

An aerial photograph of a city skyline, likely Amsterdam, viewed from a distance. The skyline is hazy and blue-toned, with various skyscrapers and buildings visible. In the foreground, a vast green field is divided by a straight canal or waterway that runs vertically through the center. The sky is a pale, hazy blue.

Effective macroprudential policy

Cross-sector substitution from price and quantity measures

Janko Cizel, Jon Frost, Aerdt Houben and Peter Wiertz

First Annual Macroprudential Policy and Research Conference

DeNederlandscheBank

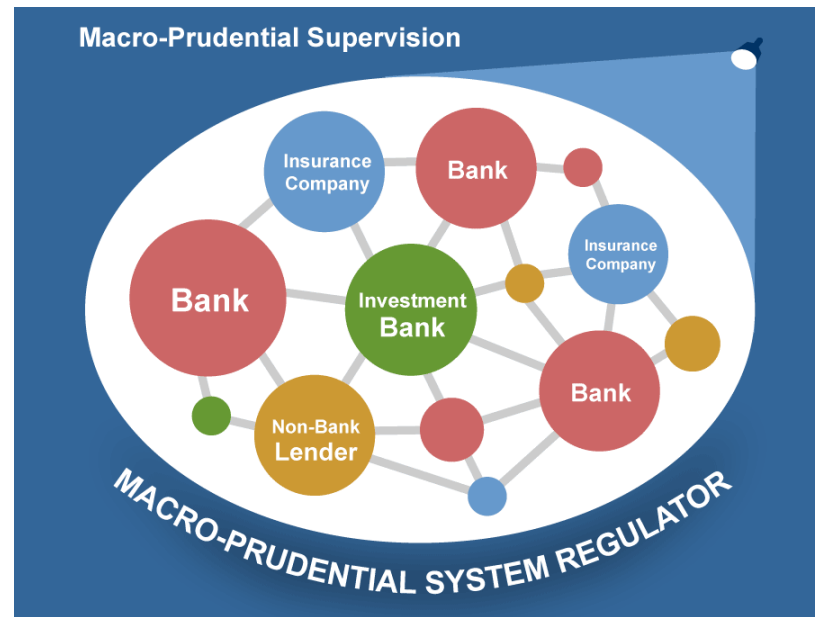
EUROSYSTEEM

The global financial crisis exposed gaps in financial regulation

Need for oversight and regulation of
systemic risks

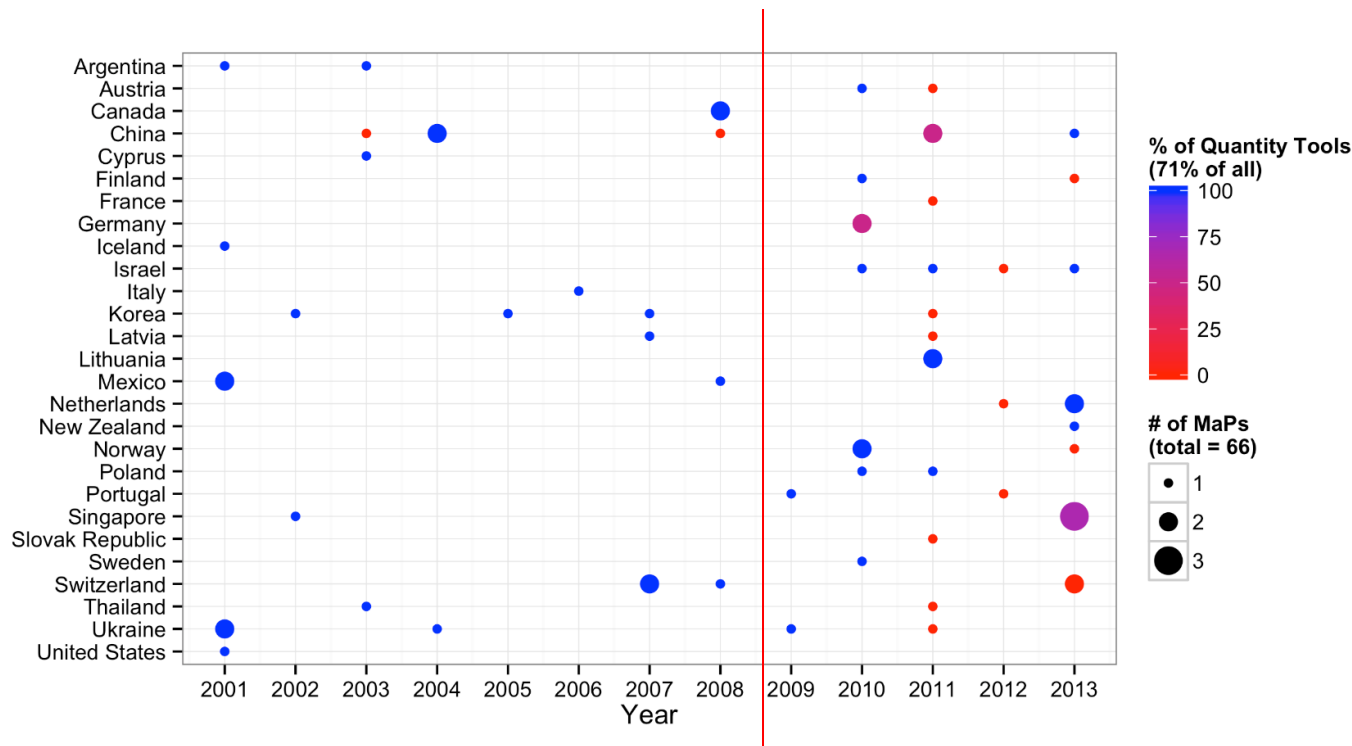


Macroprudential policy
(e.g. loan-to-value caps, leverage
ratio, counter-cyclical capital buffers)



Source: MacroBusiness, 2013

Macroprudential policies (“MaPs”) have been used actively since



Are macroprudential measures effective? (preview of results)

Yes:

- MaPs reduce (excessive) bank credit growth
 1. bank credit falls by about 8 percentage points 2 years after activation
 2. effect is stronger in EMEs (10 pp) than AEs (3 pp)
 3. effect is stronger for quantity-based than for price-based measures

But:

- MaPs appear to be subject to cross-sector substitution (regulatory arbitrage)
 1. Non-bank credit *increases* after activation; total credit falls by 5 pp
 2. substitution effect is stronger in AEs
 3. substitution effect is stronger for quantity-based measures

Findings are in line with the “boundary problem” hypothesis

*“Effective regulation, one that actually bites, is likely to penalize those within the regulated sector, relative to those just outside, **causing substitution flows towards the unregulated.**” (Goodhart, 2008)*

Cross-sector substitution – incentive to switch to a different legal form, e.g.:

- Business loans (bank) to corporate bond issuance (markets)
- Mortgage loans (bank) to mortgage-backed securitization (SPV)
- Commercial real estate loans (bank) to real estate funds
- Repos by banks (bound by the leverage ratio) to non-banks (LR does not necessarily apply)

Roadmap

1. Literature
2. Data
3. Event study design
4. Results
5. Robustness checks
6. Policy implications

Rapidly expanding literature on effects of macroprudential policy

Effectiveness:

- Credit growth: Cerutti, Claessens and Laeven (2015)
- Capital flows: Bruno, Shim and Shin (2014)
- Pro-cyclicality of credit: Lim et al. (2011)

Unintended consequences:

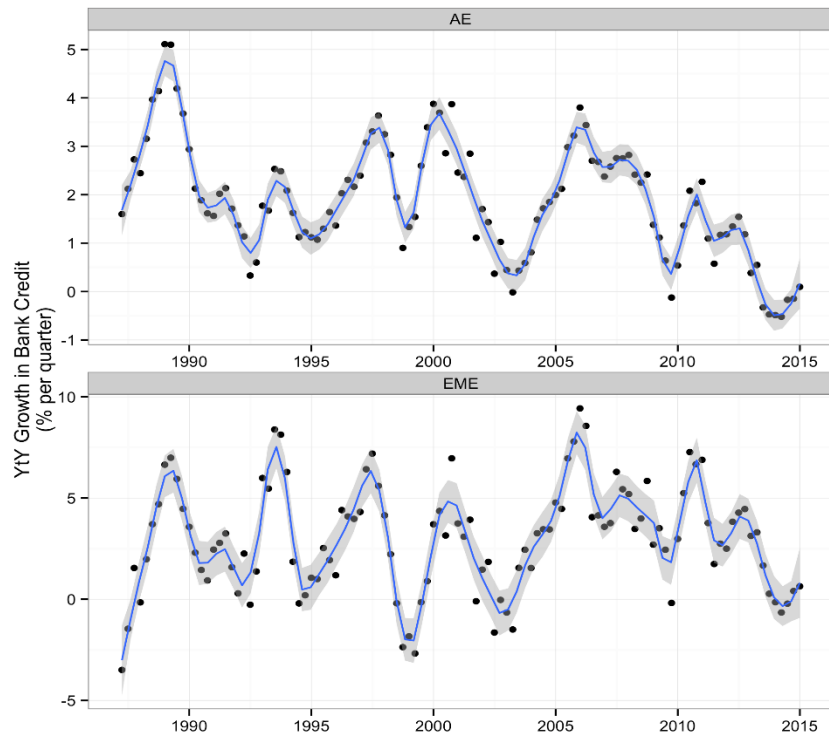
- Cross-border substitution: Aiyar, Calomiris and Wieladek (2015); Reinhardt, and Sowerbutts (2015); Buch and Goldberg (2016) / IBRN
- Cross-sector substitution: **this paper**

Roadmap

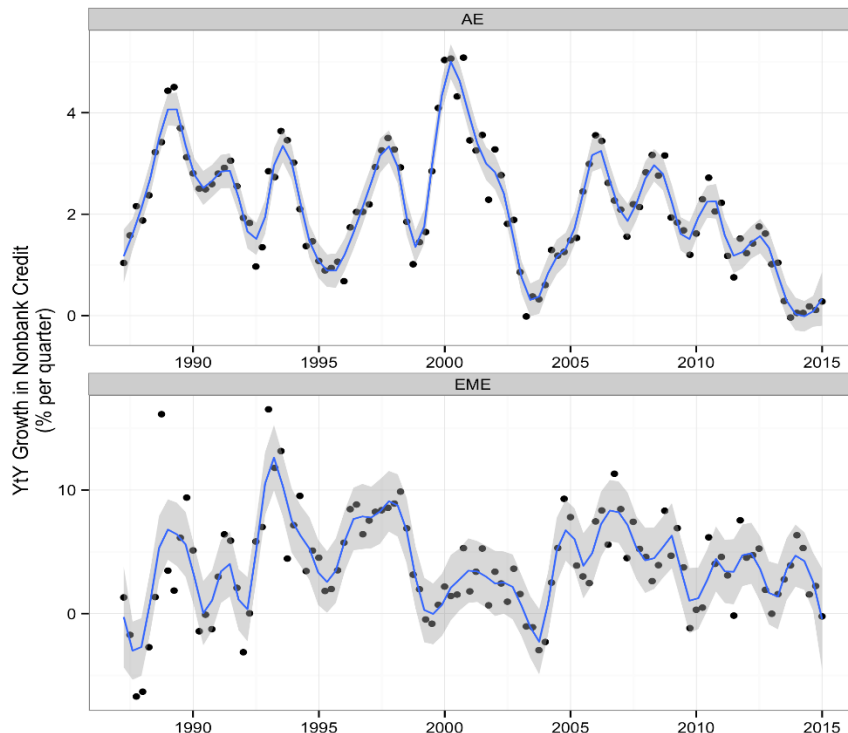
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Key data (1): bank and non-bank private credit (BIS long series)

Bank Credit Flows



Non-Bank Credit Flows



Key data (2): activation of MaP instruments (Cerutti et al., 2015)

	Borrower/Lender	Price/ Quantity
LTV ratio cap	Borrower	Quantity
DTI ratio cap	Borrower	Quantity
Dynamic Loan-Loss Provisioning	Lender	Price
CCB	Lender	Price
Leverage Ratio	Lender	Quantity
Capital Surcharges on SIFIs	Lender	Price
Limits on Interbank Exposures	Lender	Quantity
Concentration Limits	Lender	Quantity
Limits on Foreign Currency Loans	Lender	Quantity
Reserve Requirement Ratios	Lender	Quantity
Limits on Domestic Currency Loans	Lender	Quantity
Levy/Tax on Financial Institutions	Lender	Price

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Event study design with a “leads-and-lags” model

1. Bank Credit Growth
2. Non-Bank Credit Growth
3. Net Sectoral Credit Flow

Quarters relative to event date

Policy activation indicator

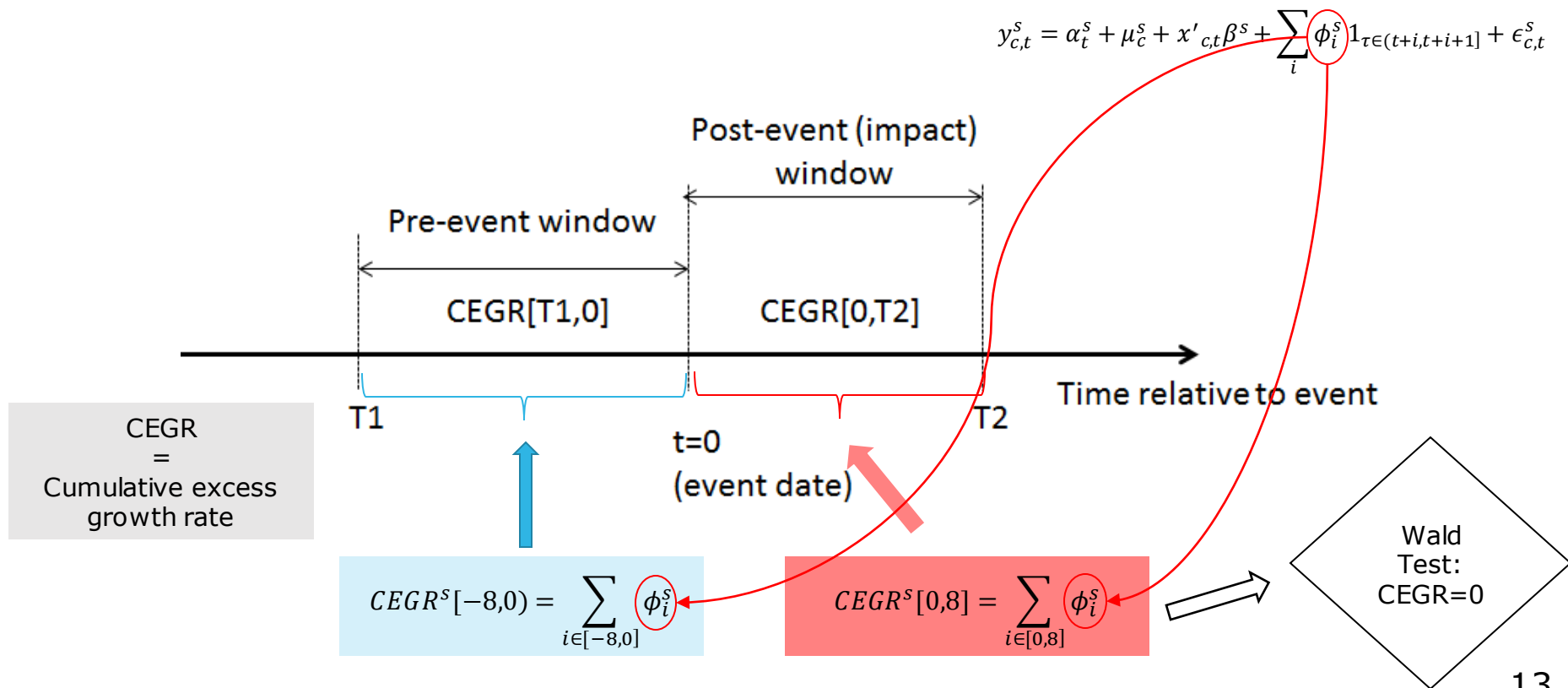
$$1_{\tau \in (t+i, t+i+1]} = \begin{cases} 1, & \text{if } \tau \in (t+i, t+i+1] \\ 0, & \text{otherwise} \end{cases}$$

$$y_{c,t}^s = \underbrace{\alpha_t^s + \mu_c^s + x'_{c,t} \beta^s}_{\text{Expected rate of growth}} + \sum_i \underbrace{\phi_i^s}_{\text{Excessive rate of growth}} 1_{\tau \in (t+i, t+i+1]} + \epsilon_{c,t}^s$$

Expected rate of growth

Excessive rate of growth

Estimation of a policy effect

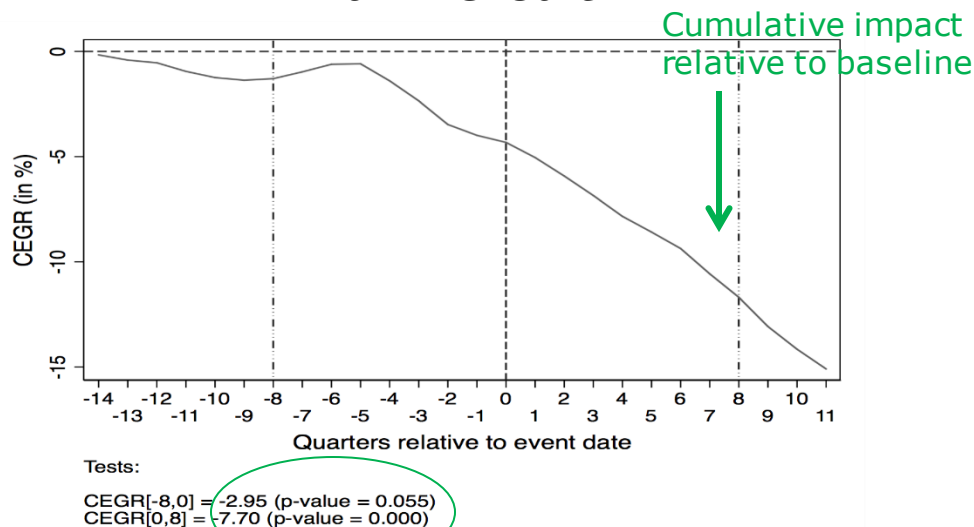


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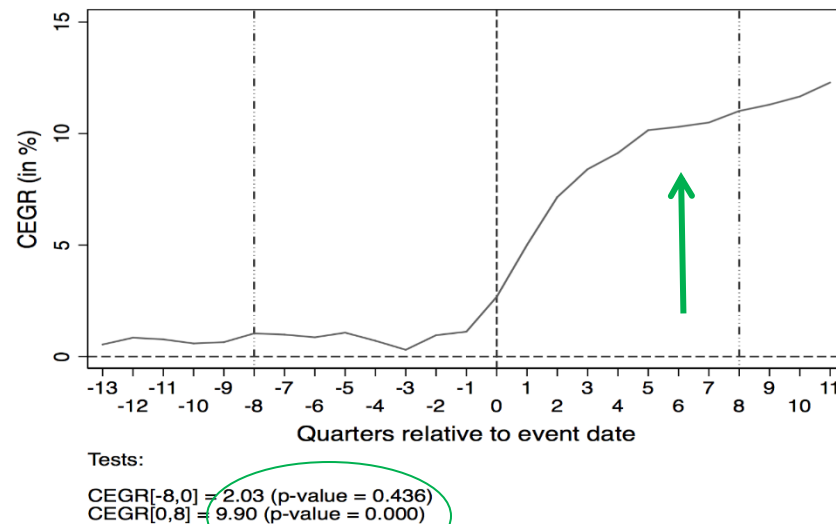
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MaPs reduce bank credit, but increase non-bank credit

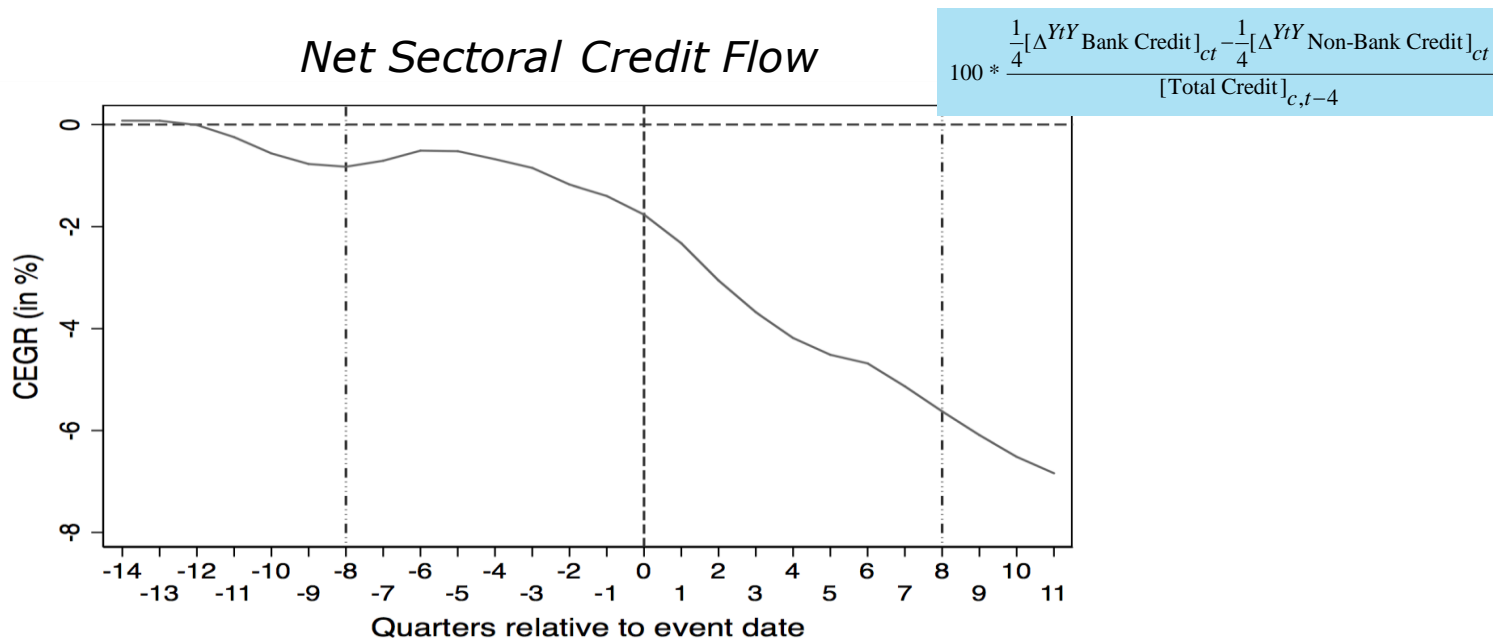
Bank Credit



Non-Bank Credit



The net result is a (relative) shift from banks to non-banks



Tests:

CEGR[-8,0] = -0.99 (p-value = 0.310)

CEGR[0,8] = -4.22 (p-value = 0.000)

Event study results across countries and tools

$$y_{c,t}^s = \alpha_t^s + \mu_c^s + x'_{c,t} \beta^s + \sum_i \phi_i^s 1_{\tau \in (t+i, t+i+1]} + \epsilon_{c,t}^s$$

$$CEGR^s[0,8] = \sum_{i \in [0,8]} \phi_i^s$$

	All Instruments		Quantity Measures		Price Measures	
	Bank Credit	Total Credit	Bank Credit	Total Credit	Bank Credit	Total Credit
All	-7.7***	-4.9***	-8.7***	-4.1***	1.7	1.2
Advanced economies	-3.2**	-1.6	-6.6***	-1.5	2.0	2.1
Emerging markets	-9.9***	-6.5***	-10.4***	-6.9***	1.5	-2.8

Note: The table reports Cumulative Excessive Growth Rates (CEGR) for the period of 2 years following policy activation.

Quantity-based measures are more effective in reducing bank credit than price-based measures, both in AEs and EMEs

	All Instruments		Quantity Measures		Price Measures	
	Bank Credit	Total Credit	Bank Credit	Total Credit	Bank Credit	Total Credit
All	-7.7***	-4.9***	-8.7***	-4.1***	1.7	1.2
Advanced economies	-3.2**	-1.6	-6.6***	-1.5	2.0	2.1
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Note: The table reports Cumulative Excessive Growth Rates (CEGR) for the period of 2 years following policy activation.

In line with the substitution hypothesis, the decline in total credit is smaller than the decline in bank credit

	All Instruments		Quantity Measures		Price Measures	
	Bank Credit	Total Credit	Bank Credit	Total Credit	Bank Credit	Total Credit
All	-7.7***	-4.9***	-8.7***	-4.1***	1.7	1.2
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Note: The table reports Cumulative Excessive Growth Rates (CEGR) for the period of 2 years following policy activation.

The magnitude of policy effects is larger in emerging than in advanced economies

	All Instruments		Quantity Measures		Price Measures	
	Bank Credit	Total Credit	Bank Credit	Total Credit	Bank Credit	Total Credit
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In advanced economies, cross-sector substitution diminishes the effect on total credit

	All Instruments		Quantity Measures		Price Measures	
	Bank Credit	Total Credit	Bank Credit	Total Credit	Bank Credit	Total Credit
All	-7.7***	-4.9***	-8.7***	-4.1***	1.7	1.2
Advanced economies	-3.2**	-1.6	-6.6***	-1.5	2.0	2.1
Emerging markets	-9.9***	-6.5***	-10.4***	-6.9***	1.5	-2.8

Note: The table reports Cumulative Excessive Growth Rates (CEGR) for the period of 2 years following policy deployment.

Roadmap

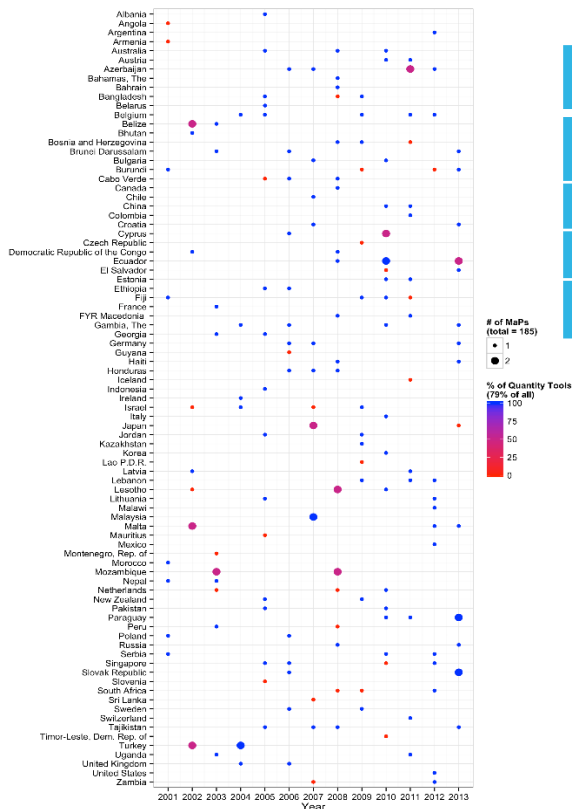
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Placebo test

Step 1:
Simulate
Event Dates



Step 2:
Repeat event studies on bank,
non-bank credit, total credit and
net sectoral credit flows



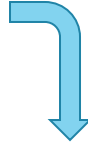
	All Instruments		Quantity Measures		Price Measures	
	Bank Credit	Total Credit	Bank Credit	Total Credit	Bank Credit	Total Credit
All	0.9	1.1	-0.8	0.1	1.6	-0.2
AEs	2.0	1.8	-0.2	0.3	2.9	-0.9
EMEs	-4.5	-6.0*	-4.2	-6.6	-7.9	-8.4



Impact window effects are in most cases statistically indistinguishable from zero, as expected.

Substitution effects **before/after 2007Q3**

Pre-2007q3



	All Instru ments	Quantity Measures	Price Measures
All	-6.1***	-6.1***	NA
AEs	-5.7***	-5.7***	NA
EMEs	-6.0***	-6.0***	NA

**Post-
2007q3**



	All Instru ments	Quantity Measures	Price Measures
All	-2.6***	-4.2***	3.1
AEs	-1.9**	-2.7**	0.1
EMEs	-5.1***	-6.5***	2.5



Substitution effects robust over time

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Key findings

- Macroprudential policy measures reduce bank credit
 - Bank credit falls by about 8 pp during 2 years after policy activation
 - Quantity-based tools are more effective in reducing bank credit
 - Intended effects of macroprudential policies stronger in EMEs than in AEs
- Credit provision shifts from banks to non-banks
 - Non-bank credit increases after macroprudential policy activation
 - Cross-sector substitution effects stronger in AEs, with more developed financial systems

Does cross-sector substitution increase systemic risk?

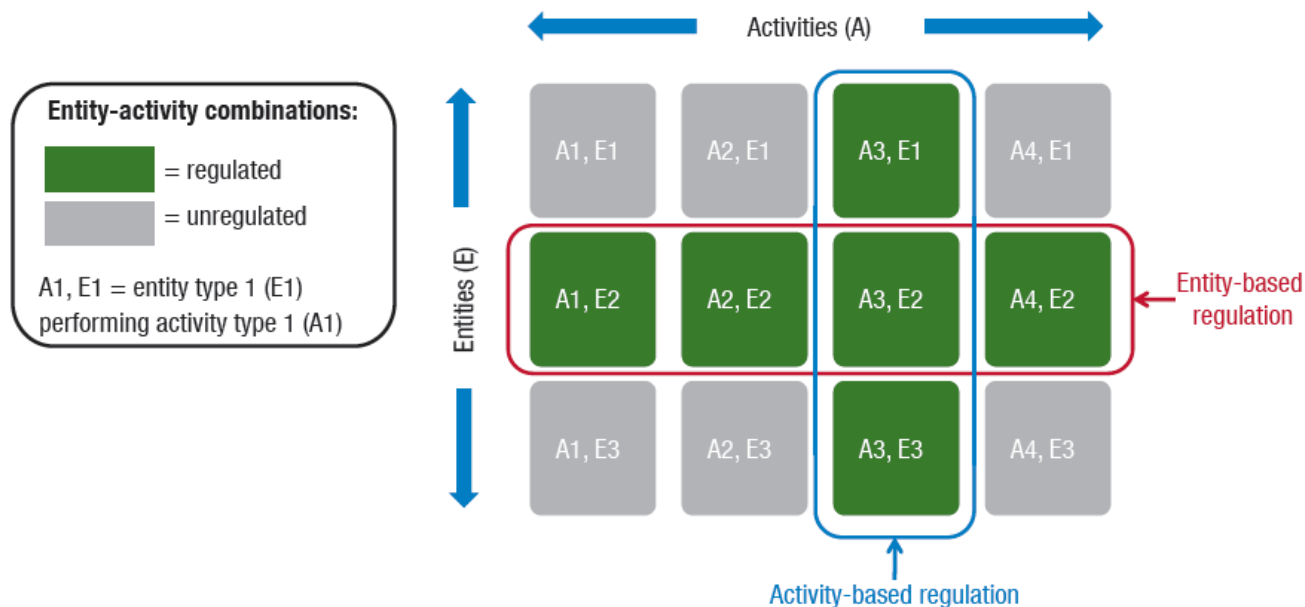
- Shift towards non-banks may be beneficial
 - Non-bank institutions are generally less leveraged
 - Fewer liquidity risks (no deposits – but also no DGS!)
 - Separated from systemic functions related to the payment infrastructure
 - Does not benefit from public sector safety nets

- But it may also shift systemic risks
 - Emergence of market liquidity events, links between banks and non-banks
 - Excessive debt burdens remain problematic, even if contagion risks decline

How can policymakers address potential systemic risks?

- Extend the scope of macroprudential policy beyond banking
 - Address systemic risks in non-bank financial institutions and markets
 - Apply limits on leverage and liquidity transformation for bank-like activities performed by non-bank institutions
- Use of activity-based (as opposed to sector-based) measures
 - Target the risk of an activity, regardless of where it is conducted
 - Examples LTV and DSTI caps, margin and haircut requirements for repos

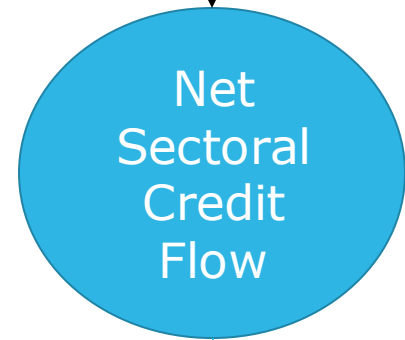
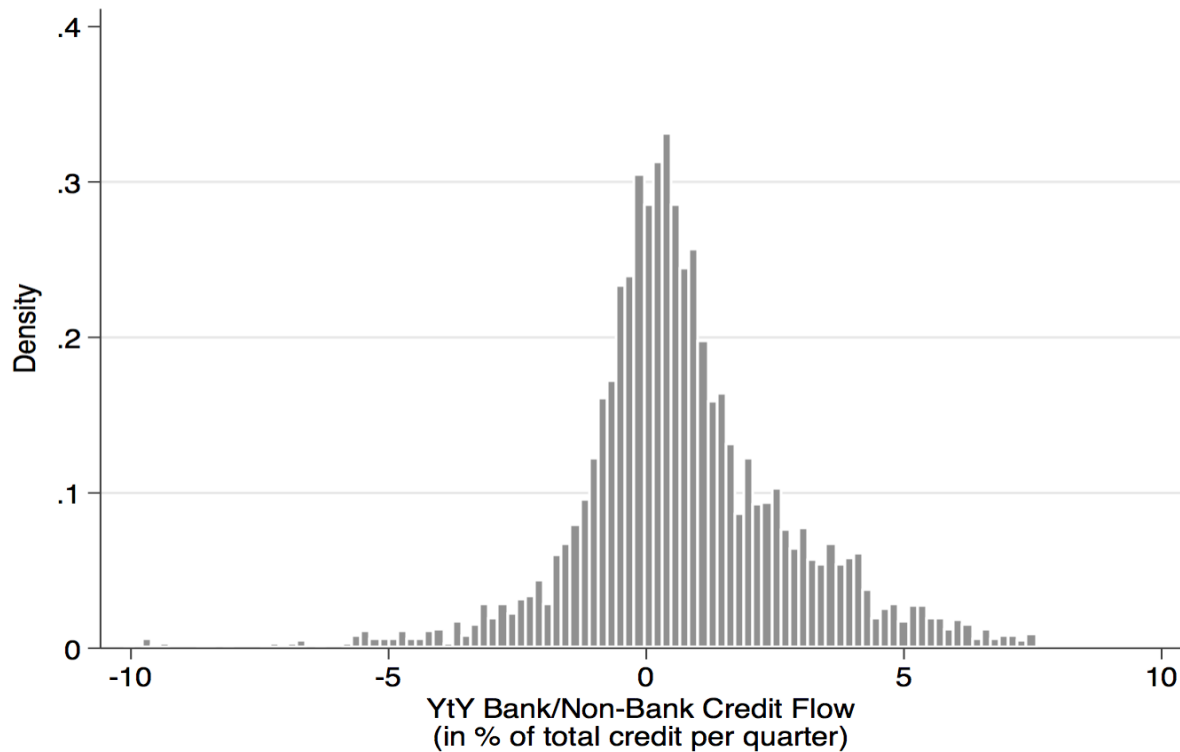
Can activity-based rules complement an entities-based approach?



Source: IMF, 2014

Thank you!

Annex



$$[\text{Quarterly Net Sectoral Credit Flow}]_{ct} = 100 * \frac{\frac{1}{4}[\Delta^{YtY} \text{Bank Credit}]_{ct} - \frac{1}{4}[\Delta^{YtY} \text{Non-Bank Credit}]_{ct}}{[\text{Total Credit}]_{c,t-4}}$$

Direct test of cross-sector substitution

$$NetFlow_{c,t} = \alpha_c + \beta_t + \theta_1 BankCrisis_{c,t} + \theta_2 \Delta MonetaryPolicy_{c,t} + \theta_3 \Delta MaP_{c,t} + \epsilon_{c,t}$$

$$100 * \frac{\frac{1}{4} [\Delta^{YtY} Bank Credit]_{ct} - \frac{1}{4} [\Delta^{YtY} Non-Bank Credit]_{ct}}{[Total Credit]_{c,t-4}}$$

Banking Crisis Indicator
(Laeven and Valencia, 2013)

Change in Monetary Policy:

1. YtY change in policy rate
2. YtY growth in central bank balance sheet size

Macro-Prudential Policy Stance:

1. YtY change in macro-prudential policy index

Test of cross-sector substitution

$\theta_3 < 0 \Rightarrow$ Cross-sector sub. from banks to non-banks

$\theta_3 > 0 \Rightarrow$ Cross-sector sub. from non-banks to banks

Compare to regression results

Test of
cross-sector
substitution

$\theta_3 < 0 \Rightarrow$ Cross-sector sub.
from banks to non-banks

$\theta_3 > 0 \Rightarrow$ Cross-sector sub.
from non-banks to banks

$$NetFlow_{c,t} = \alpha_c + \beta_t + \theta_1 BankCrisis_{c,t} + \theta_2 \Delta MonetaryPolicy_{c,t} + \theta_3 \Delta MaP_{c,t} + \epsilon_{c,t}$$

	All countries	Advanced Economies	Emerging Markets
MaP Quantity-Based Index (YtY change)	-0.49*** (0.15)	-0.45*** (0.12)	-0.38 (0.34)
MaP Price-Based Index (YtY change)	0.56** (0.26)	0.12 (0.20)	0.81 (0.74)
[CB Lending Rate] (YtY change)	0.00 (0.01)	0.04*** (0.01)	-0.09*** (0.02)
[Log of CB BS Size] (YtY change)	-0.46*** (0.11)	-0.68*** (0.08)	0.52* (0.35)
[Banking Crisis Indicator]	-1.20*** (0.11)	-0.61*** (0.09)	-2.51*** (0.36)
R-squared	0.137	0.125	0.292
Obs.	3224	2291	933

Effects are particularly large for quantity measures

Direct test of
cross-sector
substitution

$$[\text{Quarterly Net Sectoral Credit Flow}]_{ct} = 100 * \frac{\frac{1}{4}[\Delta^{YY} \text{Bank Credit}]_{ct} - \frac{1}{4}[\Delta^{YY} \text{Non-Bank Credit}]_{ct}}{[\text{Total Credit}]_{c,t-4}}$$

	All Instruments	Quantity Measures	Price Measures
All	-4.3***	-5.2***	2.3
Advanced economies	-4.1***	-4.6***	-1.2
Emerging markets	-6.2***	-6.5***	1.1

Evidence in
support of
cross-sector
substitution

Note: The table reports Cumulative Excessive Growth Rates (CEGR) for the period of 2 years following policy deployment.