# International Spillovers and Local Credit Cycles*

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**Abstract**

We show that capital inflows lead to a decrease in the cost of borrowing and an associated domestic credit expansion in an emerging economy, Turkey, during 2003–2013. Instrumenting capital inflows by changes in global risk (VIX) at the aggregate level and using a firm-bank-loan level dataset to isolate "capital inflow" driven credit supply at the micro level, we show that during episodes of low global risk and US quantitative easing, bank intermediated domestic credit for corporates expands and the cost of such credit declines. Credit supply that is driven by exogenous capital inflows can explain roughly 30 percent of the observed change in aggregate credit growth. Our data allow us to identify heterogeneous financial constraints. Larger banks provide more loans and charge lower interest rates relative to smaller banks when global liquidity is abundant, whereas smaller banks charge relatively lower interest rates on foreign currency loans during such periods. As we show, during periods of low global risk, domestic currency loans become cheaper relative to foreign currency loans, a fact that possibly drives total credit growth and the procylicality of larger banks. Our interpretation of these findings is that,larger banks' funding costs decrease more during episodes of abundant global liquidity, given their better connections to international financial markets, and this lower funding cost is reflected in lower real borrowing cost for firms. Our results suggest that empirical studies focusing on cross-country data alone will miss key international spillover effects, since time-varying heterogeneity at the micro level lies at the heart of the relaxation of financial constraints due to capital flows.

JEL Classification: F0, F1, E0

Keywords: VIX, Capital Flows, Bank Credit, Financial Constraints, FX Loans, Firm Heterogeneity

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# 1 Introduction

Volatile capital flows in and out of emerging markets once again occupy the central agenda of economists and central bankers. Since the early 2000s, emerging markets have received the bulk of world capital flows, both thanks to pull factors such as their improved fundamentals and push factors, such as near-zero interest rates due to the quantitative easing policies in advanced economies. It has proven hard to separate the relative importance of push versus pull factors for capital flows into emerging markets using aggregate country-level data.[1] Recent research has pointed to the existence of a global push factor, which has manifested itself in the form of a "global financial cycle."[2] Country-level evidence shows that this cycle involves the comovement of capital inflows and asset prices globally, transmitting global conditions into emerging markets.[3]

During these capital inflow episodes, emerging markets have not only experienced appreciations of their currencies, but also expansions in the volume of domestic credit. These exchange rate and credit movements raise a key challenge for emerging market policy makers; whether or not to raise policy rates. Raising the policy rate might help to slow down the domestic credit expansion, and hence prevent asset price bubbles from forming. At the same time, a higher interest rate might attract more capital flows leading to an even greater appreciation and fueling further local credit expansion. Many advocate the use of capital controls to avoid this dilemma. Further, as argued by Blanchard et al. (2015), exogenous capital inflows leading to an expansion in output and credit is a phenomenon that cannot be explained by the standard models since capital inflows will lead to an appreciation and a decline in net exports at a given policy interest rate. These authors present a model with an extended set of assets, where in the presence of financial frictions, capital inflows can reduce the cost of financial intermediation, leading to a credit boom and an output increase.

To date, there has not been any evidence on whether capital inflows fuel a domestic credit expansion via reduced cost of banks' external financing, and hence reduced cost of financing for firms. Put differently, we do not know how the international credit channel operates. Once global factors lead to capital inflows into an emerging market in the form of increased bank liabilities,

[1] See Calvo, Leiderman, and Reinhart (1993, 1996); Fernandez-Arias (1996).

[2] See Bruno and Shin (2015a,b); Miranda-Agrippino and Rey (2015); Rey (2015, 2016).

[3] See Fratzscher (2011) and Forbes and Warnock (2012), who show that global risk, which is proxied by VIX, is associated with capital inflows into emerging markets during the pre-2009 period. See also Cerutti, Claessens, and Puy (2015), who emphasize the sensitivity of the correlation between capital inflows and global push factors to different flow and investor types.

for example, is it the case that, financing projects becomes cheap and domestic credit expands? Can global liquidity driven capital flows relax financial constraints? And if so, for whom and by how much, and what are the aggregate implications, if any? This paper aims to answer these questions. Thanks to its unique firm-bank-loan level data at the monthly and quarterly frequencies, Turkey provides an invaluable opportunity to explore the link between global and domestic financial conditions for a typical emerging market economy, which has received capital inflows in a consistent manner over the past decade.

We follow the literature and proxy "exogenous-supply-driven" capital inflows by a global push factor, which takes the form of the global volatility index, VIX at the quarterly level. We instrument endogenous capital flows with VIX to isolate the part of capital inflows driven by push factors and we also use VIX directly in a reduced form regression. The argument for using this measure as a proxy for global liquidity is that during low levels of global risk, investors search for yield and are more willing to tolerate higher levels of country risk associated with investing in emerging markets. Our disaggregated data will help us to absorb any remaining unobservable low frequency "pull" factors through the use of firm×year fixed effects, without absorbing the direct effect of VIX that is at the quarterly level.

We focus on quantifying the impact of capital inflows on domestic credit volume and borrowing costs at the firm-bank-loan level, for which the availability of micro data is crucial because it allows us to control for latent bank and firm characteristics, both time invariant and time varying, which if omitted would lead to biased estimates. Furthermore, the micro data allow us to pay particular attention to firm and bank heterogeneity in terms of the currency of borrowing, as well as firm and bank size. The heterogeneity in the borrowing currency is particularly important to study. If such foreign currency lending is driven by smaller banks and/or smaller firms, for example, these agents will be less able to absorb a negative currency shock on their liabilities, jeopardizing real and financial stability.[4]

Our results are as follows. First, we establish the link from global factor (VIX) driven exogenous

[4]See Farhi and Werning (2015), who show that optimal policy in the case of local and foreign currency borrowing calls for different taxes on local and foreign currency debt. They argue that taxes on foreign currency debt should be higher. This result is consistent with the fact that international credit booms fueled by foreign currency debt are particularly problematic under both fixed and flexible exchange rate regimes. See also Aoki, Benigno, and Kiyotaki (2015) who show that if the financial sector is borrowing in foreign currency, it might be problematic to implement cyclical macroprudential policies.

capital inflows to an increase in domestic credit and to a decrease in borrowing costs in Turkey. Although there are several existing papers that establish a link between capital inflows and aggregate credit expansion using macro data as argued above, we are not aware of any work that identifies the effects of variables such as VIX on loan growth and loan cost directly using matched firm-bank-loan level data, conditional on a plethora of observable and unobservable firm-bank-loan-time factors.

Next, we focus on heterogeneity in the currency composition of loans, and on bank and firm size. Larger banks provide more loans and charge lower interest rates relative to smaller banks when global liquidity is abundant. However, it is the smaller firms who take advantage of this extra liquidity and borrow more than larger firms in total in those periods of low global risk and these smaller firms also pay lower interest rates.

Although, there is no difference between larger and smaller banks in terms of foreign currency loan provision during periods of low global risk, smaller banks charge relatively lower interest rates on foreign currency loans during such periods. Smaller firms can borrow at relatively lower rates in foreign currency during periods of abundant global liquidity, but larger firms borrow more in foreign currency in such periods.[5] Although foreign currency loans are cheaper on average during our sample period, during periods of low global risk and capital inflows, domestic currency loans become even cheaper relative to foreign currency loans, a fact that possibly drives total credit growth and the procylicality of the larger banks. Our interpretation of these findings is that banks' funding costs decrease during episodes of abundant global liquidity, and larger banks who are more connected to international financial markets not only benefit from lower funding costs more, but also they have reflected this as lower cost of borrowing to firms, especially to smaller firms who were presumably financially constrained before the global liquidity shock.[6]

Our results are economically significant. The baseline micro estimates of the elasticity of domestic loan growth with respect to changes in VIX range from (least to most conservative array of fixed effects) $-0.15$ to $-0.046$. In turn, these *micro* estimates imply that we can explain on average 30 percent of observed cyclical loan growth of the *aggregate* corporate sector. The elasticity of the interest rate with respect to VIX ranges between 0.013 and 0.022 (0.013 being the most conservative

[5]This result can be due to a Turkish macroprudential policy that effectively bans small firms from borrowing in foreign currency since foreign currency borrowing amount should be over a certain threshold.

[6]For the papers that model the expansionary effect of capital inflows as a relaxation of borrowing constraints on constrained agents see Korinek (2011); Korinek and Sandri (2016).

estimate), implying between a 0.74 to 1.25 percentage point fall in the average borrowing rate for an increase in global liquidity equal to the interquartile range of log(VIX) over the sample period.

We further show direct evidence that the interest rate channel is an important transmission mechanism through which global financial conditions spillover to emerging markets. Using data on new loan issuances and numerous controls at the micro level, we show that the interest rates on new loans decrease over time, making financing cheaper and cheaper. Within this broad trend, it is striking that interest rates on new loans mimic the time pattern of VIX closely, i.e. if VIX increases, they also increase. In particular, during the episode of low interest rates and quantitative easing (QE) in advanced countries, there was a dramatic reduction in domestic borrowing costs, and this reduction in borrowing costs correlated strongly with the reduction in VIX. While it is true that capital inflows led to an initial appreciation until 2009 as shown in Figure 1; since 2009, the Turkish economy experienced a persistent depreciation together with low borrowing costs. During this period, there were episodes with some capital outflows (such as the Taper-Tantrum), and hence an improving current account deficit, but overall Turkey kept running a current account deficit and was a net receiver of capital inflows during the post-2009 period (see Figure 2).

The paper proceeds as follows. Section 2 presents the related literature. Section 3 briefly discusses the macroeconomic environment faced by Turkey during our sample period. Section 4 discusses the data. Section 5 presents our identification methodology. Section 6 describes the empirical results, and Section 7 concludes.

## 2 Related Literature

Our paper is related to several strands of the literature. We relate to papers that show a link between global conditions and emerging market capital flows such Forbes and Warnock (2012); Bruno and Shin (2013, 2015a,b); Miranda-Agrippino and Rey (2015); Rey (2015). This literature focuses on the global financial conditions that are significantly influenced by the stance of US monetary policy. Both credit booms and busts in emerging markets can be driven by global capital flows, which in turn are affected by global liquidity and US interest rates. A possible shortage of dollar funding in the international markets can create spillover effects, where capital leaves the emerging markets and/or the cost of borrowing increases for these countries (e.g., see Fratzscher, Duca, and Straub, 2013; Chen and Hambright, 2015; Sobrun and Turner, 2015).[7] At the same time, a dollar appreciation against the home currency will increase the value of dollar debt of the banks, and the real burden of dollar-denominated debt will increase in emerging markets' financial sector in such a case (see Avdjiev, Chui, and Shin, 2014). On the dollar depreciation side, the work by Bruno and Shin (2013, 2015a,b) and Hofmann, Shim, and Shin (2016) argue that, when borrowing is mostly in terms of foreign currency, an appreciation of the domestic currency viz. the dollar makes foreign currency borrowing cheaper and fuels domestic credit expansion in terms of foreign currency.

A separate literature has so far established that financial crises are generally preceded by credit booms that go in tandem with capital inflows into emerging markets (Kindleberger, 1978; Reinhart and Rogoff, 2009; Schularick and Taylor, 2012; Jordà, Schularick, and Taylor, 2013, 2015). This research argues that such booms can be driven both by abundant credit supply by banks (via the bank lending channel) or excessive credit demand by firms and households (via firm and household balance sheet channels). In particular, capital inflows can be intermediated via banks, but they may be flowing through banks in response to a demand shock to firms. Turkey provides an excellent laboratory to study the supply and demand channels for overall financial activity, since banks play the primary financing role in the Turkish economy.

Our work provides a bridge between these literatures by showing that the domestic credit cycle is tied to capital flows in the case of an emerging market. We also connect such a domestic credit cycle to both bank and firm fundamentals. There is a large literature following Kashyap and Stein (2000) that analyses the bank lending channel at the bank level. However, bank-level analysis cannot identify credit supply and/or credit demand, as different banks (e.g., large banks that borrow more from foreign wholesale markets) may have different firms as borrowers.[8] This literature tends to find that smaller banks and firms are sensitive to aggregate shocks, and that

[7] There is a separate but related literature that studies the international transmission of shocks through the banking sector using country- and bank-level data. This literature argues that global banks transmit shocks across borders through their local affiliates (e.g., Cetorelli and Goldberg, 2011, 2012; Claessens and van Horen, 2013; Cull and Martínez Pería, 2013; De Haas and van Leylveld, 2014). While recent papers analyzing such data provide convincing evidence that banks transmit financial shocks internationally (e.g., Puri, Rocholl, and Steffen (2011) or Schnabl (2012)), they have not analysed the channels through which these shocks have been transmitted.

[8] For empirical evidence on differential lending by banks with high and low liquidity and capital, see Kashyap and Stein (2000); Jiménez et al. (2012); and on differential lending by domestic versus foreign banks, see Mian (2006); Berger et al. (2008); Giannetti and Ongena (2009); Gormley (2010).

large banks are more pro-cyclical in terms of their leverage.[9] Loan-level data allow us to control for such heterogeneity using bank×firm fixed effects.

We follow the identification methodologies used in previous research that exploits credit register loan level data such as Khwaja and Mian (2008); Paravisini (2008); Jiménez et al. (2012, 2014); Schnabl (2012). This literature almost exclusively focuses on the amount of loan provisions, whereas we also investigate the pricing of such credit provision, and the currency dimension which turns out to be an important transmission channel for the international credit channel.[10] This additional focus is important to bear evidence on the conjecture that QE driven low US interest rates cause an influx of supply of cheap credit into emerging markets, which in turn relaxes the financial constraints in those countries.

## 3 Macroeconomic Environment

In wake of the Global Financial Crisis, a considerable number of countries adopted major changes in their policy frameworks geared towards enhancing financial stability. Furthermore, as a response to the crisis, several advanced economies used unconventional monetary policy, such as QE, which was in part motivated to help unfreeze the credit market. In contrast, a number of emerging market economies, including Turkey, focused on curbing the destabilizing effects of volatile capital flows on their economies.

It is now conventional wisdom among the policy makers that part of the surge in capital flows to emerging markets was in part a side of effect from QE, which generated a huge amount of global liquidity, as well as low interest rates in advanced economies.[11] There has been no direct causal evidence on this conjecture so far. Furthermore, emerging markets were also attractive given their favorable macroeconomic outlooks following the decade of structural reforms and strengthening macroeconomic fundamentals as well as relatively higher nominal interest rates, which existed in several countries in response to price stability concerns. These inflows, mostly in the form of portfolio inflows, have in turn led to risks associated with a massive domestic credit expansion in

[9] See Kalemli-Özcan, Sorensen, and Yesiltas (2012); Adrian and Shin (2014).

[10] Liability dollarization has been at the heart of many emerging market crisis before, such as in the Latin American and Asian crises in the late 1990s (e.g., see Céspedes, Chang, and Velasco, 2004; Kalemli-Özcan, Kamil, and Villegas-Sanchez, 2014). See Chui, Kuruc, and Turner (2016) for the recent cases of the same phenomena.

[11] For example, see Caruana (2016) .

emerging markets. These phenomena have raised concerns of potential external imbalances, as well as maturity and currency mismatches between assets and liabilities in the household and corporate sectors, especially during the QE period.

For emerging market economies, one of the major policy challenges has become to look for ways of decreasing the sensitivity of credit and the exchange rates to capital flows. Indeed, one sees that Turkey's domestic credit conditions comove with both capital flows and global liquidity during our sample period. Figure 2 plots Turkey's credit growth (Loans/GDP Growth) and current account position (CA/GDP) against the VIX (Figure 2a) and Turkish capital inflows (K Inflows/GDP) (Figure 2b). Movements in the VIX tend to be negatively correlated with Turkey's credit growth, and positively correlated with the current account balance (a fall in the current account implies an *increase* in net capital inflows). Loan-to-GDP growth fluctuates between 5 to 10 percent quarterly during our sample. Looking at a more direct measure of capital flows to Turkey, we see that this measure is positively correlated to Turkey's credit growth, while negatively correlated to its current account. These correlations also point to the same story as described for VIX. Plotting the level of loans to GDP in Figure 3, we show that there is a five-fold increase in the loan-to-GDP ratio during our sample period. This is driven by a six-fold increase in domestic currency loans and tripling of FX loans, both as a ratio to GDP, over this period. The figure plots the aggregated loans from bank balance sheets.

## 4 Data

To identify the impact of capital flows on the domestic credit cycle, we merge three large micro-level panel datasets together. All data are confidential, and sourced from the CBRT. Specifically, we are able to merge bank- and firm-level characteristics with individual loan-level data between banks and firms using unique bank and firm identifiers. We further augment this dataset with Turkish and world macroeconomic and financial data. The final dataset is at the monthly and quarterly frequencies, except for the firm data, which are annual. We transform all loan, bank, and firm variables to real values for both level and growth rates, using 2003 as the base year for inflation adjustment. We further clean and winsorize the data in order to eliminate the impact of outliers.[12]

[12] We winsorize 1% of the data for the loan and bank variables, but need to winsorize 2% for the firm balance sheet variables given longer tails.

We discuss the characteristics of each dataset in this section, and refer the interested reader to our online data appendix for further details on the construction of the final dataset.

### 4.1 Bank-Level Data

Turkey, like many major emerging markets, has a bank-dominated financial sector: in 2014, banks held 86% of the country's financial assets and roughly 90% of total financial liabilities. The past decade has witnessed a doubling of bank deposits and assets, while loans have increased five-fold. As Table A1 shows, by 2013 the banking sector's assets represented more than 100 percent of GDP, and loans roughly 70 percent. These patterns must be viewed in a historical context: since the 2000s, fiscal repression has fallen tremendously, so that relative to the 1990s, where the banks' main task was to finance government deficits and debt (Baskaya and Kalemli-Özcan, 2016), the banking sector expansion has been driven by lending to the household and corporate sectors.[13]

Our baseline analysis uses confidential quarterly bank balance sheet data from Turkey for the 2003–2013 period.[14] These data are collected regularly as part of the *Monitoring Package*, which is the data collection and processing system for monitoring and regulation purposes. All banks operating within Turkey are required to report their balance sheets as well as extra items to the regulatory and supervisory authorities – such as the CBRT and the Banking Regulation and Supervision Agency (BRSA) – by the end of month. We also use extra reporting of the banks, such as their capital adequacy ratios.

Over the 2003–13 period there are 49 banks, of which, 28 are commercial, 14 are investment and development, 5 are branches of foreign banks, and 2 are banks that have been taken over by Turkish Deposit Insurance Fund (SDIF).[15] In total, 43 of these banks have continuously been active throughout the period, while our sample of banks varies from between 35 and 44 throughout the period due to entry and exit, as well as our focus on loans to only the corporate sector. Table A2 presents summary statistics for our final sample of banks, based on end-of-quarter data pooled

[13] This growth has been driven by a skewed banking sector, where the largest five banks hold between 50 to 60 percent of assets, deposits and loans over the sample period, while the largest ten banks' shares are between 80 to 90 percent.

[14] The data are collected at the monthly level, and we simply use March, June, September, and December reports. We also include 2002 for lagged values in the regressions below.

[15] Note that in the aftermath of the 2001 crisis, the weak capital structure of the Turkish banks resulted in a number of takeovers. As a result, in 2000–2004 period, a total of 25 banks were taken over by SDIF. Our sample begins at the end of this period, where the majority of takeovers were completed.

over the sample period. These variables, like others used in the paper, are winsorized at the one-percent level. There is quite a bit of variation in bank size, as measured by total assets as noted above. Similarly, there is variation in the capital, liquidity, and return on assets (ROA) across banks and over time. The noncore liabilities ratio, which averages 0.30 in the sample, and has wide variation across banks and over time (the standard deviation is 0.22 in the pooled data). This variable measures the ratio of "non-traditional" (or wholesale) liabilities to total liabilities,[16] which has recently been highlighted by Hahm, Shin, and Shin (2013) as a potentially important factor in transmitting shocks from abroad to the domestic economy in EMEs via banks and large nonfinancial corporations.

### 4.2 Credit Register

Our detailed monthly bank-firm individual loan transaction-level data are collected by the BRSA, and provided to us by the CBRT. Banks have to report the outstanding loans at the level of firms and individuals monthly to the BRSA at the transaction level.[17] For instance, if a firm has five loans with different maturities and interest rates at the branch of a bank and two other loans at another branch of the same bank, the bank then has to report all of the seven loans separately as long as each of the loans' outstanding amounts are above bank-specific reporting cutoff level. If a loan's outstanding amount is below the bank's reporting cutoff then the bank may aggregate such small loans at the branch-level and report the aggregated amounts. This dataset provides the same information as found in credit register data in other countries, but is in fact more comprehensive in the variables. In particular, besides providing the amount of a loan outstanding between a given individual (household, firm, government, or international institution) and a bank, the dataset also provides several other key pieces of information, such as the (i) interest rate rate; (ii) maturity date as well as extended maturity dates if relevant; (iii) collateral provided; (iv) credit limit (only beginning in 2007); (v) form of loan (e.g., cash vs. non-cash); (vi) currency of loan; (vii) detailed industry codes for the finance-activity classification for which the loan is borrowed for, as well breakdown of consumer usage of loan (e.g., credit card, mortgage); (viii) bank-determined risk

[16]These liabilities are the sum of (i) payables to money market, (ii) payables to securities, (iii) payables to banks, (iv) funds from Repo, and (v) securities issued (net).

[17]There are minimal cutoffs under which banks to not have to report the individual transactions to the authorities. These amounts vary by banks, and are agreed upon by the authorities.

measures of the loans, as well as other details such as commissions and interest fees paid.

The data are cleaned at the loan level before we move on to aggregating up to the bank-firm level for our regression analysis. The data cleaning is extensive, and is discussed in full in our online appendix. However, there are certain unique features of the Turkish data which must be tackled and which we describe in brief next. First, we use cash loans in terms of outstanding principal, since credit limit data are not available for the full sample period. Moreover, these loans naturally map into the data used to measure aggregate credit growth. Second, a significant component of lending in Turkey takes place in foreign currency (FX).[18] We clean the data to deal with exchange rate issues (i.e., valuation effects) – the interested reader may see the online appendix for more details. We adjust the individual loans for inflation before summing across bank-firm pairs. The baseline regressions pool loans regardless of their maturity. Roughly three quarter of the loans have maturities less than or equal to one year. Given this sampling issue, we therefore also run some regressions splitting the sample at the one-year mark for short and long maturities.

The final cleaned dataset reports roughly 53 million quarterly loan records over the December, 2003–December 2013 period for the full sample of banks banks. Figure A1 compares the growth rate of the aggregated loans in our dataset ('Firms') and compares it to aggregate credit growth for the whole economy ('Firms + Non-Firms'). The two series track each other very closely, with a correlation of 0.86. Of our whole sample of corporate loans, roughly one half of the loans are in in TL, and the remaining FX. Table A3 reports some key statistics on the coverage of the credit register data based on end-of-year data, both for all firm loans (Panel A), as well as for loans for the firms with matched firm balance sheet data (Panel B). We report the FX share of loans based on value within the respective firm datasets in Panels A and B. On average this number is 50-67% for all firms and the firm sub-sample with matched balance sheet data, respectively. Therefore, foreign currency loans make up an important subset of our total sample of loans in terms of value. The last two columns, columns (2) and (3), break this ratio up into loans that are issues in foreign currency ('FX Loan') and those that are issued in TL but indexed to the exchange rate ('Indexed Loan'). The FX loans make up the majority of total foreign currency loans, though indexed loans having been rising in importance the last few years.

Table A4 next reports summary statistics on banks, firms, and bank-firm pairs in the register

[18] Generally US dollar or euro (see Acharya et al., 2015).

for the end of year. As column (1) shows, the number of banks increase somewhat over the sample. Similarly, the number of firms borrowing also increases, as reflected in the second column. The total number of bank-firm-quarter pairs in the full sample of data is roughly 5.4 million (Panel A, column (5)), and 311 thousand for the firms with matched balance sheet data (Panel B, column (5)). Of these observations, firms with multiple bank relationships make up between 75-88% or more of total observations (column (4)) in both samples, as well as share of total loans ('Loan Share in Multiple BF', column (6)). Finally, the average number of banking relationships a given firm has over the sample is between 2.8-4.3 (column (7)) for the whole sample and the matched sample, respectively.

Table A5 presents summary statistics for the credit register data for loans aggregated at the bank-firm pair each quarter. The table pools all the loans, regardless of currency of denomination in Panel A, while Panels B and C present statistics on TL and FX loans separately (i.e., the unit of observations is bank-firm-denomination). The table reports summary statistics for (i) loans outstanding in thousands of 2003 TL, (ii) the interest rate, (iii) the collateral-to-loan ratio, and (iv) the remaining maturity (in months) of a loan. Furthermore, we do this and for each currency type of loan. These are the data that form the basis for our regression samples.

Since we are aggregating over several potential loans between a given bank and firm pair in a given time period, we need to take into account the size of the individual loans in calculating an "effective" interest rate and maturity for the bank-firm pair. We do this by creating weighted averages ('WA') based on the loan share of loans between each bank-firm pair in a given period. We allow the weights to vary depending on the unit of analysis we consider, and they also vary over time. Therefore, in Panel A, when we pool the TL and FX loans, the weight's numerator is simply the loan value of an individual loan, while the denominator is the sum of all TL and FX loans between a bank-firm pair in a given period. In Panels B and C, the numerator is again the individual loan value, while the denominator is total TL loans in Panel B, and in Panel C the denominator is total FX loans.[19] The loan variable is the sum of all loans between and bank-firm pair, while the collateral ratio is simply the sum of collateral divided by the sum of loans between

[19] Formally, for a loan $i$ between bank $b$ and firm $f$ in time $q$ and denomination type $d = \{ALL, TL, FX\}$, in Panel A: $w^{ALL}_{i,b,f,t} = Loan_{i,b,f,t} / \sum_{i \in I^{ALL}_{b,f,t}} Loan_{i,b,f,t}$; Panel B: $w^{TL}_{i,b,f,t} = Loan_{i,b,f,t} / \sum_{i \in I^{TL}_{b,f,t}} Loan_{i,b,f,t}$; Panel C: $w^{FX}_{i,b,f,t} = Loan_{i,b,f,t} / \sum_{i \in I^{FX}_{b,f,t}} Loan_{i,b,f,t}$, where $I^{d}_{i,b,f,t}$ is the set of loans based on currency types between the bank-firm pair in a given quarter.

banks and firms in a given quarter.

### 4.3 Firm-Level Data

Firm balance sheet and income statement data are sourced from a supervisory dataset that is collected by the CBRT annually, and date back to 1988. The data are collected to monitor the credit risk of the firms. The CBRT sends the survey to the two groups of firms. The first group contains firms that have more than 10,000 TL credit and have appeared in the CBRT's database in previous years. The second group includes the firms that have more than 1,000,000 TL credit, but have not appeared in the CBRT's database before. Although an important fraction of the firms have continuously existed over the sample period, the firm sample has been changing over time due to entry and exit. This extensive margin appears both due to real entry and exit, but also because the coverage of firms changes over time given the CBRT's sampling. The data are not drawn from the census, and tend to be dominated by manufacturing firms. We therefore compare our dataset to data collected by the Turkish Statistical Institute (Turkstat) for a much broader set of firms and industries. The aim of this dataset (Annual Industry and Service Statistics) is to produce information based on enterprise and the local unit, and is targeted for all NACE Rev.2 (4-digit) sectors. The firms that are sampled in Turkstat are all enterprises having more than 20 employees, as well as a subset of smaller firms. Sampling statistics for the aggregate economy weight the smaller firms based on the total number of small firms in Turkey. The Turkstat data exclude the following sectors: Agriculture, forestry and fishing (A), Financial and insurance activities (K), Public administration and defense; compulsory social security (O), Activities of households as employers; undifferentiated goods-and services-producing activities of households for own use (T), and activities of extraterritorial organizations and bodies (U). While running this comparison we exclude firms of these listed sectors

As one can see in Table A6, our dataset's sample of firms covers approximately 40% of Turkey's economic activity on average over the sample, when comparing total gross sales ('Gross Output') in our dataset to what is collected by Turkstat for a much broader set of firms and industries.[20] Next, Table A7 compares the firm coverage of gross sales in our dataset relative to Turkstat across different firm-size strata, which are defined based on employment. Overall, our dataset does a

[20]Note that Turkstat has not released 2013 data yet, so we cannot compare the last year of our sample.

relatively good job in terms of representing medium-sized firms (20-249 employees) for both all sectors of the economy as well as the manufacturing sector. But, the firm data collected by the CBRT under represent small firms (1-19 employees), and thus over represent very large firms (250+ employees), though this difference in sampling is less dramatic in the manufacturing sector (Panel B).

We clean the firm-level data and winsorize at the 2 percent level to eliminate the impact of potential outliers. Furthermore, we deflate all nominal values to 2003 TL values. In total, the unbalanced panel contains 28,339 firms and 68,341 firm-year observations over the 2003–2013 period. Table A8 presents summary statistics for all firms in the sample. Panel A presents data for all firms excluding the financial and government sectors, while Panel B restricts the data to only firms in the manufacturing sector. We present all measures in levels (in thousands of 2003 TL), ratios and growth rates (for sales). It is worth noting that in terms of count, manufacturing firms make up somewhat less than 50% of the sample, but they are also large on average, when measured in terms of both assets and sales. There is substantial variation in all variables across firms and over time. Moreover, in comparing Panels A and B, manufacturing firms also tend to differ from the full sample in terms of their export/sales ratio, and manufacturing firms are slightly larger and have higher net worth on average.

### 4.4 Macro-Level Data

Table A9 presents summary statistics for the quarterly Turkish and global macroeconomic and financial variables that we use as controls in our regressions, as well as measures of global financial conditions. All real variables are deflated using 2003 as the base year. The Turkish macroeconomic data are sourced from the CBRT. VIX is the period average. There is substantial variation in VIX, the logarithm of capital inflows, and the Federal Reserve's total assets over the sample period, which is crucial for our identification strategy.

## 5 Empirical Methodology

Our empirical methodology follows the common approaches used in the credit register literature, by focusing on multiple bank-firm relationships for estimating the impact of capital flows on credit volume and lending rates (see Khwaja and Mian, 2008, who pioneered the approach of exploiting information on firms' borrowing relationships in credit register data to identify the bank lending channel). We extend the two-period first-difference estimation of Khwaja and Mian (2008) into multiple periods fixed effects estimation in order to exploit the panel data at our disposable. Given the fact that error term is not a random walk, a fixed effect estimation (FE) dominates a first difference (FD) estimation.[21]

We begin with "macro regressions," which regress one of two variables: (i) the loan principal outstanding ('Loan'), or (ii) the interest rate ('$r$') on either a variable that capture global liquidity/uncertainty (VIX) or Turkish capital inflows.[22] Loans are deflated by Turkish CPI, while the interest rate remains nominal. We control for inflation in our core regressions.

We collapse the monthly transaction level loan data at the bank($b$)-firm($f$)-currency denomination($d$)-quarter($q$) level . Further, the interest rate is a weighted-sum of individual loans between bank and firms, where the weights are based on a given loans share relative to total loans. All explanatory variables are real or ratios. We run regressions in log-log, so that we can interpret the coefficients on the global liquidity or capital inflows measures as elasticities. We then run "interaction" regressions to exploit the rich heterogeneity in the data. These regressions will take into consideration the role of borrowing in different currencies as well as firm and bank size. Regressions are all weighted-least square, where weights are equal loan share at the $\{b, f, d\}$ level in a given quarter $q$ total loans. This weighting scheme leads to a natural application of our micro estimates in order to study aggregate effects, as we show below. Finally, standard errors are clustered at the firm level.

[21] We run an AR(1) on error terms and find no evidence of persistence. We also experiment with first difference specifications for additional robustness checks.

[22] We also explore the impact of the expansion of the Federal Reserve's balance sheet during the QE period 2009–13.

### 5.1 Macro Regressions

The core macro regressions at the bank-firm level for loans and interest rates are

$$\begin{aligned}\log(\text{Loan}_{b,f,d,q}) = {} & \alpha_{b,f} + \alpha_{f,y} + \lambda_L q + \beta_L \text{Global}_{q-1} + \delta_L \text{FX}_{b,f,d,q} + \gamma_L \mathbf{Bank}_{b,q-1} \\ & + \theta_L \mathbf{Macro}_{q-1} + \varepsilon_{b,f,d,q},\end{aligned} \tag{1}$$

$$\begin{aligned}\log(1 + r_{b,f,d,q}) = {} & \alpha_{b,f} + \alpha_{f,y} + \lambda_r q + \beta_r \text{Global}_{q-1} + \delta_r \text{FX}_{b,f,d,q} + \gamma_r \mathbf{Bank}_{b,q-1} \\ & + \theta_r \mathbf{Macro}_{q-1} + \nu_{b,f,d,q},\end{aligned} \tag{2}$$

where $\alpha_{b,f}$ is a bank×firm fixed effect; $\alpha_{f,y}$ is a firm×year fixed effect, which captures unobserved credit demand factors at the annual level; $q$ is a linear trend variable; 'Global' is the global liquidity measures, including (i) log(VIX), or (ii) the natural logarithm of real Turkish capital inflows; FX is a dummy variable that is one if the loan is in foreign currency, and 0 if it's in Turkish lira; **Bank** is a set of bank controls including log(Assets), capital ratio, capital adequacy ratio (CAR), liquidity ratio, noncore liabilities ratio, and return on total assets (ROA); and **Macro** is a set of macro controls, including Turkish quarterly real GDP growth and inflation.[23]

#### 5.1.1 Identification of "Push" vs. "Pull"

The estimation of equations (1) and (2) provides several advantages in identifying the importance of "push" factors, such as the VIX, in driving domestic credit growth. First, unlike with regressions using macro data, beyond including domestic variables such as GDP growth as measures of demand ("pull") factors, we can move one step further by including the *firm×year* effects, which will capture the average demand for loans by firm in a given year, and help us to control for heterogeneous changes in this demand from year to year.

Second, studying both loan volumes and borrowing rates at the micro level and their relationship to capital flows helps tease out the relative importance of supply and demand shocks, which would otherwise be difficult to do using aggregate data. In particular, capital might be flowing into the economy due to an increase in firm demand, an increase in worldwide supply (e.g., investors chasing yield in EMEs given low rates in industrial countires), or some combination of demand and supply

[23]We also run these regressions in first differences as additional checks, sine we cannot control for quarterly fixed effects in these specifications. The qualitative results are robust.

shocks.

To provide some intuition on the relative impact of supply and demand shocks on the estimated coefficients in estimating the regressions (1) and (2), Figure 4 presents two figures plotting out comparative statics arising from different sets of shocks. First, Figure 4a shows what happens for purely supply-driven changes in credit (e.g., due to a fall in VIX, which does not affect domestic firms' investment demand). In this case, the net effect on loan volumes will be positive, along with an unambiguous fall in borrowing costs, as the economy moves along the demand curve from point A to point B. Next, Figure 4b considers an increase in the supply of lending, along with several different possible demand shocks. First, assume that the increase in demand ($D_0$ to $D_1$) is greater than the increase in supply ($S_0$ to $S_1$), which implies that while credit volume increases, the interest rate also rises (point B: $r_{\mathrm{B}} > r_{\mathrm{A}}$). Second, demand and supply are assumed to increase symmetrically (i.e., $S_0$ to $S_2$), so that new equilibrium is now at point C. Here, loan volumes increase even more relative to the initial equilibrium at point A, while the interest rate remains the same as in the initial equilibrium (i.e., $r_{\mathrm{C}} = r_{\mathrm{A}}$). Finally, the increase in supply to $S_3$ is more than the shock to the demand for loans, so that the interest rate now falls relative to the pre-shock equilibrium ($r_{\mathrm{D}} < r_{\mathrm{A}}$). Again, loan volume increases.

We further examine the impact of VIX as a push factor, by rerunning (1) and (2), where we instrument Turkish capital inflows using VIX. These regressions help us tease out the supply-side effects of capital inflows. In particular, if capital inflows are driven both by demand and supply effects, and VIX is picking up a global financial cycle (Rey, 2015) and hence the supply effect, which is taken as exogenous by small-open economies, like Turkey, we would expect that the $|\beta_r^{IV}| > |\beta_r^{OLS}|$. This case will hold true as long as our identifying assumption is valid – that is changes in VIX affect Turkish loan growth only through the supply-induced effect of capital inflows.

## 5.2 FX Heterogeneity

We next explore the interaction of global financial conditions on the currency composition of borrowing by augmenting (1) and (2) with a simple interaction term between the Global and FX variables. Given that firms borrow in multiple currencies and from multiple banks, we are able to include firm×quarter effects in this regression and still identify the differential effect of changes in the Global variable on FX and TL loans and interest rates. In particular, the specification can be written as

$$\log(\text{Loan}_{b,f,d,q}) = \alpha_{b,f} + \alpha_{f,q} + \kappa_L(\text{FX}_{b,f,d,q} \times \text{Global}_{q-1}) + \delta_L \text{FX}_{b,f,d,q} + \gamma_L \mathbf{Bank}_{b,q-1} + \varepsilon_{b,f,d,q}, \tag{3}$$

$$\log(1 + r_{b,f,d,q}) = \alpha_{b,f} + \alpha_{f,q} + \kappa_r(\text{FX}_{b,f,d,q} \times \text{Global}_{q-1}) + \delta_r \text{FX}_{b,f,d,q} + \gamma_r \mathbf{Bank}_{b,q-1} + \nu_{b,f,d,q}, \tag{4}$$

where $\alpha_{f,q}$ is a firm×quarter effect. These effects absorb all firm×quarter varying characteristics such as credit demand. Given the variation used to identify the coefficients in this regression is at the quarterly level, these fixed effects deliver a very restrictive specification. Note that the inclusion of such fixed effects will eliminate any firms that borrow in a single currency and from a single bank in a given quarter. As we will see below, roughly 50% of observations in our sample are indeed dropped given the inclusion of these fixed effects. Note also that these fixed effects also absorb the direct effect of the Global and Macro variables, and the trend variable is excluded. All these variables are included when we do not employ quarterly fixed effects.

### 5.3 Bank-Level Heterogeneity

We next investigate how the effect of global flows on domestic loan provision are impacted by bank characteristics. In particular, we investigate the importance of bank size, as measured by log(Assets), by augmenting the macro regressions (1) and (2) with an interaction variable:

$$\log(\text{Loan}_{b,f,d,q}) = \alpha_{b,f} + \alpha_{f,q} + \rho_L(\log(\text{Assets}_{b,q-1}) \times \text{Global}_{q-1}) + \delta_L \text{FX}_{b,f,d,q} + \gamma_L \mathbf{Bank}_{b,q-1} + \varepsilon_{b,f,d,q}, \tag{5}$$

$$\log(1 + r_{b,f,d,q}) = \alpha_{b,f} + \alpha_{f,q} + \rho_r(\log(\text{Assets}_{b,q-1}) \times \text{Global}_{q-1}) + \delta_r \text{FX}_{b,f,d,q} + \gamma_r \mathbf{Bank}_{b,q-1} + \nu_{b,f,d,q}, \tag{6}$$

where log(Assets) is the natural logarithm of a bank's total assets. We allow this variable to vary over time, but the size distribution (and growth of bank assets) remain stable over the period. Moreover, given the small sample of banks and the skewed distribution, we choose to use a continuous variable for size, rather than simply splitting the sample into "big"-"small" as we do below for the larger set of firms. Finally, as in the FX regressions, we include the additional controls if the firm×quarter effects are not included.

We also run a triple interaction regression by interacting bank size with the FX dummy and VIX in order to test for any differential effect in FX versus TL loans during capital inflows and outflows episodes, and whether this credit supply effect varies by bank size.

### 5.4 Firm-Level Heterogeneity

Finally, we investigate how the effect of global flows on domestic loan provision are impacted by firm characteristics. In particular, we investigate the importance of firm size. Given the skewed distribution of firm size in Turkey, and the large growth rate of the non-corporate sector over the period (roughly 10%), we create a non-time varying 0/1 dummy for whether a firm is large or not, where a firm is assigned a 1 for "large" if its average assets over time is larger than the median of all firms' assets over the sample; otherwise, it receives a zero (for "small"). We call this variable "$\text{Size}_f$." The regression specification is then:

$$\log(\text{Loan}_{b,f,d,q}) = \alpha_{b,f} + \alpha_{b,q} + \zeta_L(\text{Size}_f \times \text{Global}_{q-1}) + \delta_L \text{FX}_{b,f,d,q} + \theta_L \mathbf{Firm}_{f,y-1} + \varepsilon_{b,f,d,q}, \quad (7)$$

$$\log(1 + r_{b,f,d,q}) = \alpha_{b,f} + \alpha_{b,q} + \zeta_r(\text{Size}_f \times \text{Global}_{q-1}) + \delta_r \text{FX}_{b,f,d,q} + \theta_r \mathbf{Firm}_{f,y-1} + \nu_{b,f,d,q}, \quad (8)$$

where $\alpha_{b,q}$ is a bank×quarter fixed effect, absorbing all bank-time varying characteristics, such as credit supply. We want to absorb all the capital inflows driven supply effects in these regressions to test (i) if there is any credit demand effect that varies with global risk and, (ii) if there is any credit demand effect that varies with global risk and is heterogeneous by firm size. These bank×quarter fixed effects also absorb the direct effect of banks, Global and Macro variables, and we do not include a trend variables (again, all these variables are included for specifications that do not include quarterly fixed effects). Finally, we also experiment with including firm controls **Firm**, which include log(Assets), net worth, and export share lagged one period as additional controls. Recall that these data only vary at the annual ($y$) level.

As before, we also run a triple interaction regression by interacting firm size with the FX dummy and VIX, in order to test for any differential effect in FX versus TL loans during capital inflows and outflows episodes, and whether this credit demand effect varies by firm size.

# 6 Empirical Results

## 6.1 Macro Regressions

Table 1 presents our initial set of regressions for specifications (1) and (2), but not controlling for bank controls, nor bank-firm fixed effects. Hence we use both cross sectional and time series variation here and show the average relationships between loans for bank-firm pairs and their interest rates and VIX/Turkish capital inflows. In particular, columns (1) and (2) present the results for log(Loans), while columns (3) and (4) present the interest rate results. The coefficients on VIX and capital inflows are significant at the 1% level, and imply the same thing: an increase in global liquidity/ a decrease in global risk is associated with easier lending standards due to either (i) an increase in the average size of loans, or (ii) a decrease in the interest rate that firms borrow at. The macro variables come in with the expected signs. Finally, the FX dummy shows that loans denominated in foreign currency are larger in value (twice the size of TL loans) and have lower interest rates on average relative to TL loans.

Next, Table 2 starts to include further controls as well as bank×firm fixed effects. With these fixed effects, we use the within bank×firm variation over the sample period to estimate the coefficients of interest. Hence, we only identify from changes in loans and interest rates as a function of changes in capital flows for a given bank-firm pair, relative to another pair. This strategy further address potential selection effects due to different types of banks and firms matching (e.g., "good" banks lend to "good" firms). Panel A presents the results for loans, and Panel B for the interest rate. Columns (1)-(3) are for VIX and columns (4)-(6) are for capital inflows. Columns (2) and (5) add bank controls, and columns (3) and (6) further add firm×year fixed effects to capture unobserved low frequency time-varying characteristics that are correlated with yearly changes in loan demand. Note that the number of observations drop in each specification as we lose some observations due to the inclusion of fixed effects.[24] The qualitative results are identical to those of the baseline macro regressions of Table 1. However, the magnitude of the estimated elasticities do differ relative to the baseline given the fact that we absorb a lot of variation along side with our

[24]We also lose a few observations given a few quarters of missing data for the ROA variable for a bank. We use ROA rather than non-performing loans as a control, since ROA reflects bad loans and write-offs and hence a more comprehensive variable for bank profits. Further, the NPL variable was missing for longer time periods for several banks.

demand control that requires the use of firms borrowing from multiple banks in a given year.

First, in looking at Panel A, the estimating impact of both VIX and capital inflows on the value of loans drops as we add more controls, and looking at the most stringent specifications in columns (3) and (6), we see that the elasticity for VIX is one third smaller than that of the estimate in Table 1, while the capital inflows elasticity is about one-quarter smaller that the estimate based only on macro controls and the time trend. Next, turning to the interest rate results in Panel B, a similar pattern emerges as for the loan results. The coefficients are still significant at the 1% level, but are smaller compared to the baseline estimates in Table 1.[25]

Finally, we run the loan and interest rate regressions, where we use a measure of of US quantitative easy, the Federal Reserve's total assets (in log real terms) over the 2009–13 period. Table A10 presents the result for the specification with the full saturation of fixed effects. Results are qualitatively similar with our core "macro" regressions – i.e., an expansion in the Fed's balance sheet is positively correlated with an increase in loan growth and a fall in borrowing costs in Turkey.

#### 6.1.1 Aggregate Implications

Given that the weighted-least squared regressions use loan shares for weights, there is a natural aggregation exercise to undertake in order to examine the economic significance of our micro estimates on overall credit growth. In particular, ignoring the other control variables, and considering only a generic intercept coefficient $\alpha$ and slope coefficient $\beta$, rewrite the weighted regression of (1) as

$$w_{b,f,d,q} \log(\text{Loan}_{b,f,d,q}) = w_{b,f,d,q}\alpha + w_{b,f,d,q} \log(\text{Global}_{q-1})\beta + w_{b,f,d,q}\varepsilon_{b,f,d,q}, \tag{9}$$

where $w_{b,f,d,q}$ is a bank-firm-denomination loan share viz. total loans in a given quarter, and note that $\sum w_{b,f,d,q} = 1$ by definition. Then differentiating both sides of (9), we have

$$w_{b,f,d,q} \mathrm{d} \log(\text{Loan}_{b,f,d,q}) = w_{b,f,d,q} \mathrm{d} \log(\text{Global}_{q-1})\beta, \tag{10}$$

[25] Table A11 and Table A12 further explore the loan level data by re-running the specifications of Table 2 by splitting the data into bank-firm loans for short (less than or equal to one year) and long (greater than one year) maturities, respectively. In looking at the two tables, we see that slightly more than one half of the bank-firm observations are composed of shorter maturity loans; and the estimated coefficients for VIX and capital inflows are generally similar across both types of maturities.

so,

$$w_{b,f,d,q}\frac{\Delta \text{Loan}_{b,f,d,q}}{\text{Loan}_{b,f,d,q}} = \beta w_{b,f,d,q}\frac{\Delta \text{Global}_{q-1}}{\text{Global}_{q-1}}, \tag{11}$$

where (11) comes from rewriting the change in logs from (10) as a growth rate, and $\Delta\text{Loan}_{b,f,d,q}$ is the change in Loan between quarter $q$ and $q+1$, while $\Delta\text{Global}_{q-1}$ is the change in Global between quarter $q-1$ and $q$ . Next, summing (11) over $\{b, f, d\}$ in a given quarter $q$, we have:

$$\frac{\Delta \text{Loan}_{q}}{\text{Loan}_{q}} = \beta \frac{\Delta \text{Global}_{q-1}}{\text{Global}_{q-1}}, \tag{12}$$

which yields a relationship between aggregate growth credit growth, the Global variable and the micro estimate $\beta$.

Our results are economically significant. The baseline micro estimates of the elasticity of domestic loan growth with respect to changes in VIX range from (least to most conservative array of fixed effects) $-0.15$ to $-0.046$. In turn, applying (12), the most conservative *micro* estimate implies that we can explain on average 30 percent of observed cyclical loan growth of the *aggregate* corporate sector. The elasticity of the interest rate with respect to VIX ranges between 0.013 and 0.022 (0.013 being the most conservative estimate), implying between a 0.74 to 1.25 percentage point fall in the average borrowing rate for an increase in global liquidity equal to the interquartile range of log(VIX) over the sample period.

### 6.2 Instrumental Variable Regressions

Table 3 presents instrumental variable regression results, where we instrument Turkish capital inflows by log(VIX). This strategy helps to provide clean "supply-side" estimates for the capital inflows coefficients. The table presents results without and with bank controls, in columns (1)-(3) for loan volume, and (4)-(6) for the interest rate.

Comparing the estimated coefficients to the corresponding specifications in Table 2, one sees that the IV estimated coefficients are larger (in absolute value) than the simple OLS ones, and in particular for the interest rate regressions (by a factor of ten for the most stringent specification in column (6)). This downward bias in the estimated OLS coefficients for the interest rate regressions is indeed what one would expect to find if the firm-year effects in the OLS regression did not control for all the demand-side factors – i.e., an increase in the demand for loans would put upward pressure on the interest rate, and if this demand also corresponds to increased demand for foreign capital, the estimated relationship between capital inflows and lending rates would be attenuated due to the upward pressure on interest rate. Therefore, by isolating the supply effect, the IV estimates deliver a larger negative relationship between capital inflows and interest rates, since now the estimated coefficients are free of the demand effect that creates a positive relation between capital inflows and interest rates. Moreover, IV helps to deal with measurement error in capital inflows that may also attenuate the OLS estimates.

Although we believe that the key reason for having higher IV coefficients is the "demand effect" as we explained above, it is also possible that we estimate a local average treatment effect (LATE). In particular, the regression estimates based on VIX-driven capital inflows may differ for small versus large loans and their interest rates because the effect of capital inflows differs for large versus small banks' credit supply (and hence the loans they provide), which is relevant given the observed heterogeneity of bank size in our data.

We outline our interpretation of this case as follows. Assume that there are two equally large groups of banks, which are differentially impacted by capital inflows. For banks ($b$) belonging to group $j$ ($j = 1, 2$), the impact of VIX on capital inflows, Kf, (in logs) is $\log \mathrm{Kf}^j_{b,t} = d_j \log \mathrm{VIX}^j_{b,t} + v^j_{b,t}$. Banks in group 1, where $d_1$ is large, are banks which are more likely to receive more capital inflows. Under regularity conditions in large samples, the first-stage WLS estimate from a regression using the combined sample is $\Delta \log \mathrm{Kf} = \frac{d_1+d_2}{2} \Delta \log \mathrm{VIX}$. Consider also that the impact of capital inflows differs between groups for the interest rate: $\log(1 + r_{b,t}) = \beta_j \log \mathrm{Kf}^j_{b,t} + e_{b,t}$. An IV regression of $\log(1 + r)$ on $\log \mathrm{Kf}$, using our instrument VIX, gives, in large samples, the coefficient $\frac{d_1\beta_1+d_2\beta_2}{d_1+d_2}$; that is, a weighted average of $\beta_1$ and $\beta_2$. Relatively larger coefficients $d_1$ and $\beta_1$ imply that the IV estimate is larger than the OLS estimate, which gives equal weight to $\beta_1$ and $\beta_2$. As we show later, it is indeed the case that larger banks are more procylical during capital inflow episodes by providing more loans at cheaper rates during episodes of lower VIX.

Across all specifications the first-stage F-statistic of the excluded instrument (VIX) is larger than 10, the rule-of-thumb value that alerts for weak instrument problems (Staiger and Stock, 1997; Stock, Wright, and Yogo, 2002). The F-statistic is calculated from a first-stage regression using Newey-West standard errors for one lag. See Table A13 for the first-stage regression under different assumptions on standard errors.

To gauge the difference in economic magnitude between what the OLS and IV estimates imply, we employ the estimated OLS coefficients for the loan and interest rates regressions in column (6) of Panels A and B in Table 2, which equal 0.017 and −0.002, respectively, and their IV counterparts in columns (3) and (6) of Table 3, which equal 0.104 and −0.029, respectively. The OLS estimates imply that an increase equivalent to the interquartile range of (log) capital inflows leads to an 1.5 percent increase in loan growth, and 0.2 percentage point fall in the borrowing rate. Meanwhile, applying the IV estimates imply that the same increase in capital inflows leads to 9.5 percent rise in credit growth, and a 2.5 percentage point fall in the interest rate.

### 6.3 FX Heterogeneity Regressions

Table 4 next presents the results studying the potential heterogeneous effects of global liquidity on the foreign currency denomination of loans and interest rates. In particular, we interact the global variable with an FX dummy. Further, given that we want to focus on the supply-side effects, we only report results based on VIX as the global variable, and are able to include firm×quarter effects given that we have same firms borrow from multiple banks for loans denominated in TL and FX over time.

First, in looking at the estimated impact for the FX interactions on loans in Table 4 columns (1)-(3), we find there there are more FX loans during periods of low VIX as shown in column (1). However, this differential effect becomes weak in column (2) when we control for bank characteristics that vary from quarter to quarter. The differential impact of FX versus TL loans completely disappears once we control firm×quarter effects in column (3).[26] Firm×quarter effects control for the demand for credit, but they also control for other unobserved firm characteristics such as quarterly changes in firms' net worth. These results hint that certain banks provide more FX loans or less TL loans during periods of low VIX, and certain firms borrow more in FX during periods of low VIX. Note that these cannot be time-invariant firm and bank characteristics since those are fully absorbed by the bank×firm fixed effects. We explore whether these time-varying bank and firm characteristics are correlated with more FX loans during periods of low VIX in the next

[26]Note that the number of observations more than halves when we include the firm×quarter fixed effects. We also run regressions with firm×year effects for both loans and interest rates. Results were qualitatively identical to estimations with firm×effects effects for both loans and interest rates, while the estimated interaction coefficients were also very similar in magnitude and significance.

section.

Turning to the interest rate results in columns (4)-(6), we find that the interest rate for loans denominated in TL decrease relatively more than loans denominated in FX as VIX falls. Unlike the loan outcome regressions, this result survives the inclusion of time-varying bank characteristics and unobserved firm demand, as shown in columns (2) and (3). Although FX loans are cheaper on average as captured by the negative coefficient of the FX dummy in columns (4) through (6), during periods of abundant global liquidity, TL loans become relatively cheaper. The estimated magnitudes are not that big though. To see this, first note that on average, FX loans are 8 percentage point cheaper (column (6)). Next, applying the interaction coefficient in column (6) ($-0.014$) to a fall of VIX equivalent to its interquartile range over the period, we find that interest rates on TL loans fall by 0.79 percentage points more than FX loans. This difference implies that TL loans become relatively cheaper during periods of global liquidity, but not by a large margin.

### 6.4 Bank-Level Heterogeneity Regressions

Next, we investigate the effect of bank heterogeneity in terms of bank size on both loan volumes and pricing. We control for credit demand by saturating the regressions with firm×quarter effects, so that the estimated coefficients will capture heterogeneous *supply* effects of banks of different sizes by focusing on the same firm that borrow from multiple banks in a given quarter, and in terms of different currency loans. The firm×quarter effects also absorb unobserved quarterly changes in firms' balance sheet such as net worth.

Table 5 shows the results for loans and interest rates. First, we run regressions without firm×quarter effects in columns (1). The total effect of a lower VIX on loan volumes in these specifications are in line with our baseline macro results of Table 2 when evaluated at the mean values of log(Assets). The interaction effect with log(Assets) is demeaned for ease of interpretation. At the mean value of assets the interaction effect is zero, leaving us with a similar negative coefficient on VIX as before ($-0.050$ in total). This results also shows that larger banks are more procyclical, and thus provide more loans during periods of high global liquidity (low VIX). This result survives controlling demand for credit via firm×quarter effects as shown in column (2). Note further that after controlling for unobserved firm-level heterogeneity at the quarterly level, the FX dummy is still positive and significant. Column (3) further controls for time-varying bank heterogeneity – the results are similar to the previous specifications.

Column (4) next investigates how bank size and the currency composition of loans interact. Larger banks provide more FX loans in general but there is no difference between larger and smaller banks in terms of FX loan provision during high or low periods of global risk, proxied by VIX. Larger banks provide more loans during low VIX and hence are more procyclical as before, but there is no differentiation in terms of FX versus TL loans in this procyclicality. Since we control for firm credit demand effects and other unobserved time-varying firm heterogeneity with firm×quarter effects, we also do not have any difference between TL and FX loan provision during periods of low VIX as we found in Table 4.

In terms of loan pricing, columns (5)-(8) shows that the total effect of VIX in column (5) is the same as the baseline macro regressions, where more liquidity decreases interest rates, since the interaction terms is zero at the mean level of bank assets. Column (5) also shows that larger banks charge relatively higher interest rates during periods of high global liquidity, but this result reverses in column (6) once we control for firm credit demand.[27] Therefore, conditional on demand larger banks charge lower interest rates in general. The interaction results in the first three columns for VIX mimic the findings that we found for loan volumes. Once we control for firm×quarter effects we find that larger banks offer lower rates when global financial conditions are good and VIX is low. Finally, column (8) shows that, as in the case of loans, larger banks normally offer low rates but not if the loan is FX and also not necessarily during the periods of low VIX. In fact this result shows that during the episodes of high global liquidity, it is the smaller banks who offer relatively lower rates (compared to larger banks) on FX loans.

### 6.5 Firm-Level Heterogeneity Regressions

We now turn to results exploring firm size heterogeneity, where the estimated effects will be driven by firms' heterogeneous credit demand and other firm characteristics. In particular, relative to the previous set of bank interaction regressions, we change the variation by which we identify our coefficients of interest in these regressions, by controlling for heterogeneous credit supply at the bank level, and unobserved bank heterogeneity using bank×quarter fixed effects. Doing so will

[27]Note that we re-ran column (5) on the same reduced sample as in column (6) and the positive coefficient on the size-VIX interaction remains. Therefore, it is not the sample but the firm×quarter effects that are driving the change in the sign of the interaction coefficient.

allow us to assess whether there is any role for firm credit demand. Table 6 presents the results – note that the sample size drops substantially given the smaller dataset with matched firm balance sheet data.

Column (1) begins by omitting the bank×quarter effects and finds our typical result of credit expansion with high global liquidity. Furthermore, according to the interaction term, smaller firms receive relatively more loans than large ones when VIX is low. Further, as found in previous regressions, FX loans are larger on average. Column (2) next controls for all credit supply effects and unobserved bank heterogeneity. The result that smaller firms receive relatively larger loans is unchanged. Finally, column (3) augments the specification in column (2) with our firm level controls (log(Assets), net worth and export share). The inclusion of these controls decreases the size of the interaction coefficient marginally compared to column (2), but the results remain that small firms borrow relatively more during periods of low VIX, when, for example, credit constraints are relaxed.

Column (4) next evaluates the effect of firm size on FX versus TL loans during low and high global liquidity periods. First, the $\text{Size}_f$ interaction remains positive and significant as in previous specifications. Furthermore, as found in Table 4, the coefficient on the interaction of FX and VIX is not statistically significant. Next, the coefficients for both FX and the interaction between FX and $\text{Size}_f$ are positive and significant, indicating that FX loans are larger than TL ones on average, and furthermore, large firms borrow even larger FX loans than small firms. Finally, the coefficient on the triple interaction is negative and statistically significant, implying that during periods of high global liquidity, small firms borrow relatively more in TL than large firms. Furthermore, this coefficient is identical in size to that of the size-VIX interaction in column (3), thus confirming that the differential in overall borrowing by firm size is driven by a differential in the currency composition of borrowing.

Columns (5)-(8) next investigate the effect of firm size on interest rates. Column (5) shows our previous result of lower interest rate during periods of low VIX, and the total impact of VIX is of the same order of magnitude as the coefficient estimates in Table 4. Furthermore, the interaction coefficient is negative and statically significant, indicating that smaller firms borrow at relatively lower interest rates during periods of high global liquidity. Columns (6) and (7) confirm the interaction result with the addition of bank×quarter and firm controls. Finally, column (8) investigates heterogeneity in firm size and the borrowing rates of FX and TL loans. Results are similar to previous specifications and regressions in terms of the impact of firm size on borrowing rates and the differential in FX-TL rates during periods of high global liquidity: smaller firms pay relatively lower rates, and TL rates fall relative to FX ones. Next, inspecting the triple interaction, we find that smaller firms face relatively lower rates for TL loans. This finding matches up with the results on loan value in column (4).

### 6.6 A Primer on the Mechanism

In this section we show evidence on the transmission channel of the global financial cycle to Turkish domestic credit market. Thus far, we have argued that cheaper borrowing, as a result of abundant global liquidity that drove capital inflows, is the key reason for the increase in domestic credit growth. Here we show that in fact there has been a persistent exogenous decline in the real borrowing costs for firms as a result of capital inflows conditional on firm credit demand.

To begin, we provide a simple conceptual framework in order to understand factors linking global liquidity and interest rates. First, assume the standard uncovered interest rate parity condition with a risk premium holds, where we suppress time subscripts for ease of exposition:

$$i_{TL} = i_{USD} + \mathrm{E}(\Delta \ln e) + \gamma, \tag{13}$$

where $i_{TL}$ is the Turkish average nominal interest rate, $i_{USD}$ is the US nominal interest rate, E is the expectation operator, $\Delta \ln e$ is the change in the log nominal exchange rate, and $\gamma$ is the country risk premium.

We think of $\gamma$ as being composed of two different risks: global and country. So we can write $\gamma$ as

$$\gamma = \mathrm{VIX} + \alpha_c, \tag{14}$$

where VIX represents global risk, and $\alpha_c$ is country risk.

Next, assume that the risk premium for a loan $l$ to a given firm $f$ by bank $b$ is a linear function of the firm-specific risk and loan risk:

$$\gamma_{b,f,l} = \alpha_f + \alpha_l, \tag{15}$$

where $\alpha_f$ and $\alpha_l$ represent firm and loan risk, respectively. The interest rate of a given loan is the average country rate plus the loan-specific risk premium:

$$\begin{aligned} i_{b,f,l} &= i_{TL} + \gamma_{b,f,l} \\ &= i_{USD} + \mathrm{E}(\Delta \ln e) + \gamma + \gamma_{b,f,l} \\ &= i_{USD} + \mathrm{E}(\Delta \ln e) + \mathrm{VIX} + \alpha_c + \alpha_f + \alpha_l, \end{aligned} \tag{16}$$

where the loan rate is now a function of the of foreign interest rate, expected exchange rate changes, and global, country and idiosyncratic risk factors.

We can extend the simple framework further to include a discount/premium for borrowing in FX, in addition to general firm and loan level time varying risk, and adding back the time subscripts, where we now consider monthly loans:

$$i_{b,f,l,m} = i_{USD,m} + \mathrm{E}_m(\Delta \ln e_{m+1}) + \mathrm{VIX}_m + \alpha_{c,m} + \alpha_{f,m} + \alpha_{l,m} + \alpha^{\mathrm{FX}}_{b,f,l,m}, \tag{17}$$

where $m$ represents month.

We take this simple framework to the data by using the following estimating equation, which is has the following empirical analog to (17):

$$\log(1 + i_{b,f,l,m}) = \lambda_m + \omega_{b,f} + \alpha_{f,q} + \beta_1 \mathrm{Collateral}_{b,f,l,m} + \beta_2 \mathrm{FX}_{b,f,l,m} + \varepsilon_{b,f,l,m}, \tag{18}$$

where $\lambda_m$ is a time fixed effect that absorbs the effects of VIX, exchange rate changes and $i_{USD}$, all of which are at the monthly level. The time effect further captures country-level variables such as inflation and $\mathrm{E}(\Delta \ln e)$, as well as other unobserved country risk, given the fact that we only have one country. $\omega_{b,f}$ captures non-time varying firm and bank level unobserved factors including risk. $\alpha_{f,q}$ is a firm×quarter fixed effect capturing credit demand at quarterly level and other unobservables at the firm level such as time varying firm risk. Ideally, we would like to include a firm×month effect to capture $\alpha_{f,m}$ in our framework above, but the data requirements for doing so are too restrictive – having firms borrow from multiple banks in different currencies every month (i.e., we will lose roughly 50 percent of the sample with firm×month effects). Instead, we assume that time-varying firm risk does not vary within a quarter. We proxy for time-varying loan level risk, by including

$\text{Collateral}_{b,f,l,m}$, which measures the collateral-to-principal ratio put down for each loan.[28] Note that we use the ratio rather than level of Collateral given the large heterogeneity in observed loan size (principal amount). This term captures $\alpha_{l,m}$ in our framework. Finally, $FX_{b,f,l,m}$ captures the currency denomination risk of the loan as given by the same term in our framework, and $\varepsilon_{b,f,l,m}$ is an iid shock.

We run equation (18) as is, as well as adding bank×quarter fixed effects ($\alpha_{b,q}$) and the interaction term $\text{Collateral}_{b,f,l,m} \times \text{FX}_{b,f,l,m}$, as shown below in (19). The idea behind including these additional regressors is as follows. First, we want to know if there are any differences between general loan risk and an FX-specific loan risk, so by interacting the two variables and controlling for each separately, we can evaluate the role of each and then ask if there is any differential role of loan risk among FX and TL loans. Quantifying this interaction is especially important if we want to evaluate the extent of the "risk-taking channel," since during appreciations and depreciations, FX loan risk is different than general loan risk. Second, by running this equation with and without bank×quarter fixed effects, we can try to gauge the role of credit supply on the effects of loan risk and FX-specific loan risk on loan interest rates.[29] In sum, our augmented specification is

$$\begin{aligned} \log(1 + i_{b,f,l,m}) = \lambda_m + \omega_{b,f} + \alpha_{f,q} + \alpha_{b,q} + \beta_1 \text{Collateral}_{b,f,l,m} + \beta_2 \text{FX}_{b,f,l,m} \\ + \beta_3 (\text{Collateral}_{b,f,l,m} \times \text{FX}_{b,f,l,m}) + \nu_{b,f,l,m}. \end{aligned} \tag{19}$$

The data we use to run this regression are *new* loan issuances at the monthly level. Hence we only see each loan once.

Table 7, column (1) regresses loan level interest rates (the logarithm of one plus the rate), at the loan origination, on the collateral ratio and also on an FX dummy over the entire sample period. Given the fact that we pool TL and FX loans, the dummy indicates whether or not an FX loan has higher or lower interest rate relative to a TL loan. The regression includes the set of fixed effects as shown in equation (19).[30] We include bank×firm fixed effects and thus identify the determinants of the loan level interest rates from "within" variation in loans for a given bank-firm pair. Given

[28] The regressions also control for subjective bank-assigned risk weights. Loans are put into risk weight bins by loan officers. These risk weights are used while determining capital adequacy ratios and written down by the Basel committee for determining risk weight for each loan.

[29] We also used bank×month fixed effects obtaining similar results.

[30] We also include fixed effects on the sectoral activity assigned to a loan, and the maturity of the loan, where the maturity bins are defined as less than a year, between a year and two, between two and three years, three to five years, five to ten years, and more than ten years of maturity at origination. There is a fixed effect for each bin.

that there is a new loan every month, this variation will tell us if the interest rate on new loans changes from month to month for a given bank-firm pair. Column (1) shows that loans that are in FX and loans with a higher collateral/principal ratio are much cheaper to finance, as expected. The interest rate differential between an FX and TL loan is 9 percentage points.

Column (2) adds an interaction term between collateral/principal ratio and the FX dummy. As argued above, we want to check whether our results can be driven by the so-called "risk-taking channel." Bruno and Shin (2015a,b) have argued that there is a risk-taking channel for EM borrowers that is associated with currency movements. When there is a mismatch on borrowers' balance sheets in terms of dollar liabilities and domestic currency assets, a weaker dollar relative to the domestic currency strengthens the balance sheet of dollar borrowers, whose liabilities fall relative to assets. For the global investors, this makes the borrowers less risky and creates spare capacity for additional credit extension. Hofmann, Shim, and Shin (2016) show the price dimension of this channel, where with dollar depreciations, sovereign spreads in EMs got smaller, and Avdjiev, Koch, and Shin (2016) show the quantity dimension, where there is a negative relationship between the strength of the domestic currency in EMs and cross-border bank capital flows denominated in the dollars.

As shown in column (2), a higher collateral/principal ratio implies a higher interest rate for FX loans relative to TL loans. However, column (2) uses the whole sample period, which is characterized by both episodes of appreciation and depreciation of the TL viz. the USD. Hence to better identify the impact of exchange rate channels on firms' ability to borrow, we explore different exchange rate episodes. First, in column (3), we run the same regression for the appreciation episode only, and find the interaction term to be insignificant. This result remains even when we condition on the loan amount in column (5). The insignificant interaction term tells us that there is no difference between a TL loan and a FX loan during an appreciation episode given the same amount of collateral. According to the "risk-taking channel," USD loans are "cheaper" relative to TL loans during an appreciation of TL, since a firm who wants to borrow in USD can post less collateral in TL, since the lira is appreciating and TL collateral is now worth more, thus relaxing firms' borrowing constraints. At the same time the existing USD liabilities are worth less and existing TL assets are worth more on the balance sheets, increasing firms' net worth. Therefore, for the same collateral, an FX loan should either be contracted at a lower interest rate and/or the FX loan amount should increase viz. a TL loan. The results in column (5) do not support this implication of the risk-taking channel when looking at interest rates. However, it is also possible that the effect is being pick up via loan volumes only. To test for this possibility, column (1) of Table 8 runs the same regression, but using the loan value rather than the interest rate as the endogenous variable. The estimates show that though FX loans are indeed higher in volume during appreciations in general, the effect is actually opposite when conditioning on the level of collateral ratio (i.e., the interaction term is negative and significant). Put differently, higher collateral leads to more loan volume but not for FX loans.

Next, in looking at the depreciation episode in column (4) of Table 7, we find that FX loans and higher collateral loans are cheaper, but not FX loans for the same level of collateral. In fact, these loans are more expensive. This result is as expected, since during such episodes the risk premium on FX loans increase, as also captured by our framework. This result holds when we also condition on the loan amount in column (6) of the table. Consistent with this interest rate channel finding, column (2) of Table 8 shows that the loan amount is higher in FX during a depreciation and that higher collateral leads to higher loan volume, but not for FX loans, where FX loans are smaller than TL loans for a given collateral during a depreciation.

Finally, we plot the estimated opening month fixed effects from column (1) of Table 7 in Figure 5, shown with the red line. There is a correlation of 0.87 with VIX (blue line on left axis) and the time series behavior of the borrowing costs for the firms (red line on right axis). The correlation is 0.47 before the QE period (shown as shaded area), and becomes 0.71 during the QE period.[31] Therefore, global shocks via VIX are passed-through to firms' borrowing rate almost one-for-one, especially in the QE period. The figure also plots the bilateral TL/USD exchange rate on the left axis. Until the end of 2008, there was an appreciation trend in TL as capital flowed into the country. Starting in 2009, with the exception of the second part of QE1, the lira experienced a persistent depreciation viz. the USD. Nevertheless, the correlation of loan rates and VIX got stronger over time and borrowing costs experienced a persistent decline, regardless of the exchange rate movements. This piece of evidence also provides additional support to our key transmission channel, that is the interest rate channel.

[31] Note that the overall correlation includes the quarter of Lehman's collapse, while the the two sub-samples exclude this quarter when calculating the correlations.

# 7 Conclusion

This paper exploits a unique firm-bank-loan-month-level dataset for a major emerging economy to study the impact of capital inflows on domestic credit growth. Our estimation strategy allows us to identify an important role for supply-side driven capital flows in expanding the volume of credit as well as reducing the borrowing costs faced by firms in the corporate sector. We further exploit our empirical strategy to uncover important results on the cyclicality of credit growth along several dimensions. First, both foreign and domestic currency loans expand during periods of global liquidity, but while foreign currency loans are cheaper on average, during periods of abundant global liquidity the cost of domestic currency loans fall more compared to FX loans. Second, larger banks expand their lending and lower their borrowing rates more than smaller banks during periods of high capital inflows, though when it comes to the currency composition of loans, smaller banks decrease foreign currency borrowing rates relatively more than larger banks. Finally, it is smaller firms who are able to take greater advantage of the increase in capital inflow induced credit supply, both along the loan volume and interest rate dimensions.

Our overall interpretation of these findings is that banks' funding costs decrease during episodes of abundant global liquidity, and larger banks who are more connected to international financial markets not only benefit from lower funding costs more, but also they have reflected this as lower cost of borrowing to firms, especially to smaller firms who were presumably financially constrained before the global liquidity shock. The results at the bank and firm-level provide novel insights on the heterogeneous impact of the international spillovers of the global financial cycle, which are relevant both for theoretical modeling and policy.

## References


Acharya, Viral, Stephen Cecchetti, José De Gregorio, Şebnem Kalemli-Özcan, Philip R. Lane, and Ugo Panizza. 2015. "Corporate Debt in Emerging Economies: A Threat to Financial Stability?" The Brookings Institution and the Centre for International Governance Innovation, http://www.brookings.edu/research/papers/2015/09/corporate-debt-emerging-economies.

Adrian, Tobias and Hyun Song Shin. 2014. "Procyclical Leverage and Value-at-Risk." *Review of Financial Studies* 27 (2):373–403.

Aoki, Kosuke, Gianluca Benigno, and Nobuhiro Kiyotaki. 2015. "Monetary and Financial Policies in Emerging Markets." Mimeo, Tokyo University, London School of Economics, and Princeton.

Avdjiev, Stefan, Michael Chui, and Hyun Song Shin. 2014. "Non-Financial Corporations from Emerging Market Economies and Capital Flows." *BIS Quarterly Review* URL https://ideas.repec.org/a/bis/bisqtr/1412h.html.

Avdjiev, Stefan, Catherine Koch, and Hyun Song Shin. 2016. "Exchange Rates and the Transmission of Global Liquidity." Mimeo, BIS.

Baskaya, Yusuf Soner and Şebnem Kalemli-Özcan. 2016. "Sovereign Risk and Bank Lending: Evidence from 1999 Turkish Earthquake." NBER Working Paper No. 22335.

Berger, Allen N., Leora F. Klappe, María Soledad Martínez Pería, and Rida Zaidi. 2008. "Bank ownership type and banking relationships." *Journal of Financial Intermediation* 17 (1):37–62. URL https://ideas.repec.org/a/eee/jfinin/v17y2008i1p37-62.html.

Blanchard, Olivier, Jonathan D. Ostry, Atish R. Ghosh, and Marcos Chamon. 2015. "Are Capital Inflows Expansionary or Contractionary? Theory, Policy Implications, and Some Evidence." NBER Working Paper No. 21619.

Bruno, Valentina and Hyun S. Shin. 2013. "Global Factors in Capital Flows and Credit Growth." URL https://ideas.repec.org/p/pri/cepsud/237shin.html. Griswold Center for Economic Policy Studies Working Paper No. 237.

———. 2015a. "Capital flows and the risk-taking channel of monetary policy." *Journal of Monetary Economics* 71:119–132. URL http://www.sciencedirect.com/science/article/pii/S0304393214001688.

———. 2015b. "Cross-Border Banking and Global Liquidity." *Review of Economic Studies* 82 (2):535–564.

Calvo, Guillermo, Leonardo Leiderman, and Carmen Reinhart. 1993. "Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors." *IMF Staff Papers* 40 (1):108–151.

———. 1996. "Inflows of Capital to Developing Countries in the 1990s." *Journal of Economic Perspectives* 102 (2):123–139.

Caruana, Jaime. 2016. "Credit, Commodities and Currencies." London School of Economics, Systemic Risk Centre Public Lecture.

Cerutti, Eugenio, Stijn Claessens, and Damien Puy. 2015. "Push Factors and Capital Flows to Emerging Markets: Why Knowing Your Lender Matters More Than Fundamentals." IMF Working Paper No. 15/127.

Céspedes, Luis Felipe, Roberto Chang, and Andrés Velasco. 2004. "Balance Sheets and Exchange Rate Policy." *American Economic Review* 94 (4):1183–1193.

Cetorelli, Nicola and Linda S. Goldberg. 2011. "Global Banks and International Shock Transmission: Evidence from the Crisis." *IMF Economic Review* 59 (1):41–76.

———. 2012. "Liquidity management of U.S. global banks: Internal capital markets in the great recession." *Journal of International Economics* 88 (2):299–311. URL http://www.sciencedirect.com/science/article/pii/S0022199612000918.

Chen, Victor Z. and Sara Hambright. 2015. "Home Regulatory Institutions and Outward FDI from Emerging Markets: An Empirical Review of China Studies." Available at SSRN 2551236.

Chui, Michael, Emese Kuruc, and Philip Turner. 2016. "A New Dimension to Currency Mismatches in the Emerging Markets." BIS Working Paper No. 550.

Claessens, Stijn and Neeltje van Horen. 2013. "Impact of Foreign Banks." URL https://ideas.repec.org/p/dnb/dnbwpp/370.html. DNB Working Paper No. 370.

Cull, Robert and María Soledad Martínez Pería. 2013. "Bank ownership and lending patterns during the 2008–2009 financial crisis: Evidence from Latin America and Eastern Europe." *Journal of Banking & Finance* 37 (12):4861–4878. URL http://www.sciencedirect.com/science/article/pii/S0378426613003488.

De Haas, Ralph and Iman van Leylveld. 2014. "Multinational Banks and the Global Financial Crisis: Weathering the Perfect Storm?" *Journal of Money, Credit and Banking* 46 (s1):333–364. URL http://dx.doi.org/10.1111/jmcb.12094.

Farhi, Emmanuel and Ivan Werning. 2015. "A Theory of Macroprudential Policies in the Presence of Nominal Rigidities." Mimeo, Harvard University and MIT.

Fernandez-Arias, Eduardo. 1996. "The New Wave of Private Capital Inflows: Push or Pull?" *Journal of Development Economics* 48 (2):389–418.

Forbes, Kristin J. and Francis E. Warnock. 2012. "Capital flow waves: Surges, stops, flight, and retrenchment." *Journal of International Economics* 88 (2):235–251. URL http://www.sciencedirect.com/science/article/pii/S0022199612000566.

Fratzscher, Marcel. 2011. "Capital Flows, Push versus Pull Factors and the Global Financial Crisis." URL http://www.nber.org/papers/w17357. NBER Working Paper No. 17357. Forthcoming, *Journal of International Economics*.

Fratzscher, Marcel, Marco Lo Duca, and Roland Straub. 2013. "On the International Spillovers of US Quantitative Easing." URL https://ideas.repec.org/p/diw/diwwpp/dp1304.html. DWI Berlin Discussion Paper No. 1304.

Giannetti, Mariassunta and Steven Ongena. 2009. "Financial Integration and Firm Performance: Evidence from Foreign Bank Entry in Emerging Markets." *Review of Finance* 13 (2):181–223. URL http://rof.oxfordjournals.org/content/13/2/181.abstract.

Gormley, Todd A. 2010. “The impact of foreign bank entry in emerging markets: Evidence from India.” *Journal of Financial Intermediation* 19 (1):26–51. URL http://www.sciencedirect.com/science/article/pii/S1042957309000291.

Hahm, Joon-Ho, Hyun Song Shin, and Kwanho Shin. 2013. “Noncore Bank Liabilities and Financial Vulnerability.” *Journal of Money, Credit and Banking* 45 (S1):3–36. URL http://dx.doi.org/10.1111/jmcb.12035.

Hofmann, Boris, Ilhyock Shim, and Hyun Song Shin. 2016. “Sovereign Yields and the Risk-Taking Channel of Currency Appreciation.” BIS Working Paper No. 538.

Jiménez, Gabriel, Steven Ongena, José-Luis Peydró, and Jesús Saurina. 2012. “Credit Supply and Monetary Policy: Identifying the Bank Balance-Sheet Channel with Loan Applications.” *American Economic Review* 102 (5):2301–2326. URL http://www.aeaweb.org/articles.php?doi=10.1257/aer.102.5.2301.

———. 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. URL http://dx.doi.org/10.3982/ECTA10104.

Jordà, Óscar, Moritz Schularick, and Alan M. Taylor. 2013. “When Credit Bites Back.” *Journal of Money, Credit and Banking* 45 (S2):3–28. URL http://dx.doi.org/10.1111/jmcb.12069.

———. 2015. “Betting the house.” *Journal of International Economics* 96 (S1):S2–S18. URL https://ideas.repec.org/a/eee/inecon/v96y2015is1ps2-s18.html.

Kalemli-Özcan, Şebnem, Herman Kamil, and Carolina Villegas-Sanchez. 2014. “What Hinders Investment in the Aftermath of Financial Crises: Insolvent Firms or Illiquid Banks?” Forthcoming, *Review of Economics & Statistics*.

Kalemli-Özcan, Şebnem, Bent Sorensen, and Sevcan Yesiltas. 2012. “Leverage Across Firms, Banks, and Countries.” *Journal of International Economics* 88 (2):284–298.

Kashyap, Anil K. and Jeremy C. Stein. 2000. “What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?” *American Economic Review* 90 (3):407–428. URL http://www.aeaweb.org/articles.php?doi=10.1257/aer.90.3.407.

Khwaja, Asim I. and Atif Mian. 2008. “Tracing the Impact of Bank Liquidity Shocks: Evidence from an Emerging Market.” *American Economic Review* 98 (4):1413–1442. URL http://www.aeaweb.org/articles.php?doi=10.1257/aer.98.4.1413.

Kindleberger, Charles P. 1978. “Government and International Trade.” Princeton Essays in International Finance No. 129.

Korinek, Anton. 2011. “Systemic risk-taking: amplification effects, externalities, and regulatory responses.” URL https://ideas.repec.org/p/ecb/ecbwps/20111345.html. ECB Working Paper No. 1345.

Korinek, Anton and Damiano Sandri. 2016. “Capital Controls or Macroprudential Regulation?” *Journal of International Economics* 99 (S1):S27–S42.

Mian, Atif. 2006. “Distance Constraints: The Limits of Foreign Lending in Poor Economies.” *Journal of Finance* 61 (3):1465–1505. URL http://dx.doi.org/10.1111/j.1540-6261.2006.00878.x.

Miranda-Agrippino, Silvia and Hélène Rey. 2015. "World Asset Markets and the Global Financial Cycle." URL http://www.nber.org/papers/w21722.

Paravisini, Daniel. 2008. "Local Bank Financial Constraints and Firm Access to External Finance." *Journal of Finance* 63 (5):2161–2193. URL http://dx.doi.org/10.1111/j.1540-6261.2008.01393.x.

Puri, Manju, Jörg Rocholl, and Sascha Steffen. 2011. "Global retail lending in the aftermath of the US financial crisis: Distinguishing between supply and demand effects." *Journal of Financial Economics* 100 (3):556–578. URL https://ideas.repec.org/a/eee/jfinec/v100y2011i3p556-578.html.

Reinhart, Carmen M. and Kenneth S. Rogoff. 2009. *This Time Is Different: Eight Centuries of Financial Folly*. Princeton, NJ: Princeton University Press.

Rey, Hélène. 2015. "Dilemma not Trilemma: The global Financial Cycle and Monetary Policy Independence." URL http://www.nber.org/papers/w21162. NBER Working Paper No. 21162.

———. 2016. "International Channels of Transmission of Monetary Policy and the Mundellian Trilemma." URL http://www.nber.org/papers/w21852. NBER Working Paper No. 21852.

Schnabl, Philipp. 2012. "The International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market." *Journal of Finance* 67 (3):897–932. URL http://dx.doi.org/10.1111/j.1540-6261.2012.01737.x.

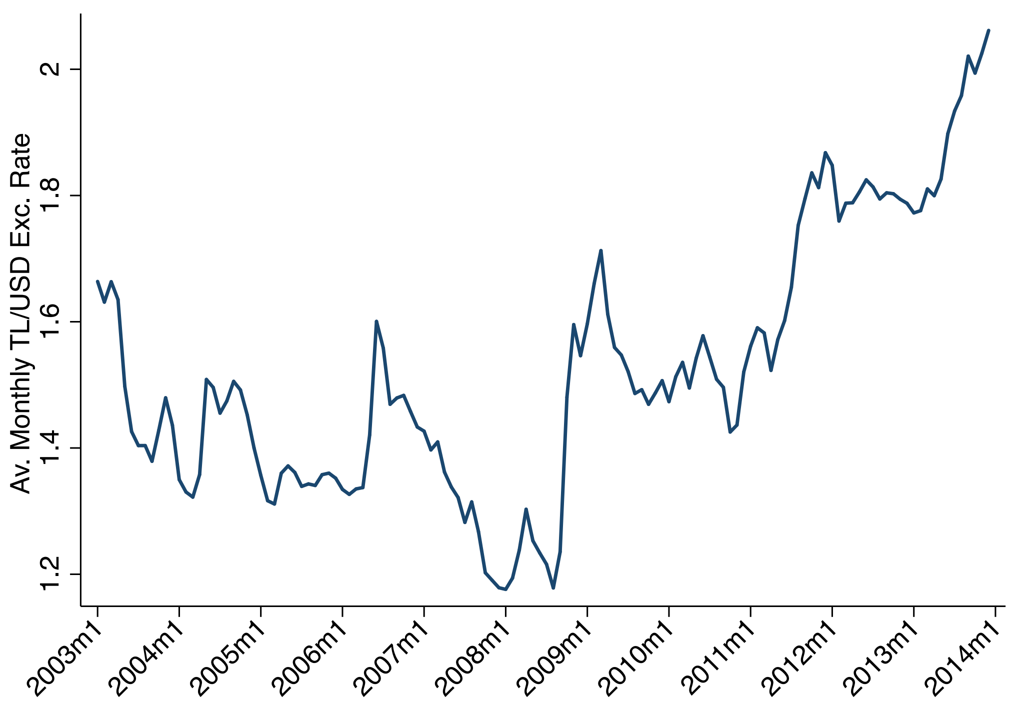
Schularick, Moritz and Alan M. Taylor. 2012. "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870-2008." *American Economic Review* 102 (2):1029–1061. URL http://www.aeaweb.org/articles.php?doi=10.1257/aer.102.2.1029.

Sobrun, Jhuvesh and Philip Turner. 2015. "Bond markets and monetary policy dilemmas for the emerging markets." URL https://ideas.repec.org/p/bis/biswps/508.html. BIS Working Paper No. 508.

Staiger, Douglas and James H. Stock. 1997. "Instrumental Variables Regression with Weak Instruments." *Econometrica* 65 (3):557–586. URL http://www.jstor.org/stable/2171753.

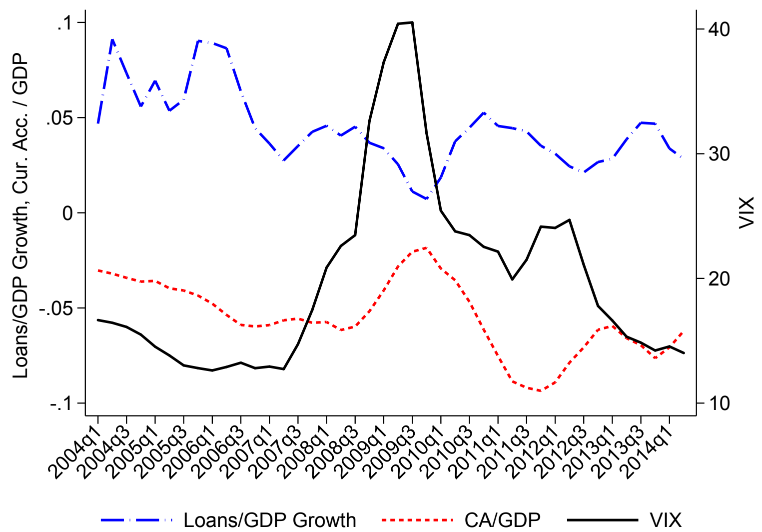
Stock, James H, Jonathan H Wright, and Motohiro Yogo. 2002. "A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments." *Journal of Business & Economic Statistics* 20 (4):518–529.

**Figure 1.** Exchange Rate, 2003–13

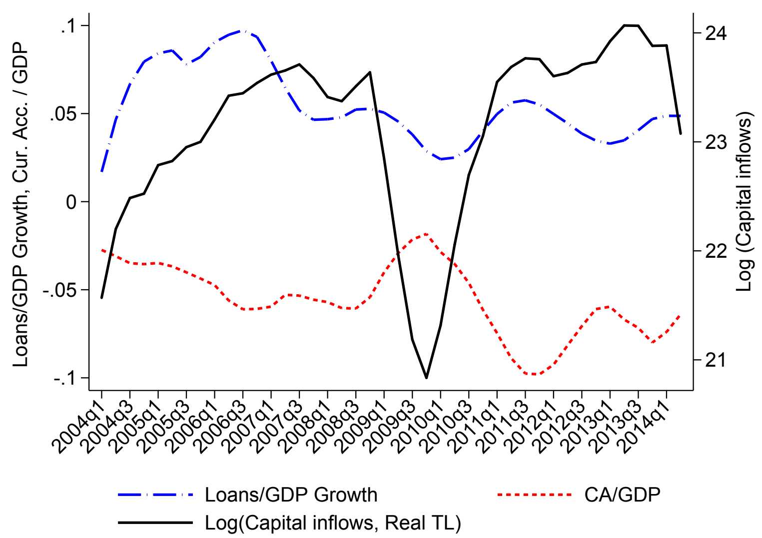



**Notes:** This figure plots the average monthly Turkish lira/USD exchange rate, where an increase implies a *depreciation* of the lira. Source: CBRT.

**Figure 2.** Capital Flows, VIX, and Credit Growth in Turkey, 2003–13



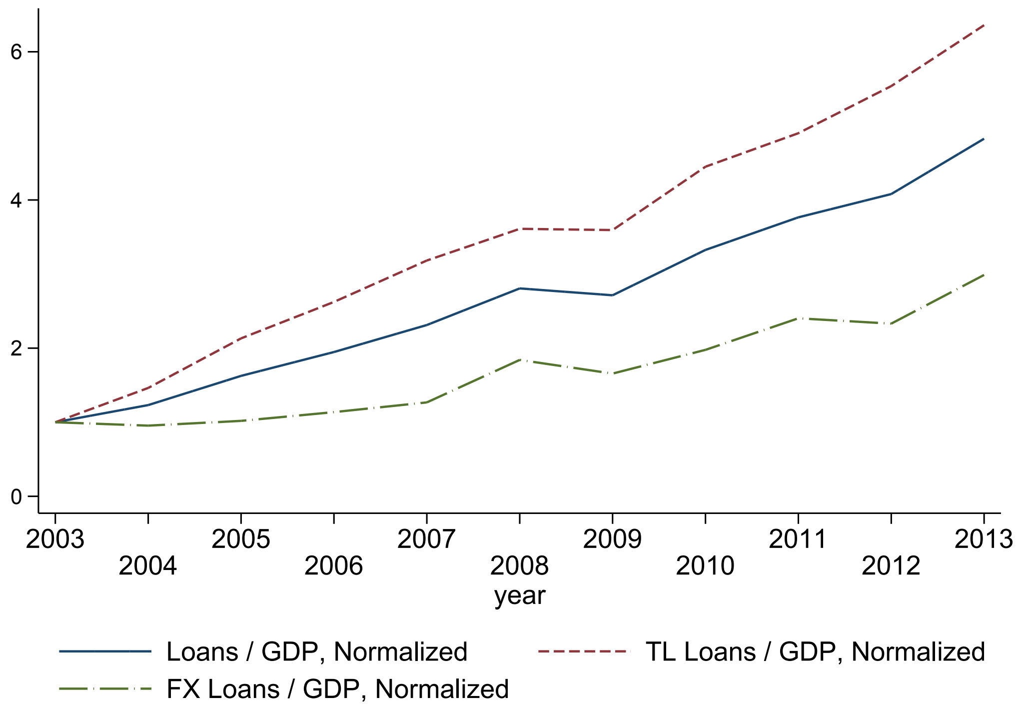

**(a)** VIX




**(b)** Capital Inflows

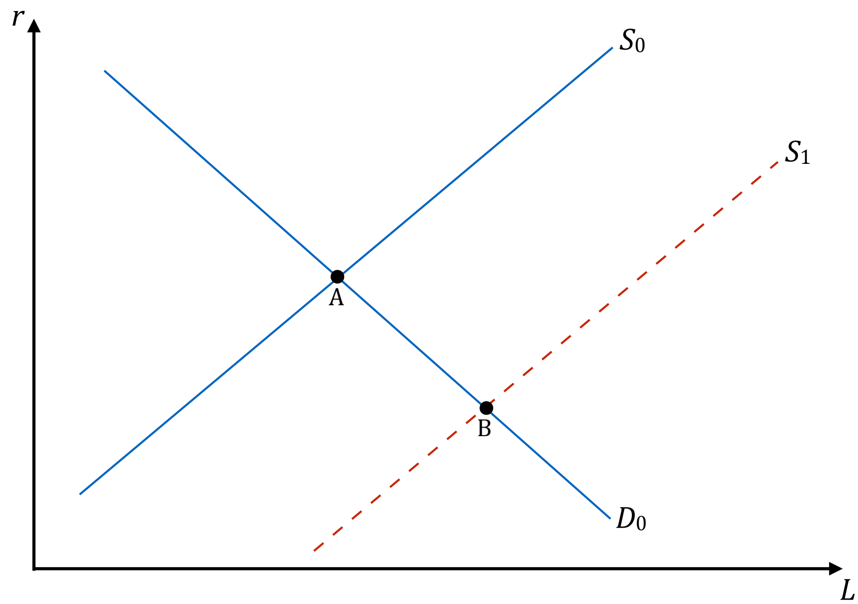
**Notes:** These figures plot Turkey's Loans/GDP and CA/GDP ratios over time with (a) VIX and (b) Turkish capital inflows. Turkey's Loans/GDP, CA/GDP, and Capital inflows are sourced from the CBRT, and VIX is the period average. Four-quarter moving averages are plotted.

**Figure 3.** Loan Growth, 2003–13

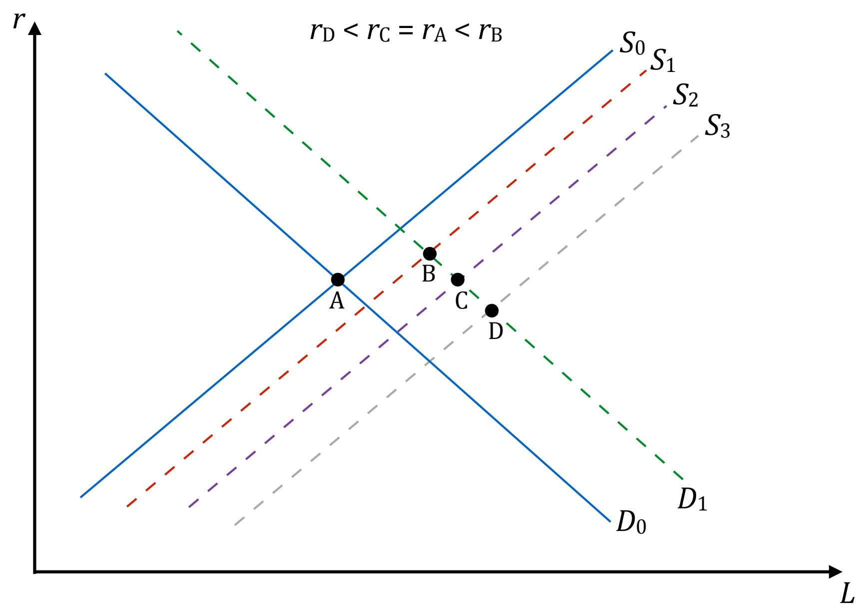



**Notes:** This figure plots the end of year ratio of total outstanding loans reported in balance sheets of Turkish banks to Turkish GDP, where each year's ratio is normalized with the ratio for the first year of sample, 2003. 'Loans/GDP' is for total loans, while 'TL Loans/GDP' and 'FX Loans/GDP' are ratios for loans denominated in Turkish lira and foreign currency, respectively. Source: official bank data, CBRT.

**Figure 4.** Supply and Demand Shocks to Credit Market: Relative impacts

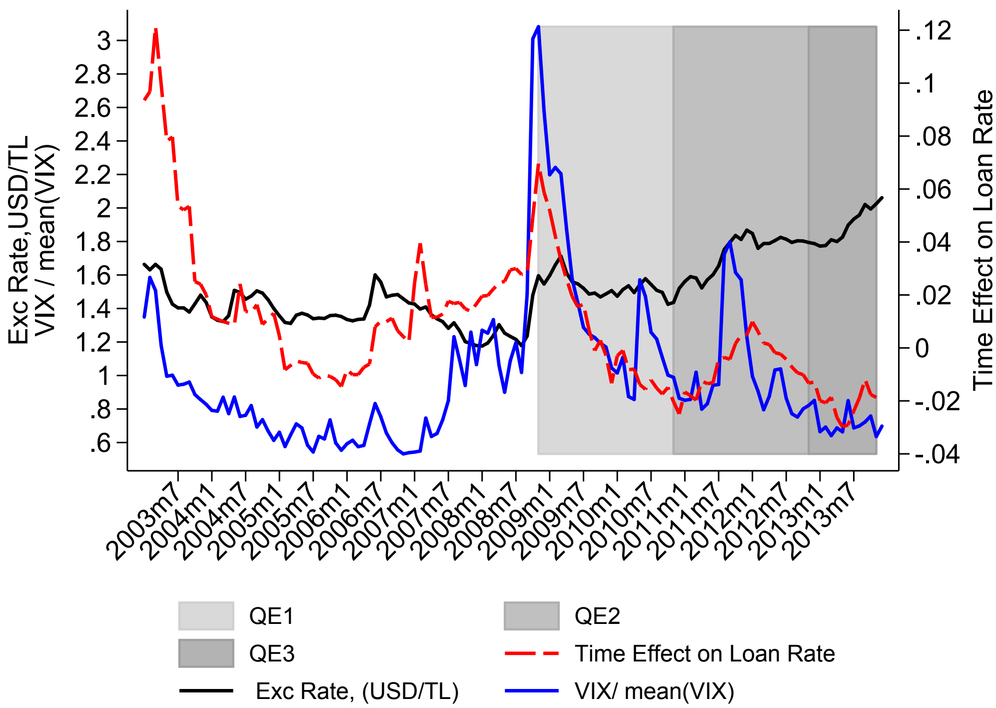



**(a)** Supply shock




**(b)** Supply and Demand shocks

**Figure 5.** VIX and Borrowing Costs, 2003–13




**Notes:** This figure plots the relationship between the VIX and borrowing costs in Turkey. The figure also plots the TL/USD bilateral exchange rate. The shaded areas highlight different Quantitative Easing (QE) periods of the US Federal Reserve Monetary policy. VIX is the quarterly average and re-scaled by its mean. The "Time effect on Loan Rate is the estimated coefficient on month fixed effect, where month capture the month that a given loan is originated. The other estimated coefficients of this regression are shown in Table 7.

**Table 1.** Capital Flows/VIX, Loans, and Interest Rates, 2003–13

| | $\log(\text{Loans}_t)$ | | $\log(1+r_t)$ | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| $\log(\text{VIX}_{t-1})$ | -0.154[a] | | 0.022[a] | |
| | (0.002) | | (9.65e-05) | |
| $\log(\text{K Inflows}_{t-1})$ | | 0.064[a] | | -0.005[a] |
| | | (0.0005) | | (3.07e-05) |
| FX | 2.065[a] | 2.067[a] | -0.084[a] | -0.084[a] |
| | (0.010) | (0.010) | (0.0001) | (0.0001) |
| Observations | 20,466,225 | 20,466,225 | 20,466,225 | 20,466,225 |
| R-squared | 0.163 | 0.163 | 0.104 | 0.101 |
| Macro controls & trend | Yes | Yes | Yes | Yes |

**Notes:** This table presents results for the regressions (1) and (2) using quarterly data for all loans. Columns (1) and (2) use the natural logarithm of total loans between a bank-firm as the dependent variable, and columns (3) and (4) use the natural logarithm of one plus the weighted-average of interest rates for loans between a bank-firm as the dependent variable. VIX is the quarterly average, and the K Inflows variable is real quarterly gross capital inflows into Turkey. Lagged Turkish real GDP growth, inflation, and a linear time trend are included as regressors. Regressions are all weighted-least square, where weights are equal to the loan share. Standard errors are clustered at the firm level, and'$a$' indicates significance at the 1% level '$b$' at the 5% level, and '$c$' at the 10% level.

**Table 2.** Capital Flows/VIX, Loans, and Interest Rates: Bank-Firm Heterogeneity, 2003–13

| | Panel A: log($Loans_t$) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| log($VIX_{t-1}$) | -0.059[a] | -0.083[a] | -0.046[a] | | | |
| | (0.001) | (0.001) | (0.0008) | | | |
| log(K $Inflows_{t-1}$) | | | | 0.033[a] | 0.031[a] | 0.017[a] |
| | | | | (0.0003) | (0.0003) | (0.0003) |
| FX | 0.643[a] | 0.642[a] | 0.676[a] | 0.642[a] | 0.642[a] | 0.676[a] |
| | (0.007) | (0.008) | (0.008) | (0.007) | (0.008) | (0.008) |
| Observations | 20,029,304 | 19,958,289 | 19,148,823 | 20,029,304 | 19,958,289 | 19,148,823 |
| R-squared | 0.849 | 0.850 | 0.901 | 0.849 | 0.850 | 0.901 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank controls | No | Yes | Yes | No | Yes | Yes |
| Firm×year F.E. | No | No | Yes | No | No | Yes |

| | Panel B: log(1+$r_t$) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| log($VIX_{t-1}$) | 0.016[a] | 0.015[a] | 0.013[a] | | | |
| | (7.57e-05) | (7.90e-05) | (6.31e-05) | | | |
| log(K $Inflows_{t-1}$) | | | | -0.003[a] | -0.002[a] | -0.002[a] |
| | | | | (2.18e-05) | (2.24e-05) | (2.26e-05) |
| FX | -0.078[a] | -0.078[a] | -0.078[a] | -0.078[a] | -0.078[a] | -0.078[a] |
| | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) | (0.0002) |
| Observations | 20,029,304 | 19,958,289 | 19,148,823 | 20,029,304 | 19,958,289 | 19,148,823 |
| R-squared | 0.782 | 0.784 | 0.877 | 0.780 | 0.782 | 0.877 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank controls | No | Yes | Yes | No | Yes | Yes |
| Firm×year F.E. | No | No | Yes | No | No | Yes |

**Notes:** This table presents results for the regressions (1) and (2) using quarterly data for all loans. Lagged Turkish real GDP growth, inflation, and a linear time trend are included as regressors. Furthermore, the following lagged values of the following bank-level characteristics are also controlled for (not reported): log(assets), capital ratio, capital adequacy ratio (CAR), liquidity ratio, noncore liabilities ratio, and return on total assets (ROA). Panel A uses the natural logarithm of total loans between a bank-firm as the dependent variable, and Panel B uses the natural logarithm of one plus the weighted-average of interest rates for loans between a bank-firm as the dependent variable. VIX is the quarterly average, and the K Inflows variable is real quarterly gross capital inflows into Turkey. Regressions are all weighted-least square, where weights are equal to the loan share. Standard errors are clustered at the firm level, and '$a$' indicates significance at the 1% level '$b$' at the 5% level, and '$c$' at the 10% level.

**Table 3.** Capital Flows/VIX, Loans, and Interest Rates: Instrumental Variables Regressions, 2003–13

| | $\log(\text{Loans}_t)$ | | | $\log(1{+}r_t)$ | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\log(\text{K Inflows}_{t-1})$ | $0.036^a$ | $0.050^a$ | $0.104^a$ | $-0.010^a$ | $-0.009^a$ | $-0.029^a$ |
| | (0.0006) | (0.0007) | (0.002) | (4.60e-05) | (4.79e-05) | (0.0002) |
| FX | $-0.022^b$ | $0.074^a$ | $0.984^a$ | $0.045^a$ | $0.024^a$ | $-0.312^a$ |
| | (0.009) | (0.009) | (0.020) | (0.0008) | (0.0007) | (0.002) |
| Observations | 20,029,304 | 19,958,289 | 19,148,823 | 20,029,304 | 19,958,289 | 19,148,823 |
| R-squared | 0.849 | 0.850 | 0.901 | 0.776 | 0.779 | 0.861 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank controls | No | Yes | Yes | No | Yes | Yes |
| Firm×year F.E. | No | No | Yes | No | No | Yes |
| First-stage F-stat | 19.55 | 19.55 | 19.55 | 19.55 | 19.55 | 19.55 |

**Notes:** This table presents results for the IV regressions (1) and (2) for all loans. Log(K inflows) are instrumented by log(VIX). Lagged Turkish real GDP growth, inflation, and a linear time trend are included as regressors. Furthermore, the following lagged values of the following bank-level characteristics are also controlled for (not reported): log(assets), capital ratio, capital adequacy ratio (CAR), liquidity ratio, noncore liabilities ratio, and return on total assets (ROA). Columns (1)-(3) use the natural logarithm of total loans between a bank-firm as the dependent variable, and columns (4)-(6) use the natural logarithm of one plus the weighted-average of interest rates for loans between a bank-firm as the dependent variable. VIX is the quarterly average, and the K Inflows variable is real quarterly gross capital inflows into Turkey. Regressions are all weighted-least square, where weights are equal to the loan share. Standard errors are clustered at the firm level, and '$a$' indicates significance at the 1% level '$b$' at the 5% level, and '$c$' at the 10% level. See Table A13 for the first-stage regression.

**Table 4.** VIX and Currency Composition of Loans, 2003–13

| | log(Loans$_t$) | | | log(1+$r_t$) | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| log(VIX$_{t-1}$) | -0.058$^a$ | -0.082$^a$ | | 0.017$^a$ | 0.016$^a$ | |
| | (0.001) | (0.001) | | (8.09e-05) | (8.47e-05) | |
| FX×log(VIX$_{t-1}$) | -0.014$^a$ | -0.008$^c$ | -0.010 | -0.012$^a$ | -0.010$^a$ | -0.014$^a$ |
| | (0.005) | (0.005) | (0.009) | (0.0002) | (0.0002) | (0.0004) |
| FX | 0.685$^a$ | 0.666$^a$ | 0.689$^a$ | -0.042$^a$ | -0.047$^a$ | -0.078$^a$ |
| | (0.015) | (0.015) | (0.009) | (0.0006) | (0.0006) | (0.0003) |
| Observations | 20,029,304 | 19,958,289 | 9,266,767 | 20,029,304 | 19,958,289 | 9,266,767 |
| R-squared | 0.849 | 0.850 | 0.876 | 0.782 | 0.784 | 0.854 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | Yes | No | Yes | Yes | No |
| Bank controls | No | Yes | Yes | No | Yes | Yes |
| Firm×quarter F.E. | No | No | Yes | No | No | Yes |

**Notes:** This table presents results for the regressions (3) and (4) using quarterly data for all loans. Lagged Turkish real GDP growth, inflation, and a linear time trend are included as regressors. Furthermore, the following lagged values of the following bank-level characteristics are also controlled for (not reported): log(assets), capital ratio, capital adequacy ratio (CAR), liquidity ratio, noncore liabilities ratio, and return on total assets (ROA). Columns (1)-(3) use the natural logarithm of total loans between a bank-firm as the dependent variable, and columns (4)-(6) use the natural logarithm of one plus the weighted-average of interest rates for loans between a bank-firm as the dependent variable. VIX is the quarterly average. Regressions are all weighted-least square, where weights are equal to the loan share. Standard errors are clustered at the firm level, and '$a$' indicates significance at the 1% level '$b$' at the 5% level, and '$c$' at the 10% level.

**Table 5.** VIX and Bank Size, 2003–13

| | log(Loans$_t$) | | | | log(1+$r_t$) | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| log(VIX$_{t-1}$) | -0.069$^a$ | | | | 0.021$^a$ | | | |
| | (0.001) | | | | (0.0001) | | | |
| log(VIX$_{t-1}$)×log(Assets$_{t-1}$) | 0.019$^a$ | -0.129$^a$ | -0.111$^a$ | -0.107$^a$ | -0.029$^a$ | 0.032$^a$ | 0.029$^a$ | 0.035$^a$ |
| | (0.003) | (0.008) | (0.009) | (0.009) | (0.0003) | (0.0004) | (0.0004) | (0.0005) |
| log(VIX$_{t-1}$)×FX | | | | -0.006 | | | | -0.013$^a$ |
| | | | | (0.009) | | | | (0.0004) |
| log(VIX$_{t-1}$)×log(Assets$_{t-1}$)×FX | | | | 0.031 | | | | -0.010$^a$ |
| | | | | (0.024) | | | | (0.001) |
| log(Assets$_{t-1}$) | 0.137$^a$ | 0.446$^a$ | 0.471$^a$ | 0.122$^a$ | 0.089$^a$ | -0.096$^a$ | -0.089$^a$ | -0.016$^a$ |
| | (0.011) | (0.026) | (0.026) | (0.008) | (0.0009) | (0.001) | (0.001) | (0.0005) |
| log(Assets$_{t-1}$)×FX | | | | 0.053$^a$ | | | | 0.023$^a$ |
| | | | | (0.014) | | | | (0.0007) |
| FX | 0.645$^a$ | 0.691$^a$ | 0.689$^a$ | 0.801$^a$ | -0.078$^a$ | -0.079$^a$ | -0.078$^a$ | -0.072$^a$ |
| | (0.007) | (0.009) | (0.009) | (0.009) | (0.0002) | (0.0003) | (0.0002) | (0.0003) |
| Observations | 19,985,567 | 9,281,588 | 9,266,767 | 9,637,910 | 19,985,567 | 9,281,588 | 9,266,767 | 9,637,910 |
| R-squared | 0.850 | 0.876 | 0.876 | 0.868 | 0.783 | 0.853 | 0.854 | 0.842 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | No | No | No | Yes | No | No | No |
| Firm×quarter F.E. | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Bank controls | No | No | Yes | Yes | No | No | Yes | Yes |

**Notes:** This table presents results for the regressions (5) and (6) using quarterly data for all loans. Lagged Turkish real GDP growth, inflation, and a linear time trend are included as regressors. Furthermore, the following lagged values of the following bank-level characteristics are also controlled for (not reported): log(assets), capital ratio, capital adequacy ratio (CAR), liquidity ratio, noncore liabilities ratio, and return on total assets (ROA). Columns (1)-(4) use the natural logarithm of total loans between a bank-firm as the dependent variable, and column (5)-(8) use the natural logarithm of one plus the weighted-average interest rate for loans between a bank-firm as the dependent variable. Columns (1)-(3) and columns (5)-(7) add more controls and fixed effects moving from left to right, respectively. Columns (4) and (8) include further FX interactions, and employ the most stringent set of fixed effects. VIX is the quarterly average. Regressions are all weighted-least square, where weights are equal to the loan share. Standard errors are clustered at the firm level, and '$a$' indicates significance at the 1% level '$b$' at the 5% level, and '$c$' at the 10% level.

**Table 6.** VIX and Firm Size, 2003–13

| | log($Loans_t$) | | | | log(1+$r_t$) | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| log($VIX_{t-1}$) | -0.111[a] | | | | 0.015[a] | | | |
| | (0.007) | | | | (0.0004) | | | |
| log($VIX_{t-1}$)×$Size_f$ | 0.050[a] | 0.065[a] | 0.054[a] | 0.077[a] | -0.004[a] | -0.005[a] | -0.005[a] | -0.004[a] |
| | (0.010) | (0.010) | (0.010) | (0.013) | (0.0005) | (0.0004) | (0.0004) | (0.001) |
| log($VIX_{t-1}$)×FX | | | | 0.025 | | | | -0.011[a] |
| | | | | (0.018) | | | | (0.001) |
| log($VIX_{t-1}$)×$Size_f$×FX | | | | -0.054[b] | | | | 0.002[b] |
| | | | | (0.024) | | | | (0.001) |
| $Size_f$×FX | | | | 0.160[a] | | | | -8.28e-05 |
| | | | | (0.030) | | | | (0.001) |
| FX | 0.787[a] | 0.784[a] | 0.784[a] | 0.678[a] | -0.074[a] | -0.075[a] | -0.075[a] | -0.075[a] |
| | (0.016) | (0.016) | (0.016) | (0.022) | (0.0004) | (0.0004) | (0.0004) | (0.001) |
| Observations | 1,079,630 | 1,086,803 | 1,086,803 | 1,086,803 | 1,079,630 | 1,086,803 | 1,086,803 | 1,086,803 |
| R-squared | 0.719 | 0.722 | 0.723 | 0.723 | 0.701 | 0.758 | 0.758 | 0.759 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | No | No | No | Yes | No | No | No |
| Bank×quarter F.E. | No | Yes | Yes | Yes | No | Yes | Yes | Yes |
| Bank controls | Yes | No | No | No | Yes | No | No | No |
| Firm controls | No | No | Yes | Yes | No | No | Yes | Yes |

**Notes:** This table presents results for the regressions (7) and (8) using quarterly data for loans with firm matched data. $Size_f$ is a 0/1 dummy indicating whether a firm is larger than the mean firm ( $= 1$) or smaller ( $= 0$); the variable is time invariant. Lagged Turkish real GDP growth, inflation, and a linear time trend are included as regressors. Furthermore, the following lagged values of the following bank-level characteristics are also controlled for (not reported): log(assets), capital ratio, capital adequacy ratio (CAR), liquidity ratio, noncore liabilities ratio, and return on total assets (ROA). Firm controls include log(Assets), the net worth ratio and exports share. Columns (1)-(4) use the natural logarithm of total loans between a bank-firm as the dependent variable, and column (5)-(8) use the natural logarithm of one plus the weighted-average interest rate for loans between a bank-firm as the dependent variable. Columns (1)-(3) and columns (5)-(7) add more controls and fixed effects moving from left to right, respectively. Columns (4) and (8) include further FX interactions, and employ the most stringent set of fixed effects. VIX is the quarterly average. Regressions are all weighted-least square, where weights are equal to the loan share. Standard errors are clustered at the firm level, and '*a*' indicates significance at the 1% level '*b*' at the 5% level, and '*c*' at the 10% level.

**Table 7.** Interest Rates at Loan Origination: The Role of the Exchange Rate, 2003–13

| | | | Exchange Rate Episodes | | | |
|---|---|---|---|---|---|---|
| | (1) Mixed | (2) Mixed | (3) Appreciation | (4) Depreciation | (5) Appreciation | (6) Depreciation |
| Collateral/Principal | -0.004[a] | -0.004[a] | 0.001[a] | -0.007[a] | 0.002[a] | -0.005[a] |
| | (0.001) | (0.001) | (0.0002) | (0.001) | (0.0002) | (0.001) |
| FX | -0.091[a] | -0.096[a] | -0.104[a] | -0.083[a] | -0.101[a] | -0.075[a] |
| | (0.002) | (0.003) | (0.006) | (0.001) | (0.006) | (0.001) |
| (Collateral/Principal)×FX | | 0.005[a] | 0.002 | 0.005[a] | 0.002 | 0.005[a] |
| | | (0.001) | (0.001) | (0.001) | (0.001) | (0.001) |
| Log(principal) | | | | | -0.006[a] | -0.015[a] |
| | | | | | (0.0006) | (0.0004) |
| Observations | 14,969,320 | 14,969,320 | 3,742,536 | 10,949,759 | 3,742,536 | 10,949,759 |
| R-squared | 0.808 | 0.808 | 0.829 | 0.820 | 0.830 | 0.827 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank×quarter F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm×quarter F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Opening month F.E. | Yes | Yes | Yes | Yes | Yes | Yes |

**Notes:** This table presents results for the regressions (18) and (19) using monthly data at the loan level. All variables are measured at the loan level, where 'Principal' is the loan value, the 'Collateral/Principal' ratio is winsorized at 5 percent, and 'FX' is a dummy variable indicating whether the loan is in foreign currency ( = 1) or Turkish lira ( = 0). The regression includes a set of fixed effects at the (i) bank×firm, (ii) opening month, (iii) bank-defined risk weights, (iv) sectoral activity of the loan, (v) maturity levels, (vi) bank×quarter, and (vii) firm×quarter levels. Columns (1) and (2) span the entire sample period, 2003–13, and thus both appreciation and depreciation episodes of the Turkish lira viz. the US dollar. Column (3) and (5) consider the 2003–08 period, when the TL was appreciating against the USD, while the columns (4) and (6) span the 2008–11 period, when the TL was depreciating against the USD. Standard errors are clustered at the firm level, and '*a*' indicates significance at the 1% level '*b*' at the 5% level, and '*c*' at the 10% level.

**Table 8.** New Loans at Origination: The Role of the Exchange Rate, 2003–13

| | Exchange Rate Episodes | |
|---|---|---|
| | (1) Appreciation | (2) Depreciation |
| Collateral/Principal | 0.0914$^a$ | 0.126$^a$ |
| | (0.002) | (0.011) |
| FX | 0.511$^a$ | 0.512$^a$ |
| | (0.037) | (0.024) |
| (Collateral/Principal)×FX | -0.0524$^a$ | -0.0373$^a$ |
| | (0.008) | (0.008) |
| Observations | 3,742,536 | 10,949,759 |
| R-squared | 0.803 | 0.792 |
| Bank×firm F.E. | Yes | Yes |
| Bank×quarter F.E. | Yes | Yes |
| Firm×quarter F.E. | Yes | Yes |
| Opening month F.E. | Yes | Yes |

**Notes:** This table presents results for the regressions (19) using monthly data at the loan level, where we use the log of the loan value at time of origination, rather than the interest rate as the left-hand-side variable. The 'Collateral/Principal' ratio is winsorized at 5 percent, and 'FX' is a dummy variable indicating whether the loan is in foreign currency ( = 1) or Turkish lira ( = 0). Column (1) considers the 2003–08 period, when the TL was appreciating against the USD, while column (2) spans the 2008–11 period, when the TL was depreciating against the USD. The regressions include a set of fixed effects at the (i) bank-firm, (ii) opening month, (iii) bank defined risk weights, (iv) sectoral activity, (v) maturity levels, (vi) bank-quarter, and (vii) firm-quarter levels. Standard errors are clustered at the firm level, and '$a$' indicates significance at the 1% level '$b$' at the 5% level, and '$c$' at the 10% level.

**Figure A1.** Loan Growth Comparison of Corporate Sector and Whole Economy, 2003–13


**Notes:** This figure plots the year-on-year loan growth rate each quarter of our sample of firms ('Firms') with that of for the whole economy ('Firms + Non-Firms'). All values are nominal. Source: authors' calculations based on official credit register data, CBRT.

**Table A1.** Banking Sector Growth, Based on Official Aggregate Data, 2003–13

| | Assets/GDP | Loans/GDP | Deposit/GDP |
|---|---|---|---|
| 2003 | 0.54 | 0.14 | 0.33 |
| 2004 | 0.55 | 0.18 | 0.34 |
| 2005 | 0.6 | 0.23 | 0.37 |
| 2006 | 0.64 | 0.28 | 0.39 |
| 2007 | 0.67 | 0.32 | 0.41 |
| 2008 | 0.74 | 0.37 | 0.46 |
| 2009 | 0.84 | 0.39 | 0.51 |
| 2010 | 0.92 | 0.48 | 0.56 |
| 2011 | 0.94 | 0.53 | 0.54 |
| 2012 | 0.97 | 0.56 | 0.54 |
| 2013 | 1.11 | 0.67 | 0.60 |

**Notes:** This tables shows the banking sector's assets, loans, and liabilities relative to GDP. The banking sector variables are created by aggregating the official bank balance sheet data for the end of year. GDP data are also sourced from the CBRT.

**Table A2.** Bank-Level Quarterly Summary Statistics, Based on Official Bank-Level Balance Sheet Data, 2003–13

| | Obs. | Mean | Median | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| log(Assets) | 1,685 | 14.40 | 14.47 | 2.230 | 8.387 | 18.31 |
| Capital Ratio | 1,685 | 0.145 | 0.138 | 0.044 | 0.064 | 0.198 |
| Capital Adequacy Ratio | 1,685 | 0.270 | 0.193 | 0.152 | 0.114 | 0.556 |
| Liquity Ratio | 1,685 | 0.400 | 0.335 | 0.217 | 0.018 | 0.960 |
| Noncore Ratio | 1,685 | 0.298 | 0.227 | 0.224 | 0.000 | 0.907 |
| ROA | 1,685 | 0.012 | 0.010 | 0.010 | 0.000 | 0.033 |

**Notes:** This table presents summary statistics using quarterly data pooled over the 2003–13 period. 'Total Assets' are in nominal terms. The 'Capital Ratio' is equity over total assets; 'Capital Adequacy Ratio' is the Tier 1 risk-weighted capital ratio; the 'Liquidity Ratio' is liquid assets over total assets; the 'NPL Ratio' is non-performing loans over total assets; and 'ROA' is return on total assets. Noncore liabilities = Payables to money market + Payables to securities + Payables to banks + Funds from Repo + Securities issued (net).

**Table A3.** Credit Register FX Breakdown, 2003–13

**Panel A: Universe of Corporate Loans**

| | (1) | (2) | (3) |
|---|---|---|---|
| | *Share of FX Loans in All Loans* | | |
| | Overall | In FX | FX-Indexed |
| 2003 | 0.557 | 0.537 | 0.020 |
| 2004 | 0.469 | 0.445 | 0.024 |
| 2005 | 0.512 | 0.434 | 0.077 |
| 2006 | 0.534 | 0.453 | 0.081 |
| 2007 | 0.506 | 0.405 | 0.100 |
| 2008 | 0.558 | 0.471 | 0.087 |
| 2009 | 0.504 | 0.430 | 0.074 |
| 2010 | 0.480 | 0.409 | 0.071 |
| 2011 | 0.512 | 0.440 | 0.071 |
| 2012 | 0.446 | 0.376 | 0.070 |
| 2013 | 0.473 | 0.399 | 0.074 |

**Panel B: Sample with Matched Firm Balance Sheet Data**

| | (1) | (2) | (3) |
|---|---|---|---|
| | *Share of FX Loans in All Loans* | | |
| | Overall | In FX | FX-Indexed |
| 2003 | 0.742 | 0.719 | 0.023 |
| 2004 | 0.718 | 0.694 | 0.024 |
| 2005 | 0.689 | 0.620 | 0.069 |
| 2006 | 0.658 | 0.591 | 0.067 |
| 2007 | 0.654 | 0.565 | 0.089 |
| 2008 | 0.695 | 0.626 | 0.069 |
| 2009 | 0.661 | 0.595 | 0.066 |
| 2010 | 0.645 | 0.551 | 0.093 |
| 2011 | 0.680 | 0.584 | 0.096 |
| 2012 | 0.641 | 0.541 | 0.100 |
| 2013 | 0.671 | 0.569 | 0.102 |

**Notes:** This table presents annual summary statistics of the credit register coverage of loans, over the 2003–13 period, using end-of-year data. Panel A presents summaries for all loans in the dataset, while Panel B presents statistics based on loans for the sample that includes loans for bank-firm pairs where the firms also have usable balance sheet data (i.e., for the matched credit register and firm-level datasets). Columns (1)-(3) present the FX share of loans within the data sample: column (1) presents the overall share, while columns (2) and (3) break down the share between loans issued in a foreign currency ('In FX') and those that are indexed to foreign currency ('FX-Indexed').

**Table A4.** Credit Register Sample Coverage of Bank-Firm Relationships, 2003–13

**Panel A: Universe of Corporate Loans**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | | | *Bank-Firm Relationship* | | | Loan Share | Av. No. Rel. |
| | Banks | Firms | Single | Multiple | Total | Multiple BF | per Firm |
| 2003 | 39 | 33,519 | 27,913 | 14,909 | 42,822 | 0.682 | 2.659 |
| 2004 | 36 | 62,815 | 50,111 | 34,152 | 84,263 | 0.722 | 2.688 |
| 2005 | 37 | 97,478 | 77,788 | 52,659 | 130,447 | 0.690 | 2.674 |
| 2006 | 35 | 135,451 | 105,129 | 86,334 | 191,463 | 0.728 | 2.847 |
| 2007 | 37 | 256,969 | 199,647 | 162,519 | 362,166 | 0.730 | 2.835 |
| 2008 | 37 | 309,491 | 242,552 | 188,818 | 431,370 | 0.745 | 2.821 |
| 2009 | 37 | 341,928 | 270,223 | 193,420 | 463,643 | 0.747 | 2.697 |
| 2010 | 41 | 453,199 | 356,062 | 277,477 | 633,539 | 0.763 | 2.857 |
| 2011 | 42 | 609,666 | 465,950 | 414,300 | 880,250 | 0.776 | 2.883 |
| 2012 | 43 | 648,474 | 499,067 | 443,766 | 942,833 | 0.815 | 2.970 |
| 2013 | 44 | 872,961 | 664,595 | 599,722 | 1,264,317 | 0.814 | 2.878 |

**Panel B: Sample with Matched Firm Balance Sheet Data**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | | | *Bank-Firm Relationship* | | | Loan Share | Av. No. Rel. |
| | Banks | Firms | Single | Multiple | Total | Multiple BF | per Firm |
| 2003 | 34 | 3,820 | 1,930 | 5,833 | 5,833 | 0.814 | 3.086 |
| 2004 | 34 | 4,546 | 1,827 | 9,154 | 9,154 | 0.849 | 3.367 |
| 2005 | 34 | 5,291 | 1,901 | 11,850 | 11,850 | 0.865 | 3.496 |
| 2006 | 36 | 5,393 | 1,486 | 15,659 | 15,659 | 0.891 | 4.008 |
| 2007 | 35 | 6,349 | 1,647 | 20,225 | 20,225 | 0.881 | 4.301 |
| 2008 | 35 | 7,737 | 2,092 | 23,761 | 23,761 | 0.880 | 4.209 |
| 2009 | 34 | 8,601 | 2,390 | 25,302 | 25,302 | 0.886 | 4.074 |
| 2010 | 38 | 10,708 | 2,444 | 38,663 | 38,663 | 0.908 | 4.678 |
| 2011 | 40 | 11,462 | 2,412 | 46,161 | 46,161 | 0.916 | 5.101 |
| 2012 | 40 | 11,079 | 2,088 | 48,265 | 48,265 | 0.920 | 5.368 |
| 2013 | 42 | 9,608 | 1,724 | 44,337 | 44,337 | 0.923 | 5.624 |

**Notes:** This table presents annual summary statistics on the frequency of different types of bank-firm relationships within the credit register using end-of-year data. Panel A presents summaries for all loans in the dataset, while Panel B presents statistics based on loans for the sample that includes loans for bank-firm pairs where the firms also have usable balance sheet data (i.e., for the matched credit register and firm-level datasets). Columns (1) and (2) list the number of banks and firms, respectively; column (3) lists the number of observations where a firm has a unique banking relationship; column (4) lists the number of observations where a firm has multiple banking relationships; column (5) lists the total number of bank-firm relationships. Column (6) presents the share of loans (relative to total) from firms with multiple bank relationships, and column (7) presents the average number of multiple banking relationships a firm has in a given year.

**Table A5.** Credit Register Quarterly Summary Statistics, Bank-Firm Level, All Loans, 2003–13

**Panel A: All Loans**

| | Obs. | Mean | Median | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| Loan | 20,466,225 | 135.4 | 35.69 | 385.9 | 0.996 | 3,484 |
| Interest Rate | 20,466,225 | 0.148 | 0.131 | 0.100 | 0.000 | 0.540 |
| Collateral/Loan | 20,466,225 | 1.802 | 1.000 | 2.852 | 0.000 | 20.90 |
| Maturity | 20,466,225 | 18.35 | 12.00 | 16.82 | 0.000 | 83.00 |

**Panel B: Turkish Lira Loans**

| | Obs. | Mean | Median | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| Loan | 19,181,614 | 95.37 | 33.21 | 261.0 | 0.996 | 3,484 |
| Interest Rate | 19,181,614 | 0.154 | 0.137 | 0.100 | 0.000 | 0.540 |
| Collateral/Loan | 19,181,614 | 1.842 | 1.000 | 2.890 | 0.000 | 20.90 |
| Maturity | 19,181,614 | 18.61 | 12.43 | 16.80 | 0.000 | 83.00 |

**Panel C: FX Loans**

| | Obs. | Mean | Median | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| Loan | 1,284,611 | 733.1 | 265.5 | 987.1 | 0.996 | 3,484 |
| Interest Rate | 1,284,611 | 0.060 | 0.060 | 0.032 | 0.000 | 0.540 |
| Collateral/Loan | 1,284,611 | 1.196 | 1.000 | 2.110 | 0.000 | 20.90 |
| Maturity | 1,284,611 | 14.46 | 8.000 | 16.55 | 0.000 | 83.00 |

**Notes:** This table presents summary statistics using quarterly data for aggregate bank-firm transactions over the 2003–13 period. The sample includes loans for all bank-firm pairs reported in the dataset. Panel A presents data based on pooling all FX and TL transactions at the bank-firm×quarter level; Panel B considers only Turkish lira loans, and Panel C considers only FX loans (expressed in Turkish liras). 'Loan' is the end-of-quarter total outstanding principal for all loans between a bank-firm pair, in thousands of Turkish lira and adjusted for inflation; 'WA Interest Rate' is the weighted average of the nominal borrowing rate reported for loans between a bank-firm pair, where the weights are constructed based on loan shares between a bank-firm pair in a given quarter, and are based on either all, TL, or FX loans for Panels A-C, respectively; 'Collateral/Loan' is the ratio of the total collateral to total principal outstanding for a bank-firm pair; 'WA Maturity' is the weighted average of the initial time to repayment reported for loans of a bank-firm pair, which is measured in months, and where the weights are constructed based on loan shares between a bank-firm pair in a given quarter, and are based on either all, TL, or FX loans for Panels A-C, respectively.

**Table A6.** Firm Database Coverage, 2003–12

| Year | Gross Output |
| --- | --- |
| 2003 | 0.45 |
| 2004 | 0.33 |
| 2005 | 0.34 |
| 2006 | 0.38 |
| 2007 | 0.40 |
| 2008 | 0.47 |
| 2009 | 0.50 |
| 2010 | 0.50 |
| 2011 | 0.49 |
| 2012 | 0.45 |

**Notes:** This table compares our cleaned sample with the Annual Industry and Service Statistics collected by the Turkish Statistical Institute (Turkstat) over the 2003-12 period. The column 'Gross Output' measures the total of the sales of goods and services invoiced by the observation unit during the reference period in our dataset relative to the same number reported in Turkstat for a broader set of firms. The aim of Annual Industry and Service Statistics is to produce information based on enterprise and the local unit. Estimations for Turkey are targeted for all NACE Rev.2 (4-digit) sectors. Full enumeration limits for the Turkstat sample are determined as follows: all enterprises having more than 20 employees, and a sample from smaller firms of the covered sectors. While calculating the aggregates for the country smaller firms are weighted. The Turkstat data exclude the following sectors: Agriculture, forestry and fishing (A), Financial and insurance activities (K), Public administration and defense; compulsory social security (O), Activities of households as employers; undifferentiated goods-and services-producing activities of households for own use (T), and Activities of extraterritorial organizations and bodies (U). While running this comparison we exclude firms of these listed sectors.

**Table A7.** Firm Database Coverage: Breakdown by Firm Employee-Size Distribution, 2012

| | Strata | **Gross Output** All Sectors | **Gross Output** Mfg. Sector |
|---|---|---|---|
| Sample | 1-19 employees | 0.053 | 0.013 |
| | 20-249 employees | 0.304 | 0.235 |
| | 250+ employees | 0.642 | 0.752 |
| TurkStat | 1-19 employees | 0.270 | 0.095 |
| | 20-249 employees | 0.364 | 0.361 |
| | 250+ employees | 0.367 | 0.544 |

**Notes:** This table compares our cleaned sample with the Annual Industry and Service Statistics collected by the Turkish Statistical Institute (Turkstat) broken down by firm size (employees) for 2012. The column 'Gross Output' measures the total of the sales of goods and services invoiced by the observation unit during the reference period in our dataset relative to the same number reported in Turkstat for a broader set of firms. The aim of Annual Industry and Service Statistics is to produce information based on enterprise and the local unit. Estimations for Turkey are targeted for all NACE Rev.2 (4-digit) sectors. Full enumeration limits for the Turkstat sample are determined as follows: all enterprises having more than 20 employees, and a sample from smaller firms of the covered sectors. While calculating the aggregates for the country smaller firms are weighted. The Turkstat data exclude the following sectors: Agriculture, forestry and fishing (A), Financial and insurance activities (K), Public administration and defense; compulsory social security (O), Activities of households as employers; undifferentiated goods-and services-producing activities of households for own use (T), and Activities of extraterritorial organizations and bodies (U). While running this comparison we exclude firms of these listed sectors.

**Table A8.** Firm-Level Annual Summary Statistics, All Firms, 2003–13

**Panel A: All Sectors excluding Finance and Government**

| | Obs. | Mean | Median | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| log(Assets) | 68,341 | 9.161 | 9.065 | 1.451 | 5.500 | 13.27 |
| Net Worth/Assets | 68,341 | 0.390 | 0.358 | 0.220 | 0.026 | 0.969 |
| Exports/Sales | 68,341 | 0.163 | 0.004 | 0.278 | 0.000 | 0.996 |

**Panel B: Manufacturing Sector**

| | Obs. | Mean | Median | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| log(Assets) | 31,683 | 9.316 | 9.200 | 1.421 | 5.500 | 13.27 |
| Net Worth/Assets | 31,683 | 0.425 | 0.403 | 0.207 | 0.026 | 0.969 |
| Exports/Sales | 31,683 | 0.231 | 0.095 | 0.288 | 0.000 | 0.996 |

**Notes:** This table presents summary statistics using firm balance sheet and income statement data are sourced from a supervisory dataset that is collected by the CBRT annually. Panel A presents statistics for firms in all sectors of the economy, excluding the financial and governmental sectors; Panel B presents statistics for only firms in the manufacturing sectors. All levels are in real thousands of TL, and the growth rate of sales are also in real terms. The base year is 2003.

**Table A9.** Turkish and World Macroeconomic and Financial Summary Statistics, 2003–13

| | Obs. | Mean | Median | Std. Dev | IQR | Min. | Max. |
|---|---|---|---|---|---|---|---|
| Real GDP Growth | 44 | 0.012 | 0.012 | 0.022 | 0.017 | -0.059 | 0.048 |
| Inflation | 44 | 0.022 | 0.017 | 0.017 | 0.006 | -0.003 | 0.080 |
| CA/GDP | 44 | -5.144 | -5.379 | 2.227 | 3.630 | -9.803 | -1.303 |
| log(Capital inflows) | 44 | 23.02 | 23.37 | 1.087 | 0.867 | 20.08 | 24.30 |
| log(VIX) | 44 | 2.957 | 2.912 | 0.368 | 0.566 | 2.401 | 4.071 |
| log(Fed total assets) | 44 | 13.42 | 12.97 | 0.528 | 1.006 | 12.88 | 14.28 |

**Notes:** This table presents summary statistics for quarterly Turkish and world macroeconomic and financial data. All real variables are deflated using 2003 as the base year. Turkish macroeconomic data are sourced from the CBRT. VIX is the quarterly average. 'IQR' stands for the interquartile range. Turkish capital inflows are in real Turkish lira. 'CA/GDP' variables measure sthe quarterly Turkish current account relative to GDP. 'Fed total assets' is the value of the US Federal Reserve's total assets, deflated to 2003.

**Table A10.** Federal Reserve Balance Sheet Expansion, Loans, and Interest Rates: Bank-Firm Heterogeneity, 2009–13

| | $\log(\text{Loans}_t)$ | $\log(1+r_t)$ |
|---|---|---|
| | (1) | (2) |
| $\log(\text{Fed TA}_{t-1})$ | $0.091^a$ | $-0.002^a$ |
| | (0.006) | (0.0003) |
| FX | $0.684^a$ | $-0.066^a$ |
| | (0.010) | (0.0002) |
| Observations | 15,041,561 | 15,041,561 |
| R-squared | 0.907 | 0.905 |
| Bank×firm F.E. | Yes | Yes |
| Macro controls & trend | Yes | Yes |
| Bank controls | Yes | Yes |
| Firm×year F.E. | Yes | Yes |

**Notes:** This table presents results for the regressions (1) and (2) using quarterly data for all loans, and with the log of (real) total assets of the Federal Reserve as the 'Global' variable. The sample period is restricted to 2009-13, which is when the balance sheet began to expand during QE operations. Lagged Turkish real GDP growth, inflation, and a linear time trend are included as regressors. Furthermore, the following lagged values of the following bank-level characteristics are also controlled for (not reported): log(assets), capital ratio, capital adequacy ratio (CAR), liquidity ratio, noncore liabilities ratio, and return on total assets (ROA). The full set of fixed effects are included. Column (1) uses the natural logarithm of total loans between a bank-firm as the dependent variable, and column (2) uses the natural logarithm of one plus the weighted-average of interest rates for loans between a bank-firm as the dependent variable. Regressions are all weighted-least square, where weights are equal to the loan share. Standard errors are clustered at the firm level, and '$a$' indicates significance at the 1% level '$b$' at the 5% level, and '$c$' at the 10% level.

**Table A11.** Robustness: Loans with Maturity ≤ 1 Year, 2003–13

| | Panel A: log(Loans$_t$) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| log(VIX$_{t-1}$) | 0.006$^a$ | -0.003$^a$ | -0.032$^a$ | | | |
| | (0.0001) | (0.0002) | (0.0004) | | | |
| log(K Inflows$_{t-1}$) | | | | 0.034$^a$ | 0.029$^a$ | 0.022$^a$ |
| | | | | (0.0004) | (0.0004) | (0.0005) |
| FX | 0.579$^a$ | 0.578$^a$ | 0.606$^a$ | 0.579$^a$ | 0.579$^a$ | 0.606$^a$ |
| | (0.008) | (0.008) | (0.009) | (0.008) | (0.008) | (0.009) |
| Observations | 9,919,950 | 9,876,669 | 9,298,556 | 9,919,950 | 9,876,669 | 9,298,556 |
| R-squared | 0.860 | 0.861 | 0.904 | 0.860 | 0.861 | 0.904 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank controls | No | Yes | Yes | No | Yes | Yes |
| Firm×year F.E. | No | No | Yes | No | No | Yes |

| | Panel B: log(1+$r_t$) | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| log(VIX$_{t-1}$) | 0.015$^a$ | 0.015$^a$ | 0.020$^a$ | | | |
| | (0.0001) | (0.0001) | (9.39e-05) | | | |
| log(K Inflows$_{t-1}$) | | | | -0.001$^a$ | -0.001$^a$ | -0.003$^a$ |
| | | | | (3.12e-05) | (3.22e-05) | (3.70e-05) |
| FX | -0.086$^a$ | -0.086$^a$ | -0.085$^a$ | -0.087$^a$ | -0.086$^a$ | -0.086$^a$ |
| | (0.0003) | (0.0003) | (0.0003) | (0.0003) | (0.0003) | (0.0003) |
| Observations | 9,919,950 | 9,876,669 | 9,298,556 | 9,919,950 | 9,876,669 | 9,298,556 |
| R-squared | 0.799 | 0.802 | 0.886 | 0.797 | 0.800 | 0.885 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank controls | No | Yes | Yes | No | Yes | Yes |
| Firm×year F.E. | No | No | Yes | No | No | Yes |

**Notes:** This table presents results for the regressions (1) and (2). Lagged Turkish real GDP growth, inflation, and a linear time trend are included as regressors. Furthermore, the following lagged values of the following bank-level characteristics are also controlled for (not reported): log(assets), capital ratio, capital adequacy ratio (CAR), liquidity ratio, noncore liabilities ratio, and return on total assets (ROA). Panel A uses the natural logarithm of total loans between a bank-firm as the dependent variable, and Panel B use the natural logarithm of one plus the weighted-average of interest rates for loans between a bank-firm as the dependent variable. VIX is the quarterly average, and the K Inflows variable is real quarterly gross capital inflows into Turkey. Regressions are all weighted-least square, where weights are equal to the loan share. Standard errors are clustered at the firm level, and '$a$' indicates significance at the 1% level '$b$' at the 5% level, and '$c$' at the 10% level.

**Table A12.** Robustness: Loans with Maturity > 1 Year, 2003–13

| | Panel A: $\log(\text{Loans}_t)$ | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\log(\text{VIX}_{t-1})$ | -0.033[a] | -0.067[a] | -0.033[a] | | | |
| | (0.001) | (0.001) | (0.0008) | | | |
| $\log(\text{K Inflows}_{t-1})$ | | | | 0.028[a] | 0.031[a] | 0.009[a] |
| | | | | (0.0003) | (0.0003) | (0.0003) |
| FX | 0.460[a] | 0.454[a] | 0.475[a] | 0.460[a] | 0.455[a] | 0.475[a] |
| | (0.014) | (0.015) | (0.019) | (0.014) | (0.015) | (0.019) |
| Observations | 9,776,849 | 9,749,647 | 9,048,032 | 9,776,849 | 9,749,647 | 9,048,032 |
| R-squared | 0.913 | 0.914 | 0.961 | 0.914 | 0.914 | 0.961 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank controls | No | Yes | Yes | No | Yes | Yes |
| Firm×year F.E. | No | No | Yes | No | No | Yes |

| | Panel B: $\log(1+r_t)$ | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\log(\text{VIX}_{t-1})$ | 0.018[a] | 0.017[a] | 0.007[a] | | | |
| | (9.13e-05) | (9.22e-05) | (6.74e-05) | | | |
| $\log(\text{K Inflows}_{t-1})$ | | | | -0.005[a] | -0.004[a] | -0.001[a] |
| | | | | (2.52e-05) | (2.63e-05) | (2.09e-05) |
| FX | -0.054[a] | -0.053[a] | -0.056[a] | -0.054[a] | -0.053[a] | -0.056[a] |
| | (0.0003) | (0.0003) | (0.0003) | (0.0003) | (0.0003) | (0.0003) |
| Observations | 9,776,849 | 9,749,647 | 9,048,032 | 9,776,849 | 9,749,647 | 9,048,032 |
| R-squared | 0.839 | 0.840 | 0.941 | 0.839 | 0.840 | 0.941 |
| Bank×firm F.E. | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro controls & trend | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank controls | No | Yes | Yes | No | Yes | Yes |
| Firm×year F.E. | No | No | Yes | No | No | Yes |

**Notes:** This table presents results for the regressions (1) and (2) using quarterly data for all loans. Lagged Turkish real GDP growth, inflation, and a linear time trend are included as regressors. Furthermore, the following lagged values of the following bank-level characteristics are also controlled for (not reported): log(assets), capital ratio, capital adequacy ratio (CAR), liquidity ratio, noncore liabilities ratio, and return on total assets (ROA). Panel A uses the natural logarithm of total loans between a bank-firm as the dependent variable, and Panel B uses the natural logarithm of one plus the weighted-average of interest rates for loans between a bank-firm as the dependent variable. VIX is the quarterly average, and the K Inflows variable is real quarterly gross capital inflows into Turkey. Regressions are all weighted-least square, where weights are equal to the loan share. Standard errors are clustered at the firm level, and '*a*' indicates significance at the 1% level '*b*' at the 5% level, and '*c*' at the 10% level.

**Table A13.** First-stage Regression: Capital Flows and VIX, 2003–13

| | Type of Standard Errors | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| | | Newey-West | Newey-West |
| | Robust | (1 Lag) | (4 Lags) |
| $\log(\text{VIX}_{t-1})$ | -1.918[a] | -1.918[a] | -1.918[a] |
| | (0.378) | (0.434) | (0.486) |
| GDP $\text{growth}_{t-1}$ | 6.376 | 6.376 | 6.376 |
| | (6.628) | (6.557) | (4.287) |
| $\text{Inflation}_{t-1}$ | 2.999 | 2.999 | 2.999 |
| | (7.712) | (7.026) | (5.477) |
| trend | 0.044[a] | 0.044[a] | 0.044[a] |
| | (0.008) | (0.008) | (0.008) |
| Constant | 27.57[a] | 27.57[a] | 27.57[a] |
| | (1.039) | (1.158) | (1.327) |
| Observations | 44 | 44 | 44 |
| Prob(F-stat>0) | 0.000 | 0.000 | 0.000 |

**Notes:** This table presents the first-stage time series regression of the natural logarithm of gross capital inflows on log(VIX) and the other macro covariates and time trend, where VIX is the instrument in the two-stage setup of Table 3. Columns (1)-(3) present the regression under different assumptions for standard errors. Column (1) runs the regression using White robust standard errors. Columns (2) and (3) allow for autocorrelation in the error terms by calculating Newey-West standard errors. Column (2) considers one lag in the error series, while column (4) allows for four lags. The resulting standard errors for VIX do not vary greatly across specifications.'*a*' indicates significance at the 1% level '*b*' at the 5% level, and '*c*' at the 10% level.