Essays on Banking, International Finance and Monetary Policy

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To my parents and my sisters

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Abstract

This thesis contributes to the empirical literature that analyses the link between banking, international finance and monetary policy. It studies several micro-level supervisory databases, each crucial for identification. The first chapter shows that global liquidity limits the effectiveness of local monetary policy on credit markets. The mechanism is via a bank carry trade in international markets when local monetary policy tightens. The second chapter shows 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. Firms connected to foreign-currency indebted firms experience binding tightening in bank credit supply, lower firm-to-firm trade, and more adverse real outcomes. The third chapter shows that forward guidance policies of Fed and ECB have spillovers in emerging markets' credit cycles. The mechanism is via banks' foreign currency cross-border liabilities.

Resumen

Esta tesis contribuye a la literatura empírica que analiza el vínculo entre banca, finanzas internacionales y política monetaria. Estudia varias bases de datos de supervisión a nivel micro, cada una de las cuales es crucial para la identificación. El primer capítulo muestra que la liquidez global limita la efectividad de la política monetaria local en los mercados crediticios. El mecanismo es a través de un *carry trade* bancario en los mercados internacionales cuando la política monetaria local se endurece. El segundo capítulo muestra que la deuda en moneda extranjera sin cobertura conlleva un riesgo que permea la economía, no solo afectando negativamente a las empresas que tienen deuda en moneda extranjera sin cobertura, sino también a otras empresas vinculadas a empresas endeudadas en moneda extranjera. Las empresas conectadas con empresas endeudadas en moneda extranjera experimentan un endurecimiento vinculante en la oferta de crédito bancario, un menor comercio entre empresas y resultados más adversos. El tercer capítulo muestra que las estrategias de *forward guidance* por parte de la Fed y el BCE tienen efectos de contagio en los ciclos crediticios de los mercados emergentes. El mecanismo es a través de los pasivos transfronterizos en moneda extranjera de los bancos.

Preface

This thesis contributes to the empirical literature that analyses the link between banking, international finance and monetary policy. It studies several micro-level supervisory databases, each crucial for identification. The first chapter shows that global liquidity limits the effectiveness of local monetary policy on credit markets. The mechanism is via a bank carry trade in international markets when local monetary policy tightens. For identification, it exploits global (VIX, U.S. monetary policy) shocks and loan-level data —the credit and international interbank registers— from a large emerging market, Turkey. Softer global liquidity conditions attenuate the pass-through of local monetary policy tightening on loan rates, especially for banks with more access to international wholesale markets. Effects are also important for other credit margins and for risk-taking, e.g. riskier borrowers in FX loans or defaults.

The second chapter shows 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. For identification, it uses supervisory transaction-level databases from Turkey, a large emerging market economy with one of the highest level of corporate foreign currency debt, and exploit the sharp Turkish lira depreciation in mid-2018. It studies and identifies two channels: bank lending channel and customer/supplier relationships. Firms connected to foreign-currency indebted firms experience binding tightening in bank credit supply (lower volume, higher loan rate, lower loan maturity and higher collateral coverage), lower firm-to-firm trade, and more adverse real outcomes such as lower investment and employment. A significant portion of the observed drop in investment and employment following the currency depreciation is due to such linkages.

The third chapter shows that forward guidance policies of Fed and ECB have spillovers in emerging markets' credit cycles. The mechanism is via banks' foreign currency cross-border liabilities. For identification, it uses Turkish supervisory data sets –the credit and international interbank registers– and exploits monetary policy expectation shocks for Fed and ECB, as proxies for forward guidance policies. International spillovers of Fed forward guidance policies are stronger than ECB. Tightening expectations for Fed policy contract the supply of credit by banks in Turkey, especially for banks that have more US dollar cross border liabilities. Effects are also important for other credit margins and induce strong firm-level real effects.

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Chapter 1

GLOBAL LIQUIDITY AND IMPAIRMENT OF LOCAL MONETARY POLICY

joint with Salih Fendoğlu *(International Monetary Fund)* and José-Luis Peydró *(Imperial College London, Universitat Pompeu Fabra-ICREA-CREI-Barcelona GSE, CEPR)*

1.1 Introduction

The last few decades have witnessed a dramatic increase in international financial integration. Global external assets have reached almost 200% of the world GDP (Lane and Milesi-Ferretti, 2017), international bank claims have massively risen (Cetorelli and Goldberg, 2012a), especially in dollars (Ivashina, Scharfstein, and Stein, 2015; IMF, 2019b) with global factors gaining further traction in affecting domestic financial conditions (IMF, 2017). Global risk aversion –as proxied by VIX– or US monetary policy are key drivers of the global financial cycle that moves local credit cycles (Miranda-Agrippino and Rey, 2015; Bruno and Shin, 2015; Albagli, Ce-

ballos, Claro, and Romero, 2019). These developments feed into a lively academic and policy debate over to what extent local monetary policy can steer their local credit conditions, even in countries without fixed exchange rates (Rey, 2013; Fischer, 2014; Rajan, 2014; Obstfeld, 2015; Federal Reserve Jackson Hole, 2019). Despite growing academic and policy interest on this debate, well-identified empirical evidence (and the associated mechanisms) is scant.

In this paper, we analyze whether (and if so, why) the transmission of local monetary policy on credit markets is impaired by the global financial cycle. For identification, we exploit global liquidity shocks in conjunction with administrative supervisory datasets from a large emerging market, Turkey. Differently from most central bank registers around the world, which do not have loan-level rates for corporate loans nor complete transaction level data from international wholesale funding, we exploit loan-level data both from the credit register –tracking all loans to firms by Turkish banks, with information on both loan *interest rates* and volume– and the International Interbank Market Register –providing transaction level information on the *universe of cross-border* borrowing by Turkish banks from global lenders, with also information on loan price and volume.

Briefly summarized, our robust results show that softer global liquidity conditions –proxied by lower VIX or softer US monetary policy– attenuate the pass-through of local monetary policy tightening on loan rates, with stronger attenuation effects for banks that borrow ex-ante more from international wholesale markets. The reduction in the effectiveness of local monetary policy is also important for other credit margins and there are key bank risk-taking effects —especially for riskier borrowers in foreign-currency (FX) loans, and with substantial higher ex-post defaults. The mechanism at work is via a carry trade by domestic banks from interna-

tional wholesale funding markets.[1] Therefore, higher risk-taking takes place both on the liabilities and assets side of the bank balance sheet, stemming from foreign currency borrowing from global banks and softening of local loan conditions – a phenomenon that is relatively more pronounced among riskier borrowers.

Following the seminal contribution by Rey (2013), several papers (that we discuss in the literature review) have argued that the global financial cycle may limit the transmission of local monetary policy on local credit markets. As far as we are aware of, our paper is the first that provides causal empirical evidence on this widely-celebrated debate –especially based on complete, administrative micro-datasets, exogenous shocks, and the mechanisms behind–. Our main contribution to the academic literature (and to the policy debate) is to show that global liquidity limits the effectiveness of local monetary policy on credit markets, even via domestic banks in local currency lending, and we uncover the mechanism behind such result. Consistently with recent theoretical insights, we highlight how interest rate differentials drive carry-trade flows on the global wholesale market for banks' financing, thereby reducing the effectiveness of local monetary policy transmission into credit dynamics, especially the pass-through to loan rates.

The remaining part of this Introduction is divided into two parts. First, we provide a detailed preview of the paper. Second, we discuss the related literature and its contrast with our paper.

Preview of the paper. We analyze whether global liquidity conditions affect the degree of local monetary policy transmission to local credit mar-

[1] When local monetary conditions tighten, borrowing in foreign currency becomes relatively cheaper (*violations of the covered interest rate parity* allow profitable arbitrage, also through an investment of such funds in domestic lending). Turkey, like other emerging markets, is characterized by violations of the covered interest parity –which makes cheaper (though riskier) to borrow in dollars in wholesale markets. Related evidence is discussed below.

kets, notably the pass-through to loan rates, as well as the risk-taking channel of monetary policy, including local loans in foreign currency, and the potential mechanism –via domestic banks' carry trade from global lenders in foreign currency in the international wholesale market.

Turkey provides an excellent laboratory to explore the nexus between global liquidity and local monetary policy transmission. First, the banking sector is the main provider of funding for firms (with other sources playing a negligible role), and Turkey is a large emerging market economy subject to foreign shocks, as it has large current account deficits and hence depends on global finance. Second, Turkey has two matched administrative, supervisory datasets crucial to tackle our questions: the Credit Register and the International Interbank Market Register.

We exploit the Credit Register (CR) of Turkey, that provides extensive information on virtually all loans granted by all banks operating in Turkey. By exploiting the CR, we overcome a key identification challenge –namely, that global liquidity and local monetary conditions affect at the same time borrower (firm) and lender (bank) balance sheet conditions. By using firm×time fixed effects in loan-level regressions, we focus on within-firm variations in credit conditions across differently exposed banks (as in Khwaja and Mian, 2008; Jimenez, Ongena, Peydro, and Saurina, 2014). Importantly, the Turkish CR has loan-level interest rates, different from most credit registers owned by central banks around the world and crucial for our question. As in Baskaya, di Giovanni, Kalemli-Ozcan, Peydro, and Ulu (2017), our analysis focuses on domestic banks, as they are especially impacted by local monetary conditions, and have a more difficult access to global funds relatively to foreign banks.[2] Moreover, domestic banks rely significantly on cross-border foreign currency funds. Their non-core

[2]Results are similar if we include foreign banks. Results are also similar if we use all firms and/or not firm fixed effects.

foreign-currency liabilities are 114% of their capital (13% of their asset size), and such liabilities move in tandem with global liquidity conditions (Figure 1.1).

To identify the underlying mechanism, we exploit a new register, the International Interbank Market Register (IIMR), which provides transaction-level information on the universe of domestic banks' cross border borrowing from global lenders (banks and other financial intermediaries). For example, a tighter local monetary policy (or softer global liquidity conditions) may render cross-border borrowing less costly for domestic banks; in turn, domestic banks, particularly the ones with higher ex-ante foreign-currency liabilities, may demand more funds from abroad (a bank carry trade), eventually affecting the degree of monetary policy transmission. IIMR contains the following information at the transaction level: interest rate charged, volume, maturity, date of origination, currency of denomination, unique identifiers for the borrower (domestic bank) and the lender (global bank), and the country where the headquarter of the lender resides. Therefore, by exploiting the highly granular IIMR, we can identify the mechanism by absorbing international liquidity supply-side effects by considering within-global-bank variations to Turkish banks' cross-border credit demand. Moreover, we match the two supervisory registers with supervisory bank balance sheets and income statements.

For global liquidity shocks, we use the VIX (a proxy of global risk aversion) as our benchmark global liquidity indicator following the large strand of literature that takes the VIX as a historically strong and robust factor that reflects the global financial cycle.[3] Moreover, given that international spillovers originating from the US monetary policy have received special

[3] See, e.g., Forbes and Warnock (2012), Fratzscher (2012), Miranda-Agrippino and Rey (2015), Bruno and Shin (2015), di Giovanni et al. (2018), among many others.

interest in the literature and policy circles, and owing to the fact that the US dollar plays a key role in global financial markets,[4] we also use the Federal Reserve's balance sheet size (or the US monetary base (Morais, Peydro, Roldan-Pena, and Ruiz-Ortega, 2019)), the shadow Federal Funds rate (Wu and Xia, 2016) and US monetary policy surprises (Gertler and Karadi, 2015; Jarocinski and Karadi, 2019).

Our results are as follows. First, we show that banks with higher access to global liquidity (proxied by higher ex-ante degree of reliance on foreign-currency wholesale non-core funding) raise their loan rates to local firms significantly less following a local monetary policy tightening. The effect is not only statistically significant but also economically large. After a 100-basis-points tightening in the local monetary policy rate, banks at the 3^{rd} quartile of non-core foreign currency liabilities-to-total-assets ratio (which we call for brevity as globally-funded or high foreign funding domestic banks) raise their loan rate on a similar type of loan to a given firm by 39 basis points less (compared to banks at the 1^{st} quartile). This estimated effect is economically sizeable as the average within-firm standard deviation of loan rates, which corresponds to our level of identification, is 206 basis points. Not only do we control for firm×time fixed effects in the benchmark regressions, but we also control for other characteristics which are important for the bank lending channel of monetary policy, notably bank capital, liquidity and size (Kashyap and Stein, 2000; Jimenez, Ongena, Peydro, and Saurina, 2012). Interestingly, the estimated coefficient is statistically identical if we do not control for any firm, bank or loan control compared to saturating the regression with observable controls and many different sets of fixed effects (that in-

[4] See, e.g., Rey (2013), Ivashina, Scharfstein, and Stein (2015), Hofmann, Shim, and Shin (2017), Buch, Bussiere, and Hills (2018), IMF (2019b), Morais, Peydro, Roldan-Pena, and Ruiz-Ortega (2019), Albagli, Ceballos, Claro, and Romero (2019) and Bräuning and Ivashina (2020).

creases the R-squared by almost 60 percentage points), thereby suggesting that our main variables of interest are exogenous to the firm balance sheet channel (demand) and other bank supply mechanisms (Altonji, Elder, and Taber, 2005; Oster, 2019).

Second, and more importantly, we find that softer global liquidity conditions directly weaken the transmission of a local monetary policy tightening. In particular, we find that softer global liquidity conditions lead ex-ante more globally-funded domestic banks to raise their loan rates significantly less after a local monetary policy tightening. The result is robust across all proxies for global liquidity conditions. Economically, when there is a reduction in VIX of one standard deviation, banks that ex-ante rely more on foreign funding set 57 basis points lower loan rate for a given firm following a 100-basis-points local monetary policy tightening.[5] We obtain similar results when we consider higher Federal Reserve balance sheet size, higher US monetary base, lower US shadow interest rate, or unexpected easing in the US monetary policy as alternative indicators of softer global liquidity conditions (the economic impacts are 44, 46, 40, and 50 basis points given a one-standard-deviation easing in the respective global liquidity variable).

Our findings also point to overall laxer credit standards by globally-funded banks. Following a local monetary policy tightening, banks with higher ex-ante foreign funding reduce their supply of credit less mildly, are more likely to extend longer term credit, and are less likely to ask for collateral, with these effects being stronger when global liquidity conditions are softer. That is, not only there is a reduction in the pass-through to loan rates but also to other credit terms. Effects are nonetheless stronger

[5] By banks that rely more on foreign funding, we mean banks at the 3^{rd} quartile of the distribution of non-core foreign-currency liabilities-to-total assets ratio (which is 16.42) compared to banks at the 1^{st} quartile (8.99). The results are economically stronger when we focus on loans at the origination (newly originated loans).

for loan interest rates than for other credit margins.

Third, we document that the global liquidity channel spurs banks' risk-taking (even after a local monetary policy tightening). When global liquidity conditions are softer, the increase in loan rates by globally-funded domestic banks is lower for ex-ante riskier (than safer) borrowers in FX loans (by 5 to 10 basis points after a 100-basis-points local monetary policy tightening), with stronger results for newly-originated loans.[6] Moreover, firms that were granted a loan from a globally-funded domestic bank when global liquidity conditions are softer are 32% more likely to default over the following year (after a local monetary policy tightening, compared to average probability of future default); effects are even stronger among foreign-currency borrowers, whose probability of default increases by a factor of 42% relative to the average. In addition, riskier firms are more likely to switch to globally-funded banks after a local monetary policy tightening.

Finally, we explore the mechanism driving our results. Controlling for global bank (supply side) effects (by including lender-bank-headquarter's country×time or lender-bank×time fixed effects), we find that globally-funded *domestic* banks perform a carry trade following a local policy tightening. In particular, domestic banks with higher ex-ante foreign funding-to-total assets ratio raise their foreign-currency wholesale borrowing from abroad by 1% more following a 100-basis-points tightening in the local monetary policy. Equally importantly, following a local monetary policy tightening, banks with higher foreign funding tap cheap foreign currency funding to earn higher yield on Turkish assets.[7] In particular, the interest

[6] For Turkish lira loans, we also find differential risk-taking effects though less robust statistically than for FX loans.

[7] In the case of the Turkish Lira, systematic deviations from covered interest rate parity (CIRP) happened throughout most of our sample. Indeed, Du and Schreger (2016) compare 5-year government bonds yields for US and Turkey from 2005 to 2015 and find that they reflect substantial departures from CIRP. Similarly, Duran and Küçüksaraç

differential that they face, the spread between average domestic interest rates (on Turkish domestic currency treasury bills) and the transaction-level cross-border borrowing rate rises (by 5 basis points), with stronger effects when the VIX is lower (by an additional 7 basis points increase in the spread if the VIX is lower by one standard deviation), following a tightening in the local monetary policy (by 100 basis points).

In sum,[8] when there is a tightening of local monetary policy in an environment of soft global financial conditions, globally-funded domestic banks take more risk in their liabilities by borrowing more from foreign financial institutions in foreign currency, and also by softening more their local lending conditions –especially a weaker pass-through to loan rates– and even more to ex-ante riskier borrowers or in FX loans, with substantial higher ex-post loan defaults.

Literature Review. In a seminal contribution, Rey (2013) argues that global risk appetite – affecting liquidity conditions and asset prices across the world – drives cross-border flows and therefore may impair the effectiveness of local monetary policy also in countries with a floating exchange rate –thus breaking the traditional Mundellian trilemma. Other authors have taken a more nuanced view (Obstfeld, 2015; Han and Wei, 2018; Obstfeld, Ostry, and Qureshi, 2019), but while they underline the additional autonomy granted by a flexible exchange rate, they still argue

(2012) reject the CIRP condition focusing on government bonds yields across different maturities along the period from 2008-2012. Hong et al. (2019) include Turkey in a sample of emerging markets for studying the impact of shocks to the cross-currency basis, a common metric for proxying departures from CIRP. We also find similar effects in our sample (not reported). Du and Schreger (2016) and Hong et al. (2019) equally provide evidence against CIRP for other emerging economies. Violations of CIRP takes place also within advanced economies, as shown also by, among the others, Borio et al. (2016) and Du et al. (2018).

[8] Our results are robust to, e.g., studying alternative time horizons for firm loan default to gauge ex-ante or ex-post firm riskiness, using estimated residuals from a Taylor-type rule for the local monetary policy rate, or policy asymmetries (splitting the sample into local policy tightening vs. easing episodes). Effects are in general stronger for tightening (vs. easing) of local monetary policy.

that global liquidity conditions may affect domestic credit dynamics. In general, the notion that financial globalization may hinder the ability of central bankers to control domestic financial conditions has also gained traction among policy-makers (IMF, 2012, 2017).

The existing literature, however, offers little causal empirical evidence based on rich administrative supervisory datasets, thereby documenting the extent of the *influence of global liquidity on the effectiveness of local monetary policy, and the mechanisms behind.* Several studies document the spillovers from global financial centers onto local credit dynamics (e.g. Ioannidou, Ongena, and Peydro, 2015; Buch, Bussiere, and Hills, 2018), often focusing on the transmitting role of multinational banks (Cetorelli and Goldberg, 2012b; Temesvary, Ongena, and Owen, 2018; Morais, Peydro, Roldan-Pena, and Ruiz-Ortega, 2019). We contribute by showing how global liquidity conditions impair the transmission of *local* monetary policy. In fact, we find that banks with higher reliance on wholesale funding in foreign currency exhibit a lower pass-through of variations in local policy rates to their borrowers, and –crucially– this phenomenon heightens during periods of loose global liquidity.

One important and innovative aspect of our study is that even banks with a purely domestic focus in lending are equally responsible for this result and hence for the transmission of international liquidity shocks. Traditionally, attention in the literature has rested predominantly on foreign banks (see, among the others, Giannetti and Laeven, 2012; Schnabl, 2012; Aiyar, Calomiris, Hooley, Korniyenko, and Wieladek, 2014; Cortés and Strahan, 2017; Morais, Peydro, Roldan-Pena, and Ruiz-Ortega, 2019) and investment funds (Jotikasthira, Lundblad, and Ramadorai, 2012).

Moreover, we uncover a mechanism which relies on banks' carry-trading cheap foreign currency financing with (relatively more) expensive domestic lending– either in local or in foreign currency. The carry trade is espe-

cially profitable following a local monetary tightening (and more so after a loosening of global liquidity stance), since they both imply a widening of the interest differential between Turkey and global markets. Covered interest rate parity (CIRP) violations, in turn, open the space for rewarding arbitrage also in the case of almost fully-hedged carry, which is likely to be the predominant case as banks normally hedge their foreign currency exposures (Ivashina, Scharfstein, and Stein, 2015; Bräuning and Ivashina, 2017). The carry-trade mechanism in our paper relates to a recent model by Cavallino and Sandri (2018) –whereby carry-trade capital flows can generate unintended expansionary effects following a local policy rate hike. Also, our findings are consistent with cross-country evidence in Avdjiev, Du, Koch, and Shin (2019), who find that, in accordance with the strength and sign of deviations from CIRP, cross-border bank flows in US dollars expand (diminish) after a depreciation (appreciation) of the US dollar (see also Avdjiev, Koch, McGuire, and von Peter, 2018). Relative to these papers, using complete supervisory data for each international transaction, we follow each step involved in banks' carry trade and highlight the potential relevance of the global interbank market in driving the observed cross-country patterns.[9]

The associated risk-taking via higher global funding in wholesale markets and the stronger effects among riskier foreign currency borrowers link our paper to a relatively large body of literature on the risk-taking channel of monetary policy (see Fishburn and Porter, 1976; Borio and Zhu, 2008; Adrian and Shin, 2010; Allen and Rogoff, 2011; Maddaloni and Peydro, 2011; Diamond and Rajan, 2012; Dell'Ariccia and Marquez, 2013;

[9]In a similar fashion, Allayannis, Brown, and Klapper (2003) and Bruno and Shin (2017) show that large and listed corporations from emerging economies exploit the interest rate differential (relatively to US) when determining the currency structure of their debt. Our analysis of the universe of loans for Turkey shows, however, that shocks to the relative cost of foreign/local currency debt are passed through to nearly *all* companies thanks to banks' intermediation.

Jimenez, Ongena, Peydro, and Saurina, 2014; Dell'Ariccia, Laeven, and Marquez, 2014; Dell'Ariccia, Laeven, and Suarez, 2017; Di Maggio and Kacperczyk, 2017). We contribute to this literature by proposing a new carry-trade based mechanism with different results than the analyses of the risk-taking channel without considering the international dimension. Different from the papers that do not analyze the international dimension (where they find low monetary policy rates increase risk-taking), we find that higher local monetary policy rates increase bank risk-taking both in assets (ex-ante softer lending conditions including pass-through, increase in riskier FX loans, and higher ex-post defaults) and in liabilities (higher borrowing from the international wholesale markets, which is a more fragile source of funding, in foreign currency). Finally, other authors (including Houston, Lin, and Ma, 2012; Ongena, Popov, and Udell, 2013) have focused on the ability of global financial institutions to arbitrage local banking regulation. Our study shows that integration in the global interbank market allows financial institutions –irrespectively of their geographical reach in lending– to partly bypass a local monetary tightening with domestic lending. A globalized interbank market allows therefore financial institutions to arbitrage not only regulation and supervision, but also macroeconomic policy.

The paper proceeds as follows. Section 1.2 presents the data, our empirical strategy, as well as variable definitions and summary statistics. Section 1.3 presents the main findings, including robustness analyses. Section 1.4 briefly concludes.

1.2 Data and Empirical Strategy

1.2.1 Data

The Credit Register of Turkey (CR) provides extensive details on all corporate loans granted by all banks operating in Turkey. The data is collected by the Banking Regulation and Supervision Agency (BRSA), the authority in charge of supervising the Turkish banking system. Banks have to report outstanding loans at a transaction level monthly to the BRSA. In addition to the loan outstanding and unique identifiers for the borrower and the lender, the CR includes loan-level interest rate (absent in most credit registers), currency of denomination, whether the loan is collateralized or not, loan origination and termination dates, and a variable indicating whether the loan is non-performing (90 days overdue). We aggregate the CR at a bank-firm loan-type level for each month.[10]

We confine our interest to domestic (locally-owned) deposit-taking banks, banks for which one could expect a strong degree of local monetary policy transmission. This is not restrictive since such banks extend over 80% of total bank credit in Turkey over our sample period. Moreover, foreign banks' use of global funds may simply reflect headquarter-affiliate adjustments (Cetorelli and Goldberg, 2012a), and thus, may not be readily interpreted as reliance on global liquidity. We therefore exclude foreign banks in our estimations.[11] To avoid data management issues due to large size, we focus on firms tracked by the Central Bank of the Republic of Turkey (CBRT) to monitor developments in the non-financial cor-

[10] In particular, we first classify loans as domestic vs. foreign currency denominated loans, short- (<1 year) vs. long-term (≥1 year) loans, and collateralized vs. non-collateralized loans. In total, we then have 8 loan types. Afterwards, we calculate bank-firm- loan-type level average loan rate at a given month using corresponding loan volumes as weights (i.e., interest rates attached to smaller loans receive lower weights).

[11] The results are robust to including foreign banks in the estimation (available upon request).

porate sector.[12] In total, we have 19 domestic (locally-owned) deposit-taking banks, 21,323 firms -that work with at least two banks-, 795,548 firm-month observations, and 8 loan types (domestic vs. foreign currency, short- vs. long-term, collateralized vs. non-collateralized).

Our second database, which we exploit to uncover the underlying mechanism driving our results, is the International Interbank Market Register (IIMR). The IIMR provides transaction-level details on the universe of domestic banks' cross border borrowing. In particular, for each transaction, the database provides the volume, interest rate charged, date of origination and termination, currency of denomination, unique identifiers for the borrower (domestic bank) and the global lender, and the lender's headquarter's country of residence. Similar to the CR, the frequency of the IIMR is monthly. There are two banks that do not borrow from international wholesale markets (i.e., they are fully domestically funded, and hence appear in CR but not in the IIMR). These banks provide less than 1% of domestic banking sector credits. Over our sample period, (globally-funded) domestic banks borrow in US dollars (64%) or Euros (35%),[13] from a total of 659 global lenders (banks and other financial intermediaries) from 91 countries (with the majority being Euro-area (41%) or US headquartered (23%)), with significant variation in foreign borrowing.

Finally, for bank controls –that we discuss below–, we use supervisory

[12]The CBRT tracks this relatively large sample of firms to monitor developments in the whole non-financial corporate sector and provide the public with comprehensive and systematic information. This database aggregated at the (NACE4) sector level is publicly available at `https://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN/Main+Menu/Statistics/Real+Sector+Statistics/Company+Accounts/`.

[13]Domestic banks borrow from abroad in Turkish lira (TRY) as well (constituting on average about 8% of total cross-border loans). So, the shares of US dollars and Euros in Turkish banks' cross-border borrowing are based on non-TRY loans. We did not include cross-border TRY loans in our estimations, since the vast majority of cross-border TRY loans are provided by Turkish banks' affiliates abroad (to their headquarters at home), which in part reflect affiliate-headquarter adjustments (not necessarily reflecting a response to a local policy tightening).

datasets on monthly bank balance sheets and income statements, obtained from Banking Regulation and Supervision Agency. By using unique bank identifiers (common across the databases), we match the bank controls with the transaction-level Credit Register and International Interbank Market Register.

1.2.2 Empirical Strategy

Our empirical strategy includes the following ingredients: First, we exploit global shocks, proxied by (US-based) VIX or US monetary policy. Our sample period is from January 2006 to December 2016, that encompasses several events that had global repercussions, e.g., the Lehman Brothers' collapse in September 2008, quantitative easing by advanced economy central banks, the European debt crisis that started to unfold in early 2010, as well as the aftermath of Bernanke's taper tantrum in May 2013. These episodes imply strong variation in VIX and US monetary policy, which are exogenous to Turkey.

Second, we identify credit supply side effects by exploiting the CR. That is, we study whether banks with different degrees of reliance on global liquidity differ in their pricing of a similar type of loan to a given firm in a given period following a change in the local monetary policy rate. To do so, we exploit the micro-level credit registry data and absorb any variation in unobserved borrower-specific characteristics by including firm×month fixed effects and focus on firms with multiple banking relationships (Khwaja and Mian, 2008).[14]

[14]Note that we apply it to loan rates (not just volumes, and also to maturity and collateral). Nevertheless, later we discuss possible limitations of this widely used identification strategy, and conduct additional analyses (results are nevertheless robust to not including firm fixed effects or to all firms in the CR). Moreover, if banks with different degrees of reliance on global liquidity systematically work with firms with different characteristics, that may confound our results. However, as we report in Table 1.12, bank loan portfolio characteristics (based on weighted average characteristics of firms

Third, we horserace bank reliance on global liquidity with bank capital, liquidity, and size, key bank variables that are shown in the literature to be reflecting banks' ability to insulate their loan portfolios following changes in market liquidity. For instance, one could expect smaller, less liquid banks (Kashyap and Stein, 1995, 2000), or weakly capitalized banks (Jimenez, Ongena, Peydro, and Saurina, 2012, 2014) to be less able to insulate their loan portfolios from changes in monetary policy, and in turn, reflect monetary policy decisions more strongly to their clients. Along these lines, we horserace ex-ante bank reliance on global liquidity with these key bank variables in levels and in all possible interaction terms (e.g., with local monetary policy or global shocks).

Fourth, we take changes in the local monetary policy rate conditional on domestic macroeconomic conditions. In particular, we control for domestic macroeconomic variables that are typical in monetary policy reaction functions for small open economies: a proxy for the GDP growth, inflation, and change in the real exchange rate. Macroeconomic controls are included exhaustively, in levels and in interactions with bank foreign funding, capital, liquidity, and size, and if applicable, with firm risk. By controlling for macroeconomic variables exhaustively, we also take into account the fact that banks may differ in how they reflect changes in macroeconomic conditions onto their loan rates. In later sections, we use estimated residuals from a Taylor-type rule instead of using changes in the local monetary policy rate.

Fifth, we employ weighted least squares with the natural logarithm of loan volumes being used as weights, that is, smaller loans receive lower

present in the bank loan portfolio) are economically or statistically weakly related to the bank reliance on global liquidity (the (absolute levels of) cross-correlations vary from 0.04 to 0.16). Importantly, Altonji, Elder, and Taber (2005) and Oster (2019) test results discussed in the Introduction and Empirical Results suggest that our main variables of interest are exogenous.

weights.[15] If applicable, we include month of-the-year dummy variables (11 in total) to account for possible seasonal effects (if not already absorbed by other set of fixed effects). Lastly, we double cluster standard errors at the bank-firm pair and month level, to take into account possible dependence in residuals for a given bank-firm pair across time and also across all loans by all banks for a given month (Petersen, 2009; Cameron, Gelbach, and Miller, 2011).

Finally, to show the mechanism, we then use the transaction-level data on domestic banks' cross-border borrowing exploiting the IIMR. We follow a similar empirical strategy, yet this time we identify the demand side from Turkish banks by absorbing supply-side effects from global banks. Namely, we saturate the model with global (lender) bank's headquarter country×month or global (lender) bank×month fixed effects to control for the supply side of liquidity by global lenders. Our question boils down to whether domestic banks with higher ex-ante reliance on global liquidity demand more funds from abroad and tap cheaper foreign funds to earn higher yields on domestic assets following a local monetary policy tightening, and whether softer global liquidity conditions make these effects stronger.

Global Liquidity and Local Monetary Policy Transmission

We first study whether banks with higher reliance on foreign funding raise their loan rates differently following a local monetary policy tightening. In the most saturated version, our benchmark model, the empirical equation is structured as follows:

[15] The results are strongly robust, and in essence numerically stronger, when we use unweighted least squares.

$$
\begin{aligned}
i_{bfa,t} = & \sum_{s=1}^{3} \beta_s \Delta MP_{t-s} * \text{Foreign Funding Ratio}_{b,t-s} + ... \\
& + \sum_{s=1}^{3} \Theta_s \Delta MP_{t-s} \otimes (\text{Capital Ratio, Liquidity Ratio, Size})_{b,t-s} + ... \\
& + \sum_{s=1}^{3} \Gamma_s Macros_{t-s} * \text{Foreign Funding Ratio}_{b,t-s} + ... \\
& + \sum_{s=1}^{3} \Upsilon_s Macros_{t-s} \otimes (\text{Capital Ratio, Liquidity Ratio, Size})_{b,t-s} + ... \\
& + \delta \mathscr{H}_{bi,t-1} + \zeta \mathscr{S}_{bf,t-1} + \text{Bank Controls}_b + \mu_b + \nu_{f,t} + \zeta_a + \varepsilon_{bfa,t}
\end{aligned}
\tag{1.1}
$$

where $i_{bfa,t}$, the dependent variable, is the interest rate on a loan at month t provided by bank b to firm f of a loan of type a. By loan type, we specifically mean the currency of denomination, maturity (short- or long-term) and collateral (collateralized or non-collateralized) property of the loan.[16]

ΔMP, our key policy variable, is the monthly change in the local monetary policy rate. $Macros$ are domestic macroeconomic variables typical in small open economy monetary policy rules: annual growth in in-

[16]We use the level of the loan rate, as opposed to its change, since about $\frac{1}{3}$ of the loans granted over our sample period are newly originated (for which a new loan book is registered, and one cannot have a change in the loan rate). We define a loan as newly originated if it has a unique bank–firm–(loan-type)–(origination-date)–(termination-date), and we take the first observation of the life cycle of a loan. We do not discard 'newly originated' loans, since they presumably provide a sharper picture on the policy rate pass-through, as opposed to previously originated loans (e.g., credit lines) that potentially adjust slowly in response to monetary policy changes (and some potentially beyond our 3-month horizon). Indeed, when we focus solely on newly originated loans, our results are in general stronger (discussed in the next section). The results are qualitatively robust to using change in the loan rate as our dependent variable (available upon request), but we do lose significant number of observations. Note also that given our set of fixed effects, basically we analyze changes of loan rates.

dustrial production index –as a proxy for GDP growth–, annual CPI inflation, and monthly change in the real effective exchange rate –where an increase means a real domestic currency appreciation–.[17] We include one-to-three lags of ΔMP as it might take time for the monetary policy to affect banks' overall funding conditions and loan prices (see Kashyap and Stein, 2000). In line with the lag specification for the monetary policy rate, one-to-three lags of $Macros$ are included in the estimation. Moreover, as for the ΔMP, $Macros$ are interacted with bank foreign funding ratio, capital ratio, liquidity ratio, and size.

Our focus variable is the interaction of bank reliance on global liquidity (i.e., ex-ante foreign funding ratio, defined as non-core foreign-currency liabilities-to-total assets ratio) with the change in the local monetary policy rate. Our main coefficient of interest is therefore $\sum_{s=1}^{3} \beta_s$. In particular, we test whether banks with higher foreign funding ratio raise their loan rates less following a local monetary tightening, i.e., $\sum_{s=1}^{3} \beta_s < 0$.[18]

μ_b are the bank fixed effects, controlling for unobserved time-invariant bank characteristics. $\nu_{f,t}$ denote firm×month fixed effects, absorbing all observed and unobserved firm-level heterogeneity, and are therefore key to identify different bank pricing. ζ_a are the loan-type fixed effects,

[17] $\otimes$ stands for tensor product. Note that, for specifications that include firm×month fixed effects ($\nu_{f,t}$), the levels of ΔMP are naturally dropped from the model.

[18] Further controls are as follows: $\mathscr{H}_{bi}$ denotes "Herfindahl by bank", –by how much bank b extends credit to firm f to finance its activity in the sector i as a share of total bank credits granted to that sector (to proxy for the bank's business experience in the sector, sectoral competition that the bank faces, or to take into account the possibility that banks with higher reliance on foreign funding may systematically be concentrated in some sectors)–. $\mathscr{S}_{bf}$ captures the strength of the bank-firm relationship, proxied by the share of bank b credit in total bank credit of firm f over the previous 12 months prior to borrowing from bank b at t. We include the strength of the bank-firm relationship, as it may serve as an implicit contract between the parties and potentially affect observable contractual terms (Berger and Udell, 1995; Bharath, Dahiya, Saunders, and Srinivasan, 2011; Gambacorta and Mistrulli, 2014). Interestingly, none of the controls affect our results (see Empirical Results section).

namely, currency, maturity and collateral types (separately or in combination, i.e., currency×maturity×collateral). Bank controls include the level of foreign funding ratio, capital ratio, liquidity ratio, size, nonperforming loans ratio, and return-on-assets. Importantly, we also show the results without any control whatsoever to check whether particular controls change the results (and hence are correlated with our main variables of interest).

Next, we explore whether softer global liquidity conditions attenuate local monetary policy transmission. To do so, we extend equation (1.1) by incorporating measures of global liquidity conditions into the picture. Namely, we estimate

$$\begin{aligned} i_{bfa,t} = & \sum_{s=1}^{3} \beta_s \Delta MP_{t-s} * \text{Foreign Funding Ratio}_{b,t-s} + ... \\ & + \sum_{s=1}^{3} \gamma_s \text{Global Liquidity Indicator}_t * \text{Foreign Funding Ratio}_{b,t-s} + ... \\ & + \sum_{s=1}^{3} \delta_s \Delta MP_{t-s} * \text{Foreign Funding Ratio}_{b,t-s} * \text{Global Liquidity Indicator}_t + ... \\ & + CONTROLS + \mu_b + \nu_{f,t} + \zeta_a + \varepsilon_{bfa,t} \end{aligned} \tag{1.2}$$

where Global Liquidity Indicator is the log of the VIX (measured at the beginning of t) as the baseline. For robustness, we use the (log of) Federal Reserve balance sheet size, the (log of) the US monetary base, the shadow Federal funds rate (Wu and Xia, 2016),[19] or US monetary policy surprises (Jarocinski and Karadi, 2019).[20] Our focus variable is the triple

[19] Studying a multi-factor shadow rate term structure model, Wu and Xia (2016) estimate a shadow measure for the Fed monetary policy stance, including the period after the funds rate hits the zero-lower bound in July 2009. Using a simple factor-augmented vector autoregression, they show that their proposed shadow federal funds rate exhibits similar dynamic correlations with key macro variables since July 2009 as the federal funds rate did in the data prior to the Great Recession.

[20] Using a Bayesian structural vector autoregression and high-frequency financial

interaction of changes in local monetary rate, bank foreign funding ratio, and global liquidity indicator. Our main coefficient of interest is then $\sum_{s=1}^{3} \delta_s$. For instance, if a lower VIX impairs local monetary policy tightening, we would expect $\sum_{s=1}^{3} \delta_s > 0$.

A natural concern related to equation (1.2) would be the possibility of local monetary policy responding directly to global liquidity indicators. To mitigate such endogeneity, we measure the global liquidity indicators at the current month t (whereas changes in the local monetary policy rate are lagged). Moreover, to avoid the possibility that a loan is granted before the observed Global Liquidity Indicator within month t, we use beginning of the month values for global liquidity indicators.[21] Also, we later use estimated residuals from a Taylor-type monetary policy rule that additionally includes the VIX –and aggregate credit growth (for reasons to be discussed more in detail in the robustness section).

$CONTROLS$ include all the variables in the equation (1.1), and additionally include bank capital ratio, liquidity ratio, and size in double interaction with the global liquidity indicator, in triple interactions with global liquidity indicator and local monetary policy changes (ΔMP), and in triple interactions with global liquidity indicator and domestic macroeconomic variables ($Macros$).

In later sections, we use (i) the log of loan volume, and indicator variables for (ii) maturity and (iii) collateral property of a loan, as alternative dependent variables (at the very same level of disaggregation). For maturity, we define an indicator variable that is equal to 1 if the loan is short

market surprises around monetary policy announcements, Jarocinski and Karadi (2019) estimate policy rate shocks for the Fed and the ECB –that controls for the information content of policy announcements.

[21] In particular, we use the opening value of the VIX at the first day of the month t, the latest weekly value for Fed balance sheet size or US monetary base at month $t-1$. For shadow Federal Funds rate, we use the monthly average (for t). For US monetary policy shocks, we use the sum of shocks up to and including t.

term (<1 year), and 0 otherwise. For collateral, we similarly define an indicator variable, that is equal to 1 if the loan is non-collateralized, and 0 otherwise.

To analyze risk-taking, we first estimate equation (1.2) separately for the subsample of firms that we define as "riskier" and for the remaining set of firms (that we define as "safer"). We label a firm as riskier if the firm had any non-performing loans (which are 90 days overdue) during the 3-year-period prior to borrowing, and safer otherwise.[22] Since recent non-performance might also be relevant for banks, we also assess shorter past horizons, 1- and 2-years, as well as study a longer horizon, i.e., 4 years. To corroborate bank risk taking, we also explore future firm loan defaults, not just simply ex-ante riskier firms.

For further evidence, we also introduce ex-ante firm riskiness explicitly in our estimation equation (by including the indicator variable for firm ex-ante riskiness –that takes a value 1 if firm f is riskier, and 0 otherwise– in interaction with changes in the local monetary policy and bank foreign funding ratio), and further, evaluate the results for high vs. low VIX episodes. Finally, we also test the robustness of our risk-taking results to focusing on newly originated loans, as well as explore whether riskier firms are different than safer firms in the probability of switching to high foreign funding banks following a local monetary policy tightening.

Mechanism: Carry Trade

Intuitively, following a local monetary policy tightening, cross-border borrowing may become more favorable compared to local funding particularly for banks with higher reliance on foreign funding, potentially due to a milder increase in foreign compared to local borrowing costs, and given

[22] Using past loan default information (credit history) for ex-ante riskiness is widely used in the literature (see, e.g., Jimenez, Ongena, Peydro, and Saurina, 2014), and we essentially follow this route.

the violation of the covered interest rate parity that we discussed in the Introduction. In turn, these banks may demand more funds from abroad after a local monetary policy tightening (a carry trade).

Our estimation is structured as follows:

$$\begin{aligned} Y_{bgc,t} = & \sum_{s=1}^{3} \alpha_s \Delta MP_{t-s} * \text{Foreign Funding Ratio}_{b,t-s} + ... \\ & + \sum_{s=1}^{3} \Theta_s \Delta MP_{t-s} \otimes (\text{Capital Ratio, Liquidity Ratio, Size})_{b,t-s} + ... \\ & + CONTROLS + \xi_{g,t} + \mu_b + \zeta_c + \varepsilon_{bgc,t} \end{aligned} \tag{1.3}$$

where $Y_{bgc,t}$ is (i) the change in (log) volume of cross-border borrowing of domestic bank b from global bank g in currency c from $t-3$ to t; (ii) the change in the associated cross-border borrowing rate from $t-3$ to t; or (iii) the interest differential (the difference between the average domestic currency Turkish treasury yields (averaging across all maturities)[23] and cross-border borrowing rate of domestic bank b from global bank g in currency c at t.

To control for the supply side effects, we saturate the model with global bank's headquarter country×month fixed effects, and in the most saturated specification, global bank×month fixed effects ($\xi_{g,t}$). These fixed effects soak up any variation in common global factors (e.g., the VIX), external macroeconomic factors, e.g., the role of US macro fundamentals for the case of Bank of America or J.P. Morgan Chase or Germany's macro fundamentals for Commerzbank lending to a Turkish bank, or for the most saturated specification, supply-side factors for a given global bank. $CONTROLS$ are (i) domestic bank controls (same as in the baseline

[23] We obtain domestic currency Turkish treasury yields from the yield curve estimated by Bloomberg. The estimated yields are reported for 3 months, 6 months, and 1, 2, 3, 4, 5, 7, 8, 9, and 10 years (time-to-maturity).

regression, equation (1.1)); (ii) domestic macro controls in interaction with domestic bank variables; and (iii) the strength of the global bank-domestic bank relationship (which, like above, proxied by the share of loans granted by the global bank to the domestic bank in total cross-border loans the domestic bank has). ζ_c denote currency-type fixed effects (US dollars or Euros). Same as above, we also control for unobserved domestic bank characteristics by including domestic bank fixed effects (μ_b).

Our coefficient of interest is $\alpha \equiv \sum_{s=1}^{3} \alpha_s$. A positive and significant α in the most saturated specification implies that, among domestic banks that borrow from the same global bank in the same month in the same currency, more globally-funded banks increase *their demand* for foreign wholesale funds more (and enjoy a higher foreign interest differential) following a local policy tightening.

In later analyses, we also explore whether these effects get stronger when the VIX is lower (by including the interaction of changes in the local policy rate and bank foreign funding ratio with the log of the VIX, and controlling for domestic macro controls in the triple interactions, as in equation (1.2)).

1.2.3 Definitions and Summary Statistics

Table 3.1 provides detailed definitions and the summary statistics of the variables used in the empirical analyses. Our key dependent variable is the loan interest rate, expressed in annual percentage terms, of a certain loan type provided by a bank to a firm. In some of our analyses, we focus on domestic currency (TRY) and foreign currency (FX) loans separately. Within-firm standard deviation of loan rates, which corresponds to our level of identification, has an average of 206 basis points. Corresponding statistics for domestic-currency and foreign-currency loan rates are 248 and 82 basis points, respectively. In some of our analyses, we also use

(log) volume of a loan, and indicator variables for maturity or collateral property of a loan as alternative dependent variables.

To proxy for global liquidity conditions, we use several indicators (each one at a time): We use the (log of) VIX as the baseline, given the extant literature showing that the global capital flows and local credit cycles co-move strongly with the VIX. For robustness, we use the (log of) Federal reserve assets (or the (log of) US monetary base (Morais et al., 2019)) to capture US unconventional monetary policy, the shadow Federal funds rate (Wu and Xia, 2016) or US monetary policy surprises (Jarocinski and Karadi, 2019) to capture both conventional and unconventional US monetary policy (where the latter reflect *unexpected* changes in the US monetary policy based on financial market surprises).

Figure 1.1 plots the evolution of global liquidity indicators (against domestic banks' foreign-currency non-core liabilities). On average, when global liquidity conditions are softer (from mid 2009 to mid 2011 due to Fed QE1/QE2, or from 2012 to late 2013 due to Fed QE3), we observe a higher growth in banks' non-core borrowing from abroad. When global liquidity conditions are tighter (e.g., from Lehman's collapse (late 2008) to mid 2009, or from late 2013 onwards due to Bernanke's Taper Tantrum and the Fed's winding down the QEs), we observe a decline in banks' non-core borrowing from abroad.

Our key policy variable is the monthly change in the weighted average cost of liquidity provided by the central bank to the banking system, i.e., the effective central bank funding rate. We use the official rates until the end of 2010 and the effective funding rate afterwards. The Central Bank of Turkey has implemented a multiple interest rate framework after end-2010 (Basci and Kara, 2011), and the effective rate is the relevant measure of policy stance. Figure 1.2 presents how the monetary policy rate has evolved after 2006.

The key bank variables are foreign funding ratio, capital ratio, liquidity ratio, and size.[24] Foreign funding ratio is defined as the ratio of non-core foreign-currency liabilities to total assets.[25] For convenience in interpreting the results and reporting the economic impacts, we label a bank as a 'bank with a high degree of reliance on global liquidity' if the bank is at the third quartile (16.42%), and as a 'bank with a low degree of reliance on global liquidity', if the bank is at the first quartile (8.99%) of the distribution of foreign funding ratio.

1.3 Empirical Results

1.3.1 Global Liquidity and Local Monetary Policy Transmission

Table 1.2 presents the first set of baseline results. We start with the least saturated specification that includes solely the change in the local mon-

[24]Capital ratio is defined as the ratio of bank equity capital to total assets. It reflects the intensity of agency problems that banks face in times of financial stress, and in this regard, the ease at which banks can raise external funds (Holmstrom and Tirole, 1997; Gertler and Karadi, 2011; Gertler and Kiyotaki, 2010). Following the related literature, we use the book value of equity, and thus, our measure is the inverse of a pure leverage ratio (for a similar measure, see also Jimenez et al., 2012, 2014). Similar as above, we label a bank as 'strongly capitalized', if the bank is at the third quartile (13.09%), and as 'weakly capitalized', if the bank is at the first quartile (9.87%). Following Kashyap and Stein (2000), liquidity ratio is defined as the ratio of liquid assets (the sum of cash, receivables from the central bank, interbank money market and reverse repo transactions) to total assets. On average, banks hold 28.7 percent of their assets in liquid assets, a value substantially higher than generally reported for banks in mature markets. Moreover, relatively liquid banks (the third quartile) hold about 34.2% of their assets as liquid, while for less liquid banks, this ratio attains 20.65%. Size is the natural logarithm of total assets. Similar as to above, we use the quartiles to label a bank as large (the 3rd quartile) or small (the 1st quartile). The remaining bank variables are nonperforming loans ratio (the ratio of loans that are overdue 90 days to total loans), return-on-assets (pre-tax net profit to total assets), and at the bank-sector level, Herfindahl by bank (a bank's total credits to a sector as a share of total bank credits granted to that sector).

[25]Non-core foreign currency (FX) liabilities is the sum of FX payables to banks, FX payables to money and securities markets, FX funds from repo transactions and net FX securities issued.

etary rate and its interaction with banks' foreign funding ratio, as well as the level of foreign funding ratio, with no controls or fixed effects (column 1). The estimated coefficient for the interaction term lays out our initial key effect: banks that ex-ante rely more on foreign funding raise their loan rates significantly less following a local monetary policy tightening. Economically, following a 100 basis-points increase in the local policy rate (in cumulative terms over the preceding 3 months), a bank at the 3^{rd} quartile of foreign funding ratio raises its loan rate by 43 basis points less (compared to a bank at the 1^{st} quartile). This estimated effect is sizeable given that average within-firm standard deviation of loan rates is 206 basis points.

We then successively saturate our model. We control for "Herfindahl by bank", the strength of the bank-firm relationship, and absorb time-invariant bank characteristics –by including bank fixed effects– (column 2), and additionally control for time-invariant firm characteristics –by including firm fixed effects– (column 3). Our key result remains intact and numerically very similar.

In column (4), we then saturate the model with loan-type fixed effects (currency, maturity and collateral-type fixed effects), and control for domestic macroeconomic variables in levels and in interaction with bank capital, liquidity and size, as well as horse-race banks' reliance on foreign funding with these bank variables. We find that banks' reliance on foreign funding stands is relatively more important for the local policy rate pass-through than bank capital, liquidity or size. For instance, while a globally-funded domestic bank raises its loan rate by 42 basis points less following a 100-basis-points increase in the local policy rate, the estimated effects for well-capitalized, more liquid or larger banks are much smaller in magnitude (7, 5, and 0.4 basis points, respectively) and statistically not significant in most cases.

In column (5), we saturate the model with firm×month fixed effects. Column (6) is the most saturated specification that additionally controls for loan-types –currency × maturity × collateral fixed effects–. Results show that banks with higher foreign funding set their loan rates by 39 basis points less *for a given firm in a given period* following a cumulative 100-basis-points increase in the local monetary policy rate.

Importantly, the estimated coefficient is statistically identical if we do not control for any firm, bank or loan control compared to saturating the regression with observable controls and many different sets of fixed effects (increasing the R-squared by almost 60 percentage points), thereby suggesting that our main variables of interest are exogenous to the firm balance sheet channel (demand) and other bank supply mechanisms (Altonji et al., 2005; Oster, 2019). Formally, we test for the relevance of potential omitted variable bias following Oster (2019). Oster (2019) shows that coefficient stability may 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 controls are included. She shows that bias-adjusted treatment effect, approximated by $\beta^* \approx \tilde{\beta} - \delta\left[\mathring{\beta} - \tilde{\beta}\right]\frac{R_{max}-\tilde{R}}{\tilde{R}-\mathring{R}}$, converges in probability to the true treatment effect; in our notation, $\tilde{\beta}$ and $\tilde{R}$ are the bias-unadjusted estimated coefficient and the R-squared from the model with larger controls, respectively. On the other hand, $\mathring{\beta}$ and $\mathring{R}$ are the estimated coefficient and the R-squared from the simplest model. Finally, δ captures the degree of self-selection into the treatment along unobservables –as a multiple of the observed degree of self-selection along observables– and R_{max} is the R-squared from the hypothetical regression that entails zero omitted variable bias. We follow the standard test parametrization proposed by Oster (2019) and fix $\delta = 1$ and $R_{max} = 1.3\tilde{R}$. We compute a bound for our coefficient of interest under the assumptions that self-selection along unobservables has compa-

rable intensity as along observables and that R_{max} is sufficiently large. We compare column (1) with our most saturated specification, column (6). The estimated bound for the treatment coefficient, $[\tilde{\beta}, \beta^*]$, is [-0.157,-0.151], which safely excludes zero. We therefore reject that the effect of banks' reliance on foreign funding on local policy rate transmission is driven by omitted variable bias.[26]

We then extend our model by additionally including the interaction of bank foreign funding (and other key bank variables) with the VIX (Table 1.3). The estimated coefficient for the interaction of bank foreign funding with the VIX implies that a lower VIX pushes banks with ex-ante higher foreign funding to set lower loan rates for a given firm (column 1). Although the estimated effect is not statistically significant at conventional levels, its significance is marginally higher than 10%.[27] More importantly for the question of our paper, in column (2), we explore whether global liquidity conditions affect local monetary policy transmission. To do so, we introduce a triple interaction, the interaction of bank foreign funding, changes in local policy rate, and the log of the VIX. We find that softer global liquidity conditions attenuate the transmission of a local monetary policy tightening, and the channel works through banks with higher reliance on foreign funding. Numerically, following a cumulative 100 basis points increase in the local monetary policy rate, banks with higher foreign funding raise their loan rates by 57 basis points less when the VIX is reduced by one standard deviation.[28]

[26] We also evaluated the bound for the treatment effect at much more conservative values for δ and R_{max}. For R_{max} as high as 1, and/or even for implausibly much high values for δ (up to $\delta = 26$), we continue to find that the bound excludes zero.

[27] Nonetheless, this effect will start to matter when we introduce firm riskiness and currency of denomination of loans, as we show below.

[28] We show many robustness to these results, e.g., Table 1.4. Results are also similar to using key bank variables (including bank foreign funding ratio) measured fixed at December 2005 (before our sample period begins) or at their sample averages (not reported).

In later columns, we study domestic and foreign currency loans separately (columns 3 to 8), or saturate the model with firm×currency×month fixed effects (columns 9 to 11). In columns (3) to (5), we focus on domestic currency denominated loans. Numerically, following a cumulative 100-basis-points tightening, a bank with higher foreign funding sets 75 basis points lower rates for domestic currency loans for a given firm when the VIX is lower by one standard deviation. This effect seems sizeable given that average within-firm standard deviation of domestic currency loan rates is 248 basis points. In columns (6) to (8), we then turn our focus to foreign currency denominated loans. Evaluating the estimated coefficient for the respective triple interaction, we find that following a cumulative 100-basis-points tightening, a bank with higher foreign funding sets 13 basis points lower rates for foreign currency loans for a given firm when the VIX is lower by one standard deviation. This effect seems economically relevant given that average within-firm standard deviation of foreign currency loan rates is only 82 basis points.

A concern related to focusing on domestic and foreign-currency loans separately is that firms that are granted domestic currency loans and those that are granted foreign currency loans may be intrinsically different, or that domestic and foreign currency loans may differ, e.g., in their maturity or collateral properties.[29] In this regard, we now exploit within firm-currency-month variation (and continue saturating the model with collateral and maturity fixed effects). Our previous results are strongly robust. Following a 100-basis-points tightening in the local monetary policy, banks with a higher degree of reliance on global liquidity raise their loan rate for a given firm in a particular currency by 59 basis points less

[29]Domestic currency loans are on average shorter term and more likely to be non-collateralized compared to foreign currency loans. In particular, the share of short-term (< 1 year) loans in total loans is 76% for domestic currency loans and 27% for foreign currency loans, and the share of non-collateralized loans in total loans is 25% for domestic currency loans and 21% for foreign currency loans.

when global liquidity conditions are softer.

Alternative Indicators for Global Liquidity

Irrespectively of the considered indicator for global liquidity, we find that softer global liquidity conditions attenuate the transmission of a local policy tightening (Table 1.4). For ease of comparison, column (1) replicates the baseline specification that uses the VIX. Column (2) shows that easier US unconventional monetary policy attenuates the transmission of tighter local monetary policy. Numerically, a one standard deviation increase in the (log of) Fed's balance sheet size makes domestic banks with higher foreign funding raise their loan rates by 44 basis points less after a cumulative 100 basis points tightening in the local monetary policy rate. We obtain similar results when we consider an increase in the US monetary base, a decrease in the shadow Federal Funds rate, or a negative US monetary policy shock (the economic impacts are 46, 40 and 50 basis points, respectively).

Other Loan Terms: Volume, Maturity, Collateral

We also explore other dimension of credit, i.e., volume, maturity or collateral, as softening of other credit margins are also important for the effectiveness of local monetary policy. For instance, a lower loan rate by high foreign funding banks may be accompanied with a lower supply of credit, or such banks may extend shorter maturity loans or ask for collateral for compensation. Table 1.5 shows that this is not the case.

On the contrary, following a local monetary policy tightening, banks with higher foreign funding raise their supply of credit more (or decrease their credit supply less strongly) (column 1), are more likely to extend longer term credit (column 2), and are less likely to extend collateralized loan (column 3), if global liquidity conditions are softer.

Taken together, these findings point to a consistent picture: softer global

liquidity conditions lead banks with relatively higher ex-ante foreign funding to soften their credit standards (relative to banks with lower foreign funding) following a local monetary policy tightening. Results are nevertheless stronger for the pass-through to loan rates than to other margins.

1.3.2 Global Liquidity and the Risk-Taking Channel of Local Monetary Policy

We provide several results in different tables to analyze risk-taking associated to global liquidity and local monetary policy. Table 1.6 presents the initial results. In this table, we re-estimate our previous specifications for riskier and safer firms separately. In column (1), we study how banks with higher foreign funding set their loan rates for a given riskier firm following changes in monetary policy or global liquidity conditions (as given by the interaction of bank foreign funding ratio with changes in local monetary policy rate, or with the VIX). In column (2), we then focus on safer firms. We observe that banks with higher foreign funding set lower rates for riskier vs. safer firms following a local policy tightening or following softer global liquidity conditions (comparing columns 1 and 2).

In column (3), we study how global liquidity affects the risk-taking channel of monetary policy (by introducing the triple interaction of local monetary policy changes, bank foreign funding and the VIX). We find that following a local policy tightening, banks with higher foreign funding set 65 basis points lower loan rate for a given riskier firm when global liquidity conditions are softer (column 3). The estimate effect is milder for safer firms (56 basis points, column 4). However, the difference in estimated coefficients appears not statistically significant (in the next table, we show that the difference is significant for domestic-currency loans when VIX is above its average, and for foreign-currency loans when VIX

is below its average).

In remaining columns, we focus on domestic-currency or foreign-currency denominated loans separately. Like above, we find that softer global liquidity conditions strengthen bank risk-taking following a local policy tightening (column 5 vs. 6, and column 7 vs. 8).[30] While pricing riskier and safer firms similarly already hints at banks' underpricing risk, below we provide finer inference by introducing firm riskiness into the estimation equation, with stronger statistical and economic effects.

To provide finer inference, we now introduce ex-ante firm riskiness explicitly in the estimation equation (Table 1.7). We find that banks with higher foreign funding set statistically significantly lower rates for riskier firms following a local monetary policy tightening (numerically by 12 basis points lower rates, see column 1). The results carry through when we focus on domestic or foreign currency loans (columns 2 and 3), with economically and statistically stronger effects for the latter (note that average within-firm variation in foreign currency loan rates is much lower than that of domestic currency loan rates, 82 vs. 248 bpts).

Next, we do the same exercises for periods of high VIX (during which the VIX is higher than its average over our sample period, i.e., 18.34) or low VIX (during which the VIX is lower than its average). The results show that globally-funded banks set statistically significantly lower loan rates for riskier firms as compared to safer firms following a local monetary policy tightening. For domestic currency loans by 23 basis points when global liquidity conditions are tighter (column 5), and for foreign currency loans by 7 basis points when global liquidity conditions are softer (column 9). There is also an asymmetry with respect to the global financial cycle, soft-

[30] In particular, following a 100 basis points policy tightening, banks with higher foreign funding set 79 basis points lower loan rate for domestic currency loans to a given ex-ante riskier firm (versus 75 basis points lower rates for safer firms), and 19 basis points lower rate for foreign currency loans to a given ex-ante riskier firm (versus 12 basis points lower rate for safer firms), when global liquidity conditions are softer.

ening FX loans more when VIX is low, and tightening local currency loans more when VIX is high.

Loans at the origination (newly originated loans) may offer a sharper reflection on how banks respond to changes in local monetary policy or the global liquidity stance. Exploiting the CR which also provides the exact date of origination of each loan, we now study our baseline specifications for the sub-sample of newly originated loans.

Our results are qualitatively robust, and for some cases, numerically stronger (Table 1.8), though we lose a great number of loans. Column (1) shows that globally-funded domestic banks originate a new domestic-currency loan to a given firm at a cheaper rate (numerically, by setting 62 basis points lower loan rate to a given firm following a 100-basis-points monetary policy tightening). Such effect is more pronounced when the VIX is lower (quantitively speaking, by 79 basis points lower rate, see column 2). Moreover, they set 86 basis points lower rate for riskier firms (column 3), and by 79 basis points lower rate for safer firms (column 4).

For newly originated foreign currency loans, banks' differential loan pricing for riskier compared to safer firms is more pronounced (column 7 vs. 8). Numerically, globally-funded banks set 17 basis points lower rates when they originate a new foreign currency loan to a given ex-ante riskier firm (column 7). The estimated effect for safer firms is essentially nil (column 8).[31] These results resonate well with the bank carry-trade channel that we document below –consisting of globally-funded banks increasing their non-core borrowing from abroad at comparatively favorable terms after a local monetary policy tightening (and more acutely so when global liqudity conditions are softer).

We also find greater ex-post loan defaults for firms borrowing from

[31] Moreover, we continue to find that globally-funded banks set lower loan rates (for a given firm) after a local policy tightening, particularly when the VIX is lower (columns 5 and 6).

higher foreign funding banks, with stronger effects for foreign-currency borrowers (Table 1.9). In particular, we study whether a firm that is granted a loan by a higher foreign funding bank when global liquidity conditions are softer is more likely to default on a loan at the bank in the near future following a local monetary policy tightening. In interpreting the economic impacts, we report the probabilities in comparison to the average probability of future loan default of a firm.

We find that a firm that was granted a loan by a high foreign funding bank when the VIX is lower is 0.5% more likely to default at the bank in the following one year after a local monetary policy tightening (which is economically sizeable, given that the estimated effect is 32% of the average probability of loan default over the next year, see column 1). We find a numerically similar result for the 2-year future horizon (0.76%, see column 2), which is 27% of the average probability of loan default over the following two years.

We find stronger results for foreign currency borrowers (columns 3 and 4). In particular, a firm that was granted a foreign currency loan by a high foreign funding bank when the VIX is lower by 1 standard deviation is 0.46% more likely to default at the bank in the following one year –and 0.67% in the following 2 years– after a 100-basis-points local monetary policy tightening. Comparing these estimated effects with the average probability of default on foreign-currency loans, the effects appear sizeable (42% and 35% of the average of respective default probabilities). The effects are smaller for domestic currency borrowers –reported in columns 5 and 6–, when assessed against the average probability of default on domestic-currency loans.[32]

[32]Regarding double interactions, following tighter local monetary policy, firms working with banks with higher foreign funding are more likely to default in the near future (as given by the positive estimated coefficient for the interaction of changes in local monetary policy with bank foreign funding), with stronger results for foreign-currency compared to domestic-currency borrowers when evaluated compared to the respective

In sum, our risk taking results are complementary. Following a local policy tightening, ex-ante riskier firms receive lower loan rates (and experience milder reduction in credit supply and softer credit terms) by banks with ex-ante higher foreign funding –and more acutely so for foreign currency loans and when global liquidity conditions are softer–, and firms that are granted loans by these banks are more likely to default in the future –with stronger effects for foreign currency borrowers–.

Do firms switch from locally-funded to globally-funded banks?

Given our findings that globally-funded domestic banks provide more loans with lower rates following a local policy tightening, one could also expect firms to switch from locally-funded to globally-funded domestic banks after the local policy tightening. To explore this possibility, we aggregate the CR at a firm level and estimate the following model:

$$\text{I(Switching)}_{f,t} = \sum_{s=1}^{3} \beta_{1,s} \Delta MP_{t-s} + \alpha\, I(\text{Low Foreign Funding Bank}_{f,t-3}) + \cdots + CONTROLS + \varepsilon_{f,t} \tag{1.4}$$

where $\text{I(Switching)}_{f,t}$ is an indicator variable that equals 1 if firm f switches from working with a low foreign funding bank at $t-3$ to a bank with a high foreign funding at t.[33] $I(\text{Low Foreign Funding Bank}_{f,t-3})$ is an indicator variable that equals 1 if the largest bank from which the firm borrows at month $t-3$ has foreign funding ratio below the median bank; and 0 otherwise.[34]

mean of future default. We find qualitatively similar results for when global liquidity conditions are tighter (as given by the positive estimated coefficient for the interaction of log(VIX) with bank foreign funding, and evaluating these impacts for foreign- vs. domestic-currency borrowers).

[33] Here, we consider the largest bank a firm is working with for each month. By largest bank, we specifically mean the bank at which the firm has the highest outstanding loan.

[34] We include the following $CONTROLS$ along with Morais et al. (2019): log(Number

Table 1.10 presents the results. We find that firms are on average 2.3% more likely to switch from banks with low foreign funding to banks with higher foreign funding after a local policy tightening (column 1). Consistent with our previous results, we also find that riskier firms are more likely to switch to higher foreign funding banks after the policy tightening compared to safer firms (3.1% vs. 2.1%, columns 2 to 3). We find qualitatively similar results when we control for the change in the (relative) presence of high foreign funding banks (columns 4 to 6).

1.3.3 Mechanism: Carry Trade

Our findings show strong evidence for bank carry trade following a local monetary tightening. In particular, we show in Table 1.11 that domestic banks with ex-ante higher foreign funding borrow more from abroad after a local policy tightening (columns 1 to 2). This effect is strongly robust to saturating the model successively with supply-side-related fixed effects (global (lender) bank's headquarter country×month fixed effects (column 1) or global (lender) bank×month fixed effects (column 2)). Numerically, a domestic bank with a higher ex-ante foreign funding-to-total assets ratio raises its foreign currency non-core borrowing from abroad by 1.04% more following a 100-basis-points tightening in the local monetary policy (column 2). Moreover, more capitalized banks demand less

of Bank Relations), the log value of the number of domestic banks from which the firm is borrowing in month $t-3$; log(Maturity), the log value of the average loan maturity of a firm at month $t-3$; log(Volume), the log value of the total outstanding amount of loans of a firm at month $t-3$. Moreover, we also control for Δ Presence of High Foreign Funding Banks, i.e. the (log) change in the number of branches of high foreign funding banks (those above or equal to the median of foreign funding ratio) in the city that the firm operates in, relative to the (log) change in the number of branches of low foreign funding banks (those below the median of foreign funding ratio) in the city, from $t-3$ to t. We have bank branch-city information starting with January 2007, whereas our baseline sample period starts from January 2006. So, in columns (4) to (6) where we control for the change in the relative presence of high foreign funding banks, we have mildly lower number of observations.

funds from abroad, in line with the intuition that such banks may be in less need of foreign funds after a tighter local monetary policy.

In columns (3) to (4), we further show that banks with higher funding concurrently face a (small) increase in foreign borrowing costs following a local policy tightening. This resonates well with the notion that a rise in demand should lead to a rise in (or at least a non-negative effect on) prices and confirms that our supply-side controls are well grounded. The estimated effect is small (and insignificant), suggesting that high foreign funding banks on average face a nearly perfectly-elastic supply schedule in foreign wholesale markets after a local policy tightening.

Importantly, banks with higher foreign funding carry-trade cheap foreign currency funding with higher-yield domestic assets (columns 5 and 6). The (transaction-level) interest differential that they face, the spread between average yield on Turkish Treasury bills and the cross-border borrowing rate, rises following a local monetary policy tightening (numerically by 5 basis points after a 100 basis-points local policy tightening). This effect gets significantly stronger when the VIX is lower (by an additional 7 basis points if the VIX is lower by one standard deviation, column 9).[35]

1.3.4 Further Discussions and Robustness Analyses

Alternative Horizons for Firm Past Loan Default

Our results are robust to using alternative horizons for past loan default to gauge firm riskiness (Table 1.13). We take shorter horizons, since more recent performance might also be relevant for banks, and a longer horizon, i.e., 1, 2, and 4 years. We continue to find that softer global liq-

[35]Moreover, following a local monetary policy tightening, a lower VIX does not significantly affect cross-border volume of borrowing (column 7), yet it lowers the cross-border borrowing rate (column 8), for banks with high vs. low foreign funding.

uidity conditions make banks with higher foreign funding raise their loan rates less for riskier firms following a local policy tightening.

An Alternative Measure of Local Monetary Policy Stance: Policy Rule Residuals

So far, we have used changes in local monetary policy rate and control for domestic macroeconomic variables that are typical in monetary policy reaction functions for small open economies (real economic activity, inflation and real exchange rate). As local monetary policy may directly respond to global liquidity conditions, and after 2010, financial stability considerations played a larger role in the setting of local monetary policy in emerging markets, including Turkey (Kara, 2016; Fendoglu, 2017),[36] we use residuals from an estimated policy rule. In particular, we regress policy rate on its own lag, lagged deviation of inflation from its target, lagged deviations of (log) industrial production index, (log) real exchange rate, (log) aggregate domestic credit from their respective trends, and the lagged log of the VIX.[37] The estimated policy rule residuals are shown in Figure 1.3.

Our results are strongly robust to using monetary policy rule residuals (Table 1.14). Lower VIX makes banks with higher foreign funding raise their domestic and foreign currency loan rates significantly less following a local monetary policy tightening shock (as given by the estimated coefficients for the triple interactions). Moreover, such banks set lower rates for both riskier and safer firms (with the former receiving comparatively lower rates).

[36]Thus, monetary policy may also have responded directly to changes in aggregate credit, i.e., aggregate credit beyond its effect of real economic activity, inflation or real exchange rate.

[37]In calculating the trend, we use Hodrick-Prescott filter with a smoothing parameter 14400 (as typical in monthly frequency data). The results are robust to using expected GDP growth in the policy rule.

Asymmetries: Monetary Policy Tightening vs. Easing Episodes and Global Liquidity

Corroborating our baseline results, softer global liquidity conditions matter relatively more during episodes of local monetary policy tightening (Table 1.15). In particular, we re-estimate our baseline findings for monetary policy tightening and easing episodes separately.[38] During a policy tightening episode and following a 100-basis-points tightening in the policy rate, banks with higher foreign funding raise their loan rates less when global liquidity softens, an estimated effect that almost doubles the baseline finding, and economically, corresponds to about half the average within-firm standard deviation of loan rates (column 1). For policy easing episodes, we find a much smaller effect (column 2). The differential effect, tightening vs. easing episodes, appear stronger for domestic currency loans (column 3 vs. 4), and not prevalent for foreign currency loans (column 5 vs. 6).

1.4 Conclusion

Does global liquidity limit the effectiveness of local monetary policy on credit markets? Our answer is a robust yes, and the mechanism works through domestic banks' carry trade in international wholesale markets. For empirical identification, we exploit global liquidity shocks in conjunction with administrative supervisory datasets from a large emerging market, Turkey. We exploit loan-level data both from the credit register –tracking all loans to firms by Turkish banks, with information on both loan interest rates and volume– and the International Interbank Market

[38] We define the tightening episodes as periods during which the change in the policy rate over the previous 3 months is greater than zero, and easing episodes as periods during which the change in the policy rate over the previous 3 months is lower than or equal to zero.

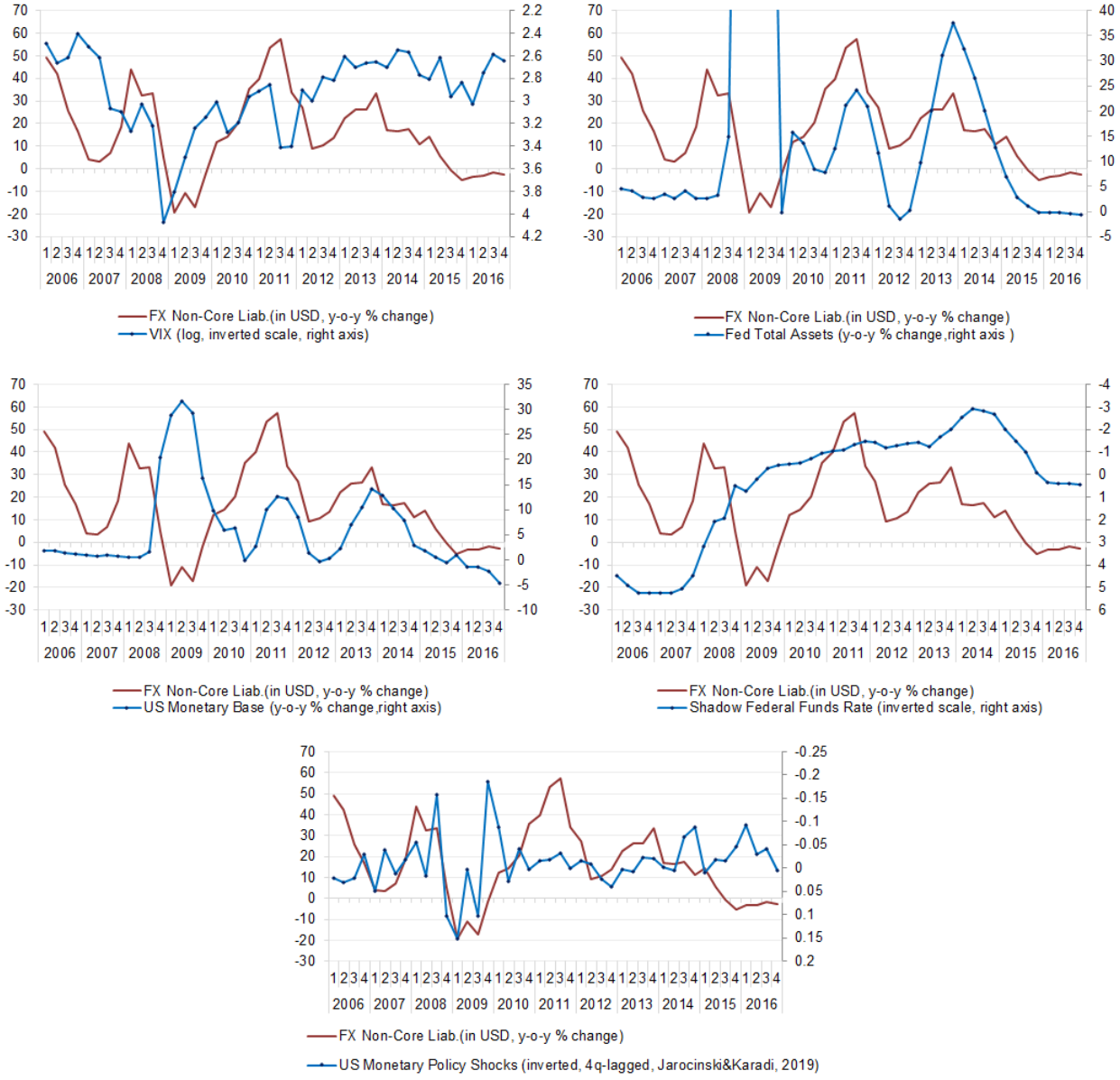
Register –providing transaction-level information on the universe of cross-border borrowing by Turkish banks from global lenders, with also information on loan price and volume.

We show that softer global liquidity conditions –proxied by lower VIX or softer US monetary policy– attenuate the pass-through of local monetary policy tightening on loan rates, with stronger attenuation effects for banks that borrow ex-ante more from international wholesale markets. The reduction in the effectiveness of local monetary policy is also important for other credit margins and there are key bank risk-taking effects –especially for riskier borrowers in foreign-currency (FX) loans, and with substantial higher ex-post defaults. The mechanism at work is via a carry trade by domestic banks from international wholesale funding markets. Therefore, higher risk-taking takes place following *tighter* local monetary policy (offering an alternative risk-taking channel of monetary policy that emerges in an open economy setting), and both on the liabilities and assets side of the bank balance sheet –stemming from domestic banks' foreign currency borrowing from global banks and their softening of local loan conditions, a phenomenon that is relatively more pronounced for the interest rate pass-through and for riskier borrowers in FX loans.

Following the seminal contribution by Rey (2013), several papers have argued that the global financial cycle may limit the transmission of local monetary policy on local credit markets. Up to our knowledge, our paper is the first to offer causal empirical evidence –especially based on complete, administrative micro-datasets, exogenous shocks, and the mechanism behind–. Our main contribution to the academic literature (and to the policy debate) is to show that global liquidity limits the effectiveness of local monetary policy on credit markets, even via domestic banks in local currency lending, and crucially, we uncover the mechanism behind such result. Consistently with recent theoretical insights, we high-

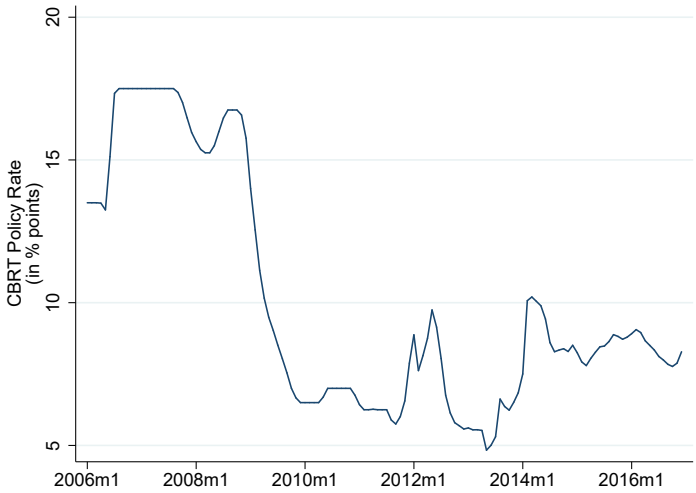
light how interest rate differentials drive carry-trade flows on the global wholesale market for banks' financing, thereby reducing the effectiveness of local monetary policy. For future work, one can analyze whether capital controls or macroprudential policies with a capital flow management focus help strengthen local monetary policy transmission. We leave this point to future work.

FIGURE 1.1: GLOBAL LIQUIDITY CYCLES AND TURKISH BANKS' NON-CORE FOREIGN-CURRENCY LIABILITIES



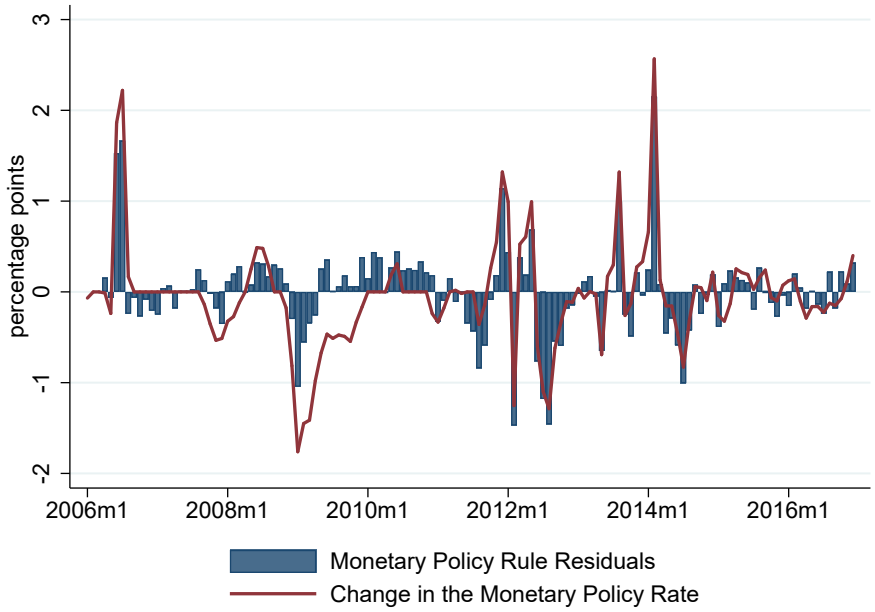
Notes. The figure shows the annual percentage change in non-core foreign-currency liabilities of deposit-taking Turkish banks against the measures of global liquidity indicators that we use in the empirical analyses. Federal Reserve Total Assets have increased by over 150% in late 2008, hence not shown for scaling purposes. Sources: Federal Reserve Economic Data (FRED), Central Bank of the Republic of Turkey, Jarocinski and Karadi (2019).

FIGURE 1.2: CBRT MONETARY POLICY RATE



Notes. The figure shows the evolution of Central Bank of the Republic of Turkey (CBRT) monetary policy rate, i.e., the weighted average cost of liquidity provided by the central bank to the banking system. We use the official rates till end-2010, and the effective funding rate in the aftermath. See Basci and Kara (2011) for details. Source. Central Bank of the Republic of Turkey.

FIGURE 1.3: MONETARY POLICY RULE RESIDUALS



Notes. To obtain monetary policy rule residuals, we regress policy rate on its own lag, lagged deviation of inflation from its target, lagged deviations of (log) industrial production index, (log) real exchange rate, (log) aggregate domestic credit from their respective trends, and the lagged log of the VIX. In calculating the trend, we use Hodrick-Prescott filter with a smoothing parameter 14400 (as typical in monthly frequency data).

TABLE 1.1: SUMMARY STATISTICS

Variables	Definition	Unit	Mean	Median	SD	25%	75%	N
$i_{bfa,t}$	Interest rate on a loan provided by bank *b* to firm *f* with loan-type *a* at month *t*	%	11.353	10.650	7.655	5.800	14.750	5,021,945
$i^{TRY}_{bfa,t}$	Interest rate on a domestic-currency loan provided by bank *b* to firm *f* with loan-type *a* at month *t*	%	13.468	12.850	7.842	9.450	16.000	3,681,428
$i^{FX}_{bfa,t}$	Interest rate on a foreign-currency loan provided by bank *b* to firm *f* with loan-type *a* at month *t*	%	5.542	5.350	2.136	4.000	6.830	1,340,517
$\log(Volume_{bfa,t})$	Volume of loan from bank b to firm f with loan type a at month t	--	12.621	12.612	1.684	11.533	13.668	5,021,945
$I(SHORT\ TERM_{bfa,t})$	Indicator variable that equals 1 if the loan's maturity (at the time of origination) is less than 1 year, and 0 otherwise	0/1	0.708	1	0.454	0	1	5,021,945
$I(NONCOLL_{bfa,t})$	Indicator variable that equals 1 if the loan is non-collateralized, and 0 otherwise	0/1	0.120	0	0.325	0	0	5,021,945
Macro-Level Variables								
Δ Monetary Policy Rate (MP)	Monthly change in the Monetary Policy Rate	%	-0.044	0.000	0.576	-0.260	0.114	129
Δ CPI	Year-over-year change in the consumer price index	%	8.260	8.171	1.719	7.205	9.500	129
Δ IPI	Year-over-year change in the industrial production index	%	3.778	4.354	7.041	1.726	7.906	129
Δ RER	Monthly change in the real effective exchange rate	%	-0.147	-0.008	2.783	-1.451	1.303	129
Global Macro-Level Variables								
log(VIX)	Natural logarithm of CBOE's volatility index on S&P500 index options	%	2.937	2.876	0.364	2.653	3.159	129
Shadow Federal Funds Rate	Shadow Federal Funds Rate, Wu-Xia(2016)	%	0.241	-0.545	2.475	-1.422	0.750	129
log(Federal Reserve Assets)	Natural logarithm of Federal Reserve's total assets	million USD	14.661	14.850	0.606	14.472	15.257	129
log(US Monetary Base)	Natural logarithm of US Monetary Base	million USD	7.659	7.858	0.581	7.317	8.213	129
US Mon. Pol. Shock	US monetary policy shock is from Jarocinski and Karadi (2019) and based on baseline VAR with sign restrictions.		-1.716	-1.688	0.185	-1.828	-1.606	129
Bank-Level Variables								
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	%	12.983	13.370	6.393	8.990	16.421	1,693
Capital Ratio	Total Equity to Total Assets	%	11.957	11.376	3.359	9.869	13.093	1,693
Liquidity Ratio	Liquid assets (cash + receivables from the central bank + interbank money market + reverse repo receivables) to total assets	%	28.719	27.099	11.417	20.652	34.181	1,693
Size	Natural logarithm of total assets	000s, TL	17.054	17.685	1.800	15.593	18.586	1,693
Additional Bank Controls								
ROA	Pre-tax net profit to total assets	%	1.146	1.153	0.654	0.77	1.579	1,693
NPL Ratio	Non-performing loans (with an overdue past 90 days) to total credit	%	0.877	0.591	0.887	0.259	1.177	1,693

(continues on the next page)

TABLE 1.1: SUMMARY STATISTICS (CONTINUED)

Variables	Definition	Unit	Mean	Median	SD	25%	75%	N
Bank-Sector Level Control								
Herfindahl by bank-industry	Total loans provided by bank *b* to the sector *s* that the firm *f* operates in as a share of total banking loans to the sector *s*	%	7.400	4.134	9.716	1.101	10.557	21,871
Bank-Firm Level Control								
Strength of Bank-Firm Relationship	Share of loan amount from bank *b* to firm *f* in firm *f*'s total bank loans during the previous 12 months	%	0.230	0.159	0.211	0.073	0.323	2,285,355
Firm Level Credit Risk Variables								
Past Default (36 months)	Indicator variable that equals 1 if the firm f has at least one loan that is overdue past 90 days during the previous 36 months	0/1	0.181	0	0.385	0	0	795,548
Past Default (12 months)	Indicator variable that equals 1 if the firm f has at least one loan that is overdue past 90 days during the previous 12 months	0/1	0.113	0	0.317	0	0	795,548
Past Default (24 months)	Indicator variable that equals 1 if the firm f has at least one loan that is overdue past 90 days during the previous 24 months	0/1	0.153	0	0.360	0	0	795,548
Past Default (48 months)	Indicator variable that equals 1 if the firm f has at least one loan that is overdue past 90 days during the previous 48 months	0/1	0.200	0	0.400	0	0	795,548
Bank-Firm Level Credit Risk Variables								
Future Default (12 months)	Indicator variable that equals 1 if the firm f that received a loan today from bank b has at least one loan that is overdue past 90 days at bank b in the following 12 months	0/1	0.017	0	0.128	0	0	2,285,355
Future Default (24 months)	Indicator variable that equals 1 if the firm f that received a loan today from bank b has at least one loan that is overdue past 90 days at bank b in the following 24 months	0/1	0.028	0	0.166	0	0	2,285,355
Mechanism								
Δ log(Volume$_{bgc,t}$)	Change in the log volume of cross-border borrowing by domestic (borrower) bank b from global (lender) bank g in currency c, from *t-3* to *t*	%	0.297	0	39.041	-6.669	6.167	59,698
Δ ($i^*_{bgc,t}$)	Change in interest rate of the cross-border borrowing of domestic (borrower) bank b from global (lender) bank g in currency c, from *t-3* to *t*	%	-0.074	0	0.545	-0.079	0.018	58,879
Interest Differential ($i-i^*_{bgc,t}$)	The spread between the average Turkish domestic currency treasury yields (spanning all maturities) and cross-border borrowing rate of domestic (borrower) bank b from global (lender) bank g in currency c at *t*	% points	8.374	7.896	2.807	6.708	10	59,155

Additional Statistics: Average within-firm standard deviation of loan rates is 206 basis points. Corresponding statistics for domestic-currency and foreign-currency loan rates are 248 and 82 basis points, respectively. Average Future Default (12 months) is 0.018 for domestic-currency loans and 0.0109 for foreign-currency loans (the respective averages for Future Default (24 months) are 0.031 and 0.019).

(end of the Table)

TABLE 1.2: BANKS' RELIANCE ON GLOBAL LIQUIDITY AND POLICY RATE TRANSMISSION

	(1)	(2)	(3)	(4)	(5)	(6)
Σ Δ MP	**2.243****	**2.63*****	**2.728*****	**3.394***		
	(0.955)	(0.972)	(0.98)	(1.927)		
Σ Δ MP * Foreign Funding Ratio$_b$	**-0.175*****	**-0.198*****	**-0.197*****	**-0.168****	**-0.157***	**-0.157***
	(0.063)	(0.067)	(0.07)	(0.08)	(0.084)	(0.083)
Σ Δ MP * Capital Ratio$_b$				**-0.061**	**-0.064**	**-0.069**
				(0.071)	(0.062)	(0.062)
Σ Δ MP * Liquidity Ratio$_b$				**-0.012**	**0.023**	**0.022**
				(0.02)	(0.017)	(0.017)
Σ Δ MP * Size$_b$				**-0.004**	**-0.136***	**-0.134***
				(0.102)	(0.077)	(0.077)
Σ Foreign Funding Ratio$_b$	**0.135*****	**0.009**	**0.024**	**0.159**	**0.119**	**0.119**
	(0.024)	(0.024)	(0.02)	(0.162)	(0.181)	(0.18)
Bank-Sector Control	No	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	No	Yes	Yes	Yes	Yes	Yes
Macro Controls x Bank Variables	No	No	No	Yes	Yes	Yes
Bank FE	No	Yes	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes	--	--
Currency FE	No	No	No	Yes	Yes	--
Maturity FE	No	No	No	Yes	Yes	--
Collateral FE	No	No	No	Yes	Yes	--
Currency x Maturity x Collateral FE	No	No	No	No	No	Yes
Firm-Month FE	No	No	No	No	Yes	Yes
Observations	5,021,945	5,021,945	5,021,945	5,021,945	5,021,945	5,021,945
R-squared	0.053	0.085	0.367	0.447	0.626	0.630
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on the Loan Rate						
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*	**-43.35**	**-49.04**	**-48.80**	**-41.61**	**-38.89**	**-38.89**
By High vs. Low Capital Ratio Banks *(p75-p25)*				**-6.56**	**-6.88**	**-7.42**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*				**-5.41**	**10.37**	**9.92**
By Large vs. Small Banks *(p75-p25)*				**-0.40**	**-13.57**	**-13.37**

Notes: The dependent variable is the interest rate on a loan extended by bank *b* to firm *f* with loan type *a*. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). In all columns, the sample is restricted to firms that work with at least two banks. All estimations are based on weighted ordinary least squares (with natural logarithm of loan volume used as weights). We control bank and macro variables in all columns. Bank controls include foreign funding ratio, capital ratio, liquidity ratio, size, profitability (return on assets, ROA), non-performing loans-to-total loans ratio (NPL ratio). Bank-sector control variable is the bank's concentration in the sector ("Herfindahl by bank", the share of bank b in total loans extended to the sector s that the firm *f* operates in). Bank-Firm control variable is the strength of the bank-firm relationship, reflected by the share of loan amount from bank b to firm *f* in firm *f*'s total bank loans during the previous 12 months. For detailed definitions and summary statistics of the variables used in the estimations, see Table 1. "Yes" indicates that the corresponding set of variables or fixed effects are included. "No" indicates that corresponding fixed effects or variables are not included. "--" indicates that the corresponding fixed effects or variables are inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.3: GLOBAL LIQUIDITY CYCLES AND POLICY RATE TRANSMISSION

	All Loans		TL Loans			FX Loans			All Loans		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Σ Δ MP * Foreign Funding Ratio$_b$ * log(VIX)$_t$		**0.634*** **			**0.830*** **			**0.149*** **			**0.651*** **
		(0.162)			(0.207)			(0.037)			(0.163)
Σ Δ MP * Capital Ratio$_b$ * log(VIX)$_t$		**-0.14**			**-0.093**			**-0.304*** **			**-0.165**
		(0.16)			(0.231)			(0.062)			(0.162)
Σ Δ MP * Liquidity Ratio$_b$ * log(VIX)$_t$		**0.041**			**0.064***			**-0.01**			**0.046***
		(0.027)			(0.037)			(0.009)			(0.026)
Σ Δ MP * Size$_b$ * log(VIX)$_t$		**0.067**			**0.191**			**-0.012**			**0.023**
		(0.228)			(0.331)			(0.071)			(0.226)
Σ Δ MP * Foreign Funding Ratio$_b$	**-0.152***	**-1.916*** **	**-0.197** **	**-0.188** **	**-2.482*** **	**-0.021**	**-0.023**	**-0.443*** **	**-0.161***	**-0.156***	**-1.966*** **
	(0.082)	(0.498)	(0.097)	(0.094)	(0.621)	(0.019)	(0.019)	(0.117)	(0.084)	(0.082)	(0.499)
Σ Δ MP * Capital Ratio$_b$	**-0.07**	**0.213**	**-0.102**	**-0.105**	**0.001**	**-0.066*** **	**-0.046** **	**0.813*** **	**-0.068**	**-0.075**	**0.277**
	(0.058)	(0.442)	(0.083)	(0.077)	(0.637)	(0.019)	(0.02)	(0.169)	(0.063)	(0.058)	(0.449)
Σ Δ MP * Liquidity Ratio$_b$	**0.02**	**-0.119**	**0.026**	**0.028**	**-0.182***	**0.003**	**0**	**0.027**	**0.023**	**0.022**	**-0.132***
	(0.018)	(0.08)	(0.023)	(0.024)	(0.111)	(0.004)	(0.004)	(0.026)	(0.017)	(0.018)	(0.08)
Σ Δ MP * Size$_b$	**-0.103**	**-0.225**	**-0.14**	**-0.099**	**-0.548**	**0.014**	**-0.017**	**0.008**	**-0.129***	**-0.095**	**-0.086**
	(0.085)	(0.697)	(0.107)	(0.118)	(1.013)	(0.03)	(0.028)	(0.198)	(0.076)	(0.084)	(0.691)
Σ log(VIX)$_t$ * Foreign Funding Ratio$_b$	**0.094**	**0.126***		**0.146***	**0.198** **		**0.006**	**0.012**		**0.092**	**0.124***
	(0.064)	(0.064)		(0.082)	(0.082)		(0.01)	(0.01)		(0.064)	(0.063)
Σ log(VIX)$_t$ * Capital Ratio$_b$	**-0.154** **	**-0.164*** **		**-0.278*** **	**-0.271*** **		**0.089*** **	**0.071** **		**-0.193*** **	**-0.203*** **
	(0.071)	(0.065)		(0.095)	(0.088)		(0.031)	(0.031)		(0.071)	(0.064)
Σ log(VIX)$_t$ * Liquidity Ratio$_b$	**-0.039** **	**-0.022**		**-0.031**	**-0.006**		**-0.016*** **	**-0.013** **		**-0.039** **	**-0.022**
	(0.018)	(0.016)		(0.024)	(0.022)		(0.006)	(0.006)		(0.017)	(0.016)
Σ log(VIX)$_t$ * Size$_b$	**0.222** **	**0.291*** **		**0.331*** **	**0.437*** **		**-0.142*** **	**-0.148*** **		**0.235** **	**0.299*** **
	(0.104)	(0.105)		(0.128)	(0.134)		(0.042)	(0.043)		(0.101)	(0.103)
Bank Variables x log(VIX)	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Bank-Sector Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	--	--	--	--	--	--	--	--	--	--	--
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity x Collateral FE	--	--	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Currency x Maturity x Collateral FE	Yes	Yes	No	No	No	No	No	No	No	No	No
Firm-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	--	--	--
Firm-Currency-Month FE	No	No	No	No	No	No	No	No	Yes	Yes	Yes
Observations	5,021,945	5,021,945	3,681,428	3,681,428	3,681,428	1,340,517	1,340,517	1,340,517	5,021,945	5,021,945	5,021,945
R-squared	0.631	0.633	0.578	0.579	0.581	0.710	0.711	0.712	0.670	0.671	0.673
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on the Loan Rate when log(VIX)$_t$ is lower by 1 standard deviation											
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*		**-57.16**			**-74.84**			**-13.43**			**-58.70**
By High vs. Low Capital Ratio Banks *(p75-p25)*		**5.48**			**3.64**			**11.89**			**6.45**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*		**-6.73**			**-10.51**			**1.64**			**-7.55**
By Large vs. Small Banks *(p75-p25)*		**-2.43**			**-6.94**			**0.44**			**-0.84**

Notes: The dependent variable is the interest rate on a loan extended by bank *b* to firm *f* with loan-type *a*. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). All columns include bank variables and their interactions with macro controls. "Yes" indicates that the corresponding set of variables or fixed effects are included. "No" indicates that corresponding fixed effects or variables are not included. "--" indicates that the corresponding fixed effects or variables are inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.4: ALTERNATIVE MEASURES FOR GLOBAL LIQUIDITY CONDITIONS

	Global Variable$_t$				
	log(VIX)$_t$	log(Fed Assets)$_t$	log(US Monetary Base)$_t$	Shadow Fed Funds Rate$_t$	US Mon. Pol. Shock$_t$
	(1)	(2)	(3)	(4)	(5)
Σ Δ MP * Foreign Funding Ratio$_b$ * Global Variable$_t$	**0.634*** **	**-0.291*** **	**-0.317*** **	**0.065*** **	**1.096*** **
	(0.162)	(0.079)	(0.08)	(0.017)	(0.335)
Σ Δ MP * Capital Ratio$_b$ * Global Variable$_t$	**-0.14**	**-0.1***	**-0.104**	**0.02***	**0.583** **
	(0.16)	(0.061)	(0.065)	(0.012)	(0.271)
Σ Δ MP * Liquidity Ratio$_b$ * Global Variable$_t$	**0.041**	**-0.011**	**-0.01**	**0.006**	**0.143***
	(0.027)	(0.019)	(0.02)	(0.004)	(0.073)
Σ Δ MP * Size$_b$ * Global Variable$_t$	**0.067**	**0.144**	**0.169**	**-0.036**	**-0.709**
	(0.228)	(0.144)	(0.149)	(0.027)	(0.588)
Σ Δ MP * Foreign Funding Ratio$_b$	**-1.916*** **	**4.187*** **	**2.356*** **	**-0.086**	**1.741*** **
	(0.498)	(1.13)	(0.597)	(0.053)	(0.541)
Σ Δ MP * Capital Ratio$_b$	**0.213**	**1.292**	**0.616**	**-0.175*** **	**0.867***
	(0.442)	(0.885)	(0.499)	(0.056)	(0.463)
Σ Δ MP * Liquidity Ratio$_b$	**-0.119**	**0.184**	**0.097**	**0.019**	**0.257** **
	(0.08)	(0.276)	(0.149)	(0.017)	(0.118)
Σ Δ MP * Size$_b$	**-0.225**	**-2.121**	**-1.307**	**-0.011**	**-1.232**
	(0.697)	(2.112)	(1.146)	(0.081)	(0.963)
Σ Global Variable$_t$ * Foreign Funding Ratio$_b$	**0.126***	**-0.022**	**-0.022**	**-0.012**	**0.604*** **
	(0.064)	(0.035)	(0.036)	(0.008)	(0.125)
Σ Global Variable$_t$ * Capital Ratio$_b$	**-0.164*** **	**0.07**	**0.092**	**-0.036** **	**0.994*** **
	(0.065)	(0.07)	(0.073)	(0.016)	(0.235)
Σ Global Variable$_t$ * Liquidity Ratio$_b$	**-0.022**	**0.027** **	**0.035*** **	**-0.004***	**-0.069**
	(0.016)	(0.012)	(0.013)	(0.002)	(0.044)
Σ Global Variable$_t$ * Size$_b$	**0.291*** **	**-0.057**	**-0.064**	**-0.011**	**0.414**
	(0.105)	(0.084)	(0.084)	(0.019)	(0.262)
Bank Variables x Global Variable	Yes	Yes	Yes	Yes	Yes
Bank-Sector Control	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Currency x Maturity x Collateral FE	Yes	Yes	Yes	Yes	Yes
Firm-Month FE	Yes	Yes	Yes	Yes	Yes
Observations	5,021,945	5,021,945	5,021,945	5,021,945	5,021,945
R-squared	0.633	0.632	0.633	0.633	0.634

Impact of a Cumulative 100 bpts Increase in the Local Policy Rate
on the Loan Rate when Global Variable$_t$ is easier by 1 standard deviation

By High vs. Low Foreign Funding Ratio Banks (p75-p25)	**-57.16**	**-43.68**	**-45.62**	**-39.85**	**-50.22**
By High vs. Low Capital Ratio Banks (p75-p25)	**5.48**	**-6.51**	**-6.49**	**-5.32**	**-11.59**
By High vs. Low Liquidity Ratio Banks (p75-p25)	**-6.73**	**-3.01**	**-2.62**	**-6.70**	**-11.93**
By Large vs. Small Banks (p75-p25)	**-2.43**	**8.71**	**9.80**	**8.89**	**13.09**

Notes: The dependent variable is the interest rate on a loan extended by bank *b* to firm *f* with loan-type *a*. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). All columns include bank variables and their interactions with macro controls. *Shadow Fed Funds Rate* is from Wu and Xia (2016). *US Mon. Pol. Shock* is from Jarocinski and Karadi (2019) and based on baseline VAR with sign restrictions. "Yes" indicates that the corresponding set of variables are included in the estimation. Regarding the fixed effects, "Yes" indicates that corresponding fixed effects is included. "No" indicates that corresponding fixed effects is not included. "--" indicates that the respective fixed effect is inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.5: OTHER CREDIT DIMENSIONS

Dependent Variable:	Log(Volume)	Prob.(Short-Term)	Prob.(Non-Collateralized)
	(1)	(2)	(3)
Σ Δ MP * Foreign Funding Ratio$_b$ * log(VIX)$_t$	**-0.011****	**0.011*****	**-0.006****
	(0.005)	(0.003)	(0.003)
Σ Δ MP * Capital Ratio$_b$ * log(VIX)$_t$	**0.011**	**-0.033*****	**0.011****
	(0.01)	(0.006)	(0.006)
Σ Δ MP * Liquidity Ratio$_b$ * log(VIX)$_t$	**-0.005*****	**0.000**	**0.004*****
	(0.002)	(0.001)	(0.001)
Σ Δ MP * Size$_b$ * log(VIX)$_t$	**0.065*****	**-0.018****	**-0.012***
	(0.017)	(0.009)	(0.007)
Σ Δ MP * Foreign Funding Ratio$_b$	**0.025***	**-0.029*****	**0.016****
	(0.013)	(0.007)	(0.008)
Σ Δ MP * Capital Ratio$_b$	**-0.025**	**0.092*****	**-0.032****
	(0.03)	(0.017)	(0.016)
Σ Δ MP * Liquidity Ratio$_b$	**0.014*****	**0.000**	**-0.013*****
	(0.006)	(0.004)	(0.003)
Σ Δ MP * Size$_b$	**-0.175*****	**0.054***	**0.04***
	(0.049)	(0.028)	(0.021)
Σ log(VIX)$_t$ * Foreign Funding Ratio$_b$	**0.001**	**0.00**	**-0.002**
	(0.002)	(0.001)	(0.002)
Σ log(VIX)$_t$ * Capital Ratio$_b$	**0.017*****	**0.001**	**-0.009*****
	(0.006)	(0.004)	(0.003)
Σ log(VIX)$_t$ * Liquidity Ratio$_b$	**0.001**	**-0.002****	**0.002*****
	(0.001)	(0.001)	(0.001)
Σ log(VIX)$_t$ * Size$_b$	**-0.038*****	**-0.011***	**-0.008**
	(0.009)	(0.006)	(0.006)
Bank Variables x log(VIX)	Yes	Yes	Yes
Bank-Sector Control	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Currency x Maturity x Collateral FE	Yes	--	--
Currency x Collateral FE	--	Yes	--
Currency x Maturity FE	--	--	Yes
Firm-Month FE	Yes	Yes	Yes
Observations	5,021,945	5,021,945	5,021,945
R-squared	0.673	0.483	0.543

Impact of a Cumulative 100 bpts Increase
in the Local Policy Rate on the Outcome Variable (% points)
when log(VIX)$_t$ is lower by 1 standard deviation

By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*	**0.99**	**-0.99**	**0.54**
By High vs. Low Capital Ratio Banks *(p75-p25)*	**-0.43**	**1.29**	**-0.43**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*	**0.82**	**0.00**	**-0.66**
By Large vs. Small Banks *(p75-p25)*	**-2.36**	**0.65**	**0.44**

Notes: The dependent variables are Log(Volume), the natural logarithm of volume of credit provided by bank b to firm f with loan type a (column 1); "Short-Term", an indicator variable that equals 1 if the loan's maturity (at the time of origination) is less than 1 year, and 0 otherwise (column 2); "Non-Collateralized", an indicator variable that equals 1 if the loan is non-collateralized, and 0 otherwise (columns 3). Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). All columns include bank variables and their interactions with macro controls. "Yes" indicates that the corresponding set of variables or fixed effects are included. "No" indicates that corresponding fixed effects or variables are not included. "--" indicates that the corresponding fixed effects or variables are inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.6: BANK RISK TAKING

	All Loans				TL Loans		FX Loans	
Set of Firms:	Riskier	Safer	Riskier	Safer	Riskier	Safer	Riskier	Safer
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Σ Δ MP * Foreign Funding Ratio$_b$ * log(VIX)$_t$			**0.716*** **	**0.623*** **	**0.873*** **	**0.828*** **	**0.208*** **	**0.136*** **
			(0.185)	(0.159)	(0.228)	(0.205)	(0.056)	(0.033)
Σ Δ MP * Capital Ratio$_b$ * log(VIX)$_t$			**-0.077**	**-0.168**	**-0.058**	**-0.121**	**-0.31*** **	**-0.294*** **
			(0.19)	(0.16)	(0.265)	(0.235)	(0.074)	(0.061)
Σ Δ MP * Liquidity Ratio$_b$ * log(VIX)$_t$			**0.083** **	**0.033**	**0.11** **	**0.055**	**-0.001**	**-0.012**
			(0.036)	(0.025)	(0.049)	(0.035)	(0.015)	(0.008)
Σ Δ MP * Size$_b$ * log(VIX)$_t$			**-0.261**	**0.169**	**-0.358**	**0.384**	**0.011**	**-0.023**
			(0.285)	(0.212)	(0.371)	(0.315)	(0.102)	(0.067)
Σ Δ MP * Foreign Funding Ratio$_b$	**-0.195*** **	**-0.14***	**-2.169*** **	**-1.879*** **	**-2.628*** **	**-2.472*** **	**-0.618*** **	**-0.402*** **
	(0.077)	(0.083)	(0.548)	(0.491)	(0.668)	(0.618)	(0.17)	(0.104)
Σ Δ MP * Capital Ratio$_b$	**-0.101***	**-0.056**	**0.022**	**0.303**	**-0.087**	**0.084**	**0.824*** **	**0.787*** **
	(0.057)	(0.059)	(0.527)	(0.446)	(0.731)	(0.652)	(0.208)	(0.167)
Σ Δ MP * Liquidity Ratio$_b$	**0.019**	**0.02**	**-0.236** **	**-0.097**	**-0.299** **	**-0.16**	**-0.01**	**0.034**
	(0.019)	(0.018)	(0.106)	(0.078)	(0.146)	(0.109)	(0.044)	(0.024)
Σ Δ MP * Size$_b$	**0.038**	**-0.139***	**0.862**	**-0.577**	**1.161**	**-1.177**	**-0.009**	**0.038**
	(0.107)	(0.079)	(0.855)	(0.644)	(1.103)	(0.964)	(0.293)	(0.187)
Σ log(VIX)$_t$ * Foreign Funding Ratio$_b$	**0.17** **	**0.072**	**0.207*** **	**0.101**	**0.261*** **	**0.177** **	**0.021**	**0.009**
	(0.071)	(0.064)	(0.072)	(0.063)	(0.089)	(0.081)	(0.016)	(0.009)
Σ log(VIX)$_t$ * Capital Ratio$_b$	**-0.288*** **	**-0.114**	**-0.285*** **	**-0.128***	**-0.361*** **	**-0.234*** **	**0.059**	**0.071** **
	(0.08)	(0.072)	(0.074)	(0.066)	(0.094)	(0.09)	(0.048)	(0.031)
Σ log(VIX)$_t$ * Liquidity Ratio$_b$	**-0.028**	**-0.043** **	**-0.002**	**-0.027***	**0.006**	**-0.01**	**-0.008**	**-0.013** **
	(0.021)	(0.017)	(0.019)	(0.016)	(0.026)	(0.021)	(0.008)	(0.005)
Σ log(VIX)$_t$ * Size$_b$	**0.071**	**0.246** **	**0.098**	**0.307*** **	**0.247***	**0.455*** **	**-0.176*** **	**-0.142*** **
	(0.121)	(0.108)	(0.124)	(0.109)	(0.147)	(0.139)	(0.058)	(0.043)
Bank Variables x log(VIX)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Sector Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Currency x Maturity x Collateral FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,140,025	3,881,920	1,140,025	3,881,920	891,546	2,789,882	248,479	1,092,038
R-squared	0.597	0.641	0.599	0.643	0.541	0.594	0.699	0.715
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on the Loan Rate when log(VIX)$_t$ is lower by 1 standard deviation								
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*			**-64.56**	**-56.17**	**-78.71**	**-74.65**	**-18.75**	**-12.26**
By High vs. Low Capital Ratio Banks *(p75-p25)*			**3.01**	**6.57**	**2.27**	**4.73**	**12.13**	**11.50**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*			**-13.62**	**-5.42**	**-18.06**	**-9.03**	**0.16**	**1.97**
By Large vs. Small Banks *(p75-p25)*			**9.48**	**-6.14**	**13.00**	**-13.94**	**-0.40**	**0.84**

Notes: The dependent variable is the interest rate on a loan extended by bank b to firm f with loan-type a. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). A firm is taken as "Riskier" if the firm has defaulted on a loan during the previous 36 months, and "Safer" otherwise. All columns include bank variables and their interactions with macro controls. "Yes" indicates that the corresponding set of variables or fixed effects are included. "No" indicates that corresponding fixed effects or variables are not included. "--" indicates that the corresponding fixed effects or variables are inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.7: AN ALTERNATIVE SPECIFICATION FOR BANK RISK-TAKING

VIX (high or low):	All			High VIX			Low VIX		
Loan Types:	All Loans	TL Loans	FX Loans	All Loans	TL Loans	FX Loans	All Loans	TL Loans	FX Loans
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Σ Δ MP * Foreign Funding Ratio$_b$ * I(Firm Risk$_{f,t}$)	**-0.05*** **	**-0.038***	**-0.025*** **	**-0.056** **	**-0.092** **	**0.008**	**-0.024**	**-0.017**	**-0.028*** **
	(0.019)	(0.021)	(0.01)	(0.026)	(0.041)	(0.011)	(0.024)	(0.023)	(0.008)
Σ Δ MP * Capital Ratio$_b$ * I(Firm Risk$_{f,t}$)	**-0.091*** **	**-0.109*** **	**0.004**	**-0.077**	**-0.071**	**-0.025**	**-0.069**	**-0.047**	**-0.005**
	(0.031)	(0.043)	(0.018)	(0.072)	(0.098)	(0.032)	(0.062)	(0.071)	(0.023)
Σ Δ MP * Liquidity Ratio$_b$ * I(Firm Risk$_{f,t}$)	**-0.009**	**0**	**-0.011*** **	**0.02***	**0.022**	**-0.001**	**0.003**	**0.017**	**-0.011** **
	(0.008)	(0.011)	(0.004)	(0.012)	(0.016)	(0.006)	(0.014)	(0.017)	(0.005)
Σ Δ MP * Size$_b$ * I(Firm Risk$_{f,t}$)	**0.186*** **	**0.199*** **	**0.027**	**0.072**	**0.123**	**-0.05**	**0.246** **	**0.233** **	**0.069** **
	(0.066)	(0.073)	(0.031)	(0.078)	(0.103)	(0.042)	(0.101)	(0.11)	(0.034)
Σ Δ MP * Foreign Funding Ratio$_b$	**-0.145***	**-0.188***	**-0.015**	**0.133**	**0.182**	**0.027** **	**-0.262*** **	**-0.314*** **	**-0.049***
	(0.085)	(0.1)	(0.016)	(0.082)	(0.125)	(0.012)	(0.088)	(0.097)	(0.025)
Σ Δ MP * Capital Ratio$_b$	**-0.049**	**-0.075**	**-0.066*** **	**-0.328*** **	**-0.441*** **	**-0.126*** **	**-0.059**	**-0.091**	**0.006**
	(0.063)	(0.088)	(0.018)	(0.081)	(0.118)	(0.035)	(0.08)	(0.094)	(0.027)
Σ Δ MP * Liquidity Ratio$_b$	**0.024**	**0.026**	**0.004**	**0.024**	**0.029**	**-0.003**	**-0.013**	**-0.004**	**-0.012** **
	(0.017)	(0.024)	(0.004)	(0.022)	(0.031)	(0.005)	(0.018)	(0.023)	(0.006)
Σ Δ MP * Size$_b$	**-0.172** **	**-0.189***	**0.012**	**-0.28***	**-0.373** **	**0.022**	**-0.03**	**-0.024**	**-0.012**
	(0.072)	(0.1)	(0.031)	(0.141)	(0.185)	(0.07)	(0.138)	(0.175)	(0.034)
Bank Variables x I(Firm Risk)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Macro Controls x Bank Variables x I(Firm Risk)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Sector Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Currency x Maturity x Collateral FE	Yes	--	--	Yes	--	--	Yes	--	--
Maturity x Collateral FE	--	Yes	Yes	--	Yes	Yes	--	Yes	Yes
Firm-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,021,945	3,681,428	1,340,517	2,047,668	1,422,011	625,657	2,974,277	2,259,417	714,860
R-squared	0.631	0.578	0.710	0.687	0.636	0.694	0.598	0.547	0.715
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on the Loan Rate to Ex-ante Riskier Firms									
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*	**-12.39**	**-9.41**	**-6.19**	**-13.87**	**-22.79**	**1.98**	**-5.94**	**-4.21**	**-6.94**
By High vs. Low Capital Ratio Banks *(p75-p25)*	**-9.78**	**-11.71**	**0.43**	**-8.27**	**-7.63**	**-2.69**	**-7.42**	**-5.05**	**-0.54**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*	**-4.06**	**0.00**	**-4.96**	**9.02**	**9.92**	**-0.45**	**1.35**	**7.67**	**-4.96**
By Large vs. Small Banks *(p75-p25)*	**18.56**	**19.85**	**2.69**	**7.18**	**12.27**	**-4.99**	**24.54**	**23.25**	**6.88**

Notes: The dependent variable is the interest rate on a loan extended by bank *b* to firm *f* with loan-type *a*. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). I(Firm Risk) is a dummy variable that takes a value 1 if the firm has defaulted on a loan during a period of 36 months prior to borrowing, and 0 otherwise. All columns include bank variables and their interactions with macro controls. "Yes" indicates that the corresponding set of variables are included in the estimation. Regarding the fixed effects, "Yes" indicates that corresponding fixed effects is included. "No" indicates that corresponding fixed effects is not included. "--" indicates that the respective fixed effect is inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.8: NEWLY ORIGINATED LOANS AND BANK RISK-TAKING

Currency Type:	TL Loans				FX Loans			
Set of Firms:	All	All	Riskier	Safer	All	All	Riskier	Safer
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Σ Δ MP * Foreign Funding Ratio$_b$ * log(VIX)$_t$		**0.875*** **	**0.959*** **	**0.881*** **		**0.065** **	**0.185*** **	**0.039**
		(0.277)	(0.326)	(0.267)		(0.03)	(0.05)	(0.029)
Σ Δ MP * Capital Ratio$_b$ * log(VIX)$_t$		**0.703***	**0.732***	**0.611***		**-0.182*** **	**-0.332*** **	**-0.152** **
		(0.365)	(0.422)	(0.363)		(0.06)	(0.088)	(0.063)
Σ Δ MP * Liquidity Ratio$_b$ * log(VIX)$_t$		**0.215*** **	**0.351*** **	**0.186*** **		**-0.009**	**-0.023**	**-0.008**
		(0.064)	(0.084)	(0.061)		(0.007)	(0.017)	(0.007)
Σ Δ MP * Size$_b$ * log(VIX)$_t$		**0.175**	**-0.008**	**0.251**		**0.07**	**-0.016**	**0.097**
		(0.422)	(0.522)	(0.397)		(0.101)	(0.17)	(0.099)
Σ Δ MP * Foreign Funding Ratio$_b$	**-0.25** **	**-2.65*** **	**-2.895*** **	**-2.67*** **	**-0.021**	**-0.204** **	**-0.552*** **	**-0.125**
	(0.115)	(0.806)	(0.936)	(0.779)	(0.014)	(0.091)	(0.144)	(0.087)
Σ Δ MP * Capital Ratio$_b$	**0.169**	**-2.074** **	**-2.239***	**-1.774***	**0.007**	**0.525*** **	**0.936*** **	**0.442*** **
	(0.147)	(1.016)	(1.189)	(1.009)	(0.019)	(0.162)	(0.242)	(0.169)
Σ Δ MP * Liquidity Ratio$_b$	**0.042**	**-0.618*** **	**-1.006*** **	**-0.537*** **	**-0.002**	**0.024**	**0.057**	**0.021**
	(0.044)	(0.191)	(0.243)	(0.184)	(0.004)	(0.022)	(0.052)	(0.021)
Σ Δ MP * Size$_b$	**-0.136**	**-0.395**	**0.391**	**-0.741**	**0.04**	**-0.177**	**0.099**	**-0.252**
	(0.156)	(1.276)	(1.531)	(1.211)	(0.034)	(0.29)	(0.487)	(0.291)
Σ log(VIX)$_t$ * Foreign Funding Ratio$_b$		**0.226**	**0.35** **	**0.186**		**0.006**	**0.015**	**0.003**
		(0.148)	(0.16)	(0.147)		(0.012)	(0.021)	(0.012)
Σ log(VIX)$_t$ * Capital Ratio$_b$		**-0.593*** **	**-0.68*** **	**-0.546*** **		**0.001**	**-0.061**	**0.012**
		(0.148)	(0.155)	(0.153)		(0.03)	(0.046)	(0.029)
Σ log(VIX)$_t$ * Liquidity Ratio$_b$		**-0.062**	**-0.025**	**-0.068***		**-0.012** **	**0.001**	**-0.014** **
		(0.04)	(0.044)	(0.04)		(0.005)	(0.008)	(0.006)
Σ log(VIX)$_t$ * Size$_b$		**0.827*** **	**0.349***	**0.911*** **		**-0.048**	**-0.01**	**-0.07**
		(0.196)	(0.21)	(0.208)		(0.06)	(0.084)	(0.061)
Bank Variables x log(VIX)	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Bank-Sector Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity x Collateral FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,533,241	1,533,241	351,807	1,181,434	234,437	234,437	43,044	191,393
R-squared	0.704	0.707	0.665	0.719	0.851	0.851	0.840	0.853
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on the Loan Rate								
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*	**-61.93**				**-5.20**			
By High vs. Low Capital Ratio Banks *(p75-p25)*	**18.16**				**0.75**			
By High vs. Low Liquidity Ratio Banks *(p75-p25)*	**18.94**				**-0.90**			
By Large vs. Small Banks *(p75-p25)*	**-13.57**				**3.99**			
… when log(VIX)$_t$ is lower by 1 standard deviation								
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*		**-78.89**	**-86.47**	**-79.43**		**-5.86**	**-16.68**	**-3.52**
By High vs. Low Capital Ratio Banks *(p75-p25)*		**-27.50**	**-28.63**	**-23.90**		**7.12**	**12.99**	**5.95**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*		**-35.29**	**-57.62**	**-30.53**		**1.48**	**3.78**	**1.31**
By Large vs. Small Banks *(p75-p25)*		**-6.36**	**0.29**	**-9.12**		**-2.54**	**0.58**	**-3.52**

Notes: The dependent variable is the interest rate on a newly originated loan extended by bank b to firm f with loan-type a. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). A firm is taken as "Riskier" if the firm has defaulted on a loan during the previous 36 months, and "Safer" otherwise. All columns include bank variables and their interactions with macro controls. "Yes" indicates that the corresponding set of variables are included in the estimation. Regarding the fixed effects, "Yes" indicates that corresponding fixed effects is included. "No" indicates that corresponding fixed effects is not included. "--" indicates that the respective fixed effect is inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.9: FUTURE DEFAULT

Horizon of Future Default :	12 months	24 months	12 months	24 months	12 months	24 months
Borrower Type$_{fbt}$:	All		FX Borrower		TL Borrower	
	(1)	(2)	(3)	(4)	(5)	(6)
Σ Δ MP * Foreign Funding Ratio$_b$ * log(VIX)$_t$	**-0.00604*** **	**-0.00845*** **	**-0.0051*** **	**-0.0074*** **	**-0.00573*** **	**-0.00795*** **
	(0.00163)	(0.00156)	(0.00134)	(0.00146)	(0.00184)	(0.0017)
Σ Δ MP * Capital Ratio$_b$ * log(VIX)$_t$	**0.00798****	**0.0134*** **	**0.00831*** **	**0.01348*** **	**0.00679***	**0.01224*** **
	(0.00323)	(0.00325)	(0.003)	(0.00303)	(0.00352)	(0.00364)
Σ Δ MP * Liquidity Ratio$_b$ * log(VIX)$_t$	**0.00054**	**0.00153*** **	**0.00089****	**0.00156*** **	**0.00016**	**0.00131*** **
	(0.00048)	(0.00044)	(0.00037)	(0.00043)	(0.00059)	(0.00047)
Σ Δ MP * Size$_b$ * log(VIX)$_t$	**-0.00409**	**-0.00059**	**-0.01362****	**-0.01356****	**0.00009**	**0.0043**
	(0.00515)	(0.00476)	(0.0063)	(0.00654)	(0.0051)	(0.00457)
Σ Δ MP * Foreign Funding Ratio$_b$	**0.01565*** **	**0.02251*** **	**0.01336*** **	**0.01968*** **	**0.01473*** **	**0.02113*** **
	(0.00439)	(0.0043)	(0.00368)	(0.00411)	(0.00494)	(0.00463)
Σ Δ MP * Capital Ratio$_b$	**-0.02067****	**-0.036*** **	**-0.02219*** **	**-0.03675*** **	**-0.01742***	**-0.03301*** **
	(0.00894)	(0.00912)	(0.00844)	(0.00861)	(0.00977)	(0.01027)
Σ Δ MP * Liquidity Ratio$_b$	**-0.002**	**-0.00489*** **	**-0.00275****	**-0.00478*** **	**-0.00097**	**-0.00431*** **
	(0.0015)	(0.00127)	(0.00115)	(0.00126)	(0.00185)	(0.00137)
Σ Δ MP * Size$_b$	**0.00556**	**-0.00262**	**0.03281***	**0.03489***	**-0.00625**	**-0.01667**
	(0.01574)	(0.01428)	(0.01903)	(0.01922)	(0.01514)	(0.01343)
Σ log(VIX)$_t$ * Foreign Funding Ratio$_b$	**0.00407*** **	**0.00463*** **	**0.0033*** **	**0.00358*** **	**0.00417*** **	**0.00485*** **
	(0.00092)	(0.00094)	(0.00072)	(0.00085)	(0.00104)	(0.001)
Σ log(VIX)$_t$ * Capital Ratio$_b$	**-0.00844*** **	**-0.00709*** **	**-0.0102*** **	**-0.01067*** **	**-0.00653*** **	**-0.00437****
	(0.00323)	(0.00325)	(0.003)	(0.00303)	(0.00352)	(0.00364)
Σ log(VIX)$_t$ * Liquidity Ratio$_b$	**0.00023**	**-0.0001**	**0.00044***	**0.0005**	**0.00012**	**-0.00042**
	(0.00032)	(0.00037)	(0.00025)	(0.00033)	(0.0004)	(0.00043)
Σ log(VIX)$_t$ * Size$_b$	**0.02158*** **	**0.01972*** **	**0.01647*** **	**0.01735*** **	**0.02214*** **	**0.02017*** **
	(0.00321)	(0.00303)	(0.00441)	(0.00425)	(0.00316)	(0.0031)
Bank-Sector Control	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,021,945	5,021,945	1,340,517	1,340,517	3,681,428	3,681,428
R-squared	0.518	0.503	0.578	0.557	0.544	0.530
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on the prob. of future loan default of firm f at bank b when log(VIX)$_t$ is lower by 1 standard deviation						
By High vs. Low Foreign Funding Ratio Banks (p75-p25)	**0.54**	**0.76**	**0.46**	**0.67**	**0.52**	**0.72**
[as a ratio of the dependent variable's mean]	[32.03]	[27.21]	[41.95]	[34.73]	[28.54]	[23.23]
By High vs. Low Capital Ratio Banks (p75-p25)	**-0.31**	**-0.52**	**-0.33**	**-0.53**	**-0.27**	**-0.48**
[as a ratio of the dependent variable's mean]	[-18.36]	[-18.72]	[-29.65]	[-27.45]	[-14.67]	[-15.52]
By High vs. Low Liquidity Ratio Banks (p75-p25)	**-0.09**	**-0.25**	**-0.15**	**-0.26**	**-0.03**	**-0.22**
[as a ratio of the dependent variable's mean]	[-5.21]	[-8.97]	[-13.33]	[-13.33]	[-1.45]	[-6.97]
By Large vs. Small Banks (p75-p25)	**0.15**	**0.02**	**0.49**	**0.49**	**0.00**	**-0.16**
[as a ratio of the dependent variable's mean]	[8.74]	[0.77]	[45.12]	[25.64]	[-0.18]	[-5.06]

Notes: The dependent variable "Future Default" is a dummy variable that takes a value 1 if the firm *f* defaults on a loan at bank b during the next 12 or 24 months, and 0 otherwise. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). All columns include bank variables and their interactions with macro controls. If a loan that is granted by bank *b* at time *t* to firm *f* is foreign-currency denominated, we call firm *f* as an "FX Borrower", and as a "TL Borrower" if the loan is domestic-currency denominated. "Yes" indicates that the corresponding set of variables are included in the estimation. Regarding the fixed effects, "Yes" indicates that corresponding fixed effects is included. "No" indicates that corresponding fixed effects is not included. "--" indicates that the respective fixed effect is inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.10: FIRM SWITCHING ACROSS BANKS

Set of Firms:	All	Riskier	Safer	All	Riskier	Safer
	(1)	(2)	(3)	(4)	(5)	(6)
Σ Δ MP	**0.023*** **	**0.031*** **	**0.021*** **	**0.024*** **	**0.026*** **	**0.023*** **
	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)
I(Low Foreign Funding Bank$_{f,t-3}$)	**0.149*** **	**0.155*** **	**0.148*** **	**0.124*** **	**0.129*** **	**0.122*** **
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
log(Number of Bank Relations)	**0.001**	**0.004**	**-0.001**	**0.001**	**0.007** **	**0.001**
	(0.002)	(0.003)	(0.002)	(0.001)	(0.003)	(0.002)
log(Volume)	**-0.001*** **	**-0.004*** **	**-0.001***	**-0.003*** **	**-0.007*** **	**-0.003*** **
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)
log(Maturity)	**0.012*** **	**0.017*** **	**0.011*** **	**0.012*** **	**0.018*** **	**0.011*** **
	(0.001)	(0.002)	(0.001)	(0.001)	(0.002)	(0.001)
Δ Presence of High Foreign Funding Banks				**0.122*** **	**0.118*** **	**0.122*** **
				(0.001)	(0.003)	(0.001)
Observations	212,856	41,869	170,987	204,595	40,597	163,998
R-squared	0.089	0.099	0.088	0.145	0.135	0.149
Probability of a firm switching from a low to a high foreign funding bank following a cumulative 100 bpts local policy tightening	**2.30**	**3.10**	**2.10**	**2.40**	**2.60**	**2.30**

Notes: The observations are at the firm-month level. The dependent variable I(switching$_{f,t}$) is an indicator variable that equals 1 if the largest bank from which the firm borrows at month t-3 has foreign funding ratio less than median bank and the firm then switches at month t to a bank that has foreign funding ratio higher than median bank; and 0 otherwise. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). A firm is taken as "Riskier" if the firm has defaulted on a loan during the previous 36 months , and "Safer" otherwise. I(Low Foreign Funding Ratiof,t-3) is an indicator variable that equals one if the largest bank from which the firm borrows at month t-3 has foreign funding ratio less than median bank; and 0 otherwise. log(Number of Bank Relations) is log value of the number of domestic banks from which the firm is borrowing in month t-3. log(Volume) is log value of the total outstanding amount of loans of a firm at month t-3. log(Maturity) is log value of the average loan maturity of a firm at month t-3. Δ Presence of High Foreign Funding Banks is the change in the number of branches of high foreign funding banks in the firm's city from month t-3 to month t, relative to the change in the number of branches of low foreign funding banks in the firm's city from month t-3 to month t. All columns include macro controls. Robust standard errors are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.11: MECHANISM: BANK CARRY-TRADE

Dependent Variable:	Δ log(Volume$_{bgc,t}$)		Δ i*$_{bgc,t}$		Interest Differential (i-i*$_{bgc,t}$)		Δ log(Volume$_{bgc,t}$)	Δ i*$_{bgc,t}$	Interest Differential (i-i*$_{bgc,t}$)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Σ Δ MP * Foreign Funding Ratio$_b$	**0.362****	**0.419*****	**0.002**	**0.002**	**0.022****	**0.022****	**0.401****	**0.008**	**0.006**
	(0.161)	(0.158)	(0.006)	(0.006)	(0.01)	(0.01)	(0.179)	(0.007)	(0.01)
Σ Δ MP * Capital Ratio$_b$	**-1.105****	**-1.098****	**0.005**	**0.009**	**-0.032**	**-0.022**	**-0.871***	**-0.002**	**-0.016**
	(0.48)	(0.471)	(0.016)	(0.016)	(0.028)	(0.029)	(0.485)	(0.017)	(0.022)
Σ Δ MP * Liquidity Ratio$_b$	**-0.123**	**-0.225**	**0.014***	**0.013**	**0.004**	**0.005**	**-0.267***	**0.012**	**0.013***
	(0.152)	(0.147)	(0.008)	(0.008)	(0.008)	(0.008)	(0.147)	(0.009)	(0.007)
Σ Δ MP * Size$_b$	**-0.47**	**-0.189**	**0.001**	**0.007**	**0.05**	**0.05**	**-0.335**	**0.003**	**0.039**
	(0.836)	(0.855)	(0.032)	(0.034)	(0.035)	(0.035)	(0.911)	(0.034)	(0.032)
Σ Δ MP * Foreign Funding Ratio$_b$ * log(VIX)$_t$							**0.211**	**0.045****	**-0.074****
							(0.538)	(0.021)	(0.03)
Σ Δ MP * Capital Ratio$_b$ * log(VIX)$_t$							**-1.801**	**0.011**	**0.232*****
							(1.458)	(0.049)	(0.056)
Σ Δ MP * Liquidity Ratio$_b$ * log(VIX)$_t$							**-0.077**	**0.008**	**-0.045*****
							(0.301)	(0.011)	(0.014)
Σ Δ MP * Size$_b$ * log(VIX)$_t$							**-0.776**	**0.175*****	**-0.136****
							(0.301)	(0.011)	(0.014)
Domestic (Borrower) Bank Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Domestic (Borrower) Bank Variables x Macro Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Currency F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Domestic (Borrower) Bank F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Global (Lender) Bank's Headquarter Country x Month F.E	Yes	No	Yes	No	Yes	No	No	No	No
Global (Lender) Bank x Month F.E	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Observations	59,698	59,698	58,879	58,879	59,155	59,155	59,698	58,879	59,155
R-squared	0.100	0.238	0.250	0.342	0.901	0.924	0.239	0.352	0.925
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on Domestic Banks' Cross-Border Foreign-Currency Borrowing									
	(in percentage terms)		*(in basis points)*		*(in basis points)*				
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*	**0.90**	**1.04**	**0.00**	**0.50**	**5.45**	**5.45**			
By High vs. Low Capital Ratio Banks *(p75-p25)*	**-1.19**	**-1.18**	**0.01**	**0.97**	**-3.44**	**-2.36**			
By High vs. Low Liquidity Ratio Banks *(p75-p25)*	**-0.55**	**-1.01**	**0.06**	**5.86**	**1.80**	**2.25**			
By Large vs. Small Banks *(p75-p25)*	**-0.47**	**-0.19**	**0.00**	**0.70**	**4.99**	**4.99**			
… when log(VIX)$_t$ is lower by 1 standard deviation							*(in percentage terms)*	*(in basis points)*	*(in basis points)*
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*							**-0.19**	**-4.06**	**6.67**
By High vs. Low Capital Ratio Banks *(p75-p25)*							**1.62**	**-0.99**	**-20.92**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*							**0.07**	**-0.72**	**4.06**
By Large vs. Small Banks *(p75-p25)*							**0.70**	**-15.78**	**12.26**

Notes: The dependent variable is the change in the logarithm of bank b's volume of borrowing in currency c from global bank g from *t-3* to *t* (columns 1,2,7), the change in the interest rate associated with the cross-border borrowing from *t-3* to *t* (columns 3,4,8), or the difference between the average Turkish domestic currency treasury yields (averaging over all maturities) and cross-border borrowing rate at time *t* (columns 5,6,9). Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). "Yes" indicates that the corresponding set of variables or fixed effects are included. "No" indicates that corresponding fixed effects or variables are not included. "--" indicates that the corresponding fixed effects or variables are inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at global (lender) bank-domestic (borrower) bank and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.12: BALANCEDNESS

Loan portfolio characteristics	Correlation Coefficient with Bank Foreign Funding Ratio
W.Aveg. Firm Log(Total Assets)	0.163*
W.Aveg. Firm Tangible Fixed Assets	0.039
W.Aveg. Firm Log(Sales)	0.073
W.Aveg. Firm Log(Age)	0.009
W.Aveg. Firm Capital-to-Total Assets Ratio	-0.120
W.Aveg. Firm EBITDA-to-Total Asset Ratio	-0.109
W.Aveg. Firm ST Debt-to-Total Debt Ratio	-0.046

Notes: Loan portfolio characteristics are the weighted average firm variables, with weights proportional to the share of a firm in the bank's total non-financial corporate sector loans. Sample size is 152 (we use averages at the bank level for December of each year). ** significant at 5%, and * significant at 10%.

TABLE 1.13: ALTERNATIVE HORIZONS FOR FIRM PAST DEFAULT

Horizon of Past Default:	36 months		12 months		24 months		48 months	
Set of Firms	Riskier	Safer	Riskier	Safer	Riskier	Safer	Riskier	Safer
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Σ Δ MP * Foreign Funding Ratio$_b$ * log(VIX)$_t$	**0.716*** **	**0.623*** **	**0.774*** **	**0.622*** **	**0.767*** **	**0.614*** **	**0.724*** **	**0.621*** **
	(0.185)	(0.159)	(0.211)	(0.158)	(0.197)	(0.157)	(0.182)	(0.159)
Σ Δ MP * Capital Ratio$_b$ * log(VIX)$_t$	**-0.077**	**-0.168**	**0.09**	**-0.176**	**-0.053**	**-0.167**	**-0.1**	**-0.169**
	(0.19)	(0.16)	(0.247)	(0.156)	(0.21)	(0.158)	(0.182)	(0.16)
Σ Δ MP * Liquidity Ratio$_b$ * log(VIX)$_t$	**0.083****	**0.033**	**0.112****	**0.034**	**0.075***	**0.034**	**0.08****	**0.032**
	(0.036)	(0.025)	(0.046)	(0.025)	(0.039)	(0.026)	(0.035)	(0.025)
Σ Δ MP * Size$_b$ * log(VIX)$_t$	**-0.261**	**0.169**	**-0.612***	**0.151**	**-0.371**	**0.163**	**-0.281**	**0.182**
	(0.285)	(0.212)	(0.344)	(0.216)	(0.319)	(0.209)	(0.278)	(0.211)
Σ Δ MP * Foreign Funding Ratio$_b$	**-2.169*** **	**-1.879*** **	**-2.34*** **	**-1.876*** **	**-2.321*** **	**-1.85*** **	**-2.187*** **	**-1.874*** **
	(0.548)	(0.491)	(0.619)	(0.489)	(0.581)	(0.488)	(0.541)	(0.492)
Σ Δ MP * Capital Ratio$_b$	**0.022**	**0.303**	**-0.448**	**0.321**	**-0.039**	**0.297**	**0.071**	**0.309**
	(0.527)	(0.446)	(0.686)	(0.436)	(0.581)	(0.441)	(0.503)	(0.446)
Σ Δ MP * Liquidity Ratio$_b$	**-0.236****	**-0.097**	**-0.311****	**-0.099**	**-0.216***	**-0.099**	**-0.23****	**-0.094**
	(0.106)	(0.078)	(0.135)	(0.078)	(0.112)	(0.078)	(0.102)	(0.078)
Σ Δ MP * Size$_b$	**0.862**	**-0.577**	**1.852***	**-0.501**	**1.202**	**-0.555**	**0.909**	**-0.612**
	(0.855)	(0.644)	(1.008)	(0.658)	(0.949)	(0.636)	(0.834)	(0.638)
Σ log(VIX)$_t$ * Foreign Funding Ratio$_b$	**0.207*** **	**0.101**	**0.262*** **	**0.106***	**0.21*** **	**0.106***	**0.191*** **	**0.103**
	(0.072)	(0.063)	(0.083)	(0.063)	(0.076)	(0.063)	(0.069)	(0.064)
Σ log(VIX)$_t$* Capital Ratio$_b$	**-0.285*** **	**-0.128***	**-0.284*** **	**-0.138****	**-0.291*** **	**-0.131****	**-0.263*** **	**-0.129***
	(0.074)	(0.066)	(0.096)	(0.064)	(0.077)	(0.066)	(0.072)	(0.066)
Σ log(VIX)$_t$ * Liquidity Ratio$_b$	**-0.002**	**-0.027***	**0.004**	**-0.024**	**-0.008**	**-0.025**	**-0.002**	**-0.028***
	(0.019)	(0.016)	(0.023)	(0.016)	(0.021)	(0.016)	(0.018)	(0.016)
Σ log(VIX)$_t$ * Size$_b$	**0.098**	**0.307*** **	**0.03**	**0.296*** **	**0.109**	**0.302*** **	**0.092**	**0.324*** **
	(0.124)	(0.109)	(0.135)	(0.107)	(0.128)	(0.108)	(0.118)	(0.109)
Bank Variables x log(VIX)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Sector Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Currency x Maturity x Collateral FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,140,025	3,881,920	742,403	4,279,542	980,347	4,041,598	1,246,801	3,775,144
R-squared	0.599	0.643	0.587	0.641	0.594	0.643	0.603	0.643
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on the Loan Rate when Global Variable$_t$ is easier by 1 standard deviation								
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*	**-64.56**	**-56.17**	**-69.79**	**-56.08**	**-69.15**	**-55.36**	**-65.28**	**-55.99**
By High vs. Low Capital Ratio Banks *(p75-p25)*	**3.01**	**6.57**	**-3.52**	**6.88**	**2.07**	**6.53**	**3.91**	**6.61**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*	**-13.62**	**-5.42**	**-18.39**	**-5.58**	**-12.31**	**-5.58**	**-13.13**	**-5.25**
By Large vs. Small Banks *(p75-p25)*	**9.48**	**-6.14**	**22.22**	**-5.48**	**13.47**	**-5.92**	**10.20**	**-6.61**

Notes: The dependent variable is the interest rate on a loan extended by bank b to firm f with loan-type a. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). A firm is taken as "Riskier" if the firm has defaulted on a loan during the corresponding horizon of past default , and "Safer" otherwise. All columns include bank variables and their interactions with macro controls. "Yes" indicates that the corresponding set of variables are included in the estimation. Regarding the fixed effects, "Yes" indicates that corresponding fixed effects is included. "No" indicates that corresponding fixed effects is not included. "--" indicates that the respective fixed effect is inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.14: MONETARY POLICY RULE RESIDUALS

Currency Type:	TL Loans				FX Loans			
Set of Firms:	All	All	Riskier	Safer	All	All	Riskier	Safer
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Σ MPR * Foreign Funding Ratio$_b$ * log(VIX)$_t$		**0.768*** **	**0.837*** **	**0.749*** **		**0.12*** **	**0.18*** **	**0.106*** **
		(0.258)	(0.291)	(0.254)		(0.043)	(0.068)	(0.038)
Σ MPR * Capital Ratio$_b$ * log(VIX)$_t$		**0.008**	**-0.22**	**0.062**		**-0.239*** **	**-0.205** **	**-0.237*** **
		(0.219)	(0.227)	(0.236)		(0.076)	(0.089)	(0.078)
Σ MPR * Liquidity Ratio$_b$ * log(VIX)$_t$		**0.022**	**0.056**	**0.013**		**-0.01**	**-0.009**	**-0.01**
		(0.047)	(0.056)	(0.047)		(0.011)	(0.016)	(0.01)
Σ MPR * Size$_b$ * log(VIX)$_t$		**0.205**	**-0.315**	**0.424**		**-0.036**	**-0.164**	**-0.016**
		(0.355)	(0.38)	(0.353)		(0.076)	(0.111)	(0.075)
Σ MPR * Foreign Funding Ratio$_b$	**-0.219** **	**-2.372*** **	**-2.579*** **	**-2.317*** **	**-0.03***	**-0.374*** **	**-0.554*** **	**-0.33*** **
	(0.098)	(0.784)	(0.865)	(0.776)	(0.018)	(0.134)	(0.206)	(0.12)
Σ MPR * Capital Ratio$_b$	**-0.269*** **	**-0.352**	**0.293**	**-0.499**	**0.001**	**0.684*** **	**0.565** **	**0.686*** **
	(0.078)	(0.633)	(0.635)	(0.693)	(0.02)	(0.215)	(0.25)	(0.221)
Σ MPR * Liquidity Ratio$_b$	**-0.012**	**-0.078**	**-0.174**	**-0.052**	**-0.006**	**0.022**	**0.015**	**0.022**
	(0.022)	(0.147)	(0.17)	(0.148)	(0.005)	(0.033)	(0.049)	(0.032)
Σ MPR * Size$_b$	**0.019**	**-0.561**	**1.103**	**-1.28**	**-0.048***	**0.054**	**0.439**	**-0.006**
	(0.104)	(1.094)	(1.161)	(1.085)	(0.029)	(0.231)	(0.326)	(0.228)
Σ log(VIX)$_t$ * Foreign Funding Ratio$_b$		**0.223** **	**0.301*** **	**0.198** **		**0.013**	**0.022**	**0.009**
		(0.093)	(0.101)	(0.093)		(0.012)	(0.018)	(0.011)
Σ log(VIX)$_t$ * Capital Ratio$_b$		**-0.246** **	**-0.343*** **	**-0.204***		**0.109*** **	**0.086***	**0.107*** **
		(0.102)	(0.1)	(0.105)		(0.032)	(0.049)	(0.032)
Σ log(VIX)$_t$ * Liquidity Ratio$_b$		**-0.024**	**-0.019**	**-0.027**		**-0.016*** **	**-0.011**	**-0.016*** **
		(0.021)	(0.025)	(0.021)		(0.006)	(0.008)	(0.005)
Σ log(VIX)$_t$ * Size$_b$		**0.324** **	**0.179**	**0.347*** **		**-0.158*** **	**-0.193*** **	**-0.15*** **
		(0.133)	(0.151)	(0.134)		(0.044)	(0.06)	(0.044)
Bank Variables x log(VIX)	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Bank-Sector Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maturity x Collateral FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,649,513	3,649,513	888,639	2,760,874	1,315,288	1,315,288	246,337	1,068,951
R-squared	0.578	0.580	0.540	0.593	0.713	0.714	0.699	0.719
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on the Loan Rate								
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*	**-54.25**				**-7.43**			
By High vs. Low Capital Ratio Banks *(p75-p25)*	**-28.91**				**0.00**			
By High vs. Low Liquidity Ratio Banks *(p75-p25)*	**-5.41**				**-2.71**			
By Large vs. Small Banks *(p75-p25)*	**1.90**				**-4.79**			
… when log(VIX)$_t$ is lower by 1 standard deviation								
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*		**-69.25**	**-75.47**	**-67.53**		**-10.82**	**-16.23**	**-9.56**
By High vs. Low Capital Ratio Banks *(p75-p25)*		**-0.31**	**8.61**	**-2.43**		**9.35**	**8.02**	**9.27**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*		**-3.61**	**-9.19**	**-2.13**		**1.64**	**1.48**	**1.64**
By Large vs. Small Banks *(p75-p25)*		**-7.44**	**11.44**	**-15.40**		**1.31**	**5.96**	**0.58**

Notes: The dependent variable is the interest rate on a loan extended by bank b to firm f with loan-type a. MPR stands for the estimated residual from a fitted monetary policy rule --discussed in the text--. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). A firm is taken as "Riskier" if the firm has defaulted on a loan during the previous 36 months, and "Safer" otherwise. All columns include bank variables and their interactions with macro controls. "Yes" indicates that the corresponding set of variables are included in the estimation. Regarding the fixed effects, "Yes" indicates that corresponding fixed effects is included. "No" indicates that corresponding fixed effects is not included. "--" indicates that the respective fixed effect is inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 1.15: ASYMMETRIES: LOCAL MONETARY POLICY TIGHTENING VS. EASING EPISODES AND GLOBAL LIQUIDITY

	All Loans		TL Loans		FX Loans	
Episodes of Local Monetary Policy:	Tightening	Easing	Tightening	Easing	Tightening	Easing
	(1)	(2)	(3)	(4)	(5)	(6)
Σ Δ MP * Foreign Funding Ratio$_b$ * log(VIX)$_t$	**1.594*** **	**0.317**	**2.059*** **	**0.248**	**0.112**	**0.12*** **
	(0.258)	(0.201)	(0.316)	(0.256)	(0.089)	(0.027)
Σ Δ MP * Capital Ratio$_b$ * log(VIX)$_t$	**0.733**	**0.564****	**0.728**	**1.112*** **	**0.688****	**-0.32*** **
	(0.599)	(0.244)	(0.667)	(0.327)	(0.339)	(0.072)
Σ Δ MP * Liquidity Ratio$_b$ * log(VIX)$_t$	**0.487*** **	**0.111*** **	**0.667*** **	**0.166*** **	**-0.023**	**0.006**
	(0.104)	(0.029)	(0.122)	(0.04)	(0.049)	(0.013)
Σ Δ MP * Size$_b$ * log(VIX)$_t$	**-2.34*** **	**0.137**	**-2.932*** **	**0.325**	**-0.156**	**0.007**
	(0.675)	(0.258)	(0.891)	(0.353)	(0.349)	(0.107)
Σ Δ MP * Foreign Funding Ratio$_b$	**-4.617*** **	**-1.068***	**-5.9*** **	**-0.884**	**-0.43***	**-0.355*** **
	(0.696)	(0.617)	(0.854)	(0.785)	(0.24)	(0.077)
Σ Δ MP * Capital Ratio$_b$	**-2.12**	**-1.88*** **	**-2.229**	**-3.569*** **	**-1.778***	**0.884*** **
	(1.6)	(0.72)	(1.772)	(0.949)	(0.896)	(0.228)
Σ Δ MP * Liquidity Ratio$_b$	**-1.329*** **	**-0.391*** **	**-1.813*** **	**-0.56*** **	**0.044**	**-0.032**
	(0.283)	(0.098)	(0.332)	(0.137)	(0.136)	(0.044)
Σ Δ MP * Size$_b$	**6.488*** **	**-0.339**	**8.155*** **	**-0.923**	**0.358**	**-0.056**
	(1.857)	(0.81)	(2.454)	(1.104)	(0.915)	(0.35)
Σ log(VIX)$_t$ * Foreign Funding Ratio$_b$	**-0.147**	**-0.017**	**-0.175**	**-0.005**	**0.013**	**-0.001**
	(0.093)	(0.076)	(0.109)	(0.106)	(0.034)	(0.01)
Σ log(VIX)$_t$ * Capital Ratio$_b$	**-0.517*** **	**-0.049**	**-0.634*** **	**-0.058**	**-0.261***	**0.057**
	(0.196)	(0.095)	(0.216)	(0.127)	(0.135)	(0.035)
Σ log(VIX)$_t$ * Liquidity Ratio$_b$	**-0.126*** **	**-0.005**	**-0.127*** **	**0.026**	**-0.012**	**-0.006**
	(0.031)	(0.016)	(0.036)	(0.024)	(0.012)	(0.009)
Σ log(VIX)$_t$ * Size$_b$	**0.538****	**0.272**	**0.717****	**0.355**	**0.057**	**-0.137****
	(0.255)	(0.176)	(0.3)	(0.232)	(0.113)	(0.063)
Bank Variables x log(VIX)	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Sector Control	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Control	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	--	--	--	--	--	--
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Maturity x Collateral FE	--	--	Yes	Yes	Yes	Yes
Currency x Maturity x Collateral FE	Yes	Yes	No	No	No	No
Firm-Month FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Currency-Month FE	No	No	No	No	No	No
Observations	1,868,928	3,153,017	1,418,419	2,263,009	450,509	890,008
R-squared	0.677	0.618	0.625	0.572	0.720	0.711
Impact of a Cumulative 100 bpts Increase in the Local Policy Rate on the Loan Rate when log(VIX)$_t$ is lower by 1 standard deviation						
By High vs. Low Foreign Funding Ratio Banks *(p75-p25)*	**-143.72**	**-28.58**	**-185.65**	**-22.36**	**-10.10**	**-10.82**
By High vs. Low Capital Ratio Banks *(p75-p25)*	**-28.67**	**-22.06**	**-28.48**	**-43.50**	**-26.91**	**12.52**
By High vs. Low Liquidity Ratio Banks *(p75-p25)*	**-79.94**	**-18.22**	**-109.49**	**-27.25**	**3.78**	**-0.98**
By Large vs. Small Banks *(p75-p25)*	**84.98**	**-4.98**	**106.48**	**-11.80**	**5.67**	**-0.25**

Notes: The dependent variable is the interest rate on a loan extended by bank *b* to firm *f* with loan-type *a*. Δ MP is the monthly change in the local monetary policy rate. Σ indicates that the sum of the three coefficients on the indicated lag terms (t-1 to t-3) is reported (with the corresponding standard error for the summation given in parentheses). All columns include bank variables and their interactions with macro controls. Local monetary policy tightening episodes are periods during which the change in the policy rate over the previous 3 months is greater than zero, and the easing episodes are periods during which the change in the policy rate over the previous 3 months is lower than or equal to zero. "Yes" indicates that the corresponding set of variables or fixed effects are included. "No" indicates that corresponding fixed effects or variables are not included. "--" indicates that the corresponding fixed effects or variables are inapplicable or already included in the wider set of fixed effects or variables. Standard errors are double clustered at bank-firm and month level, and are given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Chapter 2

FOREIGN CURRENCY DEBT AND NETWORK EXTERNALITIES

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2.1 Introduction

Non-financial corporates in emerging markets hold record levels of foreign currency debt: an equivalent of over 3 trillion US dollars in 2019, which is nearly twice as large compared to a decade ago (BIS, 2020; IIF, 2020). This unprecedented accumulation of foreign currency (FX) debt has raised considerable concern for macro-financial stability in emerging markets –especially owing to FX indebted corporates with lack of sufficient FX earnings– (IMF, 2019a; Bruno and Shin, 2018; see also Kim, Tesar, and Zhang, 2015; Alfaro, Asis, Chari, and Panizza, 2017; Bloomberg, 2018). In early 2020, these concerns mounted further as emerging markets have experienced significant retrenchment in capital inflows and strong currency depreciation, amid collapse in foreign currency earnings (Turner,

2020; WSJ, 2020; FT, 2020).

Corporate FX indebtedness has long been at the center of discussions on macro-financial stability in emerging markets, dating back to late 1990s East Asian crisis. As explored extensively –that we discuss in detail later–, the key premise of existing evidence is that when local currency depreciates sharply, 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 foreign currency indebted firms may create within the economy. In particular, do such firms exert significant negative spillover effects on banks and other (even healthy) firms following a currency depreciation? If so, what are the potential channels and how relevant are they? There has been no systematic evidence so far addressing these questions, especially based on nearly exhaustive, supervisory micro-level data, and importantly, that identifies the mechanisms behind.

Using rich micro-level databases from Turkey and exploiting the sharp Turkish lira depreciation in mid-2018, we show that foreign currency debt entails a risk that permeates the economy. It creates adverse spillover effects on banks and firms connected to foreign currency indebted firms. We identify on two types of linkages, whereby firms are connected to foreign currency indebted firms through banks ("financial linkages") or directly by having a customer or supplier relationship ("real linkages").

Turkey offers an excellent laboratory ground to address these questions. Turkey has one of the highest levels of non-financial corporate sector foreign currency debt among 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 Turkey in the first half of 2018, and finally, by a tweet by the U.S. President Trump in mid-2018 that sharply weakened the sentiment of international investors (Figure 2.2).[1]

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 (collected for VAT purposes); (iii) complete financial statements for the universe of non-financial corporates. In total, we have a large-scale network of firms (∼350K), where firms are interconnected through banks or supplier/customer relationships.

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). Moreover, having a wider coverage is crucial for studying externalities due to inter-firm linkages. Second, we use both FX debt and assets to measure vulnerability. For FX debt, we use bank FX loans, as non-financial firms in Turkey almost exclusively depend on bank financing, and foreign currency (FX) bonds

[1]Donald J. Trump has posted a series of tweets on August 10, 2018 and August 16, 2018, that states significant escalation of political tension between the US and Turkey [not for publication:, triggered by the imprisonment of a Christian pastor in Turkey. "*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).]

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. 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 Turkey 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 Turkey are not allowed to borrow in FX (since July 2009, nearly a decade before our sample period starts). Finally, we control for

[2]Moreover, equity or bond financing is a privilege to a very few firms, which makes Turkey 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.

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×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 con-

[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×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 studying bank-firm variation (that assumes away currency dimension).

trol 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 and currency). Economically, banks with a 1-standard-deviation higher exposure to risky FX borrowers reduce their supply of credit by 14.3%, increase their loan rate by 3.2%, lower maturity by 7.7%, and increase collateral coverage ratio by 12.8% 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 as well by more vs. less exposed banks.

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 1-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 are more than halved (in some cases, become nil), underlining that such a mechanism indeed plays a significant role for the tightening in credit supply conditions.

Moreover, "financial linkages" with high NOP firms lead to more ad-

verse 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 show that firms that ex-ante borrow more from such banks face binding financing constraints, and eventually, experience more adverse real outcomes.

In particular, within the same 4-digit industry and city, firms with 1-standard deviation ex-ante stronger attachment to higher NOP firms (through the banks) subsequently experience greater reduction in total liabilities, sales, profits, and capital investment (by 2.2%, 0.5%, 2.9%, 2.3%, respectively).[5] These effects are economically sizable, given that they are close to the first-order effects. Firms with 1-standard-deviation higher NOP face 2.8% lower liabilities, 2.1% lower sales, 2.9% lower profits, and 3.5% lower investment. For employment, first-order effects appear viable (having a 1-standard-deviation higher ex-ante NOP leads to 0.6% lower employment after the currency depreciation), while financial linkages seem to exert no significant effect.

Real Linkages. Besides financial linkages, externalities may also emerge due to working with higher NOP customers or suppliers. As we show above, firms –regardless of their being customer or supplier of another firm, face more adverse financial and real outcomes, to the extent they have higher NOP or work with banks with higher exposure to higher NOP firms. In this regard, by intuition, one may expect such firms scaling back their inter-firm operations, such as lower purchases from suppliers or

[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/local demand conditions.

selling less to their customers.

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 as in few countries for which this type of database is available (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]

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 1-standard-deviation subsequently experience 0.9% lower sales and 3.7% lower profits (indicating lower profit margins), 3% lower investment and 0.3% lower employment. Working more with higher NOP suppliers, in general, exerts milder effects. Firms working more with such suppliers experience lower profits, lower investment and lower employment (by 1.3%, 1.9%, and 0.3%, respectively), with no significant reduction in sales.

Corroborating the mechanism, firms working more with high NOP customers or suppliers experience lower volume of inter-firm trade following the currency depreciation. Numerically, firms with 1-standard-deviation higher weighted average customer NOPs experience lower trade receivables from customers (by 3.2%) and lower trade payables to suppli-

[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.

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

ers (by 4.3%). Firms with 1-standard-deviation higher weighted average supplier NOPs experience 2.1% lower trade receivables and 1.6% lower trade payables. 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

[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).

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. 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 un-

hedged 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 et al. (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.

More broadly, our paper is also related to the strand of empirical literature on collateral channel in closed economy settings. Gan (2007) for Japan and Chaney et al. (2012) for the US show that a decline in the value of land or real estate held by a firm induces lower investment, and this is driven mainly by greater financial constraints faced by the firm. Focusing on lenders, Cerqueiro et al. (2016) show that in response to reduced collateral values, banks increase their interest rates and lower supply of credit. While our focus is different –given our focus on FX indebtedness of borrowers, our results are broadly inline with this literature and opens up venue for inter-firm externalities.

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, and appropriate policies thereof.[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 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 2.2 presents the data and empirical strategy; Section 2.3 presents empirical results, and Section 2.4 robustness analyses and further discussions. Section 2.5 concludes.

[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).

2.2 Data and Empirical Strategy

2.2.1 Data

We study several micro-level supervisory databases, each crucial for identification. The first database is the Credit Register of Turkey (CR), 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 Turkey. 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 (using appropriate weights). We focus on three major currencies that loans are denominated, Turkish lira, US dollar, or Euro, which in total covers over 98% of total loans. We study the period December 2017-December 2018, which is about 6 months before and after the sharp Turkish lira depreciation in mid-2018. Using December values is also helpful to appropriately measure firms' net open FX positions –which includes firm-level exports and assets that are measured annually at the end of each year. 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.

The second database provides complete financial statements of the universe of non-financial corporates in Turkey (close to 350K firms), and is provided by Revenue Administration of Turkey and TURKSTAT (Turkish Statistical Institute). The database does not include entrepreneurial

firms. We exclude governmental bodies (public administration, defense, compulsory social security), and extra-territorial organizations and bodies. To avoid misreporting or measurement errors, we winsorize firm variables at 1% from both sides. We match this database with the CR to obtain a proxy for the (ex-ante) vulnerability of firms to a Turkish lira depreciation. Namely, we calculate for each firm foreign currency debt with remaining maturity less than a year net of total exports. We then normalize this measure with firm total assets:

$$\text{NOP}_{f,t-1} = \frac{\text{FX Debt due within 1 year}_{f,t-1} - \text{Exports}_{f,t-1}}{\text{Total Assets}_{f,t-1}} \tag{2.1}$$

For brevity, we label this measure as the "NOP" (net open position) of a firm throughout the text. We then measure a bank's exposure to risky FX borrowers as the weighted average NOP of firms that the bank is ex-ante working with:

$$\text{Exposure to Risky FX Borrowers}_{b,t-1} = \sum_{f \in b} \omega_{f,b,t-1} \text{NOP}_{f,t-1} \tag{2.2}$$

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.[10] 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 $t-1$. In this sense, our exposure measure

[10] Note also that households in Turkey 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.

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).

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 sales transaction, and unique identifiers for supplier and customer firms, without further details on items in invoices. We match all these databases by using unique firm identifiers common across the databases (each firm identifier is based on its tax identification number).

We exclude Islamic banks as they comply with different business operations, 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, and 3 small banks for which exposure to risky FX borrowers are clear outliers. 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. Our sample further includes 358,568 firms (or 192,482 firms with multiple banking relationships). We have complete financial statements for 234,004 firms (receiving a large share (87%) of total banking sector non-financial corporate FX loans), based on which we calculate firm NOPs and banks' exposure to risky FX borrowers. Lastly, a firm on average works with 29 supplier and 43 customer firms.

We also 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 sector (based on NACE Rev.2 sectoral

classifications) and city of location data, provided by TURKSTAT.[11]

2.2.2 Empirical Strategy

Financial Linkages

Identification. Figure 2.1 presents a simple credit network structure that summarizes our identification strategy (Khwaja and Mian, 2008).[12] 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).

We focus on bank lending channel that facilitates the connection: risky firms' higher difficulty in paying their debt may translate into banks' deteriorated capacity to lend to other firms. To make sure that this mechanism is in place, we also need to observe the following:

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

[11] 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.

[12] 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 away differences in currency of denomination of 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). We later verify that all these conditions are met.

Baseline Model. To this end, we estimate the following regression:

$$\begin{aligned}\Delta Y_{bfc,t} = \beta \text{ Exposure to Risky FX Borrowers}_{b,t-1} + \cdots \\ + \Theta \text{ Bank Controls}_{b,t-1} + \lambda X_{bf,t-1} + \mu_{f,c} + \varepsilon_{bfc,t} \qquad (2.3)\end{aligned}$$

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.[13] In the next section, we also look at extensive margins of credit supply (new lending and termination margins).

Exposure to Risky FX Borrowers is as defined in equation (2.2). $\mu_{f,c}$ 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

[13]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.

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 not including firm×currency fixed effects. We cluster standard errors at the firm level following Petersen (2009). For identification, we restrict the sample to firms that borrow from at least two banks prior to the shock (December 2017) –as we show below, our results are robust to including single-bank firms.

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), as well as FX loan share (share of FX loans in total loans) and foreign funding ratio (non-core FX liabilities-to-total assets ratio). The last two controls are added since extending FX loans may in fact be a hedging strategy for banks and may potentially spur bank earnings following a local currency depreciation –to the extent FX loan defaults are sufficiently low–, and that banks that ex-ante rely more on foreign-currency wholesale funding may find it harder to continue financing their loans. 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.

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

$$\mathscr{F}_{f,t} = \alpha_{\mathscr{F}} \text{ NOP}_{f,t-1} + \beta_{\mathscr{F}} \text{ W.Exposure}_{f,t-1} + \text{Controls}_{f,t-1} + \nu_{i,city} + \varepsilon_{f,t} \tag{2.4}$$

where $\mathscr{F}_{f,t}$ is an indicator variable that is equal to 1 if firm f has a non-performing loan at least one bank within 12 months after December 2017, and 0 otherwise.[14] 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 $\alpha_{\mathscr{F}} > 0$, 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 (2.3) 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., borrowing from less affected banks or lower NOP firms, or issuing bonds). Along

[14] 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).

these lines, we estimate the following firm-level regression:

$$\Delta X_{f,t} = \alpha_f \text{ NOP}_{f,t-1} + \beta_f \text{ W.Exposure}_{f,t-1} + \text{Controls}_{f,t-1} + \nu_{i,city} + \varepsilon_{f,t} \tag{2.5}$$

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.[15] 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.

Real Linkages

Intuitively, firms working with customers or suppliers vulnerable to (or hit by) 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 match firm-to-firm sales database with firms' financial statements, and calculate for each firm weighted average NOP of its customer and supplier firms.[16] We then augment equation (2.5) by including these NOP measures, and estimate:

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

[16] 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.

$$\Delta X_{f,t} = \alpha_{ff}\ \text{NOP}_{f,t-1} + \beta_{ff}\ \text{W.Exposure}_{f,t-1} + \\ + \gamma_D\ \text{Customers' NOP}_{\Sigma j \in f,t-1} + \gamma_U\ \text{Suppliers' NOP}_{\Sigma k \in f,t-1} \\ + \text{Controls}_{f,t-1} + \nu_{i,city} + \varepsilon_{f,t} \tag{2.6}$$

where 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 (2.5). As above, we saturate the model with industry×city fixed effects to facilitate comparison among firms operating within the same industry and city.

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 further study two additional outcome variables based on trade credit. In particular, we study whether such firms experience lower trade receivables from customers or lower trade payables to suppliers.[17]

Summary Statistics

Table 2.2 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

[17] An alternative would be to study change in firm-to-firm sales for our sample period (from December 2017 to December 2018), and exploit within-buyer or within-seller variation, but since our database on firm-to-firm sales ends at March 2018, we are not able to pursue that road.

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 2.3 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 firm size or leverage ratio are small (less than 0.03). Moreover, higher NOP firms are less likely to be an exporter firm. These results may not be surprising given our definition for the NOP, i.e., total FX liabilities net of exports, normalized by total assets.

(ii) In terms of key bank variables considered (capital adequacy ratio, liquidity ratio, total assets, non-performing loans ratio, return-on-assets, foreign funding ratio, FX loan share), banks with higher exposure to risky FX borrowers are not statistically significantly different than banks with lower exposure. The cross-correlation of bank exposure to risky FX borrowers with these banks characteristics are statistically insignificant at conventional values (p-values are higher than 0.10 in all cases), and economically weak (ranging between 0.016 and 0.25). Still, we control for these bank variables in our loan level regressions to mitigate potential bias related similarities across banks with high vs. low exposure to risky FX borrowers. 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 2.3 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).

2.3 Empirical Results

2.3.1 Financial Linkages

We first explore whether firms with higher NOPs create adverse financial or real spillover effects on other firms *through financial linkages*. Table 2.4 presents the first set of baseline results, where we focus on loan volume. In subsequent tables (Tables 2.5 and 2.6), we study other loan terms (interest rate, maturity, and collateral coverage).

We start Table 2.4 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×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.[18] Economically, banks with a 1-standard-deviation higher ex-ante exposure to risky FX borrowers reduce their supply of credit by 14.3% more. Moreover, the estimated effect changes only mildly across different specifications (ranges from 12% to 14.3% 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.[19]

We next study other loan dimensions, starting with the interest rate (Table 2.5). 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,

[18] 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.

[19] 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, [-0.714,-0.801], safely excludes zero.

banks with 1-standard-deviation higher exposure to risky FX borrowers increase their loan rates by 3.2% 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 51 basis points increase in the loan rate (at the mean). Moreover, banks with 1-standard-deviation higher ex-ante exposure to risky FX borrowers provide 7.7% shorter maturity loans and asks for 12.8% higher collateral coverage (Table 2.6, 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 (ideally nullified) once we control for *change in* bank non-performing loans and capital adequacy ratios in our baseline regressions.

We first estimate equation (2.4), 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 2.7 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 0.6% 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.[20]

Figure 2.5 confirms that banks with higher exposure to risky FX borrowers have eroded capacity to lend. 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 2.8).[21] 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

[20]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 2.20). Possible channels proposed in the literature include better access to credit and higher productivity.

[21]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.

14.8% to 4.7%, on interest rate from 3.1% to 0.3%, on maturity from 7.7% to 3.3%, and on collateral ratio from 13.4% to 6.4%. These findings support our previous results in that change in bank NPL and capital adequacy ratios (which we argue to be the transmitter of financial linkages)– can explain a significant portion of tightening in overall credit supply conditions.

The repercussions of credit market externalities are binding at the firm level, and eventually, lead to adverse real effects. It is not 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 (2.3)) at the firm level, and check if results continue to hold.[22]

Table 2.9 presents results for each loan dimension, and for the baseline and the large sample of firms. 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). In general, we find somewhat smoother yet significant and viable 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 14.3% to 14.8% reduction in credit supply that we identify at the bank-firm-currency or bank-firm level analyses. We find smoother effects for maturity and collateral coverage as well, namely, 3.4% lower maturity loans and 7% higher collateral coverage at

[22]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).

the firm-level, compared to 7.7% and 12.7% we find earlier (but not for the interest rate). 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 2.10, we show that firms fall short in doing so. In particular, firms with 1-standard-deviation higher exposure to risky FX borrowers (i.e, firms with 1-standard-deviation higher weighted average bank exposure to risky FX borrowers) experience total liabilities reduced by 2.3%. As financial constraints bind more strongly, they experience worse real outcomes: lower sales (by 0.5%), lower profits (by 2.9%), and lower investment (by 2.3%). In reaching these effects, we control for firm's own NOP (alongside firm size, leverage, and exports, and industry×city fixed effects). Moreover, as one would expect, direct effects are in general stronger. Firms with higher NOP experience lower liabilities (2.8%), lower sales (2.1%), lower profits (2.9%), and lower investment (3.5%). While indirect effects (arising due to firm's connection to high NOP firms via banks) appear somewhat milder than direct effects (arising due to firm's own NOP), the indirect effects are still sizable: in some cases, indirect effects are very close to direct effects. The strong difference between direct and indirect effects occurs for the case of employment. While firms with higher NOP reduce their employment significantly (by 0.6%), we find no effect on employment of being connected to high NOP firms via banks.

2.3.2 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 2.11 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 exposed to higher NOP customers (having 1-standard-deviation higher weighted average customers' NOP) induces 1.6% lower liabilities, 0.9% lower sales, 3.7% lower profits, 3% lower investment, and 0.32% lower employment. The adverse spillover effect is particularly large for profits (and larger than the drop in sales), reflecting squeezed profit margins and lower demand by higher NOP customers. Downstream effects are in general stronger and statistically more robust than being exposed to upstream effects. In particular, firms more exposed to higher NOP suppliers experience 1.35% lower profits, 1.9% lower investment, and 0.31% lower employment. It is intuitive that working with higher NOP suppliers has a big toll on firm investment, as such suppliers –experiencing greater deterioration in their balance sheets– are more strained to provide inputs.

Table 2.12 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. Inline with previous results, the strongest impact is due to having higher NOP (direct effects). A

firm with 1-standard deviation higher NOP experiences 5.2% lower trade receivables, and 4.2% lower trade payables (columns (1) and (5)). Moreover, credit market externalities induce lower trade credit as well –2.5% lower trade receivables and 3.5% lower trade payables–. These results can be interpreted as a reflection of how firms' own NOP or exposure to higher NOP firms via banks –both of which inducing binding and significantly adverse financial and real outcomes, as we show above– affect firm's demand for or supply of goods with other firms.

Moreover, firms working with higher NOP customers –those with 1-standard-deviation higher weighted average customer NOPs– experience lower trade receivables from its customers (by 3.6%) and lower trade payables to its suppliers (by 4.3%) (columns (3) and (7)). Finally, we additionally introduce working with high NOP suppliers, eventually have all sources of spillovers in columns (4) and (8). Consistent with Table 2.11, working with higher NOP suppliers induce qualitatively similar but milder effects than working with higher NOP customers. A firm with 1-standard-deviation higher weighted average supplier NOPs face 2.1% lower trade receivables and 1.6% lower trade payables (compared to 3.2% and 4%, respectively, due to working with higher NOP customers).

2.4 Robustness and Further Discussions

2.4.1 Extensive Margin

Baseline results carry over to the extensive margins of credit supply as well (Table 2.13). In particular, we re-estimate our baseline regression (equation 2.3) 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 De-

cember 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 3% less likely to establish a new lending relationship, and 4.8% more likely to terminate an existing relationships with a firm after the Turkish lira depreciation. Comparing these with the average probability 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.

2.4.2 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 show 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 are 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 (2.3)), by including the

interaction of banks' ex-ante Exposure to Risky FX Borrowers with one of these indicator variables (one-by-one). Table 2.14 presents the results. 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 vs. the rest.

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.[23] 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.

2.4.3 Firm Centrality

Firms that are more central in production networks might experience weaker tightening in credit supply conditions. By intuition, central firms are more likely to have supplier/customer relationships with bank's other client firms, and tighter conditions imposed by a bank on the central firm would imply adverse spillover effects on other firms the bank is working with, and in turn, has greater potential to adversely affect the bank. While there is no a priori stand on this issue –and it is largely unexplored in the literature–, we for now hypothesize that banks' risk assessments go

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

beyond idiosyncratic (firm-level) risk, and take into account such interlinkages and firms' degree of centrality in production networks to avoid adverse second-round effects.

To test this idea, 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 (2.3)), by including an interaction term between bank ex-ante exposure to risky FX borrowers and firm's total number of connected firms. Table 2.15 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), potentially leaving room for banks' taking 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 2.16 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)).

2.4.4 Foreign Currency Loans

In Table 2.17, 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. At a first sight, one may expect greater tightening in credit supply conditions for foreign currency loans, given the

sharp local currency depreciation. 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 often documented in the EM 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)).

2.4.5 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 2.18 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.[24]

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 signifi-

[24]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 2.3).

cantly lower maturity loans (by 16% lower compared to domestic banks), and ask for significantly higher collateral coverage (by 121% higher), potentially reflecting greater risk aversion.

2.4.6 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 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 (2.3)) 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 2.19 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 dif-

ferential 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.

2.4.7 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 balance sheet effects are weaker, e.g., during periods of relatively stable Turkish lira. 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 2.2). 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 (2.3)) 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 2.6). Figure 2.6 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 2.8).

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.

2.5 Conclusion

Foreign currency debt of non-financial corporates in emerging markets hit record high levels. Using supervisory transaction-level databases from Turkey and exploiting the sharp Turkish lira depreciation 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.

FIGURE 2.1: A SIMPLE CREDIT NETWORK

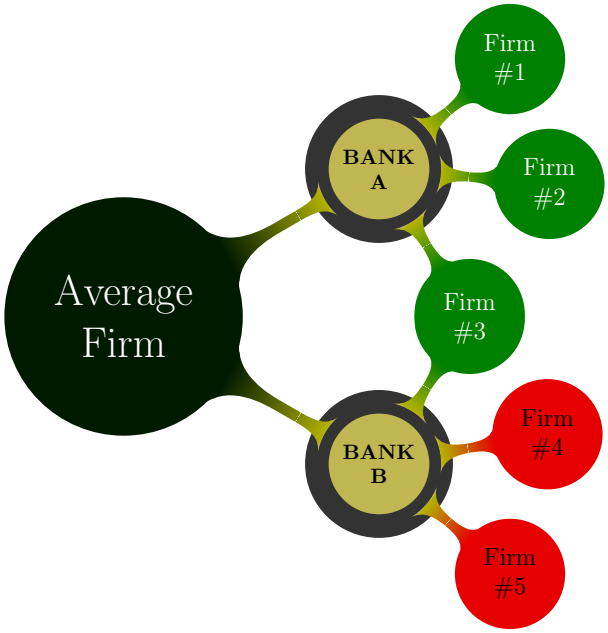
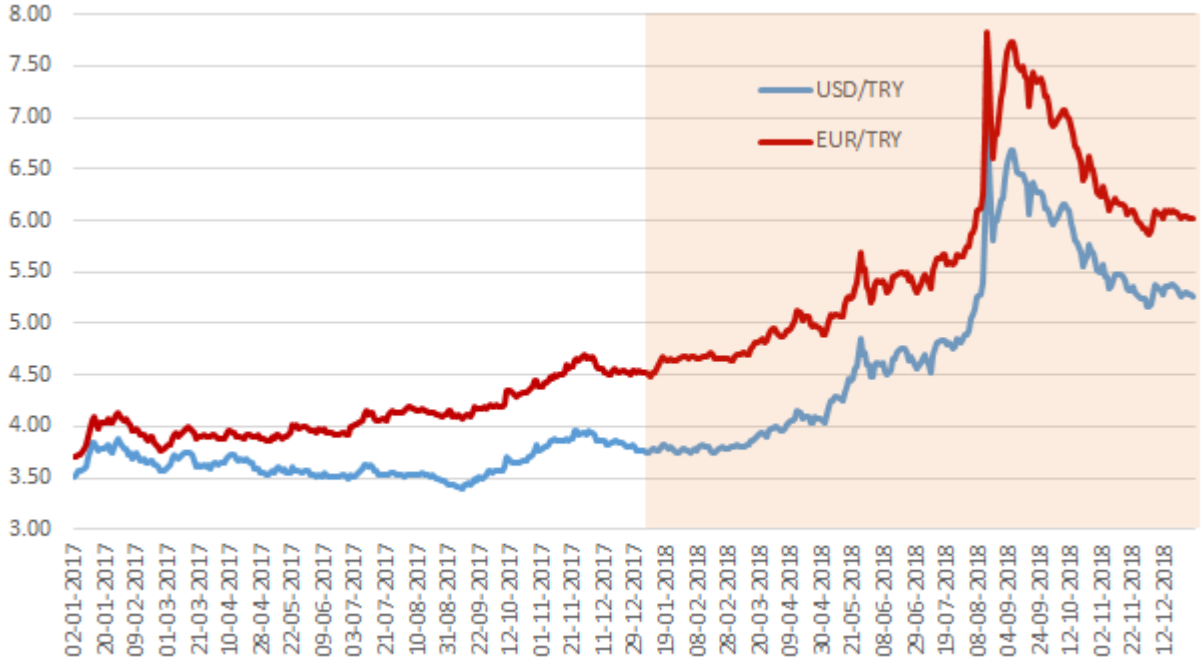


FIGURE 2.2: EVOLUTION OF TURKISH LIRA AGAINST US DOLLARS (USD) OR EUROS (EUR)



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 2.3: FOREIGN- VS. DOMESTIC-CURRENCY LOANS

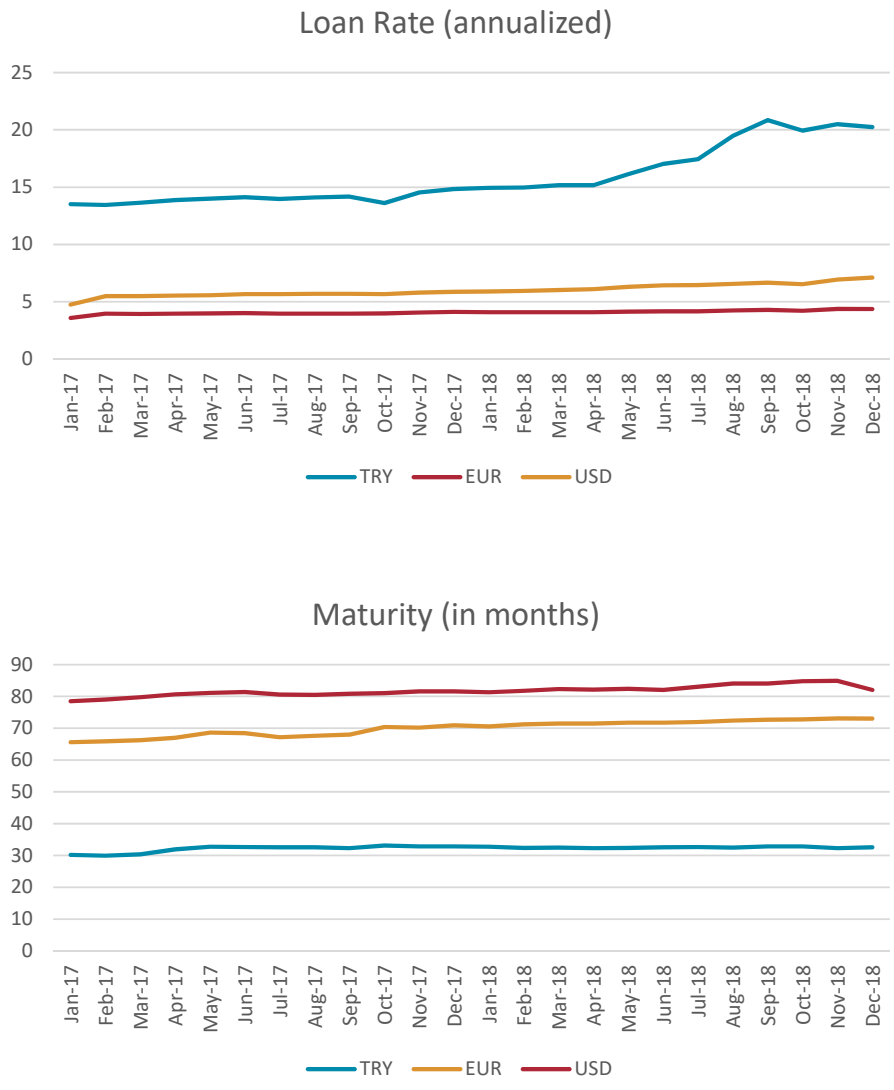
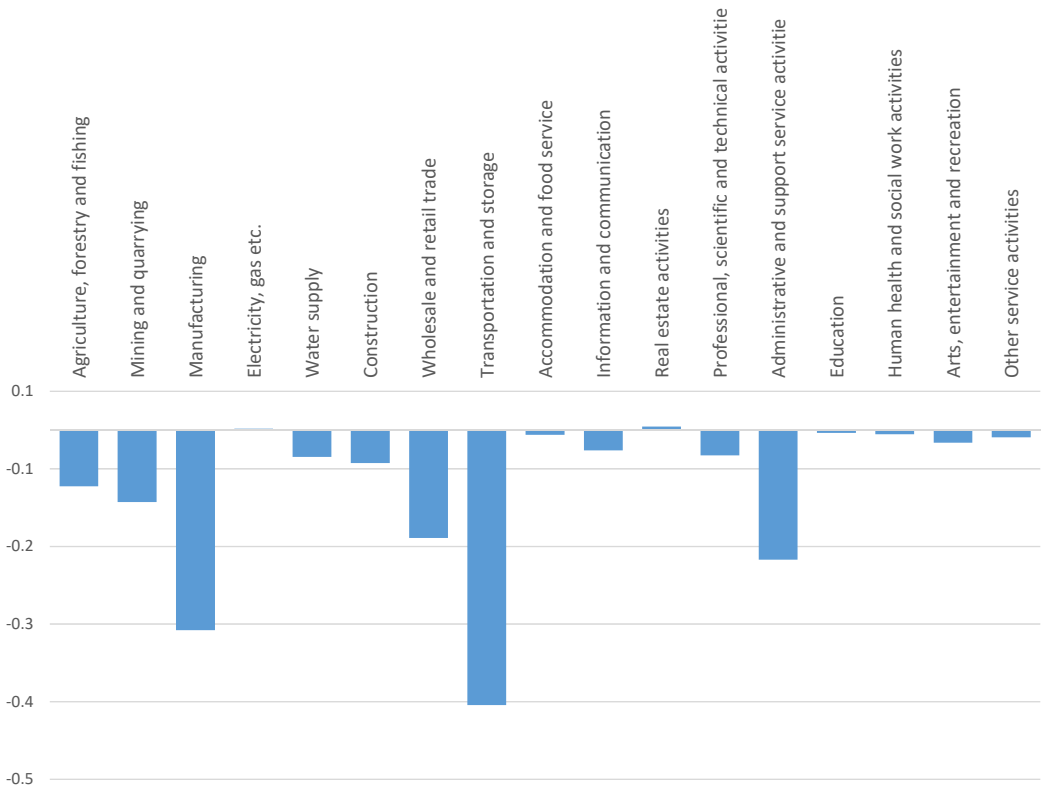
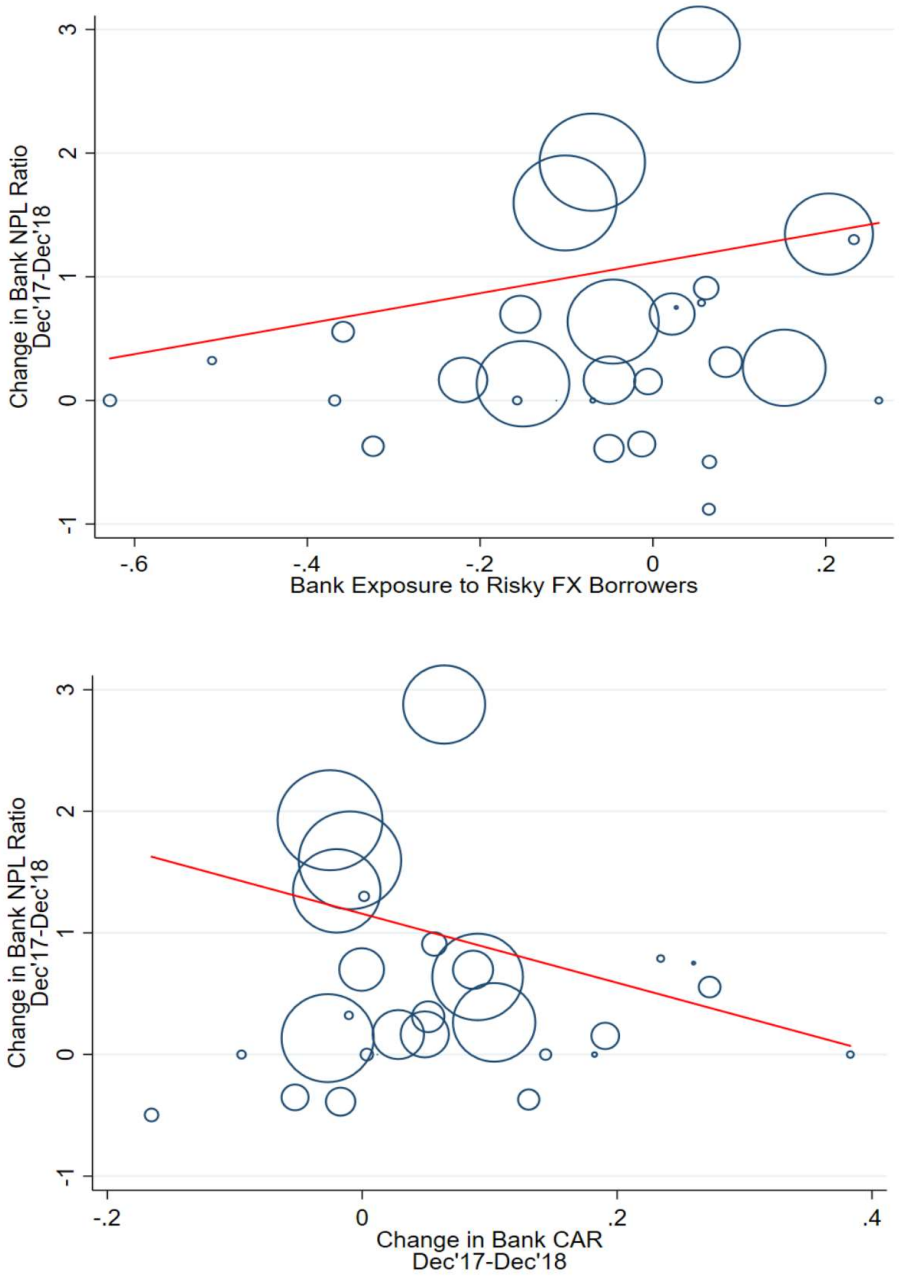


FIGURE 2.4: NET OPEN FX POSITION BY SECTORS (DECEMBER 2017)



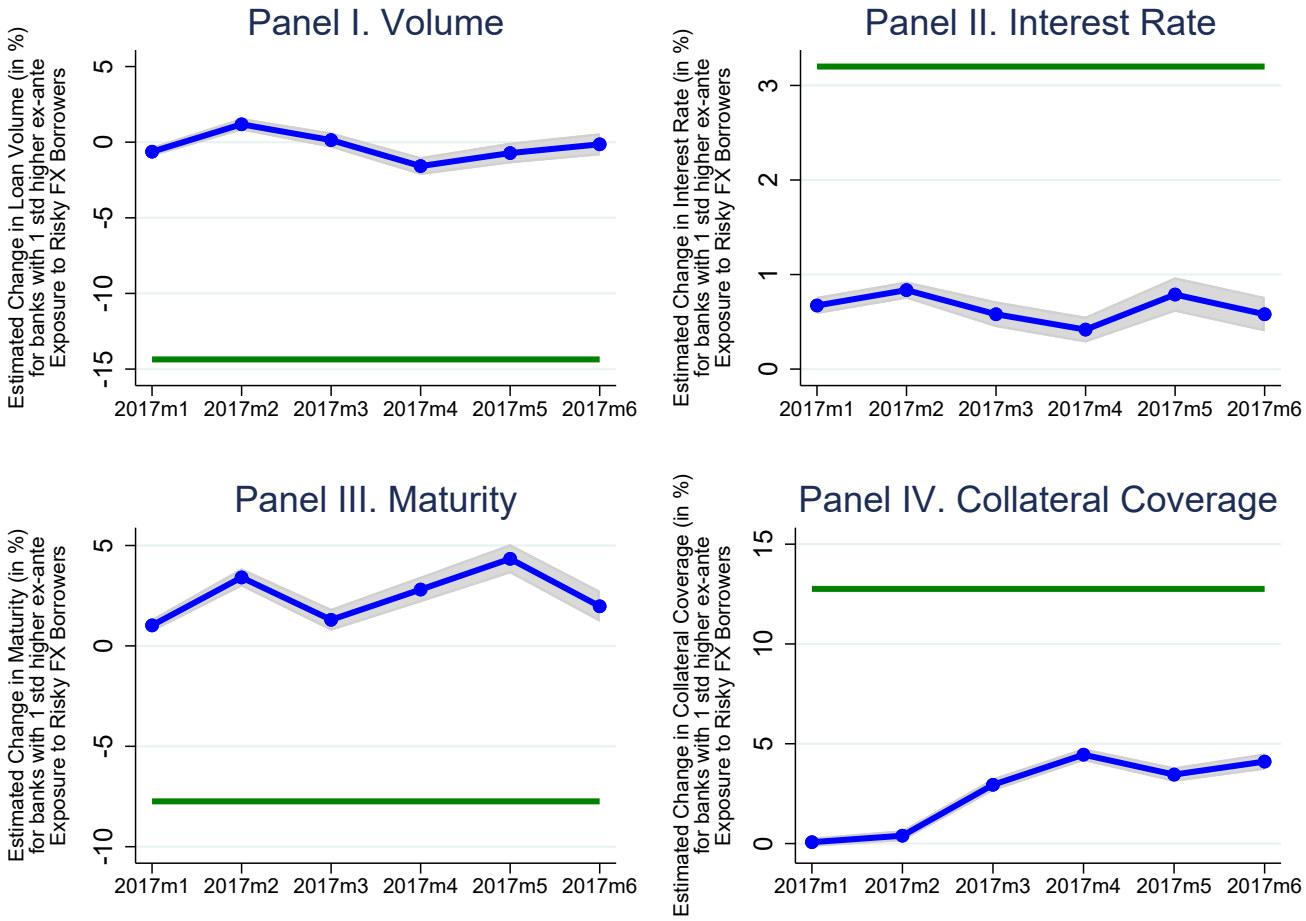
Notes. The figure plots average net open FX position of firms in each 1-digit industry (with weights proportional to firm total sales).

FIGURE 2.5: BANK NPL AND CAPITAL RATIOS VS. EXPOSURE TO RISKY FX BORROWERS



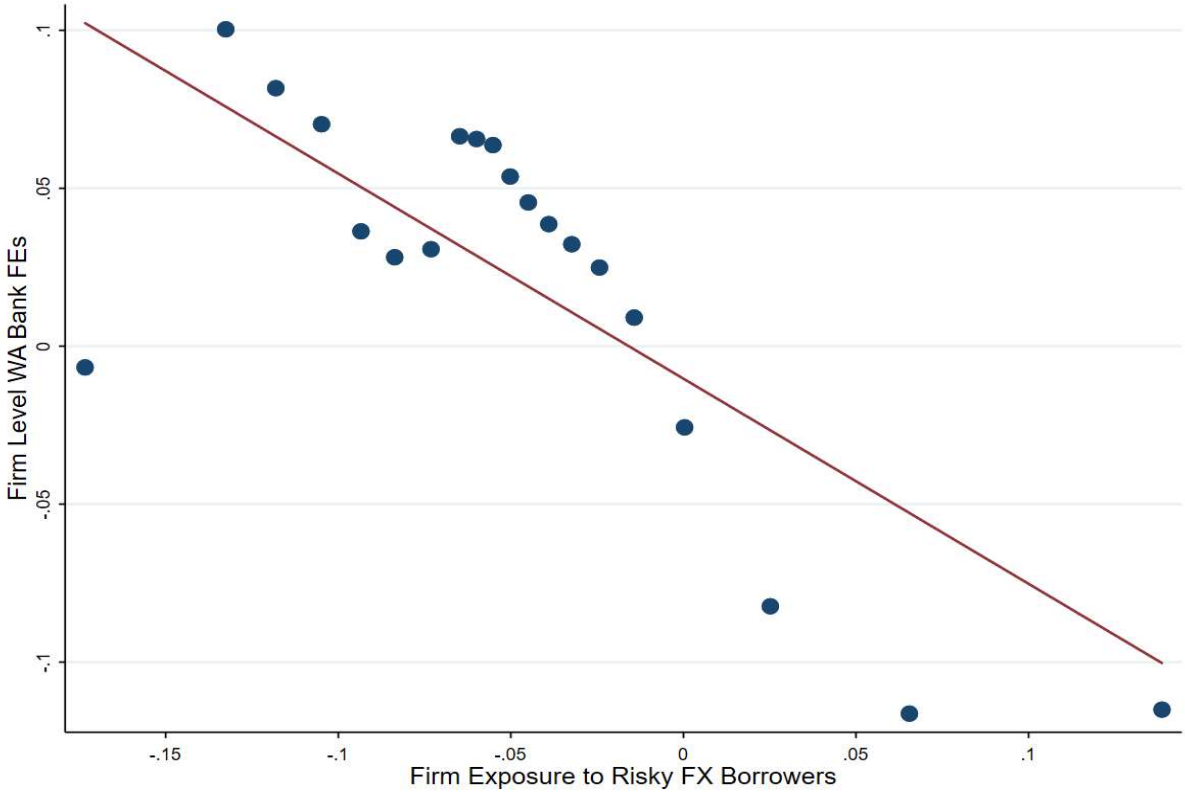
Notes. Each circle denotes a bank, and the size of each circle is based on bank's total assets in December 2017. The estimated fitted line assigns greater weight to larger banks (weighted least squares, with weights proportional to bank total assets). The upper panel plots percentage change in banks' non-performing loans-to-total loans (NPL) ratio against banks' exposure to risky FX borrowers (see equation (2.2)). The lower panel plots the percentage change in bank NPL ratio against the capital adequacy ratio (capital-to-risk-weighted assets ratio).

FIGURE 2.6: PLACEBO PERIOD (JANUARY 2017 - JUNE 2017)



Notes. Connected blue lines are based on estimating the baseline model (equation 2.3) for alternative periods that exhibit relatively stable Turkish lira against USD or Euro (Figure 2.2). 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 2.4 column (5), Table 2.5 column (5), Table 2.6 columns (3) and (6)).

FIGURE 2.7: 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 2.8: PLACEBO PERIOD: BANK-LEVEL FOREIGN EXCHANGE RATE EXPECTATIONS AND THEIR EX-ANTE EXPOSURE TO RISKY FX BORROWERS

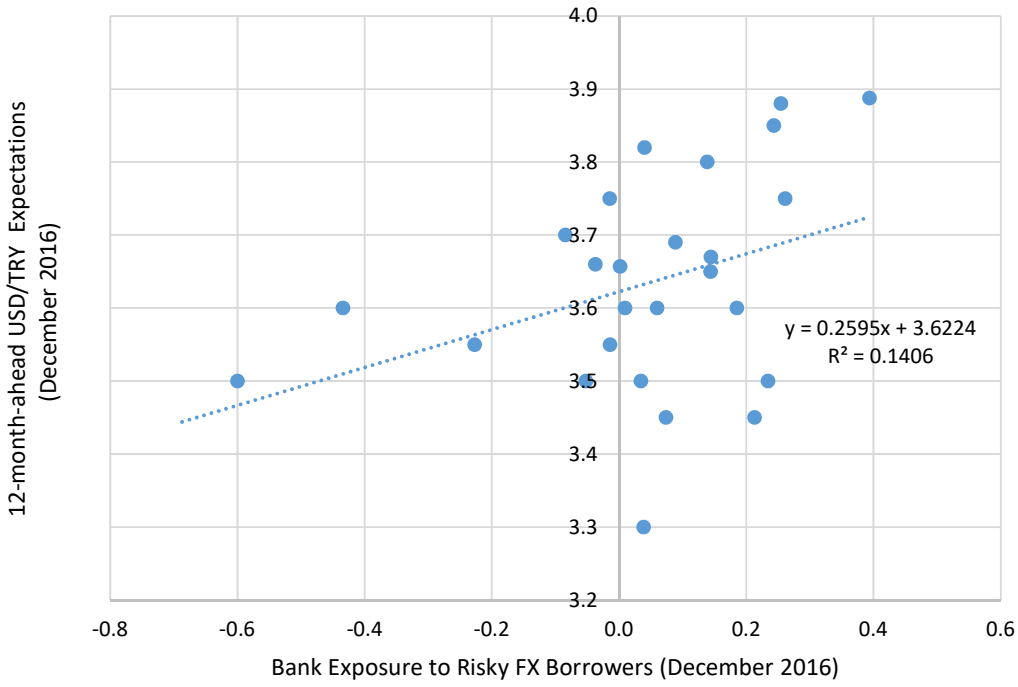


TABLE 2.1: SUMMARY STATISTICS

Variables	Definition	Unit	Mean	Median	SD	10%	25%	75%	90%	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	-0.333	-0.311	0.893	-1.214	-0.679	0.052	0.576	497,098
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	0.181	0.133	0.326	-0.062	0	0.377	0.554	478,484
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	-0.265	-0.302	0.759	-0.993	-0.59	0	0.538	466,799
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	-0.217	0	0.727	-1.062	-0.183	0	0.175	318,143
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	0.374	0.000	0.484	0	0	1	1	548,506
Termination	=1 if a bank terminates an existing relationship with a firm; 0 otherwise	1 or 0	0.373	0.000	0.484	0	0	1	1	843,126
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	-0.385	-0.329	0.859	-1.294	-0.742	0.063	0.477	358,568
Interest Rate Change	Change in the (log) level of interest rate of the loans of firm *f* between December 2017-December 2018	Δ Log	0.162	0.161	0.367	-0.193	-0.002	0.364	0.536	350,719
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	-0.254	-0.273	0.656	-0.854	-0.535	0.011	0.426	349,405
Collateral Ratio Change	Change in the (log) level of collateral ratio of collateralized loans of firm *f* between December 2017-December 2018	Δ Log	-0.267	-0.078	0.768	-1.176	-0.583	0.021	0.383	323,622
Future Default	=1 if a firm defaults on a loan during the next 12 months, and 0 otherwise	1 or 0	0.104	0	0.306	0	0	0	1	234,004
Δ Current Liabilities	Log change in firm's total short-term liabilities.	Δ Log	0.069	0.114	1.439	-0.779	-0.205	0.466	0.982	225,413
Δ Total Liabilities	Log change in firm's total liabilities.	Δ Log	0.035	0.083	1.382	-0.358	-0.085	0.309	0.622	228,474
Investment	Log change in tangible and intangible fixed assets.	Δ Log	-0.162	0	2.289	-0.535	-0.112	0.192	0.696	232,727
Δ Employment	Log change in firm's employees.	Δ Log	-0.024	0	0.452	-0.511	-0.154	0.125	0.405	228,476
Firms that borrow in both pre- and post- periods										
Loan Growth	Change in the (log) level of real loan amount of firm f between December 2017-December 2018 (FX adjusted)	Δ Log	-0.279	-0.252	0.633	-0.985	-0.597	0.082	0.418	192,482
Interest Rate Change	Change in the (log) level of interest rate of the loans of firm *f* between December 2017-December 2018	Δ Log	0.170	0.176	0.299	-0.145	0.010	0.351	0.491	192,432
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	-0.224	-0.260	0.546	-0.715	-0.470	-0.001	0.355	191,762
Collateral Ratio Change	Change in the (log) level of collateral ratio of collateralized loans of firm *f* between December 2017-December 2018	Δ Log	-0.303	-0.184	0.747	-1.181	-0.666	0.029	0.381	185,924
Future Default	=1 if a firm defaults on a loan during the next 12 months, and 0 otherwise	1 or 0	0.066	0	0.248	0	0	0	0	73,130
Δ Current Liabilities	Log change in firm's total short-term liabilities.	Δ Log	0.098	0.132	1.233	-0.623	-0.176	0.444	0.865	71,935
Δ Total Liabilities	Log change in firm's total liabilities.	Δ Log	0.06	0.101	1.21	-0.286	-0.068	0.292	0.543	72,473
Investment	Log change in tangible and intangible fixed assets.	Δ Log	-0.006	0.015	1.739	-0.396	-0.086	0.232	0.655	72,902
Δ Employment	Log change in firm's employees.	Δ Log	0.000	0.000	0.398	-0.405	-0.134	0.134	0.379	72,473

(continued)

TABLE 2.2: SUMMARY STATISTICS (CONTINUED)

Variables	Definition	Unit	Mean	Median	SD	10%	25%	75%	90%	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	0.096	0.000	0.000	0.001	0.002	493,824
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$_{f,17}$).	-	-0.070	-0.029	0.201	-0.359	-0.154	0.056	0.152	34
Capital Adequacy Ratio	Total Equity to Total Risk-Weighted Assets	%	20.522	17.040	10.131	14.200	15.140	19.930	31.360	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	17.610	20.255	27.675	44.188	34
Size	Natural logarithm of real total assets	000s, TL	16.584	16.708	2.284	13.707	14.928	18.613	19.571	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	1.737	2.351	34
ROA	Pre-tax net profit to total assets	%	1.282	1.032	1.357	0.284	0.522	1.404	2.492	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	4.217	14.607	43.975	69.527	34
FX Loan Share	Share of foreign currency credit in banks credit portfolio	%	36.454	30.774	22.044	12.848	23.692	43.05	77.176	34
Herfindahl by Industry	The Herfindahl-Hirschman index of the bank's credit portfolio by industry	%	13.469	9.197	8.945	6.502	7.178	17.231	26.993	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	-	-0.064	0	0.27	-0.07	0	0	0	234,004
Firm Exposure to Risky FX Borrowers	A firm's exposure to other firms' riskiness through their banking partners	-	-0.101	-0.051	0.775	-0.15	-0.102	0.022	0.152	234,004
	Firm-level weighted average of Banks' Exposure to Risky FX Borrowers									
Downstream Firms' Net Open FX Position	Weighted average of customer firms' net open FX position	-	-0.084	-0.007	0.207	-0.244	-0.071	0	0.001	180,064
Upstream Firms' Net Open FX Position	Weighted average of supplier firms' net open FX position	-	-0.057	-0.008	0.154	-0.165	-0.053	0	0.006	180,064
Main Bank Exposure to Risky FX Borrowers (Common with Downstream Firms)	Firm-level average of main banks' exposure to risky FX borrowers, which are also main bank of customer firms	-	-0.076	0	0.702	-0.15	-0.07	0	0.152	180,064
Main Bank Exposure to Risky FX Borrowers (Common with Upstream Firms)	Firm-level average of main banks' exposure to risky FX borrowers, which are also main bank of supplier firms	-	-0.083	0	0.732	-0.15	-0.07	0	0.152	180,064
Firm Size	Natural logarithm of firm's total assets	log (TL)	14.427	14.484	2.252	12.393	13.434	15.613	16.749	234,004
Firm Leverage Ratio	Firm's total debt normalized with total assets.	-	0.833	0.782	1.028	0.294	0.566	0.916	1.033	234,004
Exporter Firm	=1 if a firm is an exporter, and 0 otherwise	1 or 0	0.178	0	0.383	0	0	0	1	234,004
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	-	-0.065	0	0.262	-0.115	0	0	0	73,130
Firm Exposure to Risky FX Borrowers	A firm's exposure to other firms' riskiness through their banking partners	-	-0.147	-0.05	0.844	-0.139	-0.092	0.01	0.079	73,130
	Firm-level weighted average of Banks' Exposure to Risky FX Borrowers									
Downstream Firms' Net Open FX Position	Weighted average of customer firms' net open FX position	-	-0.086	-0.01	0.202	-0.243	-0.079	0	0	64,936
Upstream Firms' Net Open FX Position	Weighted average of supplier firms' net open FX position	-	-0.061	-0.014	0.143	-0.179	-0.066	0	0.006	64,936
Main Bank Exposure to Risky FX Borrowers (Common with Downstream Firms)	Firm-level average of main banks' exposure to risky FX borrowers, which are also main bank of customer firms	-	-0.11	0	0.814	-0.15	-0.102	0	0.152	64,936
Main Bank Exposure to Risky FX Borrowers (Common with Upstream Firms)	Firm-level average of main banks' exposure to risky FX borrowers, which are also main bank of supplier firms	-	-0.118	-0.046	0.844	-0.15	-0.102	0	0.152	64,936
Firm Size	Natural logarithm of firm's total assets	log (TL)	15.283	15.303	2.047	13.441	14.339	16.352	17.386	73,130
Firm Leverage Ratio	Firm's total debt normalized with total assets.	-	0.796	0.798	0.631	0.459	0.649	0.898	0.971	73,130
Exporter Firm	=1 if a firm is an exporter, and 0 otherwise	1 or 0	0.237	0	0.425	0	0	0	1	73,130

TABLE 2.3: CROSS-CORRELATIONS

Panel A. Correlation of Firm NOPs with Firm Controls

	Baseline Sample	Large Sample
Firm Size	-0.028***	-0.017***
Firm Leverage Ratio	0.023***	0.019***
Exporter Firm	-0.529***	-0.469***

Note: Baseline Sample corresponds to the sample of firms in Table 2 (firms that have a banking relationship in both pre- and post- periods -- same currency--).

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

Capital Adequacy Ratio	0.250
Liquidity Ratio	-0.212
Size	0.163
NPL Ratio	0.08
ROA	0.195
Foreign Funding Ratio	-0.016
FX Loan Share	0.158
Herfindahl by Industry	0.071
W.Aveg. Firm Size	0.087
W.Aveg. Firm Export Ratio	-0.520
W.Aveg. Firm Leverage	0.415*

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	0.113***
Customers' NOP	0.267***
Suppliers' NOP	0.275***
Number of Customer Firms	-0.012***
Number of Suppliers	-0.115***
Number of Total Connected Firms	-0.068***

Note: Number of observations is 249,120.

Panel D. Comparing average characteristics of Domestic- vs. Foreign-Owned Banks

	Domestic Bank	Foreign Bank	Difference	p-value
Exposure to Risky FX Borrowers	-0.046	-0.09	0.044	0.53
Capital Adequacy Ratio	18.08	22.68	-4.599	0.19
Liquidity Ratio	21.109	32.284	-11.175	0.007
Size	17.055	16.164	0.891	0.26
ROA	1.594	1.004	0.59	0.21
NPL Ratio	0.801	1.372	-0.571	0.29
Foreign Funding Ratio	20.922	36.993	-16.07	0.06
FX Loan Share	32.65	39.935	-7.185	0.35
Herfindahl by Industry	15.036	12.07	2.961	0.34
W.Aveg. Firm Size	21.794	21.769	0.025	0.98
W.Aveg. Firm Export Ratio	0.118	0.147	-0.029	0.43
W.Aveg. Firm Leverage	0.987	0.914	0.072	0.28

TABLE 2.4: BASELINE RESULTS: VOLUME

Dependent Variable:	Log change in real credit				
	(1)	(2)	(3)	(4)	(5)
Exposure to Risky FX Borrowers	**-0.432*** **	**-0.604*** **	**-0.732*** **	**-0.741*** **	**-0.714*** **
	(0.025)	(0.021)	(0.024)	(0.024)	(0.024)
Capital Adequacy Ratio	**0.012*** **	**0.018*** **	**0.025*** **	**0.025*** **	**0.028*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Liquidity Ratio	**-0.014*** **	**-0.013*** **	**-0.022*** **	**-0.022*** **	**-0.025*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size	**0.073*** **	**0.144*** **	**0.155*** **	**0.152*** **	**0.181*** **
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
NPL Ratio	**0.023**	**0.155*** **	**0.141*** **	**0.145*** **	**0.129*** **
	(0.016)	(0.010)	(0.011)	(0.011)	(0.012)
ROA	**0.195*** **	**0.305*** **	**0.266*** **	**0.277*** **	**0.189*** **
	(0.024)	(0.021)	(0.022)	(0.022)	(0.023)
Foreign Funding Ratio	**-0.015*** **	**-0.014*** **	**-0.015*** **	**-0.014*** **	**-0.016*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
FX Loan Share	**-0.005*** **	**-0.005*** **	**-0.000**	**0.000**	**-0.002*** **
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Herfindahl by Industry	**0.001***	**0.001***	**0.003*** **	**0.003*** **	**0.002*** **
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Strength of Relationship	**0.057***	**0.065**	**0.019**	**0.022**	**0.108*** **
	(0.033)	(0.046)	(0.026)	(0.028)	(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	669,266	596,891	503,706	503,706	497,098
R-squared	0.013	0.015	0.421	0.422	0.434
Log change in the credit supply of a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	-8.68	-12.14	-14.71	-14.89	-14.35

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 2.5: BASELINE RESULTS: INTEREST RATE

Dependent Variable:	Log change in interest rate				
	(1)	(2)	(3)	(4)	(5)
Exposure to Risky FX Borrowers	**0.035***	**0.216*****	**0.160*****	**0.159*****	**0.159*****
	(0.018)	(0.008)	(0.008)	(0.008)	(0.008)
Capital Adequacy Ratio	**0.002*****	**0.001*****	**0.011*****	**0.011*****	**0.010*****
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Liquidity Ratio	**0.003*****	**-0.000**	**0.005*****	**0.005*****	**0.006*****
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Size	**-0.021*****	**-0.076*****	**-0.049*****	**-0.049*****	**-0.054*****
	(0.005)	(0.003)	(0.002)	(0.002)	(0.002)
NPL Ratio	**-0.023***	**-0.157*****	**-0.124*****	**-0.124*****	**-0.124*****
	(0.013)	(0.006)	(0.005)	(0.005)	(0.005)
ROA	**-0.131*****	**-0.281*****	**-0.234*****	**-0.234*****	**-0.226*****
	(0.018)	(0.011)	(0.009)	(0.009)	(0.009)
Foreign Funding Ratio	**0.004*****	**0.002*****	**-0.002*****	**-0.002*****	**-0.002*****
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FX Loan Share	**0.005*****	**0.005*****	**0.001*****	**0.001*****	**0.001*****
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Herfindahl by Industry	**0.002*****	**0.002*****	**0.001*****	**0.001*****	**0.001*****
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Strength of Relationship	**-0.014****	**-0.018**	**-0.012****	**-0.013****	**-0.031*****
	(0.006)	(0.012)	(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	648,657	582,308	484,986	484,986	478,484
R-squared	0.029	0.037	0.499	0.499	0.509
Log change in the interest rate of a loan from a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	0.70	4.34	3.22	3.20	3.20

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 2.6: 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	**-0.389*** **	**-0.393*** **	**-0.385*** **	**0.691*** **	**0.688*** **	**0.635*** **
	(0.022)	(0.022)	(0.022)	(0.052)	(0.052)	(0.052)
Capital Adequacy Ratio	**0.035*** **	**0.035*** **	**0.037*** **	**0.004** **	**0.003***	**-0.004** **
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Liquidity Ratio	**-0.006*** **	**-0.006*** **	**-0.007*** **	**-0.117*** **	**-0.117*** **	**-0.117*** **
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
Size	**0.195*** **	**0.194*** **	**0.217*** **	**-0.351*** **	**-0.354*** **	**-0.391*** **
	(0.006)	(0.006)	(0.006)	(0.017)	(0.017)	(0.018)
NPL Ratio	**0.196*** **	**0.198*** **	**0.195*** **	**-0.953*** **	**-0.951*** **	**-0.920*** **
	(0.012)	(0.012)	(0.013)	(0.044)	(0.044)	(0.044)
ROA	**0.015**	**0.021**	**-0.036***	**-1.259*** **	**-1.249*** **	**-1.100*** **
	(0.021)	(0.021)	(0.022)	(0.058)	(0.057)	(0.060)
Foreign Funding Ratio	**-0.006*** **	**-0.005*** **	**-0.006*** **	**0.001**	**0.001**	**0.003*** **
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
FX Loan Share	**0.000**	**0.001***	**-0.001***	**0.020*** **	**0.020*** **	**0.024*** **
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Herfindahl by Industry	**0.000**	**0.000**	**-0.001** **	**-0.012*** **	**-0.012*** **	**-0.011*** **
	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Strength of Relationship	**0.019**	**0.020**	**0.118*** **	**0.170*** **	**0.173*** **	**0.193*** **
	(0.026)	(0.027)	(0.017)	(0.065)	(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	473,286	473,286	466,799	324,482	324,482	318,143
R-squared	0.406	0.407	0.415	0.434	0.435	0.450
Log change in the outcome variable of a loan from a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	-7.82	-7.90	-7.74	13.89	13.83	12.76

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 2.7: 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 2.8: MECHANISM: FURTHER EVIDENCE

Outcome Variable:	Volume		Interest Rate		Maturity		Collateral Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure to Risky FX Borrowers	**-0.737*** **	**-0.235*** **	**0.153*** **	**0.014***	**-0.382*** **	**-0.162*** **	**0.669*** **	**0.320*** **
	(0.024)	(0.025)	(0.009)	(0.008)	(0.022)	(0.023)	(0.052)	(0.057)
Δ NPL Ratio		**-0.120*** **		**0.050*** **		**-0.131*** **		**0.152*** **
		(0.006)		(0.002)		(0.005)		(0.015)
Δ Capital Adequacy Ratio		**-2.240*** **		**0.541*** **		**-0.430*** **		**1.392*** **
		(0.047)		(0.017)		(0.041)		(0.056)
Capital Adequacy Ratio	**0.026*** **	**-0.006*** **	**0.011*** **	**0.019*** **	**0.036*** **	**0.029*** **	**0.001**	**0.007*** **
	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Liquidity Ratio	**-0.023*** **	**0.011*** **	**0.005*** **	**-0.007*** **	**-0.006*** **	**0.022*** **	**-0.116*** **	**-0.157*** **
	(0.001)	(0.002)	(0.000)	(0.001)	(0.001)	(0.001)	(0.003)	(0.004)
Size	**0.167*** **	**-0.128*** **	**-0.048*** **	**0.042*** **	**0.202*** **	**0.054*** **	**-0.368*** **	**-0.181*** **
	(0.007)	(0.010)	(0.003)	(0.005)	(0.006)	(0.008)	(0.017)	(0.024)
NPL Ratio	**0.142*** **	**-0.107*** **	**-0.122*** **	**-0.039*** **	**0.193*** **	**0.018**	**-0.942*** **	**-0.700*** **
	(0.012)	(0.014)	(0.005)	(0.005)	(0.013)	(0.013)	(0.044)	(0.054)
ROA	**0.241*** **	**0.450*** **	**-0.232*** **	**-0.320*** **	**-0.007**	**0.202*** **	**-1.195*** **	**-1.326*** **
	(0.023)	(0.025)	(0.010)	(0.013)	(0.021)	(0.021)	(0.058)	(0.048)
Foreign Funding Ratio	**-0.014*** **	**-0.015*** **	**-0.003*** **	**-0.003*** **	**-0.006*** **	**-0.005*** **	**0.001**	**-0.003*** **
	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
FX Loan Share	**-0.142*** **	**0.287*** **	**0.056*** **	**-0.119*** **	**0.021**	**0.416*** **	**2.108*** **	**1.921*** **
	(0.051)	(0.055)	(0.019)	(0.025)	(0.045)	(0.045)	(0.096)	(0.088)
Herfindahl by Industry	**0.003*** **	**0.020*** **	**0.001*** **	**-0.004*** **	**-0.000**	**0.005*** **	**-0.012*** **	**-0.024*** **
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Strength of Relationship	**0.018**	**-0.071*** **	**-0.010** **	**0.020** **	**0.014**	**-0.048*** **	**0.192*** **	**0.333*** **
	(0.025)	(0.014)	(0.004)	(0.008)	(0.023)	(0.006)	(0.064)	(0.068)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	495,833	494,923	477,465	476,585	465,984	465,094	317,446	316,728
R-squared	0.430	0.438	0.492	0.501	0.410	0.414	0.436	0.445
Log change in the outcome variable of a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	-14.81	-4.72	3.08	0.28	-7.68	-3.26	13.45	6.43

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 2.9: 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	**-0.096*****	**0.116*****	**-0.062*****	**0.127*****	**-0.063*****	**0.070*****	**-0.052*****	**0.172*****
	(0.005)	(0.004)	(0.004)	(0.006)	(0.006)	(0.003)	(0.004)	(0.008)
W. Aveg. Bank Capital Adequacy Ratio	**-0.003**	**-0.014*****	**-0.000**	**0.046*****	**-0.014*****	**0.001**	**-0.001**	**0.049*****
	(0.003)	(0.002)	(0.002)	(0.004)	(0.001)	(0.001)	(0.001)	(0.002)
W. Aveg. Bank Liquidity Ratio	**0.000**	**-0.008*****	**0.014*****	**-0.019*****	**0.005*****	**-0.006*****	**0.011*****	**-0.032*****
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
W. Aveg. Bank Size	**0.010***	**0.011*****	**-0.017*****	**-0.008**	**-0.007*****	**0.009*****	**-0.005****	**-0.004**
	(0.005)	(0.004)	(0.004)	(0.007)	(0.002)	(0.001)	(0.002)	(0.004)
W. Aveg. Bank Non-Performing Loans	**-0.027**	**0.011**	**0.051*****	**-0.102*****	**-0.001**	**-0.004**	**0.006**	**-0.024**
	(0.026)	(0.017)	(0.018)	(0.037)	(0.003)	(0.006)	(0.008)	(0.018)
W. Aveg. Bank Return on Assets	**0.199*****	**-0.080***	**0.208*****	**-0.380*****	**0.350*****	**-0.107*****	**0.078*****	**-0.419*****
	(0.068)	(0.045)	(0.047)	(0.100)	(0.020)	(0.014)	(0.018)	(0.040)
W. Aveg. Bank Foreign Funding	**-0.011*****	**0.010*****	**-0.011*****	**-0.010*****	**-0.007*****	**0.004*****	**-0.009*****	**-0.002*****
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
W. Aveg. Bank FX Loan Share	**-0.452*****	**0.814*****	**0.129***	**1.430*****	**-0.045**	**0.569*****	**-0.013**	**1.565*****
	(0.098)	(0.062)	(0.071)	(0.138)	(0.043)	(0.024)	(0.036)	(0.063)
W. Aveg. Bank Herfindahl by Industry	**-0.012*****	**0.000**	**-0.002*****	**0.006*****	**-0.010*****	**-0.002*****	**0.000**	**0.002*****
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)
Observations	192,482	192,432	191,762	185,924	358,568	350,719	349,405	323,622
R-squared	0.020	0.065	0.010	0.018	0.013	0.025	0.005	0.044
Log change in the the outcome variable of a firm with 1 std. higher W. Aveg. Bank Exposure to Risky FX Borrowers (in %)	-5.28	6.38	-3.41	6.99	-3.55	4.14	-2.96	10.17

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 2.10: 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)
Firm Net Open FX Position	**-0.108*** **	**-0.102*** **	**-0.079*** **	**-0.077*** **	**-0.115*** **	**-0.107*** **	**-0.134*** **	**-0.128*** **	**-0.021*** **	**-0.021*** **
	(0.013)	(0.012)	(0.011)	(0.011)	(0.036)	(0.035)	(0.030)	(0.029)	(0.005)	(0.005)
Firm Exposure to Risky FX Borrowers		**-0.030*** **		**-0.007*** **		**-0.038*** **		**-0.031*** **		**-0.000**
		(0.003)		(0.002)		(0.005)		(0.005)		(0.001)
Firm Size	**-0.109*** **	**-0.110*** **	**-0.016*** **	**-0.017*** **	**-0.124*** **	**-0.125*** **	**-0.143*** **	**-0.144*** **	**-0.008** **	**-0.008** **
	(0.010)	(0.010)	(0.006)	(0.006)	(0.010)	(0.010)	(0.014)	(0.014)	(0.003)	(0.003)
Firm Leverage Ratio	**-0.047*** **	**-0.048*** **	**0.010**	**0.010**	**0.064**	**0.064**	**-0.086*** **	**-0.087*** **	**-0.014*** **	**-0.014*** **
	(0.009)	(0.009)	(0.012)	(0.012)	(0.039)	(0.040)	(0.010)	(0.010)	(0.002)	(0.002)
Exporter Firm	**0.168*** **	**0.163*** **	**0.047*** **	**0.046*** **	**0.200*** **	**0.194*** **	**0.247*** **	**0.241*** **	**0.019*** **	**0.019*** **
	(0.016)	(0.015)	(0.011)	(0.011)	(0.022)	(0.021)	(0.021)	(0.020)	(0.006)	(0.006)
Industry-City Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	242,793	242,793	218,178	218,178	152,045	152,045	247,727	247,727	242,796	242,796
R-squared	0.077	0.077	0.058	0.058	0.087	0.087	0.071	0.072	0.063	0.063
Change in the dependent variable for firm f with 1 std. higher net open FX position	-2.93	-2.76	-2.14	-2.09	-3.12	-2.90	-3.63	-3.47	-0.57	-0.57
Change in the dependent variable for firm f with 1 std. higher Exposure to Risky FX Borrowers		-2.26		-0.53		-2.86		-2.33		0.00

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 total 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 2.11: 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	**-0.095*****	**-0.093*****	**-0.073*****	**-0.074*****	**-0.092****	**-0.085****	**-0.114*****	**-0.103*****	**-0.019*****	**-0.018*****
	(0.013)	(0.013)	(0.011)	(0.010)	(0.038)	(0.037)	(0.028)	(0.027)	(0.005)	(0.005)
Firm Exposure to Risky FX Borrowers	**-0.030*****	**-0.030*****	**-0.006*****	**-0.006*****	**-0.037*****	**-0.037*****	**-0.030*****	**-0.030*****	**-0.000**	**-0.000**
	(0.003)	(0.003)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)	(0.005)	(0.001)	(0.001)
Customers' Net Open FX Position	**-0.088*****	**-0.084*****	**-0.046*****	**-0.047*****	**-0.211*****	**-0.197*****	**-0.182*****	**-0.161*****	**-0.020*****	**-0.017****
	(0.014)	(0.013)	(0.013)	(0.012)	(0.037)	(0.035)	(0.025)	(0.024)	(0.006)	(0.007)
Suppliers' Net Open FX Position		**-0.026**		**0.010**		**-0.092***		**-0.129*****		**-0.021***
		(0.028)		(0.020)		(0.051)		(0.038)		(0.012)
Firm Size	**-0.110*****	**-0.110*****	**-0.017*****	**-0.017*****	**-0.126*****	**-0.126*****	**-0.144*****	**-0.144*****	**-0.008****	**-0.008****
	(0.010)	(0.010)	(0.006)	(0.006)	(0.010)	(0.010)	(0.014)	(0.014)	(0.003)	(0.003)
Firm Leverage Ratio	**-0.047*****	**-0.047*****	**0.010**	**0.010**	**0.065***	**0.065***	**-0.086*****	**-0.086*****	**-0.014*****	**-0.014*****
	(0.009)	(0.009)	(0.012)	(0.012)	(0.040)	(0.040)	(0.010)	(0.010)	(0.002)	(0.002)
Exporter Firm	**0.160*****	**0.159*****	**0.044*****	**0.044*****	**0.186*****	**0.185*****	**0.234*****	**0.232*****	**0.018*****	**0.018*****
	(0.015)	(0.016)	(0.012)	(0.012)	(0.021)	(0.021)	(0.020)	(0.020)	(0.006)	(0.006)
Industry-City Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	242,793	242,793	218,178	218,178	152,045	152,045	247,727	247,727	242,796	242,796
R-squared	0.078	0.078	0.058	0.058	0.087	0.087	0.072	0.072	0.063	0.063
Change in the dependent variable for firm *f* …										
… with 1 std. higher net open FX position	-2.57	-2.52	-1.98	-2.01	-2.49	-2.30	-3.09	-2.79	-0.51	-0.49
Financial Linkages										
… with 1 std. higher bank Exposure to Risky FX Borrowers	-2.26	-2.26	-0.45	-0.45	-2.78	-2.78	-2.26	-2.26	0.00	0.00
Real Linkages										
Downstream Effects: … with 1 std. higher weighted average NOP of customer firms	-1.66	-1.59	-0.87	-0.89	-3.99	-3.72	-3.44	-3.04	-0.38	-0.32
Upstream Effects: … with 1 std. higher weighted average NOP of supplier firms		-0.38		0.15		-1.35		-1.90		-0.31

TABLE 2.12: 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	**-0.191*****	**-0.185*****	**-0.170*****	**-0.158*****	**-0.154*****	**-0.146*****	**-0.128*****	**-0.119*****
	(0.030)	(0.029)	(0.030)	(0.029)	(0.027)	(0.026)	(0.026)	(0.025)
Firm Exposure to Risky FX Borrowers		**-0.033*****	**-0.032*****	**-0.032*****		**-0.047*****	**-0.046*****	**-0.046*****
		(0.005)	(0.005)	(0.005)		(0.009)	(0.009)	(0.009)
Customers' Net Open FX Position			**-0.192*****	**-0.169*****			**-0.229*****	**-0.211*****
			(0.029)	(0.031)			(0.056)	(0.056)
Suppliers' Net Open FX Position				**-0.146*****				**-0.108****
				(0.052)				(0.046)
Firm Size	**-0.173*****	**-0.174*****	**-0.174*****	**-0.175*****	**-0.187*****	**-0.188*****	**-0.189*****	**-0.189*****
	(0.016)	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.016)	(0.016)
Firm Leverage Ratio	**-0.040****	**-0.040****	**-0.040****	**-0.040****	**-0.147*****	**-0.148*****	**-0.147*****	**-0.147*****
	(0.016)	(0.016)	(0.016)	(0.016)	(0.019)	(0.019)	(0.019)	(0.019)
Exporter Firm	**0.183*****	**0.177*****	**0.170*****	**0.167*****	**0.341*****	**0.332*****	**0.324*****	**0.322*****
	(0.029)	(0.029)	(0.028)	(0.028)	(0.023)	(0.022)	(0.022)	(0.022)
Industry-City Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	249,120	249,120	249,120	249,120	249,120	249,120	249,120	249,120
R-squared	0.066	0.066	0.066	0.066	0.064	0.064	0.064	0.064
Change in the dependent variable for firm *f* …								
… with 1 std. higher net open FX position	-5.18	-5.01	-4.61	-4.28	-4.17	-3.96	-3.47	-3.22
Financial Linkages								
… working with banks with 1 std. higher exposure to risky FX borrowers		-2.48	-2.41	-2.41		-3.53	-3.46	-3.46
Real Linkages								
Downstream Effects:			-3.63	-3.19			-4.33	-3.99
… with 1 std. higher weighted average NOP of customer firms								
Upstream Effects:								
… with 1 std. higher weighted average NOP of supplier firms				-2.15				-1.59

TABLE 2.13: EXTENSIVE MARGIN

Dependent Variable:	New Lending	Termination
	(1)	(2)
Exposure to Risky FX Borrowers	**-0.152*** **	**0.238*** **
	(0.011)	(0.012)
Capital Adequacy Ratio	**0.003*** **	**-0.019*** **
	(0.000)	(0.000)
Liquidity Ratio	**-0.003*** **	**-0.002*** **
	(0.000)	(0.000)
Size	**0.040*** **	**-0.056*** **
	(0.003)	(0.003)
NPL Ratio	**-0.011** **	**0.016** **
	(0.005)	(0.007)
ROA	**-0.008**	**0.010**
	(0.009)	(0.011)
Foreign Funding Ratio	**-0.004*** **	**0.005*** **
	(0.000)	(0.000)
FX Loan Share	**-0.002**	**0.071*** **
	(0.018)	(0.019)
Strength of Relationship	**-0.002*** **	**0.006*** **
	(0.000)	(0.000)
Firm FE	Yes	Yes
Observations	548,506	843,126
R-squared	0.799	0.703
Probability of the outcome variable for a bank with 1 std. higher ex-ante exposure to risky FX borrowers (in %)	-3.06	4.78

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 2.14: 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	**0.160*** **	**-0.000**	**0.060***	**0.120*** **	**-0.012**	**-0.074*** **
	(0.041)	(0.012)	(0.035)	(0.033)	(0.023)	(0.013)
Exposure to Risky FX Borrowers	**-0.840*** **	**0.031*** **	**-0.275*** **	**0.781*** **	**-0.250*** **	**0.362*** **
	(0.031)	(0.009)	(0.028)	(0.057)	(0.013)	(0.009)
			Panel II: Less Leveraged Firm			
Exposure to Risky FX Borrowers* Healthy Firm	**-0.056**	**-0.019***	**-0.010**	**-0.030**	**-0.026**	**0.020***
	(0.037)	(0.011)	(0.032)	(0.027)	(0.019)	(0.012)
Exposure to Risky FX Borrowers	**-0.771*** **	**0.039*** **	**-0.254*** **	**0.828*** **	**-0.240*** **	**0.334*** **
	(0.034)	(0.009)	(0.030)	(0.058)	(0.015)	(0.010)
			Panel III: More Profitable Firm			
Exposure to Risky FX Borrowers* Healthy Firm	**0.063***	**-0.018***	**0.112*** **	**0.097*** **	**-0.020**	**-0.019***
	(0.038)	(0.011)	(0.033)	(0.027)	(0.019)	(0.012)
Exposure to Risky FX Borrowers	**-0.834*** **	**0.041*** **	**-0.325*** **	**0.757*** **	**-0.242*** **	**0.355*** **
	(0.036)	(0.010)	(0.032)	(0.059)	(0.015)	(0.011)
			Panel IV: Firm Size			
Exposure to Risky FX Borrowers* Firm Size	**0.049*** **	**-0.009*** **	**0.036*** **	**0.037*** **	**0.016*** **	**-0.048*** **
	(0.010)	(0.003)	(0.009)	(0.011)	(0.004)	(0.003)
Exposure to Risky FX Borrowers	**-1.574*** **	**0.171*** **	**-0.825*** **	**0.219**	**-0.523*** **	**1.098*** **
	(0.165)	(0.047)	(0.138)	(0.184)	(0.058)	(0.052)
			Panel V: Firm Export Ratio			
Exposure to Risky FX Borrowers* Firm Export Ratio	**0.207** **	**-0.020**	**0.005**	**0.448*** **	**0.040**	**-0.132*** **
	(0.097)	(0.032)	(0.082)	(0.109)	(0.052)	(0.031)
Exposure to Risky FX Borrowers	**-0.808*** **	**0.027*** **	**-0.257*** **	**0.786*** **	**-0.270*** **	**0.343*** **
	(0.030)	(0.008)	(0.027)	(0.056)	(0.012)	(0.009)
Firm FE	--	--	--	--	Yes	Yes
Firm x Currency FE	Yes	Yes	Yes	Yes	--	--
Observations	241,094	233,693	224,005	203,902	145,857	362,500

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 2.15: 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$_f$	**0.143*** **	**-0.008***	**0.092*** **	**0.121*** **	**0.017** **	**-0.082*** **
	(0.016)	(0.005)	(0.014)	(0.016)	(0.007)	(0.005)
Exposure to Risky FX Borrowers$_b$	**-1.433*** **	**0.063*** **	**-0.669*** **	**0.270*** **	**-0.338*** **	**0.688*** **
	(0.076)	(0.023)	(0.066)	(0.091)	(0.029)	(0.024)
	Panel II: additionally controlling for firm characteristics at the interaction					
Exposure to Risky FX Borrowers$_b$ * Number of Connected Firms$_f$	**0.156*** **	**0.002**	**0.093*** **	**0.137*** **	**0.001**	**-0.053*** **
	(0.021)	(0.006)	(0.018)	(0.015)	(0.008)	(0.006)
Exposure to Risky FX Borrowers	**-1.351*** **	**0.159*** **	**-0.694*** **	**0.497*** **	**-0.567*** **	**1.022*** **
	(0.177)	(0.050)	(0.151)	(0.186)	(0.060)	(0.055)
Exposure to Risky FX Borrowers$_b$ * Firm Size$_f$	**-0.014**	**-0.010*** **	**-0.001**	**-0.020***	**0.017*** **	**-0.027*** **
	(0.013)	(0.004)	(0.011)	(0.012)	(0.004)	(0.004)
Exposure to Risky FX Borrowers$_b$ * Firm Export Ratio$_f$	**0.157**	**-0.008**	**-0.034**	**0.417*** **	**0.014**	**-0.072** **
	(0.097)	(0.032)	(0.083)	(0.106)	(0.053)	(0.032)
Exposure to Risky FX Borrowers$_b$ * Firm Leverage$_f$	**0.099**	**0.018**	**0.040**	**-0.008**	**0.047*** **	**-0.031**
	(0.067)	(0.021)	(0.053)	(0.070)	(0.015)	(0.021)
Firm FE	--	--	--	--	Yes	Yes
Firm x Currency FE	Yes	Yes	Yes	Yes	--	--
Observations	233,362	226,458	217,101	199,133	154,639	347,027

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 2.16: 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$_f$	**-0.157***		**-0.115**	**0.089*****		**0.069****	**-0.060**		**-0.010**	**-0.466*****		**-0.340*****
	(0.089)		(0.094)	(0.029)		(0.031)	(0.074)		(0.078)	(0.089)		(0.096)
Exposure to Risky FX Borrowers$_b$ * Suppliers' Net Open FX Position$_f$		**-0.216***	**-0.168**		**0.116*****	**0.087****		**-0.215****	**-0.211***		**-0.662*****	**-0.516*****
		(0.118)	(0.125)		(0.039)	(0.041)		(0.107)	(0.113)		(0.095)	(0.103)
Exposure to Risky FX Borrowers$_b$	**-0.724*****	**-0.725*****	**-0.730*****	**0.164*****	**0.164*****	**0.167*****	**-0.389*****	**-0.395*****	**-0.396*****	**0.602*****	**0.599*****	**0.583*****
	(0.025)	(0.025)	(0.025)	(0.008)	(0.008)	(0.008)	(0.023)	(0.023)	(0.023)	(0.052)	(0.052)	(0.052)
Firm x Currency FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	497,098	497,098	497,098	478,484	478,484	478,484	466,799	466,799	466,799	318,143	318,143	318,143
R-squared	0.434	0.434	0.434	0.509	0.509	0.509	0.415	0.415	0.415	0.450	0.450	0.450

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 2.17: 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	**0.319*** **	**-0.060** **	**0.100***	**0.185***		
	(0.070)	(0.024)	(0.056)	(0.110)		
Exposure to Risky FX Borrowers	**-0.755*** **	**0.162*** **	**-0.398*** **	**0.679*** **	**-0.000**	**0.224*** **
	(0.024)	(0.008)	(0.022)	(0.051)	(0.001)	(0.035)
FX Loan	**-0.262*** **	**-0.052*** **	**-0.135*** **	**-0.147*** **		
	(0.016)	(0.005)	(0.012)	(0.014)		
Capital Adequacy Ratio	**0.025*** **	**0.011*** **	**0.035*** **	**0.004***	**0.000***	**-0.006** **
	(0.001)	(0.000)	(0.001)	(0.002)	(0.000)	(0.003)
Liquidity Ratio	**-0.022*** **	**0.005*** **	**-0.006*** **	**-0.117*** **	**-0.000*** **	**0.009*** **
	(0.001)	(0.000)	(0.001)	(0.003)	(0.000)	(0.001)
Size	**0.153*** **	**-0.049*** **	**0.194*** **	**-0.353*** **	**-0.000**	**-0.061*** **
	(0.007)	(0.002)	(0.007)	(0.017)	(0.000)	(0.009)
NPL Ratio	**0.144*** **	**-0.124*** **	**0.198*** **	**-0.952*** **	**-0.002*** **	**-0.025** **
	(0.011)	(0.005)	(0.012)	(0.044)	(0.001)	(0.011)
ROA	**0.272*** **	**-0.234*** **	**0.019**	**-1.253*** **	**-0.002**	**-0.039**
	(0.022)	(0.009)	(0.021)	(0.057)	(0.001)	(0.032)
Foreign Funding Ratio	**-0.014*** **	**-0.002*** **	**-0.005*** **	**0.001**	**0.000*** **	**-0.002** **
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)
FX Loan Share	**-0.000**	**0.001*** **	**0.001**	**0.020*** **	**0.004**	**-0.181*** **
	(0.001)	(0.000)	(0.000)	(0.001)	(0.003)	(0.064)
Herfindahl by Industry	**0.003*** **	**0.001*** **	**0.000**	**-0.012*** **	**-0.000*** **	**0.001***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
Strength of Relationship	**0.023**	**-0.012** **	**0.021**	**0.174*** **		**-0.012**
	(0.029)	(0.006)	(0.028)	(0.064)		(0.009)
Firm FE	--	--	--	--	Yes	Yes
Firm x Currency FE	Yes	Yes	Yes	Yes	--	--
Observations	503,706	484,986	473,286	324,482	1,506,775	20,091
R-squared	0.422	0.499	0.407	0.105	0.425	0.474
Chage in the outcome variable for a bank with 1 std. higher ex-ante exposure to	6.41	-1.21	2.01	3.72	0.00	4.50

TABLE 2.18: 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	**0.607*** **	**-0.047** **	**-0.797*** **	**6.053*** **	**0.098*** **	**-0.074*** **
	(0.057)	(0.020)	(0.050)	(0.105)	(0.017)	(0.017)
Exposure to Risky FX Borrowers	**-1.202*** **	**0.174*** **	**-0.267*** **	**-1.624*** **	**-0.176*** **	**0.318*** **
	(0.035)	(0.012)	(0.031)	(0.065)	(0.011)	(0.016)
Foreign Banks	**0.252*** **	**0.002**	**0.148*** **	**-0.400*** **	**-0.003**	**-0.051*** **
	(0.009)	(0.003)	(0.008)	(0.015)	(0.003)	(0.003)
Capital Adequacy Ratio	**-0.011*** **	**0.011*** **	**0.019*** **	**0.017*** **	**0.003*** **	**-0.011*** **
	(0.002)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
Liquidity Ratio	**0.008*** **	**0.005*** **	**-0.002**	**-0.048*** **	**-0.002*** **	**-0.007*** **
	(0.002)	(0.001)	(0.002)	(0.004)	(0.000)	(0.001)
Size	**0.156*** **	**-0.050*** **	**0.146*** **	**0.127*** **	**0.042*** **	**-0.055*** **
	(0.007)	(0.003)	(0.007)	(0.017)	(0.003)	(0.004)
NPL Ratio	**0.119*** **	**-0.128*** **	**0.131*** **	**-0.203*** **	**-0.011** **	**0.022** **
	(0.013)	(0.005)	(0.012)	(0.021)	(0.005)	(0.009)
ROA	**0.186*** **	**-0.234*** **	**0.058*** **	**-1.202*** **	**-0.018***	**0.019**
	(0.022)	(0.009)	(0.021)	(0.054)	(0.009)	(0.013)
Foreign Funding Ratio	**-0.013*** **	**-0.003*** **	**-0.016*** **	**0.079*** **	**-0.003*** **	**0.005*** **
	(0.001)	(0.000)	(0.001)	(0.002)	(0.000)	(0.000)
FX Loan Share	**0.002*** **	**0.001*** **	**0.006*** **	**-0.004*** **	**-0.035***	**-0.009**
	(0.001)	(0.000)	(0.000)	(0.001)	(0.019)	(0.019)
Herfindahl by Industry	**0.012*** **	**0.001*** **	**0.003*** **	**-0.008*** **	**-0.002*** **	**0.004*** **
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
Strength of Relationship	**0.008**	**-0.013** **	**0.009**	**0.295*** **		**-0.015**
	(0.014)	(0.006)	(0.021)	(0.066)		(0.011)
Firm FE	--	--	--	--	Yes	Yes
Firm x Currency FE	Yes	Yes	Yes	Yes	--	--
Observations	503,706	484,986	473,286	324,482	548,506	843,126
R-squared	0.423	0.499	0.408	0.481	0.799	0.703
Chage in the dependent variable for a bank with 1 std. higher ex-ante exposure to risky FX borrowers for Foreign vs. Domestic bank	12.20	-0.80	-16.02	121.67	1.97	-1.41

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

TABLE 2.19: 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	**0.308*** **	**-0.059*** **	**-0.003**	**0.947*** **	**0.032*** **	**-0.072*** **
	(0.013)	(0.004)	(0.010)	(0.024)	(0.004)	(0.003)
Exposure to Risky FX Borrowers * Foreign Funding Ratio	**-0.028*** **	**0.021*** **	**0.001**	**0.506*** **	**-0.004***	**-0.002**
	(0.006)	(0.002)	(0.004)	(0.021)	(0.002)	(0.002)
Exposure to Risky FX Borrowers * Liquidity Ratio	**-0.151*** **	**0.030*** **	**-0.044*** **	**0.683*** **	**-0.022*** **	**0.019*** **
	(0.013)	(0.004)	(0.009)	(0.112)	(0.003)	(0.003)
Exposure to Risky FX Borrowers * Size	**-0.645*** **	**0.228*** **	**-0.179*** **	**1.453*** **	**-0.041*** **	**0.132*** **
	(0.021)	(0.007)	(0.017)	(0.036)	(0.008)	(0.010)
Exposure to Risky FX Borrowers * NPL Ratio	**0.612*** **	**-0.058*** **	**0.103*** **	**-4.391*** **	**-0.007**	**-0.054***
	(0.041)	(0.014)	(0.039)	(0.174)	(0.014)	(0.028)
Exposure to Risky FX Borrowers * ROA	**-0.589*** **	**0.388*** **	**-1.057*** **	**13.714*** **	**0.032**	**0.103** **
	(0.087)	(0.027)	(0.073)	(0.186)	(0.033)	(0.043)
Exposure to Risky FX Borrowers * FX Loan Share	**-0.105*** **	**0.025*** **	**-0.028*** **	**0.131*** **	**-1.126*** **	**1.976*** **
	(0.003)	(0.001)	(0.002)	(0.006)	(0.112)	(0.108)

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%.

TABLE 2.20: 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%.

Chapter 3

INTERNATIONAL SPILLOVERS OF FORWARD GUIDANCE POLICIES

3.1 Introduction

Communication about how the policy is likely to be set in the future can be a powerful monetary policy tool, as expectations about the future course of monetary policy have a strong influence on the many different interest rates that affect the economy (mortgages, business credit, bank deposits, the cost of public debt, etc.) and hence on economic outcomes. Such a tool may be particularly important at times when a central bank is unable (or unwilling) to further change the current policy rate (Woodford, 2012; Svensson, 2015). Indeed, in response to the 2008 financial crisis and the 2020 Coronavirus shock, many central banks, particularly in advanced countries, cut their policy rate to near zero and turned to forward guidance about the future policy. While these monetary policy actions target the domestic economy, they also have international spillovers, especially on the emerging market economies (EMEs).

Following Chairman Bernanke's congressional testimony hinting that Fed would start scaling back its large-scale asset purchases, many EMs experienced a sharp withdrawal of portfolio flows in the second half of 2013 (Figure 3.1). Also, cross-border bank lending to EMEs slowed sharply. Its growth rate dropped to 2.5% in the second and third quarters of 2013 from around 10% over the previous two quarters (Avdjiev and Takáts, 2014). The market turmoil during the taper tantrum was mainly driven by changes in the monetary policy expectations for Fed (Bauer and Rudebusch, 2013). These developments feed into a lively academic and policy debate over the spillovers of the Fed and ECB's monetary policy in EMEs credit cycles (Rey, 2013; Rajan, 2014; Fischer, 2014).

In this paper, I study the international credit channel of monetary policy, in particular, the effects of advanced countries' forward guidance policies on emerging markets' credit cycles. I analyze (i) whether forward guidance policies of Fed and ECB affect the supply of credit from banks with higher exposure to Fed and ECB policies through their US dollar- and euro-denominated cross-border liabilities, (ii) whether the underlying mechanism works through the balance sheet effect of forward guidance policies on domestic banks' cross-border borrowing, (iii) whether advanced countries' forward guidance policies have real effects in terms of firm investment, total sales, and employment, or whether firms are able to compensate the effects of such forward guidance policies by resorting to non-bank funding resources.

In order to explore these questions precisely and identify the effects of advanced countries' forward guidance policies on the bank lending channel, at first I need a matched bank-firm data set. As banks that are more exposed to Fed and ECB policies may lend to different type of firms, I need to control for unobserved time-varying firm fundamentals. On the other hand, to explore the underlying mechanism I need a matched do-

mestic bank-global bank data on the cross-border borrowing. For the mechanism analysis, as banks that are more exposed to Fed and ECB policies may borrow from different type of global lenders, I need to control for unobserved time-varying lender global bank fundamentals. In order to examine the associated real effects, I need a matched firm financial statement data set. For identification I exploit global forward guidance policy shocks, proxied by US and Eurozone future monetary policy expectations, in conjunction with the micro-level three administrative supervisory datasets from Turkey: the Credit Register, the International Interbank Market Register (IIMR), and the Firm Database. The Credit Register tracks all corporate loans at a monthly frequency from all banks in Turkey, with information on loan volume, interest rate, maturity, and collateral coverage. The International Interbank Market Register provides transaction-level data of wholesale funding of banks in Turkey from global lenders, with information on loan price, volume, and currency of denomination. Lastly, the Firm Database provides complete financial statements for the universe of non-financial corporates.

Turkey provides an excellent laboratory to analyze the link between forward guidance policies of advanced countries and its spillovers to local credit conditions. First, firms in Turkey mostly rely on banks for finance; direct access to international financial markets, equity or bond issuing play negligible roles in the firms' sources of finance. Second, banks in Turkey are highly integrated with the international money and capital markets. As of end-2018, the share of foreign currency wholesale non-core funding in total liabilities of Turkish banks is around 18 percent. Third, Turkey is a large emerging market economy subject to foreign shocks, as it has large current account deficits and hence depends on global finance. Fourth, Turkey has three matched administrative, supervisory datasets important to address my questions.

I start with measuring exposure of a bank to Fed and ECB's forward guidance policies. Monetary policy shocks induced by the issuing authority of a given currency will have a direct impact on the value of that currency and also the amount of funding that is available to foreign banking systems in that currency. Therefore, banks that have higher share of US dollar (euro) cross-border liability in their balance sheets will be more exposed to Fed's (ECB's) monetary policy shocks. Using the IIMR, I calculate each bank's US dollar- and euro-denominated cross-border liability to total asset ratio as an indicator that shows a bank's exposure to Fed and ECB policies, respectively. This bank-level exposure variable implies that if a bank has higher share of US dollar-denominated cross-border liability in its balance sheet, this bank will be more affected by the changes in the value of US dollar and also by Fed's monetary policy. Similarly, if a banks holds higher share of euro-denominated cross border liability, then this bank will be more exposed to changes in the value of euro and ECB's monetary policy.

To identify the credit channel of monetary policy, I analyze the CR at the monthly frequency with firm-month fixed effects. In this way, I control for unobserved, time-varying firm fundamentals and focus on within-firm variations in loan conditions across banks that are differently exposed to advanced countries' forward guidance policies (as in (Khwaja and Mian, 2008; Mian, 2016; Jimenez et al., 2014)). Since only 18% of all firms borrow from more than one bank in a given month, in some specifications, I use firm-bank and city-industry-month fixed effects to include firms that are working with a single bank and also to control for sticky bank-firm relationship.

To identify the underlying mechanism through cross-border borrowing, I exploit the IIMR. For instance, a forward guidance policy by Fed that indicates a tighter monetary policy in the future may render cross-

border borrowing more costly for domestic banks, particularly the ones with higher ex-ante US dollar cross-border liabilities. In turn, these banks may demand less funds from abroad, eventually affecting the domestic loan conditions. I analyze the IIMR at the monthly frequency with global (lender) bank-month fixed effects. This allows to focus on within-global (lender) bank variations in cross-border borrowing conditions across differently exposed domestic banks and to identify the mechanism by absorbing international liquidity supply-side effects.

To identify the associated real effects, I analyze firm-year level domestic loan outcomes as well as firm liability, firm assets, sales and employment from the Firm Database. Examining the firm level domestic loan outcomes and firm level liability are important as firms could switch to alternative sources of finance to mitigate the effects of advanced countries' forward guidance policies. Furthermore, I use financial market based future monetary policy expectations for Fed and ECB, which are exogenous to Turkish economy, for forward guidance policies of advanced countries.

I find the following results. Forward guidance policies of Fed and ECB have statistically significant direct impacts on the loan margins. However, Fed policies are more effective compare to ECB policies. Fed future policy expectation shocks affect the supply of credit to Turkish firms mainly via banks that have higher ex-ante exposure to Fed policies with their US dollar-denominated cross border liabilities. Tightening expectations for Fed translates into not only less loans but also loans with higher interest rate and shorter maturity. These results reinforce the supply-driven channel. Economically, on average, banks with one-standard deviation higher ex-ante exposure to Fed policies cut their loan lending by 4.5% more, increase their loan rates by 45 basis points more and provide 10% shorter maturity loans for a given firm following a 100-basis-points increase in the future monetary policy expectations for Fed. On the other

hand, ECB monetary policy expectations have significant impacts on volume and collateral coverage. Estimation results show that, on average, banks with one-standard deviation higher ex-ante exposure to ECB policies decrease their loan lending by 2.7% more and ask for 12.7% higher collateral coverage to a given firm following a 100-basis points increase in monetary policy expectations for ECB.

I then explore the mechanism driving these results. Forward guidance policies of Fed also have significant impact on the cross-border borrowing conditions of banks in Turkey. Tightening expectations for Fed make banks with ex-ante higher exposure to Fed policies to demand less funds from abroad due to higher cross-border borrowing rates. This resonates well with the notion that tightening expectations for Fed deteriorates the balance sheets of Turkish banks that have higher ex-ante US dollar cross-border liabilities. Economically, a domestic bank with a one-standard-deviation higher ex-ante exposure to Fed policies decreases its cross-border borrowing by 10% more, due to 10 basis points more increase in its cross-border borrowing rate, following a 100-basis points tightening in the monetary policy expectations for Fed. For ECB's forward guidance policies, I find significant impacts only on cross-border borrowing rates.

I also analyze implications of forward guidance policies at the firm level. Tightening expectations for Fed and ECB translates into reduction in the firm-level credit; increase in the loan rate and decrease in the loan maturity. I find that domestic loan outcomes of firms that have more borrowing relationships with higher exposure banks, are more affected by the forward guidance policies of advanced countries. For instance, the reduction in the firm-level credit is 6.1% stronger; the increase in the firm-level loan rate is 36.4 basis points higher and decrease in the firm-level maturity is 1.6% more for firms whose weighted average of banks' expo-

sure to Fed and ECB policies are one-standard deviation higher, following a 100-basis points increase in the average monetary policy expectations for Fed and ECB. I also find that firms do not compensate the tightening in the bank credit with other sources of finance. Total and current liabilities of firms, which have higher exposure to Fed and ECB policies through their banking partners decrease more strongly following the tightening expectations for Fed and ECB. Moreover, as financial constraint binds, those firms that are connected to more exposed banks experience worse real outcomes: lower total and fixed assets, lower sales and lower employment.

My paper contributes to several strands of literature, most notably, on the identification of the international credit channel of monetary policy (forward guidance policy) via foreign currency cross-border borrowings of banks. I also analyze the associated credit supply channel with its impact on the firm level real variables. This paper contributes to the literature on the international spillovers of monetary policy (Buch et al., 2018), where most of this literature focuses on the role of global banks (Cetorelli and Goldberg, 2012b; Temesvary et al., 2018; Avdjiev et al., 2018; Morais et al., 2019; Avdjiev and Hale, 2019; Bräuning and Ivashina, 2020). One essential aspect of my study is that even domestic banks are also responsible for the international spillovers due to their reliance on wholesale funding in foreign currency.

Closest to my work are the papers which investigate how monetary policy shocks in a given currency are transmitted internationally. Using a newly available dataset on the bilateral cross-border lending flows, Takats and Temesvary (2020) find that monetary changes in a currency significantly affect cross-border lending flows in that currency and call it *the currency dimension of the international bank lending channel* in international monetary transmission. On the other hand, my paper shows that

exposure to a given currency reduces the cross-border borrowing following the tightening expectations for the monetary policy in that currency.

Moreover, this paper adds to the strand of literature that examines the drivers of cross-border bank flows to emerging market economies. In the literature global (push) factors and borrowing country-specific (pull) factors are defined as the main determinants of international bank lending. Recent studies have found that country-specific (pull) factors are largely irrelevant; on the other hand global factors such as movements in global risk appetite, typically approximated by the VIX (Forbes and Warnock, 2012; Miranda-Agrippino and Rey, 2015) and monetary policy in advanced countries (Milesi-Ferretti and Tille, 2011; Shin, 2012; Rey, 2013; Cerutti et al., 2017) are strongly associated with cross-border bank flows. I introduce forward guidance policies of advanced countries, measuring future monetary policy expectations for their central banks, as one of the drivers of cross-border bank flows.

This paper also relates to the literature that uses loan-level data to trace out the impact of foreign monetary policy shocks or global financial cycle on domestic lending conditions (di Giovanni et al., 2018), as well as the associated real effects (Morais et al., 2019). By matching loan level credit register data with firm level financial statements, my paper analyzes the real effects of advanced countries' forward guidance policies through cross-border bank flows.

The paper proceeds as follows. Section 3.2 presents the data and empirical strategy, as well as variable definitions and summary statistics. Section 3.4 presents the main findings of the paper. Section **??** briefly concludes.

3.2 Data and Empirical Strategy

3.2.1 Data

I study several micro-level supervisory databases, each crucial for identification. The first database, the International Interbank Market Register (IIMR), includes transaction-level supervisory information on the universe of cross-border borrowing by Turkish banks from global lenders. For each transaction, the IIMR provides the volume, interest rate, date of origination and termination, currency of denomination as well as unique identifiers for the borrower and the lender bank. Moreover, it provides the types of transaction, e.g. loan, deposit, loan to finance foreign trade, syndicated loan, securitization loan. Lastly, the name of the country that the lender bank operates and in the case of the lender bank being a subsidiary (e.g. J.P. Morgan, London branch), the name of the country where the main headquarter resides (in this case, the US) are available in the database. The reporting period is monthly and the data is collected by the Banking Regulation and Supervision Agency (BRSA), the authority in charge of supervising the Turkish banking system. The sample period is from January 2007 to December 2018.

Turkish banks' cross-border borrowing transactions are mostly denominated in the US dollar and euro. During the sample period, of all the cross-border transactions, 57% are denominated in US dollars and 31% in euros (with 10% in Turkish lira and 2% in other currencies). Moreover, Turkish banks predominantly borrow from banks headquartered in euro area and US. Of all cross-border transactions, 40% of volume of cross-border borrowing transactions are from banks headquartered in euro area and 20% from US headquartered banks. These patterns are inline with Shin (2012) findings on the dominant role of the Euoropean global banks

in intermediating US dollar funds.

Cross-border borrowings of banks in Turkey exhibit a pattern similar to that observed for those in EMEs. Besides the prominent role of the US dollar and euro area headquartered banks, maturity of cross-border borrowings of banks in Turkey are also similar, on average, to that observed for banks in EMEs. Average maturity of cross-border borrowing (weighted by the volume of the transaction) is around 48 months for the whole sample period. These patterns are by and large inline with Cerutti et al. (2015) who document similar figures for EMEs.

Figure 3.2 presents further evidence on how US dollar and euro cross-border borrowings of banks in Turkey have evolved over time. During the periods of global financial crisis, cross-border borrowings in US dollar and euro have been retrenched and the average maturity has declined. Total volume of cross-border borrowings increased notably with the quantitative easings by advanced economy central banks. As the share of US dollar borrowings have increased significantly, quantitative easing policies of the Fed appear to play a more important role in Turkish banks' cross-border borrowings. Cost of borrowing in US dollar and euro have followed similar pattern after the global financial crisis. However with the divergence in the monetary policies of Fed and ECB, US dollar funding cost has noticeably increased while euro funding cost has been mostly stable since 2015.

The second database, the Financial Institutions Database, includes supervisory balance sheet and income statements of Turkish banks, provided by the BRSA. I match this database with the IIMR to obtain a proxy for the exposure of Turkish banks to Fed and ECB's forward guidance policies. Namely, I calculate each bank's cross-border liabilities in US dollar and euro for Fed and ECB monetary policy exposures, respectively. I then

normalize these measures with bank total assets:

$$\text{Exposure to Fed}_{b,t} = \frac{\text{Cross-Border Liabilities}^{\$}_{b,t}}{\text{Total Assets}_{b,t}} \tag{3.1}$$

$$\text{Exposure to ECB}_{b,t} = \frac{\text{Cross-Border Liabilities}^{€}_{b,t}}{\text{Total Assets}_{b,t}} \tag{3.2}$$

where *Cross-Border Liabilities*$^{\$}_{b,t}$ and *Cross-Border Liabilities*$^{€}_{b,t}$ denote total US dollar and euro cross-border liabilities of bank b at month t, respectively. Eq. 3.1 and Eq. 3.2 imply that if a bank has a higher share of cross-border liabilities in US dollar (euro) in its balance sheet, then it is more exposed to Fed (ECB) policies. For the sample period, the average bank level *Exposure to Fed* and *Exposure to ECB* values are 10.2% and 4.2%, respectively. These values show that banks in Turkey are exposed more to Fed policies.

The third database, the Credit Register of Turkey (CR), tracks all loans to firms by Turkish banks. It includes extensive details on all loans granted by all banks operating in Turkey. The data is collected by the BRSA and banks have to report outstanding loans at a transaction level monthly to the BRSA. In addition to the loan outstanding and unique identifiers for the borrower and the lender, the CR includes loan level interest rate, currency of denomination, loan origination and termination dates, and total collateral pledged, for each loan extended by banks to firms in a given day. I first aggregate loans at the bank-firm-currency level for each month (using loan amounts as weights). I focus on three major currencies that loans are denominated Turkish lira, US dollar, or euro, which in total covers over 98% of total loans during the sample period.

Figure 3.3 presents how domestic loans have evolved over time. For-

eign currency loans have lower interest rate and longer maturity compared to local currency ones. Total loans (and most notably foreign-currency denominated loans) has declined sharply during the episodes of global liquidity crunch (Lehman Brothers' collapse and the European sovereign debt crisis) and also after the sharp Turkish lira depreciation in mid-2018. Moreover, loan rates have risen significantly for both domestic and foreign currency loans in these periods. Loan maturities follow a similar pattern; average maturity of loans has declined sharply during the financial turmoil periods.

The last database, the Firm Database provides complete financial statements of the universe of non-financial corporates in Turkey (close to 350K firms). The reporting period is yearly and and is provided by Revenue Administration of Turkey and TURKSTAT (Turkish Statistical Institute). The database does not include entrepreneurial firms. I exclude governmental bodies (public administration, defense,compulsory social security), and extra-territorial organizations and bodies. To avoid misreporting or measurement errors, I winsorize firm variables at 0.5% from both sides. For non-financial firms, I also use sector (based on NACE Rev.2 sectoral classifications) and city of location data, provided by Revenue Administration of Turkey. I match all these databases by using unique firm identifiers common across the databases (each firm identifier is based on its tax identification number).

I exclude investment, development and Islamic banks as they serve with different business operations. I have 27 domestic banks in the sample, extending 94.2% of total banking sector credits during the sample period. The domestic loans analysis include 807,009 firms. For the real effects part, I can match financial statements for 298,268 firms. In the mechanism analysis, 27 domestic banks borrow from 507 global banks which are headquartered in 73 countries (with the majority from Euro-

zone and US).

Future Monetary Policy Expectations

I use future monetary policy expectations for Fed and ECB as proxies for forward guidance policies. The basic premise for including future monetary policy expectations is that forward guidance attempts to influence the financial decisions of economic agents by providing a guidepost for the expected path of interest rates. I use overnight indexed swap (OIS) forward rates for US and Eurozone as a measure of future monetary policy expectations for Fed and ECB, respectively.[1] OIS forward rates have been used as financial market-based measures of future monetary policy expectation in the literature (Christensen and Rudebusch, 2012; Woodford, 2012; Lloyd, 2020). In an OIS, one agent pays a fixed interest rate on the notional principal and receives the overnight rate over the entire maturity period. Under no arbitrage, OIS rates reflect risk adjusted expectations of the average policy rate over the horizon corresponding to the maturity of the swap. The reference rate for US OIS is the effective federal funds rate, while for Eurozone contracts the reference rate is EONIA. I use 36-month ahead OIS rates for US and Eurozone, which is the most distant data point that is available. Using expectations for Fed and ECB's policy settings relatively far into the future is the most promising strategy because financial markets in certain periods do not expect any changes in the policy rate over the subsequent months.

The future monetary policy expectations variables used in the empirical analysis are shown in Figure 3.4. To address concerns about potential

[1] Expectations for US monetary policy rates are calculated primarily using Fed Funds futures and eurodollar futures rates (Gürkaynak et al., 2007). Since they are available for both US and Eurozone, I use OIS forward rates to measure the future monetary policy expectations. During the sample period, US OIS forward rates have a near-perfect correlation of 0.99 with Fed Funds futures rates at 36-month horizon.

endogeneity of future monetary policy expectations, I run an OLS regression of the US OIS rate on US annual industrial production growth and CPI inflation, and use the residuals in my benchmark regressions to isolate movements in the US future monetary policy expectations that are not explained by movements in the US economic activity and inflation. Given the synchronization of the world economy, one possible concern is multicollinearity of monetary policy expectations for Fed and ECB.[2] To address this concern, I regress the Eurozone OIS rates on Eurozone annual industrial production growth and CPI inflation, as well as on the US future monetary policy expectations. Consequently, the monetary policy expectations variables used in the empirical analysis account for any movement in the future monetary policy expectations for Fed and ECB that is not related to their respective macroeconomic conditions.

3.2.2 Emprical Strategy

My empirical strategy includes the following components: First, I exploit global forward guidance policy shocks, proxied by US and Eurozone future monetary policy expectations. The sample period is from January 2007 to December 2018, that coincides with the actively use of forward guidance policies by Fed and ECB, and encompasses several events that had global repercussions, e.g., the Lehman Brothers' collapse in September 2008, quantitative easing by advanced economy central banks, the European sovereign debt crisis, as well as the aftermath of Bernanke's taper tantrum in May 2013. These episodes imply strong variation in US and Eurozone future monetary policy expectations, which are exogenous to Turkey.

Second, I identify bank lending channel by exploiting the CR. That is,

[2]The correlation between raw 36-month ahead US and Eurozone monetary policy expectations is 0.76 for the sample period.

I study whether banks with different degrees of exposure to Fed and ECB policies differ in their lending conditions of a loan denominated in the same currency, to a given firm following a change in the future monetary policy expectations for Fed and ECB. A key challenge is that different banks may lend to different type of firms, complicating the identification of the bank lending channel. To achieve identification, I exploit the micro-level credit registry data and saturate the firm-bank-currency level specification with different sets of fixed effects such as bank-firm, city-sector-month and firm-month level. Moreover, I double cluster standard errors at the bank-sector pair and month level, to take into account possible dependence in residuals for a given bank-sector pair across time and also across all loans by all banks for a given month (Petersen, 2009; Cameron et al., 2011).

Third, I use future monetary policy expectations for US and Eurozone conditional on their respective macroeconomic conditions. In particular, I control for US and Eurozone economic activity and inflation. In addition to controlling for foreign macroeconomic conditions, I control for domestic macroeconomic variables: a proxy for the GDP growth, inflation, and change in the real exchange rate. Macroeconomic controls are included exhaustively, in levels and in interactions with exposure to Fed and ECB monetary policy variables. By controlling for macroeconomic variables exhaustively, I also take into account the fact that banks may differ in how they reflect changes in foreign and domestic macroeconomic conditions onto their lending conditions.

Fourth, to show the mechanism, I then use the global bank-domestic bank level database on domestic banks' cross-border borrowing exploiting the IIMR. This time I identify the demand side by absorbing supply-side effects by saturating the model with global (lender) bank's headquarter country-month or global (lender) bank-month fixed effects. My ques-

tion is whether domestic banks that borrow ex-ante more in US dollar and euro from international wholesale markets demand less funds from abroad following the tightening expectations for Fed and ECB.

Lastly to identify real effects at the firm level, first I calculate firm level exposure to Fed and ECB policies through their banking partners. I weigh banks' exposure to Fed and ECB policies by the share of loans that a firm had with banks in the previous year. If a firm borrows only from one bank which has higher US dollar cross-border liability and no euro cross-border liability in its balance sheet, then the most relevant forward guidance policy for the firm outcomes due to bank lending channel will be the Fed policies. This firm level exposure variable allows us to investigate whether firms that on average borrowed more from banks that have more US dollar (euro) cross-border liability in their balance sheets experience worse financial or real outcomes when monetary policy expectations for Fed (ECB) tightens. To achieve identification, I exploit the Firm Database and saturate the firm-year level specification with industry-city-year fixed effects and compare firms operating within the same industry and city for their financial and real outcomes.

Outcomes for Domestic Loans

My main objective is to understand whether Fed and ECB's forward guidance policies are transmitted to local firms through the banks that have ex-ante more cross-border liability in the currency of the country in which the monetary policy expectations shocks occur (e.g., Fed forward guidance policy transmitted by banks in Turkey that have more US dollar cross-border borrowing in their balance sheets through their lending to Turkish firms). The baseline specification is given in Eq. 3.3, which is an OLS regression that relates the loan outcome in a currency of each firm-bank pair in a given month to lagged monetary policy expectations for Fed and

ECB. Each monetary policy expectation is also interacted with the bank's corresponding exposure variable that is Fed (ECB) policy expectations are interacted with total US dollar (euro) liability from international wholesale market to total assets ratio of the bank, respectively. The baseline specification is as follows:

$$
\begin{aligned}
Y_{bfc,t} = & \sum_{s=1}^{3} \beta_{1,s} \text{Fed}_{t-s}^{\text{MP Exp.}} * \text{Exposure to Fed}_{b,t-1-s} + \cdots \\
& + \sum_{s=1}^{3} \beta_{2,s} \text{ECB}_{t-s}^{\text{MP Exp.}} * \text{Exposure to ECB}_{b,t-1-s} + \cdots \\
& + \sum_{s=1}^{3} \beta_{3,s} \text{Fed}_{t-s}^{\text{MP Exp.}} + \sum_{s=1}^{3} \beta_{4,s} \text{Exposure to Fed}_{b,t-1-s} + \cdots \\
& + \sum_{s=1}^{3} \beta_{5,s} \text{ECB}_{t-s}^{\text{MP Exp.}} + \sum_{s=1}^{3} \beta_{6,s} \text{Exposure to ECB}_{b,t-1-s} + \cdots \\
& + \text{Bank Controls}_b + \text{Macro Controls} + \varepsilon_{bfc,t} \qquad (3.3)
\end{aligned}
$$

where $Y_{bfc,t}$ corresponds to the outcome y for a loan denominated in currency c (Turkish lira, US dollar or euro) extended to firm f by bank b in month t, where the loan outcome y is: (i) volume (real amount in 2013 prices), in logs, (ii) interest rate, (iii) maturity, or (iv) value of total collateral pledged-to-total volume (collateral coverage) ratio. $Fed^{MP\ Exp.}$ and $ECB^{MP\ Exp.}$ are residual 36-month ahead monetary policy expectations for Fed and ECB, respectively. I include one-to-three lags of $Fed^{MP\ Exp.}$ as it might take time for the monetary policy expectations to affect banks' overall funding and loan conditions. *Exposure to Fed* and *Exposure to ECB* are as defined in Eq. 3.1 and Eq. 3.2, respectively. I use ex-ante exposure variables and include two-to-four month lags of *Exposure to Fed* and *Exposure to ECB*. $Bank\ Controls_b$ include standard bank characteristics used in the literature, capital ratio (total equity-to-total assets), liquidity

ratio (bank liquid assets to total assets) and size (log of total assets). *Macro Controls* include one-to-three month lagged annual industrial production growth and inflation of US, Eurozone and Turkey as well as monthly change in the real effective exchange rate of Turkey. Macroeconomic variables are included all in levels and US and Eurozone macro controls are interacted with *Exposure to Fed* and *Exposure to ECB* variables respectively. These variables allow us to control for the foreign and domestic macroeconomic conditions, and to better isolate changes in monetary policy expectations from other changes in the macroeconomic conditions.

My focus variable is the interaction of bank exposure to Fed and ECB policies (i.e., US dollar and euro cross-border borrowing from international wholesale market-to-total assets ratio) with the future monetary policy expectations. The main coefficients of interest are therefore $\sum_{s=1}^{3} \beta_{1,s}$ and $\sum_{s=1}^{3} \beta_{2,s}$. In particular, I test whether banks with higher exposure to Fed and ECB policies tighten their lending conditions to local firms following increase in the expected monetary policy rates of Fed and ECB, respectively.

Eq. 3.3 also includes several fixed effects. I first saturate the model with bank fixed effects to control for unobserved time-invariant bank characteristics. I then successively saturate the model. I add firm and currency level fixed effects to control for unobserved time-invariant firm characteristics and differences in the domestic and foreign currency loan types, respectively. In addition, to control also for persistent differences across lending relationships, I saturate the model with firm-bank level fixed effects. The identification is drived from the fact that within a month, banks with higher level of cross-border liability in a currency may be differently affected by the monetary policy expectations shocks of that currency. To proxy for demand shocks I saturate the model with city-sector-month fixed effects. Lastly in the most saturated specification, I use firm-month

fixed effects. Consequently, I control for exhaustively for unobserved time-varying firm characteristics. In this case, I examine whether for a given firm in a given month, the lending conditions offered in a given currency by banks with different degrees of exposure to Fed and ECB policies depend on the forward guidance policy shocks of Fed and ECB. When I include firm-month fixed effects, I restrict the sample to firms with multiple banking relationships at a given month (Khwaja and Mian, 2008). These firms represent only 18% of the sample firms and have 31% of loans.

Mechanism

From the UIP condition, unexpected increases in the monetary policy expectations for Fed (ECB) lead US dollar (euro) to appreciate. When the US dollar (euro) appreciates, the Turkish banks that have ex-ante higher share of US dollar (euro) denominated cross-border liability will experience deterioration in their balance sheets. In turn, these banks may demand less borrowing from abroad after a tightening expectations for Fed (ECB) and they are less likely to lend to local firms. To uncover this mechanism, I exploit the IIMR database and the estimation is structured as follows:

$$
\begin{aligned}
Y_{gbc,t} = & \sum_{s=1}^{3} \delta_{1,s} \text{Fed}_{t-s}^{\text{MP Exp.}} * \text{Exposure to Fed}_{b,t-1-s} + \cdots \\
& + \sum_{s=1}^{3} \delta_{2,s} \text{ECB}_{t-s}^{\text{MP Exp.}} * \text{Exposure to ECB}_{b,t-1-s} + \cdots \\
& + \sum_{s=1}^{3} \delta_{3,s} \text{Fed}_{t-s}^{\text{MP Exp.}} + \sum_{s=1}^{3} \delta_{4,s} \text{Exposure to Fed}_{b,t-1-s} + \cdots \\
& + \sum_{s=1}^{3} \delta_{5,s} \text{ECB}_{t-s}^{\text{MP Exp.}} + \sum_{s=1}^{3} \delta_{6,s} \text{Exposure to ECB}_{b,t-1-s} + \cdots \\
& + \text{Bank Controls}_b + \text{Macro Controls} + \varepsilon_{gbc,t} \qquad (3.4)
\end{aligned}
$$

where $Y_{gbc,t}$ corresponds to the outcome y for a cross-border borrowing denominated in currency c of domestic bank b from a global bank g in month t, where the borrowing outcome y is: (i) volume of cross-border borrowing, in logs, or (ii) cross-border borrowing rate. The explanatory variables are same as in the Equation 3.3.

I successively saturate the Equation 3.4 by adding global bank, domestic bank and currency fixed effects; to control for unobserved time-invariant global bank, domestic bank and loan characteristics, respectively. To absorb the supply side effects, I also saturate the model with global bank's headquarter country-month fixed effects, which controls for common global shocks and external macroeconomic conditions, e.g., the role of UK macro fundamentals for the case of HSBC and Barclays or US fundamentals for JP Morgan lending to a Turkish bank. In the most saturated specification, I include global bank-month fixed effects. This allows to exploit the variation within the same global bank lending to different Turkish banks (with respect to their exposure to Fed and ECB policies) in the same month. In this case, we control for unobserved time-varying global bank fundamentals. The coefficients of interest are $\sum_{s=1}^{3} \delta_{1,s}$ and $\sum_{s=1}^{3} \delta_{2,s}$. These coefficients show how the cross-border borrowing conditions of domestic banks that are more exposed to Fed and ECB policies differ among domestic banks that borrow from the same global bank in the same month and in the same currency,

Real Effects

If banks that ex-ante more exposed to Fed and ECB policies tighten their credit supply conditions more strongly following expectations for Fed and ECB tightening, then one may expect firms tied to these banks to experience worse economic outcomes. This could happen to the extent firms are unable to switch to other sources of finance (e.g., borrowing from less

affected banks or firms, or market debt). Therefore, to examine the real effects, I exploit firm-level data. The specification that I use for the effect of Fed and ECB's forward guidance policies on firm loan outcomes and for other real effect is as follows:

$$X_{f,y} = \alpha_1 \text{Fed-ECB}_y^{\text{MP Exp.}} * \text{Firm Exposure to Fed-ECB}_{f,y-1} + \cdots + \alpha_2 \text{Firm Exposure to Fed-ECB}_{f,y-1} + \zeta_f + \eta_{i,city,y} + \varepsilon_{f,y} \quad (3.5)$$

where $X_{f,y}$ is: (i) domestic loan outcomes aggregated at the firm-year level (*Loan Volume*$_{f,y}$, *Loan Interest Rate*$_{f,y}$, *Loan Maturity*$_{f,y}$, and *Loan Collateral Ratio*$_{f,y}$), (ii) firm total and current liabilities, (iii) firm total and fixed assets (as a proxy for investment), (iv) firm total sales, and (v) firm employment. *Fed-ECB*$_y^{MP\ Exp.}$ refers to the average of monetary policy rate expectations in year *y* for Fed and ECB. *Firm Exposure to Fed-ECB*$_{f,y-1}$ is the weighted average of *Exposure to Fed* and *Exposure to ECB* of banks that the firm *f* is working with in year *y-1*. These variables are measures of firm-level exposure to Fed's and ECB's monetary policies that is based on the sticky bank-firm relationship.

I saturate the specification with firm level fixed effects (ζ_f) which control for time-invariant unobserved firm characteristics and industry-city-year level fixed effects ($\eta_{i,city,y}$), which control for time varying firm fundamentals and exploit the variation among the firms from the same industry, located in the same city and the same period. In Equation 3.5, we investigate whether firms are able to smooth the adverse credit conditions with other sources of finance. If firms can smooth the effects of the Fed's and ECB's monetary policy expectations shocks then the coefficient α_1 will not be statistically different from zero.

3.2.3 Summary Statistics and Definitions

Table 3.1 provides detailed definitions and the summary statistics of the variables used in the empirical analyses. For the domestic loans analysis, I aggregate the CR observations at the bank-firm-currency-month level. The dependent variables are volume, interest rate, maturity and collateral ratio of a loan provided by a bank to a firm in a given currency. I calculate the volume of loans in 2013 prices and sum all outstanding loans that a firm has from a certain bank in a certain currency. For the other dependent variables, I calculate weighted averages of individual loans, using loan volumes as weights. In the mechanism analysis, I aggregate the IIMR database at the global bank-domestic bank-currency-month level. The variables of interest are volume and borrowing rate of international wholesale funding (cross-border borrowing) of a given domestic bank from a global bank in a given currency. The volume of transactions are reported in US dollar and I sum the volume of transactions that a domestic bank have with a global bank in a given currency. For the borrowing rate, I calculate the weighted averages of interest rates of the cross-border transactions, using the volume of transactions as weights. In the firm level analysis, for financial outcomes I aggregate the CR observations at the firm-year level. The variables of interest are firm's loan volume, which is the sum of all outstanding loans that a firm has in a given year; interest rate, maturity and collateral ratio which are the weighted averages of corresponding variable of a firm's all loans in a given year, using corresponding loan volumes as weights. For the real outcomes I use the firm-year level Firm database. The main variables of interest are firm's total and current liabilities, total and fixed assets, total sales, and number of employees that a firm has in a given year.

The key bank variables are exposure to Fed and ECB policies, which

are defined as the ratio of US dollar- and euro-denominated cross-border liabilities to total assets, respectively. In the regressions, for interpreting the results and reporting the economic impacts, I use standardized bank-level exposure to Fed and ECB series, which have zero mean and unit variance.

As proxies for forward guidance policies of Fed and ECB, future monetary policy expectations are derived from US and Eurozone OIS forward rates at 36-month ahead horizon. To resolve the possible concern on endogeneity of future monetary policy expectations, I use residuals from regression of US OIS forward rates on US industrial production growth and inflation. In addition, to address concerns on the collinearity of future monetary policy expectations, I isolate movements in Eurozone OIS forward rates that are not explained by Eurozone industrial production growth, inflation, as well as US OIS forward rates. Figure 3.4 presents how the residual monetary policy expectations for Fed and ECB have evolved after 2007.

I control for foreign and domestic macroeconomic variables (in levels and in interactions with exposure variables): annual growth in industrial production index, as an indicator for changes in aggregate economic activity of US, Eurozone and Turkey; annual inflation, defined as annual change in the consumer price index of US, Eurozone and Turkey; lastly monthly change in the RER (where a higher RER is defined as a real appreciation of the domestic currency) of Turkey, which is a small open economy.

3.3 Empirical Results

This section presents my findings. I use data at the bank-firm-currency-month level to analyze the impact of Fed's and ECB's forward guidance

policy on Turkish banks credit supply to firms. To uncover the mechanism I use data at the global bank-domestic bank-currency-month level. Moreover, to study the associated real effects of credit supply outcomes, I exploit data at the firm-year level.

Domestic Credit Supply Outcomes

Table 3.3 presents results on the impact of monetary policy expectations for Fed and ECB on the volume of loans to firms in Turkey. In the subsequent tables (Tables 3.4 and 3.5), I study other loan margins (interest rate, maturity, and collateral coverage ratio).

I start Table 3.3 with the specification that includes future monetary policy expectations for Fed (ECB), its interaction with banks' exposure to Fed (ECB) policies, as well as the level of banks' exposure to Fed (ECB) policies. I absorb time-invariant bank, firm and loan (currency of loan) characteristics -by including bank, firm and currency fixed effects- (Column 1). The estimated coefficients of the future monetary policy expectations for Fed and ECB suggest a significant and negative direct effect of Fed and ECB's forward guidance policies on Turkish banks credit supply to firms. The estimated coefficient for the interaction term of future monetary policy expectations and bank exposure variables lay out the key effect: banks that are ex-ante more exposed to Fed policies, due to their higher share of US dollar denominated cross-border liabilities, reduce their supply of credit significantly more following Fed's tightening expectations. On the other hand, there is no significant difference in the credit supply of banks that are ex-ante more exposed to ECB policies following ECB's tightening expectations.

I then successively saturate Eq. 3.3. I additionally control for time-varying observed bank characteristics by including bank control variables such as bank capital, liquidity and size variables- (Column 2). I also con-

trol for sticky bank-firm relationship by including bank-firm fixed effects-(Column 3). The key result is robust to including these controls and remains economically and statistically significant. For example, focusing on Column (3), banks with a one-standard-deviation higher ex-ante exposure the Fed policies reduce their supply of credit by 9% more, following a 100 basis points increase in the future monetary policy expectations for Fed.

In Column (4), I further control time-varying unobserved firm characteristics by saturating the model with city-sector-month fixed effects in addition to bank-firm fixed effects. City-sector-month fixed effects can be taken as proxy for firms' credit demand. Then, the estimation results show that even after controlling for credit demand, the coefficient of the interaction term of future monetary policy expectation for Fed and bank exposure to Fed remains statistically and economically significant. Economically, following a 100-basis points increase in the future monetary policy expectations for Fed, on average banks with a one-standard-deviation higher ex-ante exposure to Fed policies reduce their supply of credit by 10% more to firms located in a given city, working in a given sector in a given month. It is important to note that the coefficients in Column (4) are better identified that those in Columns (1)-(3) as in addition to bank-firm fixed effects, I control for time-varying firm fundamentals via city-sector-month fixed effects.

In Column (6), I saturate Eq. 3.3 with firm-month fixed effects in addition to firm-bank fixed effects. This specification focuses on firms borrowing from multiple banks in a given month and I lose 70% of the observations. Such firms are more likely to be larger and may be differently affected by monetary policy expectations shocks. Compare to Column (4), the estimated coefficient of interaction of Fed policy expectations with exposure to Fed variable drops by half in Column (6). Results show that

banks with one-standard deviation higher US dollar-denominated cross-border liabilities cut their loan lending by 4.5% more *for a given firm in a given month* following a 100-basis-points increase in the future monetary policy expectations for Fed. To investigate whether the coefficients change due to the sample selection, in Column (5) I use the same specification as in Column (4) but include firms that have multiple banking relationship in a given month. The estimated coefficients show that the drop in the coefficient of interest in Column (6) is due to the selection bias towards larger firms. On the other hand, for ECB policy expectations, we have significant estimated coefficients of interest in Columns (5)-(6). Results show that, on average, banks with one-standard deviation higher ex-ante exposure to ECB policies decrease their loan lending by 2.7% more *for a given firm in a given month* following a 100-basis-points increase in the future monetary policy expectations for ECB.

I next study other margins of loans, starting with the interest rate (Table 3.4). I successively saturate the model as in Table 3.3. I find that banks that ex-ante borrow more in US dollar from international wholesale market increase their loan rate more strongly for a given firm following Fed's tightening expectations-confirming that the reduction in the loan volume found in Table 3.3 is driven mainly by supply effects rather than demand effects. Economically, focusing Column (4), banks with one-standard-deviation higher exposure to Fed policies increase their loan rates by 45 basis points more *for firms from a given industry in a given city in a given month.* The estimation results for the coefficients of interest in Column (5) and (6) show that, compare to less exposed ones, banks with higher exposure to Fed and ECB policies do not significantly increase their loan rates to a given firm with multiple banking relationship.

Moreover, Table 3.5 reports results on the effects of future monetary policy expectations on maturity and collateral coverage ratio. On aver-

age, banks with one-standard-deviation higher exposure to Fed policies provide 10% shorter maturity loans following a 100-basis points increase in the future monetary policy expectations for Fed (Column 3). Moreover, future monetary policy expectations for ECB have no statistically significant impact on maturity of loans from banks that are ex-ante more exposed to ECB policies to a given firm. On the other hand, in Column (4)-(6) the estimated coefficients for the interaction term of monetary policy expectations and exposure to monetary policy variables suggest that Fed tightening expectations have no statistically significant impact on collateral coverage ratio of loans, while banks that are one-standard-deviation higher exposure to ECB policies ask for 12.7% higher collateral coverage to a given firm following a 100-basis points increase in monetary policy expectations for ECB.

Overall, the estimation results on domestic loan outcomes point that forward guidance policies of Fed is more effective on domestic loan conditions of banks in Turkey. Moreover, tightening expectations for Fed translates into loans that are not only lower, but also with higher loan rate and shorter maturity by banks that ex-ante borrow more in US dollar from international wholesale market.

Mechanism

To uncover the mechanism, I next study whether banks with higher share of US dollar (euro) cross-border liability in their balance sheets borrow less with higher interest rate from the international wholesale market following Fed's (ECB's) tightening expectations. I first estimate Eq. 3.4, that relates cross-border borrowing outcomes of Turkish banks to their exposure to Fed and ECB policies as well as future monetary policy expectations for Fed and ECB in levels and in interaction with exposure variables. Table 3.6 and Table 3.7 present results on cross-border borrowing volume

and interest rate, respectively.

In Table 3.6, I successively saturate Eq. 3.4 with global (lender) bank, domestic (borrower) bank and currency fixed effects to control for time-invariant characteristics of lender bank, borrower banks and borrowing currency, as well as time-varying observable borrower bank characteristics such as bank capital, liquidity and size variables. I also control for global bank-lender bank lending relationship by including global bank-domestic bank fixed effects. Lastly, I saturate the model with more supply-side-related fixed effects, global(lender) bank's headquarter country-month fixed effects in Column (5) and global (lender) bank- month fixed effects in Column (6). In Table 3.6, the estimated coefficients for the level of monetary policy expectations for Fed and ECB show that tightening forward guidance shock of Fed decreases the cross-border borrowing of banks in Turkey, while forward guidance policies of ECB do not have a significant effect. On the other hand, the estimated coefficient for the interaction term of future monetary policy expectation for Fed with bank exposure to Fed policies suggest that domestic banks with ex-ante higher US dollar cross-border liability borrow less from abroad following tightening expectations for Fed. This result is strongly robust to saturating the model with different controls. Economically, a domestic bank with a one-standard-deviation higher ex-ante US dollar cross-border liability-to-total assets ratio decreases its cross-border borrowing from abroad by 10% more following a 100-basis points tightening in the monetary policy expectations for Fed.

In Table 3.7, I further show that Fed and ECB forward guidance policies have statistically significant impact on cross-border borrowing rates of domestic banks; tightening expectations for Fed and ECB increase the cross-border borrowing rate of domestic banks. On the other hand, banks with ex-ante higher exposure to Fed policies face a higher increase in their

cross-border borrowing rates following a tightening expectations for Fed. This result is strongly robust to different specifications. However, we get similar results for the effects of ECB's forward guidance policies when we control for supply-side effects (Columns (4)-(6)).

Overall, the estimation results on mechanism shows that, similar to domestic loan outcomes, forward guidance policies of Fed is more effective for cross-border borrowing conditions of banks in Turkey. Moreover, banks with ex-ante higher US dollar cross-border liabilities demand less funds from abroad due to higher borrowing rates following tightening expectations for Fed. This resonates well with the notion that tightening expectations for Fed deteriorates the balance sheets of Turkish banks that have higher ex-ante US dollar cross-border liability.

Firm-Level Loan Outcomes and Real Effects

To identify whether forward guidance policies of Fed and ECB have real effects on firms, I need to analyze firm-year level data by matching the domestic loan data to firm financial statements data. By this way, we will be able to analyze whether loan outcomes or real variables of a firm is affected by future monetary policy expectations for Fed and ECB. Regression results in Table 3.3 show that when the domestic loan regressions include the firms that have borrowed from multiple banks in a given period, the estimated coefficients of interaction of future monetary policy expectations for Fed and ECB with the bank exposure variables remained relatively intact. Thereby, to identify the effects of the bank credit supply channel on the firm level loan and real outcomes, firm and city-sector-year fixed effects will be sufficient controls for unobserved firm (borrower) characteristics.

Table 3.8 presents results on the firm-level credit supply outcomes. I find that, on average, domestic loan outcomes of firms that have more

borrowing relationship with banks, which have ex-ante higher share of US dollar- and euro-denominated cross-border liabilities, are more affected by the forward guidance policies of Fed and ECB. For example, the reduction in the firm-level credit is 6.1% stronger; the increase in the firm-level loan rate is 36.4 basis points higher and decrease in the firm-level maturity is 1.6% more for firms whose weighted average of banks' exposure to Fed and ECB policies is one-standard deviation higher, following a 100-basis points increase in the average monetary policy expectations for Fed and ECB.

There are also significant real effects. Table 3.9 presents results for the firm-level variables obtained from the Firm Database. I find that total and current liabilities of firms, which have higher exposure to Fed and ECB policies through their banking partners decrease more strongly following tightening expectations for Fed and ECB (Column (1)-(2)). This result implies that firms do not switch to non-bank funding, e.g., by issuing bonds or borrowing from other firms, to compensate the tightening in the bank credit conditions. Column (3)-(6) results show that as credit conditions get tighter, those firms that have one-standard-deviation higher ex-ante exposure to Fed and ECB policies experience worse real outcomes: lower fixed assets (by 0.7%), lower total assets (by 0.5%), lower sales (by 0.6%), and lower employment (by 0.7%).

3.4 Conclusion

I analyze the international bank lending channel of advanced countries' forward guidance policies on an emerging market's credit cycle, through banks' currency composition of cross-border liabilities. For identification, I exploit monetary policy expectation shocks for Fed and ECB, as proxies for forward guidance policies. I use loan-level data from the credit

register –containing information on all business loans by banks in Turkey, including volume, interest rate, maturity and collateral coverage ratio– and international interbank registers –providing transaction level information on cross-border borrowings of banks in Turkey, including volume, interest rate and currency denomination.

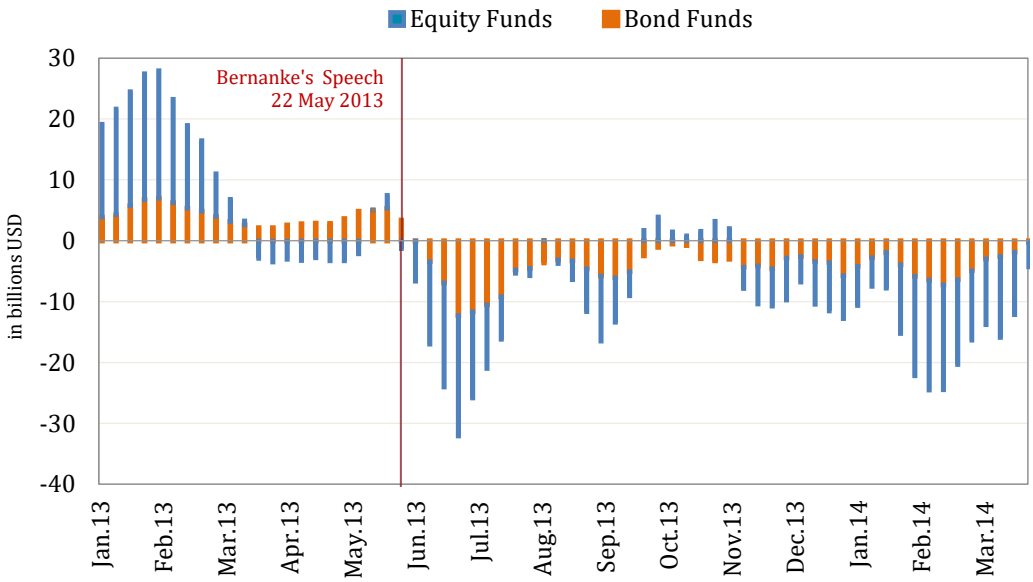
Results suggest that tighter forward guidance policies of advanced countries –proxied by higher future monetary policy expectations– contract the supply of credit by banks in Turkey and the mechanism is via banks' currency composition of cross-border liabilities. For instance, Fed future monetary policy expectation shocks affect the supply of credit to Turkish firms mainly via banks that have higher ex-ante exposure to Fed policies with their US dollar-denominated cross border liabilities. Tightening expectations for Fed translate into not only less loans but also loans with higher interest rate and shorter maturity. On the other hand, ECB monetary policy expectations have significant impacts on volume and collateral coverage. The mechanism driving the international spillovers is that tightening expectations for Fed deteriorate the balance sheets of Turkish banks with ex-ante higher share of US dollar cross-border liabilities. These banks demand less funds from abroad due to higher cross-border borrowing rates, following tightening expectations for Fed.

For the implications of forward guidance policies at the firm level, the results show that domestic loan outcomes of firms that have more borrowing relationships with higher exposure banks, are more affected by the forward guidance policies of advanced countries. Firm level analysis also suggest that firms do not compensate the tightening in the bank credit with other sources of finance. Total and current liabilities of firms, which have higher exposure to Fed and ECB policies through their banking partners, decrease more strongly following the tightening expectations for Fed and ECB. Moreover, as financial constraint binds, those firms

that are connected to more exposed banks experience worse real outcomes: lower total and fixed assets, lower sales and lower employment.

In sum, the results suggest that there are spillovers of advanced countries' forward guidance policies into emerging markets' credit cycles. This implies that lending conditions in an emerging market economy is not only determined by local economic conditions but also changes in advanced countries' forward guidance policies. Indeed the results are in line with claims by Rey (2013), Rajan (2014), and Fischer (2014) on the effects advanced countries' monetary policies on emerging market economies, and thus suggest a need for more coordinated global monetary policy. The findings of this paper also suggest that the currency composition of banks' cross-border liabilities plays a prominent role for the international spillovers. Therefore, policymakers should pay attention not only to the source of cross-border bank flows but also to its currency denomination for the cross-border monetary and liquidity spillovers.

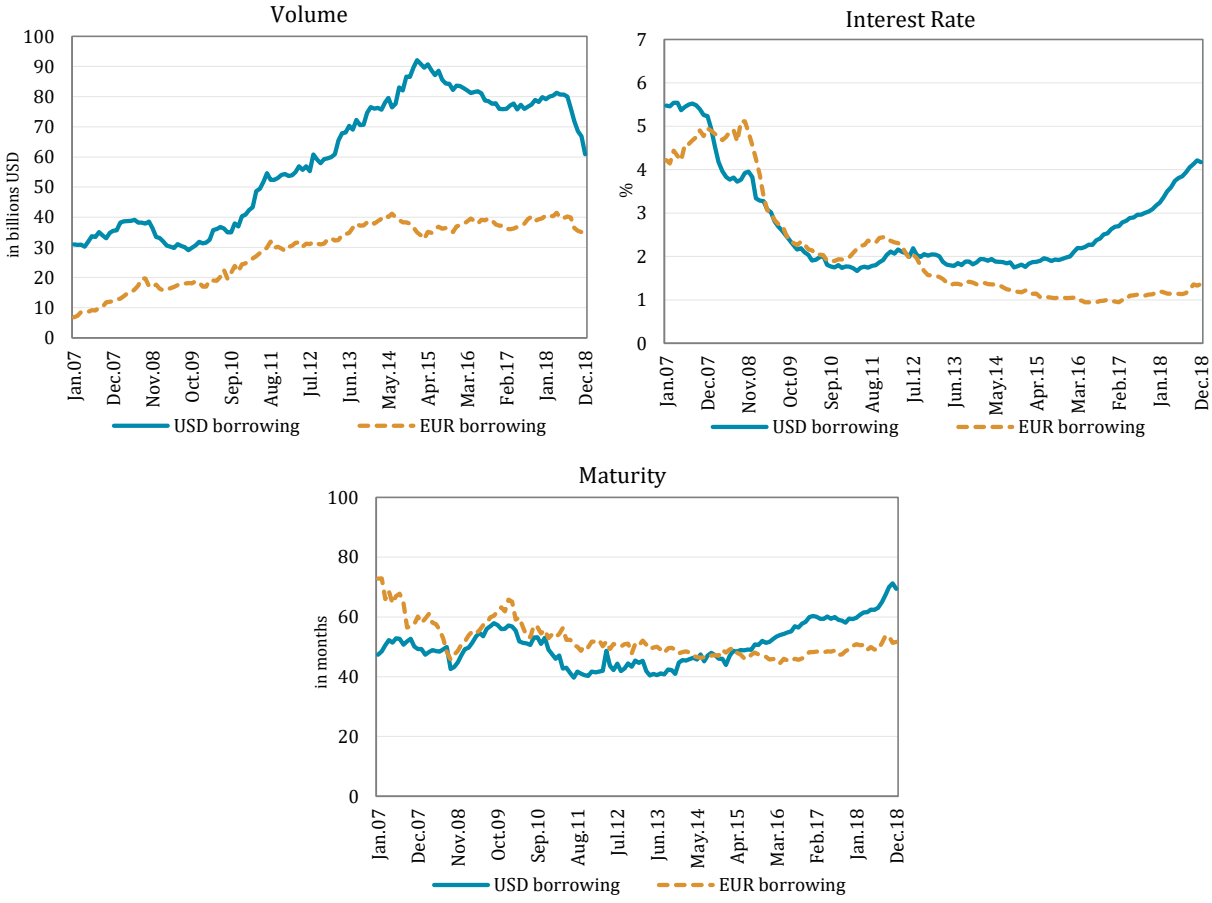
FIGURE 3.1: NET PORTFOLIO FLOWS TO EMS DURING THE "TAPER TANTRUM"



Notes: The figure shows net flows to emerging market economies' equity and fund markets during the "taper tantrum" in May 2013. Values in the y-axis show 4-week cumulative series, in billions US dollar.

Source: EPFR.

FIGURE 3.2: CROSS-BORDER BORROWINGS OF BANKS IN TURKEY



Notes: The figure shows the evolution of volume, interest rate and maturity of Turkish banks' cross-border borrowings, with the breakdown of currency. For interest rate and maturity, weighted averages are reported, where the volumes of transactions are used as weights in the calculations.

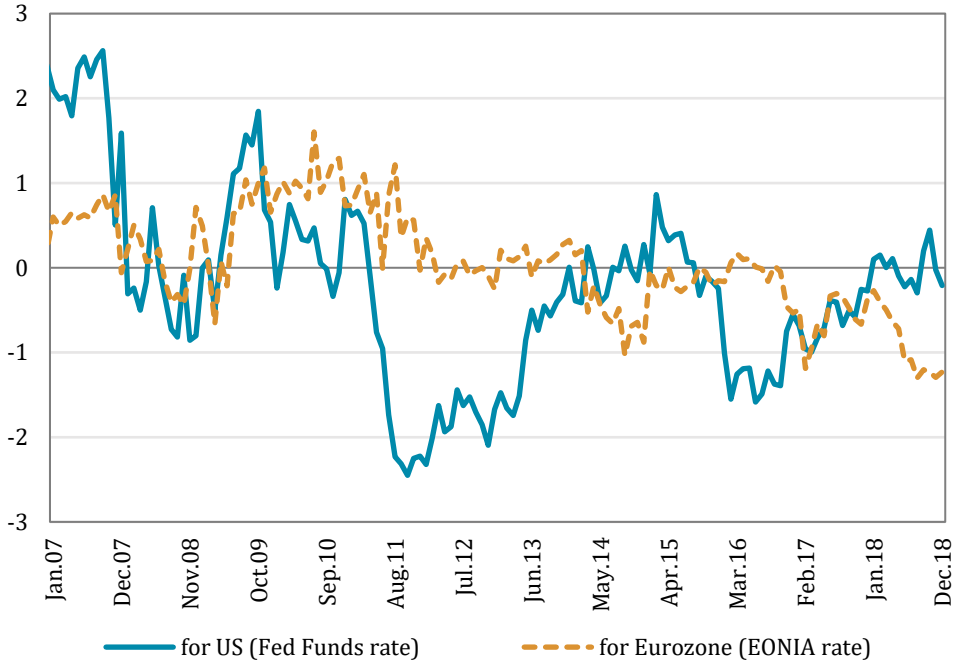
Sources: International Interbank Market Register, Author's calculations.

FIGURE 3.3: DOMESTIC LOANS (VOLUME, INTEREST RATE, MATURITY)

Notes. The figure shows the evolution of volume, interest rate and maturity of banks' newly-originated loans to firms in Turkey, with the breakdown of currency. In the volume graph, values are in logs of thousands and TL loans series show the real amount of newly-originated Turkish lira loans in 2013 prices. To avoid for the effect of exchange rate changes on the volume of foreign currency loans, USD and EUR loans are reported in US dollar and euro, respectively. For interest rate and maturity, weighted averages are reported, where the outstanding amount of loans are used as weights in the calculations.

Sources: Credit Register, Author's calculations.

FIGURE 3.4: FINANCIAL MARKET-BASED MONETARY POLICY EXPECTATIONS



Notes. This figure shows the residual monetary policy expectations for Fed and ECB. The series for US is the residuals from the regression of 36-month ahead US OIS forward rate on US annual industrial production growth and CPI inflation. Series for Eurozone is the residuals from regression of 36-month ahead Eurozone OIS forward rates on Eurozone annual industrial production growth, CPI inflation and 36-month ahead US OIS forward rate.

Sources: Bloomberg and author's calculations.

TABLE 3.1: SUMMARY STATISTICS

Variables	Definition	Unit	Mean	Median	SD	10%	25%	75%	90%	N
DEPENDENT VARIABLES										
Domestic Bank-Firm-Currency-Month Level Regressions										
Loan Volume$_{bfc,t}$	Real amount of newly-originated loans from domestic bank *b* to firm *f* in currency *c* at month *t*, in logs (FX adjusted)	Log	4.204	4.123	1.590	2.280	3.176	5.172	6.225	14,502,042
Loan Interest Rate$_{bfc,t}$	Interest rate of newly-originated loans from domestic bank *b* to firm *f* in currency *c* at month *t*	%	15.327	15.000	6.519	6.500	11.880	18.450	24.240	14,432,430
Loan Maturity$_{bfc,t}$	Maturity (in days) of newly-originated loans from domestic bank *b* to firm *f* in currency *c at* month *t*, in logs	Log	5.671	5.897	1.113	4.5	5.187	6.308	6.999	14,502,042
Loan Collateral Ratio$_{bfc,t}$	Level of collateral ratio of newly-originated loans from domestic bank *b* to firm *f* in currency *c* at month *t*		1.782	1	3.016	0	1	1	3.766	14,502,042
Global Bank-Domestic Bank-Currency-Month Level Regressions										
Cross-Border Loan Volume$_{gbc,t}$	Volume of newly-originated cross-border borrowings of domestic bank *b* from global bank *g* in currency *c at* month *t*, in logs	Log	9.308	9.387	1.827	6.938	8.103	10.632	11.560	29,095
Cross-Border Loan Interest Rate$_{gbc,t}$	Interest rate of newly-originated cross-border borrowings of domestic bank *b* from global bank *g* in currency *c* at month *t*	%	2.071	1.753	2.086	0.500	0.950	2.750	4.235	29,095
Firm-Year Level Regressions										
Loan Volume$_{f,y}$	Firm *f*'s real amount of newly-originated loans at year *y*, in logs	Log	5.068	4.878	1.756	3.061	3.928	6.048	7.394	3,103,987
Loan Interest Rate$_{f,y}$	Interest rate of firm f 's newly-originated loans at year *y*	%	14.538	14.456	5.845	6.432	11.174	17.473	22.08	3,103,987
Loan Maturity$_{f,y}$	Maturity (in days) of firm f 's newly-originated loans at year *y*, in logs	Log	6.243	6.269	0.763	5.38	5.869	6.799	7.19	3,103,987
Loan Collateral Ratio$_{f,y}$	Collateral ratio of firm f 's newly-originated loans at year *y*		2.287	1	3.209	0.541	1	2.4	5.377	3,103,987
Total Liabilities$_{f,y}$	Firm *f*'s total liabilities at year *y*, in logs	Log	14.128	14.164	2.092	12.1	13.112	15.289	16.43	2,267,509
Current Liabilities$_{f,y}$	Firm *f*'s total short-term liabilities at year *y*, in logs	Log	13.292	13.504	2.393	10.728	12.244	14.692	15.815	2,328,713
Total Fixed Assets$_{f,y}$	Firm *f*'s total tangible and intangible fixed assets at year *y*, in logs	Log	12.387	12.383	2.256	9.725	11.089	13.754	15.102	2,256,617
Total Assets$_{f,y}$	Firm *f*'s total assets at year *y*, in logs	Log	14.106	14.137	2.182	12.083	13.088	15.26	16.401	2,351,378
Total Sales$_{f,y}$	Firm *f*'s total sales at year *y*, in logs	Log	14.139	14.206	2.130	11.738	12.994	15.433	16.588	2,192,957
Employment$_{f,y}$	Firm *f*'s number of employees at year *y*, in logs	Log	2.133	1.946	1.319	0.693	1.099	2.944	3.85	2,351,379

(continued)

TABLE 3.2: SUMMARY STATISTICS (CONTINUED)

Variables	Definition	Unit	Mean	Median	SD	10%	25%	75%	90%	N
INDEPENDENT VARIABLES										
Domestic Bank-Month Level Variables										
Exposure to Fed_b	Ratio of domestic bank *b*'s cross-border borrowings in U.S. dollar to *d*'s total assets (standardized).	%	0.000	-0.192	1.000	-0.939	-0.612	0.220	0.887	3,642
Exposure to ECB_b	Ratio of domestic bank *b*'s cross-border borrowings in Euro to *d*'s total assets (standardized).	%	0.000	-0.230	1.000	-0.837	-0.598	0.258	0.810	3,642
$Size_b$	Domestic bank *b*'s total assets, in logs	Log	16.466	16.549	2.073	13.692	15.081	18.182	19.064	3,642
Capital Adequacy $Ratio_b$	Domestic bank *b*'s total equity to total assets	%	14.895	11.852	11.263	8.378	9.962	14.601	21.895	3,642
Liquidity $Ratio_b$	Domestic bank *b*'s liquid assets (cash + receivables from the central bank + interbank money market + reverse repo receivables) to total assets	%	33.412	27.221	17.981	17.839	21.614	38.372	60.288	3,642
Firm-Year Level Variables										
Firm Exposure to Fed-ECB	A firm's exposure to Fed and ECB policies through their banking partners. Firm-level weighted average of Banks' Exposure to Fed and ECB	%	-0.194	-0.268	0.601	-0.732	-0.528	0.157	0.539	3,103,987
Macro (Month) Level Variables										
$Fed^{MP\ Exp.}$	The residual monetary policy expectations for Fed at 36-month ahead horizon		-0.243	-0.239	1.095	-1.672	-0.855	0.294	1.173	144
$ECB^{MP\ Exp.}$	The residual monetary policy expectations for ECB at 36-month ahead horizon		0.06	0.017	0.619	-0.665	-0.325	0.586	0.881	144
ΔIPI^{Turkey}	Year-on-year change in the Turkey industrial production index	%	5.238	6.539	7.746	-5.46	3.21	9.312	14.112	144
ΔCPI^{Turkey}	Year-on-year change in the Turkey consumer price index	%	9.052	8.466	3.213	6.164	7.289	10.176	11.766	144
$\Delta REER^{Turkey}$	Monthly change in the Turkey real effective exchange rate	%	-0.233	-0.06	3.017	-3.89	-1.63	1.34	3.26	144
ΔIPI^{US}	Year-on-year change in the US industrial production index	%	0.657	2.349	4.845	-5.958	-1.167	3.303	4.062	144
ΔCPI^{US}	Year-on-year change in the US consumer price index	%	1.857	1.906	1.351	0.008	1.121	2.606	3.611	144
$\Delta IPI^{Eurozone}$	Year-on-year change in the Eurozone industrial production index	%	-0.091	1.004	5.186	-4.301	-1.731	3.34	4.695	144
$\Delta CPI^{Eurozone}$	Year-on-year change in the Eurozone consumer price index	%	1.514	1.556	1.094	0.065	0.525	2.254	2.997	144

TABLE 3.3: IMPACT OF GLOBAL MONETARY POLICY EXPECTATIONS ON DOMESTIC LOAN VOLUME

Dependent Variable:	Loan Volume$_{bfc,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Σ Fed$^{MP\ Exp.}$ * Exposure to Fed$_b$	**-0.135*** **	**-0.097*** **	**-0.086*** **	**-0.104*** **	**-0.052*** **	**-0.045*** **
	(0.033)	(0.025)	(0.025)	(0.021)	(0.014)	(0.011)
Σ Fed$^{MP\ Exp.}$	**-0.129*** **	**-0.036***	**-0.032***			
	(0.027)	(0.019)	(0.018)			
Σ Exposure to Fed$_b$	**-0.045**	**-0.071**	**-0.098**	**-0.048**	**-0.078**	**-0.094** **
	(0.081)	(0.066)	(0.064)	(0.06)	(0.056)	(0.044)
Σ ECB$^{MP\ Exp.}$ * Exposure to ECB$_b$	**0.001**	**0.033**	**0.034**	**0.012**	**-0.034** **	**-0.027***
	(0.031)	(0.024)	(0.024)	(0.019)	(0.016)	(0.014)
Σ ECB$^{MP\ Exp.}$	**-0.576*** **	**-0.181*** **	**-0.175*** **			
	(0.035)	(0.045)	(0.044)			
Σ Exposure to ECB$_b$	**-0.004**	**-0.065**	**-0.071**	**-0.006**	**0.006**	**-0.01**
	(0.052)	(0.045)	(0.047)	(0.037)	(0.029)	(0.021)
Domestic Bank Controls	No	Yes	Yes	Yes	Yes	Yes
Domestic Bank F.E.	Yes	Yes	--	--	--	--
Firm F.E.	Yes	Yes	--	--	--	--
Currency F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Domestic Bank-Firm F.E.	No	No	Yes	Yes	Yes	Yes
City-Sector-Month F.E.	No	No	No	Yes	Yes	--
Firm-Month F.E.	No	No	No	No	No	Yes
Firms borrowing from more than one bank	No	No	No	No	Yes	Yes
Observations	14,502,042	14,502,042	14,502,042	14,502,042	4,453,836	4,453,836
R-squared	0.602	0.606	0.651	0.655	0.657	0.650

Notes: This table reports the estimates from OLS regressions for the period January 2007 to December 2018. Observations are at the domestic bank-firm-currency-month level. The dependent variable is volume of newly-originated loans of firm *f* from domestic bank *b* in currency *c* at month *t,* in logs. *Fed$^{MP\ Exp.}$* and *ECB$^{MP\ Exp.}$* are the residual monetary policy expectations for Fed and ECB at 36-month ahead horizon, respectively. *Exposure to Fed$_b$* and *Exposure to ECB$_b$* are the ratio of domestic bank b's cross-border borrowings in US dollar and euro to b's total assets, respectively. Σ indicates that the sum of the three coefficients on the indicated lag terms is reported (with the corresponding standard error for the summation given in parentheses). Domestic bank controls include capital ratio, liquidity ratio and size. Other controls are listed in Empirical Strategy section. "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 domestic bank-sector and month level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 3.4: IMPACT OF GLOBAL MONETARY POLICY EXPECTATIONS ON DOMESTIC LOAN INTEREST RATE

Dependent Variable:	Loan Interest Rate$_{bfc,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Σ Fed$^{MP\ Exp.}$ * Exposure to Fed$_b$	**0.506****	**0.367***	**0.361***	**0.413*****	**0.025**	**-0.011**
	(0.219)	(0.207)	(0.199)	(0.145)	(0.111)	(0.107)
Σ Fed$^{MP\ Exp.}$	**0.296****	**0.403***	**0.393***			
	(0.135)	(0.211)	(0.221)			
Σ Exposure to Fed$_b$	**3.274*****	**2.692****	**2.994****	**3.991*****	**2.839*****	**2.962*****
	(1.235)	(1.229)	(1.246)	(1.019)	(1.041)	(0.667)
Σ ECB$^{MP\ Exp.}$ * Exposure to ECB$_b$	**0.559**	**0.663**	**0.182**	**-0.116**	**-0.144**	**-0.178**
	(0.451)	(0.43)	(0.462)	(0.425)	(0.187)	(0.14)
Σ ECB$^{MP\ Exp.}$	**0.341**	**1.166***	**1.527****			
	(0.479)	(0.641)	(0.651)			
Σ Exposure to ECB$_b$	**-2.959*****	**-3.303*****	**-2.897****	**-1.431*****	**-0.955*****	**-0.84*****
	(1.004)	(1.093)	(1.208)	(0.452)	(0.257)	(0.214)
Domestic Bank Controls	No	Yes	Yes	Yes	Yes	Yes
Domestic Bank F.E.	Yes	Yes	--	--	--	--
Firm F.E.	Yes	Yes	--	--	--	--
Currency F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Domestic Bank-Firm F.E.	No	No	Yes	Yes	Yes	Yes
City-Sector-Month F.E.	No	No	No	Yes	Yes	Yes
Firm-Month F.E.	No	No	No	No	No	No
Firms borrowing from more than one bank	No	No	No	No	Yes	Yes
Observations	14,432,430	14,432,430	14,432,430	14,432,430	4,419,275	4,419,275
R-squared	0.615	0.618	0.693	0.737	0.784	0.780

Notes: This table reports the estimates from OLS regressions for the period January 2007 to December 2018. Observations are at the domestic bank-firm-currency-month level. The dependent variable is interest rate of newly-originated loans of firm *f* from domestic bank *b* in currency *c,* at month *m*. $Fed^{MP\ Exp.}$ and $ECB^{MP\ Exp.}$ are the residual monetary policy expectations for Fed and ECB at 36 month ahead horizon, respectively. *Exposure to Fed*$_b$ and *Exposure to ECB*$_b$ are the ratio of domestic bank *b*'s cross-border borrowings in US dollar and euro to *b*'s total assets, respectively. Σ indicates that the sum of the three coefficients on the indicated lag terms is reported (with the corresponding standard error for the summation given in parentheses). Domestic bank controls include capital ratio, liquidity ratio and size. Other controls are listed in Empirical Strategy section. "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 domestic bank-sector and month level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 3.5: IMPACT OF GLOBAL MONETARY POLICY EXPECTATIONS ON DOMESTIC LOAN MATURITY AND COLLATERAL RATIO

Dependent Variable:	Loan Maturity$_{bfc,t}$			Loan Collateral Ratio$_{bfc,t}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Σ Fed$^{MP\ Exp.}$ * Exposure to Fed$_b$	**-0.134*** **	**-0.142*** **	**-0.103*** **	**-0.004**	**0.017**	**-0.035**
	(0.04)	(0.039)	(0.024)	(0.06)	(0.073)	(0.041)
Σ Fed$^{MP\ Exp.}$	**0.017**			**-0.04**		
	(0.019)			(0.14)		
Σ Exposure to Fed$_b$	**0.7*** **	**0.553*** **	**0.376*** **	**0.205**	**-0.147**	**-0.299*** **
	(0.155)	(0.117)	(0.079)	(0.483)	(0.264)	(0.112)
Σ ECB$^{MP\ Exp.}$ * Exposure to ECB$_b$	**-0.072**	**0.013**	**0.038**	**0.279*** **	**0.222*** **	**0.127** **
	(0.046)	(0.041)	(0.029)	(0.087)	(0.065)	(0.053)
Σ ECB$^{MP\ Exp.}$	**-0.041**			**-0.271**		
	(0.044)			(0.339)		
Σ Exposure to ECB$_b$	**0.158** **	**0.053**	**0.057***	**-0.413**	**-0.599** **	**-0.479*** **
	(0.07)	(0.052)	(0.035)	(0.436)	(0.28)	(0.161)
Domestic Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Domestic Bank F.E.	--	--	--	--	--	--
Firm F.E.	--	--	--	--	--	--
Currency F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Domestic Bank-Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
City-Sector-Month F.E.	No	Yes	--	No	Yes	--
Firm-Month F.E.	No	No	Yes	No	No	Yes
Observations	14,502,042	14,502,042	4,453,836	14,502,042	14,502,042	4,453,836
R-squared	0.544	0.554	0.490	0.594	0.610	0.628

Notes: This table reports the estimates from OLS regressions for the period January 2007 to December 2018. Observations are at the domestic bank-firm-currency-month level. The dependent variable is the (i) maturity (in days), in logs (columns (1) to (3)), or (ii) collateral coverage ratio (columns (4) to (6)); of newly-originated loans of firm *f* from domestic bank *b* in currency *c*. $Fed^{MP\ Exp.}$ and $ECB^{MP\ Exp.}$ are the residual monetary policy expectations for Fed and ECB at 36 month ahead horizon, respectively. $Exposure\ to\ Fed_b$ and $Exposure\ to\ ECB_b$ are the ratio of domestic bank *b*'s cross-border borrowings in US dollar and euro to *b*'s total assets, respectively. Σ indicates that the sum of the three coefficients on the indicated lag terms is reported (with the corresponding standard error for the summation given in parentheses). Domestic bank controls include capital ratio, liquidity ratio and size. Other controls are listed in Empirical Strategy section. "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 domestic bank-sector and month level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 3.6: MECHANISM: GLOBAL MONETARY POLICY EXPECTATIONS AND CROSS-BORDER BORROWING VOLUME

Dependent Variable:	Cross-Border Borrowing Volume$_{gbc,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Σ Fed$^{MP\ Exp.}$ * Exposure to Fed$_b$	**-0.143*** **	**-0.155*** **	**-0.111*** **	**-0.076*** **	**-0.103*** **	**-0.105** **
	(0.053)	(0.035)	(0.029)	(0.026)	(0.039)	(0.049)
Σ Fed$^{MP\ Exp.}$	**-0.059***	**-0.061*** **	**-0.059** **	**-0.014**		
	(0.032)	(0.024)	(0.03)	(0.025)		
Σ Exposure to Fed$_b$	**0.05**	**-0.149**	**-0.302** **	**-0.109**	**0.022**	**0.017**
	(0.286)	(0.188)	(0.143)	(0.145)	(0.17)	(0.175)
Σ ECB$^{MP\ Exp.}$ * Exposure to ECB$_b$	**0.167**	**0.184***	**-0.001**	**-0.087**	**-0.082**	**-0.135**
	(0.167)	(0.096)	(0.083)	(0.082)	(0.087)	(0.099)
Σ ECB$^{MP\ Exp.}$	**-0.02**	**-0.065**	**-0.014**	**0.072**		
	(0.078)	(0.052)	(0.076)	(0.071)		
Σ Exposure to ECB$_b$	**0.318**	**0.206**	**0.423*** **	**0.331** **	**0.118**	**0.118**
	(0.275)	(0.183)	(0.143)	(0.141)	(0.179)	(0.171)
Domestic Bank Controls	No	No	Yes	Yes	Yes	Yes
Global (Lender) Bank F.E.	No	Yes	Yes	--	--	--
Domestic (Borrower) Bank F.E.	No	No	Yes	--	--	--
Currency F.E.	No	No	Yes	Yes	Yes	Yes
Global (Lender) Bank-Domestic (Borrower) Bank F.E.	No	No	No	Yes	Yes	Yes
Global (Lender) Bank's Hq Country-Month F.E.	No	No	No	Yes	--	--
Global (Lender) Bank-Month F.E.	No	No	No	No	Yes	Yes
Observations	29,095	28,990	28,990	28,572	27,302	22,644
R-squared	0.017	0.418	0.480	0.600	0.646	0.693

Notes: This table reports the estimates from OLS regressions for the period January 2007 to December 2018. Observations are at the global bank-domestic bank-currency-month level. The dependent variable is the volume of newly-originated cross-border borrowings of domestic bank *b* from global bank *g* in currency *c* at month *m,* in logs. *Fed$^{MP\ Exp.}$* and *ECB$^{MP\ Exp.}$* are the residual monetary policy expectations for Fed and ECB at 36 month ahead horizon, respectively. *Exposure to Fed$_b$* and *Exposure to ECB$_b$* are the ratio of domestic bank *b*'s cross-border borrowings in US dollar and euro to *b*'s total assets, respectively. Σ indicates that the sum of the three coefficients on the indicated lag terms is reported (with the corresponding standard error for the summation given in parentheses). Domestic bank controls include capital ratio, liquidity ratio and size. Other controls are listed in Empirical Strategy section. "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 domestic bank-global bank headquarter country and month level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 3.7: MECHANISM: GLOBAL MONETARY POLICY EXPECTATIONS AND CROSS-BORDER BORROWING RATE

Dependent Variable:	Cross-Border Borrowing Interest Rate$_{gbc,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Σ Fed$^{MP\ Exp.}$ * Exposure to Fed$_b$	**0.139*** **	**0.151*** **	**0.153*** **	**0.195*** **	**0.112***	**0.097***
	(0.051)	(0.05)	(0.043)	(0.048)	(0.057)	(0.057)
Σ Fed$^{MP\ Exp.}$	**0.459*** **	**0.454*** **	**0.533*** **	**0.535*** **		
	(0.057)	(0.054)	(0.066)	(0.063)		
Σ Exposure to Fed$_b$	**-0.46*** **	**-0.194**	**0.02**	**0.007**	**-0.014**	**0.17**
	(0.184)	(0.179)	(0.2)	(0.194)	(0.212)	(0.207)
Σ ECB$^{MP\ Exp.}$ * Exposure to ECB$_b$	**0.461**	**0.599**	**0.63**	**0.702***	**1.23** **	**1.257** **
	(0.427)	(0.456)	(0.424)	(0.421)	(0.528)	(0.533)
Σ ECB$^{MP\ Exp.}$	**0.277**	**0.41** **	**0.74*** **	**0.775*** **		
	(0.185)	(0.183)	(0.193)	(0.187)		
Σ Exposure to ECB$_b$	**-0.245**	**-0.417**	**-0.4**	**-0.426**	**-0.34**	**-0.295**
	(0.335)	(0.331)	(0.303)	(0.314)	(0.437)	(0.439)
Domestic Bank Controls	No	No	Yes	Yes	Yes	Yes
Global (Lender) Bank F.E.	No	Yes	Yes	--	--	--
Domestic (Borrower) Bank F.E.	No	No	Yes	--	--	--
Currency F.E.	No	No	Yes	Yes	Yes	Yes
Global (Lender) Bank-Domestic (Borrower) Bank F.E.	No	No	No	Yes	Yes	Yes
Global (Lender) Bank's Hq Country-Month F.E.	No	No	No	Yes	--	--
Global (Lender) Bank-Month F.E.	No	No	No	No	Yes	Yes
Observations	29,095	28,990	28,990	28,572	27,302	22,644
R-squared	0.204	0.269	0.289	0.351	0.480	0.567

Notes: This table reports the estimates from OLS regressions for the period January 2007 to December 2018. Observations are at the global bank-domestic bank-currency-month level. The dependent variable is interest rate of newly-originated cross-border borrowings of domestic bank *b* from global bank *g* in currency *c* at month *m*. *Fed$^{MP\ Exp.}$* and *ECB$^{MP\ Exp.}$* are the residual monetary policy expectations for Fed and ECB at 36 month ahead horizon, respectively. *Exposure to Fed$_b$* and *Exposure to ECB$_b$* are the ratio of domestic bank b's cross-border borrowings in US dollar and euro to b's total assets, respectively. Σ indicates that the sum of the three coefficients on the indicated lag terms is reported (with the corresponding standard error for the summation given in parentheses). Domestic bank controls include capital ratio, liquidity ratio and size. Other controls are listed in Empirical Strategy section. "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 domestic bank-global bank headquarter country and month level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 3.8: IMPACT OF GLOBAL MONETARY POLICY EXPECTATIONS ON FIRM-LEVEL LOAN OUTCOMES

Dependent Variable:	Loan Volume$_{f,y}$	Loan Interest Rate$_{f,y}$	Loan Maturity$_{f,y}$	Loan Collateral Ratio$_{f,y}$
	(1)	(2)	(3)	(4)
Fed-ECB$_y^{MP\ Exp.}$ * Firm Exposure to Fed-ECB	**-0.101*** **	**0.606*** **	**-0.026*** **	**0.096**
	(0.007)	(0.063)	(0.005)	(0.085)
Firm Exposure to Fed-ECB	**-0.016*** **	**0.480*** **	**-0.010*** **	**-0.131*** **
	(0.004)	(0.038)	(0.003)	(0.013)
Firm F.E.	Yes	Yes	Yes	Yes
City-Sector-Year F.E.	Yes	Yes	Yes	Yes
Observations	3,103,987	3,103,987	3,103,987	3,103,987
R-squared	0.815	0.670	0.562	0.627

Notes: This table reports the estimates from OLS regressions for the period 2007 to 2018. Observations are from the domestic loan dataset and aggregated at the firm-year level. The dependent variables are a firm's newly-originated loan volume in logs (column 1), interest rate (column 2), maturity (in days) in logs (column 3) and collateral ratio (column 4). *Fed-ECB$_y^{MP\ Exp.}$* is the annual average of the residual 36 month ahead monetary policy expectations for Fed and ECB. *Firm Exposure to Fed-ECB* shows a firm's exposure to Fed and ECB policies through their banking partners. It is one-year lagged firm-level weighted averages of Banks' Exposure to Fed and ECB. "Yes" indicates that the corresponding fixed effects are included. Standard errors are clustered at the city-year level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

TABLE 3.9: IMPACT OF GLOBAL MONETARY POLICY EXPECTATIONS ON FIRM-LEVEL REAL EFFECTS

Dependent Variable:	Total Liabilities$_{f,y}$	Current Liabilities$_{f,y}$	Total Fixed Assets$_{f,y}$	Total Assets$_{f,y}$	Total Sales$_{f,y}$	Employment$_{f,y}$
	(1)	(2)	(3)	(4)	(5)	(6)
Fed-ECB$_y^{MP\ Exp.}$ * Firm Exposure to Fed-ECB	**-0.007***	**-0.015*****	**-0.011*****	**-0.008***	**-0.010*****	**-0.011*****
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.002)
Firm Exposure to Fed-ECB	**-0.008****	**-0.003**	**0.001**	**-0.006**	**0.004**	**-0.004***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.002)
Firm F.E.	Yes	Yes	Yes	Yes	Yes	Yes
City-Sector-Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,267,509	2,328,713	2,256,617	2,351,378	2,192,957	2,351,379
R-squared	0.773	0.741	0.875	0.749	0.762	0.856

Notes: This table reports the estimates from OLS regressions for the period 2007 to 2018. Observations are at the firm-year level. The dependent variables are a firm's log total liabilities (column 1), log current liabilities (column 2), log total fixed assets (column 3), log total assets (column 4), log total sales (column 5), and log firm's number of employees (column 6) in a given year. Fed-ECB$_y^{MP\ Exp.}$ is the annual average of the residual 36 month ahead monetary policy expectations for Fed and ECB. *Firm Exposure to Fed-ECB* shows a firm's exposure to Fed and ECB policies through their banking partners. It is one-year lagged firm-level weighted averages of Banks' Exposure to Fed and ECB. "Yes" indicates that the corresponding fixed effects are included. Standard errors are clustered at the city-year level, and given in parentheses. *** Significant at 1%, ** significant at 5%, and * significant at 10%.

Bibliography

Adrian, T. and H. Shin (2010). Financial intermediaries and monetary economics. In B. M. Friedman and W. M. (Eds.), *Handbook of Monetary Economies*, Volume 3, pp. 601–650. Elsevier.

Aguiar, M. (2005). Investment, devalution, and foreign currency exposure: The case of Mexico. *Journal of Development Economics 78*, 95–113.

Aiyar, S., C. Calomiris, J. Hooley, Y. Korniyenko, and T. Wieladek (2014). The international transmission of bank capital requirements: Evidence from the UK. *Journal of Financial Economics 113*(3), 368–382.

Albagli, E., L. Ceballos, S. Claro, and D. Romero (2019). Channels of US monetary policy spillovers to international bond markets. *Journal of Financial Economics 134*, 447–473.

Alfaro, L., G. Asis, A. Chari, and U. Panizza (2017). Lessons Unlearned? Corporate Debt in Emerging Markets. *NBER Working Paper*, No.23407.

Alfaro, L., M. Garcia-Santana, and E. Moral-Benito (2019). On the Direct and Indirect Real Effects of Credit Supply Shocks. *NBER Working Paper No.25458*.

Allayannis, G., G. Brown, and L. Klapper (2003). Capital Structure and

Financial Risk: Evidence from Foreign Debt Use in East Asia. *Journal of Finance 58*(6), 2667–2710.

Allen, F. and K. Rogoff (2011). Asset prices, financial stability and monetary policy. In P. Jansson and M. Persson (Eds.), *The Riksbank's Inquiry into the Risks in the Swedish Housing Market*, pp. 189–218. Sveriges Riksbank.

Altonji, J., T. Elder, and C. Taber (2005). Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools. *Journal of Political Economy 113*(1), 151–184.

Amity, M. and D. Weinstein (2018). How Much Do Idiosyncratic Bank Shocks Affect Investment? Evidence from Matched Bank-Firm Loan Data. *Journal of Political Economy 126*(2), 525–587.

Avdjiev, S., W. Du, C. Koch, and H. Shin (2019). The Dollar, Bank Leverage, and Deviations from Covered Interest Parity. *American Economic Review: Insights 1*(2), 193–208.

Avdjiev, S. and G. Hale (2019). U.S. monetary policy and fluctuations of international bank lending. *Journal of International Money and Finance 95*, 251–268.

Avdjiev, S., C. Koch, P. McGuire, and G. von Peter (2018). Transmission of monetary policy through global banks: whose policy matters? *Journal of International Money and Finance 89*, 67–82.

Avdjiev, S. and E. Takáts (2014). Cross-border bank lending during the taper tantrum: the role of emerging market fundamentals. *BIS Quarterly Review September*.

Barrot, J.-N. and J. Sauvagnat (2016). Input Specificity and the Propagation of Idiosyncractic Shocks in Production Networks. *Quarterly Journal of Economics 131*(3), 1543–1592.

Basci, E. and H. Kara (2011). Financial Stability and Monetary Policy. CBRT Working Paper No. 11/08, Central Bank of the Republic of Turkey.

Baskaya, Y., J. di Giovanni, S. Kalemli-Ozcan, J.-L. Peydro, and M. F. Ulu (2017). Capital Flows and the International Credit Channel. *Journal of International Economics 108*, S15–S22.

Bauer, M. D. and G. D. Rudebusch (2013). Expectations for monetary policy liftoff. *FRBSF Economic Letter 34*.

BCBS (2019). The costs and benefits of bank capital - a review of the literature. *Basel Committee on Banking Supervision Working Paper No. 37*.

Berger, A. and G. Udell (1995). Relationship Lending and Lines of Credit in Small Firm Finance. *Journal of Business 68*(3), 351–382.

Bharath, S., S. Dahiya, A. Saunders, and A. Srinivasan (2011). Lending Relationships and Loan Contract Terms. *Review of Financial Studies 24*(4), 1141–1203.

Bianchi, J. (2011). Overborrowing and Systemic Externalities in the Business Cycle. *American Economic Review 101*, 3400–3426.

BIS (2020). Statistical release: BIS global liquidity indicators at end-September 2019. Bank for International Settlements, Basel.

Bleakley, H. and K. Cowan (2008). Corporate Dollar Debt and Depreciations: Much Ado About Nothing? *Review of Economics and Statistics 90*(4), 612–626.

Bloomberg (2018). This USD 16 Billion Turkish Wall of Debt Is at Risk from Lira Crash. *August 14*.

Borio, C., R. McCauley, P. McGuire, and V. Sushko (2016). Covered interest parity lost: understanding the cross-currency basis. *BIS Quarterly Review September*, 45–64.

Borio, C. and H. Zhu (2008). Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism. *BIS Working Paper No.268*.

Bräuning, F. and V. Ivashina (2017). Monetary Policy and Global Banking. *NBER Working Paper No.23316*.

Bräuning, F. and V. Ivashina (2020). U.S. Monetary Policy and Emerging Market Credit Cycles. *Journal of Monetary Economics 112*, 57–76.

Bruno, V. and H. Shin (2018). Currency depreciation and emerging market corporate distress. *BIS Working Papers*, No.753.

Bruno, V. and H. S. Shin (2015). Cross-Border Banking and Global Liquidity. *Review of Economic Studies 82*, 535–564.

Bruno, V. and H. S. Shin (2017). Global Dollar Credit and Carry Trades: A Firm-Level Analysis. *Review of Financial Studies 30*(3), 703–749.

Buch, C., G. L. Bussiere, M., and R. Hills (2018). The International Transmission of Monetary Policy. *NBER Working Paper No.24454*.

Cameron, A., J. Gelbach, and D. Miller (2011). Robust Inference with Multiway Clustering. *Journal of Business & Economic Statistics 29*(2), 238–249.

Cavallino, P. and D. Sandri (2018). The Expansionary Lower Bound: Contractionary Monetary Easing and the Trilemma. IMF Working Paper No. 18/236.

Cerqueiro, G., S. Ongena, and K. Roszbach (2016). Collateralization, Bank Loan Rates, and Monitoring. *Journal of Finance 71*(3), 1295–1322.

Cerutti, E., S. Claessens, and L. Ratnovski (2017). Global liquidity and Cross-Border Banking Flows. *Economic Policy 32*, 81–125.

Cerutti, E., G. Hale, and C. Minoiu (2015). Financial Crises and the Composition of Cross-Border Lending. *Journal of International Money and Finance 52*, 60–81.

Cespedes, L., R. Chang, and A. Velasco (2004). Balance sheets and exchange rate policy. *American Economic Review 94*(4), 1183–1193.

Cetorelli, N. and L. S. Goldberg (2012a). Liquidity management of U.S. Global Banks: Internal Capital Markets in the Great Recession. *Journal of International Economics 88*, 299–311.

Cetorelli, N. and L. S. Goldberg (2012b). Banking Globalization and Monetary Transmission. *Journal of Finance 67*(5), 1811–1843.

Chaney, T., D. Sraer, and D. Thesmar (2012). The Collateral Channel: How Real Estate Shocks Affect Corporate Investment. *American Economic Review 102*(6), 2381–2409.

Chetty, R., J. N. Friedman, and J. E. Rockoff (2014). Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood. *American Economic Review 102*(6), 2381–2409.

Christensen, J. H. E. and G. D. Rudebusch (2012). The response of interest rates to us and uk quantitative easing. *The Economic Journal 122*(564), F385–F414.

Chui, M., E. Kuruc, and P. Turner (2016). A new dimension to currency mismatches in the emerging markets: non-financial corporates. *BIS Working Papers No.550*.

Cortés, K. and P. Strahan (2017). Tracing out capital flows: How financially integrated banks respond to natural disasters. *Journal of Financial Economics 125*(1), 182–199.

Costello, A. (2017). Credit Market Disruptions and Liquidity Spillover Effects in the Supply Chain. *Working Paper*.

Cowan, K., E. Hansen, and L. O. Herrera (2006). Currency Mismatches in Chilean Nonfinancial Corporates. In R. Caballero and C. Calderon (Eds.), *External Vulnerability and Preventive Policies*, Volume 10, pp. 207–252. Central Bank of Chile.

Dell'Ariccia, G., L. Laeven, and R. Marquez (2014). Real interest rates, leverage, and bank risk-taking. *Journal of Economic Theory 149*, 65–99.

Dell'Ariccia, G., L. Laeven, and G. Suarez (2017). Bank Leverage and Monetary Policy's Risk-Taking Channel: Evidence from the United States. *Journal of Finance 72*(2), 613–654.

Dell'Ariccia, G. and R. Marquez (2013). Interest rates and the bank risk-taking channel. *Annual Review of Financial Economics 5*, 123–141.

Dewachter, D., T. Joris, and V. H. Jan (2020). The Production Network Sources of Bank Influence. Working Paper.

Dhyne, E., G. Magerman, and S. Rubínova (2015). The Belgian production network 2002-2012. *National Bank of Belgium Working Paper Research No.28*.

di Giovanni, J., S. Kalemli-Ozcan, M. F. Ulu, and Y. S. Baskaya (2018). International Spillovers and Local Credit Cycles. *NBER Working Paper No. 23149*.

di Giovanni, J., A. Levchenko, and I. Mejean (2018). The Micro Origins of International Business Cycle Comovement. *American Economic Review 108*(1), 82–108.

Di Maggio, M. and M. Kacperczyk (2017). The unintended consequences of the zero lower bound policy. *Journal of Financial Economics 123*(1), 59–80.

Diamond, D. W. and R. G. Rajan (2012). Illiquid banks, financial stability, and interest rate policy. *Journal of Political Economics 120*(3), 552–591.

Du, W. and J. Schreger (2016). Local Currency Sovereign Risk. *Journal of Finance 71*(3), 1027–1070.

Du, W., A. Tepper, and A. Verdelhan (2018). Deviations from Covered Interest Rate Parity. *Journal of Finance 73*(3), 915–957.

Duran, M. and D. Küçüksaraç (2012). Are Swap and Bond Markets Alternatives to Each Other in Turkey? *Research and Monetary Policy Department, Central Bank of the Republic of Turkey Working Paper No. 12/23*.

Federal Reserve Jackson Hole (2019). Challenges for Monetary Policy, Jackson Hole Economic Policy Symposium. Federal Reserve Bank of Kansas City. `https://www.kansascityfed.org/publications/research/escp/symposiums/escp-2019`.

Fendoglu, S. (2017). Credit Cycles and Capital Flows: Effectiveness of the Macroprudential Policy Framework in Emerging Market Economies. *Journal of Banking and Finance 79*, 110–128.

Fischer, S. (2014). The Federal Reserve and the Global Economy. In *Per Jacobsson Foundation Lecture, 2014 Annual Meetings of the International Monetary Fund and the World Bank Group*.

Fishburn, P. and R. B. Porter (1976). Optimal portfolios with one safe and one risky asset: Effects of change in rate of return and risk. *Management Science 22*, 1064–1073.

Forbes, K. and F. Warnock (2012). Capital flow waves: Surges, stops, flight, and retrenchment. *Journal of International Economics 88*(2), 235–251.

Fratzscher, M. (2012). Capital Flows, push versus pull factors and the global financial crisis. *Journal of International Economics 88*(2), 341–356.

FT (2020). Investors braced for credit crisis in emerging markets. *April 2*.

Galaasen, S., R. Jamilov, R. Juelsrud, and H. Rey (2020). Granular Credit Risk. *CEPR Discussion Paper No. DP15385*.

Galindo, A., U. Panizza, and F. Schiantarelli (2003). Debt composition and balance sheet effects of currency depreciation: a summary of micro evidence. *Emerging Markets Review 4*, 330–339.

Gambacorta, L. and P. Mistrulli (2014). Bank Heterogeneity and Interest Rate Setting: What Lessons Have We Learned since Lehman Brothers. *Journal of Money, Credit and Banking 46*(4), 753–778.

Gambacorta, L. and H. Shin (2018). Why bank capital matters for monetary policy? *Journal of Financial Intermediation 35*, 17–29.

Gan, J. (2007). Collateral, debt capacity, and corporate investment: Evidence from a natural experiment. *Journal of Financial Economics 85*, 709–734.

Gertler, M. and P. Karadi (2011). A model of unconventional monetary policy. *Journal of Monetary Economics 58*(1), 17–34.

Gertler, M. and P. Karadi (2015). Monetary Policy Surprises, Credit Costs, and Economic Activity. *American Economic Journal: Macroeconomics 7*(1), 44–76.

Gertler, M. and N. Kiyotaki (2010). Financial Intermediation and Credit Policy in Business Cycle Analysis. In B. Friedman and M. Woodford (Eds.), *Handbook of Monetary Economics*, Volume 3, Chapter 11, pp. 547–599. Elsevier.

Giannetti, M. and L. Laeven (2012). The flight home effect: Evidence from the syndicated loan market during financial crises. *Journal of Financial Economics 104*(1), 23–43.

Gürkaynak, R. S., B. T. Sack, and E. P. Swanson (2007). Market-based measures of monetary policy expectations. *Journal of Business & Economic Studies 25*(564), 201–212.

Han, X. and S. Wei (2018). International transmissions of monetary shocks: Between a trilemma and a dilemma. *Journal of International Economics 110*, 205–219.

Hardy, B. (2018). Foreign currency borrowing, balance sheet shocks and real outcomes. *BIS Working Paper No. 758*.

Hofmann, B., I. Shim, and H. Shin (2017). Sovereign yields and the risk-taking channel of currency appreciation. BIS Working Paper No.538.

Holmstrom, B. and J. Tirole (1997). Financial Intermediation, Loanable Funds, and the Real Sector. *Quarterly Journal of Economics 112*(3), 663–691.

Hong, G., A. Oeking, K. Kang, and C. Rhee (2019). What Do Deviations from Covered Interest Parity and Higher FX Hedging Costs Mean for Asia? *IMF Working Paper No. 19/169*.

Houston, J., C. Lin, and Y. Ma (2012). Regulatory Arbitrage and International Bank Flows. *Journal of Finance 67*(5), 1845–1895.

Huneeus, F. (2018). Production Network Dynamics and the Propagation of Shocks. *Working Paper*.

IIF (2020). COVID-19 infects corporate debt markets. In *IIF Weekly Insight (March 12th, 2020)*. Institute of International Finance, Washington, DC.

IMF (2012). The Liberalization and Management of Capital Flows: An Institutional View. International Monetary Fund, Washington D.C.

IMF (2017). Chapter 3: Are countries losing control of domestic financial conditions? In *Global Financial Stability Report*. International Monetary Fund, Washington D.C.

IMF (2019a). Chapter 4: Emerging and Frontier Markets: Mind the Debt. In *Global Financial Stability Report*. International Monetary Fund, Washington D.C.

IMF (2019b). Chapter 5: Banks' Dollar Funding: A Source of Financial Vulnerability. In *Global Financial Stability Report*. International Monetary Fund, Washington D.C.

Ioannidou, V., S. Ongena, and J.-L. Peydro (2015). Monetary Policy, Risk-Taking, and Pricing: Evidence from a Quasi-Natural Experiment. *Review of Finance 19*(1), 95–144.

Ivashina, V., D. Scharfstein, and J. Stein (2015). Dollar Funding and the Lending Behavior of Global Banks. *Quarterly Journal of Economics 130*, 1241–1281.

Iyer, R., J.-L. Peydro, S. da Rocha-Lopes, and A. Schoar (2014). Interbank Liquidity Crunch and the Firm Credit Crunch: Evidence from the 2007-2009 Crisis. *Review of Financial Studies 27*, 347–372.

Jarocinski, M. and P. Karadi (2019). Deconstructing Monetary Policy Surprises - The Role of Information Shocks. *American Economic Journal: Macroeconomics*, forthcoming.

Jimenez, G., S. Ongena, J. Peydro, and J. Saurina (2012). Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications. *American Economic Review 102*, 2301–2326.

Jimenez, G., S. Ongena, J. Peydro, and J. Saurina (2014). Hazardous Times for Monetary Policy: What Do Twenty-three Million Bank Loans Say about the Effects of Monetary Policy on Credit Risk-taking? *Econometrica 82*(2), 463–505.

Jimenez, G., S. Ongena, J. Peydro, and J. Saurina (2017). Macroprudential Policy, Countercyclical Capital Buffers and Credit Supply: Evidence from the Spanish Dynamic Provisioning Experiments. *Journal of Political Economy 125*(6), 2126–2177.

Jotikasthira, C., C. Lundblad, and T. Ramadorai (2012). Asset Fire Sales and Purchases and the International Transmission of Funding Shocks. *Journal of Finance 67*(6), 2015–2050.

Kara, H. (2016). Turkey's Experience with Macroprudential Policy. *BIS Working Paper*, No. 86q.

Kashyap, A. and J. Stein (1995). The Impact of Monetary Policy on Bank Balance Sheets. *Carnegie-Rochester Conference Series on Public Policy 42*(1), 151–195.

Kashyap, A. K. and J. C. Stein (2000). What Do a Million Observations on Banks Say about the Transmission of Monetary Policy. *American Economic Review 90*(3), 407–428.

Khwaja, A. I. and A. Mian (2008). Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market. *American Economic Review 98*(4), 1413–1442.

Kim, Y., L. Tesar, and J. Zhang (2015). The impact of foreign liabilities on small firms: Firm-level evidence from the Korean crisis. *Journal of International Economics 97*, 209–230.

Korinek, A. (2010). Excessive dollar borrowing in emerging markets: balance sheet effects and macroeconomic externalities. University of Maryland, Mimeo.

Lane, P. and G. Milesi-Ferretti (2017). International Financial Integration in the Aftermath of the Global Financial Crisis. IMF Working Paper No.17/115.

Lloyd, S. P. (2020). Estimating nominal interest rate expectations: Overnight indexed swaps and the term structure. *Journal of Banking & Finance 119*(C).

Maddaloni, A. and J. Peydro (2011). Bank Risk-taking, Securitization, Supervision, and Low Interest Rates: Evidence from the Euro-area and the U.S. Lending Standards. *Review of Financial Studies 24*(6), 2121–2165.

Mendoza, E. (2010). Sudden Stops, Financial Crises, and Leverage. *American Economic Review 100*(5), 1941–1966.

Mian, A. (2016). Distance Constraints: The Limits of Foreign Lending in Poor Economies. *Journal of Finance 61*, 1465–1505.

Milesi-Ferretti, G. and C. Tille (2011). The Great Retrenchment: International capital flows during the global financial crisis. *Economic Policy 66*, 285–330.

Miranda-Agrippino, S. and H. Rey (2015). US Monetary Policy and the Global Financial Cycle. *NBER Working Paper*, No. 21722.

Morais, B., J. L. Peydro, J. Roldan-Pena, and C. Ruiz (2019). The international bank lending channel of monetary policy rates and qe: Credit supply, reach-for-yield, and real effects. *Journal of Finance 74*(1), 55–90.

Morais, B., J.-L. Peydro, J. Roldan-Pena, and C. Ruiz-Ortega (2019). The International Bank Lending Channel of Monetary Policy Rates and Quantitative Easing: Credit Supply, Reach-for-yield, and Real Effects. *Journal of Finance 74*(1), 55–90.

Obstfeld, M. (2015). Trilemmas and Tradeoffs: Living with Financial Globalization. In C. Raddatz, D. Saravia, and J. Ventura (Eds.), *Global Liquidity, Spillovers to Emerging Markets and Policy Responses*, Chapter 2, pp. 13–78. Central Bank of Chile.

Obstfeld, M., J. Ostry, and M. Qureshi (2019). A Tie That Binds: Revisiting the Trilemma in Emerging Market Economies. *Review of Economics and Statistics 101*(2), 279–293.

Ongena, S., A. Popov, and G. Udell (2013). When the cat's away the mice will play": Does regulation at home affect bank risk-taking abroad? *Journal of Financial Economics 108*(3), 727–750.

Oster, E. (2019). Unobservable Selection and Coefficient Stability: Theory and Evidence. *Journal of Business and Economic Statistics 37*(2), 187–204.

Petersen, M. (2009). Estimating standard errors in finance panel data sets: comparing approaches. *Review of Financial Studies 22*, 435–480.

Rajan, R. (2014). Competitive Monetary Easing: Is it yesterday once more? In *Speech at the Brookings Institutions, April 10, 2014*.

Rey, H. (2013). Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence. In *Global Dimensions of Unconventional Monetary Policy*. Jackson Hole Symposium Proceedings, Federal Reserve Bank of Kansas City.

Schnabl, P. (2012). International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market. *Journal of Finance 67*(3), 897–932.

Shin, H. (2012). Global Banking Glut and Loan Risk Premium. *Mundell-Fleming Lecture, IMF Economic Review 60*, 155–192.

Svensson, L. (2015). Forward guidance. *International Journal of Central Banking 11*(Supplement 1), 19–64.

Takats, E. and J. Temesvary (2020). The currency dimension of the bank lending channel in international monetary transmission. *Journal of International Economics 125*, 103309.

Temesvary, J., S. Ongena, and A. Owen (2018). A Global Lending Channel Unplugged: Does U.S. Monetary Policy Affect Cross-border and Affiliate Lending by Global U.S. Banks? *Journal of International Economics 112*(5), 50–69.

Tintelnot, F., K. Kikkawa, M. Mogstad, and E. Dhyne (2017). Trade and Domestic Production Networks. *Working Paper*.

Turner, P. (2020). Containing the Dollar Credit Crunch. *Project Syndicate March 18*.

Woodford, M. (2012). Methods of policy accomodation at the interest-rate lower bound. *Proceedings-Economic Policy Symposium-Jackson Hole*, 185–288.

World Bank (2019). Global Financial Development Report 2019 / 2020: Bank Regulation and Supervision a Decade after the Global Financial Crisis. `https://www.worldbank.org/en/publication/gfdr`.

WSJ (2020). Emerging Markets Take Hit as Investors Flee for Safety. *March 18*.

Wu, J. and F. Xia (2016). Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound. *Journal of Money, Credit, and Banking 48*(2-3), 253–291.