# A Loan-level Analysis of Bank Lending in Mexico.

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**BANCO DE MÉXICO**

# A Loan-level Analysis of Bank Lending in Mexico

Carlos Cantú [1]    Roberto Lobato [2]    Calixto López [2]
Fabrizio López-Gallo [2]

[1]Bank for International Settlements
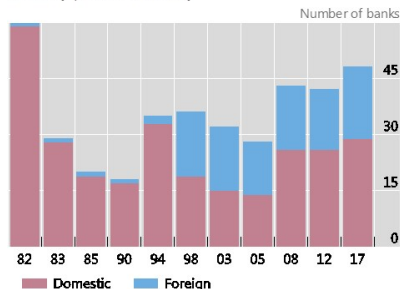
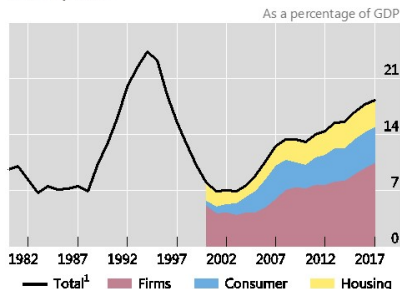[2]Bank of Mexico

September 06, 2018

# Motivation

## Evolution of banks and credit in Mexico

Banks by parent nationality



Credit by sector



[1] CNBV starting in 2001, previous data extrapolated from BIS statistics bank credit to the private non-financial sector.

Source: Graf (1999), Herández-Murillo (2007), CNBV and BIS Statistics

# Non-technical Summary

### Focus
Changes in the global financial system after the GFC have impacted how banks fund their operations, grant credit, the business line they engage into and their reaction to monetary policy and external shocks.

### Contribution
We use loan-level data from Mexico to study how bank-specific characteristics affect the supply of credit. Then, we explore how these characteristics influence the transmission of monetary policy and their role in building banks' resilience against external shocks.

# Non-technical Summary

### Findings

1. Banks that are large, well-capitalised, have lower credit risk, and with stable sources of funding grant more credit.

2. Banks that are liquid, well-capitalised, have lower credit risk, and are more efficient are more sheltered against monetary policy shocks.

3. Banks that are liquid, well-capitalised and with low dependence on funding from foreign sources reduce less their credit supply when faced with external shocks.

# Data

- Credit registry of all the commercial loans from banks to firms between September 2009 and December 2017 on a quarterly basis (3,394,771 observations from 113,548 firms and 42 banks).

- Balance sheet information of banks from Mexico's financial system regulatory and supervisory institution.
  - **Main indicators:** size (log of total assets), liquidity coverage ratio and bank capital ratio (net capital to total assets).
  - **Risk profile:** share of non-performing loans to total loans and share of write-offs to total loans.
  - **Revenue mix:** diversification ratio (non-interest income to total income) and share of trading assets to total assets.
  - **Funding composition:** share of long-term funding, share of funding from foreign sources and share of demand deposits to total funding.
  - **Profitability:** efficiency (operating cost to total income).

# Empirical Specification

The dependent variable in all specifications is the log-change in the total amount (sum of loans) owed by creditor $i$ to bank $b$ at time $t$.

$$\Delta log(Credit_{i,b,t}) = \beta X_{b,t-1} + \alpha_b + \gamma_{i,t} + \varepsilon_{i,b,t} \qquad (1)$$

- $X_{b,t-1}$ a vector of bank specific characteristics.
- $\alpha_b$ time invariant bank fixed effects.
- $\gamma_{i,t}$ time variant firm fixed effects.
- We focus on firms with multiple banking relationships (Khwaja and Mian (2008)).

# Role of BSC on the Credit Supply in Mexico

| $\Delta$ log(Credit) | (1) Main | (2) Risk | (3) Revenue | (4) Funding | (5) Profit | (6) All |
|---|---|---|---|---|---|---|
| $\log(\text{Assets})_{(t-1)}$ | 0.00867* (0.00514) | | | | | 0.00870* (0.00517) |
| $\text{LCR}_{(t-1)}$ | -0.00531*** (0.000983) | | | | | -0.00362*** (0.00102) |
| $\text{Capital}_{(t-1)}$ | 0.0407 (0.0477) | | | | | 0.142*** (0.0498) |
| $\text{NPL}_{(t-1)}$ | | -0.621*** (0.0720) | | | | -0.647*** (0.0747) |
| $\text{Write-offs}_{(t-1)}$ | | -1.406*** (0.435) | | | | -0.900** (0.446) |
| $\text{Div. Ratio}_{(t-1)}$ | | | -0.00637*** (0.00220) | | | -0.00798*** (0.00226) |
| $\text{Trading assets}_{(t-1)}$ | | | -0.0909*** (0.0228) | | | -0.0829*** (0.0233) |
| $\text{LT funding}_{(t-1)}$ | | | | 0.0600*** (0.0113) | | 0.0463*** (0.0113) |
| $\text{Fund foreign}_{(t-1)}$ | | | | -0.170*** (0.0405) | | -0.159*** (0.0397) |
| $\text{Deposits}_{(t-1)}$ | | | | -0.0126 (0.0160) | | |
| $\text{Efficiency}_{(t-1)}$ | | | | | -6.63e-06 (1.74e-05) | |
| Number of debtors | 112,905 | 112,905 | 112,905 | 112,905 | 112,905 | 112,905 |
| Number of banks | 42 | 42 | 42 | 42 | 42 | 42 |
| Observations | 2,661,018 | 2,663,249 | 2,663,249 | 2,663,249 | 2,662,027 | 2,661,018 |
| $R^2$ | 0.440 | 0.440 | 0.440 | 0.440 | 0.440 | 0.440 |

Standard errors in parentheses. All regressions include bank and firm*time fixed effects.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

# Monetary Policy and Global Shocks

## Monetary Policy

$$\Delta log(Credit_{i,b,t}) = (\beta + \beta^* \Delta i_{t-1}) X_{bt-1} + \alpha_b + \gamma_{i,t} + \varepsilon_{ibt} \quad (2)$$

$\Delta i_{t-1}$ corresponds to the quarterly change in the monetary policy rate.

## Global Shocks

$$\Delta log(Credit_{i,b,t}) = (\beta + \beta^* C) X_{b,t-1} + \alpha_b + \gamma_{i,t} + \varepsilon_{ibt} \quad (3)$$
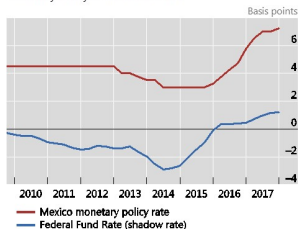
$C$ alternates between four shocks

- **Global liquidity**-Federal Funds shadow rate (Wu and Xia (2016)).
- **Global risk**- VIX index.
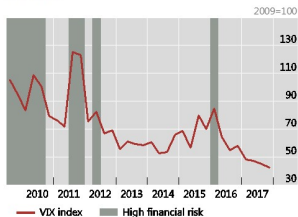- **Economic Policy Uncertainty**- Baker, Bloom and Davis (2016).
- **Commodity prices**

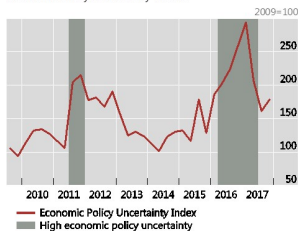# Domestic and External Shocks
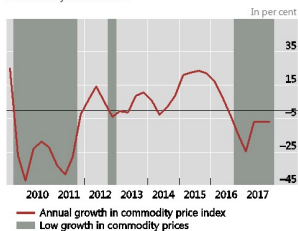
Domestic and External Shocks



Source: Wu and Xia (2016), Baker et al (2016), Banco de México and Bloomberg.

# Interaction between BSC and MP Shock

| $\Delta \log(\text{Credit})$ | (1) Main | (2) Risk | (3) Revenue | (4) Fund | (5) Profit | (6) All |
|---|---|---|---|---|---|---|
| $\Delta i_{t-1}$ * | | | | | | |
| $\quad$ ln(Assets)$_{(t-1)}$ | -0.00514*** | | | | | -0.00779*** |
| | (0.00169) | | | | | (0.00249) |
| $\quad$ LCR$_{(t-1)}$ | 0.0134*** | | | | | 0.0200*** |
| | (0.00171) | | | | | (0.00211) |
| $\quad$ Capital$_{(t-1)}$ | 0.0917 | | | | | 0.286*** |
| | (0.0753) | | | | | (0.0943) |
| $\quad$ NPL$_{(t-1)}$ | | -0.352*** | | | | -1.151*** |
| | | (0.135) | | | | (0.180) |
| $\quad$ Write-offs$_{(t-1)}$ | | -2.795*** | | | | -8.004*** |
| | | (1.083) | | | | (1.446) |
| $\quad$ Div. Ratio$_{(t-1)}$ | | | -0.116*** | | | -0.0138 |
| | | | (0.0222) | | | (0.0269) |
| $\quad$ Trading assets$_{(t-1)}$ | | | -0.201*** | | | -0.188*** |
| | | | (0.0496) | | | (0.0590) |
| $\quad$ LT funding$_{(t-1)}$ | | | | 0.00244 | | |
| | | | | (0.0152) | | |
| $\quad$ Fund foreign$_{(t-1)}$ | | | | -0.653*** | | -0.557*** |
| | | | | (0.0750) | | (0.0861) |
| $\quad$ Deposits$_{(t-1)}$ | | | | 0.168*** | | 0.165*** |
| | | | | (0.0222) | | (0.0273) |
| $\quad$ Efficiency$_{(t-1)}$ | | | | | 0.000297*** | 0.000125*** |
| | | | | | (4.63e-05) | (5.45e-05) |
| Number of debtors | 112,905 | 112,905 | 112,905 | 112,905 | 112,905 | 112,905 |
| Number of banks | 42 | 42 | 42 | 42 | 42 | 42 |
| Observations | 2,661,018 | 2,663,249 | 2,663,249 | 2,663,249 | 2,662,027 | 2,662,027 |
| $R^2$ | 0.440 | 0.440 | 0.440 | 0.440 | 0.440 | 0.440 |

Standard errors in parentheses. All regressions include bank and firm*time fixed effects.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

# Interaction between BSC and Global Shocks

| Δ log(Credit) | (1) Global Risk | (2) Global Liquidity | (3) Economic Policy | (4) Commodity P |
|---|---|---|---|---|
| **Shock \*** | | | | |
| ln(Assets)$_{(t-1)}$ | -0.000228 | -0.00139 | -0.00182 | 0.00168 |
| | (0.00242) | (0.000949) | (0.00170) | (0.00248) |
| LCR$_{(t-1)}$ | 0.00542*** | 0.00432*** | -0.00103 | 0.00877*** |
| | (0.00129) | (0.000663) | (0.00109) | (0.00132) |
| Capital$_{(t-1)}$ | 0.249*** | 0.0211 | 0.227*** | 0.0670 |
| | (0.0576) | (0.0289) | (0.0571) | (0.0596) |
| NPL$_{(t-1)}$ | -0.201 | -0.361*** | | -0.0589 |
| | (0.152) | (0.0539) | | (0.135) |
| Write-offs$_{(t-1)}$ | -1.100 | -1.983*** | | -4.443*** |
| | (1.005) | (0.361) | | (0.976) |
| Div. Ratio$_{(t-1)}$ | -0.0137*** | | -0.0101** | -0.0232 |
| | (0.00481) | | (0.00500) | (0.0142) |
| Trading assets$_{(t-1)}$ | 0.0998* | -0.0406* | | -0.0763* |
| | (0.0513) | (0.0216) | | (0.0449) |
| LT funding$_{(t-1)}$ | 0.0789*** | | | 0.0926*** |
| | (0.0193) | | | (0.0177) |
| Fund foreign$_{(t-1)}$ | -0.386*** | -0.183*** | -0.219*** | -0.519*** |
| | (0.0849) | (0.0284) | (0.0646) | (0.0673) |
| Deposits$_{(t-1)}$ | 0.0198 | 0.0811*** | 0.0928*** | 0.112*** |
| | (0.0282) | (0.0113) | (0.0215) | (0.0235) |
| Efficiency$_{(t-1)}$ | | | | 0.000202** |
| | | | | (8.19e-05) |
| | | | | |
| Number of debtors | 112,905 | 112,905 | 112,905 | 112,905 |
| Number of banks | 42 | 42 | 42 | 42 |
| Observations | 2,640,106 | 2,640,106 | 2,640,106 | 2,639,682 |
| R-squared | 0.492 | 0.492 | 0.492 | 0.492 |

Standard errors in parentheses. All regressions include bank and firm*time fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

# Conclusions

- This paper explores the determinants of the credit supply in Mexico taking advantage of the granularity provided by credit registry data.
- We find that the strength of a bank's balance sheets is fundamental for credit provision in Mexico.
  - Bank characteristics that are positively related to the growth of credit are: size, capitalisation, low share of riskier loans, less income diversification, high long-term funding and low funding from foreign sources.
  - Bank characteristics that shelter banks against a tightening of monetary policy are: liquidity, capitalisation, low share of riskier loans, low trading assets, low share of funding from foreign sources, high short term funding and efficiency.
  - Bank characteristics that build resilience against external shocks are: high liquidity, high capitalisation, less diversification, low share of funding from foreign sources and a high share of long-term and short-term funding.

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