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Has Regulatory Capital Made Banks Safer?

Skin in the Game vs Moral Hazard

Macroprudential Policy Effectiveness: Theory and Practice
Bank of Russia
Saint Petersburg
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Introduction

Financial crisis highlighted undercapitalized banks were unable to withstand shocks

* **Individual financial firms,** acting in their own interests, **deviate from social planner may hold too little capital**

* After crisis **the regulatory response is to increase capital: "Skin in the game"**

* **Increase equity to build up absorption capacity but also to lower moral hazard** > reduces risk-taking

* However, **more capital can have unintended consequences and increase moral hazard due to distorted incentives between principal-agent**

* **Research Questions:**

   1. How banks adjust to higher (macroprudential) capital requirements?

   2. Have banks increased capital and reduced risk-taking?

   3. What is the overall impact on solvency?

The EU capital based regulation CRD IV/CRR

Regulatory Framework

- Basel III capital framework translated into EU **CRR and CRD IV**
- **Combined Buffers Requirements (CBR) to be fulfilled in terms of CET1 ratio**
- Staggered **phase-in period:** from 2014 until 2019
- Scope: **G-SII and O-SII**
- Not evaluation **Pillar 2 Requirement**

Data

- **Sample:**
  - Each Member State introduces **bank-specific staggered capital requirements**
  - Global and Other Systemically Important Banks (**14 G-SIIs, 191 O-SIIs**)
  - **205** total banking institutions across **28 states in the EU + Norway**
  - Sample covers **86%** of total consolidated assets of EU banks in 2016

- **Data:**
  - Time period **2006Q1-2017Q3**
  - SNL Financials **bank-level consolidated balance-sheet data**
  - **ESRB macroprudential database** on combined capital buffers
  - **Ratings and mapping of PDs** from Merton option formula

Capital and Macroprudential Buffers

RW density and Macroprudential Buffers

Legend: RWA/TA — Macroprudential Capital Req., rhs
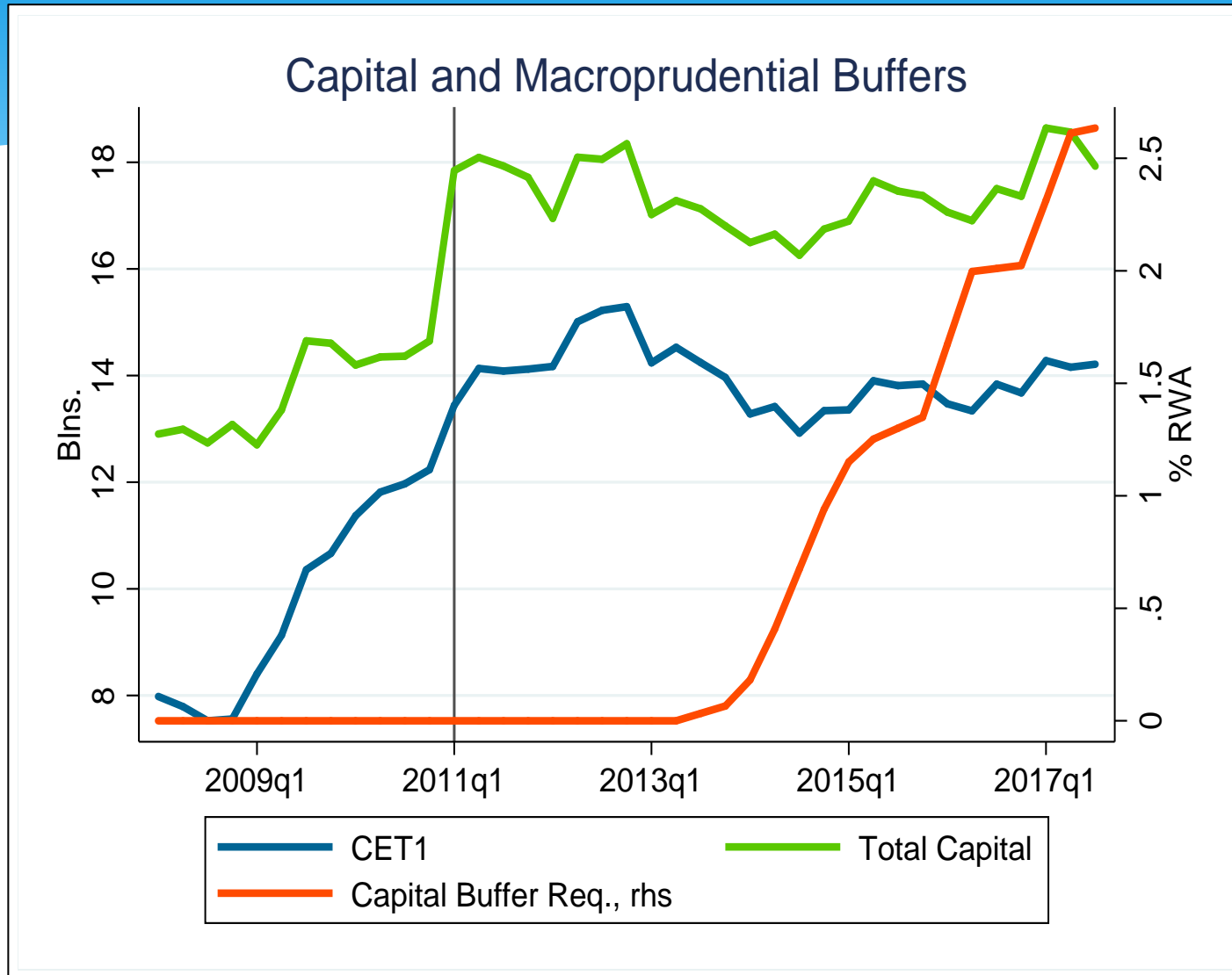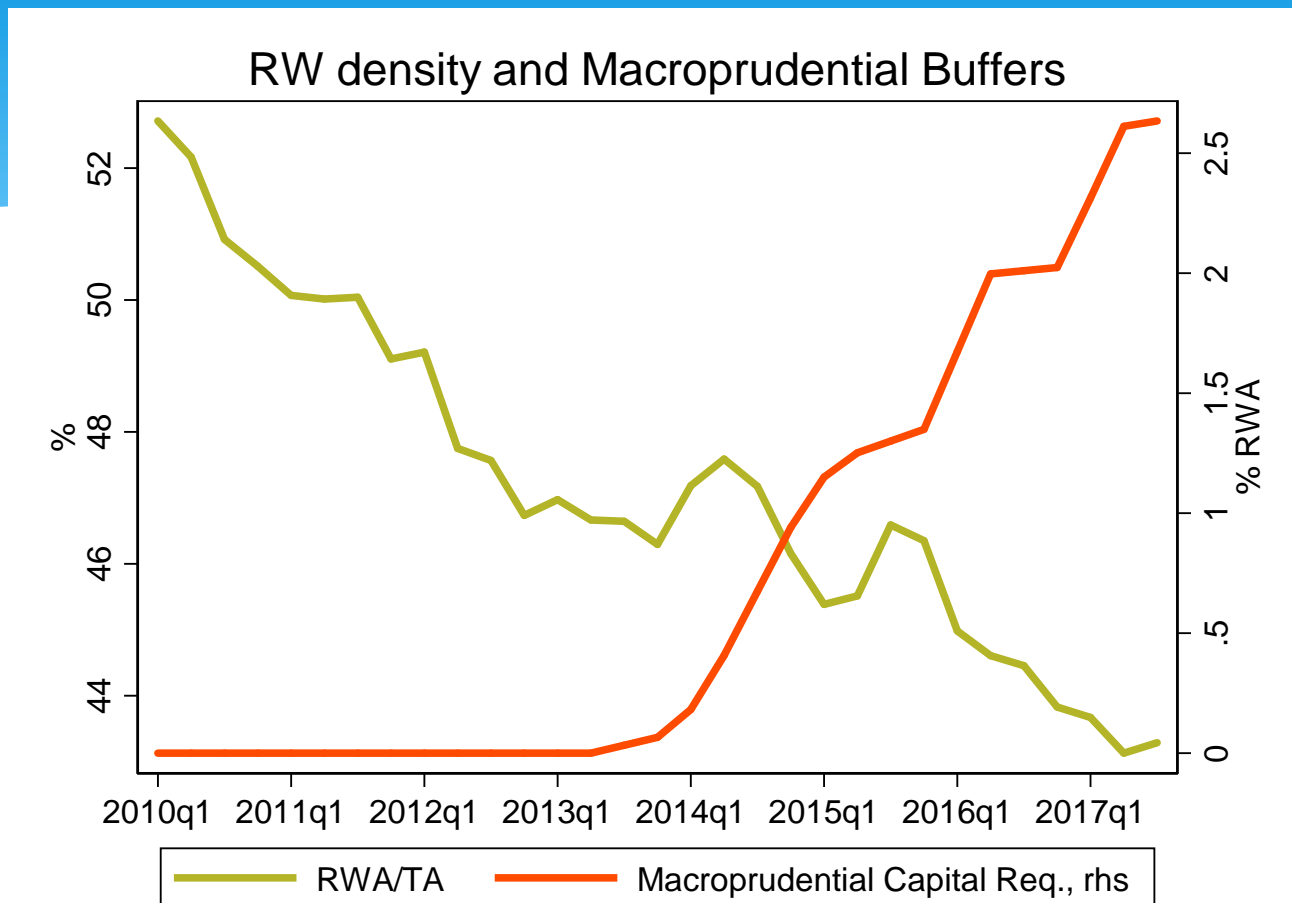
- This is just descriptive, a lot of confounding factors, RWs may go down because of QE incentive to buy sovereign bonds with RW=0 in the EU
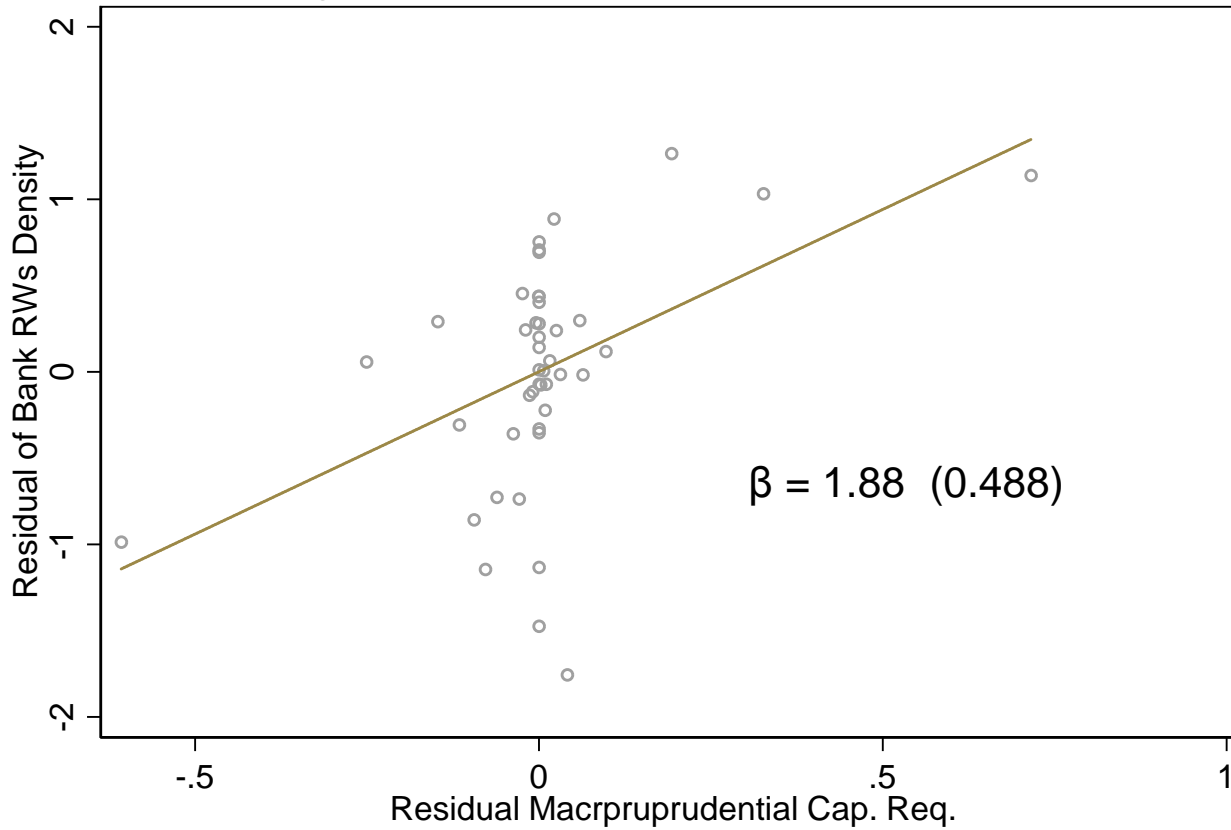 - **APPs, LTRO in 20102, TLTRO June 2014, TLTRO-II March 2016 etc...**

RWs density and Macroprudential Buffers
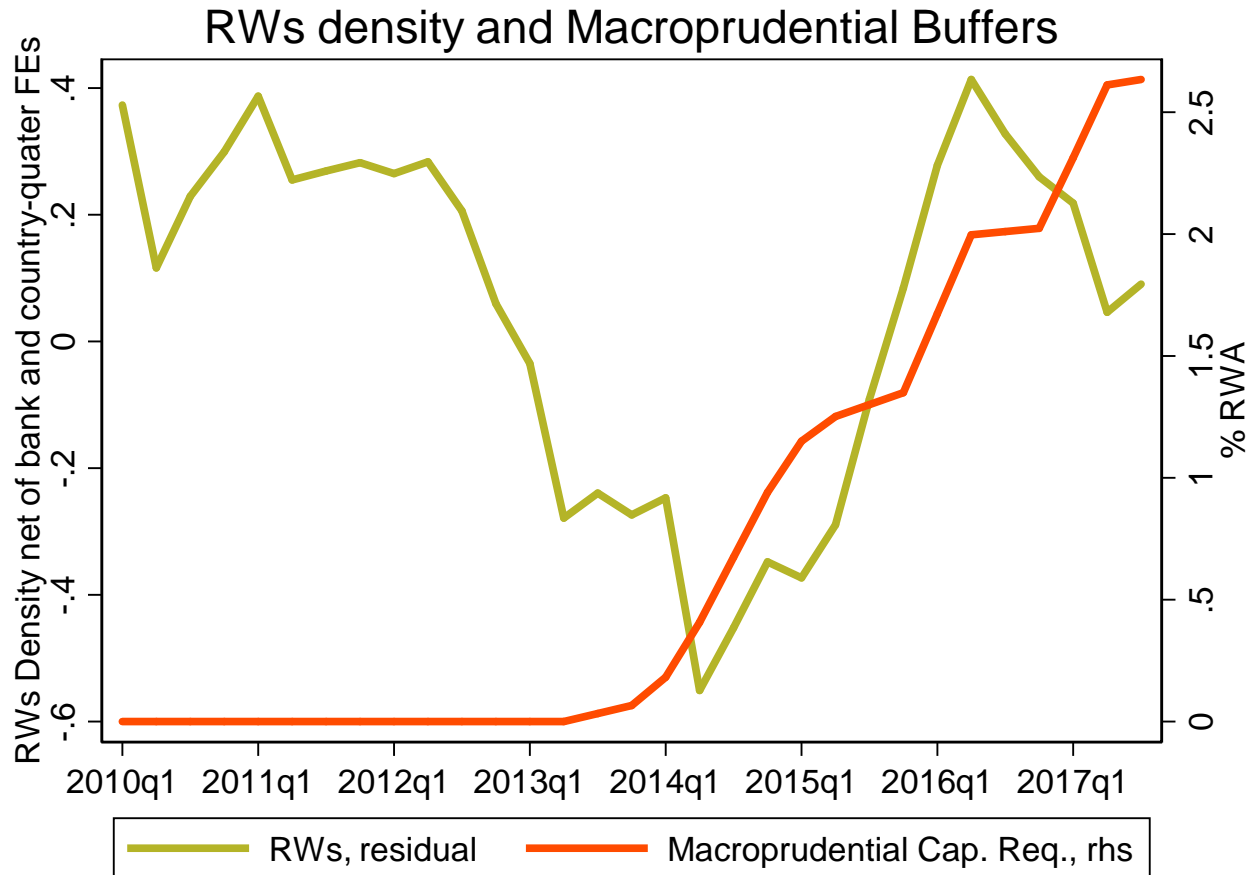
Regression: bank and country-quarter FE

β = 1.88 (0.488)

Empirical Methodology

Empirical Specification

- **Regression is a matching estimator** (Angrist, 1998, Angrist and Krueger 1999)
- **Staggered policy implementation across countries and bank specific**
- **The aim is to identify the causal effect**

$$Y_{ict} = \alpha_i + \beta SMCR_{ict} + lnX_{ict-1}\gamma + \delta_{ct} + [\phi_i \cdot t] + u_{ict}$$

- Y_{ict} : outcomes (CET1 ratio/level, TC, RWA, RWA/Assets, Assets, Pr. Default)
- $SMCR_{ict}$: change in additional CET1 Systemic Macroprudential Cap. Req.
- lnX_{ict-1}:
    - total assets (size),
    - total deposits (funding),
    - total debt and equity (leverage),
    - total balances at the central bank (liquidity and quantitative easing),
    - loans, impaired loans and loan loss reserves (assets' composition),
    - ROA, cost to income ratio (profitability),
    - OTC derivatives, securities (HFT, AFS, HTM), loans to banks, size trading book (interconnectedness)
- α_i: bank level time invariant fixed-effects
- δ_{ct} : country-time fixed-effects, absorbs time varying macroeconomic developments (unemployment, consumption, public and private investment, fiscal policy, etc.)

Results

$$Capital\ Ratio = \frac{CET1}{RWA} = \frac{CET1}{RW_a Asset_a}$$

* The bank has three ways to comply with increase regulatory ratios (ceteris paribus):

  1. **Increase capital**
  2. **De-leverage reducing assets**
  3. **Changing the composition of the portfolio and reducing risk-weights**

* Desirable adjustments from policy perspective:

  1. **Increase capital**
  2. **Reduce RWs**

* Undesirable adjustments from policy perspective:

  1. **Increase RWs**
  2. **Reduce Assets (pro-cyclical in downturn)**

Impact on Capital

- The impact on CET1 ratio significant only for banks with low distance from OCR
- **All banks increase CET1 level**: banks with lower distance by 17.7%, banks with higher distance by 13%
- Total capital increase by 8-11% and shows less variation across distance

	Non-Binding			Binding		
	(1) CET1 Ratio (p.p.)	(2) CET1 (ln)	(3) Tot. Capital (ln)	(4) CET1 Ratio (p.p.)	(5) CET1 (ln)	(6) Tot. Capital (ln)
SMCR	-0.054 (0.359)	0.089 (0.027)***	0.081 (0.027)***	0.834 (0.402)**	0.177 (0.036)***	0.116 (0.042)***
SMCR × 2pp< OCR distance <5pp				-0.143 (0.215)	-0.042 (0.022)*	-0.003 (0.026)
SMCR × 5pp< OCR distance <10pp				0.003 (0.214)	-0.047 (0.024)*	-0.012 (0.031)
SMCR × OCR distance >10pp				0.087 (0.232)	-0.053 (0.024)**	-0.013 (0.031)
Bank Controls	yes	yes	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes	yes	yes
Country-quarter FE	yes	yes	yes	yes	yes	yes
Obs.	3174	3174	3174	3173	3173	3173
N. clusters	137	137	137	137	137	137
R2	0.688	0.672	0.663	0.800	0.763	0.695

Impact on Risk-taking

- **RWA increase by 6-10%,** no difference across distance

- **RWs increase by >6p.p. across all banks**

- **Total assets are not affected**

	Non-Binding			Binding		
	(1) RWA (ln)	(2) RWA/Assets (p.p.)	(3) Tot. Assets (ln)	(4) RWA (ln)	(5) RWA/Assets (p.p.)	(6) Tot. Assets (ln)
SMCR	0.101 (0.023)***	6.873 (1.388)***	-0.007 (0.008)	0.065 (0.026)**	6.073 (1.455)***	-0.016 (0.012)
SMCR × 2pp< OCR distance <5pp				0.002 (0.009)	-0.139 (0.419)	-0.002 (0.006)
SMCR × 5pp< OCR distance <10pp				0.011 (0.011)	-0.219 (0.533)	0.005 (0.005)
SMCR × OCR distance >10pp				0.013 (0.011)	0.242 (0.523)	0.004 (0.005)
Bank Controls	yes	yes	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes	yes	yes
Country-quarter FE	yes	yes	yes	yes	yes	yes
Obs.	3277	3277	3277	3195	3195	3195
N. clusters	137	137	137	137	137	137
R2	0.749	0.646	0.875	0.768	0.677	0.875

	Size			Size and IRB Banks		
	(1) RWA (ln)	(2) RWA/Assets (p.p.)	(3) Tot.Assets (ln)	(4) RWA (ln)	(5) RWA/Assets (p.p)	(6) Tot.Assets (ln)
SMCR	0.071	3.944	-0.004	0.066	4.345	-0.020
	(0.036)*	(1.731)**	(0.018)	(0.043)	(1.904)**	(0.019)
SMCR × 20bln.< Tot.Ass <100bln.	0.020	1.864	-0.002	0.030	2.963	-0.006
	(0.019)	(1.073)*	(0.010)	(0.024)	(1.224)**	(0.010)
SMCR × Tot.Ass>100bln.	0.022	2.079	-0.001	0.181	5.324	0.004
	(0.024)	(1.149)*	(0.011)	(0.049)***	(2.149)**	(0.018)
SMCR ×IRB				0.001	-0.034	0.008
				(0.014)	(0.901)	(0.004)*
SMCR ×IRB× 20bln.< Tot.Ass <100bln.				-0.009	-1.498	0.008
				(0.031)	(1.469)	(0.010)
SMCR ×IRB× Tot.Ass >100bln.				-0.157	-3.595	-0.002
				(0.042)***	(1.802)**	(0.016)
Bank Controls	yes	yes	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes	yes	yes
Country-quarter FE	yes	yes	yes	yes	yes	yes
Obs.	3277	3277	3277	3277	3277	3277
N. clusters	137	137	137	137	137	137
R2	0.750	0.648	0.878	0.756	0.655	0.878

	NII		Wholesale Funding		Leverage Ratio	
	(1) RWA (ln)	(2) RWA/Assets (p.p.)	(3) RWA (ln)	(4) RWA/Assets (p.p.)	(5) RWA (ln)	(6) RWA/Assets (p.p.)
SMCR	0.070 (0.029)**	4.296 (1.262)***	0.066 (0.032)**	3.699 (1.341)***	0.052 (0.032)	3.943 (1.389)***
SMCR × >20bln.< Tot.Ass <100bln.	0.026 (0.017)	2.158 (0.815)***	0.022 (0.018)	2.101 (0.897)**	0.030 (0.024)	2.199 (1.226)*
SMCR × Tot.Ass>100bln.	0.055 (0.025)**	2.842 (0.993)***	0.027 (0.027)	2.310 (1.104)**	0.033 (0.026)	2.605 (1.141)**
SMCR $\times NII$	0.018 (0.013)	1.142 (0.741)				
SMCR $\times NII \times$ >20bln.< Tot.Ass <100bln.	-0.029 (0.013)**	-1.634 (0.761)**				
SMCR $\times NII \times$ Tot.Ass >100bln.	-0.055 (0.020)***	-2.067 (0.925)**				
SMCR $\times WSF$			0.011 (0.011)	1.339 (0.633)**		
SMCR $\times WSF \times$ >20bln.< Tot.Ass <100bln.			-0.059 (0.025)**	-2.124 (1.132)*		
SMCR $\times WSF \times$ Tot.Ass >100bln.			-0.060 (0.025)**	-2.110 (0.994)**		
SMCR $\times LR$					0.026 (0.027)	0.456 (1.328)
SMCR $\times LR \times$ >20bln.< Tot.Ass <100bln.					-0.014 (0.027)	-0.451 (1.355)
SMCR $\times LR \times$ >20bln.< Tot.Ass <100bln.					-0.021 (0.027)	-1.010 (1.396)
Bank Controls	yes	yes	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes	yes	yes
Country-quarter FE	yes	yes	yes	yes	yes	yes
Obs.	2794	2794	2713	2713	2794	2794
N. clusters	142	142	142	142	142	142
R2	0.747	0.644	0.747	0.649	0.748	0.644

Probability of Default

- **The tightening of the capital requirements has two opposing effects:**
    - i) higher CET1 $\Rightarrow$ banks more solvent $\Rightarrow$ lower probability of default;
    - ii) increased risk-taking $\Rightarrow$ higher probability of default

	Probability of Default Horizon				
	5yrs (p.p.)	4yrs (p.p.)	3yrs (p.p.)	2yrs (p.p.)	1yr (p.p.)
SMCR	1.346	1.293	1.161	0.930	0.533
	(1.044)	(1.042)	(1.028)	(0.981)	(0.776)
SMCR × >20bln.< Tot.Ass <100bln.	-1.843	-1.840	-1.811	-1.717	-1.345
	(0.833)**	(0.835)**	(0.831)**	(0.803)**	(0.654)**
SMCR × Tot.Ass>100bln.	-2.011	-1.999	-1.960	-1.868	-1.471
	(0.893)**	(0.895)**	(0.888)**	(0.858)**	(0.699)**
Bank Controls	yes	yes	yes	yes	yes
Bank FE	yes	yes	yes	yes	yes
Country-quarter FE	yes	yes	yes	yes	yes
Obs.	1969	1969	1969	1969	1969
N. clusters	87	87	87	87	87
R2	0.451	0.451	0.446	0.433	0.396
	Marginal Effects				
SMCR × >20bln.< Tot.Ass <100bln.	-0.497	-0.548	-0.650	-0.787	-0.811
	(1.100)	(1.101)	(1.094)	(1.052)	(0.840)
SMCR × Tot.Ass>100bln.	-0.665	-0.706	-0.799	-0.938	-0.938
	(1.183)	(1.182)	(1.172)	(1.126)	(0.900)

Conclusions

1. EU **banks increased their capital ratios by an average 13%** after capital requirement hikes (driven by CET1 increases)

2. As a consequence, **banks can be regarded as more resilient with improved loss absorption capacity**

3. **Unintended consequence: macropru capital requirement can promote moral hazard** (skin in the game is dominated by moral hazard)

4. In particular, **risk-taking increased by the larger, retail funded and less profitable banks**

5. Large banks relying on **IRB approach show a lower risk-taking**

6. The **positive effect** of accumulating more equity capital is **crowded-out by the negative substitution effect toward riskier assets**

7. The overall **net effect on probability of default is zero**