

## Bank Capital Requirements and Loan Pricing: Loan-level Evidence from a Macro Prudential Within-Sector Policy

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# Disclaimer

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*The views expressed in this work are those of the author(s) and do not necessarily reflect those of the Banco Central do Brasil or its members.*



# Introduction

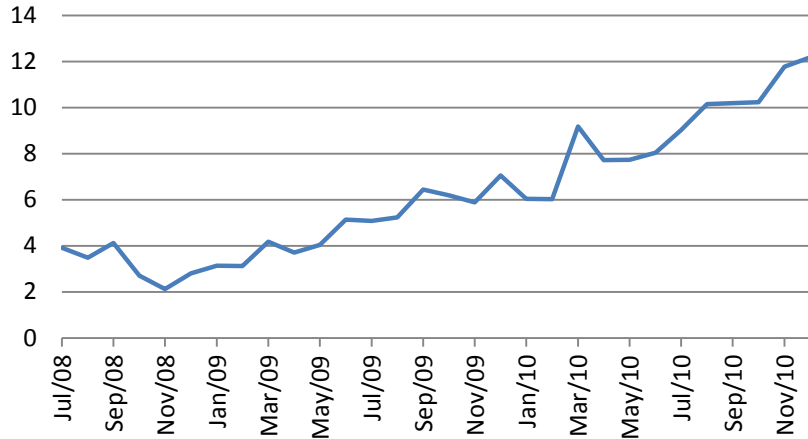
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- International financial crisis of 2007/2008  $\Rightarrow$  financial regulation with a new macro prudential dimension
  - Countercyclical capital requirements
    - Example: Basel III countercyclical buffer.
  - Sectoral capital requirements
    - The policy of varying capital requirements only on lending to sectors that may be exhibiting particular exuberance (CGFS, 2012; BoE, 2014)
  - Within-sector capital requirements (Brazil, circulars 3515, 3563)
    - Capital requirements raised, and later released, only for particular targets within the sector

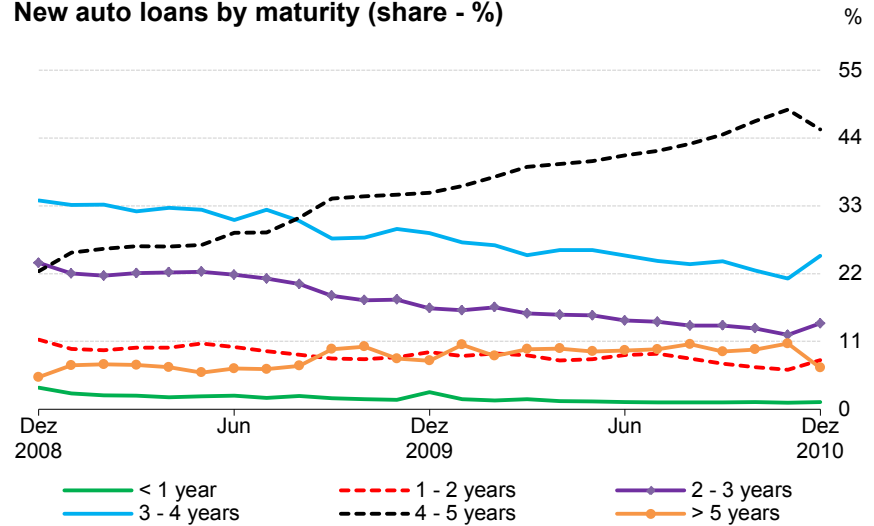


# The Brazilian auto loan credit sector in 2009-2010: too fast and unbalanced expansion ?

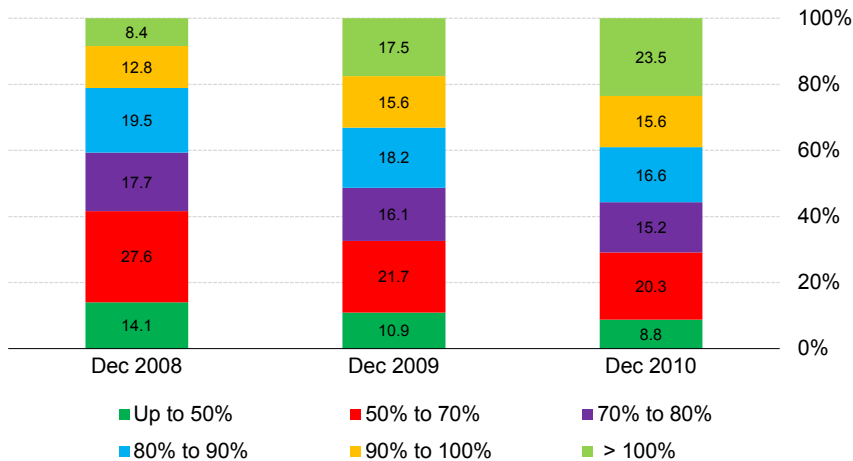
Credit to new auto loans (R\$ bill)



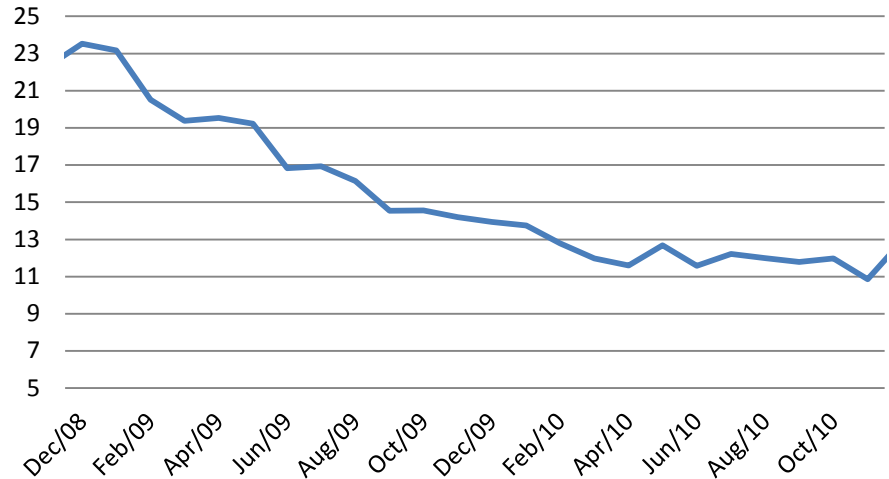
New auto loans by maturity (share - %)



New auto loans by LTV (share - %)



Loan Spread (monthly average - %)



# The Brazilian within-sector capital requirements

- 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:

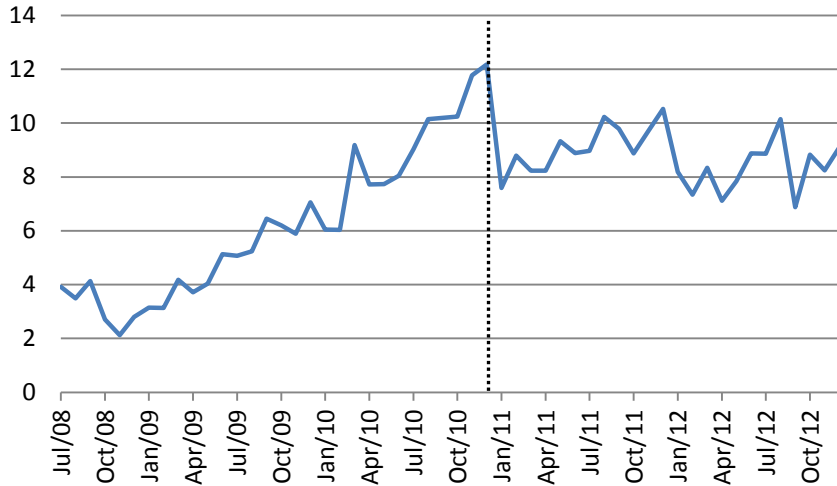
Table: universe of auto loans targeted by new regulation				
Maturity (months)	>24	>36	>48	>60
LTV(%)	>80	>70	>60	All

- New regulation established on December, 3th of 2010

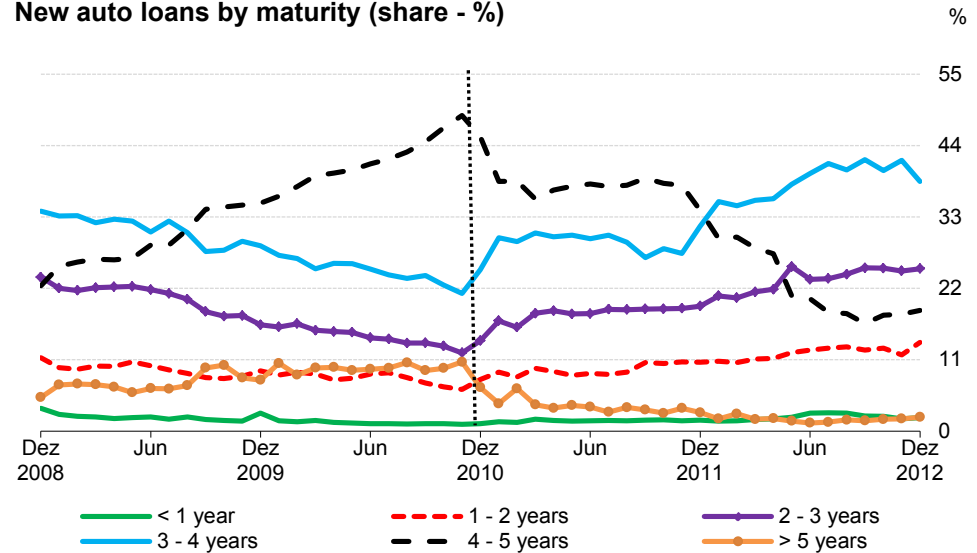


# What happened afterwards ?

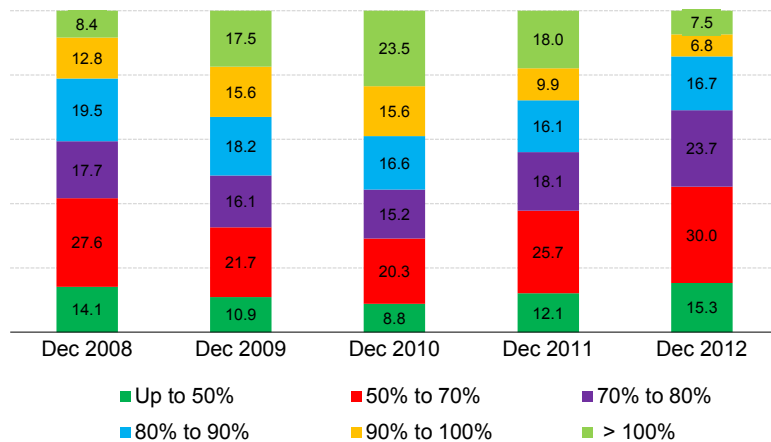
### Credit to new auto loans (R\$ bill)



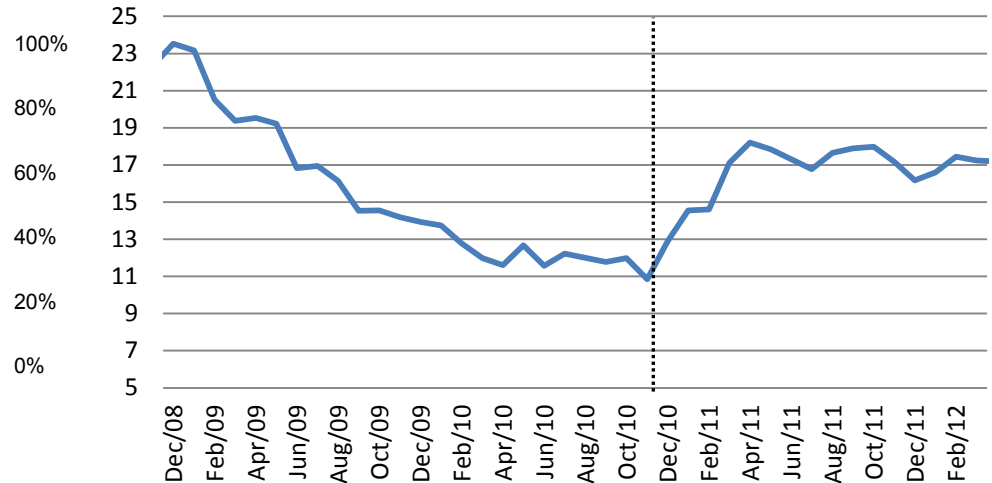
### New auto loans by maturity (share - %)



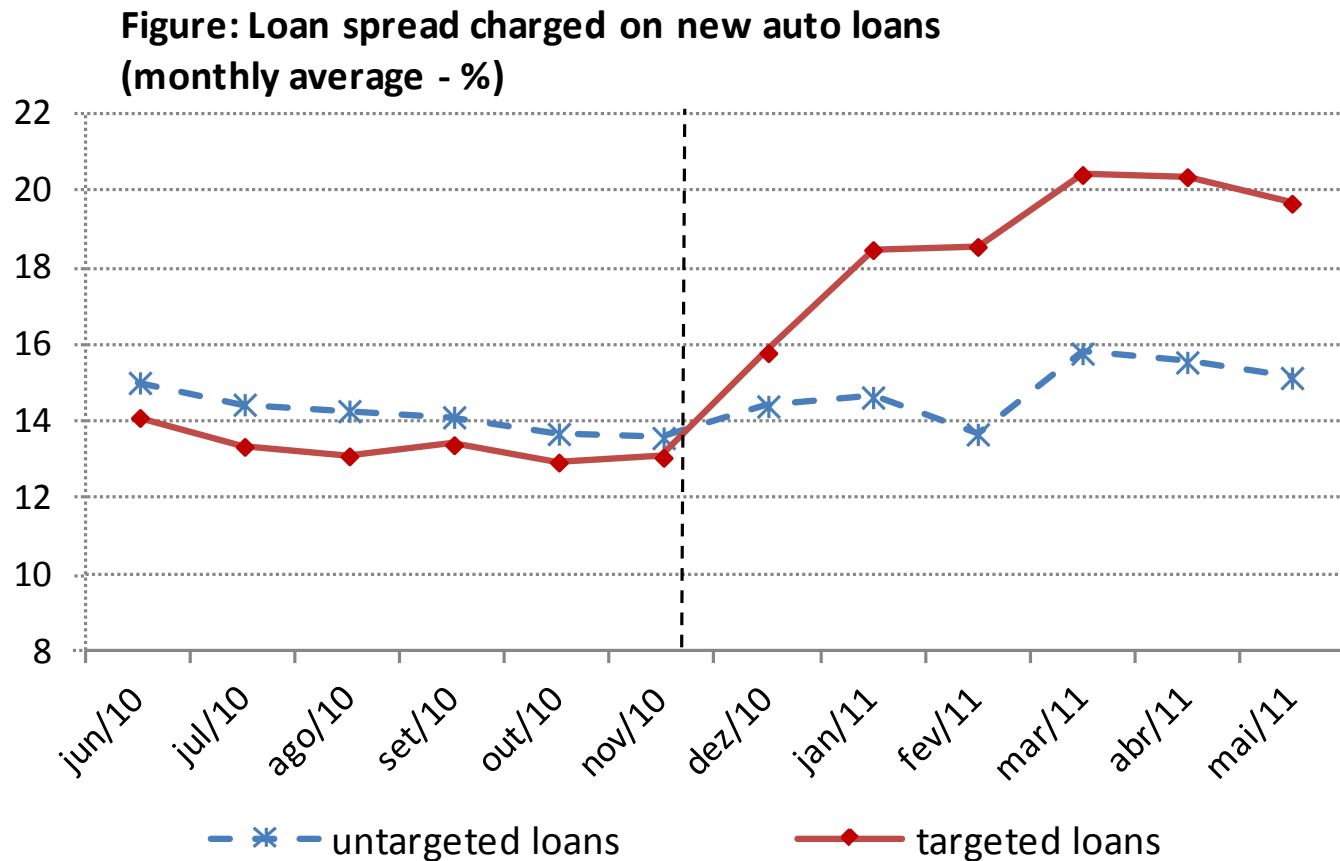
### New auto loans by LTV (share - %)



### Loan Spread (monthly average - %)



# The spread behavior of targeted and untargeted auto loans



- Banks passing to targeted loans their higher total financing costs derived from the higher capital requirements ?



# Transmission mechanism

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- 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, 2012; Hancock and Wilcox, 1993 and 1994)
  - Higher (future) capital increases bank total financing costs, (e.g. Admati, 2011; Freixas and Rochet, 2008), then passed to lending spreads.
    - The intensity of this effect is a matter of large debate (e.g. BCBS, 2010; Hanson *et al.*, 2010; MAG, 2010; Miles *et al.*, 2013)
  - This paper provides new evidence of material effects.
    - Our results are new: previous studies gauge the consequences on spreads of increases in actual capital.





# This paper's goal

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- To examine the consequences on auto loan spreads of the novel macro prudential within-sector capital measure
  - If banks consider in their pricing the cost of allocated regulatory capital, then they will increase the spreads mainly of targeted auto loans.
    - Previous graphical analysis suggests this is the case.
- Remark: the set of untargeted auto loans may be affected by spillovers
  - Some pass-through of the higher bank total financing costs also to untargeted loans
  - Migration of demand from targeted to untargeted loans (substitution effect)



# The identification strategy

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- Disentangle credit supply behavior from demand effects by means of a regulatory capital shock.
  - Aiyar et al. (2014), Berger and Udell (1994), Brinkmann and Horvitz (1995) and Jimenez et al. (2013)
- To further control for demand effects: loan-level data and fixed effects (Jimenez et al., 2012 and 2013 and our paper)
- Differently to most of this literature, our focus is on prices rather than quantities.
  - Average new auto loan size slightly changed following the new regulation while number of new auto loans sharply declined.



# Methodology

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- Model for the impact of new regulation:

$$\text{Loan\_spread}_{i,b,l,t} = c + \gamma \cdot \text{Targeted loan}_l + \alpha \cdot \text{New regulation}_t + \beta \cdot \text{New regulation}_t \times \text{Targeted loan}_l + \text{bank controls}_{b,t-1} + \text{loan controls}_l + \text{time controls}_t + \text{fixed effect}_{i,b} + \text{error term}_{i,b,l,t}$$

- $\beta$  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
  - Spillovers to the set of untargeted loans would be consistent with  $\alpha > 0$



# Methodology

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- 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 approach: no migration
    - Robustness: matched loans sufficiently close.



# Methodology

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- On November 11<sup>th</sup>, 2011, regulation changed again, abolishing most of the previous capital increases for auto loans.
- Model for the impact of the regulatory capital release:

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

- We expect  $\beta < 0$
- Comparison of  $\beta$ 's



# Data

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- Sample: new auto loans granted from June 2010 to May 2011 (new regulation models) or from July 2011 to March 2012 (regulatory release models).
- Data sources: SCR (Brazilian Public Credit Register) and COSIF (accounting database of Brazilian financial institutions)



# Results: introduction of new regulation

Dependent variable: Loan_spread	(1)	(2)	(3)	(4)	(5)	(6)
New regulation ( $\alpha$ )	0.29	0.38***	0.78***	0.27	0.15	0.11
New regulation x Targeted loan ( $\beta$ )	3.52***	2.87***	2.33***	2.39***	2.33***	2.19***
Loan controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	No	borrower	borrower-bank	borrower-bank	borrower-bank	borrower-bank
Before and after new regulation	No	No	No	Yes	Yes	Yes
Matched by loan type (no migration)	No	No	No	No	Yes	Yes
Short distance between matched loans	No	No	No	No	No	Yes
Number of observations	2,746,173	200,860	70,017	37,020	23,305	9,097
R <sup>2</sup> (adj)	0.58	0.50	0.30	0.33	0.37	0.34

# Comments

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- Model (1) does not control for any unobservable borrower characteristic  $\Rightarrow$  estimates based on the full set of auto loan borrowers
  - $\beta$  equal to 3.52p.p.;  $\alpha$  insignificant
- Model (2) has  $\beta = 2.87$ p.p. and borrower fixed effects , whereas model (3) has borrower-bank fixed effects and  $\beta = 2.33$ p.p.
- 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 at most 90 days apart
  - Models (4)-(6): magnitude of  $\beta$  close to that of model (3),  $\alpha$  again insignificant; increasingly smaller samples but adj-R<sup>2</sup> higher than in model (3)
- Smallest estimated  $\beta$ : the spread charged on the same borrower by the same bank for targeted auto loans increased 2.19 p.p. after the new regulation
  - This figure represents an increase of 0.26 p.p. in spreads for an additional capital requirement of 1%.





# Comments

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- Potential endogeneity of loan controls  $\Rightarrow$  same previous models estimated without them
- Coefficient  $\beta$  remains always positive, significant and with magnitudes not distant from 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 untargeted loans has also been limited.



# Results: introduction of new regulation

Dependent variable: Loan_spread	(1)	(2)	(3)	(4)	(5)	(6)
New regulation ( $\alpha$ )	-0.17	0.14	0.70***	0.03	-0.10	-0.17
New regulation x Targeted loan ( $\beta$ )	3.94***	3.09***	2.20***	2.14***	2.05***	2.12***
Loan controls	No	No	No	No	No	No
Fixed effects	No	borrower	borrower-bank	borrower-bank	borrower-bank	borrower-bank
Before and after new regulation	No	No	No	Yes	Yes	Yes
Matched by loan type (no migration)	No	No	No	No	Yes	Yes
Short distance between matched loans	No	No	No	No	No	Yes
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R <sup>2</sup> (adj)	0.22	0.25	0.11	0.16	0.19	0.17

# Bank cross-section analysis

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- Estimated increases on loan spreads really driven by higher bank financing costs ?
- Banks are ordered according to their expected accounting-based  $\Delta$ spreads
  - Expected  $\Delta$ spreads take into account the rise in bank financing costs by means of a simple accounting approach (e.g. BCBS 2010; Elliot, 2009)
    - Assumptions: capital ratio, ROE and total assets constant
- $\beta$ 's estimated for each bank separately.
- Results for the three largest banks in our sample (>3/4 of the number of loans)



# Results by bank

Dependent variable: Loan_spread	(1)	(2)	(3)	(4)	(5)	(6)
New regulation <sub>t</sub> x Targeted loan ( $\beta$ )						
Bank 1 (low $\Delta$ spread)	3.01***	1.51***	1.52***	1.56***	1.50***	1.40***
Bank 2 (medium $\Delta$ spread)	4.57***	2.81***	2.86***	2.86***	2.84***	2.20***
Bank 3 (high $\Delta$ spread)	4.33***	4.29***	4.13***	4.43***	4.70***	5.07***
Loan controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	No	borrower	borrower-bank	borrower-bank	borrower-bank	borrower-bank
Before and after new regulation	No	No	No	Yes	Yes	Yes
Matched by loan type (no migration)	No	No	No	No	Yes	Yes
Short distance between matched loans	No	No	No	No	No	Yes

# Results: regulatory capital release

Dependent variable: Loan_spread	(1)	(2)	(3)	(4)	(5)	(6)
Regulatory release ( $\alpha$ )	0.06	-0.03	-0.01	0.31	0.55	0.45
Regulatory release x Targeted loan ( $\beta$ )	-0.42	-0.09	-0.46***	-0.72***	-0.82***	-0.65***
Loan controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	No	borrower	borrower-bank	borrower-bank	borrower-bank	borrower-bank
Before and after regulatory release	No	No	No	Yes	Yes	Yes
Matched by loan type (no migration)	No	No	No	No	Yes	Yes
Short distance between matched loans	No	No	No	No	No	Yes
Number of observations	2,660,465	178,170	50,120	26,380	16,505	10,828
R <sup>2</sup> (adj)	0.53	0.47	0.32	0.32	0.31	0.31

# Comments

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- Coefficient of the interaction ( $\beta$ ) negative and significant at 1%, except for models (1) and (2)
  - 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 capital increase.
  - Possible explanation: more precautionary behavior adopted by banks



# Conclusion

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- 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 auto loans whose capital requirements increased.
  - Rise was at least 2.19 p.p. for a 8.25% additional capital requirement.
  - In the universe of the largest banks, the spread rise was higher the larger the increase of bank financing costs.
- 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
  - However, reduction in spreads smaller than the original rise



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**Thank you for your attention!**

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