International Spillovers and Local Credit Cycles*

Yusuf Soner Başkaya\textsuperscript{1} Julian di Giovanni\textsuperscript{2}
Şebnem Kalemli-Özcan\textsuperscript{3} Mehmet Fatih Ulu\textsuperscript{4}

\textsuperscript{1}Bilkent University \textsuperscript{2}ICREA, UPF, BGSE, CREI, and CEPR
\textsuperscript{3}University of Maryland, CEPR, and NBER
\textsuperscript{4}Central Bank of Republic of Turkey

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*This project does not represent official views of the CBRT
Is there any effect of advanced country shocks/policies on emerging market business cycles?

- We use a new and a very big dataset to address an old and policy relevant question:
  
  How does advanced country shocks/policies transmit to emerging markets?
  
  ⇒ What role capital flows/global financial conditions play in this transmission?
Motivation for the Paper

**In Emerging Markets:**

- Business cycles correlate strongly with credit cycles
- **Capital flows** go hand-in-hand with credit cycles
  - Often resulting in financial crisis
- EM policy makers: “capital flows problem”
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- EM policy makers: “capital flows problem”

We ask whether:

- Are capital flows causally related to domestic credit cycles in EMs?
- If so, what are the mechanisms at work?
A basic *identification problem*:

- Relative importance of “pull” or “push” factors for capital flows?
  ⇒ Is domestic credit growth being driven by *exogenous* capital flows, i.e., an *exogenous international supply of credit*?

- Is there any role for heterogeneous agents?
  ⇒ important to shed light on micro-foundations of macro models
This Paper

Micro data from credit registry of Turkey together with macro data: 2003-13
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- A decade long panel on every single loan contract between a bank and a firm in a representative EM

- Evaluate the effect of push-capital flows on lending and borrowing patterns at the firm-bank level

- Role of funding structure of banks

- Role of firm/bank risk taking and balance sheet shocks

- Role of currency denomination of loan: FX vs. TL (Turkish lira)

- Literature so far is mixed

- Many papers on the transmission of VIX/US Policy on global/country specific asset prices; few papers on flow quantities

- Very little evidence on the effect of “risk-on-flows” on EM real and financial outcomes
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Preview of Results

1. **Supply (“push”)** driven capital inflows have a quantitatively important impact on domestic credit cycle

   - An increase in capital flows equivalent to its IQR leads to a 1 pp reduction in real borrowing costs (lower in OLS)
   - Supply driven capital inflows explain 43% of aggregate corporate sector cyclical credit growth on average

2. “Good” banks are more procyclical
   - Banks with higher non-core liabilities expand more credit and offer lower rates during periods of “risk-on” capital flows

3. “Risky” firms pay relatively lower rates during “risk-on” periods
   - However, their borrowing will not exceed that of “non-risky” firms due to collateral constraints
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1. **Push-pull factors**: Mostly on *net* capital flows
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   - Miranda-Agrippino and Rey (2015); Bruno and Shin (2015a,b); Rey (2015, 2016); Bekaert et al. (2013); Hoffman et al. (2016)
   - Trilemma-Dilemma debate: Rey (2013); Han and Wei (2016); Klein and Shambaugh (2015); Aizenman et al (2016)
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   - Country Level Data (IMF, EPFR): Forbers and Warnock (2012); Fratzscher et al. (2013); Ahmed and Zlate (2014); Cerutti et al. (2016); Chari et al. (2016); Curcuru et al. (2015)
   - Syndicated Loans/Global Banks: Braunning and Ivashina (2016)
1. Supply-Side Flows: Diversification/liquidity allocation as drivers of gross capital flows

- Obstfeld (2009); Caballero and Simsek (2016); Brunnermeier et al. (2012); Bruno and Shin (2013); Miranda-Agrippino and Rey (2015); Gabaix and Maggiori (2015)
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2. Heterogeneity: Bank/firm credit constraints, FX dimension, Capital flow management

   - Holmstrom and Tirole (1997); Fahri and Werning (2015); Gopinath et al. (2017); Aoki et al (2015); Korinek and Davilla (2016); Korinek and Nowak (2015); Caballero and Krishnamurthy (2005, 2006); Korinek (2010); Jeanne and Korinek (2010); Ostry et al. (2010); Brunnermeier and Sannikov (2015); Korinek and Sandri (2016)
VIX, CA/GDP, and Domestic Credit

Domestic credit and capital inflows: Demand or Supply Driven? Or Both?

Sources: CBRT
Bank Intermediated External Finance

Non-financial corporate sector’s external debt issuance is tiny (percent of GDP)

Sources: CBRT
FX and TL Loan Growth

Sources: CBRT
**Conceptual Framework**

- **Channel:** real borrowing costs decline as a result of exogenous capital flows. Simple framework built on arbitrage condition with time varying risk premium (UIP):

\[ i_t = i_t^* + \mathbb{E}_t \Delta e_{t+1} + \gamma_t, \quad \text{where} \]
\[ \gamma_t \equiv \omega VIX_t + \alpha_{c,t} \]

- Then at *firm-bank* level,

\[ \gamma_{f,b,t} \equiv \alpha_{f,t}, \quad \text{then} \]
\[ i_{f,b,t} = i_t + \gamma_{f,b,t} \]
\[ = i_t^* + \mathbb{E}_t (\Delta e_{t+1}) + \omega VIX_t + \alpha_{c,t} + \alpha_{f,t} \]

- Assuming PPP, we have real equivalent:

\[ r_t = r_t^* + \gamma_t \]
\[ r_{f,b,t} = r_t^* + \omega VIX_t + \alpha_{c,t} + \alpha_{f,t} \]
Empirical Strategy: Two-Layer Identification, Layer I

Effect of economy wide supply shock (exogenous capital inflows)

- Analyze impact of an exogenous push factor, VIX, both in IV and reduced form

- Focus on domestic credit variables, both volume (loans) and price for identification

- Include individual time-varying firm and bank variables, and bank × firm fixed effects
Basics of Identification
Layer II: Within Firm Estimator Over a Long Panel

Which banks experience larger supply shock and what is the effect?

- Include individual time-varying firm and bank variables, and bank×firm fixed effects
- Use a within firm estimator via firm×time fixed effects

⇒ Analyze the same firm who borrows from multiple different banks, over time

- ... (Khwaja and Mian, 2008; Jiménez et al., 2014; Chodorow-Reich, 2014)
1. Credit register data has information on universe of loans in economy to households and firms

- **Focus on loans to corporate sector**
  - Bank, firm, currency, quarter level: 53+ million loans
  - Loan value, **interest rate**, maturity, collateral, risk measures
  - Roughly 75% of observations in value are firms with loans from multiple banks (50% in counts, 2.5 bank per firm on average)
  - TL/FX approximately 50-50 split in counts; 40-60 in value
  - Avg TL loan: 18 months maturity, 15%nominal rate, 7%real rate
  - Avg FX loan: 14 months maturity, 7%nominal rate, -1%real rate
Data: Merging Three Large Datasets over 2003–13

2. Regulatory bank data capture the balance sheet items and portfolio items for the universe of banks (45)
   - Banks capture 90 percent of corporate liabilities and 86 percent of country’s financial assets

3. Regulatory survey firm data capture 50 percent of the real economy
   - Annual balance sheet and income statement data

⇒ Core dataset has all data collapsed to bank-firm-currency-quarter level for 20+ million observations
“Macro” Capital Flows Regressions

\[ \log Y_{f,b,d,q} = \alpha_{f,b} + \lambda \text{Trend}_q + \beta \log \text{Capital inflows}_{q-1} + \delta \text{FX}_{f,b,d,q} \]
\[ + \Theta_1 \text{Bank}_{b,q-1} + \Theta_2 \text{Macro}_{q-1} + \varepsilon_{f,b,d,q}, \]

(1)
“Macro” Capital Flows Regressions

\[
\log Y_{f,b,d,q} = \alpha_{f,b} + \lambda T\text{rend}_q + \beta \log \text{Capital inflows}_{q-1} + \delta \text{FX}_{f,b,d,q} \\
+ \Theta_1 \text{Bank}_{b,q-1} + \Theta_2 \text{Macro}_{q-1} + \varepsilon_{f,b,d,q},
\]

(1)

- **Y**: Loan or interest rate (nominal and real) at firm \((f)\times \text{bank} (b)\times \text{currency denomination} (d)\times \text{quarter} (q)\) level
- **Capital inflows**: Turkish real inflows
  - \(\Rightarrow\) Instrument with VIX
- **FX**: FX dummy \((0 = \text{TL}, 1 = \text{FX})\)
- **Bank**: \(\log(\text{Assets}), \text{capital ratio, liquidity ratio, noncore ratio, ROA}\)
- **Macro controls**: GDP growth, inflation, exchange rate change, expectations, policy rate
  - Turkish policy rate
  - Macro Variables
Macro Regressions

- Low VIX/high capital inflow episodes lead to more credit and lower rates
- IV estimates systematically larger (in absolute value) than OLS

Panel A. OLS and Second-stage of IV

<table>
<thead>
<tr>
<th></th>
<th>OLS (1)</th>
<th>IV (2)</th>
<th>OLS (3)</th>
<th>IV (4)</th>
<th>OLS (5)</th>
<th>IV (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log(K Inflows$_{q-1}$)</td>
<td>0.040$^a$</td>
<td>0.040$^b$</td>
<td>-0.005$^a$</td>
<td>-0.011$^a$</td>
<td>-0.005$^b$</td>
<td>-0.009$^a$</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.017)</td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>FX</td>
<td>0.645$^a$</td>
<td>0.645$^a$</td>
<td>-0.070$^a$</td>
<td>-0.070$^a$</td>
<td>-0.078$^a$</td>
<td>-0.078$^a$</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Policy rate$_{q-1}$</td>
<td>-0.078</td>
<td>0.153</td>
<td>0.231$^a$</td>
<td>0.197$^a$</td>
<td>0.046</td>
<td>0.015</td>
</tr>
<tr>
<td></td>
<td>(0.262)</td>
<td>(0.320)</td>
<td>(0.022)</td>
<td>(0.024)</td>
<td>(0.059)</td>
<td>(0.054)</td>
</tr>
</tbody>
</table>

Observations 19,982,267 19,982,267 19,982,267 19,982,267 19,982,267 19,982,267
R-squared 0.850 0.850 0.791 0.793 0.778 0.779
Bank×firm F.E. Yes Yes Yes Yes Yes Yes
Macro controls & trend Yes Yes Yes Yes Yes Yes
Bank controls Yes Yes Yes Yes Yes Yes
### VIX Reduced Form Regressions

\[
\log Y_{f,b,d,q} = \tilde{\alpha}_{f,b} + \tilde{\lambda}_q + \tilde{\beta} \log VIX_{q-1} + \tilde{\delta}FX_{f,b,d,q} \\
+ \tilde{\Theta}_1 Bank_{b,q-1} + \tilde{\Theta}_2 Macro_{q-1} + \xi_{f,b,d,q}
\]

<table>
<thead>
<tr>
<th></th>
<th>(\log(\text{Loans}_q))</th>
<th>(\log(1+i_q))</th>
<th>(\log(1+r_q))</th>
</tr>
</thead>
<tbody>
<tr>
<td>(\log(VIX_{q-1}))</td>
<td>-0.067(^b) (0.029)</td>
<td>0.019(^a) (0.003)</td>
<td>0.017(^a) (0.004)</td>
</tr>
<tr>
<td>(FX)</td>
<td>0.645(^a) (0.012)</td>
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<td>-0.078(^a) (0.003)</td>
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<tr>
<td>(\text{Policy rate}_{q-1})</td>
<td>0.127 (0.323)</td>
<td>0.204(^a) (0.024)</td>
<td>0.021 (0.053)</td>
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- R-squared 0.850 0.793 0.779
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- Bank controls Yes Yes Yes

⇒ A fall in \(\log(VIX)\) equivalent to its IQR leads to a 1 pp fall in real borrowing costs

⇒ Estimates can explain 43 percent of the cyclical aggregate corporate credit growth on average over the sample period
QE, VIX, Interest Rates

Effect of VIX on Dynamics of Real Borrowing Costs

The diagram shows the effect of VIX on real borrowing costs and loan rates from 2006 to 2014. QE1, QE2, and QE3 are shaded areas indicating the periods of quantitative easing. The x-axis represents the months from 2006 to 2014, with specific months marked for each year. The y-axis shows the time effect on loan rates and log(VIX) values. The real loan rate is represented by a blue line, the nominal loan rate by a red dashed line, and log(VIX) by a black line.

Key observations:
- Real Loan Rate and Nominal Loan Rate are influenced by log(VIX) and the periods of quantitative easing.
- The real loan rate tends to rise duringQE periods and fall during non-QE periods.
- Nominal loan rates follow a similar trend but are influenced by the nominal rate and the overall market conditions.
- Log(VIX) shows fluctuations that correlate with the economic landscape and policy changes.
Robustness

- Add firm × year effects
- Decompose VIX into volatility and risk aversion
- Use only non-exporters
- Separate short and long term maturity loans
- Pre-post GFC
- Private, state and foreign banks
Heterogeneity: Differences-in-Differences

Test: Bank and Firm Risk-Taking

$$\log Y_{f,b,d,q} = \alpha_{b,q} + \alpha_{f,q} + \kappa(\text{Noncore}_b \times \text{FinConstraint}_f \times \log \text{VIX}_{q-1})$$
$$+ \delta_2 \text{FX}_{f,b,d,q} + \nu_{f,b,d,q},$$

$$\log Y_{f,b,d,q} = \alpha_{b,q} + \alpha_{f,q} + \rho(\text{Noncore}_b \times \text{FX}_{f,b,d,q} \times \log \text{VIX}_{q-1})$$
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+ \delta_3 \text{FX}_{f,b,d,q} + \upsilon_{f,b,d,q}
\]

- Noncore\(_b\): non-core liabilities ratio (0 = “low,” 1 = “high”)
- FinConstraint\(_f\): Firm Net Worth: (0 = “low,” 1 = “high”)
- \(\alpha_{f,q}\): firm×quarter effect; fully controls time varying firm unobservables
- \(\alpha_{b,q}\): bank×quarter effect; fully controls time varying bank unobservables
- ALLOW heterogenous trends by bank type
- **Macro** controls are in the quarter fixed effect
Heterogeneity Results: During low VIX

★ Higher non-core banks decrease their rates/increase loan provision more: (elasticity double)
★ Low net worth firms obtain lower rates from high non-core banks
★ Higher non-core banks decrease their rate more on TL loans

<table>
<thead>
<tr>
<th></th>
<th>log(Loans&lt;sub&gt;q&lt;/sub&gt;)</th>
<th>log(1+r&lt;sub&gt;q&lt;/sub&gt;)</th>
</tr>
</thead>
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<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>log(VIX&lt;sub&gt;q−1&lt;/sub&gt; × Noncore&lt;sub&gt;b&lt;/sub&gt;)</td>
<td>-0.035&lt;sup&gt;b&lt;/sup&gt; (0.017)</td>
<td>0.015&lt;sup&gt;a&lt;/sup&gt; (0.004)</td>
</tr>
<tr>
<td>log(VIX&lt;sub&gt;q−1&lt;/sub&gt; × Noncore&lt;sub&gt;b&lt;/sub&gt; × NetWorth&lt;sub&gt;f&lt;/sub&gt;)</td>
<td>-0.0004 (0.021)</td>
<td>-0.005&lt;sup&gt;a&lt;/sup&gt; (0.001)</td>
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<tr>
<td>log(VIX&lt;sub&gt;q−1&lt;/sub&gt; × Noncore&lt;sub&gt;b&lt;/sub&gt; × FX)</td>
<td>-0.007 (0.018)</td>
<td>-0.012&lt;sup&gt;a&lt;/sup&gt; (0.004)</td>
</tr>
<tr>
<td>FX</td>
<td>0.690&lt;sup&gt;a&lt;/sup&gt; (0.013)</td>
<td>0.806&lt;sup&gt;a&lt;/sup&gt; (0.019)</td>
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<th>Observations</th>
<th>9,280,825</th>
<th>1,240,310</th>
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<td>R-squared</td>
<td>0.876</td>
<td>0.763</td>
<td>0.877</td>
<td>0.852</td>
<td>0.812</td>
<td>0.877</td>
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<td>Bank×firm F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bank controls</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Firm×quarter F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Bank×quarter F.E.</td>
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<td>Yes</td>
<td>No</td>
<td>Yes</td>
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Interpretation

- A fall in real borrowing rates faced by all firms in the economy is the main transmission channel for int’l spillovers.

- Banks with higher non-core liability ratio are more procyclical and they decrease the rates more for low net worth (risky) firms.

- Why low net worth firms DO NOT increase their borrowing more than high net worth firms given relatively lower interest rates?
  
  - **Hypothesis 1**: They borrow more from other banks.
  
  - **Hypothesis 2**: They are collateral constrained.

- Exploit loan-level data for *new issuances* each month to test existence of collateral constraints at the loan level.
Issuance Regressions: Within firm-bank estimator

- Identify from within variation in loans given a firm-bank pair
- Firm $f$’s new loan $l$ and month $m$ from bank $b$ (in FX or TL):

$$Y_{f,b,l,m} = \omega_{f,b,m} + \beta_1 \text{Collateral}_{f,b,l,m} + \beta_2 VIX_m \times \text{Collateral}_{f,b,l,m} + e_{f,b,l,m}$$

where ‘Collateral’ is the loan’s collateral-to-principal ratio, and $\omega_{f,b,m}$ is a configuration of firm-bank-month effects
- Further control for other loan-level characteristics (maturity, risk, sectoral use...)

Loan Level Results

★ Loan level collateral constraints are not related to firm and bank factors

★ Collateral constraints at loan level relax very little during low VIX periods; total effect of collateral on loan still positive

★ Interest rate-collateral relation does not respond to VIX once firm factors are controlled

<table>
<thead>
<tr>
<th></th>
<th>log(Loans&lt;sub&gt;m&lt;/sub&gt;)</th>
<th>log(1+&lt;i&gt;r&lt;/i&gt;&lt;sub&gt;m&lt;/sub&gt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Collateral/Loan</td>
<td>0.102&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.088&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.010)</td>
</tr>
<tr>
<td>Collateral/Loan × log(VIX&lt;sub&gt;m-1&lt;/sub&gt;)</td>
<td>0.015&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.028&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.011)</td>
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<tr>
<td>FX</td>
<td>0.409&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.454&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.037)</td>
</tr>
</tbody>
</table>

Observations: 18,239,721 13,043,273 11,311,762 18,239,721 13,043,273 11,311,762

R-squared: 0.731 0.833 0.845 0.646 0.832 0.855

Bank × firm F.E. Yes Yes No Yes Yes No
Sector FE Yes Yes Yes Yes Yes Yes
Risk F.E. Yes Yes Yes Yes Yes Yes
Maturity F.E. Yes Yes Yes Yes Yes Yes
Month F.E. Yes No No Yes No No
Firm × month F.E. No Yes No No Yes No
Bank × firm × month F.E. No No Yes No No Yes
Alternative Channels

- Exchange rate appreciation (demand side): exporter-importer demand or firm balance sheet shock — firm-quarter effects
- Exchange rate appreciation (supply side): Valuation effects creating bank balance sheet shocks — no support in the data
## Bank Balance Sheet Shock

<table>
<thead>
<tr>
<th></th>
<th>log(Loans$_q$)</th>
<th></th>
<th></th>
<th>log(1+$r_q$)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>log(VIX$_{q-1}$)$\times$Capital$_b$</td>
<td>-0.028</td>
<td></td>
<td></td>
<td>-0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td></td>
<td></td>
<td>(0.002)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta$ log(XR$_{q-1}$)$\times$Capital$_b$</td>
<td>-0.092</td>
<td></td>
<td></td>
<td>0.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.101)</td>
<td></td>
<td></td>
<td>(0.010)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1( Depreciation$_{q-1}$)$\times$Capital$_b$</td>
<td>-0.006</td>
<td></td>
<td></td>
<td>-0.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.015)</td>
<td></td>
<td></td>
<td>(0.001)</td>
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<td></td>
</tr>
<tr>
<td>FX</td>
<td>0.690$^a$</td>
<td>0.690$^a$</td>
<td>0.690$^a$</td>
<td>-0.070$^a$</td>
<td>-0.070$^a$</td>
<td>-0.070$^a$</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Observations</td>
<td>9,280,825</td>
<td>9,280,825</td>
<td>9,280,825</td>
<td>9,280,825</td>
<td>9,280,825</td>
<td>9,280,825</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.876</td>
<td>0.876</td>
<td>0.876</td>
<td>0.857</td>
<td>0.857</td>
<td>0.857</td>
</tr>
<tr>
<td>Bank$\times$firm F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Bank controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Firm$\times$quarter F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Conclusion

- We provide causal evidence on impact of a global push factor on domestic loan growth in an important EM economy using micro data

- Our argument: A fall in borrowing rates faced by all firms in the economy is the main transmission channel for int’l spillovers

- Heterogeneous effects shed light on micro foundations of macro models

  - Internationally funded banks extend more credit at lower rates; offer even lower rates to low net worth (risky) firms

  - Risky firms can finance their borrowing at a lower cost but not necessarily over-borrow due to collateral constraints
1. Are capital flows good or bad? Funds vs domestic financial instability

- **EM central banker dilemma:**

  \[ i_t = \alpha(y_t - y^f) + \beta(\pi - \bar{\pi}) + \gamma(e_t - \bar{e}) \]

- Two objectives, one instrument

- With loose US MP/high global risk appetite driven capital inflows—not clear whether to raise or lower rates so use other tools.

2. Our results: Regardless of policy stance and tools, **exogenous** capital inflows reduce borrowing costs of agents that lead to credit expansion due to reduced cost of financial intermediation.

- Importance of financial frictions (Rajan, 2014 vs. Bernanke 2013)

- MP independence vs effectiveness (Rey, 2013 vs. Obstfeld 2014)
Appendix Slides
Exchange Rates via-vis-USD

Quarterly av. USD/TL Exc. Rate
Quarterly av. USD/TL Real Exc. Rate
## Collateral Shock via Exchange Rate Changes

<table>
<thead>
<tr>
<th></th>
<th>( \log(\text{Loans}_m) )</th>
<th></th>
<th>( \log(1+r_m) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>Collateral/Loan</td>
<td>0.103^a</td>
<td>0.090^a</td>
<td>0.093^a</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.010)</td>
<td>(0.012)</td>
</tr>
<tr>
<td>Collateral/Loan × ( \Delta \log XR )</td>
<td>-0.045</td>
<td>0.005</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(0.095)</td>
<td>(0.098)</td>
<td>(0.133)</td>
</tr>
<tr>
<td>FX</td>
<td>0.409^a</td>
<td>0.455^a</td>
<td>0.511^a</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.037)</td>
<td>(0.043)</td>
</tr>
<tr>
<td>Observations</td>
<td>18,239,721</td>
<td>13,043,273</td>
<td>11,311,762</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.731</td>
<td>0.833</td>
<td>0.845</td>
</tr>
<tr>
<td>Bank × firm F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Sector FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Risk F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Maturity F.E.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Month F.E.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Firm × month F.E.</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Bank × firm × month F.E.</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(continued)
Aggregate Impact

Global-predicted loan growth:

$$\log(\text{Loan}_{f,b,d,q}) = \tilde{\beta} \log(VIX_{q-1})$$

Differentiate and multiply by $w_{f,b,d,q-1}$, such that $\sum w_{f,b,d,q-1} = 1$

$$w_{f,b,d,q-1}d\log(\text{Loan}_{f,b,d,q}) = w_{f,b,d,q-1}\tilde{\beta}d\log(VIX_{q-1})$$

so,

$$w_{f,b,d,q-1}\left(\frac{\Delta \text{Loan}_{f,b,d,q}}{\text{Loan}_{f,b,d,q}}\right) = w_{f,b,d,q-1}\tilde{\beta}\left(\frac{\Delta VIX}{VIX}\right)_{q-1}$$

Summing above equation over $\{f, b, d\}$ in a given quarter $q$:

$$\left(\frac{\Delta \text{Loan}}{\text{Loan}}\right)_q = \tilde{\beta}\left(\frac{\Delta VIX}{VIX}\right)_{q-1}$$
Loan Growth Comparison of Corporate Sector and Whole Economy, 2003–13

Notes: Firm matched sample and Whole CR growth rate of loans.
Policy Rate, Average Lending Rates, and VIX, 2003–13

Sources: CBRT  Macro regressions
## First-Stage Regressions: Capital Inflows, 2003–13

### Panel A. OLS and Second-stage of IV

<table>
<thead>
<tr>
<th></th>
<th>log(Loans$q$)</th>
<th>log(1+i$q$)</th>
<th>log(1+r$q$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS (1)</td>
<td>IV (2)</td>
<td>OLS (3)</td>
</tr>
<tr>
<td>log(K Inflows$q-1$)</td>
<td>0.040$^a$</td>
<td>0.040$^b$</td>
<td>-0.005$^a$</td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td>(0.017)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>FX</td>
<td>0.645$^a$</td>
<td>0.645$^a$</td>
<td>-0.070$^a$</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.012)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Policy rate$q-1$</td>
<td>-0.078</td>
<td>0.153</td>
<td>0.231$^a$</td>
</tr>
<tr>
<td></td>
<td>(0.262)</td>
<td>(0.320)</td>
<td>(0.022)</td>
</tr>
</tbody>
</table>

| Observations     | 19,982,267     | 19,982,267     | 19,982,267 | 19,982,267 | 19,982,267 | 19,982,267 |
| R-squared        | 0.850          | 0.850          | 0.791       | 0.793       | 0.778       | 0.779       |
| Bank×firm F.E.   | Yes            | Yes            | Yes         | Yes         | Yes         | Yes         |
| Macro controls & trend | Yes            | Yes            | Yes         | Yes         | Yes         | Yes         |
| Bank controls    | Yes            | Yes            | Yes         | Yes         | Yes         | Yes         |

### Panel B. First-stage of IV: log(K inflows$q$) Regression

<table>
<thead>
<tr>
<th>log(VIX$q-1$)</th>
<th>Observations</th>
<th>R-squared</th>
<th>F-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.694$^a$</td>
<td>1,685</td>
<td>0.571</td>
<td>16.35</td>
</tr>
<tr>
<td>(0.419)</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Bank Heterogeneity

Large and high non-core liability banks are more procyclical

“Capital Flows and International Credit Channel” (Baskaya, di Giovanni, Kalemli-Ozcan, Peydro, Ulu)
## Banking Sector Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Assets/GDP</th>
<th>Loans/GDP</th>
<th>Deposit/GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>0.54</td>
<td>0.14</td>
<td>0.33</td>
</tr>
<tr>
<td>2004</td>
<td>0.55</td>
<td>0.18</td>
<td>0.34</td>
</tr>
<tr>
<td>2005</td>
<td>0.60</td>
<td>0.23</td>
<td>0.37</td>
</tr>
<tr>
<td>2006</td>
<td>0.64</td>
<td>0.28</td>
<td>0.39</td>
</tr>
<tr>
<td>2007</td>
<td>0.67</td>
<td>0.32</td>
<td>0.41</td>
</tr>
<tr>
<td>2008</td>
<td>0.74</td>
<td>0.37</td>
<td>0.46</td>
</tr>
<tr>
<td>2009</td>
<td>0.84</td>
<td>0.39</td>
<td>0.51</td>
</tr>
<tr>
<td>2010</td>
<td>0.92</td>
<td>0.48</td>
<td>0.56</td>
</tr>
<tr>
<td>2011</td>
<td>0.94</td>
<td>0.53</td>
<td>0.54</td>
</tr>
<tr>
<td>2012</td>
<td>0.97</td>
<td>0.56</td>
<td>0.54</td>
</tr>
<tr>
<td>2013</td>
<td>1.11</td>
<td>0.67</td>
<td>0.60</td>
</tr>
</tbody>
</table>
### Firm Coverage

<table>
<thead>
<tr>
<th>Strata</th>
<th>Gross Output</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>All Sectors</td>
<td>Mfg. Sector</td>
<td></td>
</tr>
<tr>
<td>1-19 employees</td>
<td>0.053</td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td>20-249 employees</td>
<td>0.304</td>
<td>0.235</td>
<td></td>
</tr>
<tr>
<td>250+ employees</td>
<td>0.642</td>
<td>0.752</td>
<td></td>
</tr>
<tr>
<td>TurkStat</td>
<td>All Sectors</td>
<td>Mfg. Sector</td>
<td></td>
</tr>
<tr>
<td>1-19 employees</td>
<td>0.270</td>
<td>0.095</td>
<td></td>
</tr>
<tr>
<td>20-249 employees</td>
<td>0.364</td>
<td>0.361</td>
<td></td>
</tr>
<tr>
<td>250+ employees</td>
<td>0.367</td>
<td>0.544</td>
<td></td>
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</tbody>
</table>
### Macro Variables

<table>
<thead>
<tr>
<th></th>
<th>Obs.</th>
<th>Mean</th>
<th>Median</th>
<th>Std. Dev</th>
<th>IQR</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real GDP Growth (q-o-q)</td>
<td>44</td>
<td>0.012</td>
<td>0.012</td>
<td>0.017</td>
<td>0.022</td>
<td>-0.059</td>
<td>0.048</td>
</tr>
<tr>
<td>Inflation (q-o-q, annualized)</td>
<td>44</td>
<td>0.089</td>
<td>0.069</td>
<td>0.066</td>
<td>0.073</td>
<td>-0.013</td>
<td>0.322</td>
</tr>
<tr>
<td>Δ log(TL/US$) (q-o-q)</td>
<td>44</td>
<td>0.006</td>
<td>0.001</td>
<td>0.066</td>
<td>0.058</td>
<td>-0.104</td>
<td>0.271</td>
</tr>
<tr>
<td>CBRT overnight rate</td>
<td>44</td>
<td>0.188</td>
<td>0.182</td>
<td>0.113</td>
<td>0.118</td>
<td>0.067</td>
<td>0.517</td>
</tr>
<tr>
<td>Expected annual inflation (y-on-y)</td>
<td>44</td>
<td>0.088</td>
<td>0.07</td>
<td>0.049</td>
<td>0.017</td>
<td>0.055</td>
<td>0.264</td>
</tr>
<tr>
<td>CA/GDP</td>
<td>44</td>
<td>-5.144</td>
<td>-5.379</td>
<td>3.63</td>
<td>2.227</td>
<td>-9.803</td>
<td>-1.303</td>
</tr>
<tr>
<td>log(Capital inflows)</td>
<td>44</td>
<td>18.25</td>
<td>18.61</td>
<td>0.926</td>
<td>0.730</td>
<td>15.92</td>
<td>19.22</td>
</tr>
<tr>
<td>log(VIX)</td>
<td>44</td>
<td>2.957</td>
<td>2.913</td>
<td>0.368</td>
<td>0.567</td>
<td>2.401</td>
<td>4.071</td>
</tr>
<tr>
<td>US 10-year/3-month spread</td>
<td>44</td>
<td>0.020</td>
<td>0.023</td>
<td>0.012</td>
<td>0.016</td>
<td>-0.004</td>
<td>0.036</td>
</tr>
</tbody>
</table>