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Riscos, Estabilidade Financeira e Economia Bancária
Loan pricing following a macro prudential within-sector capital measure

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Introduction

- International financial crisis of 2007/2008 ⇒ financial regulation with a new macro prudential dimension
  - Countercyclical capital requirements
    - Example: Basel III countercyclical buffer.
  - Sectoral capital requirements
    - The policy of varying capital requirements only on lending to sectors that may be exhibiting particular exuberance (CGFS, 2012)
  - Within-sector capital requirements (Brazil, circulars 3515, 3563)
    - Capital requirement raised, and later released, only for particular targets within the sector
The Brazilian auto loan credit sector in 2009-2010: fast and unbalanced expansion?

Credit to new auto loans (R$ bill)

New auto loans by maturity (share - %)

New auto loans by LTV (share - %)

Loan Spread (monthly average - %)
• Central Bank of Brazil adopted a macro-prudential approach

• Capital requirement doubled, from 8.25% to 16.5%, for new auto loans with long maturities and high LTVs:

<table>
<thead>
<tr>
<th>Maturity (months)</th>
<th>&gt;24</th>
<th>&gt;36</th>
<th>&gt;48</th>
<th>&gt;60</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTV(%)</td>
<td>&gt;80</td>
<td>&gt;70</td>
<td>&gt;60</td>
<td>All</td>
</tr>
</tbody>
</table>

• New regulation established on December, 3th of 2010
What happened afterwards?

Credit to new auto loans (R$ bill)

New auto loans by maturity (share - %)

New auto loans by LTV (share - %)

Loan Spread (monthly average - %)
The spread behavior of targeted and untargeted auto loans

**Figure: Loan spread charged on new auto loans**

(monthly average - %)

- Banks passing on to targeted loans their higher total funding costs derived from the higher capital requirements?
Transmission mechanism from higher capital requirements to higher banks’ loan spreads:

- Higher capital requirement increases optimal internal target for bank capital ratio (e.g. Berrospide and Edge, 2009; Francis e Osborne, 2009)
- Need to constitute more capital may be addressed by higher lending spreads.
- Additionally, higher (future) capital increases bank total funding costs, passed on to lending spreads. (e.g. Admati, 2011)
  - The intensity of this effect is a matter of large debate (e.g. BCBS, 2010; Kashyap et al., 2010; Miles et al., 2013)
  - This paper contributes to the debate by providing new evidence of material effects.
This paper’s goal

- To examine the consequences on auto loan spreads of the novel macro prudential within-sector capital measure
  - If banks price each loan based on its marginal funding cost, then banks will increase more the spread of targeted auto loans after the new regulation.
    - Previous graphical analysis suggests this is the case.

- Remark: the set of untargeted auto loans may be indirectly affected.
  - Some pass-through of the higher bank total financing costs also to untargeted loans
  - Migration of demand from targeted to untargeted loans (substitution effect)
Empirical literature on the effects of bank capital shocks on bank credit supply

- Challenge of disentangling supply from demand effects

- Natural experiments: shocks to capital unrelated to lending opportunities
  - Peek and Rosengreen (1997) and Houston et al. (1997): classical papers
  - Aiyar et al. (2012), Jimenez et al. (2012) and our paper: capital shocks derive from specific regulatory changes
    - Regulatory actions may still be partly endogenous

- To control for demand effects: loan-level data and fixed effects (Jimenez et al., 2012 and our paper)

- Differently to most of the literature, this paper focuses on prices rather than on quantities.
Methodology

- Model for the impact of new regulation:

\[
\log(\text{Loan\_spread}_{i,b,l,t}) = c + \gamma \cdot \text{Loan targeted}_i + \alpha \cdot \text{New regulation}_t + \beta \cdot \text{New regulation}_t \times \text{Loan targeted}_i + \text{bank controls}_{b,t-1} + \text{loan controls}_i + \text{time controls}_t + \text{fixed effect}_{i,b} + \text{error term}_{i,b,l,t}
\]

- \(\beta\) measures the relative impact of the regulatory capital increase on the spread charged on targeted auto loans in comparison to untargeted ones
  - We expect \(\beta > 0\)

- \(\alpha\) represents the spread increase suffered by untargeted auto loans after the new regulation
  - Some pass-through of the higher bank total financing costs to untargeted loans and migration of demand to untargeted loans after the new regulation might be consistent with \(\alpha > 0\)
Methodology

- Borrower and borrower-bank fixed effects
- Bank controls: \( Assets, Liquidity, Reserves, Capital, Npl, Roa \), among others
- Monthly dummies

- Loan controls: \( amount, maturity \) and \( LTV \)
  - Possibly jointly determined with loan spreads
  - Models estimated both with and without loan controls

- Variable \( Loan \ targeted \) also possibly jointly determined with loan spreads
  - At the core of the analysis
  - Matched loan approaches:
    - No migration
    - Similar maturities, sizes and LTVs
    - Robustness: matched loans sufficiently close.
• On November 11th, 2011, regulation changed again, abolishing most of the previous capital increases for auto loans.

• Model for the impact of the regulatory capital release:

$$\log(\text{Loan}_i, b, l, t) = c + \gamma \cdot \text{loan targeted}_l + \alpha \cdot \text{regulatory release}_t + \beta \cdot \text{regulatory release}_t \times \text{loan targeted}_l + \text{bank controls}_{b, t-1} + \text{loan controls}_l + \text{time controls}_t + \text{fixed effect}_{i, b} + \text{error term}_{i, b, l, t}.$$  

• We expect $\beta < 0$

• Comparison of $\beta$’s
Data

- Sample: new auto loans granted from June 2010 to May 2011 (new regulation models) or from July 2011 to March 2012 (capital regulatory release).

- Data sources: SCR (Brazilian Public Credit Register) and COSIF (accounting database of Brazilian financial institutions)
### Results: introduction of new regulation

<table>
<thead>
<tr>
<th>Dependent variable: Lspread</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New regulation ($\alpha$)</td>
<td>-0.004</td>
<td>0.027***</td>
<td>0.065***</td>
<td>0.035*</td>
<td>0.025</td>
<td>0.078</td>
<td>0.050</td>
</tr>
<tr>
<td>New regulation x Loan targeted ($\beta$)</td>
<td>0.262***</td>
<td>0.203***</td>
<td>0.165***</td>
<td>0.165***</td>
<td>0.157***</td>
<td>0.165***</td>
<td>0.128***</td>
</tr>
</tbody>
</table>

| Loan controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Fixed effects | No | borrower | borrower-bank | borrower-bank | borrower-bank | borrower-bank | borrower-bank |
| Before and after new regulation | No | No | No | Yes | Yes | Yes | Yes |
| Matched by loan type (no migration) | No | No | No | No | Yes | Yes | Yes |
| Matched also by (maturity, LTV, amount) | No | No | No | No | No | Yes | Yes |
| Short distance between matched loans | No | No | No | No | No | No | Yes |
| Number of observations | 2,851,357 | 212,366 | 71,909 | 38,038 | 21,110 | 3,401 | 729 |
| $R^2$ (adj) | 0.5029 | 0.4078 | 0.2604 | 0.2905 | 0.3211 | 0.4483 | 0.3884 |
• Model (1) does not control for any unobservable characteristic ⇒ estimates based on the full set of auto loan borrowers
  • $\beta$ equal to 26%; $\alpha$ insignificant

• Model (2) has $\beta = 20\%$ and borrower fixed effects, whereas model (3) has borrower-bank fixed effects and $\beta = 16\%$

• Model (4): only borrowers who have taken out loans from the same bank both before and after the new regulation
• Model (5): within each borrower-bank, only auto loans with no migration
• Model (6): matched loans with maturity, size and LTV at most 20% distant
  • Models (4)-(6): magnitude of $\beta$ close to the model (3), $\alpha$ again generally insignificant; increasingly smaller samples and higher adj-$R^2$

• Model (7): matched loans at most 90 days apart

• Smallest estimated $\beta$: the spread charged on the same borrower by the same bank for similar targeted auto loans increased 13% after the new regulation
  • 13% increase translates into an addition of 1.74 p.p. to the average spread before the new regulation.
Results: introduction of new regulation

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<th>Dependent variable: Lspread</th>
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<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New regulation ((\alpha))</td>
<td>-0.033</td>
<td>0.007</td>
<td>0.061***</td>
<td>0.012</td>
<td>-0.002</td>
<td>0.069</td>
<td>0.039</td>
</tr>
<tr>
<td>New regulation x Loan targeted ((\beta))</td>
<td>0.302***</td>
<td>0.228***</td>
<td>0.163***</td>
<td>0.157***</td>
<td>0.150***</td>
<td>0.163***</td>
<td>0.127***</td>
</tr>
</tbody>
</table>

- Loan controls: No, No, No, No, No, No, No, No
- Fixed effects: No, borrow er, borrow er-bank, borrow er-bank, borrow er-bank, borrow er-bank, borrow er-bank
- Before and after new regulation: No, No, No, Yes, Yes, Yes, Yes, Yes
- Matched by loan type (no migration): No, No, No, No, Yes, Yes, Yes, Yes
- Matched also by (maturity, LTV, amount): No, No, No, No, No, Yes, Yes, Yes
- Short distance between matched loans: No, No, No, No, No, No, No, Yes

- Number of observations: 2,851,357, 212,366, 71,909, 38,038, 21,110, 3,401, 729
- \(R^2\) (adj): 0.2213, 0.2259, 0.1176, 0.1747, 0.2039, 0.4457, 0.3755
• Potential endogeneity of loan controls ⇒ same previous models estimated without them

• Coefficient $\beta$ remains always significant with magnitudes very close to the respective previous models.

• Except for model (3), coefficient $\alpha$ never significant.

• Combined evidence does not allow conclusion that the spread of untargeted loans has also increased due to the introduction of new regulation
  • Substitution effects related to the migration of demand have been limited.
  • Pass-through of higher bank total financing costs to the set of loans not targeted by the regulation has also been limited.
### Results: capital regulatory release

<table>
<thead>
<tr>
<th>Dependent variable: Lspread</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory release ($\alpha$)</td>
<td>0.050***</td>
<td>0.019***</td>
<td>0.0070</td>
<td>0.027*</td>
<td>0.048***</td>
<td>0.038</td>
<td>0.041</td>
</tr>
<tr>
<td>Regulatory release x Loan targeted ($\beta$)</td>
<td>-0.081***</td>
<td>-0.054***</td>
<td>-0.065***</td>
<td>-0.078***</td>
<td>-0.088***</td>
<td>-0.044*</td>
<td>-0.052*</td>
</tr>
<tr>
<td>Loan controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Fixed effects</td>
<td>No</td>
<td>borrower</td>
<td>borrower-bank</td>
<td>borrower-bank</td>
<td>borrower-bank</td>
<td>borrower-bank</td>
<td>borrower-bank</td>
</tr>
<tr>
<td>Only borrowers before and after modification regulation</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Matched by loan type (no migration)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Matched also by (maturity, LTV, amount)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Short distance between matched loans</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Number of observations</td>
<td>2,862,479</td>
<td>191,648</td>
<td>52,970</td>
<td>28,243</td>
<td>14,717</td>
<td>1,228</td>
<td>885</td>
</tr>
<tr>
<td>$R^2$ (adj)</td>
<td>0.3818</td>
<td>0.4659</td>
<td>0.2107</td>
<td>0.2182</td>
<td>0.2060</td>
<td>0.1583</td>
<td>0.0951</td>
</tr>
</tbody>
</table>
• Coefficient of the interaction ($\beta$) always negative and significant.
  • Banks charged relatively smaller spreads after the regulatory release on their auto loans whose capital requirements decreased.

• Absolute magnitudes much smaller than corresponding magnitudes in the models for the introduction of new regulation.
  • The cancelation of the capital requirement increase had a smaller impact on spreads than original increase.
  • Possible explanation: more precautionary behavior adopted by banks

• Coefficient on Regulatory release ($\alpha$) insignificant in three models and in almost all models when loan controls are withdrawn (not shown).
  • No strong evidence that auto loans that continued to receive the same capital requirement have been charged different or lower spreads.
• Capital requirements raised and later released in Brazil for auto-loans with specific long maturities and high LTVs. (Within-sector capital requirements)

• Brazilian banks raised, after the new regulation, spreads charged on the same borrower for similar auto loans whose capital charges increased.
  • Increase was at least of 13%

• Evidence on increase of spreads charged for the set of untargeted auto loans not robust.
  • Spillovers were limited

• Release of regulatory capital similarly associated to lower spreads charged on the same borrower for similar auto loans whose capital charges decreased
  • Relatively, reduction in spreads smaller than the original rise
Thanks!

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