Taxes and bank capital structure

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Motivation

- Call for higher capital buffers vs. fear of real impact through **higher funding costs**
- Higher costs through Modigliani-Miller frictions: how important are they? Potential real impact of higher funding cost?

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- Call for higher capital buffers vs. fear of real impact through **higher funding costs**
- Higher costs through Modigliani-Miller frictions: how important are they? Potential real impact of higher funding cost?
- One frequently mentioned friction: **tax shield** of debt (Poole (2009), Kashyap et al. (2010),Admati et al. (2010,2013), Miles et al.(2012),...)
  - But little **empirical evidence** for financial institutions!
  - Should tax shields play a role in the capital buffer discussion? Can it serve as a **policy instrument** by itself?

This paper

- Contributes to the discussion on bank capital regulation by investigating the role of tax shields
- I analyze the introduction of the **notional interest rate deduction (NID)** in Belgium
  - Introduced in 2006, in reaction to a ruling by the European Commission in 2003.
  - Allows firms to deduct a notional rate on their equity
    $\Rightarrow$ Equity funding gets subsidized, in a similar way as debt funding.
  - The deduction equals the calculated average 10-year government bond rate of the year preceding the current fiscal year by two years.
  - Ideal setting to study the **impact of tax shields on bank capital structure.**

This paper (2)

- I find a significant increase in equity ratios after the introduction of the NID
- Equity ratio is 0.91 percentage points higher compared to control group, which corresponds with an increase of around 12 percent for the average bank.
- Heterogeneity in treatment: more profitable banks react stronger
- The increase in equity ratios especially makes low-capitalized banks more stable (increase in Z-scores)
- Potentially interesting measure to reduce bank leverage and increase financial stability
- Remaining question: underlying drivers? Potential impact credit demand?

Empirical setup

1. Evolution of equity ratios **in Belgium over time**
   - 35 Belgian banks, 2003-2007

$$ETA_{i,t} = \alpha_i + \beta_1 * 2006_i + \beta_2 * 2007_i + \beta_3 * X_{it} + \varepsilon_{i,t}$$

   - Increase in equity ratio of 0.32 to 1.16 percentage points.

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2. **Difference-in-Difference analysis**
   - Match Belgian banks with a control group of European banks
   - Use difference-in-difference setup to analyze impact of NID

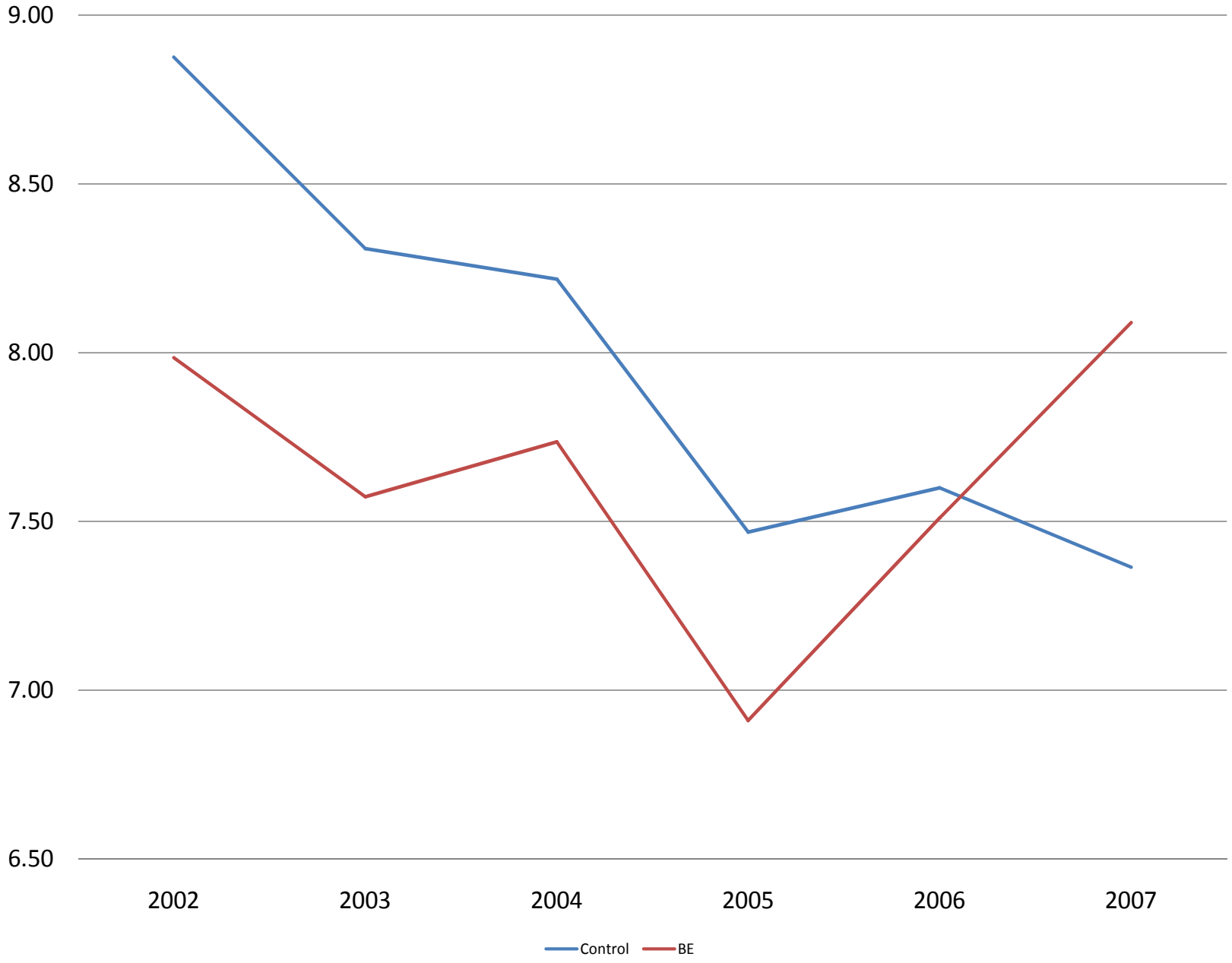
$$ETA_{i,t} = \alpha + \beta_1 * Treated_i + \beta_2 * Post_t + \beta_3 * Treated_i * Post_t + \varepsilon_{i,t}$$

Matched sample

	Belgian Banks			Non-Belgian Banks							
	Treatment Group			Full Sample				Control Group			
Variables	N	Mean	St. Dev.	N	Mean	St. Dev.	P-value	N	Mean	St. Dev.	P-value
Equity ratio - Growth	**105**	**-2.03**	**24.07**	**8251**	**2.84**	**20.99**	**0.04**	**315**	**-2.70**	**19.59**	**0.80**
Equity ratio	**105**	**7.41**	**7.16**	**8358**	**8.93**	**7.51**	**0.03**	**315**	**8.00**	**4.62**	**0.43**
Size	**105**	**8.40**	**2.23**	**8358**	**6.76**	**1.65**	**0.00**	**315**	**8.35**	**1.94**	**0.84**
Profits	105	0.64	1.55	8358	0.58	1.16	0.71	315	0.71	1.03	0.65
Market share	105	0.03	0.06	8358	0.01	0.03	0.00	315	0.02	0.06	0.65
Loan ratio	105	0.37	0.22	8358	0.58	0.20	0.00	315	0.59	0.23	0.00
Non-interest income share	105	0.31	0.24	8358	0.30	0.16	0.71	315	0.32	0.15	0.54
Non-performing loans	105	0.34	0.35	8340	0.30	0.36	0.21	315	0.34	0.25	0.91
Risk	96	0.49	0.79	8038	0.24	0.44	0.00	315	0.36	0.48	0.11

Propensity score matching procedure to 1) come as close as possible to **common trend assumption** and 2)to reduce probability that differences along unobservables invalidate diff-in-diff.

Equity ratios - Belgium vs. control group



Difference-in-Difference - Results

VARIABLES	(1) ETA	(2) Average ETA	(3) ETA
Post	-0.516*	-0.361	-0.238
	(0.286)	(0.241)	(0.273)
Treated x Post	**0.910****	**0.838****	**0.807***
	(0.424)	**(0.346)**	**(0.463)**
Constant	7.851***	7.714***	21.95***
	(0.0915)	(0.135)	(4.660)
Observations	700	280	648
Adjusted R-squared	0.842	0.901	0.858
Bank FE	Yes	Yes	Yes
Clusterlevel	Bank	Bank	Bank
Bank control variables	No	No	Yes
Country control variables	No	No	Yes

Robust standard errors in parentheses

Results

- Strong **increase in equity ratio** of Belgian banks after introduction NID
  - Average 2007 equity ratio is **1.17 percentage points higher than the pre-treatment average**.
  - **Diff-in-diff** shows that average Belgian equity ratio increased by 0.91 percentage points, which equals a **12 percent increase for the average Belgian bank.**
  - **Robust** to alternative matching procedure (number of matches/matching variables), sample selection issues, controlling for country/bank characteristics in diff-in-diff,...

Empirical difficulties - confounding shocks

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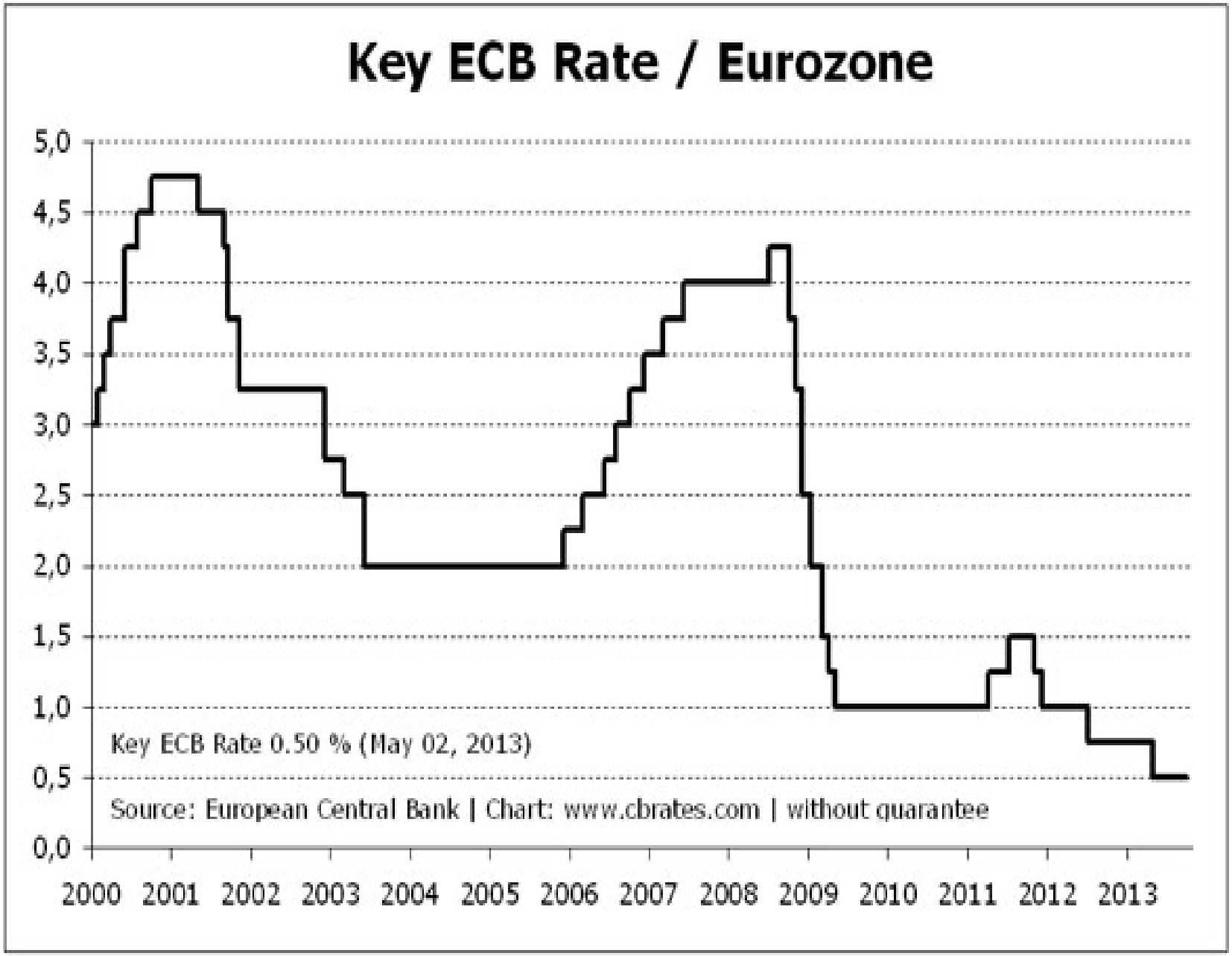
  $\Rightarrow$ Control for bank characteristics in diff-in-diff regressions in diff-in-diff regressions
- Results could be sensitive to **contemporaneous events that have a differential impact across countries**


Key ECB Rate / Eurozone
5,0
4,5
4,0
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
Key ECB Rate 0.50 % (May 02, 2013)
Source: European Central Bank | Chart: www.cbrates.com | without guarantee
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013

Increasing ECB rate

- Increase in ECB policy rate between 2006- mid-2008
  $\Rightarrow$ Exactly our treatment period!

- Cross-country heterogeneity in pass-through of MP : Higher market concentration / market power $\rightarrow$ slower pass through (e.g. Van Leuvensteijn et al. (2007), Kok and Werner (2006), De Graeve et al. (2007))

- Could impact denominator of equity ratio and bias our analysis

  $\Rightarrow$ **Three robustness checks**

Increasing ECB rate - Robustness

1. Between country test - **Placebo analysis** - similar increase in ECB rate in 2000 : **No impact**

	ETA	Average ETA
Post	-0.0137	-0.150
	(0.301)	(0.260)
Treated x Post	**0.162**	**0.328**
	(0.439)	**(0.379)**
Observations	700	548
Adjusted R-squared	0.842	0.893
Bank FE	Yes	Yes
Clusterlevel	Bank	Bank

Increasing ECB rate - Robustness

2. Between country test - Belgian market concentration on average higher than in control sample
   $\Rightarrow$ **Should thus work against us** - potentially too conservative

Increasing ECB rate - Robustness

3. Within country test - higher impact on banks with high market share?

	2000 Placebo		Market Share
	ETA	Average ETA	ETA
Post	-0.0137	-0.150	-0.449
	(0.301)	(0.260)	(0.322)
Treated x Post	**0.162**	**0.328**	**0.889***
	(0.439)	**(0.379)**	**(0.490)**
Treated x Post x Variable			**-0.0104**
			(0.0750)
Observations	700	548	700
Adjusted R-squared	0.842	0.893	0.842
Bank FE	Yes	Yes	Yes
Clusterlevel	Bank	Bank	Bank

Risk profile

- Low vs. High capitalized banks

VARIABLES	(1) ETA	(2) ETA	(3) Z-score	(4) Z-score	(5) $\sigma(ROA)$	(6) $\sigma(ROA)$
Post	-0.516*	-0.386*	0.0350	-0.112	-0.0758**	-0.0278
	(0.286)	(0.233)	(0.105)	(0.160)	(0.0383)	(0.0539)
Treated x Post	**0.910****	**0.823***	**0.157**	**0.689***	**0.0502**	**-0.191**
	(0.424)	**(0.432)**	**(0.299)**	**(0.369)**	**(0.142)**	**(0.130)**
Treated x Post x ETA-high		**0.175**		**-1.058***		**0.476***
		(0.856)		**(0.578)**		**(0.272)**
Constant	7.851***	7.851***	3.712***	3.709***	0.389***	0.390***
	(0.0915)	(0.0915)	(0.0440)	(0.0428)	(0.0186)	(0.0179)

- Low cap banks $\Rightarrow$ Stronger increase in Z-score!

Conclusions

- I analyze the introduction of the **notional interest rate deduction (NID)** in Belgium
  - Introduced a **tax shield for equity**
- Belgian **equity ratios are significantly higher** in 2006-2007, rising between 32 and 117 percentage points.
- Difference-in-difference analysis: Equity ratio for the average Belgian bank increases with 12 percent.
- More profitable banks show a stronger increase - more sensitive to tax shields.
- low capitalized banks become more stable.
- Tax shields do impact bank capital structures.
- Reduction of tax discrimination could potentially be used as a policy tool.

Work in progress

- Average growth rates 2006-2007

		ETA growth	Equity growth	Asset growth	LTA growth
Belgium	N	35	35	35	35
	Mean	13.79	23.01	1.892	1.578
Control group	N	105	105	105	105
	Mean	0.0681	18.77	2.974	4.044
Total	N	140	140	140	140
	Mean	3.497	19.83	2.704	3.428

- Not only higher equity growth in BE, but also lower asset and LTA growth

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- Not only higher equity growth in BE, but also lower asset and LTA growth
- Existing evidence (Panier et al.(2012) Princen (2011)) show reduction of leverage of NID for non-financial firms
- Potential impact of **credit demand factors**?!

Countries

Country	N	Equity ratio	Corporate tax rate
Austria	2	4.72	29.05
Belgium	35	7.56	34.93
Denmark	1	11.37	29.00
France	6	5.39	33.91
Germany	9	5.39	38.54
Greece	4	8.70	31.83
Italy	32	8.37	37.89
Luxembourg	2	4.62	29.73
Portugal	5	10.73	27.58
Romania	10	12.56	21.33
Spain	13	7.15	34.58
The Netherlands	1	2.34	31.43
United Kingdom	4	5.90	30.83

Heterogeneity in the treatment effect

- Focus on bank market share, participations, **profits**
- Tax shields more valuable the higher profits are
  $\Rightarrow$ **Expect higher impact for more profitable firms.**
- Interact post and treatment dummies with pre-tax profit levels.

$$\text{ETA}_{i,t} = \alpha_i + \beta_1 * \mathit{Profits}_{i,t} + (1 + \mathit{Profits}_{i,t}) * [\beta_2 * \mathit{Post}_t + \beta_3 * \mathit{Treated}_i * \mathit{Post}_t] + \varepsilon_{i,t}$$

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Profits	10th Percentile	**25th Percentile**	**Median**	**75th Percentile**	**90th Percentile**
Coef.	0.0970	**0.852**	**1.034**	**1.071**	**1.077**
P-value	0.881	**0.0440**	**0.0420**	**0.0460**	**0.0470**

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- Focus on bank market share, participations, **profits**
- Tax shields more valuable the higher profits are
  $\Rightarrow$ **Expect higher impact for more profitable firms.**
- Interact post and treatment dummies with pre-tax profit levels.
- Similar result for participations (less participations, higher impact)
- This is an additional confirmation of the direct impact of the NID on bank capital structure