Macroprudential FX Regulations: Sacrificing Small Firms for Stability?

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Motivation

- Debt dollarization of non-tradable firms associated with financial fragility in EM
  - Peru: $\approx$ 46% of loans to NT firms
- Regulators respond with Macroprudential FX (MaP FX) policies
- This paper:
  - Hidden costs of MaP FX policies
    - Do they increase the financing disparities between small and large firms?
- Why do we care?
  - Disproportionally hurt small firms unable to reallocate to local currency debt
  - Potentially affect firm size distribution
  - Unintended consequences on income inequality

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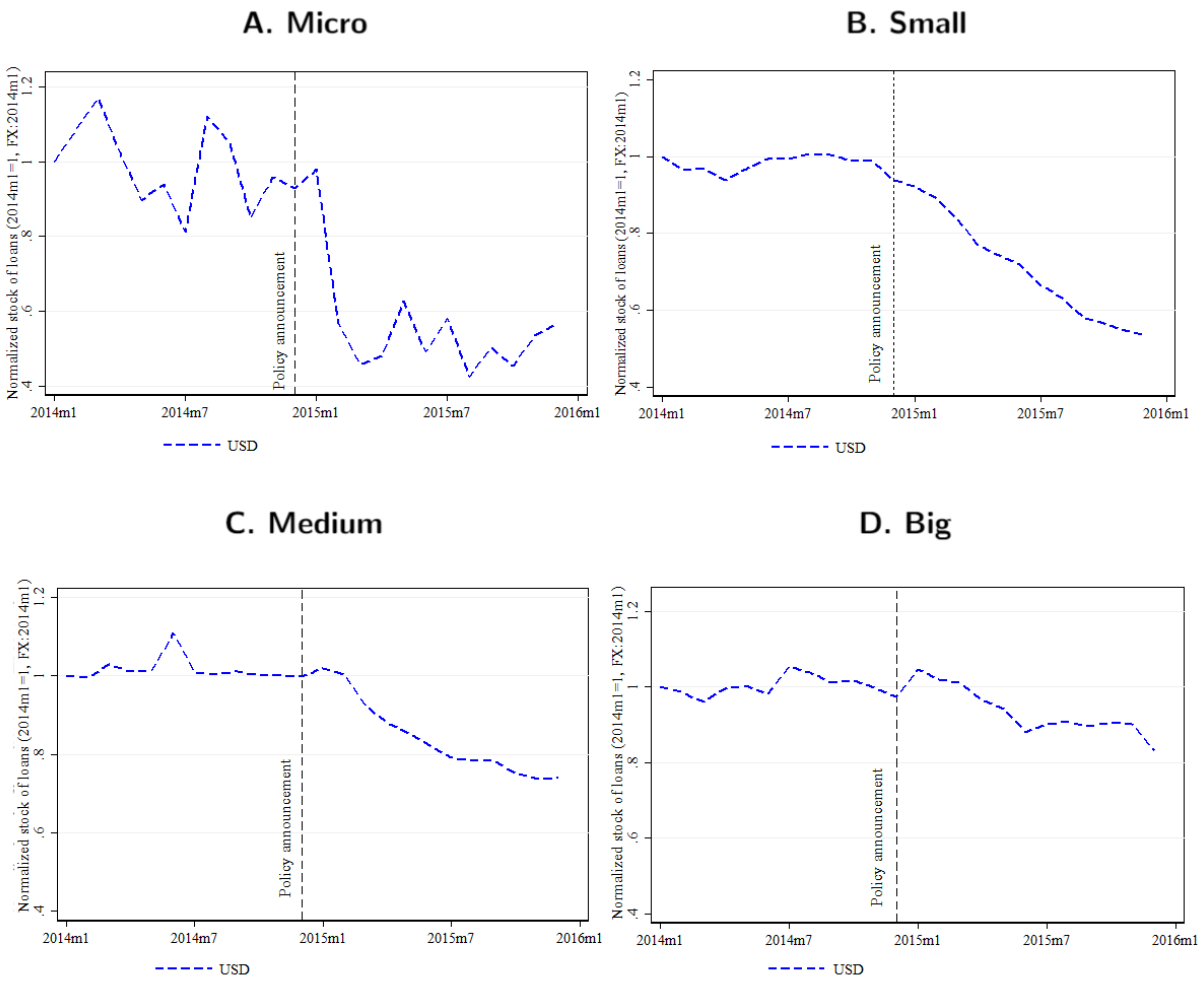
The Case of Peru

An (implicit) tax on dollar lending

Dollar loans to nontradable firms

(2014m1=1, FX:2014m1)

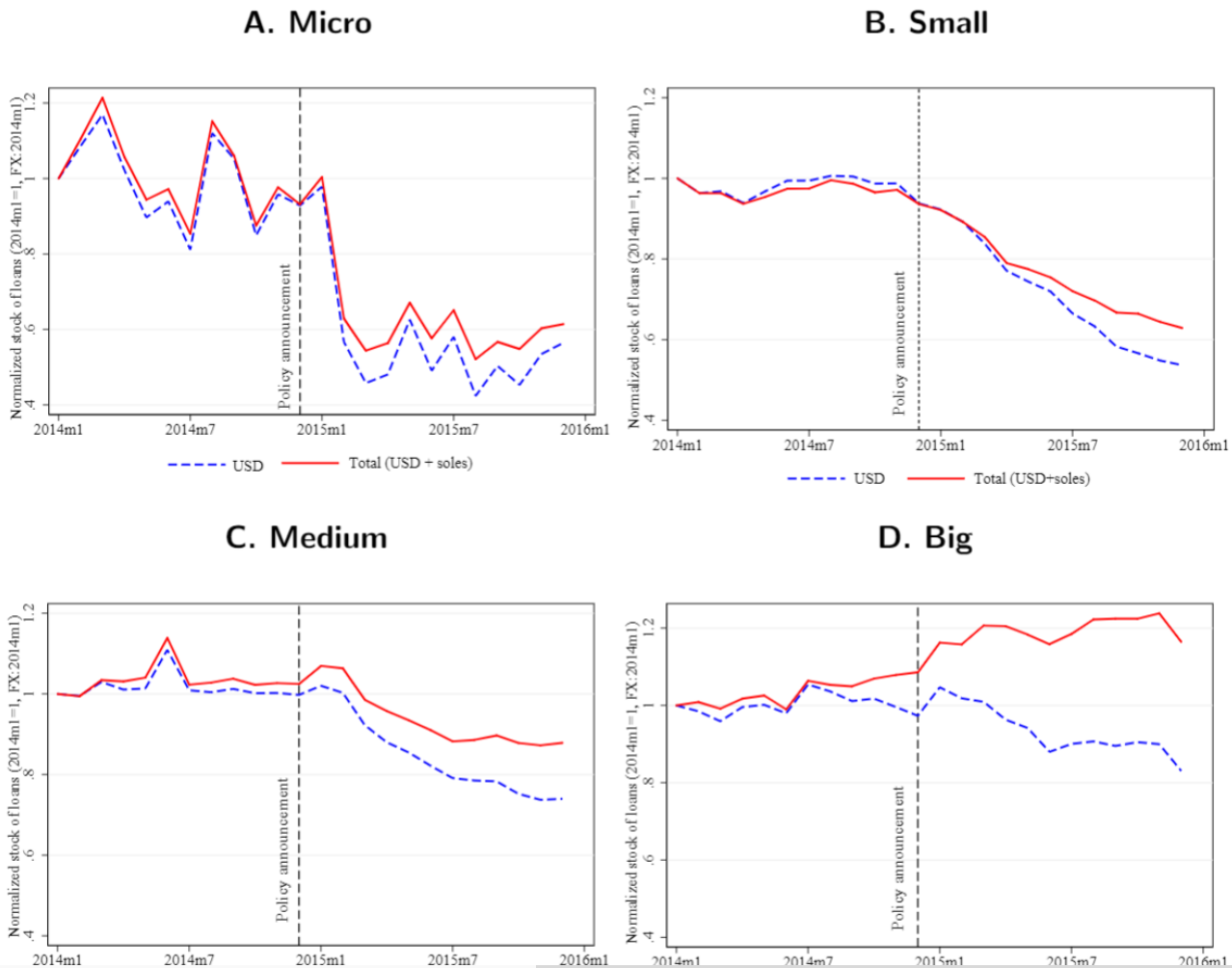


The Case of Peru

An (implicit) tax on dollar lending

Dollar and Total loans to nontradable firms

(2014m1=1, FX:2014m1)



Stylized facts in Peru

- **3 ways to limit exchange rate exposure**

  1. Use of FX derivatives $\rightarrow$ mostly used by large firms
  2. One-to-one adjustment of selling prices to exchange rate changes $\rightarrow$ incomplete pass-through
  3. Natural hedge: Matching amount and maturity of dollar receivables $\rightarrow$ not relevant

▸ Use of FX derivatives

Stylized facts in Peru

- $\approx$ **30% of loans granted to the 2 smallest size segments are denominated in dollars**
- Small segments: Almost all dollar debt is granted to unhedged firms

Size	% USD debt (unhedged firms' debt)	% loans to unhedged firms (USD loans)	% Tradable firms (firms with USD debt)
Micro	36.11	87.8	0.68
Small	25.89	93.06	2.5
Medium	59.54	74.44	13.76
Large	51.63	44.24	29.51

Source: SBS, own calculations. Dec. 2014

Contribution I

1. **I propose a mechanism leading to heterogeneous responses to a tax on dollar lending:**

   - Currency mismatch acts as a means for relaxing small firms borrowing constraints but exposes them to insolvency risk
   - Trade-off: leverage gains vs insolvency risk is irrelevant for unconstrained (large) firms
   - Tax on dollar lending negatively affects total borrowing of small firms
   - Tax only has compositional effects on the amount large firms borrow

▸ Why is dollar debt cheaper?

Contribution II

1. I propose a mechanism leading to heterogeneous responses to a tax on dollar lending

2. **Verify the implications of the mechanism empirically:**

   - Effect of a tax across firms of different sizes:
     - Dollar loans
     - Total (Dollar + Soles) loans

Contribution II

1. I propose a mechanism leading to heterogeneous responses to a tax on dollar lending

2. **Verify the implications of the mechanism empirically:**

   - Why Peru?

     - As in most EM: (1) high levels of financial dollarization (2) dollar debt is cheaper source of financing (3) open economy inflation targeter
     - Quasi-Experiment: unexpected and unprecedented increase in RR rate on FX liabilities
     - Confidential credit register: Exploit the universe of all loans granted by the banking system

Related Literature

- Financial liberalization and capital allocation across firms: Varela (2017), Alfaro, Chari, and Kanczuk (2017), Andreasen, Bauducco, and Dardati (2017), DeGregorio, Edwards, and Valdes (2000), Forbes(2007), Larrain and Stumpner (2017)...
  - Contribution:
    1. Additional source of heterogeneity $\rightarrow$ trade-off dollar vs. local currency borrowing
    2. Universe of loans $\rightarrow$ small firms are arguably the most financially constrained

Related Literature

- Unintended consequences of MaP FX regulations: Keller (2018), Ahnert, Forbes, Friedrich, and Reinhardt (2018), Aiyar, Calomiris, and Wieladek (2014), Cerutti, Claessens, and Laeven (2017), Reinhardt and Sowerbutts (2015)...
  - Contribution:
    1. First paper addressing unintended consequences from a distributional perspective

Related Literature

- Determinants of currency mismatch: Ranciere and Tornell (2016), Salomao and Varela (2018), Basso, Calvo-Gonzales, and Jurgilas (2007), Brown, Ongena and Yesin (2009), Allayannis, Brown and Klapper (2007), Bruno and Shin(2015), DiGiovanni, Kalemli-Ozcan, Ulu and Baskaya (2020), Ivashina, Salomao and Gutierrez (2020), Richers (2019)...
  - Contribution:
    1. My theoretical mechanism heavily relies on this literature to derive implications of a MaP FX tax
    2. Suggestive empirical evidence on small firms more willing to exploit gains from currency mismatch

Outline

1. Model
2. The MaP FX tax: Policy rule
3. Data
4. Identification Strategy
5. Results
6. Conclusions

Model Set-up

- 2 period credit market game. 2 agents: Non-tradable firms and lenders:
  - NT firms produce N-goods using capital: $q_t = \theta I_{t-1}$ with capacity constraints
  - Revenues are denominated in soles
  - Use B_t and its own wealth w_t to finance investment
  - e_t (soles to dollar) only source of uncertainty in this model

$$e_{t+1} = \begin{cases} \overline{e_{t+1}} & probability \quad u \\ \underline{e_{t+1}} & probability \quad 1-u \end{cases}$$

  - Firms can choose to denominate their debt in dollars b_t or b_t^s soles
    - Risky financing plan: If firms issue dollar debt, they go bankrupt in the bad state, $\underline{e_{t+1}}$, with probability of $(1-u)$
    - Safe financing plan: If firms issue soles debt, firms are not exposed to exchange rate risk

Model Set-up

- Borrowing constraints (BC) may arise as a result of an agency problem
  - Key Parameter: h (diversion cost)
  - If h is high enough $\rightarrow$ cost of diversion $>$ cost of paying debt $\rightarrow$ BC do not arise
  - If h is low enough $\rightarrow$ cost of diversion $<$ cost of paying debt $\rightarrow$ BC arise
- The tightness of BC is endogenous to the size of parameter h
- Assumption: h is a proxy of size in this model, i.e. larger firms can borrow more
- Comparative statics: Equilibrium is estimated for different values of h. Before and after a tax on dollar lending.

Model Set-up

- Lenders only supply funds if they are repaid their cost of funding in expectation: $(1 + r_t)$
- Lenders break-even conditions

$$\textit{Dollar lending}: \quad \underbrace{E_t[\psi_{t+1} + (1 - \psi_{t+1})\phi_{t+1}]}_{\textit{repayment probability in dollars}}(1 + \rho_t) = (1 + r_t)$$

$$\textit{Soles lending}: \quad \underbrace{E_t[\psi_{t+1} + (1 - \psi_{t+1})\phi_{t+1}]}_{\textit{repayment probability in soles}}(1 + \rho_t^s) = \frac{(1 + r_t)}{E\left[e_{t+1}\right]}$$

- If $\psi_{t+1} = 1$, firm is solvent at $t + 1$ and if $\psi_{t+1} = 0$ firm goes bankrupt
- If $\psi_{t+1} = 0 \rightarrow$ Assumption: Lenders expect a bailout of size ϕ_{t+1}

Model

Rationalizing cheaper dollar debt

- Lender's Expectations on ψ_{t+1} and ϕ_{t+1} are endogenous to the currency denomination of firm's debt:

1. **If firms choose a risky plan (dollar debt)** $\rightarrow \psi_{t+1} = 0$ and $\phi_{t+1} = 1$ with probability $(1-u)$
   - Firm's Expected cost of debt: $u \times (1+\rho_t) = u \times (1+r_t)$.
   - Firm only pays debt in the good state (with probability u)
2. **If firms choose a safe plan (soles debt)**$\rightarrow \psi_{t+1} = 1$ and $\phi_{t+1} = 0$, in all the states.
   - Firm's expected cost of debt: $(1+\rho_t) = (1+r_t)$

▸ Model Solution

- **Two opposing forces**

1. Risky plan (dollar debt) $\rightarrow$ profit gains + leverage gains if BC arise
2. Safe plan (soles debt) $\rightarrow$ No insolvency risk

- **Proposition 1. Optimal debt denomination and h.**
  - For a set of low h (small) firms, dollar debt is optimal.
    - if $\tilde{h} \leq h < u$. Dollar debt is optimal and generates leverage gains
  - For high h (large) firms, optimal debt denomination depends on w_t:
    - if $u \leq h$ and $w_t < \underline{w}$. Dollar debt is optimal generates profit gains. No leverage gains.
    - if $u \leq h$ and $w_t > \underline{w}$. Firm is indifferent to any debt composition.

▸ Data

- Lender's break-even conditions

$$\textit{Dollar lending}: \quad \underbrace{E[\psi_{t+1} + (1-\psi_{t+1})\phi_{t+1}]}_{\textit{repayment probability in dollars}}(1+\rho_t) = (1+r_t)(1+\tau)$$

  - ρ increases after tax $\rightarrow$ Either:

1. Firms keep issuing dollar debt and pay the tax
2. Or firms switch to soles borrowing

- **Proposition 2. The effect of the tax on total borrowing is decreasing in firm size.**
  - A tax reduces total borrowing of low h (small) firms.
    - Firms either: (1) assume the burden of the tax and borrow less dollars or (2) switch to more expensive soles loans, and borrow less.
  - A tax has no effect on total borrowing of high h (large) firms. Effect is only compositional.
    - Firms either: (1) assume the burden of the tax (2) switch completely to soles loans.

▸ Data

Outline

1. Model
2. The MaP FX tax
    - Institutional Background
    - Policy rule
3. Data
4. Identification Strategy
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MaP FX regulation in Peru

Background features

- **4 features of Peruvian financial system**

1. High levels of financial dollarization ▸ Evolution dollarization
2. Banks do not assume FX risk in their balance sheets ▸ Assets vs. Liab
3. Dollar loans are cheaper than soles loans ▸ IR differentials
4. Central Bank allows for FX fluctuations ▸ Exch. rate evolution

MaP FX regulation in Peru

Institutional Background

- **Goal:** Reduce financial system *indirect* exposure to fluctuations to exchange rate risk
  - Increase of the reserve requirements rate (tax) on bank dollar liabilities conditional on dollar loans reduction
- **Three suitable features:**
  - Unprecedented, aggressive and arguably unexpected

MaP FX regulation in Peru
The Policy Rule

- Banks are differently exposed to the MaP FX tax
- In Dec-2014 (announcement), banks are informed that by Dec-2015 (deadline) they will be subject to the following tax rate:

$$\tau_b = \begin{cases} 0.3 \times \left(\frac{D_b^{Dec2015}}{D_b^{Sep2013}} - 0.9 \right) & if \quad \frac{D_b^{Dec2015}}{D_b^{Sep2013}} > 0.9 \\ 0 & o/w \end{cases}$$

  - Where D_b^t is the stock of bank's b dollar loans at date t

- Tax base: bank's FX liabilities s.t. reserve requirements.
- Credit for trade operations is excluded from D_b^t

MaP FX regulation in Peru

Bank Exposure

- **Which banks are more exposed to the policy?**

  1. Banks with a stronger reliance on dollar funding, $\frac{Liab\ USD}{Assets}$ at the announcement.

  2. Banks that at the announcement are further from the regulatory benchmark: $\frac{D^{Dec2014}}{D^{Sep2013}} - 0.9$

MaP FX regulation in Peru

Bank Exposure

- $\frac{Liab\ USD_b}{Assets_b}$ strongly correlated with $\frac{D_b^{Dec2014}}{D_b^{Sep2013}}$:
  - Hedging incentives and regulatory limits to banks' exposure to FX risk ▸ data
- $\frac{D_b^{Dec2014}}{D_b^{Sep2013}}$ endogenous response to the policy. ▸ data
- Main indicator of exposure: $\frac{Liab\ USD_b}{Assets_b}$

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Data
2014m1-2015m12

1. **Credit register:** Universe of all loans in the financial system.
    - Source: Central Bank of Peru (BCRP)
    - Monthly frequency
    - Relevant variables: size of the firm, currency denomination of the loan, credit for trade operations
2. **FX derivatives dataset.** All FX derivatives contracts outstanding for the universe of banks in Peru.
    - Source: Regulator of the Financial System (SBS)
3. **Monthly data on Banks' balance sheets.**
    - Source: Regulator of the Financial System (SBS)
4. **Firm level data on the universe of all formally registered firms.**
    - Source: Tax collection agency (SUNAT)
    - Annual frequency

Data
Sample Construction

- **Additional confidential dataset:** Link between tax payer ID and SBS code
- **Exclude informal firms:** not registered as tax payers, natural persons issuing business loans
- **Credit for trade activities excluded from regulation:** I exclude all firms issuing at least once loans classified as for trade purposes $\rightarrow$ avoid capturing regulatory arbitrage
- **Exclude non-banking financial institutions:** subject to fusions, mergers, transfers of patrimonial blocks
- **Banks starting operations around announcement:** outliers with respect to the rest of the banking system

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Identification Strategy

- **Diff-in-diff with continuous treatment**
- Exploit banks' heterogeneous exposure to the tax $\rightarrow$ identify bank lending channel and simultaneously...
- I test whether firms borrowing from differently exposed banks, respond heterogeneously depending on their size.
- **Two outcome variables:**
  1. Growth rate of new dollar loans
  2. Growth rate of new total (dollar + soles) loans

Identification Strategy

$$y_{fbt} = \beta_0 + \beta_1 Exposure_b \times shock_t + \sum_{s=2}^{4} \beta_2^s Exposure_b \times shock_t \times size^s$$

$$+ \sum_{s=2}^{4} \beta_3^s Exposure_b \times size^s + \Theta X_{bf} + \Phi X_{b,t-1} + TimeFE + BankFE + FirmFE + \epsilon_{fbt}$$

- y_{fbt}: gr. rate new dollar loans or growth rate new total loans.
- *Shock:* 1 after policy announcement
- $size^s$: 1 if firm size is s. $s = \{1 : micro, 2 : small, 3 : medium, 4 : big\}$. s=1 omitted category
- X_{bf}: Bank-firm relationship controls: share of loans, share of NPL
- $X_{b,t-1}$: Time varying lagged bank controls: roa, liquidity ratio

Outline

Identification Strategy
Validity

- I rely on **four** identification assumptions to validate my strategy:

1. **Parallel trends** ▸ Discussion
2. **MaP FX regulation should be exogenous** ▸ Discussion
3. **Demand shocks uncorrelated with bank exposure** ▸ Discussion
4. **Banks should not anticipate the regulation** ▸ Discussion

Outline

Main Results

	Δ(*log New Dollar loans*)(*FX* : 2014*m*1)				Δ(*log New Total loans*)
	(1)	(2)	(3)	(4)	
Exposure*Shock (Micro)	-0.478**	-0.505**	-0.498**	-0.502**	
	(0.196)	(0.201)	(0.202)	(0.205)	
Exposure*Shock*Small	-0.0426	-0.0432	-0.0293	-0.0219	
	(0.0565)	(0.0587)	(0.0590)	(0.0610)	
Exposure*Shock*Medium	0.0307	0.0269	0.0251	0.0277	
	(0.0519)	(0.0554)	(0.0548)	(0.0579)	
Exposure*Shock*Large	0.246***	0.261***	0.246***	0.261***	
	(0.0689)	(0.0729)	(0.0721)	(0.0762)	
Joint Test (Small Firms)	0.00705	0.00545	0.00781	0.00921	
Joint Test (Medium Firms)	0.0195	0.0144	0.0161	0.0172	
Joint Test (Large Firms)	0.237	0.224	0.212	0.238	
Firm FE	✓	✓	✓	✓	
Time FE	✓				
Bank FE	✓	✓	✓	✓	
Industry-Time FE		✓		✓	
Geog. Location-Time FE			✓	✓	
Additional controls	✓	✓	✓	✓	
Observations	145,085	144,374	142,870	142,144	
R-squared	0.306	0.331	0.324	0.349	
N. of firm clusters	24,643	24,557	24,183	24,097	

Notes. Robust Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Joint test reports the p-value of the F-test that the sum of the coefficients of Exposure*Shock and Exposure*Shock*Size is equal to 0. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency.

Main Results

1. **Effect on new dollar loans:**
   - Significantly increasing in bank exposure
   - heterogeneous on firm size: micro, small and medium-sized firms dollar borrowing significantly more affected by the policy than large firms.
     - 10% increase in bank exposure ($\equiv$ from the median to the 75th percentile of exposure) reduction of new dollar loan growth in $\approx$ 5pp for 3 smallest size segments
     - For large firms, this effect is $\approx -2.4pp$
   - **Captures both effects:**
     - **(1) Firms paying τ and reducing dollar borrowing**
     - **(2) Firms switching to soles and reducing dollar borrowing**

Main Results

	Δ(*log New Dollar loans*)(*FX* : 2014*m*1)				Δ(*log New Total loans*)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure*Shock (Micro)	-0.478**	-0.505**	-0.498**	-0.502**	−0.350*	−0.364*	−0.368*	−0.345*
	(0.196)	(0.201)	(0.202)	(0.205)	(0.183)	(0.191)	(0.190)	(0.197)
Exposure*Shock*Small	-0.0426	-0.0432	-0.0293	-0.0219	0.0392	0.0253	0.0574	0.0513
	(0.0565)	(0.0587)	(0.0590)	(0.0610)	(0.0547)	(0.0567)	(0.0569)	(0.0588)
Exposure*Shock*Medium	0.0307	0.0269	0.0251	0.0277	−0.0110	−0.0180	−0.0277	−0.0291
	(0.0519)	(0.0554)	(0.0548)	(0.0579)	(0.0486)	(0.0519)	(0.0518)	(0.0546)
Exposure*Shock*Large	0.246***	0.261***	0.246***	0.261***	0.158**	0.163**	0.161**	0.156**
	(0.0689)	(0.0729)	(0.0721)	(0.0762)	(0.0638)	(0.0690)	(0.0673)	(0.0725)
Joint Test (Small Firms)	0.00705	0.00545	0.00781	0.00921	0.0862	0.0713	0.0972	0.129
Joint Test (Medium Firms)	0.0195	0.0144	0.0161	0.0172	0.0466	0.0427	0.0344	0.0538
Joint Test (Large Firms)	0.237	0.224	0.212	0.238	0.309	0.305	0.288	0.351
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓				✓			
Bank FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry-Time FE		✓		✓		✓		✓
Geog. Location-Time FE			✓	✓			✓	✓
Additional controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	145,085	144,374	142,870	142,144	115,928	115,095	113,920	113,065
R-squared	0.306	0.331	0.324	0.349	0.345	0.373	0.367	0.395
N. of firm clusters	24,643	24,557	24,183	24,097	21,104	20,998	20,643	20,533

Notes. Robust Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Joint test reports the p-value of the F-test that the sum of the coefficients of Exposure*Shock and Exposure*Shock*Size is equal to 0. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency.

2. Effect on total loans

- Effect on small firms smaller in magnitude: $\approx -3.5pp$
- Differential effect between small segments and large segment remains statistically significant but smaller in magnitude
  - **Additional sources of substitution for large firms?**
- **Proposition 2:**
  - **(1) Small firms reduce total borrowing. Some compositional effect**
  - **(2) Only compositional effects for large firms**

Firm level outcomes

- Firms may have incentives to look for cheaper dollar loans in less exposed banks after the policy
- To account for potential substitution of firm's debt between banks, I study the effect of the MaP regulation on firm's total outcomes

$$y_{ft} = \alpha_0 + \alpha_1 Exposure_f + \alpha_2 Shock_t + \alpha_3 Exposure_f \times Shock_t$$

$$\sum_{s=2}^{4} \alpha_s Exposure_f \times shock \times size^s + \Theta X^b_{f,t} + FirmFE + Industry \times timeFE + location \times timeFE + \epsilon_{ft}$$

- Where $Exposure_f = \sum_b \frac{exp_{bf} \times debt_{bf}}{debt_f}$

Firm level outcomes: Main Results

	$\Delta(log\ New\ Dollar\ loans)(FX: 2014m1)$				$\Delta(log\ New\ Total\ loans)$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Exposure_f$*Shock	-0.407***	-0.458***	-0.434***	-0.494***				
	(0.121)	(0.124)	(0.126)	(0.129)				
$Exposure_f$*Shock*Small	-0.0402	-0.0466	-0.0332	-0.0355				
	(0.0649)	(0.0661)	(0.0676)	(0.0689)				
$Exposure_f$*Shock*Medium	0.0615	0.0631	0.0684	0.0776				
	(0.0581)	(0.0617)	(0.0609)	(0.0643)				
$Exposure_f$*Shock*Large	0.192**	0.218**	0.217**	0.229**				
	(0.0926)	(0.0993)	(0.0973)	(0.104)				
Joint Test (Small Firms)	0.000189	3.64e-05	0.000174	3.04e-05				
Joint Test (Medium Firms)	0.00284	0.000886	0.00234	0.000728				
Joint Test (Large Firms)	0.116	0.0946	0.128	0.0770				
Firm FE	✓	✓	✓	✓				
Time FE	✓							
Firm-Bank controls	✓	✓	✓	✓				
Industry-Time FE		✓		✓				
Geog. Location-Time FE			✓	✓				
Observations	100,566	99,695	98,398	97,476				
R-squared	0.374	0.403	0.399	0.429				
N. of firm clusters	20,747	20,634	20,296	20,169				

Notes. Robust Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Joint test reports the p-value of the F-test that the sum of the coefficients of $Exposure_f * Shock$ and $Exposure_f * Shock * Size$ is equal to 0 for each size. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency.

Firm level outcomes: Main Results

	$\Delta(log\ New\ Dollar\ loans)(FX: 2014m1)$				$\Delta(log\ New\ Total\ loans)$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Exposure_f$*Shock	-0.407***	-0.458***	-0.434***	-0.494***	−0.302**	−0.343**	−0.265*	−0.298**
	(0.121)	(0.124)	(0.126)	(0.129)	(0.132)	(0.135)	(0.136)	(0.139)
$Exposure_f$*Shock*Small	-0.0402	-0.0466	-0.0332	-0.0355	0.129**	0.112*	0.145**	0.131**
	(0.0649)	(0.0661)	(0.0676)	(0.0689)	(0.0607)	(0.0630)	(0.0628)	(0.0651)
$Exposure_f$*Shock*Medium	0.0615	0.0631	0.0684	0.0776	0.131**	0.145***	0.136**	0.145**
	(0.0581)	(0.0617)	(0.0609)	(0.0643)	(0.0519)	(0.0555)	(0.0553)	(0.0584)
$Exposure_f$*Shock*Large	0.192**	0.218**	0.217**	0.229**	0.249***	0.285***	0.268***	0.286***
	(0.0926)	(0.0993)	(0.0973)	(0.104)	(0.0819)	(0.0888)	(0.0867)	(0.0933)
Joint Test (Small Firms)	0.000189	3.64e-05	0.000174	3.04e-05	0.185	0.0859	0.375	0.229
Joint Test (Medium Firms)	0.00284	0.000886	0.00234	0.000728	0.182	0.133	0.327	0.262
Joint Test (Large Firms)	0.116	0.0946	0.128	0.0770	0.710	0.698	0.985	0.940
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓				✓			
Firm-Bank controls	✓	✓	✓	✓	✓	✓	✓	✓
Industry-Time FE		✓		✓		✓		✓
Geog. Location-Time FE			✓	✓			✓	✓
Observations	100,566	99,695	98,398	97,476	73,647	72,644	71,736	70,697
R-squared	0.374	0.403	0.399	0.429	0.431	0.468	0.455	0.494
N. of firm clusters	20,747	20,634	20,296	20,169	16,492	16,334	16,052	15,892

Notes. Robust Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Joint test reports the p-value of the F-test that the sum of the coefficients of $Exposure_f * Shock$ and $Exposure_f * Shock * Size$ is equal to 0 for each size. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency.

Firm level outcomes: Main Results

- New dollar loans: No evidence of switching to dollar debt for other banks.
- New total loans: Switching to soles loans is increasing in firm size

Main results: Extensive margin

- Dependent variable: 1 if the firm increases its outstanding debt balance (extensive margin) and 0 o/w (i.e firm repays its debt/reduces outstanding balance)

Sample of:	Exposed firms			
Dependent variable	New dollar debt		New total debt	
	(1)	(2)	(3)	(4)
$Exposure_f$*Shock	-0.211***	-0.201***	-0.371***	-0.343***
	(0.0473)	(0.0479)	(0.0530)	(0.0511)
$Exposure_f$*Shock*Small	0.0781***	0.0832***	0.0957***	0.101***
	(0.0151)	(0.0154)	(0.0161)	(0.0159)
$Exposure_f$*Shock*Medium	0.0524***	0.0562***	0.0800***	0.0533***
	(0.0153)	(0.0157)	(0.0164)	(0.0162)
$Exposure_f$*Shock*Large	0.0857***	0.0956***	0.139***	0.137***
	(0.0218)	(0.0223)	(0.0231)	(0.0233)
Joint Test (Small Firms)	0.00308	0.00975	5.86e-08	8.70e-07
Joint Test (Medium Firms)	0.000447	0.00161	1.24e-08	4.50e-09
Joint Test (Large Firms)	0.00915	0.0309	1.74e-05	8.36e-05
Firm FE	✓	✓	✓	✓
Time FE	✓		✓	
Firm-Bank controls	✓	✓	✓	✓
Industry-Time FE		✓		✓
Geog. Location-Time FE		✓		✓
Observations	659,893	656,512	543,526	656,512
R-squared	0.203	0.219	0.184	0.192
N. of firm clusters	28,691	28,544	26,915	28,544

Notes. Robust Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Joint Test reports the p-value of the F-test that the sum of the coefficients of $Exposure_f * Shock$ and $Exposure_f * Shock * Size$ is equal to 0 for each size. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency.

Extensive margin

- New dollar loans: an increase in firm exposure of 10% reduces the probability of increasing *dollar loans* in 2 pp. for micro firms. This reduction is significantly lower for larger size segments.
- New total loans: an increase in firm exposure of 10% reduces the probability of increasing *total loans* in 3.5 pp. for micro firms. This reduction is significantly lower for larger size segments.

Aggregate Effects
Intensive margin

Sample of:	Exposed firms		Exposed firms (excl. FX derivatives)	
Panel A: Bank-supply effect (pp.): $\sum_b \alpha_b^s \left(\hat{\beta}_1 + \hat{\beta}_2^s\right) \times Exposure_b$				
	Dollar Loans (1)	Total Loans (2)	Dollar Loans (3)	Total Loans (4)
Micro	-14.2**	-10.4*	-14.2**	-10.4*
Small	-16.0***	-9.6*	-16.0**	-9.6
Medium	-13.5**	-10.9**	-13.6**	-11.0*
Large	-7.1	-5.8	-7.0	-5.8
Panel B: Effect on total firm loans (pp.): $\sum_f \alpha_f^s \left(\hat{\beta}_1 + \hat{\beta}_2^s\right) \times Exposure_f$				
Micro	-12.1***	-9.0**	-12.1***	-8.9**
Small	-13.8***	-5.3	-13.9***	-4.8
Medium	-10.5***	-5.2	-10.6***	-4.9
Large	-6.5	-1.6	-4.0	-2.0
Total effect (intensive):	-8.0**	-2.9	-7.0*	-3.3

Aggregate effects
Extensive margin

Sample of:	Exposed firms		Exposed firms (excl. FX derivatives)	
Effect on prob. of increasing outstanding loans (pp.): $\sum_f \alpha_f^s \left(\hat{\beta}_1^{ext} + \hat{\beta}_2^{ext,s}\right) \times Exposure_f$				
	Dollar Loans (1)	Total Loans (2)	Dollar Loans (3)	Total Loans (4)
Micro	-6.3***	-11.0***	-6.4***	-10.7***
Small	-4.1***	-8.5***	-4.2***	-8.0***
Medium	-4.8***	-8.8***	-4.9***	-9.3***
Large	-3.8***	-7.1***	-3.4**	-6.9***
Total effect (extensive):	-4.2**	-7.7***	-4.0**	-7.9***

Outline

Identification Strategy

Robustness

- My results remain robust to:

1. **Alternative size-related indicators:** sales-range, age, workers ▸ size
2. **Adding date clusters** ▸ clusters
3. **Excluding firms using FX derivatives** ▸ FX derivatives
4. **Alternative exposure:** $\frac{D_b^{Dec2014}}{D_b^{Sep2013}}$ ▸ alt. exp.

Outline

Concluding Remarks

- I show theoretically and empirically that a MaP FX tax increase financing disparities between small and large firms
- Mechanism: trade-off insolvency risk-leverage gains is not homogeneous across firms of different sizes
- Taxing banks' dollar liabilities hurts small firms disproportionally$\rightarrow$ reallocation to soles debt is harder
- Policy response: hedged soles liquidity facilities conditional on lending to small size segments $\rightarrow$ switch to soles debt smooth
- *Is it worth to tax the poor to achieve stability?*
  - Counterfactual analysis
  - Optimal policy mix

Macroprudential FX Regulations: Sacrificing Small Firms for Stability?

Maria A. Amado

Banco de España

11th Research Workshop, Banco de España-CEMFI
November, 2022

Why is dollar debt cheaper?

- UIP failure (using government rates differentials): DiGiovanni, Kalemli-Ozcan, Ulu and Baskaya (2020), Salomao and Varela (2019), Richers (2019)...
- Dollar deposit discount → Ivashina, Salomao and Gutierrez (2020), Bocola and Lorenzoni (2020), Dalgic (2020), Gopinath and Stein (2018)
- Why do banks fail to account for indirect FX risk?
  - Moral hazard: bailout expectations Ranciere and Tornell (2016), Schneider and Tornell (2004)...
  - FX intervention Burnside, Eichenbaum, and Rebelo (2001)

▸ back

Stylized facts in Peru

- **Share of firms issuing FX derivatives contracts**

Size	(1) Firms with USD debt Share (%)	(2) Tradable firms Share (%)	(3) NT firms with USD debt Share (%)
Micro	0	0	0
Small	0.16	0	0.17
Medium	3.89	6.43	3.47
Large	17.59	26.50	13.89

Source: SBS, own calculations. Dec. 2014

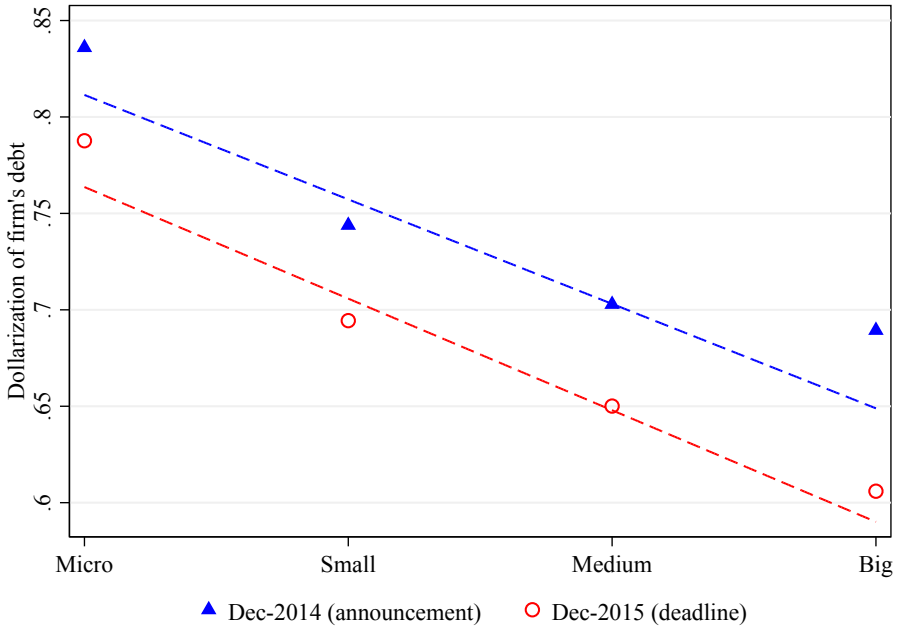
▸ back

Stylized facts in Peru

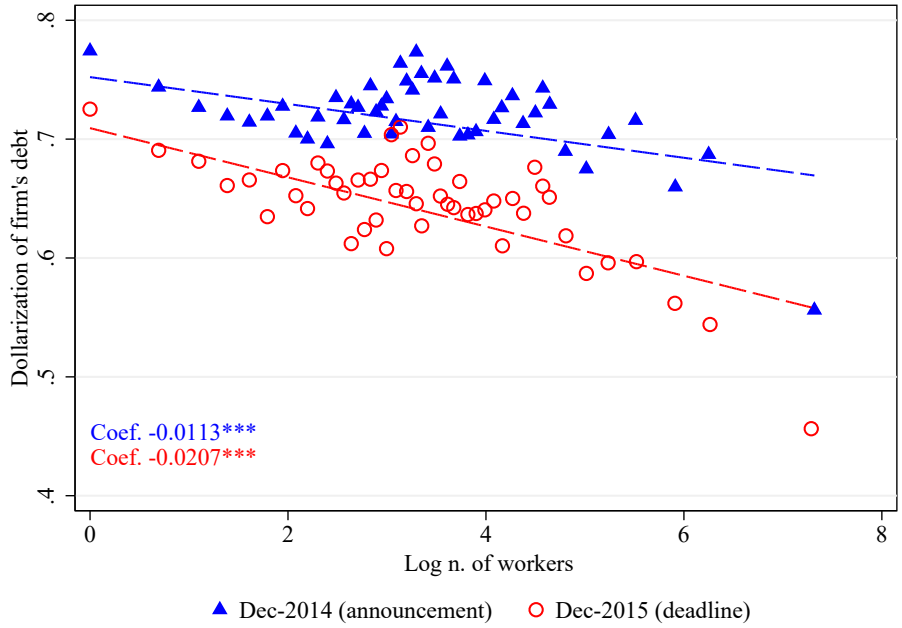
- **Dollarization ratio of unhedged firms (issuing dollar debt) is decreasing in size**

Binscatter (mean value)

A. Size segment



B. Log. n. of workers



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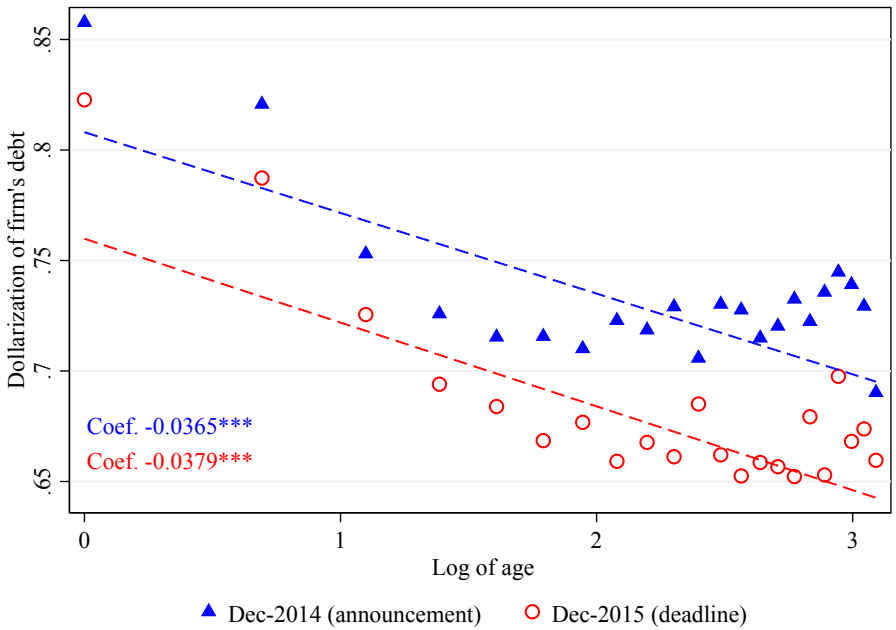
Stylized facts in Peru

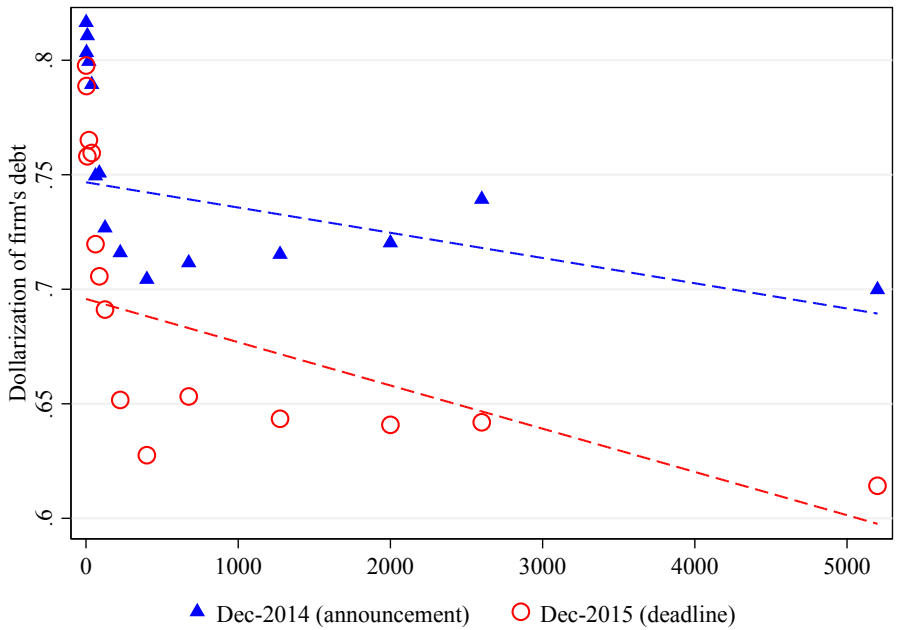
- **Dollarization ratio of unhedged firms (issuing dollar debt) is decreasing in size**

Binscatter (mean value)

C. Log of Age



D. Sales range



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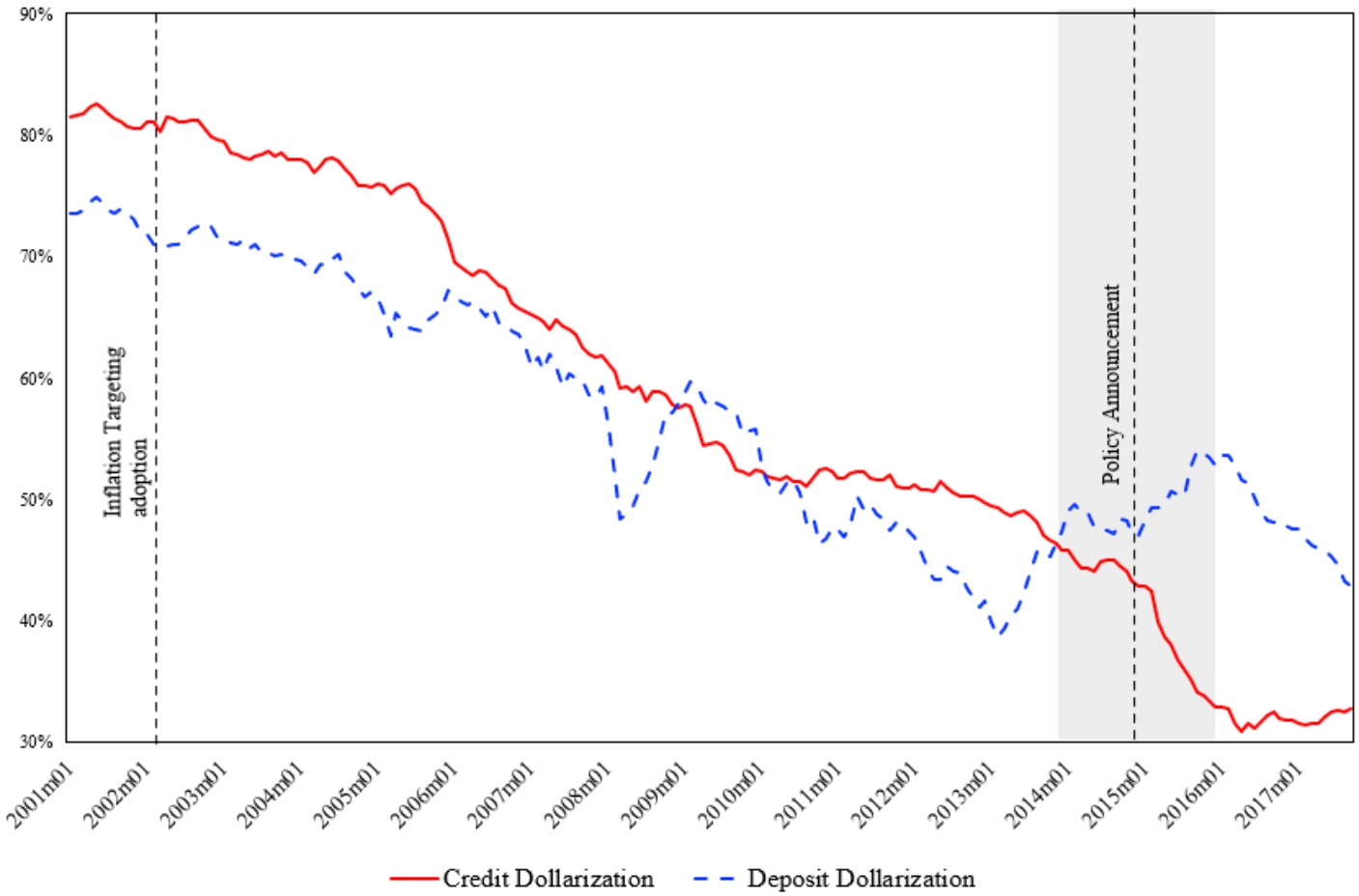
Evolution of Deposit and Credit Dollarization



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Cross Country Deposit and Credit Dollarization

Country	% Loans	% Deposits
Argentina	11.60	13.60
Bolivia	17.68	26.42
Chile	15.15	10.65
Guatemala	35.09	28.65
Honduras	30.98	28.54
Nicaragua	97.65	89.13
Peru	37.82	44.58
Paraguay	43.03	50.49
Uruguay	63.02	72.53

Source: Ivashina, et al. (2020), using data from IMF's FSI and CEPAL

▸ back

Model

1. Best risky plan (dollar debt)

- $\max_{\{I_t\}} E(\pi_{t+1}) = \delta u \left\{ \overline{e_{t+1}} \theta I_t - b_t(1+r_t) - b_t^s(1+r_t) \frac{\overline{e_{t+1}}}{E(e_{t+1})} \right\}$

  s.t.

- Budget constraint and insolvency condition $\pi(\underline{e_{t+1}}) < 0$
- If h is high enough $\rightarrow$ capacity constraints: $I_t < \bar{I}$
- If h is low enough $\rightarrow$ B.C: $\frac{B_t}{w_t + B_t} < \frac{h}{u}$

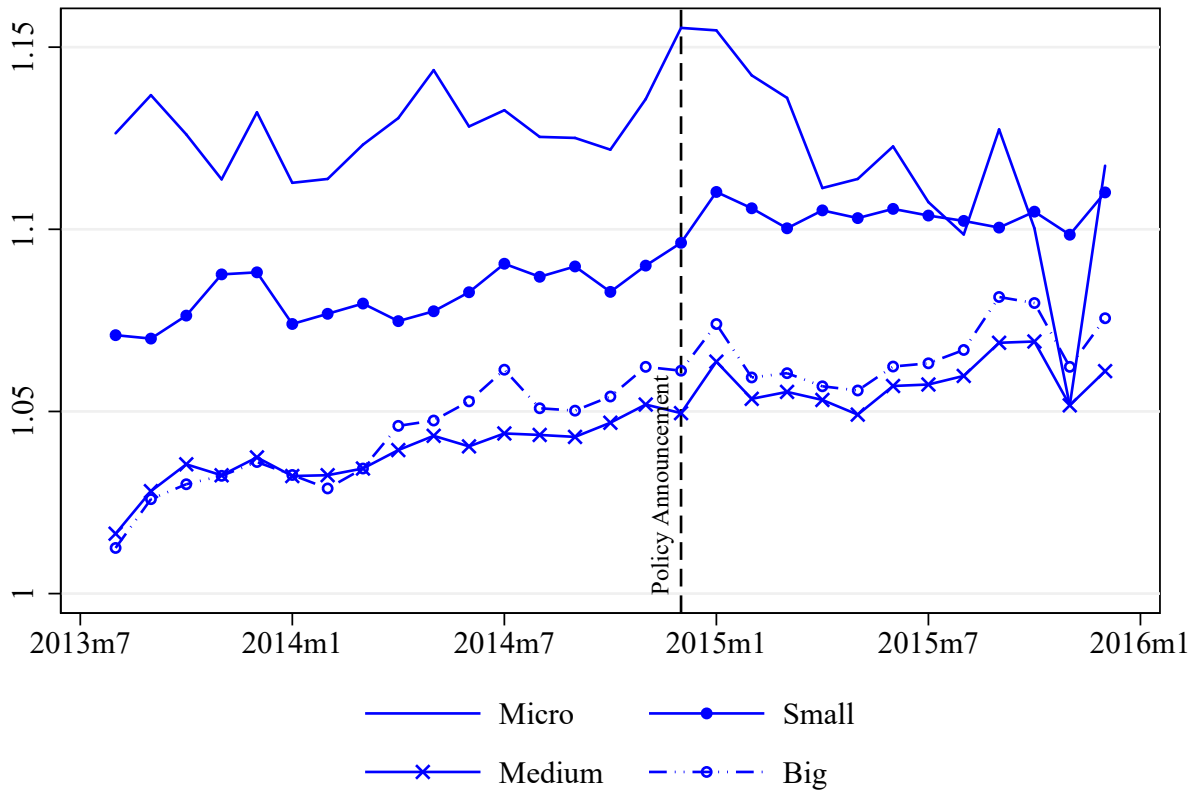
2. Best safe plan (soles debt)

Model

1. Best risky plan (dollar debt)
2. **Best safe plan (soles debt)**
   - $\max_{\{I_t\}} E(\pi_{t+1}) = \delta \{E(e_{t+1})\theta I_t - (1 + r_t)(b_t^s + b_t)\}$ s.t.
   - Budget constraint and solvency constraints $\pi(\underline{e_{t+1}}) > 0$ and $\pi(\overline{e_{t+1}}) > 0$
   - If h is high enough $\rightarrow$ capacity constraints: $I_t < \bar{I}$
   - If h is low enough $\rightarrow$ B.C: $\frac{B_t}{w_t + B_t} < h$

▸ back

Average interest rate spread soles to dollar loans

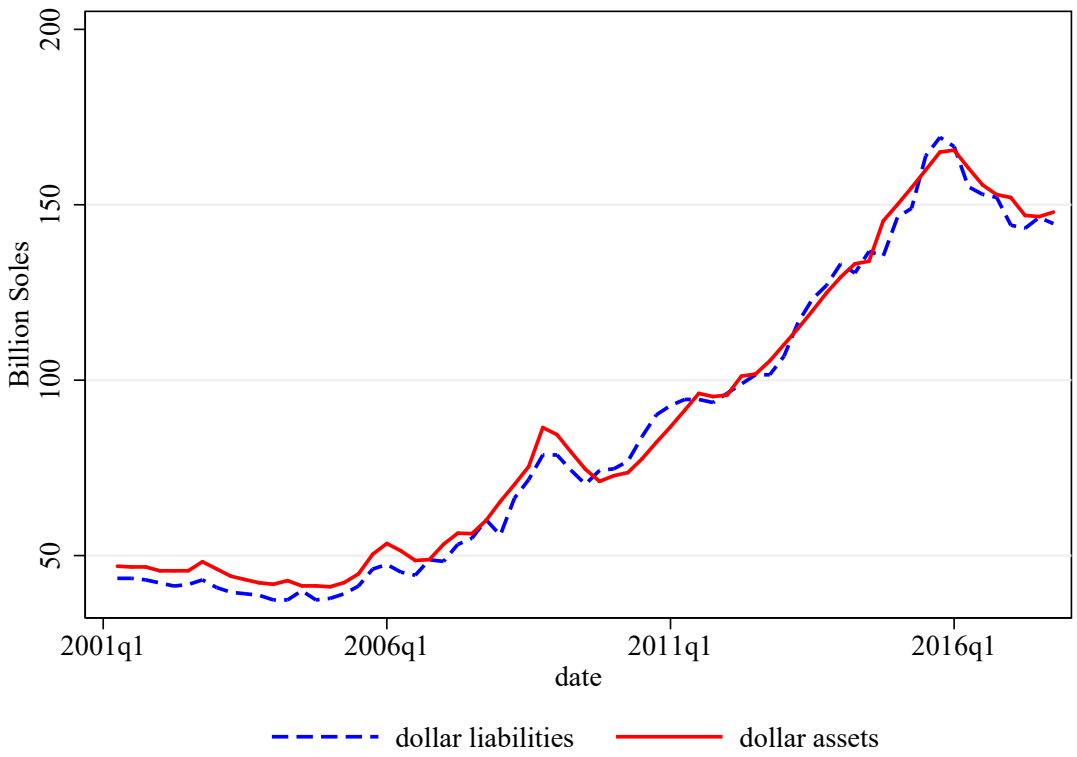


$$spread^{size} = \left(\frac{e_t}{E[e_{t+1}]}\right)\left(\frac{1+r_t^{L,size}}{1+r_t^{L^*,size}}\right)$$

▸ back

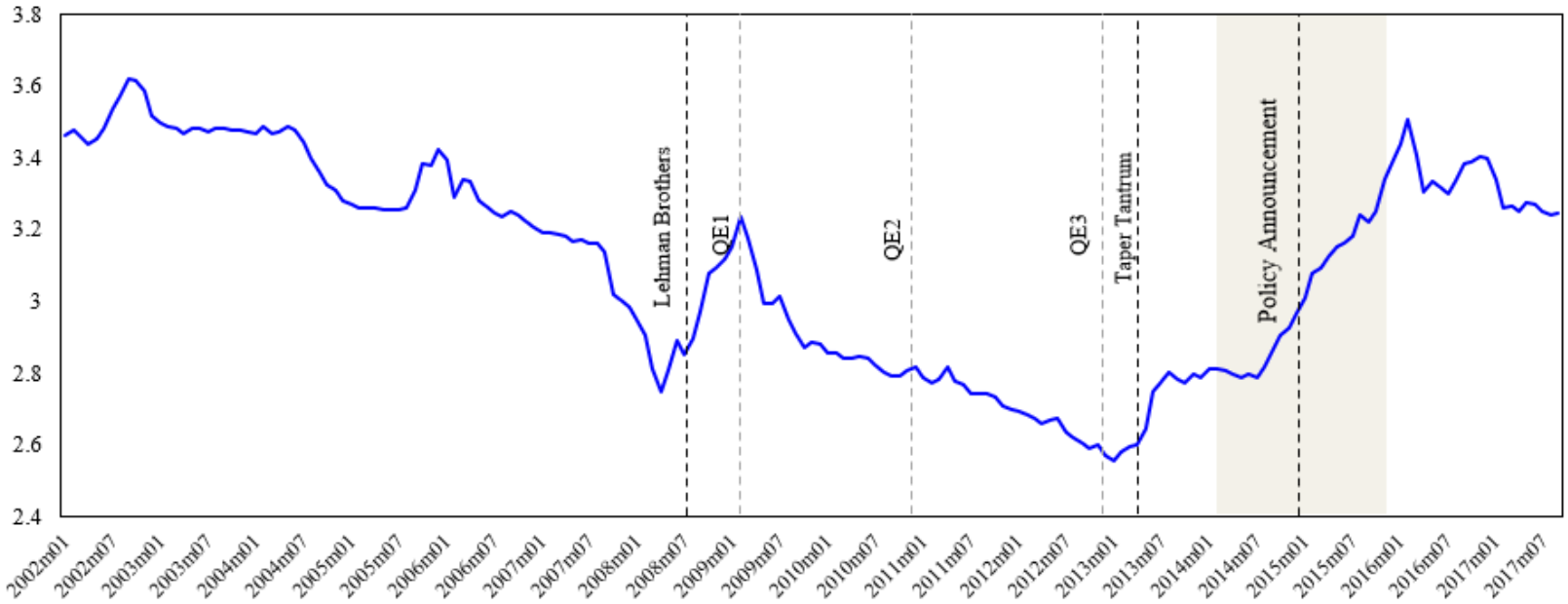
Dollar assets and Dollar liabilities of the Banking System

- True for Local and Foreign Banks (43,5% of total assets)



back

Historical Evolution of Exchange rate (1 USD to Soles)



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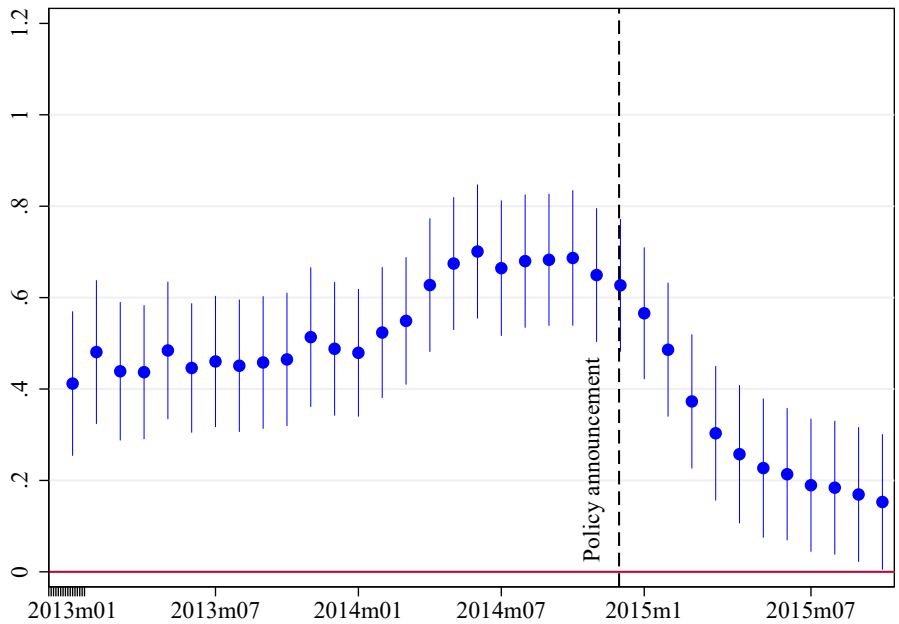
Identification Strategy

Normalized stock of dollar loans vs. share of dollar funding

$$\frac{D_{b,t}}{D_b^{Sep2013}} = \beta_t \sum_{i=1}^{36} \frac{Liab\ USD_{b,t}}{Assests_{b,t}} \times \mathbb{1}[t = i] + \epsilon_{b,t}$$

Evolution of cross-sectional correlation β_t (95% CI)



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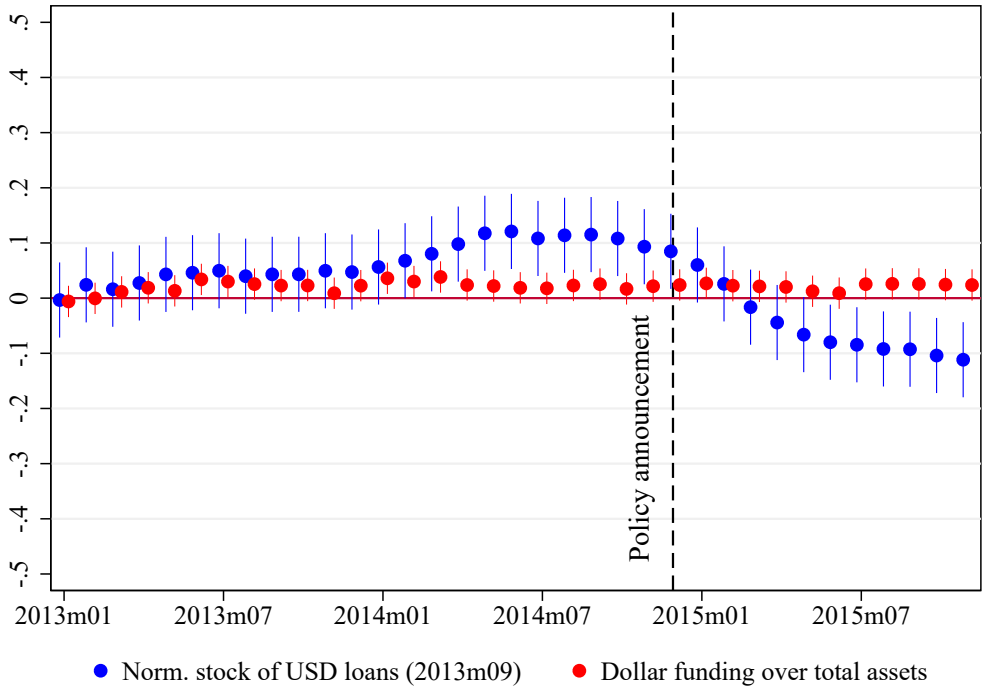
$$\frac{D_{b,t}}{D_b^{Sep2013}} = \gamma_t \sum_{i=2}^{36} \mathbb{1}[t=i] + BankFE + \epsilon_{b,t}, \qquad \frac{Liab\ USD_{b,t}}{Assests_{b,t}} = \theta_t \sum_{i=2}^{36} \mathbb{1}[t=i] + BankFE + \varepsilon_{b,t}$$

Evolution of avg. norm.stock of USD loans
and avg. share of dollar funding to assets (95% CI)



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Validity
Parallel trends

- Lending trends of differently exposed banks should be the same before policy announcement accounting for FE and relevant controls

- Effect of $Exposure_b$ across time for each size group:

$$y_{fbt} = \alpha_0 + \beta_t^z \sum_{\substack{\tau=-12 \\ \tau \neq -1}}^{\tau=12} Exposure_b \times 1[t=\tau] + \sum_{s \neq z} \beta_t^s \sum_{\substack{\tau=-12 \\ \tau \neq -1}}^{\tau=12} Exposure_b \times 1[t=\tau] \times size^s$$

$$+ \sum_{s \neq z} \alpha_1^s Exposure_b \times size^s + \Theta X_{bf} + \Phi X_{b,t-1} + TimeFE + BankFE + FirmFE + \epsilon_{fbt}$$

▸ Back

Validity
Parallel trends

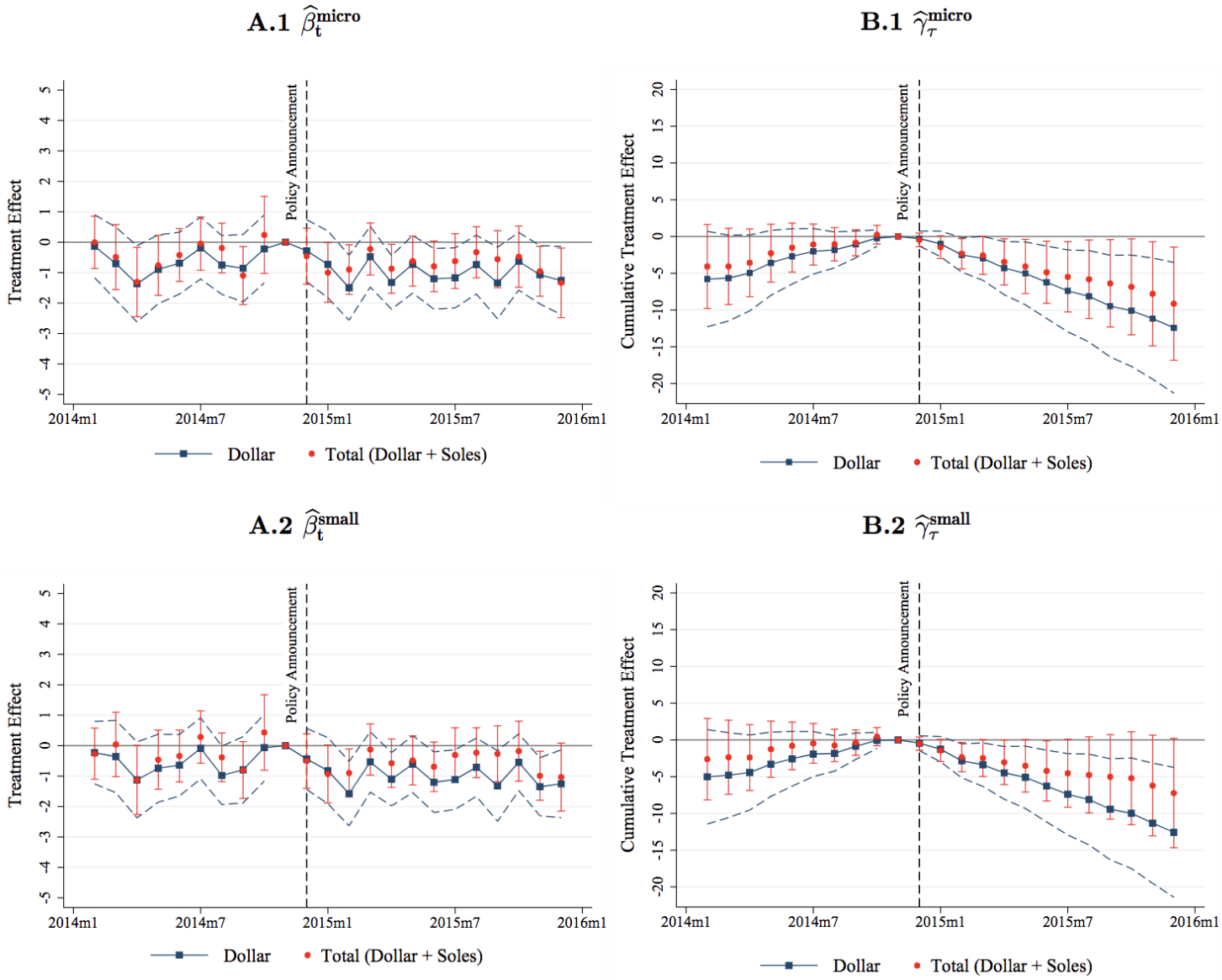
- Policy is not immediately binding after the announcement
- Cumulative treatment effects $\rightarrow$ running sum of contemporaneous policy responses:

$$\hat{\gamma}^s_\tau = \begin{cases} \sum_{0 \leq t \leq \tau} \hat{\beta}^z_t & for \quad \tau \geq 0 \\ \sum_{\tau \leq t < 0} \hat{\beta}^z_t & for \quad \tau < 0 \end{cases}$$

▸ Back

Validity

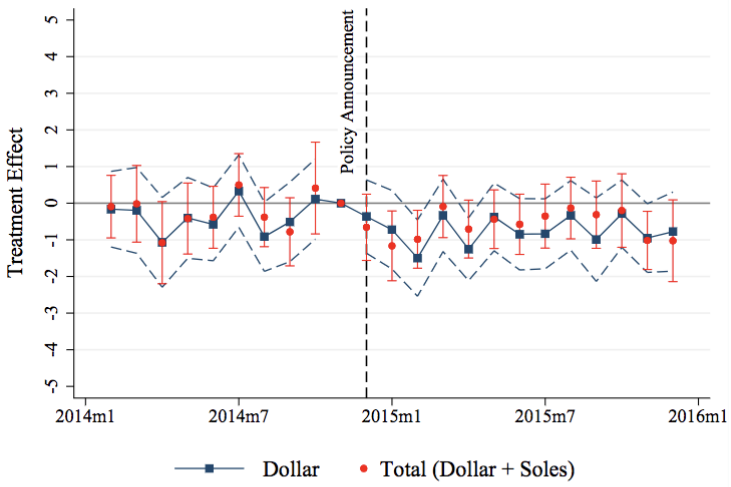
Parallel trends (95% CI)



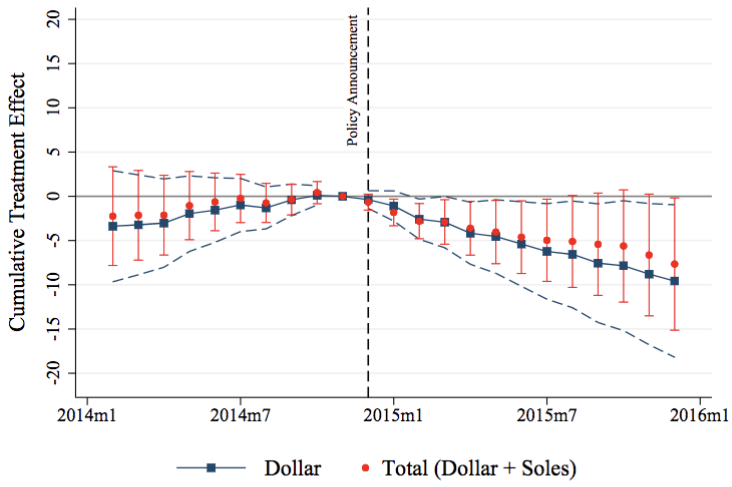
Validity

Parallel trends (95% CI)

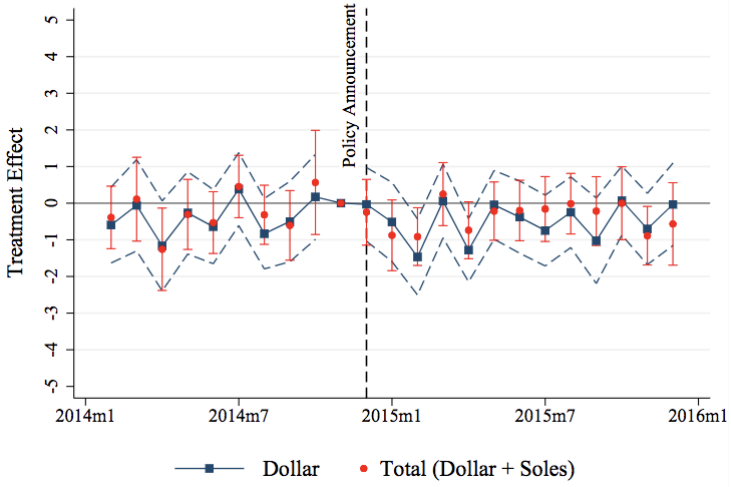
A.3 $\widehat{\beta}_t^{\text{medium}}$



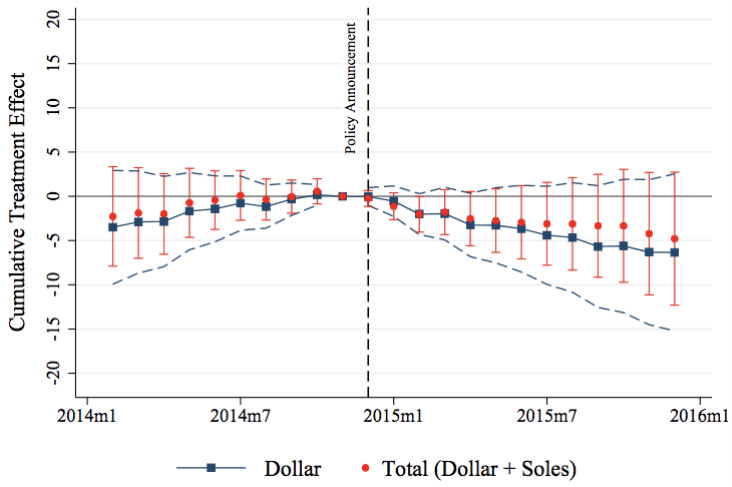
B.3 $\widehat{\gamma}_\tau^{\text{medium}}$



A.4 $\widehat{\beta}_t^{\text{large}}$



B.4 $\widehat{\gamma}_\tau^{\text{large}}$



Validity

Balance on relevant observables

Difference of Means Between Banks above and below the median of exposure (Dec. 2014)

	Below median		Above median			
	mean	N	mean	N	T-stat	beta
Exposure	0.324	5	0.483	4	-2.6606	-0.1595**
Financial ratios						
Roa	0.013	5	0.016	4	-0.6027	-0.0025
Assets (billions)	29.7	5	30.1	4	-0.0141	-0.351
Liquidity ratio USD	0.5	5	0.5786	4	-1.3163	-0.0785
Liquidity ratio soles	0.2655	5	0.2043	4	0.9593	0.0611
Structure of the Portfolio of dollar loans						
Micro firms (%)	0.21	5	0.28	4	-0.5459	-0.07
Small firms (%)	2.41	5	4.15	4	-1.1304	-1.74
Medium firms (%)	52.59	5	41.51	4	0.9682	11.08
Large firms (%)	44.77	5	54.04	4	-0.7705	-9.2
Sales (q1-q3) (%)	18.03	5	17.52	4	0.1132	0.51663
Workers (q1-q3) (%)	25.97	5	23.39	4	0.7849	2.57
Age (q1-q3) (%)	38.4	5	38.41	4	0.0201	0.07

Back

Validity

Implementation of MaP FX policy should be exogenous

- Assumption: My results reflect the effects of the policy itself not of any other factor driving it
- Economic context: US Taper Tantrum (May 2013) → Depreciatory trend
  - No abnormal change in the exchange rate at December 2014.

▸ Exchange rate ▸ Back

Validity

Demand shocks are uncorrelated with bank exposure

- Economic context: US Taper Tantrum (May 2013) → Depreciatory trend
  - Demand shifts if any, are not correlated with exposure before the Policy announcement (no pre-trends)
  - Why do firms shift their dollar demand in response to appreciatory trend in December 2014 and not before?
- Ideally: absorb firm-specific demand changes with firm-time FE
- Limitation: Small firms are typically clients of a unique bank
- In my sample: 98% of micro firms, 70% of small firms, 40% of medium firms are clients of a unique bank
- Check 1: Results remain quantitatively robust to control for 5-digit geographic-time FE and 5-digit industry- time FE
- Check 2: Adding firm-time fixed effects with alternative size measures ▸ check2

▸ Back

Robustness

Adding firm-time fixed effects with alternative size measures

Dependent variable:	Δ(*log New Dollar loans*)(*FX* : 2014*m*1)			Δ(*log New Total loans*)		
Size indicator:	*Log(sales)*	*Log(age)*	*Log(workers)*	*Log(sales)*	*Log(age)*	*Log(workers)*
	(1)	(2)	(3)	(4)	(5)	(6)
Exposure*Shock*Size	0.462**	1.295*	0.0857	0.239	0.148	-0.0889
	(0.233)	(0.707)	(0.168)	(0.203)	(0.607)	(0.166)
Exposure*Shock	-7.961**	-3.965**	-0.978	-3.839	-0.434	0.313
	(3.719)	(1.905)	(0.770)	(3.208)	(1.603)	(0.707)
Exposure*Size	-0.301**	-0.649	-0.369**	-0.272*	-0.378	-0.278*
	(0.146)	(0.469)	(0.150)	(0.153)	(0.442)	(0.158)
Firm-Time FE	✓	✓	✓	✓	✓	✓
Bank FE	✓	✓	✓	✓	✓	✓
Bank controls	✓	✓	✓	✓	✓	✓
Relationship controls	✓	✓	✓	✓	✓	✓
Observations	22,983	23,093	22,344	17,421	17,511	16,927
R-squared	0.521	0.521	0.520	0.536	0.535	0.535
N. of firm clusters	3,505	3,526	3,345	2,957	2,975	2,830

Notes. Robust standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05,* p<0.1. Sample includes all firms that are neither exporters nor importers and that have loans with more than one bank. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency. Size is either Log(sales), the logarithm of the median of firm's annual sales range. Log(age) is the logarithm of firm's years of operation and Log(workers) is the logarithm of firm's number of workers, the first year the firm appears in the sample.

▸ back

Robustness

Alternative size-related indicators: Sales

	$\Delta(log\ New\ Dollar\ loans)(FX: 2014m1)$				$\Delta(log\ New\ Total\ loans)$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure*Shock*log(sales)	0.0405***	0.0374***	0.0400***	0.0366***	0.0234***	0.0247***	0.0233***	0.0243***
	(0.00727)	(0.00770)	(0.00766)	(0.00816)	(0.00698)	(0.00745)	(0.00739)	(0.00792)
Exposure*Shock	-1.048***	-1.023***	-1.063***	-1.006***	-0.682***	-0.716***	-0.697***	-0.688***
	(0.218)	(0.223)	(0.226)	(0.230)	(0.200)	(0.209)	(0.209)	(0.217)
Exposure*log(sales)	-0.179**	-0.148	-0.167*	-0.140	-0.186**	-0.166*	-0.178**	-0.162*
	(0.0911)	(0.0929)	(0.0916)	(0.0934)	(0.0854)	(0.0879)	(0.0855)	(0.0883)
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓				✓			
Bank FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry-Time FE		✓		✓		✓		✓
Geog. Location-Time FE			✓	✓			✓	✓
Bank controls	✓	✓	✓	✓	✓	✓	✓	✓
Relationship controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	141,349	140,652	139,152	138,445	112,690	111,861	110,681	109,831
R-squared	0.302	0.328	0.321	0.347	0.341	0.370	0.364	0.393
N. of firm clusters	23,929	23,845	23,475	23,392	20,473	20,363	20,014	19,901

Notes. Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency. Log(sales) is the logarithm of the median of annual sales range, the first year the firm appears in the sample.

▸ back

Robustness

Alternative size-related indicators: Age

	Δ(*log New Dollar loans*)(*FX* : 2014*m*1)				Δ(*log New Total loans*)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure*Shock*log(age)	0.186***	0.185***	0.190***	0.186***	0.153***	0.144***	0.155***	0.144***
	(0.0233)	(0.0247)	(0.0248)	(0.0261)	(0.0229)	(0.0242)	(0.0243)	(0.0255)
Exposure*Shock	-0.834***	-0.864***	-0.852***	-0.849***	-0.637***	-0.643***	-0.654***	-0.624***
	(0.196)	(0.199)	(0.201)	(0.204)	(0.186)	(0.194)	(0.193)	(0.200)
Exposure*log(age)	-0.168	-0.160	-0.119	-0.117	-0.271	-0.239	-0.223	-0.195
	(0.249)	(0.252)	(0.251)	(0.256)	(0.232)	(0.234)	(0.232)	(0.237)
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓				✓			
Bank FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry-Time FE		✓		✓		✓		✓
Geog. Location-Time FE			✓	✓			✓	✓
Bank controls	✓	✓	✓	✓	✓	✓	✓	✓
Relationship controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	141,972	141,253	139,781	139,044	113,221	112,372	111,200	110,326
R-squared	0.305	0.330	0.323	0.349	0.343	0.371	0.364	0.393
N. of firm clusters	23,627	23,540	23,179	23,091	20,202	20,094	19,741	19,628

Notes. Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency. Log(age) is the logarithm of firm's years of operations, the first year the firm appears in the sample.

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Robustness

Alternative size-related indicators: N. of workers

	Δ(*log New Dollar loans*)(*FX* : 2014*m*1)				Δ(*log New Total loans*)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure*Shock*log(workers)	0.0483***	0.0502***	0.0460***	0.0480***	0.0277**	0.0228*	0.0282**	0.0208
	(0.0114)	(0.0122)	(0.0121)	(0.0130)	(0.0110)	(0.0124)	(0.0117)	(0.0130)
Exposure*Shock	-0.601***	-0.638***	-0.607***	-0.618***	-0.406**	-0.389*	-0.417**	-0.344
	(0.213)	(0.217)	(0.219)	(0.222)	(0.198)	(0.205)	(0.204)	(0.211)
Exposure*log(workers)	-0.293***	-0.267**	-0.287***	-0.260**	-0.272***	-0.229**	-0.275***	-0.231**
	(0.105)	(0.105)	(0.106)	(0.106)	(0.0961)	(0.0968)	(0.0980)	(0.0979)
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓				✓			
Bank FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry-Time FE		✓		✓		✓		✓
Geog. Location-Time FE			✓	✓			✓	✓
Bank controls	✓	✓	✓	✓	✓	✓	✓	✓
Relationship controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	123,602	122,858	121,633	120,878	98,095	97,217	96,237	95,331
R-squared	0.293	0.321	0.312	0.341	0.331	0.362	0.355	0.387
N. of firm clusters	19,848	19,759	19,456	19,368	16,963	16,850	16,544	16,426

Notes. Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency. Log(workers) is the logarithm of firm's number of workers, the first year the firm appears in the sample.

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Robustness

Adding date clusters

	Δ(*log New Dollar loans*)(*FX* : 2014*m*1)				Δ(*log New Total loans*)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure*Shock (Micro)	-0.478**	-0.505**	-0.498***	-0.502***	-0.350*	-0.364*	-0.368*	-0.345*
	(0.172)	(0.181)	(0.165)	(0.177)	(0.184)	(0.191)	(0.182)	(0.188)
Exposure*Shock*Small	-0.0426	-0.0432	-0.0293	-0.0219	0.0392	0.0253	0.0574	0.0513
	(0.0693)	(0.0723)	(0.0732)	(0.0782)	(0.0669)	(0.0690)	(0.0677)	(0.0685)
Exposure*Shock*Medium	0.0307	0.0269	0.0251	0.0277	-0.0110	-0.0180	-0.0277	-0.0291
	(0.0665)	(0.0734)	(0.0725)	(0.0785)	(0.0623)	(0.0641)	(0.0689)	(0.0701)
Exposure*Shock*Large	0.246**	0.261**	0.246**	0.261**	0.158**	0.163*	0.161*	0.156*
	(0.0903)	(0.0985)	(0.0980)	(0.104)	(0.0756)	(0.0821)	(0.0799)	(0.0869)
Joint Test (Small Firms)	0.00301	0.00228	0.00212	0.00286	0.104	0.0804	0.101	0.123
Joint Test (Medium Firms)	0.00939	0.00692	0.00477	0.00564	0.0782	0.0674	0.0529	0.0688
Joint Test (Large Firms)	0.227	0.232	0.161	0.213	0.351	0.350	0.303	0.370
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓				✓			
Bank FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry-Time FE		✓		✓		✓		✓
Geog. Location-Time FE			✓	✓			✓	✓
Additional controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	145,085	144,374	142,870	142,144	115,928	115,095	113,920	113,065
R-squared	0.306	0.331	0.324	0.349	0.345	0.373	0.367	0.395
N. of firm clusters	24,643	24,557	24,183	24,097	21,104	20,998	20,643	20,533
N. of date clusters	23	23	23	23	23	23	23	23

Notes. Robust Standard errors in parentheses. Standard errors have been clustered by firm and date. *** p<0.01, ** p<0.05,* p<0.1. Joint Test reports the p-value of the F-test that the sum of the coefficients of Exposure*Shock and Exposure*Shock*Size is equal to 0. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency.

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Robustness

Excluding FX derivatives–Firm-level regressions

	$\Delta(log\ New\ Dollar\ loans)(FX: 2014m1)$				$\Delta(log\ New\ Total\ loans)$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Exposure_f$*Shock	-0.409***	-0.468***	-0.439***	-0.514***	-0.285**	-0.321**	-0.247*	-0.281**
	(0.120)	(0.124)	(0.125)	(0.129)	(0.132)	(0.135)	(0.137)	(0.139)
$Exposure_f$*Shock*Small	-0.0419	-0.0486	-0.0348	-0.0364	0.130**	0.117*	0.150**	0.138**
	(0.0651)	(0.0664)	(0.0678)	(0.0691)	(0.0606)	(0.0631)	(0.0628)	(0.0651)
$Exposure_f$*Shock*Medium	0.0581	0.0683	0.0681	0.0850	0.124**	0.148***	0.130**	0.147**
	(0.0586)	(0.0622)	(0.0615)	(0.0648)	(0.0521)	(0.0561)	(0.0558)	(0.0591)
$Exposure_f$*Shock*Large	0.276***	0.335***	0.312***	0.351***	0.217**	0.261***	0.246***	0.273***
	(0.0999)	(0.107)	(0.104)	(0.111)	(0.0868)	(0.0933)	(0.0913)	(0.0967)
Joint Test (Small Firms)	0.000156	2.33e-05	0.000129	1.37e-05	0.239	0.130	0.474	0.304
Joint Test (Medium Firms)	0.00238	0.000779	0.00195	0.000495	0.211	0.193	0.377	0.325
Joint Test (Large Firms)	0.349	0.375	0.388	0.292	0.645	0.695	0.993	0.958
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓				✓			
Firm-Bank controls	✓	✓	✓	✓	✓	✓	✓	✓
Industry-Time FE		✓		✓		✓		✓
Geog. Location-Time FE			✓	✓			✓	✓
Observations	97,353	96,455	95,174	94,216	71,391	70,323	69,503	68,395
R-squared	0.376	0.405	0.401	0.432	0.431	0.467	0.456	0.494
N. of firm clusters	20,302	20,185	19,842	19,708	16,128	15,951	15,685	15,502

Notes. Robust Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Joint Test reports the p-value of the F-test that the sum of the coefficients of $Exposure_f * Shock$ and $Exposure_f * Shock * Size$ is equal to 0 for each size. Sample includes all firms that are neither exporters nor importers and excludes firms using FX derivative contracts. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency.

Robustness

Exposure$=\frac{D_b^{Dec2014}}{D_b^{Sep2013}}$

	$\Delta(log\ New\ Dollar\ loans)(FX:2014m1)$				$\Delta(log\ New\ Total\ loans)$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure*Shock (Micro)	-0.486***	-0.525***	-0.530***	-0.552***	-0.423***	-0.460***	-0.487***	-0.502***
	(0.138)	(0.139)	(0.141)	(0.142)	(0.147)	(0.152)	(0.151)	(0.156)
Exposure*Shock*Small	-0.0110	-0.0112	-0.00681	-0.00461	0.0138	0.00967	0.0196	0.0177
	(0.0163)	(0.0169)	(0.0170)	(0.0176)	(0.0158)	(0.0164)	(0.0164)	(0.0169)
Exposure*Shock*Medium	0.0110	0.00988	0.00956	0.0102	-0.00102	-0.00340	-0.00562	-0.00648
	(0.0149)	(0.0160)	(0.0158)	(0.0167)	(0.0140)	(0.0149)	(0.0149)	(0.0157)
Exposure*Shock*Large	0.0736***	0.0775***	0.0739***	0.0774***	0.0482***	0.0491**	0.0496***	0.0474**
	(0.0198)	(0.0209)	(0.0207)	(0.0219)	(0.0181)	(0.0196)	(0.0191)	(0.0206)
Joint Test (Small Firms)	0.000297	0.000109	0.000136	7.99e-05	0.00517	0.00283	0.00191	0.00183
Joint Test (Medium Firms)	0.000525	0.000194	0.000208	0.000119	0.00384	0.00219	0.00110	0.00111
Joint Test (Large Firms)	0.00254	0.00120	0.00112	0.000746	0.0108	0.00686	0.00388	0.00377
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓				✓			
Bank FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry-Time FE		✓		✓		✓		✓
Geog. Location-Time FE			✓	✓			✓	✓
Additional controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	145,085	144,374	142,870	142,144	115,928	115,095	113,920	113,065
R-squared	0.306	0.331	0.324	0.349	0.345	0.373	0.367	0.395
N. of firm clusters	24,643	24,557	24,183	24,097	21,104	20,998	20,643	20,533

Notes. Robust Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, *p<0.1. Joint test reports the p-value of the F-test that the sum of the coefficients of Exposure*Shock and Exposure*Shock*Size is equal to 0. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency.

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Firm size (Based on Financial Regulator definition)

Size	Includes Listed firms	annual sales	Total debt (USD) above	Total debt (USD) below	Reference stats. 2014 sales (avg)	Reference stats. 2014 workers (avg)
Micro	NO			7,142	137,872	8
Small	NO		7,142	107,142	298,951	9
Medium	NO	below 7 mill. USD	107,142		1,503,714	32
Large	YES	above 7 mill. USD			28,357,143	472

*Source: SBS and own calculations based on SUNAT data

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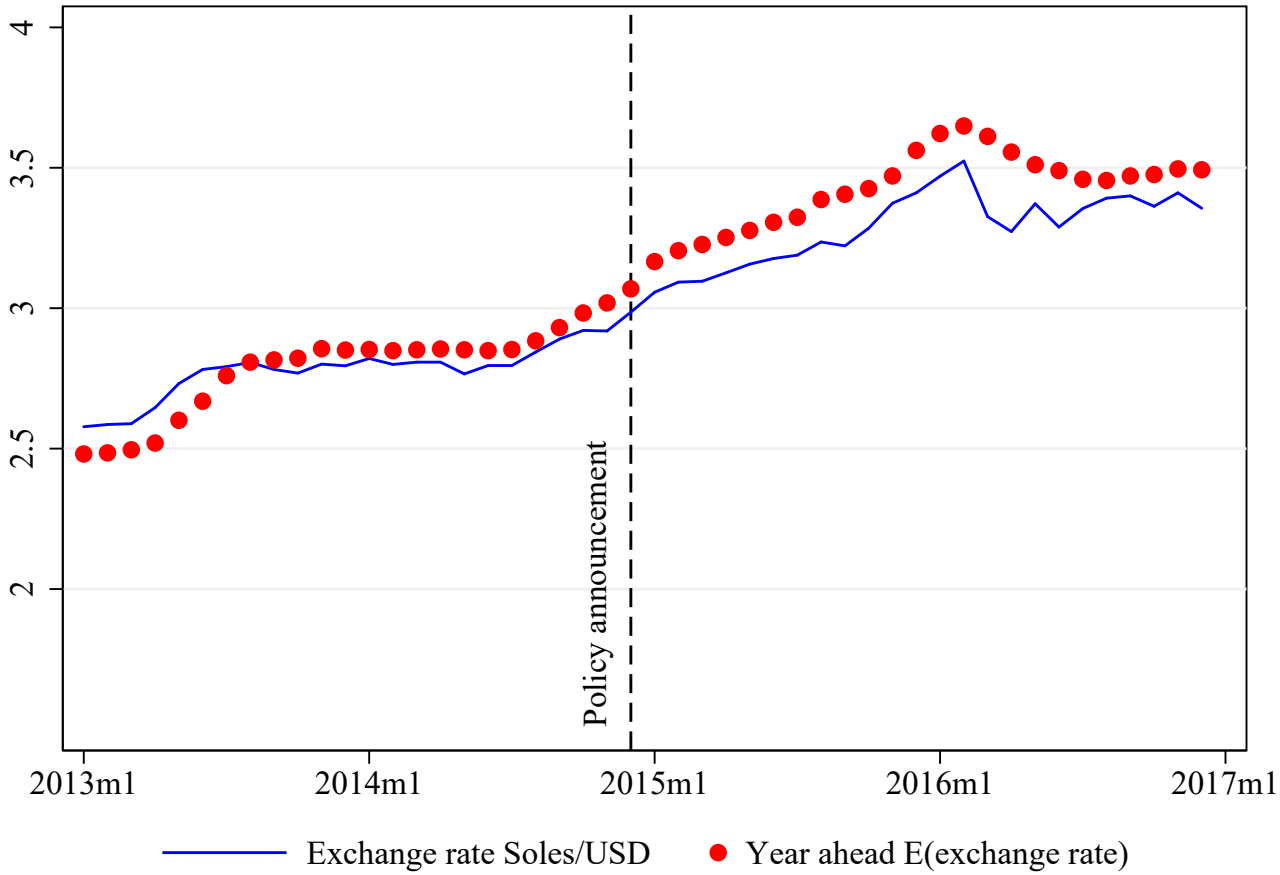
Exchange rate
soles to dollar (2013m1-2016m12)



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Validity

Demand shocks are uncorrelated with bank exposure: Check 1

	Δ(*log New Dollar loans*)(*FX* : 2014*m*1)				Δ(*log New Total loans*)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exposure*Shock	-0.419***	-0.408***	-0.468***	-0.463***	-0.374***	-0.343***	-0.399***	-0.374***
	(0.123)	(0.120)	(0.121)	(0.119)	(0.123)	(0.121)	(0.119)	(0.118)
Exposure*Shock*small	0.00226	-0.0139	-0.0153	-0.0249	0.0829*	0.0511	0.0530	0.0282
	(0.0458)	(0.0456)	(0.0459)	(0.0457)	(0.0443)	(0.0442)	(0.0440)	(0.0438)
Exposure*Shock*medium	0.0628	0.0625	0.0289	0.0301	0.0433	0.0459	-0.00950	-0.00268
	(0.0424)	(0.0429)	(0.0426)	(0.0431)	(0.0401)	(0.0403)	(0.0400)	(0.0401)
Exposure*Shock*Big	0.240***	0.250***	0.195***	0.206***	0.177***	0.175***	0.123**	0.122**
	(0.0558)	(0.0563)	(0.0557)	(0.0562)	(0.0522)	(0.0538)	(0.0516)	(0.0529)
Joint Test	0.1402	0.1883	0.0234	0.03	0.1167	0.1816	0.0231	0.0388
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES
Bank controls	YES	YES	YES	YES	YES	YES	YES	YES
Relationship controls	NO	NO	YES	YES	NO	NO	YES	YES
Geog. location x time FE	YES	NO	YES	NO	YES	NO	YES	NO
Industry x time FE	NO	YES	NO	YES	NO	YES	NO	YES
Observations	145,125	146,660	142,870	144,374	115,897	117,119	113,920	115,095
R-squared	0.313	0.320	0.324	0.331	0.351	0.357	0.367	0.373
N. of firm clusters	24,573	24,952	24,183	24,557	21,001	21,368	20,643	20,998

Robust Standard errors in parentheses. Standard errors have been clustered by firm. *** p<0.01, ** p<0.05, * p<0.1. Joint Test reports the p-value of the F-test that the sum of the coefficients of Exposure*Shock and Exposure*Shock*Big is equal to 0. Sample includes all firms that are neither exporters nor importers. The sample covers the period from 2014m1 to 2015m12 at a monthly frequency. The coefficient on Exposure was dropped due to collinearity with bank FE. The coef. on Shock, was dropped due to collinearity with Ind×time and Geog×time FE.

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Summary Statistics

Panel A. Bank-Firm level

	2014						2015					
Micro	**mean**	**median**	**SD**	**p5**	**p95**	**N**	**mean**	**median**	**SD**	**p5**	**p95**	**N**
Monthly average growth rate of new dollar loans	0.80	0.56	0.91	0.00	2.46	8,957	0.74	0.52	0.80	0.00	2.25	9,376
Monthly average growth rate of new total loans	0.78	0.55	0.91	0.00	2.41	8,497	0.73	0.50	0.80	0.00	2.20	8,918
Bank-firm controls												
Non-performing loans/total loans (2014)	0.22	0.11	0.28	0.00	0.99	8,957						
Share of firm total debt per bank (2014)	0.96	1.00	0.16	0.70	1.00	8,957						
Small												
Monthly average growth rate of new dollar loans	0.63	0.38	0.87	0.00	2.13	10,743	0.58	0.33	0.81	0.00	2.00	9,275
Monthly average growth rate of new total loans	0.52	0.25	0.81	0.00	1.89	9,153	0.49	0.18	0.86	0.00	1.84	7,550
Bank-firm controls												
Non-performing loans/total loans (2014)	0.13	0.00	0.27	0.00	0.89	10,743						
Share of firm total debt per bank (2014)	0.69	0.83	0.35	0.00	1.00	10,743						
Medium												
Monthly average growth rate of new dollar loans	0.57	0.28	0.97	0.00	2.03	13,462	0.52	0.27	0.82	0.00	1.93	12,033
Monthly average growth rate of new total loans	0.47	0.22	0.88	0.00	1.66	12,334	0.43	0.19	0.78	0.00	1.63	10,739
Bank-firm controls												
Non-performing loans/total loans (2014)	0.08	0.00	0.22	0.00	0.67	13,462						
Share of firm total debt per bank (2014)	0.46	0.39	0.35	0.01	1.00	13,462						
Big												
Monthly average growth rate of new dollar loans	0.64	0.35	0.89	0.01	2.28	2,693	0.66	0.37	0.88	0.01	2.28	2,849
Monthly average growth rate of new total loans	0.51	0.26	0.78	0.01	1.85	2,555	0.49	0.24	0.74	0.01	1.90	2,659
Bank-firm controls												
Non-performing loans/total loans (2014)	0.03	0.00	0.15	0.00	0.17	2,693						
Share of firm total debt per bank (2014)	0.41	0.31	0.34	0.01	1.00	2,693						

Summary Statistics

Panel B. Firm level

	2014						2015					
Micro	**mean**	**median**	**SD**	**p5**	**p95**	**N**	**mean**	**median**	**SD**	**p5**	**p95**	**N**
Monthly average growth rate of new dollar loans	0.82	0.62	0.91	0.00	2.45	5,479	0.75	0.55	0.81	0.00	2.19	4,936
Monthly average growth rate of new total loans	0.78	0.58	0.89	0.00	2.36	5,122	0.70	0.49	0.83	0.00	2.12	4,546
Bank-firm controls												
Non-performing loans/total loans (2014)	0.29	0.00	0.40	0.00	1.00	5,479						
Small												
Monthly average growth rate of new dollar loans	0.66	0.37	1.00	0.00	2.26	8,554	0.56	0.31	0.82	0.00	1.99	7,433
Monthly average growth rate of new total loans	0.49	0.21	0.92	0.00	1.78	6,763	0.41	0.13	0.79	0.00	1.61	5,554
Bank-firm controls												
Non-performing loans/total loans (2014)	0.12	0.00	0.29	0.00	1.00	8,554						
Medium												
Monthly average growth rate of new dollar loans	0.50	0.22	0.85	0.00	1.94	7,903	0.41	0.16	0.74	0.00	1.68	6,475
Monthly average growth rate of new total loans	0.34	0.16	0.65	0.00	1.22	6999	0.27	0.11	0.57	0.00	1.01	5,326
Bank-firm controls												
Non-performing loans/total loans (2014)	0.06	0.00	0.20	0.00	1.00	7,903						
Big												
Monthly average growth rate of new dollar loans	0.60	0.30	0.88	0.01	2.19	1,256	0.57	0.27	0.82	0.01	2.12	1,197
Monthly average growth rate of new total loans	0.42	0.19	0.68	0.01	1.54	1,170	0.40	0.16	0.67	0.01	1.54	1,086
Bank-firm controls												
Non-performing loans/total loans (2014)	0.03	0.00	0.14	0.00	0.01	1,256						