

Regulatory Arbitrage in Action: Evidence from Banking Flows and Macroprudential Policy

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Bank of England

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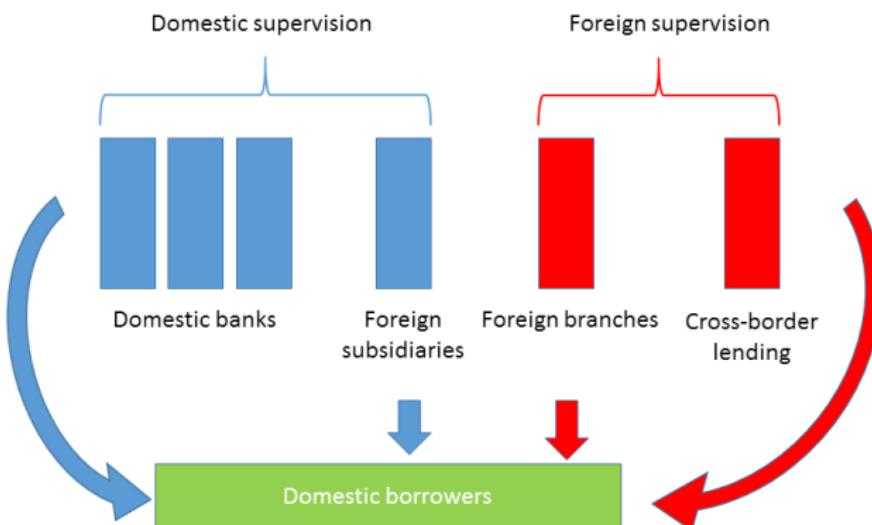
First annual ECB macroprudential policy and research conference

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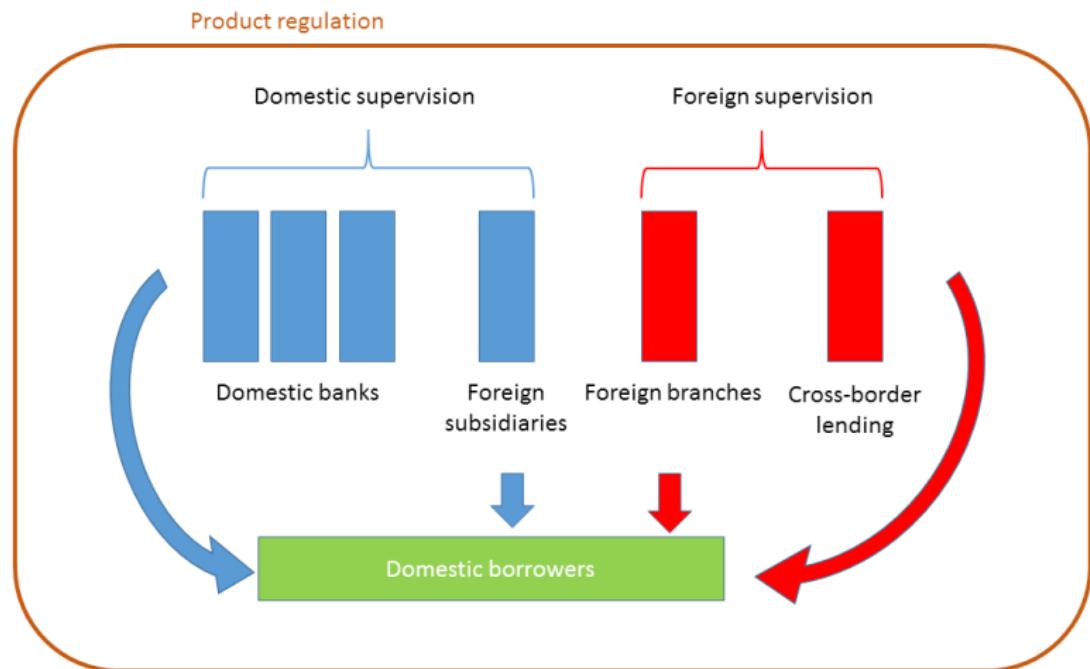
Macroprudential policies

- Since the global financial crisis there has been increased attention paid to 'macroprudential policies'
- A number of policies have become widely used - such as increased capital requirements or loan-to-value limits on housing
- But these policies may be subject to 'leakage' as agents try to avoid them
- Most of the focus has been on 'shadow' banks but alternative source is borrowing from countries with less stringent regimes

Capital regulation does not apply evenly



But lending standards generally apply to all products sold in a county



The research question

- How does the borrowing of domestic non-banks from foreign banks changes following domestic macropru actions?
 - If so does it change for some instruments more than others?
 - And for both tightening and loosening actions?
 - What can we uncover about the cause of the change?

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Policy Relevance

Matters for the design of instruments:

- Instrument choice
- Instrument strength
- Reciprocation (to get rid of this uneven application of regulation)

But also for understanding how banks react to other countries' macroprudential measures:

- Bank exposures
- Reciprocation
- Risk analysis

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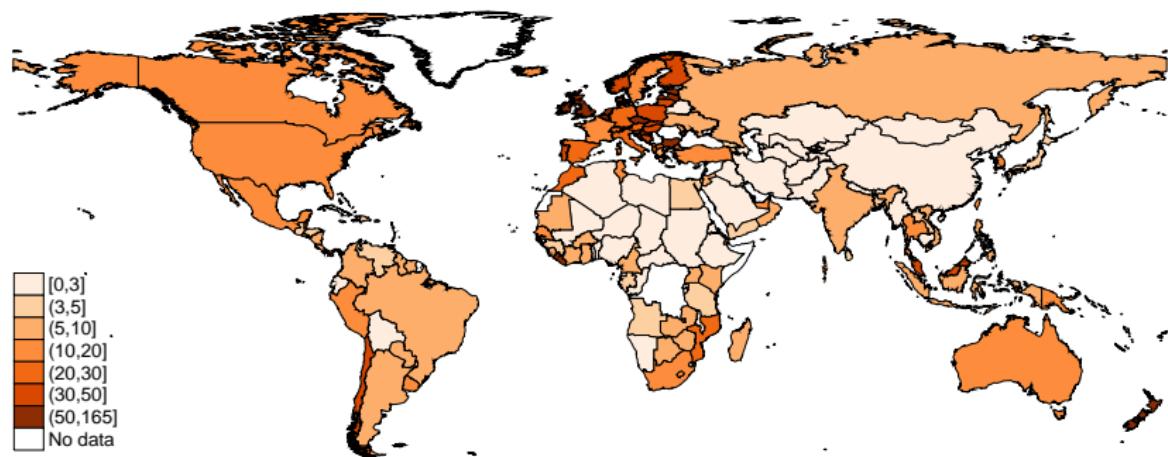
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The size of foreign bank lending



Note: Gross Lending of Foreign Banks to Non-Banks in respective countries (% of GDP)

What we look at:

We investigate these issues using a database on macroprudential policy actions (collected by the authors) and international banking statistics (BIS) for a number of different instruments:

- Capital requirements (changes in risk weights, minimum capital ratios etc)
- Lending standards regulation (LTV, LTI, DSR limits etc)
- Reserve Requirements

We note that other macroprudential instruments have been used but there aren't enough actions to use in empirical analysis.

Hypotheses

We have a number of hypotheses which we build from a number of priors and are informed by the theoretical literature

- Raising/issuing capital is expensive. Not having to do it leads to a (short-term) competitive advantage.
- Replacing liquidity is costly. Foreign banks are able to replace it from abroad/their parents more easily leading to a competitive advantage.
- Regulations affecting all banks [such as lending standards] should have no relative effects.

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Hypotheses

Effect of regulatory tightening on foreign bank lending to non-banks:

| Instrument | Lending to non-banks |
|----------------------|----------------------|
| Capital | Increase |
| Lending standards | No effect |
| Reserve requirements | Increase |

Hypotheses vs Results

Effect of regulatory tightening on foreign bank lending to non-banks:

| Instrument | Lending to non-banks |
|----------------------|--------------------------------|
| Capital | Increase ✓ (for tightening) |
| Lending standards | No effect ✓ |
| Reserve requirements | Increase ✓ |

- Tightening of domestic capital requirements leads foreign banks to lend more to domestic non-banks
- No expansion in borrowing from abroad after tightening in lending standards regulation

Related literature I

Domestic impact of regulation:

- Lim et al. (2011, IMF). Macroprudential Policy: What Instruments and How to Use Them. Lessons from Country Experiences
- Vandenbussche, Vogel, Detragiache. (2012). Macroprudential Policies and Housing Prices - A New Database and Empirical Evidence for Central, Eastern, and Southeastern Europe.

Regulation as driver of capital flows:

- Houston, Lin, and Ma (2011, JF) Regulatory Arbitrage and International Bank Flows
- Bremus and Fratscher (2015, JIMF), Drivers of structural change in cross-border banking since the global financial crisis
- Buch and Goldberg (2016) International Banking Research Network project

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Related literature II: leakages

Regulatory policies and capital controls with cross-country spillovers: theory

- Bengui, Julien and Javier Bianchi. 2014. Capital Flow Management when Capital Controls Leak.

Leakages from abroad:

- Aiyar, Calomiris, Wieladek (2014, JMBC) Does Macropru Leak? Evidence from a UK Policy Experiment
- Cerutti, Claessens and Laeven (2015) The use and effectiveness of macroprudential policies: new evidence

Leakages from non-banks:

- Cizel, Frost, Hoben and Wierts (2015) Effective macroprudential policy: Cross-sector substitution effects of price and quantity measures

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Data

We use two main data sources apart from standard macroeconomic data sources:

- ① Database of macroprudential actions for 68 countries - collected from the IMF and BIS and our own hand collection.
- ② BIS International Banking Statistics database of bilateral consolidated international banking assets and liabilities
- Baseline Sample
 - 38 AEs and EMEs: Argentina, Australia, Austria, Belgium, Brazil, Canada, Switzerland, China, Czech Republic, Germany, Denmark, Spain, Finland, France, UK, Greece, Hong Kong, Hungary, Indonesia, India, Ireland, Italy, Japan, Korea, Mexico, Malaysia, Netherlands, Norway, Poland, Portugal, Russia, Saudi Arabia, Singapore, Sweden, Thailand, Turkey, US, South Africa
 - 2005 Q1 to 2013 Q4

Data: Macroprudential policy actions

Independent variable: change in regulation

- Hand-collected database
- 1000+ actions on 68 emerging markets and advanced economies
- Mid-90s to 2015
- Covers a very wide range of actions - reflecting the lack of international framework pre-GFC
- Covers the action rather than the intent of an action - difficult to separate out macroprudential vs microprudential actions
- Implementation dates rather than announcement dates

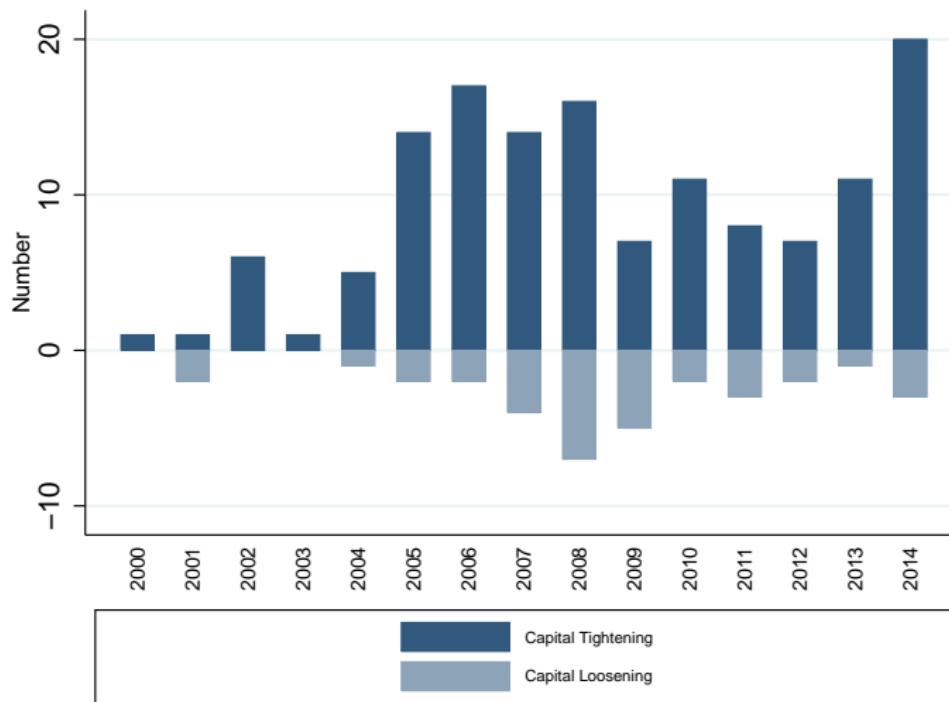
Dealing with macroprudential actions

- Aggregate action 'types' together so:
 - 1 **Lending criteria:** LTV, DTI, DSR, underwriting criteria
 - 2 **Reserve requirements, liquidity**
 - 3 **Capital:** Risk weights, capital requirements, provisioning
- Dummy variable for if an action is taken in that quarter
- Focus in this paper: prudential measures rather than controls or FX measures (CFMs)

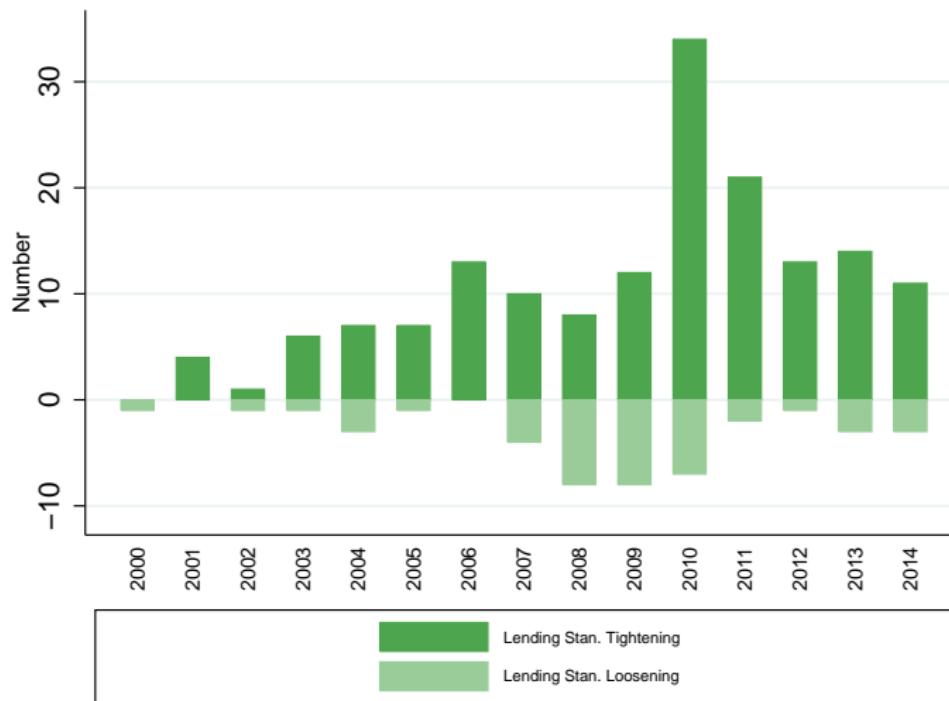
Macroprudential actions in the database



Capital actions in the database



Lending standards in the database



Data: Banking Flows

- BIS Consolidated International Banking Statistics
 - Bilateral cross-border *and* local lending of affiliates abroad
 - Ultimate risk basis (Data available from 2005 onwards)
 - By sector and by type (cross-border/local) but not both
 - **Leakages:** Consolidated lending of foreign banks to domestic non-bank sectors following domestic macropru action

Data: Dependent variable

Dependent variable: Quarterly per cent change in bilateral lending by foreign banks to domestic non-bank sector:

$$\Delta Lending_{i,j,t} = \frac{F_{i,j,t}}{S_{i,j,t-1}} \times 100, \quad (1)$$

- F denotes the change in lending of country j 's banks to non-banks in country i at time t , while S denotes the previous-quarter *stock* of lending.

Adjustments:

- Winsorisation at the 5% level
- Exclude bilateral pairs where stock of bilateral foreign bank lending is below 0.2 % of receiving country GDP

Estimation Methodology

Panel regression with country level fixed effects:

$$\Delta Lending_{i,j,t} = \alpha + \beta Macropru_{i,t-x} + Controls_{i,j,t} + \delta_i + \theta_{j,t} + \epsilon_{i,j,t} \quad (2)$$

- *Macropru* is a dummy variable
- δ_i are domestic (borrowing/taking macropru action) country fixed effects
- $\theta_{j,t}$ are lending country-quarter fixed effects
- Domestic *Controls*: Exchange Rate Depreciation, Inflation, Real GDP Growth (all expressed as a difference between country i and j) + Domestic Credit Growth
- Standard errors are clustered at the bilateral pair (i,j) level
- We vary the lag structure x of the Macropru variable to estimate longer-run effects (Baseline: $t-1/2$)

Baseline results: Lending of foreign banks to domestic non-bank sectors

| | (1) | (2) |
|---------------------------------|---------------------|----------------------|
| Lending Standards Tightening | 0.428 (0.453) | 0.274 (0.457) |
| Lending Standards Loosening | 0.320 (0.919) | 0.556 (0.927) |
| Reserve Requirements Tightening | 1.425** (0.664) | 1.126* (0.665) |
| Reserve Requirements Loosening | -1.349** (0.543) | -1.409*** (0.539) |
| Capital Regulation Tightening | 1.506*** (0.481) | 1.289*** (0.483) |
| Capital Regulation Loosening | -1.397 (1.495) | -1.298 (1.472) |
| Credit Growth | | 0.058*** (0.017) |
| GDP Growth Differential | | 0.298*** (0.075) |
| Inflation Differential | | 0.271** (0.108) |
| ER Depreciation Differential | | -0.342 (4.191) |
| Constant | 1.996*** (0.769) | -2.945** (1.150) |
| Observations | 19,574 | 19,574 |
| Country Pairs | 584 | 584 |
| Adjusted R2 | 0.180 | 0.181 |

Focusing in on Lending Standards

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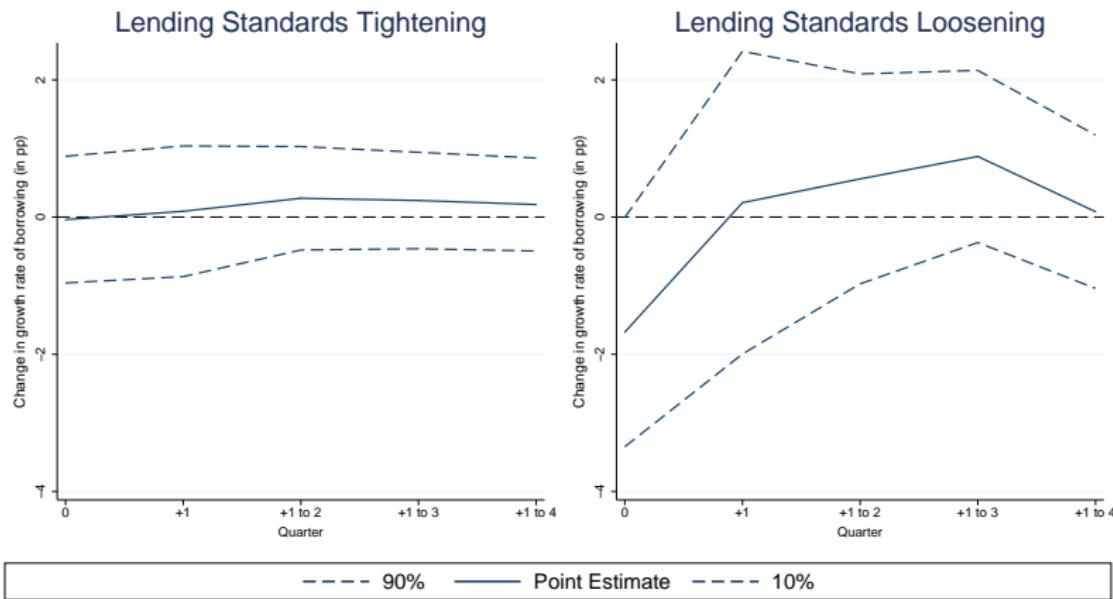
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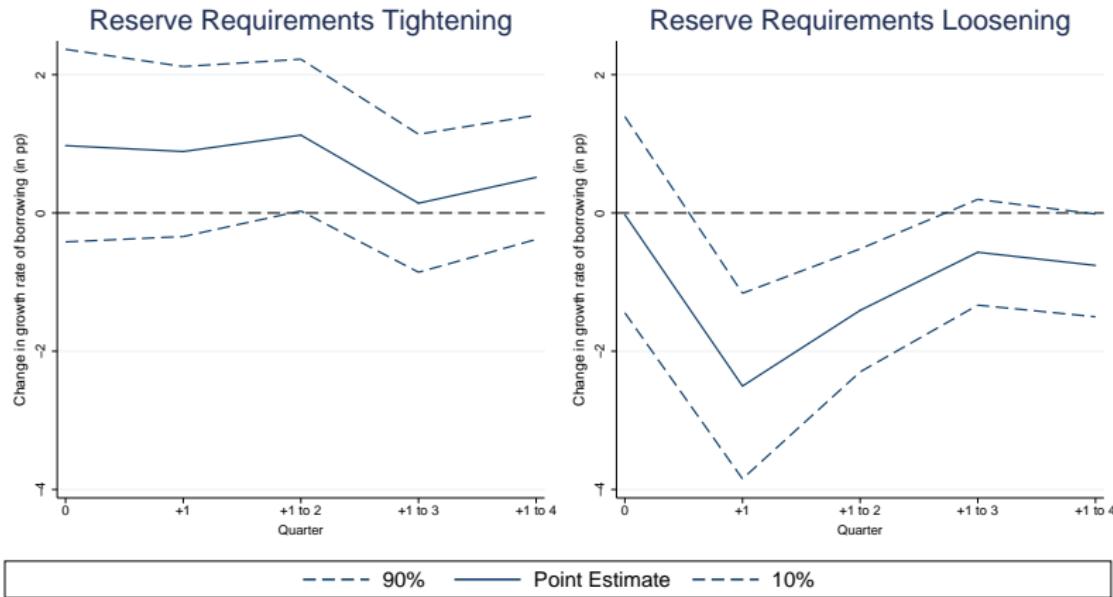
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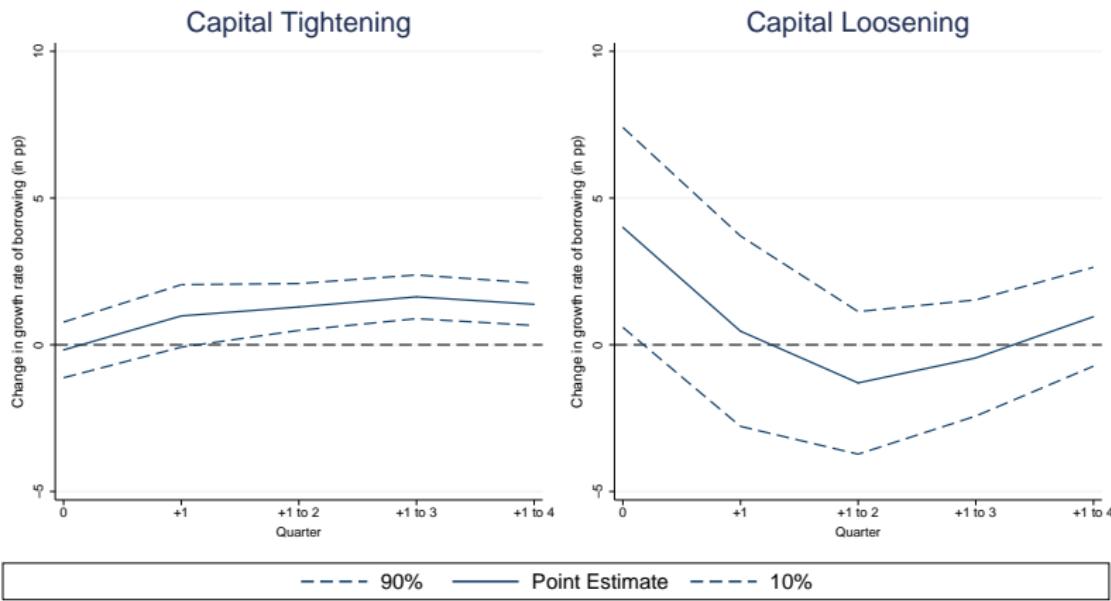
Lending Standards



Reserve Requirements



Capital Requirements



Share of subsidiaries

| | (1) | (2) |
|--|---------------------|----------------------|
| Lending Standards Tightening | 0.685 (0.619) | 0.743 (0.621) |
| Lending Standards Loosening | 0.625 (1.374) | 0.308 (1.393) |
| Reserve Requirements Tightening [1] | 2.506 (1.887) | 0.690 (0.792) |
| Reserve Requirements Loosening | -1.417** (0.622) | -1.376** (0.618) |
| Capital Regulation Tightening [2] | 1.242** (0.608) | 3.329*** (0.928) |
| Capital Regulation Loosening | 1.064 (1.836) | 1.265 (1.855) |
| Share of Subsidiaries | 3.380 (2.741) | 3.449 (2.742) |
| RR Tightening * Share of Subsidiaries [3] | -2.267 (2.135) | |
| Capital Tightening * Share of Subsidiaries [4] | | -3.750*** (1.435) |
| Controls | YES | YES |
| Observations | 15,677 | 15,677 |
| Countries | 475 | 475 |
| Adjusted R2 | 0.192 | 0.192 |

Emerging markets vs AEs, excluding the crisis and including policy rates

| | (1) EMEs | (2) Excluding Crisis | (3) Policy Rate |
|-------------------------------------|----------------------|-------------------------|---------------------|
| Lending Standards Tightening | -0.108 (0.570) | 0.308 (0.462) | 0.294 (0.459) |
| Lending Standards Loosening | 0.979 (1.139) | 1.162 (0.981) | 0.500 (0.931) |
| Reserve Requirements Tightening | 2.422 (3.396) | 0.931 (0.669) | 1.115 (0.738) |
| Reserve Requirements Loosening | -1.218 (0.933) | -0.899 (0.547) | -1.253** (0.556) |
| Capital Regulation Tightening | 1.467** (0.673) | 1.250** (0.512) | 1.344*** (0.486) |
| Capital Regulation Loosening | -7.285*** (2.173) | -0.935 (1.545) | -1.383 (1.479) |
| Lending Standards Tightening*EME | 1.001 (0.937) | | |
| Lending Standards Loosening*EME | -1.717 (1.880) | | |
| Reserve Requirements Tightening*EME | -1.758 (3.464) | | |
| Reserve Requirements Loosening*EME | -0.326 (1.112) | | |
| Capital Regulation Tightening*EME | -0.448 (0.928) | | |
| Capital Regulation Loosening*EME | 9.232*** (2.804) | | |
| Policy Rate (Change) | | | -0.272 (0.417) |

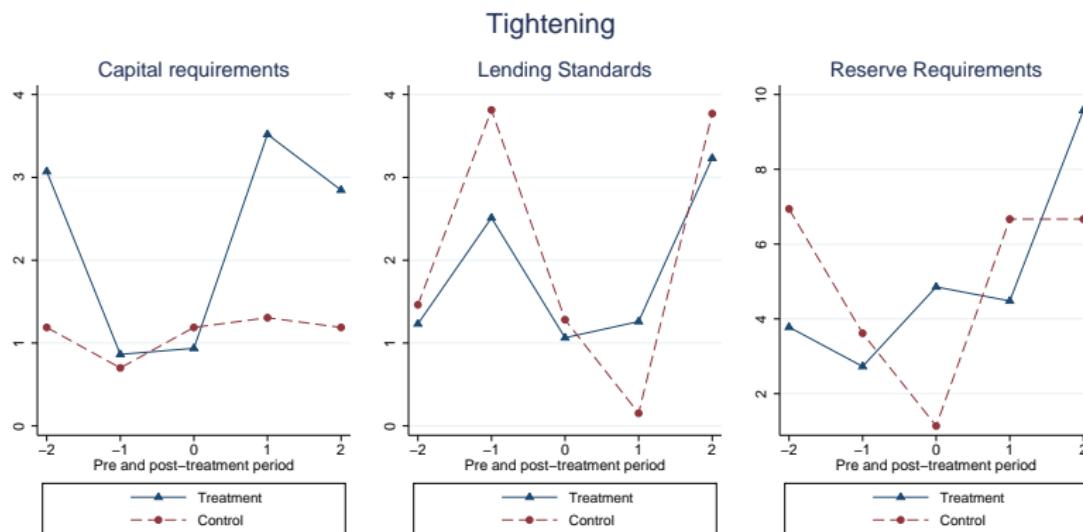
Conclusion

- Tightening of domestic capital requirements leads foreign banks to lend more to domestic non-banks
- Results stronger in countries with high proportion of branches [which are not subject to the regulation]
- Suggests banks expand lending when regulation is *tightened* so long as the regulation does not apply to them
- No expansion in borrowing from abroad after tightening in lending standards regulation
- Implications for instrument choice and design of reciprocity framework

Exogeneity of capital requirements to foreign lending

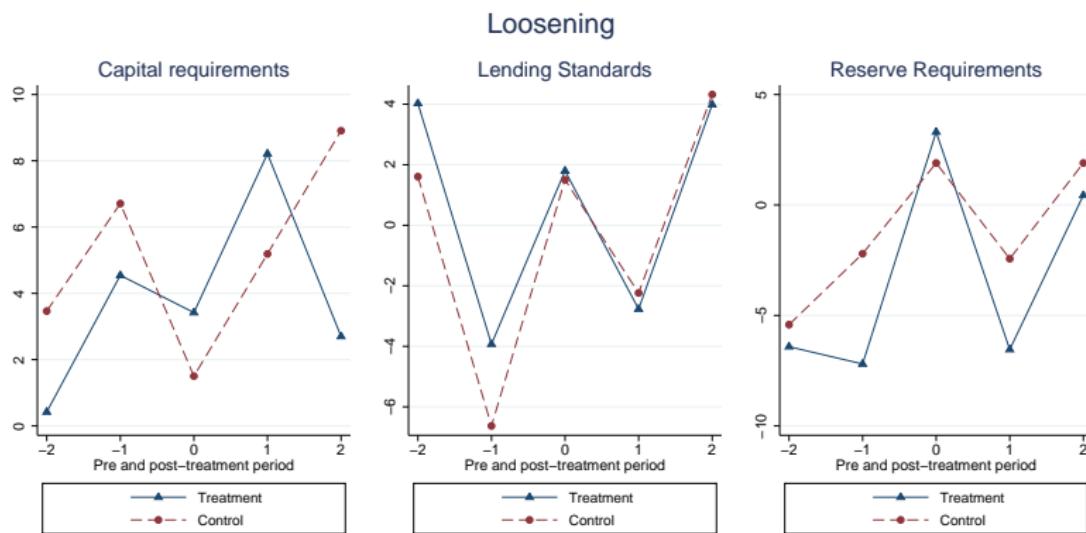
| | (1) Lending Standards | | (3) Reserve Requirements | | (5) Capital Regulation | | (6) |
|-----------------------------|-----------------------|------------|--------------------------|------------|------------------------|------------|-----|
| | Tightening | Loosening | Tightening | Loosening | Tightening | Loosening | |
| Foreign Bank Lending Growth | -0.0001* | -0.0000 | 0.0000 | -0.0001 | 0.0001 | 0.0000 | |
| | (0.0001) | (0.0000) | (0.0001) | (0.0000) | (0.0001) | (0.0000) | |
| Credit Growth | 0.0009*** | 0.0002* | 0.0004** | -0.0002* | 0.0010*** | 0.0004*** | |
| | (0.0003) | (0.0001) | (0.0002) | (0.0001) | (0.0002) | (0.0001) | |
| GDP Growth | 0.0010 | -0.0001 | 0.0046*** | 0.0008 | 0.0046*** | -0.0015*** | |
| | (0.0011) | (0.0006) | (0.0013) | (0.0009) | (0.0011) | (0.0004) | |
| Inflation | -0.0019 | -0.0047*** | 0.0078*** | 0.0080*** | -0.0058*** | -0.0009 | |
| | (0.0012) | (0.0009) | (0.0018) | (0.0015) | (0.0015) | (0.0006) | |
| ER Depreciation | 0.2066*** | -0.0227 | 0.1523*** | 0.0898** | -0.3131*** | 0.0248 | |
| | (0.0466) | (0.0203) | (0.0462) | (0.0409) | (0.0408) | (0.0209) | |
| Constant | 0.0067 | 0.0399*** | -0.0667*** | -0.0486*** | 0.0881*** | 0.0577*** | |
| | (0.0131) | (0.0095) | (0.0188) | (0.0138) | (0.0170) | (0.0058) | |
| Observations | 19,574 | 19,574 | 19,574 | 19,574 | 19,574 | 19,574 | |
| Country Pairs | 584 | 584 | 584 | 584 | 584 | 584 | |
| Adjusted R2 | 0.0944 | 0.0619 | 0.191 | 0.240 | 0.103 | 0.0324 | |

Pararell trends: Tightening



Note: The figure plots the mean of the growth in domestic non-bank borrowing from foreign banks around tightening or loosening events of regulatory policies.

Pararell trends: Loosening



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