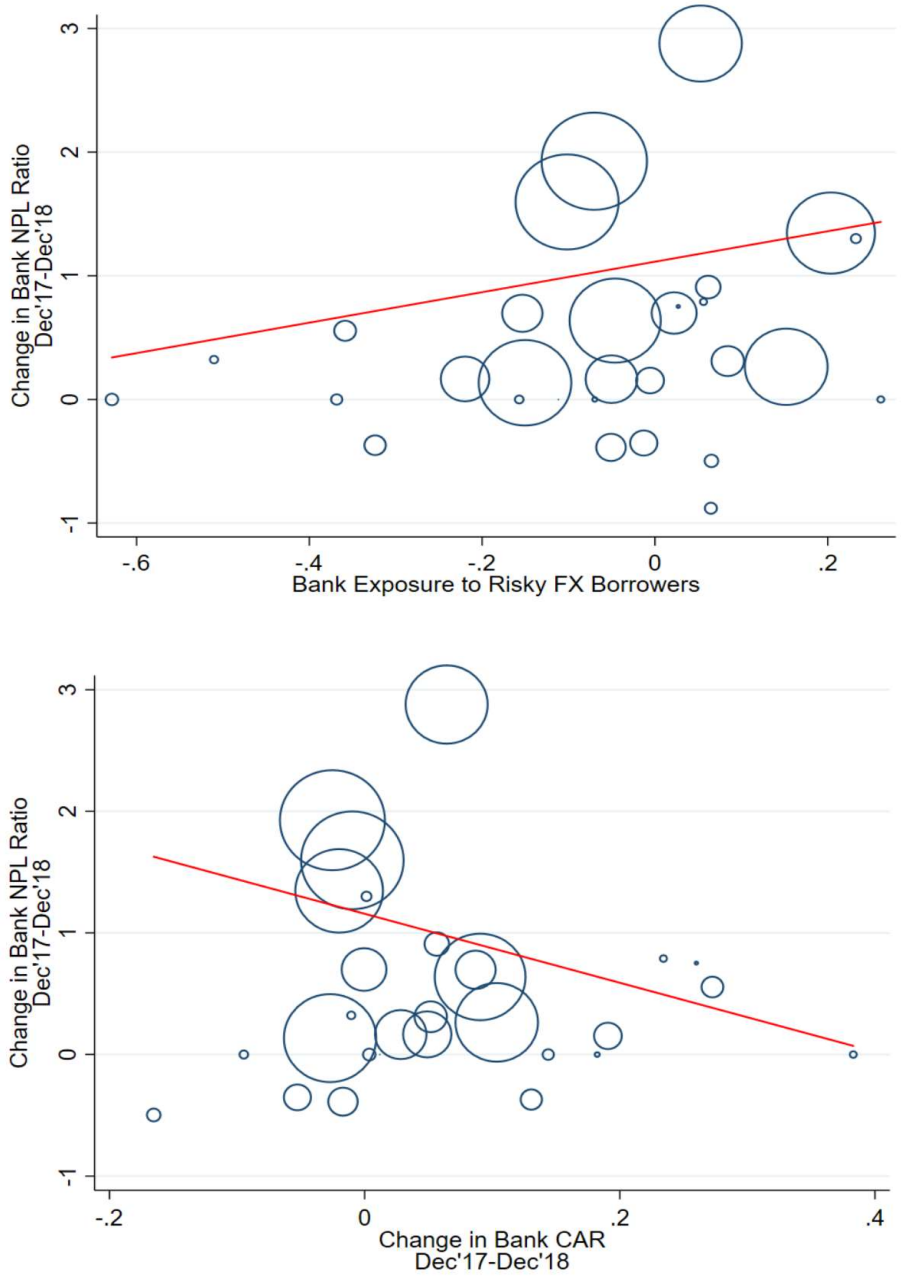


Figure 4: Net Open FX Position by Sectors (December 2017)



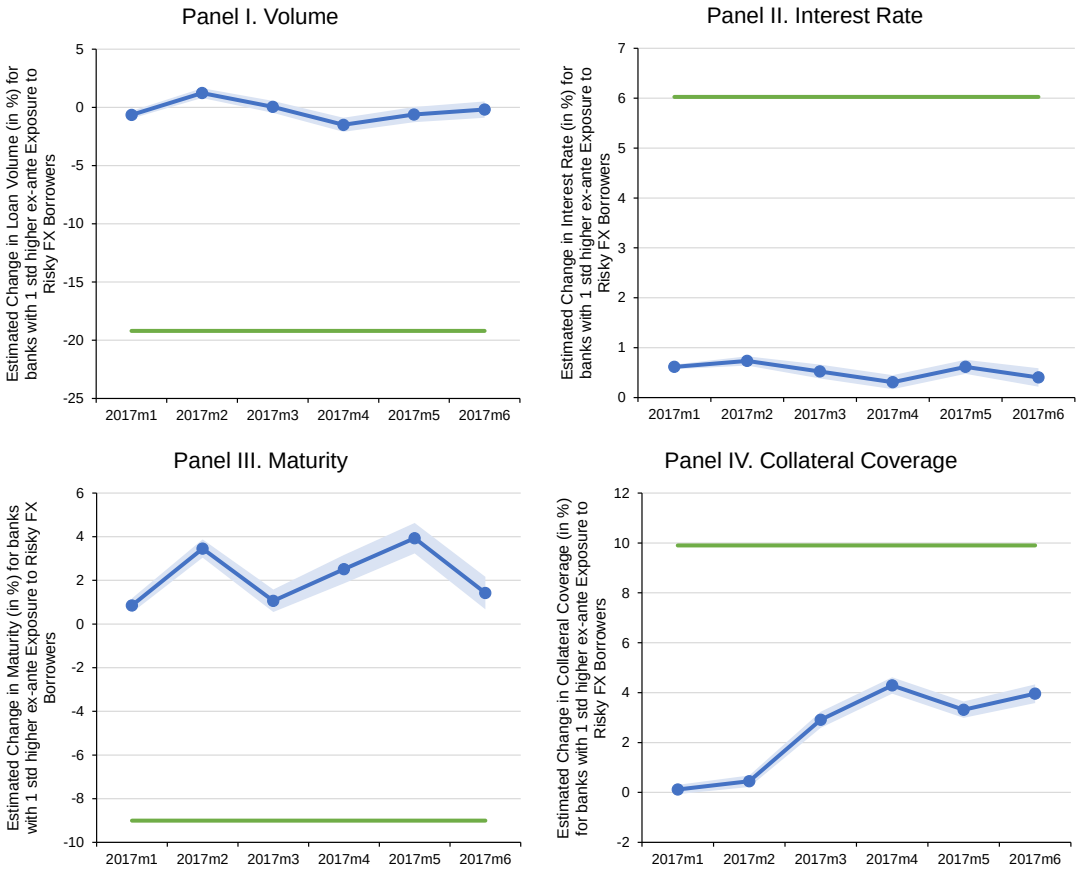
Notes. The figure plots average net open FX position of firms in each 1-digit industry (with weights proportional to firm total sales).

FIGURE 5: BANK NPL AND CAPITAL RATIOS VS. EXPOSURE TO RISKY FX BORROWERS



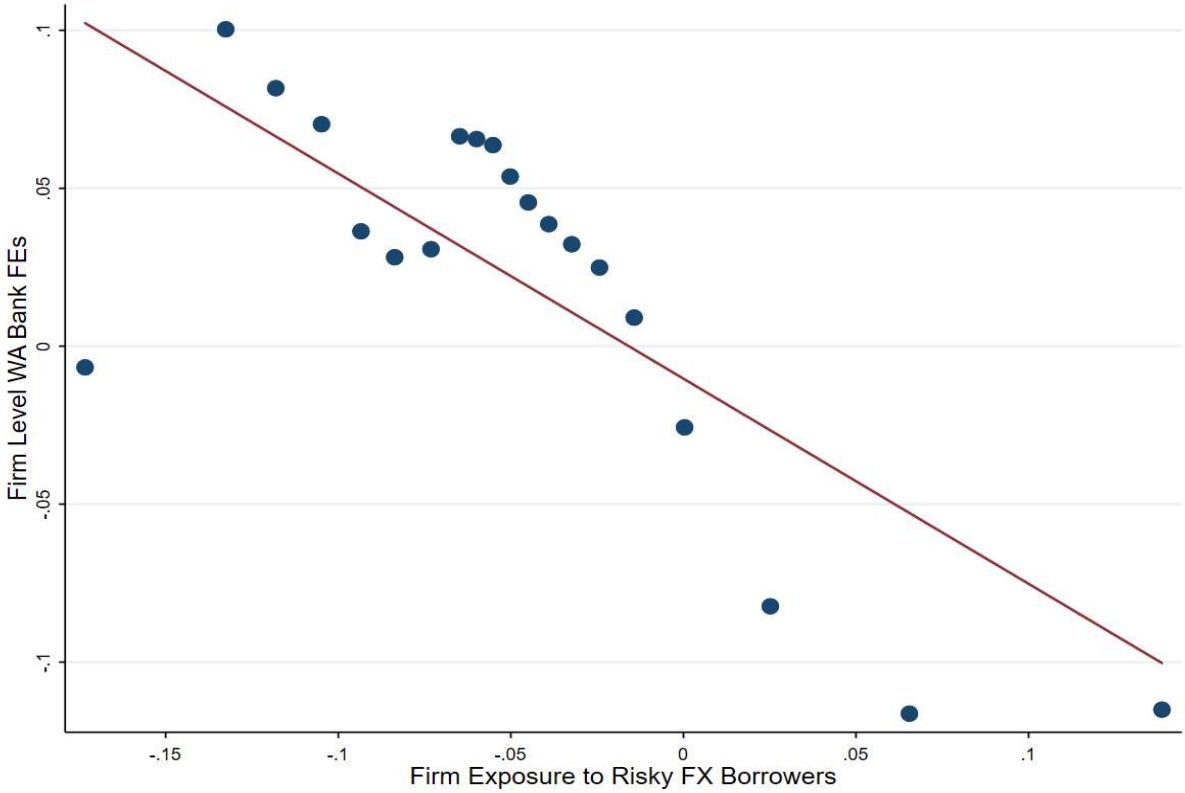
Notes. Each circle denotes a bank, and the size of each circle is based on bank's total assets in December 2017. The estimated fitted line assigns greater weight to larger banks (weighted least squares, with weights proportional to bank total assets). The upper panel plots percentage change in banks' non-performing loans-to-total loans (NPL) ratio against banks' exposure to risky FX borrowers (see equation (2)). The lower panel plots the percentage change in bank NPL ratio against the capital adequacy ratio (capital-to-risk-weighted assets ratio).

Figure 6: Placebo Period (January 2017 - June 2017)



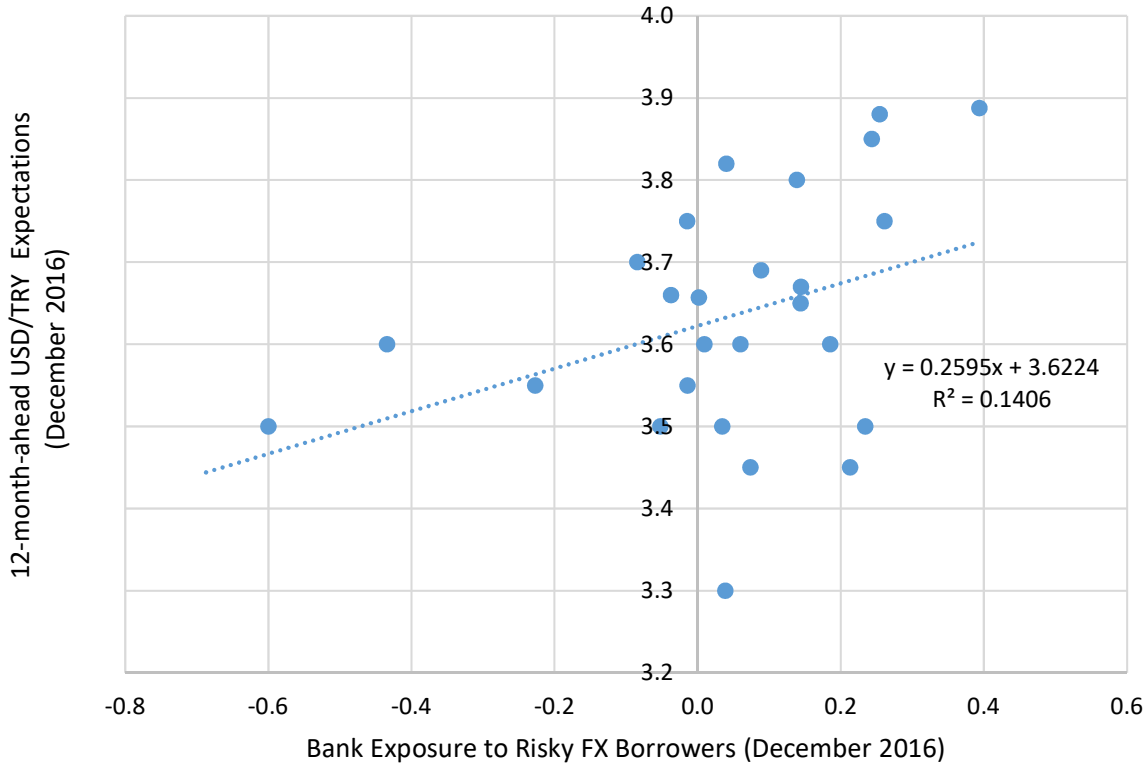
Notes. Connected blue lines are based on estimating the baseline model (equation 3) for alternative periods that exhibit relatively stable Turkish lira against USD or Euro (Figure 2). The first period we study is December 2016-January 2017 (the left most dot in each panel). We report economic impacts (the estimated coefficient times the standard deviation of bank ex-ante Exposure to Risky FX Borrowers (in December 2016), times 100). We then successively expand the end-period by one month (i.e., studying the periods December 2016-February 2017, December 2016-March 2017, ...), hence the following dots in each panel. Gray areas around economic impacts are 95% confidence intervals. Green horizontal lines correspond to our baseline estimates (see Table 3 column (5), Table 4 column (5), Table 5 columns (3) and (6)).

FIGURE 7: BANKS' HIGHER EXPOSURE TO RISKY FX BORROWERS INDEED REFLECTS STRONGER TIGHTENING IN BANK CREDIT SUPPLY AT THE FIRM LEVEL



Notes. The figure plots firm-level credit supply shocks against firm-level weighted average of bank exposure to risky FX borrowers. Firm-level credit supply shocks are estimated following Amity and Weinstein (2018), by regressing log-change in credit volume on bank and firm fixed effects (with weighting proportional to ex-ante log of loan volume), and calculating at the firm-level weighted average bank fixed effects (with weights proportional to share of each bank loan in firm's total bank loans in December 2017). The figure is based on 193,083 firms. For exposition, we plot averages of vertical- and horizontal-axis variables for 20 equally-sized bins, following Chetty et al. (2014) and Stata `binscatter` command. The fitted line is statistically significant at 0.01 level.

Figure 8: Placebo Period: Bank-Level Foreign Exchange Rate Expectations and Their Ex-ante Exposure to Risky FX Borrowers



Tables

Table 1: Summary Statistics

Variables	Definition	Unit	Mean	Median	SD	Min	10%	25%	75%	90%	Max	N
DEPENDENT VARIABLES												
Bank-Firm-Currency Level Regressions												
Loan Growth	Change in the (log) level of real loan amount from bank *b* to firm *f* in currency-type *c* between December 2017-December 2018 (FX adjusted)	Δ Log	-0.325	-0.302	0.878	-9.336	-1.196	-0.667	0.055	0.571	10.817	518,536
Interest Rate Change	Change in the (log) level of interest rate of the loan from bank *b* to firm *f* in currency-type *c* between December 2017-December 2018	Δ Log	0.174	0.121	0.327	-6.789	-0.068	0	0.368	0.549	7.892	499,698
Maturity Change	Change in the (log) level of the remaining maturity (in months) of loans from bank *b* to firm *f* in currency-type *c* between December 2017-December 2018	Δ Log	-0.261	-0.296	0.755	-18.002	-0.981	-0.588	0	0.536	19.331	487,285
Collateral Ratio Change	Change in the (log) level of collateral ratio of collateralized loans from bank *b* to firm *f* in currency-type *c* between December 2017-December 2018	Δ Log	-0.221	0	0.728	-13.817	-1.072	-0.194	0	0.172	9.102	320,182
Bank-Firm Level Regressions												
New Lending	=1 if a bank establishes a new lending relationship with a firm that it was not working with previously; 0 otherwise	1 or 0	0.400	0.000	0.490	0	0	0	1	1	1	355,005
Termination	=1 if a bank terminates an existing relationship with a firm; 0 otherwise	1 or 0	0.300	0.000	0.458	0	0	0	1	1	1	887,184
Firm-Level Regressions												
Firms that borrow in the pre- period												
Loan Growth	Change in the (log) level of real loan amount of firm f between December 2017-December 2018 (FX adjusted)	Δ Log	-0.275	-0.308	0.793	-9.975	-1.011	-0.604	0.070	0.573	10.659	1,050,385
Interest Rate Change	Change in the (log) level of interest rate of the loans of firm *f* between December 2017-December 2018	Δ Log	0.087	0.023	0.396	-7.221	-0.242	-0.004	0.258	0.486	8.992	1,007,935
Maturity Change	Change in the (log) level of the remaining maturity (in months) of loans of firm *f* between December 2017-December 2018	Δ Log	-0.209	-0.262	0.705	-19.816	-0.838	-0.526	0.009	0.549	19.768	1,020,782
Collateral Ratio Change	Change in the (log) level of collateral ratio of collateralized loans of firm *f* between December 2017-December 2018	Δ Log	-0.229	-0.027	0.770	-14.134	-1.143	-0.566	0.015	0.450	10.124	796,954
Future Default	=1 if a firm defaults on a loan during the next 12 months, and 0 otherwise	1 or 0	0.061	0	0.239	0	0	0	0	0	1	215,709
Δ Total Liabilities	Log change in firm's total liabilities.	Δ Log	0.100	0.087	0.506	-2.832	-0.337	-0.083	0.301	0.582	2.99	212,399
Δ Domestic Sales	Log change in firm's total domestic sales.	Δ Log	0.096	0.142	0.911	-4.304	-0.724	-0.15	0.407	0.837	4.41	198,537
Δ Profit	Log change in firm's pre-tax profits.	Δ Log	-0.05	0.007	0.972	-2.09	-1.433	-0.562	0.484	1.167	2.063	138,222
Investment	Log change in tangible fixed assets.	Δ Log	-0.167	0	2.232	-23.988	-0.535	-0.122	0.195	0.686	18.658	215,705
Δ Employment	Log change in firm's employees.	Δ Log	-0.032	0	0.458	-5.583	-0.405	-0.159	0.121	0.357	5.793	212,399
Firms that borrow in both pre- and post- period												
Loan Growth	Change in the (log) level of real loan amount of firm f between December 2017-December 2018 (FX adjusted)	Δ Log	-0.273	-0.247	0.617	-7.313	-0.962	-0.585	0.083	0.411	5.122	204,132
Interest Rate Change	Change in the (log) level of interest rate of the loans of firm *f* between December 2017-December 2018	Δ Log	0.161	0.165	0.300	-4.761	-0.155	0.004	0.344	0.486	7.250	204,092
Maturity Change	Change in the (log) level of the remaining maturity (in months) of loans of firm *f* between December 2017-December 2018	Δ Log	-0.223	-0.259	0.541	-18.245	-0.709	-0.465	-0.003	0.348	5.621	203,385
Collateral Ratio Change	Change in the (log) level of collateral ratio of collateralized loans of firm *f* between December 2017-December 2018	Δ Log	-0.312	-0.198	0.751	-11.923	-1.196	-0.686	0.026	0.383	9.264	196,501
Future Default	=1 if a firm defaults on a loan during the next 12 months, and 0 otherwise	1 or 0	0.020	0	0.139	0	0	0	0	0	1	70,085
Δ Total Liabilities	Log change in firm's total liabilities.	Δ Log	0.113	0.104	0.388	-2.832	-0.266	-0.064	0.287	0.516	2.99	69,911
Δ Domestic Sales	Log change in firm's total domestic sales.	Δ Log	0.151	0.163	0.717	-4.304	-0.435	-0.066	0.389	0.719	4.41	68,479
Δ Profit	Log change in firm's pre-tax profits.	Δ Log	-0.056	-0.002	0.907	-2.09	-1.275	-0.526	0.426	1.05	2.063	50,188
Investment	Log change in tangible fixed assets.	Δ Log	0.011	0.015	1.429	-17.644	-0.4	-0.092	0.233	0.649	15.752	70,084
Δ Employment	Log change in firm's employees.	Δ Log	-0.001	0.000	0.405	-4.394	-0.348	-0.134	0.134	0.336	5.793	69,911

(continued)

Table 1: Summary Statistics (continued)

Variables	Definition	Unit	Mean	Median	SD	Min	10%	25%	75%	90%	Max	N
INDEPENDENT VARIABLES												
Bank-Firm Level Variables												
Strength of Relationship	Share of loan amount from bank *b* to firm *f* in bank *b*'s total loans	%	0.003	0.000	0.093	0.000	0.000	0.000	0.000	0.002	20.146	515,294
Bank Level Variables												
Ex-ante Exposure to Risky FX Borrowers	Bank-level weighted average of firms short term net open FX position, divided by total assets: ((Short-Term FX Credits$_{f,Dec'17}$-Export Revenues$_{f,17}$)/Total Assets$_{f,17}$).	-	-0.078	-0.027	0.224	-0.843	-0.357	-0.149	0.041	0.174	0.243	34
Capital Adequacy Ratio	Total Equity to Total Risk-Weighted Assets	%	20.522	17.040	10.131	13.980	14.200	15.140	19.930	31.360	56.080	34
Liquidity Ratio	Liquid assets (cash + receivables from the central bank + interbank money market + reverse repo receivables) to total assets	%	27.026	23.147	12.484	5.661	17.610	20.255	27.675	44.188	70.397	34
Size	Natural logarithm of real total assets	000s, TL	16.584	16.708	2.284	11.948	13.707	14.928	18.613	19.571	19.889	34
NPL Ratio	Non-performing loans (with an overdue past 90 days) to total credit	%	1.103	0.622	1.562	0.000	0.000	0.000	1.737	2.351	7.783	34
ROA	Pre-tax net profit to total assets	%	1.282	1.032	1.357	-0.061	0.284	0.522	1.404	2.492	7.207	34
Foreign Funding Ratio	Non-Core FX Liabilities (FX Payables to Money Market, FX Payables to Securities Market, FX Payables to Banks, FX Funds from Repo Transactions and Net FX Securities Issued) to Total Assets	%	29.431	18.208	25.060	1.479	4.217	14.607	43.975	69.527	89.235	34
FX Loan Share	Share of foreign currency credit in banks credit portfolio	%	36.454	30.774	22.044	0	12.848	23.692	43.05	77.176	95.034	34
Herfindahl by Industry	The Herfindahl-Hirschman index of the bank's credit portfolio by industry	%	13.382	9.499	8.956	5.403	6.257	6.98	17.231	26.993	42.175	34
Firm-Level Variables												
Firms that borrow in the pre- period												
Firm Net Open FX Position	Firm short-term net open FX position divided by total assets	-	-0.062	0	0.257	-1.623	-0.079	0	0	0	0.282	215,709
Firm Exposure to Risky FX Borrowers	A firm's exposure to other firms' riskiness through their banking partners Firm-level weighted average of Banks' Exposure to Risky FX Borrowers	-	-0.097	-0.03	0.835	-45.046	-0.149	-0.09	0.041	0.174	5.336	215,709
Downstream Firms' Net Open FX Position	Weighted average of customer firms' net open FX position	-	-0.066	-0.001	0.181	-1.623	-0.19	-0.045	0	0	0.282	215,709
Upstream Firms' Net Open FX Position	Weighted average of supplier firms' net open FX position	-	-0.044	-0.003	0.132	-1.623	-0.131	-0.037	0	0.005	0.282	215,709
Firm Size	Natural logarithm of firm's total assets	log (TL)	14.694	14.618	1.837	-4.605	12.767	13.641	15.714	16.839	24.356	215,709
Firm Leverage Ratio	Firm's total debt normalized with total assets.	-	0.793	0.783	0.744	0	0.333	0.582	0.91	1.007	16.888	215,709
Exporter Firm	=1 if a firm is an exporter, and 0 otherwise	1 or 0	0.188	0	0.39	0	0	0	0	1	1	215,709
Firms that borrow in both pre- and post- periods												
Firm Net Open FX Position	Firm short-term net open FX position divided by total assets	-	-0.063	0	0.248	-1.623	-0.124	0	0	0	0.282	70,085
Firm Exposure to Risky FX Borrowers	A firm's exposure to other firms' riskiness through their banking partners Firm-level weighted average of Banks' Exposure to Risky FX Borrowers	-	-0.146	-0.037	0.882	-21.119	-0.137	-0.083	0.024	0.093	5.336	70,085
Downstream Firms' Net Open FX Position	Weighted average of customer firms' net open FX position	-	-0.075	-0.006	0.183	-1.623	-0.213	-0.063	0	0	0.282	70,085
Upstream Firms' Net Open FX Position	Weighted average of supplier firms' net open FX position	-	-0.052	-0.01	0.128	-1.623	-0.155	-0.055	0	0.006	0.282	70,085
Firm Size	Natural logarithm of firm's total assets	log (TL)	15.519	15.411	1.567	-4.605	13.738	14.498	16.429	17.443	24.271	70,085
Firm Leverage Ratio	Firm's total debt normalized with total assets.	-	0.774	0.798	0.323	0	0.484	0.658	0.893	0.96	16.888	70,085
Exporter Firm	=1 if a firm is an exporter, and 0 otherwise	1 or 0	0.246	0	0.431	0	0	0	0	1	1	70,085

Table 2: Cross-Correlations

Panel A. Correlation on Firm NOPs with Firm Controls

	Baseline Sample	Large Sample
Firm Size	-0.054***	-0.055***
Firm Leverage Ratio	0.024***	0.024***
Exporter Firm	-0.469***	-0.525***

Note: Baseline Sample corresponds to firms present in the baseline intensive margin analyses, and Large Sample includes all firms that have at least one banking relationship in December 2017. Number of observations is 70,085 for the Baseline Sample and 215,709 for the Large Sample.

Panel B. Correlation of Banks' Exposure to Risky FX Borrowers with Bank Controls

Capital Adequacy Ratio	0.269
Liquidity Ratio	-0.230
Size	0.202
NPL Ratio	0.087
ROA	0.140
Foreign Funding Ratio	-0.071
FX Loan Share	0.191
Herfindahl by Industry	0.027
W.Aveg. Firm Size	0.475**
W.Aveg. Firm Export Ratio	-0.376*
W.Aveg. Firm Leverage	0.554***

Note: Weighted by bank-level total non-financial corporate loans in December 2017.

Panel C. Correlation of Firm NOP with Other Firm Variables

W. Aveg. Bank Exposure to Risky FX Borrowers	0.125***
Customers' NOP	0.278***
Suppliers' NOP	0.280***
Number of Customer Firms	-0.010***
Number of Suppliers	-0.082***
Number of Total Connected Firms	-0.039***

Note: Number of observations is 215,709.

Panel D. Comparing Average Characteristics of Domestic- vs. Foreign-Owned Banks

	Domestic Bank	Foreign Bank	Difference	p-value
Exposure to Risky FX Borrowers	-0.049	-0.105	0.056	0.479
Capital Adequacy Ratio	18.087	22.686	-4.599	0.191
Liquidity Ratio	21.109	32.285	-11.175	0.007
Size	17.056	16.165	0.891	0.262
NPL Ratio	0.801	1.372	-0.571	0.295
ROA	1.594	1.004	0.590	0.210
Foreign Funding Ratio	20.923	36.993	-16.071	0.061
FX Loan Share	32.650	39.835	-7.185	0.351
Herfindahl by Industry	15.013	11.931	3.082	0.324
W.Aveg. Firm Size	21.851	22.148	-0.297	0.833
W.Aveg. Firm Export Ratio	0.119	0.151	-0.032	0.403
W.Aveg. Firm Leverage	0.986	0.920	0.065	0.303

Table 3: Baseline Results: Volume

Dependent Variable:	Log change in real credit				
	(1)	(2)	(3)	(4)	(5)
Exposure to Risky FX Borrowers	**-0.497*** **	**-0.706*** **	**-0.872*** **	**-0.882*** **	**-0.857*** **
	(0.031)	(0.021)	(0.024)	(0.024)	(0.024)
Capital Adequacy Ratio	**0.021*** **	**0.031*** **	**0.040*** **	**0.040*** **	**0.043*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Liquidity Ratio	**-0.010*** **	**-0.011*** **	**-0.020*** **	**-0.020*** **	**-0.023*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size	**0.107*** **	**0.176*** **	**0.192*** **	**0.190*** **	**0.216*** **
	(0.009)	(0.007)	(0.007)	(0.007)	(0.007)
NPL Ratio	**0.034**	**0.166*** **	**0.158*** **	**0.162*** **	**0.148*** **
	(0.022)	(0.010)	(0.011)	(0.011)	(0.011)
ROA	**0.117*** **	**0.224*** **	**0.176*** **	**0.186*** **	**0.111*** **
	(0.029)	(0.020)	(0.021)	(0.021)	(0.022)
Foreign Funding Ratio	**-0.016*** **	**-0.015*** **	**-0.015*** **	**-0.014*** **	**-0.016*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
FX Loan Share	**-0.007*** **	**-0.004*** **	**0.001** **	**0.002*** **	**-0.001**
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Herfindahl by Industry	**0.002*** **	**0.002*** **	**0.004*** **	**0.004*** **	**0.003*** **
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Strength of Relationship	**0.061***	**0.056**	**0.013**	**0.015**	**0.106*** **
	(0.036)	(0.046)	(0.028)	(0.030)	(0.023)
# of banking relationship >1	No	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	--
Currency FE	No	No	No	Yes	--
Firm x Currency FE	No	No	No	No	Yes
Observations	1,335,586	626,586	524,867	524,867	518,536
R-squared	0.017	0.017	0.426	0.427	0.439
Log change in the credit supply of a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	-11.13	-15.81	-19.53	-19.76	-19.20

Notes: The dependent variable is the log change in real credit extended by bank b to firm f in currency c from December 2017 to December 2018. "Exposure to Risky FX Borrowers" denotes bank-level weighted average of short-term net open FX position to-total assets ratio of firms that the bank is working with in December 2017. All control variables are measured ex ante (December 2017). "Yes" indicates that the corresponding fixed effects are included. "No" indicates that the corresponding fixed effects are not included. "--" indicates that corresponding fixed effects are already absorbed by a wider set of fixed effects or not applicable. Standard errors are clustered at the firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 4: Baseline Results: Interest Rate

Dependent Variable:	Log change in interest rate				
	(1)	(2)	(3)	(4)	(5)
Exposure to Risky FX Borrowers	**0.221*** **	**0.329*** **	**0.269*** **	**0.267*** **	**0.269*** **
	(0.032)	(0.008)	(0.008)	(0.008)	(0.008)
Capital Adequacy Ratio	**-0.001*** **	**-0.005*** **	**0.006*** **	**0.006*** **	**0.006*** **
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Liquidity Ratio	**0.004*** **	**-0.002*** **	**0.004*** **	**0.005*** **	**0.005*** **
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Size	**-0.052*** **	**-0.101*** **	**-0.070*** **	**-0.070*** **	**-0.074*** **
	(0.008)	(0.003)	(0.002)	(0.002)	(0.002)
NPL Ratio	**-0.044***	**-0.186*** **	**-0.151*** **	**-0.150*** **	**-0.151*** **
	(0.025)	(0.006)	(0.005)	(0.005)	(0.005)
ROA	**-0.165*** **	**-0.281*** **	**-0.238*** **	**-0.238*** **	**-0.232*** **
	(0.031)	(0.010)	(0.008)	(0.008)	(0.008)
Foreign Funding Ratio	**0.008*** **	**0.002*** **	**-0.003*** **	**-0.003*** **	**-0.003*** **
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
FX Loan Share	**0.005*** **	**0.004*** **	**-0.000*** **	**-0.000*** **	**-0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Herfindahl by Industry	**0.003*** **	**0.001*** **	**0.000*** **	**0.000*** **	**0.001*** **
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Strength of Relationship	**-0.020***	**-0.013**	**-0.009**	**-0.009***	**-0.029*** **
	(0.011)	(0.013)	(0.006)	(0.005)	(0.009)
# of banking relationship >1	No	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	--
Currency FE	No	No	No	Yes	--
Firm x Currency FE	No	No	No	No	Yes
Observations	1,283,070	611,983	505,914	505,914	499,698
R-squared	0.045	0.043	0.509	0.509	0.519
Log change in the interest rate of a loan from a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	4.95	7.37	6.03	5.98	6.03

Notes: The dependent variable is the log change in the interest rate of a loan extended by bank b to firm f in currency c from December 2017 to December 18. "Exposure to Risky FX Borrowers" denotes bank-level weighted average of short-term net open FX position to-total assets ratio of firms that the bank is working with in December 2017. All control variables are measured ex ante (December 2017). "Yes" indicates that the corresponding fixed effects are included. "No" indicates that the corresponding fixed effects are not included. "--" indicates that corresponding fixed effects are already absorbed by a wider set of fixed effects or not applicable. Standard errors are clustered at the firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 5: Baseline Results: Maturity and Collateral Coverage

Dependent Variable:	Log change in maturity			Log change in collateral ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure to Risky FX Borrowers	**-0.405*** **	**-0.410*** **	**-0.402*** **	**0.504*** **	**0.500*** **	**0.442*** **
	(0.022)	(0.022)	(0.022)	(0.048)	(0.048)	(0.049)
Capital Adequacy Ratio	**0.041*** **	**0.041*** **	**0.043*** **	**-0.003**	**-0.003**	**-0.010*** **
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Liquidity Ratio	**-0.005*** **	**-0.005*** **	**-0.006*** **	**-0.117*** **	**-0.118*** **	**-0.117*** **
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
Size	**0.205*** **	**0.204*** **	**0.225*** **	**-0.329*** **	**-0.331*** **	**-0.363*** **
	(0.006)	(0.006)	(0.006)	(0.017)	(0.017)	(0.017)
NPL Ratio	**0.189*** **	**0.190*** **	**0.188*** **	**-0.864*** **	**-0.862*** **	**-0.831*** **
	(0.012)	(0.012)	(0.012)	(0.039)	(0.039)	(0.039)
ROA	**-0.038** **	**-0.033** *	**-0.083*** **	**-1.088*** **	**-1.078*** **	**-0.945*** **
	(0.019)	(0.019)	(0.020)	(0.049)	(0.049)	(0.051)
Foreign Funding Ratio	**-0.006*** **	**-0.006*** **	**-0.007*** **	**0.005*** **	**0.005*** **	**0.007*** **
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
FX Loan Share	**0.001*** **	**0.001*** **	**-0.000**	**0.020*** **	**0.020*** **	**0.024*** **
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Herfindahl by Industry	**0.001*** **	**0.001*** **	**0.000**	**-0.013*** **	**-0.013*** **	**-0.012*** **
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Strength of Relationship	**0.015**	**0.016**	**0.115*** **	**0.178*** **	**0.182*** **	**0.200*** **
	(0.027)	(0.028)	(0.017)	(0.064)	(0.064)	(0.059)
# of banking relationship >1	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	--	Yes	Yes	--
Currency FE	No	Yes	--	No	Yes	--
Firm x Currency FE	No	No	Yes	No	No	Yes
Observations	493,489	493,489	487,285	326,279	326,279	320,182
R-squared	0.412	0.413	0.420	0.436	0.436	0.451
Log change in the outcome variable of a loan from a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	-9.07	-9.18	-9.00	11.29	11.20	9.90

Notes: The dependent variable is the (i) log change in the remaining maturity (in months) (columns (1) to (3), or (ii) log change in the collateral coverage ratio (columns (4) to (6)); of loans extended by bank b to firm f in currency c from December 2017 to December 2018. For (ii), we focus on loans with a collateral coverage ratio greater than zero. "Exposure to Risky FX Borrowers" denotes bank-level weighted average of short-term net open FX position to-total assets ratio of firms that the bank is working with in December 2017. As before, all control variables are measured ex ante (December 2017). "Yes" indicates that corresponding fixed effects are included. "No" indicates that corresponding fixed effects are not included. "--" indicates that corresponding fixed effects are already absorbed by a wider set of fixed effects or not applicable. Standard errors are clustered at the firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 6: Mechanism

Dependent Variable:	Probability of Future Loan Default (over the next 12 months)					
Set of Firms:	Baseline Sample			Large Sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Net Open FX Position	**0.012*** **	**0.012*** **	**0.010** **	**0.028*** **	**0.028*** **	**0.018*** **
	(0.002)	(0.002)	(0.004)	(0.002)	(0.002)	(0.003)
Firm Exposure to Risky FX Borrowers		**-0.000**	**0.001**		**0.001**	**0.001**
(Firm's W. Aveg. Bank Exposure to Risky FX Borrowers)		(0.001)	(0.001)		(0.002)	(0.002)
Firm Size			**0.003*** **			**0.001**
			(0.001)			(0.001)
Firm Leverage Ratio			**0.004*** **			**0.006*** **
			(0.001)			(0.001)
Exporter Firm			**-0.002**			**-0.015*** **
			(0.004)			(0.002)
Industry-City Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	73,130	73,130	73,130	249,120	249,120	249,120
R-squared	0.081	0.081	0.081	0.052	0.053	0.053
Probability of future default of a firm *f* with 1 std. higher net open FX position	0.31	0.31	0.26	0.76	0.76	0.49
Probability of future default of a firm *f* working with banks with 1 std. higher exposure to risky FX borrowers			0.08			0.08

Notes: The dependent variable is a dummy variable that takes a value 1 if the firm *f* defaults on at least one bank loan during the period January 2018-December 2018, and 0 otherwise. Baseline Sample corresponds to firms present in the baseline intensive margin analyses (Table 2, column (5)), and Large Sample includes all firms that have at least one banking relationship in December 2017. "Firm Net Open FX Position" is firm short term net open FX position, divided by total assets: ((Short-Term FX Credits$_{f,Dec'17}$-Export Revenues$_{f,17}$)/Total Assets$_{f,17}$). "Firm Exposure to Risky FX Borrowers" denotes the firm's exposure to other firms' riskiness through their banking partners. "Firm Size" is the log of firm's total assets, "Firm Leverage Ratio" denotes the firm's total debt normalized with total assets and "Exporter Firm" is the indicator variable that takes 1 if the firm is an exporter and 0 oterwise. All right-hand-side variables are measured at December 2017. "Yes" indicates that corresponding fixed effects is included. Standard errors are clustered at industry and city level and given in parantheses.*** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 7: Mechanism: Further Evidence

Outcome Variable:	Volume		Interest Rate		Maturity		Collateral Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure to Risky FX Borrowers	**-0.879*** **	**-0.254*** **	**0.263*** **	**0.103*** **	**-0.398*** **	**-0.106*** **	**0.479*** **	**-0.105***
	(0.024)	(0.026)	(0.009)	(0.009)	(0.022)	(0.024)	(0.048)	(0.054)
Δ NPL Ratio		**-0.118*** **		**0.045*** **		**-0.135*** **		**0.193*** **
		(0.006)		(0.003)		(0.005)		(0.015)
Δ Capital Adequacy Ratio		**-2.197*** **		**0.487*** **		**-0.464*** **		**1.621*** **
		(0.047)		(0.018)		(0.042)		(0.054)
Capital Adequacy Ratio	**0.041*** **	**-0.004*** **	**0.006*** **	**0.017*** **	**0.042*** **	**0.029*** **	**-0.005*** **	**0.013*** **
	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Liquidity Ratio	**-0.021*** **	**0.011*** **	**0.005*** **	**-0.006*** **	**-0.006*** **	**0.023*** **	**-0.117*** **	**-0.163*** **
	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.003)	(0.004)
Size	**0.203*** **	**-0.122*** **	**-0.069*** **	**0.021*** **	**0.210*** **	**0.041*** **	**-0.343*** **	**-0.075*** **
	(0.007)	(0.011)	(0.003)	(0.005)	(0.006)	(0.009)	(0.016)	(0.024)
NPL Ratio	**0.159*** **	**-0.106*** **	**-0.149*** **	**-0.069*** **	**0.186*** **	**-0.005**	**-0.853*** **	**-0.507*** **
	(0.011)	(0.014)	(0.005)	(0.005)	(0.012)	(0.013)	(0.039)	(0.047)
ROA	**0.159*** **	**0.423*** **	**-0.239*** **	**-0.332*** **	**-0.055*** **	**0.184*** **	**-1.030*** **	**-1.212*** **
	(0.022)	(0.024)	(0.009)	(0.012)	(0.020)	(0.020)	(0.050)	(0.041)
Foreign Funding Ratio	**-0.014*** **	**-0.015*** **	**-0.003*** **	**-0.003*** **	**-0.007*** **	**-0.006*** **	**0.005*** **	**-0.001**
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
FX Loan Share	**0.032**	**0.367*** **	**-0.040** **	**-0.173*** **	**0.100** **	**0.459*** **	**2.117*** **	**2.047*** **
	(0.052)	(0.054)	(0.019)	(0.024)	(0.046)	(0.046)	(0.101)	(0.094)
Herfindahl by Industry	**0.004*** **	**0.020*** **	**0.000** **	**-0.004*** **	**0.001** **	**0.006*** **	**-0.012*** **	**-0.026*** **
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Strength of Relationship	**0.010**	**-0.071*** **	**-0.006**	**0.020*** **	**0.009**	**-0.051*** **	**0.200*** **	**0.375*** **
	(0.026)	(0.013)	(0.005)	(0.008)	(0.023)	(0.006)	(0.064)	(0.069)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	517,251	516,350	498,641	497,771	486,439	485,559	319,430	318,716
R-squared	0.435	0.443	0.502	0.510	0.416	0.420	0.438	0.448
Log change in the outcome variable of a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	-19.69	-5.69	5.89	2.31	-8.92	-2.37	10.73	-2.24

Notes: "Yes" indicates that corresponding fixed effects are included. "No" indicates that corresponding fixed effects are not included. "--" indicates that corresponding fixed effects are already absorbed by a wider set of fixed effects or not applicable. Standard errors are clustered at the firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 8: Tightening in Bank Credit Supply Conditions: Binding at the Firm-Level?

Set of Firms:	Baseline Sample				Large Sample			
Outcome Variable:	Volume	Interest Rate	Maturity	Collateral Ratio	Volume	Interest Rate	Maturity	Collateral Ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
W. Aveg. Bank Exposure to Risky FX Borrowers	**-0.097*** **	**0.125*** **	**-0.065*** **	**0.132*** **	**-0.105*** **	**0.085*** **	**-0.090*** **	**0.161*** **
	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.003)	(0.003)	(0.004)
W. Aveg. Bank Capital Adequacy Ratio	**-0.000**	**-0.018*** **	**0.003**	**0.038*** **	**0.017*** **	**0.000**	**0.014*** **	**0.016*** **
	(0.003)	(0.002)	(0.002)	(0.004)	(0.001)	(0.001)	(0.001)	(0.002)
W. Aveg. Bank Liquidity Ratio	**0.002**	**-0.008*** **	**0.014*** **	**-0.018*** **	**0.003*** **	**-0.002** **	**0.009*** **	**-0.034*** **
	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
W. Aveg. Bank Size	**0.008***	**0.011*** **	**-0.018*** **	**-0.007**	**-0.020*** **	**0.000**	**-0.006*** **	**0.026*** **
	(0.005)	(0.003)	(0.004)	(0.007)	(0.002)	(0.002)	(0.002)	(0.003)
W. Aveg. Bank Non-Performing Loans	**-0.027**	**0.022**	**0.045** **	**-0.084** **	**-0.007**	**-0.014**	**0.001**	**-0.011**
	(0.025)	(0.016)	(0.018)	(0.034)	(0.005)	(0.009)	(0.008)	(0.016)
W. Aveg. Bank Return on Assets	**0.173*** **	**-0.064**	**0.197*** **	**-0.331*** **	**0.203*** **	**-0.098*** **	**0.012**	**-0.359*** **
	(0.065)	(0.043)	(0.047)	(0.090)	(0.014)	(0.019)	(0.016)	(0.034)
W. Aveg. Bank Foreign Funding	**-0.011*** **	**0.012*** **	**-0.013*** **	**-0.010*** **	**-0.016*** **	**0.012*** **	**-0.016*** **	**-0.001*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
W. Aveg. Bank FX Loan Share	**-0.499*** **	**0.826*** **	**0.158** **	**1.521*** **	**-0.392*** **	**0.547*** **	**-0.222*** **	**1.301*** **
	(0.095)	(0.061)	(0.072)	(0.130)	(0.031)	(0.029)	(0.030)	(0.055)
W. Aveg. Bank Herfindahl by Industry	**-0.012*** **	**-0.000**	**-0.001**	**0.005*** **	**0.009*** **	**-0.003*** **	**0.012*** **	**-0.007*** **
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Observations	204,132	204,092	203,385	196,501	1,050,385	1,007,935	1,020,782	796,954
R-squared	0.019	0.072	0.010	0.018	0.012	0.026	0.008	0.033
Log change in the the outcome variable of a firm with 1 std. higher W. Aveg. Bank Exposure to Risky FX Borrowers (in %)	-5.34	6.88	-3.58	7.26	-5.91	5.02	-5.32	9.52

Notes: Baseline Sample corresponds to firms present in the baseline intensive margin analyses (Table 2, column (5)), and Large Sample includes all firms that have at least one banking relationship in December 2017. Weighted average bank variables are the weighted average of corresponding variables of banks that the firm is working with (December 2017). Weights are the share of bank-b credit in firm f's total bank credit. Robust standard errors are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 9: Financial Spillovers Lead to Adverse Real Effects

Dependent Variable:	Δ Total Liabilities		Δ Domestic Sales		Δ Profit		Investment		Δ Employment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Firm Net Open FX Position	**-0.094****	**-0.091****	**-0.094****	**-0.094****	**-0.084****	**-0.080****	**-0.121****	**-0.120****	**-0.028****	**-0.028****
	(0.009)	(0.009)	(0.022)	(0.022)	(0.025)	(0.024)	(0.015)	(0.014)	(0.004)	(0.004)
Firm Exposure to Risky FX Borrowers		**-0.011****		**-0.001**		**-0.015****		**-0.004**		**-0.001**
		(0.001)		(0.002)		(0.002)		(0.005)		(0.001)
Firm Size	**-0.037****	**-0.038****	**0.003**	**0.003**	**-0.021****	**-0.022****	**-0.063****	**-0.063****	**-0.004***	**-0.004**
	(0.004)	(0.003)	(0.006)	(0.006)	(0.004)	(0.004)	(0.006)	(0.006)	(0.003)	(0.003)
Firm Leverage Ratio	**-0.016****	**-0.016****	**0.017**	**0.017**	**0.120****	**0.121****	**-0.077****	**-0.077****	**-0.018****	**-0.018****
	(0.007)	(0.007)	(0.014)	(0.014)	(0.033)	(0.033)	(0.007)	(0.007)	(0.003)	(0.003)
Exporter Firm	**0.053****	**0.050****	**0.032****	**0.031****	**0.072****	**0.070****	**0.142****	**0.141****	**0.021****	**0.021****
	(0.005)	(0.004)	(0.012)	(0.012)	(0.007)	(0.007)	(0.008)	(0.008)	(0.005)	(0.005)
Industry-City Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	212,399	212,399	198,537	198,537	138,222	138,222	215,705	215,705	212,399	212,399
R-squared	0.040	0.040	0.029	0.029	0.037	0.037	0.019	0.019	0.036	0.036
Change in the dependent variable for firm f with 1 std. higher net open FX position	-2.42	-2.34	-2.42	-2.42	-2.16	-2.06	-3.11	-3.08	-0.72	-0.72
Change in the dependent variable for firm f with 1 std. higher Exposure to Risky FX Borrowers		-0.92		-0.08		-1.25		-0.33		-0.08

Notes: This table shows the firm-level estimation results for the Large Sample (that includes all firms that borrow from at least one bank in December 2017). Firm Exposure to Risky FX Borrowers is the firm-level weighted average of Bank Exposure to Risky FX Borrowers. The dependent variables are "Δ Total Liabilities" the log change in firm's total liabilities (columns (1) and (2)); "Δ Domestic Sales" the log change in firm's total domestic sales (columns (3) and (4)); "Δ Profit" the log change in firm's pre-tax profits (columns (5) and (6)); "Investment" the log change in firm's tangible fixed assets (columns (7) and (8)); "Δ Employment" the log change in firm's total number of employees (columns (9) and (10)). All control variables are measured ex ante (December 2017). "Yes" indicates that corresponding fixed effects is included. Standard errors are double clustered at industry and city level, and are given in parentheses.*** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 10: Financial Spillovers Lead to Adverse Real Effects

Dependent Variable:	Δ Total Liabilities				Δ Domestic Sales				Δ Profit				Investment				Δ Employment			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Firm Net Open FX Position	**-0.087*** **	**-0.087*** **	**-0.088*** **	**-0.088*** **	**-0.088*** **	**-0.090*** **	**-0.090*** **	**-0.090*** **	**-0.070*** **	**-0.072*** **	**-0.073*** **	**-0.073*** **	**-0.104*** **	**-0.091*** **	**-0.093*** **	**-0.094*** **	**-0.025*** **	**-0.023*** **	**-0.023*** **	**-0.023*** **
	(0.009)	(0.009)	(0.009)	(0.009)	(0.024)	(0.022)	(0.022)	(0.022)	(0.026)	(0.025)	(0.025)	(0.025)	(0.017)	(0.017)	(0.017)	(0.016)	(0.005)	(0.005)	(0.005)	(0.005)
Firm Exposure to Risky FX Borrowers	**-0.011*** **	**-0.011*** **	**-0.011*** **	**-0.011*** **	**-0.001**	**-0.001**	**-0.001**	**-0.001**	**-0.015*** **	**-0.015*** **	**-0.014*** **	**-0.014*** **	**-0.004**	**-0.004**	**-0.003**	**-0.002**	**0.000**	**0.000**	**0.000**	**0.000**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)	(0.005)	(0.001)	(0.001)	(0.001)	(0.001)
Customers' Net Open FX Position	**-0.040*** **	**-0.040*** **	**-0.033*** **	**-0.035*** **	**-0.050*** **	**-0.054*** **	**-0.050*** **	**-0.051*** **	**-0.098*** **	**-0.104*** **	**-0.094*** **	**-0.096*** **	**-0.154*** **	**-0.126*** **	**-0.101*** **	**-0.107*** **	**-0.028*** **	**-0.025*** **	**-0.023*** **	**-0.023*** **
	(0.008)	(0.009)	(0.009)	(0.009)	(0.013)	(0.015)	(0.016)	(0.016)	(0.017)	(0.017)	(0.016)	(0.016)	(0.032)	(0.023)	(0.024)	(0.025)	(0.004)	(0.005)	(0.005)	(0.005)
Suppliers' Net Open FX Position		**0.002**	**0.004**	**0.012**		**0.024**	**0.025**	**0.028**		**0.031**	**0.035**	**0.048** **		**-0.159*** **	**-0.150*** **	**-0.112***		**-0.020**	**-0.019**	**-0.015**
		(0.010)	(0.009)	(0.010)		(0.031)	(0.032)	(0.033)		(0.021)	(0.022)	(0.020)		(0.054)	(0.051)	(0.057)		(0.013)	(0.013)	(0.013)
Customers' Exposure to Risky FX Borrowers			**-0.004*** **	**-0.003*** **			**-0.002**	**-0.002**			**-0.006***	**-0.004**			**-0.016*** **	**-0.012*** **			**-0.001**	**-0.001**
			(0.001)	(0.001)			(0.003)	(0.003)			(0.003)	(0.003)			(0.003)	(0.002)			(0.001)	(0.001)
Suppliers' Exposure to Risky FX Borrowers				**-0.003** **				**-0.001**				**-0.004** **				**-0.016*** **				**-0.002**
				(0.001)				(0.001)				(0.002)				(0.006)				(0.001)
Firm Size	**-0.038*** **	**-0.038*** **	**-0.038*** **	**-0.038*** **	**0.003**	**0.003**	**0.003**	**0.003**	**-0.023*** **	**-0.023*** **	**-0.023*** **	**-0.023*** **	**-0.064*** **	**-0.064*** **	**-0.064*** **	**-0.065*** **	**-0.004***	**-0.004***	**-0.005***	**-0.005***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.006)	(0.006)	(0.006)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)	(0.003)
Firm Leverage Ratio	**-0.016** **	**-0.016** **	**-0.016** **	**-0.016** **	**0.017**	**0.017**	**0.017**	**0.017**	**0.122*** **	**0.122*** **	**0.122*** **	**0.122*** **	**-0.077*** **	**-0.077*** **	**-0.077*** **	**-0.077*** **	**-0.018*** **	**-0.017*** **	**-0.017*** **	**-0.017*** **
	(0.007)	(0.007)	(0.007)	(0.007)	(0.014)	(0.014)	(0.014)	(0.014)	(0.033)	(0.033)	(0.033)	(0.033)	(0.007)	(0.007)	(0.007)	(0.007)	(0.003)	(0.003)	(0.003)	(0.003)
Exporter Firm	**0.049*** **	**0.049*** **	**0.049*** **	**0.049*** **	**0.030** **	**0.030** **	**0.030** **	**0.030** **	**0.067*** **	**0.067*** **	**0.067*** **	**0.067*** **	**0.136*** **	**0.134*** **	**0.133*** **	**0.134*** **	**0.020*** **	**0.020*** **	**0.020*** **	**0.020*** **
	(0.004)	(0.004)	(0.004)	(0.004)	(0.012)	(0.012)	(0.012)	(0.012)	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)	(0.008)	(0.005)	(0.005)	(0.005)	(0.005)
Industry-City Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	212,399	212,399	212,399	212,399	198,537	198,537	198,537	198,537	138,222	138,222	138,222	138,222	215,705	215,705	215,705	215,705	212,399	212,399	212,399	212,399
R-squared	0.040	0.040	0.040	0.040	0.029	0.029	0.029	0.029	0.038	0.038	0.038	0.038	0.020	0.020	0.020	0.020	0.036	0.036	0.036	0.036
Change in the dependent variable for firm *f* …																				
… with 1 std. higher net open FX position	-2.24	-2.24	-2.26	-2.26	-2.26	-2.31	-2.31	-2.31	-1.80	-1.85	-1.88	-1.88	-2.67	-2.34	-2.39	-2.42	-0.64	-0.59	-0.59	-0.59
Financial Linkages																				
… with 1 std. higher bank Exposure to Risky FX Borrowers	-0.92	-0.92	-0.92	-0.92	-0.08	-0.08	-0.08	-0.08	-1.25	-1.25	-1.17	-1.17	-0.33	-0.33	-0.25	-0.17	0.00	0.00	0.00	0.00
Real Linkages																				
Downstream Effects:																				
… with 1 std. higher weighted average NOP of customer firms	-0.73	-0.73	-0.60	-0.64	-0.92	-0.99	-0.92	-0.93	-1.79	-1.90	-1.72	-1.76	-2.82	-2.31	-1.85	-1.96	-0.51	-0.46	-0.42	-0.42
Upstream Effects:																				
… with 1 std. higher weighted average NOP of supplier firms		0.03	0.05	0.15		0.31	0.32	0.36		0.40	0.45	0.61		-2.04	-1.92	-1.43		-0.26	-0.24	-0.19
Indirect Financial Linkages (through Real Linkages)																				
Downstream Effects:																				
… with 1 std. higher customer bank Exposure to Risky FX Borrowers			-0.49	-0.37			-0.25	-0.25			-0.74	-0.49			-1.97	-1.48			-0.12	-0.12
Upstream Effects:																				
… with 1 std. higher supplier bank Exposure to Risky FX Borrowers				-0.34				-0.11				-0.45				-1.81				-0.23

Notes: This table shows the firm-level estimation results for the Large Sample (that includes all firms that borrow from at least one bank in December 2017). "Customers' Net Open FX Position" is the weighted average NOP of customers of a firm (where weights are based on the year 2017). Similarly, "Suppliers' Net Open FX Position" is the weighted average of suppliers of a firm (again, the weights are based on the year 2017). "Customers' Exposure to Risky FX Borrowers" is the firm-level weighted average of customer firms' Bank Exposure to Risky FX Borrowers. "Suppliers' Exposure to Risky FX Borrowers" is the firm-level weighted average of supplier firms' Bank Exposure to Risky FX Borrowers. "Yes" indicates that corresponding fixed effects is included. Standard errors are double clustered at industry and city level, and are given in parentheses.*** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 11: Financial Spillovers Lead to Adverse Real Effects: Mechanism

Dependent Variable:	Δ Trade Receivables from Customers				Δ Trade Payables to Suppliers			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Net Open FX Position	**-0.121*****	**-0.119*****	**-0.115*****	**-0.116*****	**-0.103*****	**-0.100*****	**-0.090*****	**-0.089*****
	(0.012)	(0.013)	(0.013)	(0.014)	(0.020)	(0.021)	(0.023)	(0.023)
Firm Exposure to Risky FX Borrowers		**-0.009*****	**-0.009*****	**-0.009*****		**-0.014*****	**-0.013*****	**-0.013*****
		(0.003)	(0.003)	(0.003)		(0.003)	(0.003)	(0.004)
Customers' Net Open FX Position			**-0.039****	**-0.042****			**-0.097*****	**-0.095*****
			(0.018)	(0.019)			(0.023)	(0.023)
Suppliers' Net Open FX Position				**0.013**				**-0.011**
				(0.019)				(0.028)
Firm Size	**-0.052*****	**-0.052*****	**-0.053*****	**-0.053*****	**-0.031*****	**-0.031*****	**-0.032*****	**-0.032*****
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Firm Leverage Ratio	**-0.011**	**-0.011**	**-0.011**	**-0.011**	**-0.069*****	**-0.069*****	**-0.069*****	**-0.069*****
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)
Exporter Firm	**-0.009**	**-0.011**	**-0.012**	**-0.012**	**0.105*****	**0.102*****	**0.099*****	**0.099*****
	(0.013)	(0.014)	(0.013)	(0.013)	(0.011)	(0.012)	(0.011)	(0.011)
Industry-City Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	215,709	215,709	215,709	215,709	215,709	215,709	215,709	215,709
R-squared	0.029	0.029	0.029	0.029	0.023	0.023	0.023	0.023
Change in the dependent variable for firm *f* …								
… with 1 std. higher net open FX position	-3.11	-3.06	-2.96	-2.98	-2.65	-2.57	-2.31	-2.29
Financial Linkages								
… working with banks with 1 std. higher exposure to risky FX borrowers		-0.75	-0.75	-0.75		-1.17	-1.09	-1.09
Real Linkages								
Downstream Effects:								
… with 1 std. higher weighted average NOP of customer firms			-0.71	-0.77			-1.78	-1.74
Upstream Effects:								
… with 1 std. higher weighted average NOP of supplier firms				0.17				-0.14

Notes: "Yes" indicates that corresponding fixed effects is included. Standard errors are double clustered at industry and city level, and are given in parentheses.*** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 12: Financial Spillovers Lead to Adverse Real Effects: Link Level Regressions- Upstream Propagation

Upstream Propagation

Dependent Variable:	Δ log(sales from supplier to customer)	
	(1)	(2)
Customer's Net Open FX Position	**-0.025*** **	**-0.023*** **
	(0.006)	(0.006)
Customer's Exposure to Risky FX Borrowers		**-0.003*** **
		(0.001)
Customer's Firm Size	**-0.004*** **	**-0.005*** **
	(0.001)	(0.001)
Customer's Firm Leverage Ratio	**-0.045*** **	**-0.045*** **
	(0.005)	(0.005)
Customer's Exporter Firm	**0.030*** **	**0.030*** **
	(0.005)	(0.005)
Supplier Fixed Effects	Yes	Yes
Supplier's Industry-City Fixed Effects	Yes	Yes
Customer's Industry-City Fixed Effects	Yes	Yes
Observations	2,012,854	2,012,854
R-squared	0.113	0.113
Change in the dependent variable for firm *f* …		
… with 1 std. higher weighted average NOP of customer firms	-0.82	-0.75
… with 1 std. higher customer bank Exposure to Risky FX Borrowers		-0.68

Notes: "Customers' Net Open FX Position" is the weighted average NOP of customers of a firm. "Customers' Exposure to Risky FX Borrowers" is the firm-level weighted average of customer firms' Bank Exposure to Risky FX Borrowers. "Yes" indicates that corresponding fixed effects is included. Standard errors are double clustered at supplier and customer firm level, and are given in parentheses.*** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 13: Financial Spillovers Lead to Adverse Real Effects: Link Level Regressions- Downstream Propagation

Downstream Propagation

Dependent Variable:	Δ log(sales from supplier to customer)	
	(1)	(2)
Supplier's Net Open FX Position	**-0.005**	**-0.004**
	(0.007)	(0.007)
Supplier's Exposure to Risky FX Borrowers		**-0.001**
		(0.001)
Supplier's Firm Size	**-0.002**	**-0.002**
	(0.001)	(0.002)
Supplier's Firm Leverage Ratio	**-0.028*** **	**-0.028*** **
	(0.009)	(0.009)
Supplier's Exporter Firm	**-0.003**	**-0.003**
	(0.004)	(0.004)
Customer Fixed Effects	Yes	Yes
Supplier's Industry-City Fixed Effects	Yes	Yes
Customer's Industry-City Fixed Effects	Yes	Yes
Observations	2,020,002	2,020,002
R-squared	0.136	0.136
Change in the dependent variable for firm *f* …		
… with 1 std. higher weighted average NOP of supplier firms	-0.14	-0.11
… with 1 std. higher supplier bank Exposure to Risky FX Borrowers		-0.20

Notes: "Suppliers' Net Open FX Position" is the weighted average NOP of suppliers of a firm. "Suppliers' Exposure to Risky FX Borrowers" is the firm-level weighted average of supplier firms' Bank Exposure to Risky FX Borrowers. "Yes" indicates that corresponding fixed effects is included. Standard errors are double clustered at supplier and customer firm level, and are given in parentheses.*** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 14: Extensive Margin

Dependent Variable:	New Lending	Termination
	(1)	(2)
Exposure to Risky FX Borrowers	**-0.505*** **	**0.366*** **
	(0.021)	(0.008)
Capital Adequacy Ratio	**-0.008*** **	**-0.031*** **
	(0.001)	(0.000)
Liquidity Ratio	**-0.002*** **	**-0.008*** **
	(0.000)	(0.000)
Size	**0.054*** **	**-0.085*** **
	(0.005)	(0.003)
NPL Ratio	**0.013**	**0.002**
	(0.010)	(0.003)
ROA	**0.140*** **	**0.027*** **
	(0.015)	(0.008)
Foreign Funding Ratio	**-0.009*** **	**0.009*** **
	(0.000)	(0.000)
FX Loan Share	**0.627*** **	**-0.036***
	(0.027)	(0.022)
Herfindahl by Industry	**-0.004*** **	**0.013*** **
	(0.000)	(0.000)
Strength of Relationship		**-0.019**
		(0.018)
Firm FE	Yes	Yes
Observations	355,005	887,184
R-squared	0.580	0.517
Probability of the outcome variable for a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	-11.31	8.20

Notes: New Lending is the probability of a bank establishing a new lending relationship with a firm that the bank has not been previously working with. Termination is the probability of a bank terminating an existing relationship with a firm. All control variables are measured ex ante (December 2017). "Yes" indicates that corresponding fixed effects is included. "--" indicates that corresponding fixed effects are already absorbed by a wider set of fixed effects or not applicable. Standard errors are clustered at firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 15: Firm Heterogeneity I: Healthy Firms

Dependent Variable:	Log change in real credit	Log change in interest rate	Log change in maturity	Log change in collateral ratio	New Lending	Termination
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel I: Negative or zero NOP Firm			
Exposure to Risky FX Borrowers* Healthy Firm	**0.203*** **	**-0.007**	**0.045**	**0.115*** **	**-0.012**	**-0.081*** **
	(0.040)	(0.012)	(0.035)	(0.034)	(0.024)	(0.013)
Exposure to Risky FX Borrowers	**-1.004*** **	**0.071*** **	**-0.255*** **	**0.683*** **	**-0.312*** **	**0.432*** **
	(0.032)	(0.009)	(0.029)	(0.053)	(0.016)	(0.010)
			Panel II: Less Leveraged Firm			
Exposure to Risky FX Borrowers* Healthy Firm	**-0.027**	**-0.018***	**-0.009**	**0.025**	**-0.032**	**0.034*** **
	(0.036)	(0.010)	(0.032)	(0.028)	(0.022)	(0.012)
Exposure to Risky FX Borrowers	**-0.935*** **	**0.078*** **	**-0.238*** **	**0.704*** **	**-0.299*** **	**0.394*** **
	(0.035)	(0.009)	(0.031)	(0.054)	(0.018)	(0.011)
			Panel III: More Profitable Firm			
Exposure to Risky FX Borrowers* Healthy Firm	**0.101*** **	**-0.020** **	**0.090*** **	**0.119*** **	**-0.009**	**-0.030** **
	(0.037)	(0.010)	(0.033)	(0.028)	(0.022)	(0.012)
Exposure to Risky FX Borrowers	**-1.005*** **	**0.081*** **	**-0.294*** **	**0.647*** **	**-0.311*** **	**0.427*** **
	(0.037)	(0.010)	(0.033)	(0.055)	(0.019)	(0.012)
			Panel IV: Firm Size			
Exposure to Risky FX Borrowers* Firm Size	**0.089*** **	**-0.018*** **	**0.032*** **	**0.052*** **	**0.025*** **	**-0.068*** **
	(0.012)	(0.003)	(0.010)	(0.016)	(0.004)	(0.004)
Exposure to Risky FX Borrowers	**-2.366*** **	**0.350*** **	**-0.755*** **	**-0.120**	**-0.710*** **	**1.486*** **
	(0.191)	(0.054)	(0.168)	(0.263)	(0.070)	(0.064)
			Panel V: Firm Export Ratio			
Exposure to Risky FX Borrowers* Firm Export Ratio	**0.287*** **	**-0.034**	**-0.004**	**0.445*** **	**0.063**	**-0.159*** **
	(0.096)	(0.032)	(0.083)	(0.116)	(0.053)	(0.032)
Exposure to Risky FX Borrowers	**-0.962*** **	**0.069*** **	**-0.240*** **	**0.686*** **	**-0.323*** **	**0.416*** **
	(0.031)	(0.008)	(0.028)	(0.052)	(0.013)	(0.010)
Firm FE	--	--	--	--	Yes	Yes
Firm x Currency FE	Yes	Yes	Yes	Yes	--	--
Observations	225,275	219,170	209,055	195,054	109,676	334,443

Notes: "Healthy Firm" is an indicator variable that takes a value 1 if the firm has negative or zero NOP (Panel I), its leverage ratio (total debt-to-total assets ratio) is below the median (Panel II), or its profitability (net profits-to-total sales) is higher than the median (Panel III). All these indicator variables are measured ex-ante (December 2017). Firm size is log of total assets of the firm and Firm Export Ratio is the ratio of total exports-to-total sales of the firm (both measured in December 2017). Each panel is based on re-estimating the baseline model (equation (3)) that additionally includes the interaction of bank Exposure to Risky FX Borrowers with the Healthy Firm indicator variable (Panels I-III) or firm size or export ratio (Panels IV and V, respectively). The set of control variables is the same as in baseline model (see, e.g, Table 3), and not reported for brevity. "Yes" indicates that corresponding fixed effects is included. "--" indicates that corresponding fixed effects are already absorbed by a wider set of fixed effects or not applicable. Standard errors are clustered at firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 16: Firm Heterogeneity II: Connected Firms

Dependent Variable:	Log change in real credit	Log change in interest rate	Log change in maturity	Log change in collateral ratio	New Lending	Termination
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel I: Number of Connected Firms					
Exposure to Risky FX Borrowers$_b$ * Number of Connected Firms$_f$	**0.157*** **	**-0.016*** **	**0.075*** **	**0.118*** **	**0.021*** **	**-0.092*** **
	(0.016)	(0.005)	(0.014)	(0.017)	(0.007)	(0.005)
Exposure to Risky FX Borrowers$_b$	**-1.647*** **	**0.137*** **	**-0.576*** **	**0.182** **	**-0.409*** **	**0.807*** **
	(0.078)	(0.023)	(0.068)	(0.090)	(0.032)	(0.025)
	Panel II: additionally controlling for firm characteristics at the interaction					
Exposure to Risky FX Borrowers$_b$ * Number of Connected Firms$_f$	**0.153*** **	**0.006**	**0.096*** **	**0.152*** **	**-0.008**	**-0.046*** **
	(0.025)	(0.007)	(0.022)	(0.022)	(0.009)	(0.007)
Exposure to Risky FX Borrowers	**-1.725*** **	**0.344*** **	**-0.366***	**0.732** **	**-0.784*** **	**1.341*** **
	(0.231)	(0.063)	(0.205)	(0.300)	(0.073)	(0.072)
Exposure to Risky FX Borrowers$_b$ * Firm Size$_f$	**0.001**	**-0.020*** **	**-0.020**	**-0.039***	**0.028*** **	**-0.043*** **
	(0.018)	(0.005)	(0.016)	(0.022)	(0.005)	(0.005)
Exposure to Risky FX Borrowers$_b$ * Firm Export Ratio$_f$	**0.205** **	**-0.010**	**-0.030**	**0.410*** **	**0.025**	**-0.078** **
	(0.098)	(0.032)	(0.084)	(0.113)	(0.053)	(0.033)
Exposure to Risky FX Borrowers$_b$ * Firm Leverage$_f$	**0.085**	**0.035**	**0.025**	**-0.135***	**0.062*** **	**-0.054** **
	(0.076)	(0.023)	(0.072)	(0.070)	(0.018)	(0.025)
Firm FE	--	--	--	--	Yes	Yes
Firm x Currency FE	Yes	Yes	Yes	Yes	--	--
Observations	220,336	214,454	204,825	191,142	140,151	325,165

Notes: Number of Connected Firms is the total number of customers *and* suppliers of each firm (results are robust to studying total number of suppliers *or* customers separately). Each panel is based on re-estimating the baseline model (equation (3)) that additionally includes the interaction of bank Exposure to Risky FX Borrowers with the Number of Connected Firms. The set of control variables is the same as in baseline model (see, e.g, Table 3), and not reported for brevity. "Yes" indicates that corresponding fixed effects is included. "--" indicates that corresponding fixed effects are already absorbed by a wider set of fixed effects or not applicable. Standard errors are clustered at firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 17: Firm Heterogeneity III: Customers' or Suppliers' Net Open FX Position

Dependent Variable:	Log change in real credit			Log change in interest rate			Log change in maturity			Log change in collateral ratio		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Exposure to Risky FX Borrowers$_b$ * Customers' Net Open FX Position$_f$	**-0.306*****		**-0.255****	**0.150*****		**0.097*****	**-0.097**		**-0.039**	**-0.712*****		**-0.491*****
	(0.094)		(0.101)	(0.031)		(0.034)	(0.081)		(0.086)	(0.097)		(0.106)
Exposure to Risky FX Borrowers$_b$ * Suppliers' Net Open FX Position$_f$		**-0.328****	**-0.202**		**0.263*****	**0.215*****		**-0.252****	**-0.232***		**-1.132*****	**-0.893*****
		(0.137)	(0.147)		(0.044)	(0.047)		(0.128)	(0.136)		(0.115)	(0.126)
Exposure to Risky FX Borrowers$_b$	**-0.874*****	**-0.871*****	**-0.879*****	**0.278*****	**0.280*****	**0.283*****	**-0.408*****	**-0.412*****	**-0.414*****	**0.397*****	**0.389*****	**0.369*****
	(0.025)	(0.025)	(0.025)	(0.008)	(0.008)	(0.008)	(0.023)	(0.023)	(0.023)	(0.049)	(0.049)	(0.049)
Firm x Currency FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	518,536	518,536	518,536	499,698	499,698	499,698	487,285	487,285	487,285	320,182	320,182	320,182
R-squared	0.439	0.439	0.439	0.519	0.519	0.519	0.420	0.420	0.420	0.452	0.452	0.452

Notes:"Customers' Net Open FX Position" is the weighted average NOP of customers of a firm (where weights are based on the year 2017). Similarly, "Suppliers' Net Open FX Position" is the weighted average of suppliers of a firm (again, the weights are based on the year 2017). The set of control variables is the same as in baseline model (see, e.g, Table 3), and not reported for brevity. "Yes" indicates that corresponding fixed effects is included. Standard errors are clustered at firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 18: Foreign Currency Loans

Dependent Variable:	Log change in real credit	Log change in interest rate	Log change in maturity	Log change in collateral ratio	Prob. of New Lending	Prob. of Termination
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure to Risky FX Borrowers* FX Loan	**0.280*** **	**-0.085*** **	**0.050**	**0.427*** **		
	(0.070)	(0.024)	(0.057)	(0.115)		
Exposure to Risky FX Borrowers	**-0.895*** **	**0.272*** **	**-0.412*** **	**0.480*** **	**0.001**	**0.237*** **
	(0.024)	(0.008)	(0.022)	(0.048)	(0.001)	(0.038)
FX Loan	**-0.271*** **	**-0.055*** **	**-0.135*** **	**-0.144*** **		
	(0.016)	(0.005)	(0.012)	(0.014)		
Capital Adequacy Ratio	**0.040*** **	**0.006*** **	**0.041*** **	**-0.003**	**0.000** **	**-0.007** **
	(0.001)	(0.000)	(0.001)	(0.002)	(0.000)	(0.003)
Liquidity Ratio	**-0.020*** **	**0.004*** **	**-0.005*** **	**-0.117*** **	**-0.000*** **	**0.009*** **
	(0.001)	(0.000)	(0.001)	(0.003)	(0.000)	(0.001)
Size	**0.191*** **	**-0.070*** **	**0.204*** **	**-0.329*** **	**-0.000**	**-0.067*** **
	(0.007)	(0.002)	(0.006)	(0.017)	(0.000)	(0.010)
NPL Ratio	**0.161*** **	**-0.151*** **	**0.190*** **	**-0.863*** **	**-0.003*** **	**-0.025** **
	(0.011)	(0.005)	(0.012)	(0.039)	(0.000)	(0.011)
ROA	**0.181*** **	**-0.238*** **	**-0.034***	**-1.085*** **	**-0.003*** **	**-0.022**
	(0.021)	(0.008)	(0.019)	(0.049)	(0.001)	(0.030)
Foreign Funding Ratio	**-0.014*** **	**-0.003*** **	**-0.006*** **	**0.005*** **	**0.000**	**-0.002** **
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
FX Loan Share	**0.002*** **	**-0.000*** **	**0.001*** **	**0.020*** **	**0.001**	**-0.211*** **
	(0.001)	(0.000)	(0.000)	(0.001)	(0.003)	(0.064)
Herfindahl by Industry	**0.004*** **	**0.000*** **	**0.001*** **	**-0.013*** **	**-0.000*** **	**0.002** **
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
Strength of Relationship	**0.016**	**-0.009**	**0.016**	**0.183*** **		**-0.014**
	(0.031)	(0.006)	(0.028)	(0.064)		(0.010)
Firm FE	--	--	--	--	Yes	Yes
Firm x Currency FE	Yes	Yes	Yes	Yes	--	--
Observations	524,867	505,914	493,489	326,279	1,681,765	20,093
R-squared	0.427	0.509	0.413	0.104	0.424	0.468
Chage in the outcome variable for a bank with 1 std. higher ex-ante exposure to risky FX borrowers for FX vs. TL loans (in %)	6.27	-1.79	1.12	9.56	0.02	5.31

Notes: FX Loan is an indicator variable that takes a value 1 if the loan is denominated in foreign currency, and 0 otherwise. "Yes" indicates that corresponding fixed effects is included. "--" indicates that corresponding fixed effects are already absorbed by a wider set of fixed effects or not applicable. Standard errors are clustered at firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 19: Foreign Banks

Dependent Variable:	Log change in real credit	Log change in interest rate	Log change in maturity	Log change in collateral ratio	Prob. of New Lending	Prob. of Termination
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure to Risky FX Borrowers* Foreign Bank	**0.808*** **	**-0.208*** **	**-0.689*** **	**5.440*** **	**0.462*** **	**-0.019**
	(0.056)	(0.018)	(0.048)	(0.096)	(0.021)	(0.019)
Exposure to Risky FX Borrowers	**-1.539*** **	**0.363*** **	**-0.406*** **	**-1.222*** **	**-0.641*** **	**0.516*** **
	(0.035)	(0.012)	(0.031)	(0.068)	(0.019)	(0.011)
Foreign Banks	**0.318*** **	**-0.021*** **	**0.181*** **	**-0.513*** **	**0.001**	**-0.120*** **
	(0.009)	(0.003)	(0.008)	(0.014)	(0.004)	(0.003)
Capital Adequacy Ratio	**-0.002**	**0.009*** **	**0.023*** **	**0.035*** **	**-0.011*** **	**-0.016*** **
	(0.002)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Liquidity Ratio	**0.020*** **	**0.000**	**0.003** **	**-0.073*** **	**0.002*** **	**-0.018*** **
	(0.002)	(0.001)	(0.002)	(0.004)	(0.001)	(0.001)
Size	**0.203*** **	**-0.075*** **	**0.166*** **	**0.069*** **	**0.062*** **	**-0.077*** **
	(0.008)	(0.003)	(0.006)	(0.019)	(0.005)	(0.003)
NPL Ratio	**0.124*** **	**-0.153*** **	**0.139*** **	**-0.331*** **	**0.013**	**0.026*** **
	(0.012)	(0.005)	(0.012)	(0.024)	(0.010)	(0.004)
ROA	**0.024**	**-0.214*** **	**0.006**	**-1.277*** **	**0.095*** **	**0.054*** **
	(0.024)	(0.008)	(0.019)	(0.054)	(0.015)	(0.009)
Foreign Funding Ratio	**-0.012*** **	**-0.005*** **	**-0.016*** **	**0.072*** **	**-0.005*** **	**0.011*** **
	(0.001)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
FX Loan Share	**0.006*** **	**-0.001*** **	**0.007*** **	**0.001**	**0.565*** **	**-0.304*** **
	(0.001)	(0.000)	(0.001)	(0.001)	(0.025)	(0.023)
Herfindahl by Industry	**0.015*** **	**-0.000*** **	**0.005*** **	**-0.015*** **	**-0.003*** **	**0.010*** **
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Strength of Relationship	**-0.004**	**-0.008***	**0.002**	**0.310*** **		**-0.014**
	(0.012)	(0.005)	(0.019)	(0.068)		(0.014)
Firm FE	--	--	--	--	Yes	Yes
Firm x Currency FE	Yes	Yes	Yes	Yes	--	--
Observations	524,867	505,914	493,489	326,279	355,005	887,184
R-squared	0.429	0.509	0.414	0.482	0.581	0.519
Chage in the dependent variable for a bank with 1 std. higher ex-ante exposure to risky FX borrowers for Foreign vs. Domestic bank	18.10	-4.48	-15.43	121.86	10.35	-0.22

Notes: "Foreign Bank" is an indicator variable that takes a value 1 if the bank is a foreign subsidiary, and 0 otherwise. "Yes" indicates that corresponding fixed effects is included. "--" indicates that corresponding fixed effects are already absorbed by a wider set of fixed effects or not applicable. Standard errors are clustered at firm level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Table 20: Bank Heterogeneity: Further Dimensions

Dependent Variable:	Log change in real credit	Log change in interest rate	Log change in maturity	Log change in collateral ratio	Prob. of New Lending	Prob. of Termination
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure to Risky FX Borrowers * Capital Adequacy Ratio	**0.329*** **	**-0.068*** **	**0.004**	**0.834*** **	**0.097*** **	**-0.125*** **
	(0.013)	(0.004)	(0.010)	(0.024)	(0.008)	(0.004)
Exposure to Risky FX Borrowers * Foreign Funding Ratio	**-0.025*** **	**0.013*** **	**-0.004**	**0.579*** **	**-0.012*** **	**0.004** **
	(0.005)	(0.002)	(0.004)	(0.045)	(0.002)	(0.002)
Exposure to Risky FX Borrowers * Liquidity Ratio	**-0.159*** **	**0.039*** **	**-0.047*** **	**0.606*** **	**-0.026*** **	**0.030*** **
	(0.012)	(0.005)	(0.008)	(0.093)	(0.004)	(0.003)
Exposure to Risky FX Borrowers * Size	**-0.621*** **	**0.214*** **	**-0.189*** **	**1.482*** **	**-0.132*** **	**0.253*** **
	(0.020)	(0.006)	(0.016)	(0.030)	(0.008)	(0.006)
Exposure to Risky FX Borrowers * NPL Ratio	**0.763*** **	**-0.096*** **	**0.252*** **	**-4.751*** **	**0.070*** **	**-0.267*** **
	(0.039)	(0.014)	(0.037)	(0.149)	(0.006)	(0.013)
Exposure to Risky FX Borrowers * ROA	**-0.367*** **	**0.212*** **	**-0.994*** **	**12.758*** **	**0.015**	**0.339*** **
	(0.079)	(0.026)	(0.069)	(0.149)	(0.061)	(0.027)
Exposure to Risky FX Borrowers * FX Loan Share	**-0.101*** **	**0.024*** **	**-0.034*** **	**0.100*** **	**-2.520*** **	**4.006*** **
	(0.002)	(0.001)	(0.002)	(0.003)	(0.107)	(0.081)

Notes: Each entry is based on a separate regression. For instance, for the first row and first column, we estimate the baseline regression model (the most saturated specification in Table 3) by additionally including the interaction term "Exposure to Risky FX Borrowers * Capital Adequacy Ratio". For other interaction terms and dependent variables, we followed a similar procedure (including the respective interaction term as an additional variable to the regression (Table 4 column (5), Table 5 columns (3) and (6), and Table 12 columns (1) and (2)). As in the baseline, standard errors are clustered at firm level, and given in parentheseses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Appendix

Table A.1: Mechanism: Foreign Firms

Dependent Variable:	Probability of Future Loan Default (over the next 12 months)
Firm Net Open FX Position	**0.018*** **
	(0.003)
Foreign Firm	**-0.035*** **
	(0.012)
Firm Net Open FX Position * Foreign Firm	**-0.088**
	(0.079)
Firm Exposure to Risky FX Borrowers	**0.000**
	(0.002)
Firm Exposure to Risky FX Borrowers * Foreign Firm	**0.004**
	(0.013)
Firm Size	**0.000**
	(0.001)
Firm Leverage Ratio	**0.006*** **
	(0.001)
Exporter Firm	**-0.015*** **
	(0.002)
Industry-City Fixed Effects	Yes
Observations	249,120
R-squared	0.053
Probability of future default of a foreign firm compared to a domestically-owned firm (in %)	-3.50
Probability of future default of a firm with 1 std. higher NOP for foreign vs domestically-owned firm	-2.38

Notes: Foreign firm is a dummy variable taking a value 1 if the firm is owned by a foreign entity, 0 otherwise. "Yes" indicates that corresponding fixed effects is included. Standard errors are clustered at industry and city level and given in parantheses.*** Significant at 1%, ** significant at 5%, and * significant at 10%.