The Value of Regulators as Monitors: Evidence from Banking

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Motivation and Research Question

- Policy debate highlights costs of regulation for bank shareholders
  - Decline of small US banks often attributed to regulatory burden
  - Regulatory costs concern policymakers

    "We will continue to consider appropriate ways to ease regulatory burdens while preserving core reforms." Powell (Nov 28, 2017)
  - Since 2014, multiple reforms to reduce (small) bank regulatory burden

- However, financial regulators monitor banks
  - Such supervision can reduce shareholder monitoring costs
  - Agency theory suggests this can be valuable to shareholders

$\Rightarrow$ Does supervision increase or destroy bank value?

This Paper: Supervision Increases Bank Value

- I study the impact of financial supervision on bank value
- I exploit a quasi-natural experiment that reduced small-bank supervision
  - Examine changes in value due to reduced regulatory monitoring
- I show that reduced supervision *decreases* bank value
  - 1% decline in Tobin's q
  - 7% decline in equity Market-to-Book

Mechanism

- Regulatory monitoring reduces shareholder monitoring costs
- To guide tests, I build a stylized model of monitoring (Townsend (1979))
  - Interpret reduced Fed monitoring as shock to shareholder monitoring costs
  - Use model to attribute value losses to their economic drivers
- Empirical evidence
  - Consistent with model, I document two sources of value losses
    - Internal monitoring: Show increase in internal controls' expenditure
    - Managerial rents: Show increase in earnings management
  - Additional support for mechanism: Value losses are larger for banks with high cash flow risk, non-bank subsidiaries
  - In paper, show little evidence for alternative hypotheses
    - E.g. changes in risk, implicit government guarantees

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Institutional Framework

Fed Supervision and Bank Reporting

- 86% of US banks are part of a Bank Holding Company (BHC)
- Federal Reserve is primary BHC supervisor
- *BHC Supervision Manual* details Fed officials' monitoring tasks
  - BHC financial statement collection
  - Off-site financials' verification, *peer group* analysis
  - On-site inspections based on results/flags from off-site analysis
- Financial statements collected by Fed vary with BHC size
  - Large BHCs: Consolidated financial statements, quarterly (FR Y-9C)
  - Small BHCs: Parent-only, annually (FR Y-9SP)

$\Rightarrow$ BHC reporting, Fed off-site monitoring functions of BHC size

Quasi-Natural Experiment: Small-Bank Definition Change

- Quasi-natural experiment: March 2006 increase in threshold defining small banks
  - $150M in assets before Q1-2006
  - $500M in assets starting Q1-2006
- Experiment reduces Fed's supervisory attention to banks below new threshold
  - Treated banks excluded from peer group analysis
- In a few slides, will provide support for experiment validity

Empirical Setting

Data Sources and Sample Period

- Data sources
  - Fed Regulatory Data: BHC assets (treatment assignment)
  - Quarterly Compustat Bank: Balance sheet/income statement
  - CRSP: Stock prices
  - I/B/E/S: Analyst profitability estimates
- Sample period: Q1-2004 to Q4-2007

Treatment Assignment

- Treatment: Shock to regulatory monitoring for banks below $500M
- Using 2005 asset data, assign banks to treated/control groups

Treated Group

- 108 BHCs
- 2005 assets $150-$500M
- Below new threshold
- Average assets: $387M

Control Group

- 100 BHCs
- 2005 assets $500-$850M
- Above new threshold
- Average assets: $720M

Treatment Assignment: An Example

Landmark Bancorp, Inc.

- 2005 assets: $455 million
- Large for 2005 reporting

Timberland Bancorp, Inc.

- 2005 assets: $547 million
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$\Rightarrow$ Part of treated group

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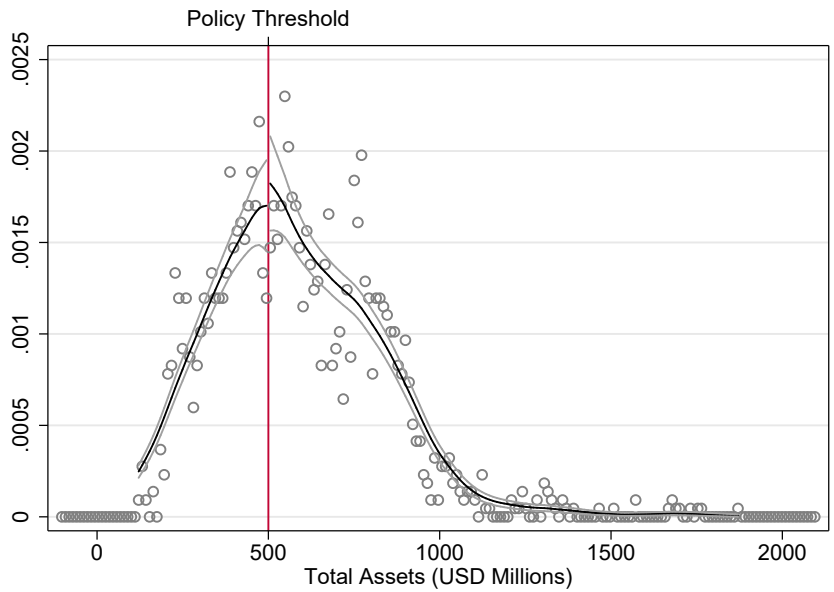
$\Rightarrow$ Part of control group

Identification

- Identification assumption
  - Quasi-random assignment around new threshold *before* change
    - Controlling for observables, Landmark and Timberland are "equal" before treatment
  - Value differences *after* change are only due to differences in regulatory monitoring
- Two potential violations of this assumption
  - Systematic pre-treatment differences in treated/control value Trends
  - Pre-treatment size manipulation

Size Manipulation around New Threshold?

- Regulation details prevent ex-post size manipulation
  - Threshold change announced in late 2005, based on early 2005 assets
- McCrary (2008) tests show no signs of manipulation
  - Idea: Manipulation leads to concentration on either threshold side
  - No density discontinuities $\Rightarrow$ No manipulation



Estimating Equation

$$Y_{it} = \beta_0 + \beta_1 \left(\text{Post}_t \times \text{Treated}_i\right) + \beta_2 X_{it} + \gamma_i + \delta_t + \varepsilon_{it}$$

- Y_{it}: Value outcome (e.g. Market-to-Book) for bank i in quarter t
- Post_t: Post-treatment indicator for quarter t
- Treated_i: Treatment indicator for bank i
- β_1: Treatment effect

Main Result: The Value of Regulatory Monitoring

Fed Monitoring Increases Bank Value

	log Tobin's q			log Market-to-Book		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	-0.010***	-0.011***	-0.011***	-0.074***	-0.083***	-0.078***
	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.02)
Leverage		0.337***	0.274***		5.640***	5.387***
		(0.12)	(0.10)		(0.81)	(0.67)
Tier 1 Ratio		0.381***	0.285***		2.573***	1.778***
		(0.08)	(0.07)		(0.52)	(0.49)
Other Controls	No	No	Yes	No	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.365	0.398	0.424	0.416	0.476	0.511
Observations	2,076	2,076	2,076	2,076	2,076	2,076

- Treatment effect: 1% Tobin's q loss, 7% Market-to-Book loss
  - Result not affected by controls (e.g. leverage, ROE, asset growth)
- On average, \$4M relative market cap loss, \$430M total loss
- In paper, provide robustness tests on main result
  - E.g. change sample bandwidth, run placebo tests, event study

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Mechanism: Regulatory Monitoring Reduces Shareholder Monitoring Costs

A Stylized Model of Monitoring

- In the paper, I build a stylized model of monitoring by bank outsiders (Townsend (1979))
  - Interpret experiment as shock to monitoring costs
  - Use model to attribute value losses to economic drivers, test mechanism
- Model gives three testable predictions
  - Increased monitoring costs decrease shareholder value
  - Value losses come from monitoring expenditure, managerial rents
    - In the data, treated banks increase their internal controls' expenditure, earnings management
  - Value losses increase with bank cash flow risk
    - In the data, value losses are larger for treated banks with high cash flow risk, non-bank subsidiaries (Pogach and Unal (2018))

Results: Monitoring Expenditure

	log Professional Fees			log $\frac{\text{Professional Fees}}{\text{Net Interest Income}}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	0.243**	0.254***	0.224***	0.210**	0.212**	0.213***
	(0.09)	(0.09)	(0.07)	(0.09)	(0.09)	(0.07)
Leverage Controls	No	Yes	Yes	No	Yes	Yes
Other Controls	No	No	Yes	No	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.070	0.097	0.191	0.046	0.064	0.152
Observations	978	978	978	978	978	978

- Treatment leads to 25% increase in professional fees
  - Discounted PV of increased expenditure ∼25% of value loss
- Consistent with model predictions
  - Professional fees related to internal controls in my sample
  - Professional fee growth strongly correlated with value losses

More

Results: Managerial Rents

	log $\frac{\text{Int. Expense}}{\text{Total Loans}}$		log $\frac{\text{LLP}}{\text{Total Loans}}$		log DNLLP	
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis × Unmonitored	0.053**	0.054***	-0.151	-0.289*	0.610**	0.614**
	(0.02)	(0.02)	(0.18)	(0.15)	(0.25)	(0.25)
Controls	No	Yes	No	Yes	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.673	0.760	0.380	0.526	0.336	0.351
Observations	899	899	746	746	543	543

- Use August 2007 interbank lending distress as funding shock
  - Study response to funding shock for banks around $500M
  - Coefficient captures crisis effect on banks below $500M
- Results
  - Funding cost *increase* for banks below threshold
  - Loan Loss Provisions *decrease* after controlling for observables
  - Discretionary LLP increase ⇒ Earnings management

Robustness

Cash Flow Risk and Value Losses

- Third model prediction: Value losses increase in cash flow risk
  - Intuition: Cash flow risk increases likelihood of low cash flows or high managerial rents
- Test prediction with different cash flow risk proxies
  - Absolute difference between consensus forecast of one-year-forward EPS and realized EPS
  - Equity volatility and tail risk (Ellul and Yerramilli (2013))
  - Presence of non-bank subsidiaries (Pogach and Unal (2018))
- Sort treated banks by cash flow risk
  - Show that value losses are larger for banks with high cash flow risk

Results: Cash Flow Risk and Value Losses

	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	-0.033	-0.052**	-0.025	-0.035	-0.026	-0.029
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Post × Treated × High CF Risk	-0.165**	-0.102*				
	(0.06)	(0.06)				
Post × Treated × High Eq. Vol.			-0.121**	-0.106**		
			(0.06)	(0.05)		
Post × Treated × High Tail Risk					-0.104*	-0.111**
					(0.05)	(0.05)
Controls	No	Yes	No	Yes	No	Yes
Low-Order Interaction Terms	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.429	0.519	0.423	0.516	0.421	0.516
Observations	2,076	2,076	2,076	2,076	2,076	2,076

- Dependent variable is log Market-to-Book
- CF risk is absolute difference between forcasted and realized EPS
- Treated banks with above-median risk experience 10% higher losses

Results: Non-Bank Subsidiaries

	log Market-to-Book			log Prof. Fees		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	-0.053	-0.051*	-0.060**	0.032	0.045	0.022
	(0.03)	(0.03)	(0.03)	(0.10)	(0.10)	(0.10)
Post × Treated × Non-Bank Subs	-0.066	-0.091**	-0.080*	0.313**	0.270*	0.277*
	(0.05)	(0.04)	(0.04)	(0.14)	(0.15)	(0.15)
Leverage Controls	No	Yes	Yes	No	Yes	Yes
Other Controls	No	No	Yes	No	No	Yes
Low-Order Interaction Terms	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.099	0.227	0.271	0.051	0.060	0.090
Observations	1,039	1,039	1,039	512	512	512

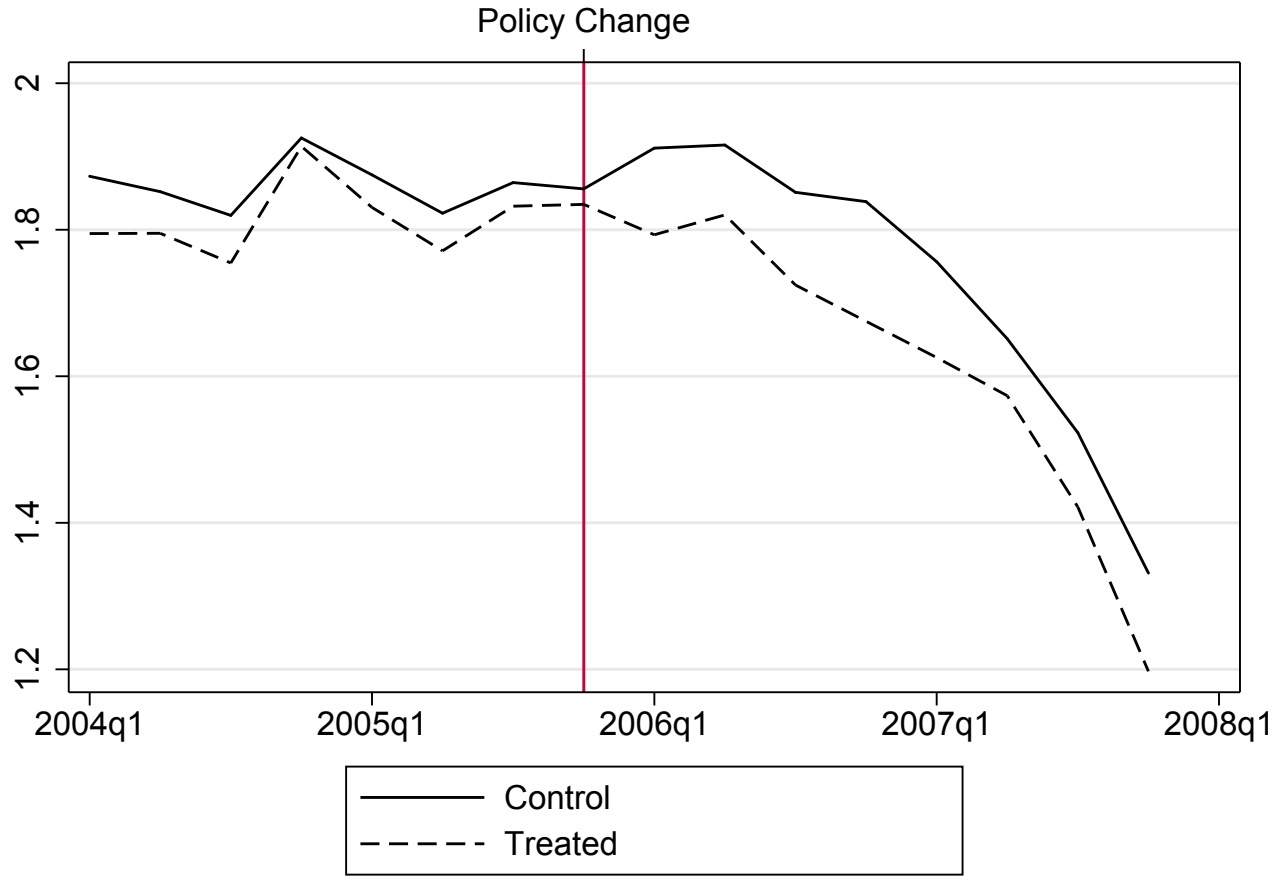
- Value losses, monitoring expenditure larger for treated BHCs with at least one non-bank subsidiary
- Result also confirms role of Fed monitoring
  - Bank subsidiaries are monitored by FDIC, Fed, OCC
  - Non-bank subsidiaries are monitored exclusively by Fed

Conclusion

- What is the impact of financial supervision on bank value?
- Exploit quasi-natural shock to small-bank supervision to answer question
- Consistent with agency theory predictions, show
  - Reduced supervision induces large value losses
  - Value losses come from internal monitoring and managerial rents
  - Value losses are larger for banks with high cash flow risk, non-bank subsidiaries
- Implications:
  - Policy: Possible unintended consequences of current small-bank deregulation
  - Economics: Large impact of (regulatory) monitoring on firm value

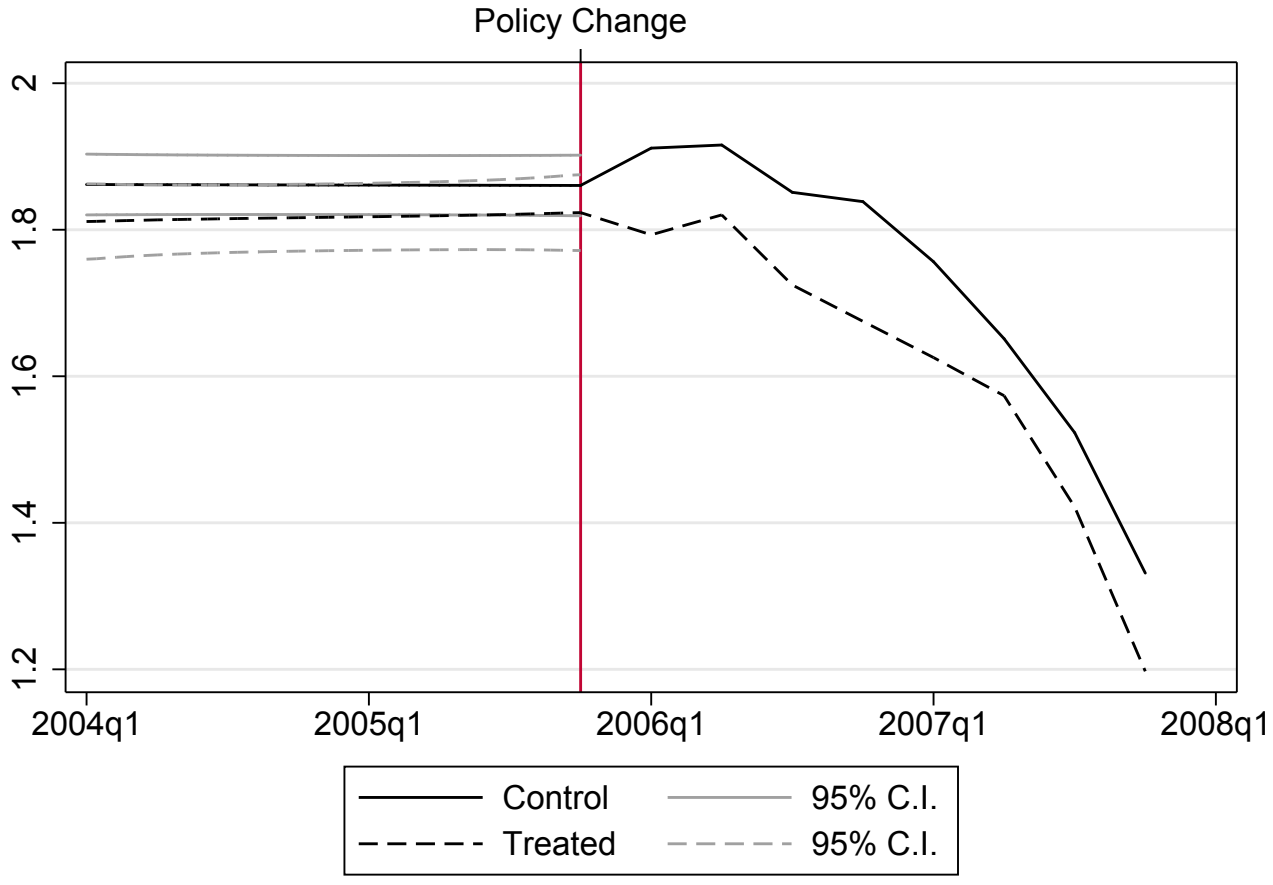
The Value of Regulators as Monitors: Evidence from Banking

Pre-Treatment Market-to-Book Differences?



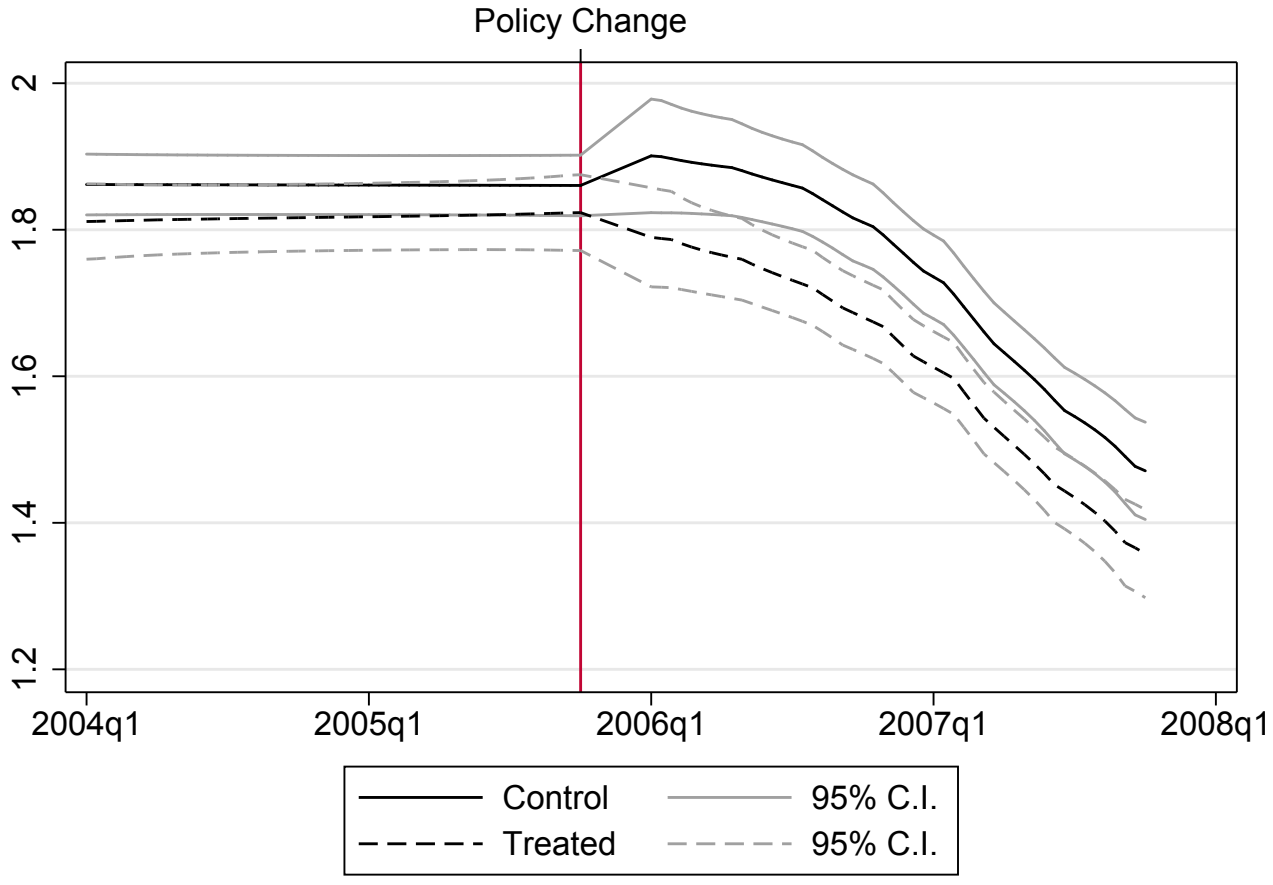
- Similar pre-treatment average Market-to-Book across two groups
- *Statistically* equal before treatment? Quarterly averages are noisy

Pre-Treatment Market-to-Book Differences?



- Local polynomial approximates value trend before/after
- No differences across groups before treatment

Pre-Treatment Market-to-Book Differences?



- Local polynomial approximates value trend before/after
- Visual preview of main result

Back

Robustness: Sample Bandwidth around Threshold

Dependent Variable: log Market-to-Book						
	$400M-600M		$300M-700M		$150M-1B	
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	-0.087**	-0.088**	-0.055**	-0.072***	-0.052**	-0.073***
	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
Controls	No	Yes	No	Yes	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.149	0.338	0.106	0.296	0.068	0.250
Observations	355	355	724	724	1,313	1,313

- Possible concern: Results driven by sample bandwidth
- Strategy: Experiment with different bandwidths
- Results not affected by bandwidth choice

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Placebo: Arbitrary Treatment Assignment

Dependent Variable: log Market-to-Book								
	$300M Threshold		$1B Threshold		After 12/2004		After 12/2006	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post × Treated	-0.03	-0.04	0.03	0.01	-0.01	-0.00	-0.04	-0.04*
	(0.04)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.432	0.528	0.427	0.532	0.038	0.145	0.407	0.496
Observations	1,056	1,056	2,076	2,076	1,028	1,028	2,177	2,177

- Possible concern: Results driven by sub-samples of banks/specific time periods
- Strategy: Experiment with placebo thresholds/treatment dates
- Results disappear when using different thresholds/dates

Back

Event Study

	Daily Frequency		Weekly Frequency	
	Treated	Control	Treated	Control
Cumulative Abnormal Return	-0.0180	0.00264	-0.0139	0.00725
t-stat	-2.144	0.277	-3.315	1.189
Observations (Event Window)	24	24	5	5

- Event study around March 6, 2006
- 2% negative CAR for portfolio of treated banks
- No CAR changes for portfolio of control banks

Back

Sample Restrictions

Dependent Variable: log Market-to-Book								
	2005-2006 Sample		2004-2008 Sample		Survivors Only		Listed in 2005	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post × Treated	-0.078***	-0.094***	-0.072**	-0.074**	-0.061**	-0.070**	-0.074***	-0.079***
	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.089	0.260	0.650	0.738	0.426	0.522	0.408	0.511
Observations	1,064	1,064	2,599	2,599	1,454	1,454	2,004	2,004

- Results robust to
  - Shorter, longer sample analysis
  - Exclusion of non-surviving banks
  - Exclusion of post-treatment listings

Back

Quarterly Treatment Effect

	log Tobin's q			log Market-to-Book		
	(1)	(2)	(3)	(4)	(5)	(6)
Q1-2006 × Treated	-0.010**	-0.011***	-0.010**	-0.060**	-0.066***	-0.063**
	(0.00)	(0.00)	(0.00)	(0.03)	(0.02)	(0.02)
Q2-2006 × Treated	-0.011**	-0.012***	-0.011***	-0.071**	-0.078***	-0.075***
	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.03)
Q3-2006 × Treated	-0.012***	-0.014***	-0.014***	-0.084***	-0.093***	-0.089***
	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.03)
Q4-2006 × Treated	-0.013***	-0.013***	-0.013***	-0.075**	-0.083***	-0.078***
	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.03)
Q1-2007 × Treated	-0.010**	-0.011***	-0.011**	-0.077**	-0.083***	-0.077***
	(0.00)	(0.00)	(0.00)	(0.03)	(0.03)	(0.03)
Q2-2007 × Treated	-0.008*	-0.010**	-0.010**	-0.070*	-0.084**	-0.083***
	(0.00)	(0.00)	(0.00)	(0.04)	(0.03)	(0.03)
Q3-2007 × Treated	-0.009*	-0.010**	-0.010**	-0.079**	-0.085**	-0.077**
	(0.01)	(0.00)	(0.00)	(0.04)	(0.04)	(0.03)
Q4-2007 × Treated	-0.008	-0.008	-0.009	-0.081*	-0.090**	-0.082**
	(0.01)	(0.01)	(0.01)	(0.05)	(0.04)	(0.04)
Leverage Controls	No	Yes	Yes	No	Yes	Yes
Other Controls	No	No	Yes	No	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.366	0.399	0.424	0.417	0.476	0.511
Observations	2,076	2,076	2,076	2,076	2,076	2,076

Back

Falsification: Non-Fed-Regulated Financial Firms

	log Tobin's q			log Market-to-Book		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Small Non-BHC	0.109	0.040	-0.032	0.131	0.112	0.040
	(0.20)	(0.19)	(0.15)	(0.20)	(0.18)	(0.15)
log Assets		-0.383*	-0.415*		-0.105	-0.164
		(0.20)	(0.20)		(0.18)	(0.17)
Other Controls	No	No	Yes	No	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.231	0.337	0.508	0.310	0.314	0.558
Observations	299	299	299	299	299	299

- Non-BHC Financials (SIC Code 6000-6799)
- No effect in falsification test around $500M
- Same result for non-financials

Back

Post-Treatment Monitoring and Value Losses

	log Tobin's q			log Market-to-Book		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	-0.001	-0.001	-0.000	0.003	0.005	0.004
	(0.01)	(0.01)	(0.01)	(0.04)	(0.03)	(0.03)
Prof. Fees	-0.037	-0.062	-0.075*	-0.103	-0.416	-0.437
	(0.05)	(0.04)	(0.04)	(0.52)	(0.42)	(0.36)
Post × Treated × Prof. Fees	-0.139***	-0.101**	-0.124**	-1.447***	-1.300***	-1.188***
	(0.05)	(0.05)	(0.06)	(0.54)	(0.38)	(0.39)
Risk Controls	No	Yes	Yes	No	Yes	Yes
Other Controls	No	Yes	Yes	No	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.290	0.338	0.376	0.368	0.452	0.485
Observations	1,641	1,641	1,641	1,641	1,641	1,641

- Interact professional fees with treatment indicator
- Treatment effect's significance absorbed by professional fees
  - Strong correlation between value losses and professional fees

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Funding Costs and Profitability during the Crisis

	log Funding Costs			log Loan Loss Provisions		
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis × Unmonitored	0.051**	0.044**	0.054**	-0.175	-0.208	-0.215
	(0.02)	(0.02)	(0.02)	(0.18)	(0.18)	(0.17)
Leverage Controls	No	Yes	Yes	No	Yes	Yes
Other Controls	No	No	Yes	No	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.676	0.727	0.758	0.383	0.389	0.416
Observations	873	873	873	723	723	723

- Small bank cost of funding increase, LLP decrease

Earnings Management

	log Discretionary LLP-v1			log Discretionary LLP-v2		
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis × Unmonitored	0.610**	0.611**	0.731***	0.704***	0.699***	0.715***
	(0.25)	(0.25)	(0.27)	(0.24)	(0.24)	(0.26)
Leverage Controls	No	Yes	Yes	No	Yes	Yes
Other Controls	No	No	Yes	No	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.336	0.342	0.353	0.344	0.350	0.360
Observations	543	543	543	549	549	549

- Discretionary Negative LLP: absolute negative residual from first-stage regression of LLP on observables (Kanagaretnam et al. (2014))

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Results: Government Bailout Guarantees

	Factor Loading (Market Model)			Factor Loading (GL Model)		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	0.001	0.001	0.000	0.001	0.001	0.000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Liquidity Controls	No	Yes	Yes	No	Yes	Yes
Other Controls	No	No	Yes	No	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.016	0.023	0.045	0.013	0.018	0.037
Observations	1,955	1,955	1,955	1,955	1,955	1,955

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Results: Disclosure

Dependent Variable: log Market-to-Book						
	Voluntary Reporting			Not Reporting		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	-0.090**	-0.096**	-0.092**	-0.083***	-0.090***	-0.080***
	(0.04)	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
Other Controls	No	Yes	Yes	No	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.424	0.493	0.509	0.411	0.469	0.521
Observations	1,351	1,351	1,351	1,837	1,837	1,837

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Other Fed Regulations

	log Tier 1 Ratio		log Tier 2 Ratio		log Combined Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	0.029	0.035	-0.065	-0.065	0.011	0.016
	(0.03)	(0.02)	(0.05)	(0.05)	(0.02)	(0.02)
Controls	No	Yes	No	Yes	No	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.029	0.178	0.047	0.054	0.061	0.176
Observations	2,077	2,077	2,062	2,062	2,100	2,100

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