# Bank Capital (Requirements) and Credit Supply: evidence from Pillar 2 decisions

Olivier De Jonghe (Tilburg University, NBB)
Hans Dewachter (National Bank of Belgium, KULeuven)
Steven Ongena (University of Zurich)

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# Motivation and contribution

Regulatory response after financial crisis

- ▶ Add macroprudential supervision and regulation
- ▶ ... to an improved microprudential framework

Common tool: **time-varying bank-specific capital requirements**

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Goal of macroprudential policy

- ▶ increase resilience and shock absorption capacity of the financial sector
- ▶ by internalizing cost of systemic risk contribution
- ▶ and cooling down lending booms / maintaining credit during crisis

$\leftrightarrow$ Microprudential policy: soundness of individual banks

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↔ Microprudential policy: soundness of individual banks

But, **microprudential capital requirements may also affect lending** (unintentionally) if

- ▶ raising external equity is costly
- ▶ costs are transmitted to borrowers

# Literature on capital requirements and credit supply

Large literature on effect of introduction Basel I, II and III

- ▶ drawback 1: implementation is usually uniform across banks
- ▶ drawback 2: response to (lending) crisis
- ▶ drawback 3: coinciding events/confounding factors

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- ▶ *bank level data*

- ▶ *firm-bank level data*

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- *bank level data*
  - UK, 1998-2007, aggregate lending (Aiyar, Calomiris and Wieladek; 2014, 2016); euro-area, 2011-2012, EBA, aggregate lending: (Mesonnier and Monks, 2015); France, 2003-2011, lending standards (Labonne and Lamé, 2014)
  - Belgium, 2003-2015, mortgage lending rates: Ferrari, Pirovano and Rovira Kaltwasser, 2016

- *firm-bank level data*

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- *firm-bank level data*
  - UK, mortgage lending (Uluc and Wieladek,2016); Spain, corporate lending, dynamic provisioning (Jimenez et al., 2016); France, corporate lending, Basel 2 IRB (Fraisse, Lè and Thesmar; 2016)

# Questions and main findings of this paper

1. Does regulatory capital affect corporate credit supply?

2. Are all banks and firms equal?

3. Does regulatory capital affect banks' balance sheet?

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3. Does regulatory capital affect banks' balance sheet?
   - Yes, off-setting channels lead to aggregate balance sheet effects
   - Yes, reduction in domestic mortgages and foreign corporate lending

# Structure of presentation

# The Supervisory Review and Evaluation Procedure

Figure: **SREP 2011-2014 (Source: IMF country report 13/138. Belgium: technical note on financial conglomerate supervision)**

## Sample representativeness

Banks covered by the review process are **half** the total number of banks, but constitute **more than 95%** of (i) number of corporate loans, (ii) volume of corporate loans, (iii) aggregate total assets

| time | Banks with regulatory capital data | | | Share of regulatory sample in total sample | | | |
|---|---|---|---|---|---|---|---|
| | Number of bank-firm relation-ships | Aggregate Firm-Bank credit exposure (million EUR) | Aggregate Total Assets (million EUR) | Number of bank-firm relation-ships | Aggregate Firm-Bank credit exposure | Aggregate Total Assets | Number of Banks |
| 2013Q1 | 298956 | 96921.66 | 628056 | 0.78 | 0.75 | 0.75 | 0.39 |
| 2013Q2 | 302272 | 97886.88 | 629150 | 0.78 | 0.76 | 0.75 | 0.39 |
| 2013Q3 | 302126 | 97033.13 | 613582 | 0.78 | 0.76 | 0.75 | 0.39 |
| 2013Q4 | 305951 | 96932.13 | 578778 | 0.78 | 0.76 | 0.75 | 0.39 |
| 2014Q1 | 371011 | 120623 | 751995 | 0.96 | 0.95 | 0.95 | 0.50 |
| 2014Q2 | 369473 | 120984.4 | 767089 | 0.96 | 0.95 | 0.95 | 0.50 |
| 2014Q3 | 366790 | 121525.7 | 778424 | 0.96 | 0.95 | 0.95 | 0.50 |
| 2014Q4 | 373748 | 133141.3 | 777075 | 0.96 | 0.95 | 0.95 | 0.50 |
| 2015Q1 | 370489 | 134097.3 | 821347 | 0.96 | 0.95 | 0.95 | 0.50 |
| 2015Q2 | 369956 | 136131.9 | 788704 | 0.96 | 0.95 | 0.95 | 0.50 |
| 2015Q3 | 370060 | 136918.5 | 782849 | 0.96 | 0.96 | 0.95 | 0.50 |
| 2015Q4 | 369152 | 141002.3 | 754160 | 0.96 | 0.96 | 0.95 | 0.52 |

# Required and actual capital ratio: summary statistics

Our data: computed over 124 bank-quarter observations

- ▶ Required capital ratio
  - ▶ average is 11.2% of risk-weighted assets
  - ▶ more importantly (for analysis), standard deviation is 2.0%
- ▶ Actual capital ratio
  - ▶ average is 14.9% of risk-weighted assets
  - ▶ and a standard deviation of 3.7%
- ▶ On average, banks hold a sizable cushion/buffer

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Compared with e.g. Aiyar, Calomiris and Wieladek (UK, 1998-2007, 88 regulated banks)

> *the variation in minimum capital requirements as a share of risk-weighted assets over the sample period was large. The mean capital requirement ratio was 10.8%, the standard deviation 2.26%*

# Structure of presentation

# Impact of (required) capital on corporate credit supply

## Empirical specification

$$
\begin{aligned}
\text{Credit Growth (Quarterly)}_{b,f,t} = {} & \beta_1 * \text{Actual Cap. Ratio}_{b,t-1} \\
& + \beta_2 * \text{Prev year Actual Cap. Ratio}_{b,t-4} \\
& + \beta_3 * \text{Required cap. ratio}_{b,t-1} \\
& + \beta_4 * \text{Prev year Required Cap. Ratio}_{b,t-4} \\
& + \gamma * \text{Bank Controls}_{b,t-1} + \nu_{f,t} + \nu_b + \epsilon_{b,f,t}
\end{aligned}
$$

Various measures of credit growth

- ▶ firm-bank-quarter level
- ▶ intensive and extensive margin
- ▶ based on authorized amount
- ▶ breakdown according to maturity and type

Lagged actual and required capital ratio (quarter/year)

$\nu_{f,t}$ are firm-time fixed effects: demand control

- ▶ hence, only firms that borrow from multiple banks in a quarter

$\nu_b$ are bank fixed effects: business model, corporate structure

# Impact of (required) capital on corporate credit supply

## Estimation results: multiple borrower sample

| VARIABLES | Credit growth | Large drop in credit | New bank-firm relation-ships | Utiliza-tion rate | Credit growth - Term Loans |
|---|---|---|---|---|---|
| Actual capital ratio | -0.133** | 0.431** | 0.0662 | 0.190** | -0.256** |
| | (0.0525) | (0.167) | (0.0954) | (0.0705) | (0.115) |
| Previous year actual capital ratio | -0.00645 | -0.0363 | -0.0782 | 0.0121 | 0.0499 |
| | (0.0474) | (0.0743) | (0.100) | (0.0777) | (0.128) |
| Required capital ratio | -0.126* | 0.330 | -0.807*** | 0.279* | -0.308** |
| | (0.0666) | (0.265) | (0.245) | (0.153) | (0.135) |
| Previous year required capital ratio | -0.250*** | 0.394* | -0.858*** | 0.0897 | -0.281** |
| | (0.0498) | (0.184) | (0.198) | (0.125) | (0.101) |
| Observations | 1,022,324 | 1,022,324 | 1,067,410 | 1,067,410 | 577,090 |
| R-squared | 0.467 | 0.504 | 0.510 | 0.579 | 0.477 |
| multiple sample, Firm x Time fixed effects, Bank fixed effects, Bank controls, SE bank clusters | | | | | |
| *constant buffer effect* | -0.26 | 0.76 | -0.74 | 0.47 | -0.56 |
| p-value of constant buffer effect | 0.04 | 0.09 | 0.02 | 0.04 | 0.02 |

Increasing the required and actual capital ratio with 1 p.p. leads c.p. to:

- ▶ a 0.26pp reduction in quarterly credit growth
- ▶ a 0.76pp increase in seeing a large credit reduction
- ▶ a 0.74pp reduction in starting a new bank-firm relationship

Effects are small in economic terms!

# Robustness of the baseline

Including single bank borrowers: (I,L,S,T) fixed effects
(as in De Jonghe et al. (2016) and Degryse et al. (2016))

- ▶ Sample increases from 1 to 3.3 million observations
- ▶ Effects are smaller and sometimes insignificant
- ▶ Mostly small firms (calls for an interaction effect)

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Restriction on multiple borrowers:

- ▶ Should borrow from a bank with increasing and bank with decreasing capital requirements
- ▶ Robust and stronger results

# Structure of presentation

1. Pillar 2 capital requirements
   - The Supervisory Review and Evaluation Procedure
   - Representativeness of the sample of reviewed banks
   - Required and actual capital ratio: summary statistics

2. Impact of (required) capital on corporate credit supply
   - Empirical specification
   - Estimation results
   - Robustness

3. **Extensions**
   - Interaction with bank characteristics
   - Interaction with firm characteristics
   - Effects on other assets and aggregate balance sheet composition?

# Interaction with bank characteristics: theory

Modigliani and Miller's irrelevance theorem

- ▶ loan rates and lending volume should be independent of funding structure (leverage)
- ▶ if not, indication that raising capital requirements affects the cost of capital

Indirect test: exploit heterogeneity across banks in the perceived cost of capital

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Modigliani and Miller's irrelevance theorem

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Indirect test: exploit heterogeneity across banks in the perceived cost of capital

- ▶ lower cost of capital for larger and safer banks (Gandhi and Lustig, 2015; Baker and Wurgler, 2015; Kashyap et al., 2010)
- ▶ scope for earnings retention and passive capital management (De Jonghe and Öztekin, 2015)
- ▶ banks that recently built financial slack (recent equity expansion or asset shrinkage)

# Interaction with bank characteristics: results

The (negative) impact of higher capital requirements on credit supply is smaller for: **larger** and **safer** banks, more **profitable** banks, and banks with more **financial slack**

| VARIABLES | Credit growth | Credit growth | Credit growth | Credit growth | Credit growth |
|---|---|---|---|---|---|
| Actual capital ratio | -0.131** | -0.131** | -0.125** | -0.147** | -0.136** |
| | (0.0535) | (0.0477) | (0.0550) | (0.0583) | (0.0536) |
| Previous year actual capital ratio | -0.00497 | -0.0337 | 0.00909 | -0.00184 | -0.000395 |
| | (0.0470) | (0.0448) | (0.0444) | (0.0441) | (0.0460) |
| **Required capital ratio** | -0.107 | -0.210** | -0.132* | -0.124* | -0.105 |
| | (0.0672) | (0.0743) | (0.0738) | (0.0675) | (0.0695) |
| Previous year required capital ratio | -0.252*** | -0.256*** | -0.264*** | -0.267*** | -0.243*** |
| | (0.0482) | (0.0411) | (0.0515) | (0.0531) | (0.0496) |
| **Required capital ratio x Bank Characteristic** | 0.0480** | -0.0709*** | 0.118 | 0.0848*** | -0.0466 |
| | (0.0177) | (0.0154) | (0.0775) | (0.0269) | (0.0557) |
| Bank Characteristic | **(lagged) log Total Assets** | **(lagged) loan loss provisions to total loans** | **(lagged) Return on equity** | **(lagged) Quarterly growth in Common Equity** | **(lagged) Quarterly growth in Assets** |
| Observations | 1,022,324 | 1,022,324 | 1,022,324 | 1,022,324 | 1,022,324 |
| R-squared | 0.467 | 0.467 | 0.467 | 0.467 | 0.467 |
| multiple sample, Firm x Time fixed effects, Bank fixed effects, Bank controls, SE bank clusters | | | | | |

# Interaction with firm characteristics: channels

Should all firms be treated equally?

- ▶ No, depending on their effect on risk-weighted assets
- ▶ No, depending on the returns they generate

How we test it: exploit heterogeneity across firms

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How we test it: exploit heterogeneity across firms

- ▶ cutting more for larger firms has more sizable effect
- ▶ cutting more on riskier firms, for a given size, affects RWA more
- ▶ cutting less on high interest-paying firms, for a given risk, affects bank profits less (earnings retention)
- ▶ effect of firm age is ambiguous; older firms are less risky (survivorship bias) but also larger on average

# Interaction with firm characteristics: results

The (negative) impact of higher capital requirements on credit supply is smaller for: **smaller**, **younger** and **less risky** firms, as well as firm which pay **higher implicit interest rates**

| VARIABLES | Credit growth | Credit growth | Credit growth | Credit growth |
|---|---|---|---|---|
| Actual capital ratio | -0.214** | -0.215** | -0.214** | -0.198** |
| | (0.0975) | (0.0990) | (0.0958) | (0.0870) |
| Previous year actual capital ratio | -0.0214 | -0.0234 | -0.0206 | -0.0163 |
| | (0.0618) | (0.0631) | (0.0603) | (0.0553) |
| **Required capital ratio** | -0.183 | -0.180 | -0.185* | -0.190* |
| | (0.105) | (0.108) | (0.101) | (0.0889) |
| Prev. year required capital ratio | -0.266*** | -0.265*** | -0.269*** | -0.289*** |
| | (0.0658) | (0.0679) | (0.0644) | (0.0683) |
| Required capital ratio x MP | -0.177** | -0.177** | -0.175** | -0.160** |
| | (0.0730) | (0.0729) | (0.0738) | (0.0703) |
| **Required capital ratio x Firm Characteristic** | **-0.0909***** | **-0.142***** | **0.0553*** | **0.0590***** |
| | **(0.0201)** | **(0.0321)** | **(0.0259)** | **(0.0132)** |
| Required capital ratio x IA x MP | -0.0306 | -0.0477 | 0.0101 | 0.00283 |
| | (0.0309) | (0.0423) | (0.0267) | (0.0134) |
| IA | **lagged firm size** | **lagged firm age** | **lagged Altman Z** | **lagged cost of borrowing** |
| Observations | 969,725 | 969,725 | 969,651 | 874,134 |
| R-squared | 0.467 | 0.467 | 0.467 | 0.464 |
| multiple sample, Firm x Time fixed effects, Bank fixed effects, Bank controls, SE bank clusters | | | | |

# Broad balance sheet categories: bank-level evidence

Using bank-level, aggregate balance sheet data, we find that:

- ▶ Asset side exhibits derisking and reorientation

- ▶ Bank funding reacts mixed

- ▶ Limited impact on the (imputed) pricing of bank products

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Using bank-level, aggregate balance sheet data, we find that:

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**Overall, mix of channels resulting in adjusted balance sheet**

# Conclusion: Implications and road ahead

Economically speaking, the effect on corporate credit is small
Why?

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- ▶ Foreign lending and domestic mortgages

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But also small compared to other countries:

- ▶ Time- or sample specific?
- ▶ Or is it due to subsidy on equity: notional interest deduction?
- ▶ See e.g. Schepens (2016) or Pannier et al. (2016)

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Does it affect firm investment and production choices?

What if requirements would be disclosed?

Short versus Long-run effects? Leakage?

# Conclusion: Summary of findings

1. Statistically significant, but economically small corporate credit supply effects
   - both on intensive and extensive margin
   - especially for (long) term loans

2. (bank heterogeneity) Negative effect is smaller for:
   - large and safe banks (lower cost of equity)
   - more profitable banks (earnings retention)
   - banks that recently raised capital ratio

3. (firm heterogeneity) Negative effect is larger:
   - for larger and older firms
   - for riskier and more indebted firms
   - for low borrowing cost firms

4. Offsetting effects (mortgages, foreign lending, equity subsidy)