Supervising Failing Banks

Sergio Correia, Stephan Luck, and Emil Verner *

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Abstract

How does banking supervision contribute to financial stability? For most failures in the contemporary U.S. banking system, we document that supervisors know about a bank's financial trouble well ahead of failure. Bank closures almost always involve a supervisory decision to close the bank and are conducted in an orderly fashion with low losses for uninsured depositors. Outside of failure, supervisors play an important role in shaping banks' financial statements, requiring troubled banks to recognize otherwise unreported losses and subjecting them to enforcement actions. To establish the causal effect of supervision on financial stability, we exploit exogenous variation in supervisory scrutiny at the onset of the 2008 Global Financial Crisis. We find that, in the short run, heightened supervisory scrutiny increases the accuracy of financial reporting, the frequency of public enforcement actions, and the likelihood of bank closures. Moreover, in the medium run, it reduces bank size and increases capitalization. Taken together, these results provide evidence that a key role of banking supervision is to avoid regulatory forbearance and prevent banks from "kicking the can down the road."

JEL: G01, G21, N20, N24

*Correia: Board of Governors of the Federal Reserve System, sergio.a.correia@frb.gov; Luck: Federal Reserve Bank of New York, stephan.luck@ny.frb.org; Verner: MIT Sloan School of Management and NBER, everner@mit.edu. We thank Rosalind Bennett, Mark Carey, Bev Hirtle, Joe Mason, and Matt Plosser, as well as seminar participants at the Federal Reserve Bank of New York for useful comments. We thank Natalia Fischl-Lanzoni and Tiffany Fermin for excellent research assistance. The opinions expressed in this paper do not necessarily reflect those of the Federal Reserve Bank of New York or the Board of Governors of the Federal Reserve System.

1 Introduction

Banking supervision seeks to safeguard the stability of the financial system by monitoring financial institutions and enforcing regulatory compliance. In the U.S., both government agencies and banks spend considerable resources on bank examinations. However, the effectiveness of banking supervision is hotly debated. A failure of banking supervisors to rein in bank risk-taking is commonly quoted as having contributed to the fragility of the banking system in the run-up to the Global Financial Crisis (GFC) (see, e.g. Financial Crisis Inquiry Commission, 2011; Barth et al., 2012). More recently, in the aftermath of 2023 banking sector turmoil, some academics and policymakers questioned why supervisors failed to anticipate or address the financial stability risks posed by rising interest rates (see, e.g. Gopalan and Granja, 2024).[1]

Against this backdrop, we ask: How does banking supervision contribute to financial stability? What is the role of banking supervision in failing banks? What do supervisors know about troubled banks? What do supervisors do to prevent costly failures?

We study the role of banking supervision in all commercial bank failures in the U.S. between 2000 and 2023. First, we use confidential supervisory data to provide a set of facts about how banking supervision operates in failing banks. We document that supervisors identify failing banks with a high degree of accuracy before failure. Moreover, supervisors play an important role in monitoring troubled banks, ensuring that banks' financial statements recognize losses, subjecting banks to enforcement actions, and closing failing banks. Second, we analyze a natural experiment that allows us to assess the causal impact of supervisory scrutiny on bank-level outcomes during the Global Financial Crisis. We find that banks exogenously subject to stricter supervision at the onset of the GFC were more likely to be closed, were closed more quickly, recognized more losses, were subject to more public enforcement actions, and, conditional on survival, became leaner

[1]For instance, in an interview on March 18, 2024, Anat R. Admati said: "The Fed failed. The FDIC failed. These people just failed to do their supervision job, and then it's the big 'oops,' and we have got to give them liquidity support and all of that."

and better capitalized in the aftermath of the GFC.

We begin by documenting that supervisors identify failing banks with a high degree of precision. Supervisory CAMELS ratings, which assess a bank's financial health based on six criteria (Capital, Assets, Management, Earnings, Liquidity, and Sensitivity), increase substantially in the run-up to failure. Supervisors almost always rate banks on the verge of failure with the worst CAMELS rating of 5. In line with this pattern, supervisory ratings strongly predict failure. We assess predictability based on the area under the receiver operating characteristic curve (AUC), a common measure of performance for binary classifiers. The AUC obtained from a simple predictive model that regresses failure on CAMELS ratings is around 96-98%, both in-sample and out-of-sample.

Banks undergo a slow deterioration in solvency over several years before failure. As a consequence, bank failures are also highly predictable based on simple observable metrics from publicly available financial statements (Correia et al., 2024). Thus, it is not entirely surprising that supervisory ratings predict failure. However, we find that supervisory ratings are more informative about failure than simple balance sheet metrics, indicating that the supervisory assessment of a bank's risk may reflect additional information that is not yet fully captured in publicly available balance sheets.

Given that supervisors identify failing banks before they fail, what actions do supervisors take in failing banks? First, we find that supervisors pay special attention to troubled banks. We document that the frequency of bank examinations more than doubles in the run-up to failure. Moreover, examinations in failing banks are more likely to be led by federal rather than state bank regulators. Previous research has shown that the federal regulators are relatively stricter supervisors (Agarwal et al., 2014). Thus, conditional on being subject to an exam, failing banks face tougher supervisors.

Second, we find that supervisors play a crucial role in shaping banks' financial statements, ensuring that financial information of banks reported in regulatory filing is accurate. Specifically, we document that the probability that a bank revises a previously

submitted publicly available financial statement shoots up right after bank examinations. Moreover, this pattern is particularly pronounced in troubled or failing banks. Right after examinations, failing banks commonly revise their loan loss provisions and charge-offs upward and their book equity and net income downward. Such revisions can be material. We find that Call Report revisions following supervisory exams explain around 50% of the decline in a bank's capitalization in the year before failure.

Third, supervisors are more likely to make use of public enforcement actions in troubled banks. Failing banks are more likely to be subjected to enforcement actions such "cease and desist orders", "written agreements," or "prompt corrective action (PCA)" than non-troubled banks. More than 80% of banks that failed between 2000 and 2023 were subject to some public enforcement action from federal agencies before they failed, in contrast to only 35% for banks that did not fail. Moreover, the most drastic form of enforcement action, prompt corrective action (PCA), is almost never used in non-failing banks, while around 25% of failing banks were subject to PCA before failure.

Although PCA is more common in failing banks, most banks that fail are not subject to PCA beforehand. The lack of PCA in failing banks is partly because formalizing an enforcement action requires clearly documenting a legal or regulatory violation, a time-consuming process that might not be completed by the time of failure. In particular, triggering PCA requires a bank's reported tangible common equity to fall short of legal cutoffs, which we show is usually only crossed when bank closure is imminent.[2] Nevertheless, we also highlight that supervisors' impact on financial statements allows for a greater scope to invoke PCA, as recognizing losses makes it more likely that a bank crosses the tangible common equity threshold.

Fourth, failing banks are almost always closed in an orderly fashion through a sale to another bank that assumes all of the failing bank's deposits. Consequently, loss rates on uninsured deposits are low. Since 2008, uninsured deposits have an average recovery rate

[2]However, our results also allow for alternative interpretations in which supervisors are facing political pressure, are lacking formal authority, or the right incentives to take action in failing banks earlier.

of 97 cents on the dollar (FDIC, 2023). Moreover, market forces such as sudden deposit withdrawals very rarely precede a supervisory decision to close a bank, and banks are almost always closed on Friday's as a result of a supervisory decision. These patterns are in stark contrast to the historical, pre-FDIC experience of the US banking system, when banks were closed by bank owners or by deposit runs and losses for depositors were large (Correia et al., 2024). They are also in contrast to the more recent failure of Silicon Valley Bank (SVB) in March 2023.

Altogether, our descriptive evidence suggests that supervisors are well-informed about which banks are troubled. Supervisory actions in failing banks mostly center around auditing and ensuring the accuracy of financial statements. Supervisors also take enforcement action when banks' financial conditions are sufficiently bad, but the strictest enforcement actions are relatively uncommon. Bank closures almost always happen in an orderly fashion. Expected losses for uninsured depositors in the contemporary U.S. banking system tend to be low.

In the second part of the paper, we ask: what is the *causal effect* of supervision on bank-level outcomes? To address the challenge that supervision is endogenous to a bank's financial condition, we exploit exogenous variation in supervisory scrutiny at the onset of the 2008 Global Financial Crisis (GFC). Specifically, we exploit that on-site examinations for some banks rotate between being led by either federal or state examiners. Importantly, federal examiners tend to be tougher supervisors, as shown in the seminal paper by Agarwal et al. (2014). We then use the fact that banks on this "rotating schedule" are quasi-randomly assigned to a relatively tougher or weaker supervisor in the early phase of the GFC. We find that additional scrutiny early in the GFC increases scrutiny throughout the GFC, as banks assigned to a tougher supervisor early are more likely to be rated as a troubled bank.

Using the rotating schedule as an instrument, we show that banks that exogenously receive more supervisory scrutiny throughout the GFC are more likely to get closed

by a supervisor. These banks are also more likely to be subject to enforcement actions. Thus, our findings suggest that some banks in the U.S. banking system were in financial conditions that warranted bank closure but were allowed to continue to exist. Moreover, we document that banks subject to additional supervisory scrutiny are more likely to revise previously submitted Call Reports and to recognize additional credit losses. Thus, our findings suggest that supervision plays an important role not just for bank closures but also for overall loss recognition in the banking sector.

Further, we find that supervision also affects bank capitalization and bank size of surviving banks. Banks that receive additional supervisory scrutiny operate with slightly higher equity-to-assets ratios after the GFC. Importantly, this increase in capitalization is not driven by an increase in retained earnings. Rather, it is driven by a leaner banking operation, a lower loans-to-assets ratio, fewer employees, lower wages, and a smaller branch network after the GFC.

Taken together, we find that supervisors are important in requiring banks to realize losses and to shut down unviable banking operations. These findings emphasize that supervision operates through the enforcement of loss recognition and ensuring capital adequacy. The causal estimates suggest that reducing supervisory scrutiny allows banks to operate longer with undetected losses. This potentially allows non-viable banking operations to continue to exist and gamble for resurrection, with possible large ramifications for the real economy (see, e.g., Caballero et al., 2008).

Related Literature. Our paper relates to a rich empirical literature that studies the effects of banking supervision on banking market outcomes (see, e.g., Hirtle and Kovner, 2022, for an overview). The most closely related paper is Agarwal et al. (2014), which studies the differences between federal and state regulatory agencies. Agarwal et al. (2014) show that when comparing federal and state regulator supervisory ratings within the same bank, federal regulators are systematically tougher in their assessment of bank riskiness.

We build on their original findings to construct our instrument for supervisor scrutiny in Section 4 and use the instrument to document new results about the effect of supervision on troubled banks in the GFC.

Several existing studies use quasi-natural experiments to identify the effects of banking supervision on bank risk-taking and bank lending. Granja et al. (2017) exploit the formal closure of the thrift supervisor (OTS) to analyze the effects of supervision on bank lending and bank management. They find that supervision can act as a catalyst for operational changes that correct deficiencies in bank management and lending practices, leading to increased lending. Hirtle et al. (2020) find that banks that receive more supervisory attention hold less risky loan portfolios, are less volatile, and are less sensitive to industry downturns, but do not have lower growth or profitability. Kandrac and Schlusche (2020) use variation in supervisory attention to assess the effect of supervision on financial institutions' willingness to take risk and document that supervision can reduce bank risk-taking and lower the chance of bank failures. Gopalan and Granja (2024) study the evolution of supervisory ratings during the 2022-23 hiking cycle to study whether supervisors understood and acted on the potential implications of interest rate risk. Our paper complements these existing papers by providing causal evidence that banking supervision is key in winding down banks that have become unviable as a consequence of realized credit risk. Thus, a key role of supervision is to help avoid "kicking the can down the road" and allowing undercapitalized banks to continue to exist (Kane, 1989; Kroszner and Strahan, 1996; Acharya et al., 2021). Thereby, our paper also contributes to the work that studies "gambling for resurrection" (see, e.g., Ben-David et al., 2019) and more broadly to studies on the effects of the regulatory and supervisory regime on bank risk-taking (Laeven and Levine, 2009).

Our paper's finding on the role of supervisors in auditing bank Call Reports also relates to an important set of papers on the relevance of supervisors to ensure the accuracy of banks' financial statements. We complement and reinforce the findings in Costello et al.

(2019), who document that being subject to stricter supervisors leads to a higher chance or revising previously submitted Call Reports. The difference between our analysis and that of Costello et al. (2019) is that we observe exam dates and lead agencies (as opposed to bank types) and can thus provide more precise estimates of the effects of exams on financial statement revisions. Further, our findings relate to Granja (2013), who studies the impact of disclosure requirements on the resolution costs of failed banks and finds that more comprehensive disclosure requirements improve the efficiency of the sales of failing banks. Granja (2018) exploit across-state variation during the National Banking Era in disclosure requirements to show that requirements to report financial statements in local newspapers is associated with greater stability and development of commercial banks. Passalacqua et al. (2021) use administrative data from Italy to show that banks are more likely to reclassify loans as non-performing after unexpected bank examinations.

There is also a rich literature that studies the informational content or supervisory ratings, to which our findings on the informational content or ratings about bank failure contribute by showing the CAMELS ratings are the margin slightly more informative about whether a bank is at risk of failure. Wheelock and Wilson (2000) examine the determinants of individual bank failures and acquisitions in the United States during 1984-1993 and find that CAMELS ratings are predictive of bank failure. Berger and Davies (1998) shows that changes in regulatory ratings become eventually priced in by the stock market, partially via changes in assessments of the riskiness of the banks loan portfolio. Cole and Gunther (1998), Hirtle and Lopez (1999), and Berger et al. (2000) study how quickly the informational content or supervisory ratings decays compared to information contained in publicly available Call Reports or stock prices. Oshinsky and Olin (2005) study what determines the final outcomes of banks that receive a CAMELS rating of 4 or 5 at some point in their history.

Roadmap. The paper proceeds as follows. Section 2 describes the data. Section 3 provides a set of facts about failing banks and asks whether supervisors are able to identify failing banks before they fail and discusses the actions supervisors take in both troubled banks but also more generally. Section 4 provides evidence from a natural experiment in which we trace the impact exogenous variation in supervisory scrutiny at the onset of the GFC. Section 5 concludes.

2 Data

We build a dataset on bank financial statements and revisions, supervisory examinations and ratings, regulatory actions, and bank failures, by combining the following data sources.

First, we use examination dates, examination types, and regulatory CAMELS ratings from safety and soundness examinations conducted by bank supervisors and as reported in confidential data provided by the National Informaton Center (NIC). The Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) requires that banks be subject to regular on-site examinations. For state-member banks (SMBs), exams are conducted by either the Federal Reserve System or state regulatory agencies. For non-member banks (NMBs), exams are conducted by both Federal Deposit Insurance Corporation (FDIC) and state regulatory agencies. For national banks, exams are conducted by the Office of the Comptroller of the Currency (OCC). On-site examinations result in an assessment of a bank's safety and soundness, which is summarized in the CAMELS rating. The composite CAMELS rating is a bank-level score that takes a value between 1 and 5, with 1 representing the best possible rating and 5 being the worst rating (see Appendix A.1 for details on the different rating categories). CAMELS ratings are assigned by supervisors based on their evaluation of six different aspects: capital adequacy, asset

quality, management, earnings, liquidity, and sensitivity to market risks.[3] The records from bank examinations are collected in a confidential database available within the Federal Reserve System.

Second, we use the Federal Financial Institutions Examination Council (FFIEC) Consolidated Reports of Condition and Income ("Call Report"). These publicly available data provide quarterly information on balance sheets and income statements (FFFIEC031 and 041) on a consolidated basis for all commercial banks operating in the United States and regulated by the Federal Reserve System, the FDIC, and the OCC. We also merge in additional information on bank charters, such as bank founding dates and primary regulator using the National Information Center (NIC) tables.

Third, we combine publicly available finalized Call Report data with data on historical revisions on specific Call Report line items. These data allows to study whether regulatory filings are more likely to be revised as response to examinations. We explain these data in more detail in Appendix A.3. Data on historical revisions of Call Report filings are available after 2007.

Fourth, we complement the Call Report data with the FDIC list of failing banks. This list documents all failures of FDIC member banks from 1934 through 2023. We define failure as an instance when a bank is closed and either liquidated or if the deposit franchise is sold in part or entirely to another bank.[4]

Finally, to measure regulatory actions, we use publicly reported enforcement actions in banks. These include "Cease and Desist Orders," "Written Agreements," and "Prompt Corrective Action." Enforcement actions are provided by all three federal banking supervisors, FDIC, FRS, and OCC on their respective websites.

Our main sample is quarterly from 2000 through 2023. In total, we observe more

[3]CAMELS is an acronym for Capital, Assets, Management, Earnings, Liquidity, and Sensitivity.

[4]The FDIC defines a bank failure as the closing of a bank by regulators or an instance of open bank assistance. In the former case, the FDIC acts as receiver of the failed bank. In the latter, the FDIC provides financial assistance to prevent failure under a systemic risk exception; the bank would likely have failed without assistance. We define bank failures as bank closures and do not consider open bank assistance as failure. Our findings are robust to including the latter.

than 200,000 bank examinations, more than 17,000 enforcement actions, and quarterly financial statements for around 10,000 unique banks, of which around 550 fail over the same period. It is important to emphasize that most of our main results rely on using only variation across state-chartered institutions. Hence, for much of our analysis, we drop all OCC-regulated national banks.[5] Our identification strategy in Section 4 requires banks to qualify for the rotating exam schedule, which also requires us to drop commercial banks with more than $10 billion in assets. Hence, to a large extent, the findings in our paper are about the role of supervision in relatively smaller, state-chartered "community banks," rather than large and complex banking institutions or super-regional banks.

3 Banking Supervision and Failing Banks

In this section, we investigate two questions. First, do supervisors identify failing banks before they fail? Second, what actions do supervisors take in troubled banks?

3.1 Do supervisors identify failing banks before they fail?

Dynamics in Failing Banks

To understand whether supervisors identify failing banks, we start by studying the dynamics of failing banks in the five years before their failure. We estimate variants of the following specification:

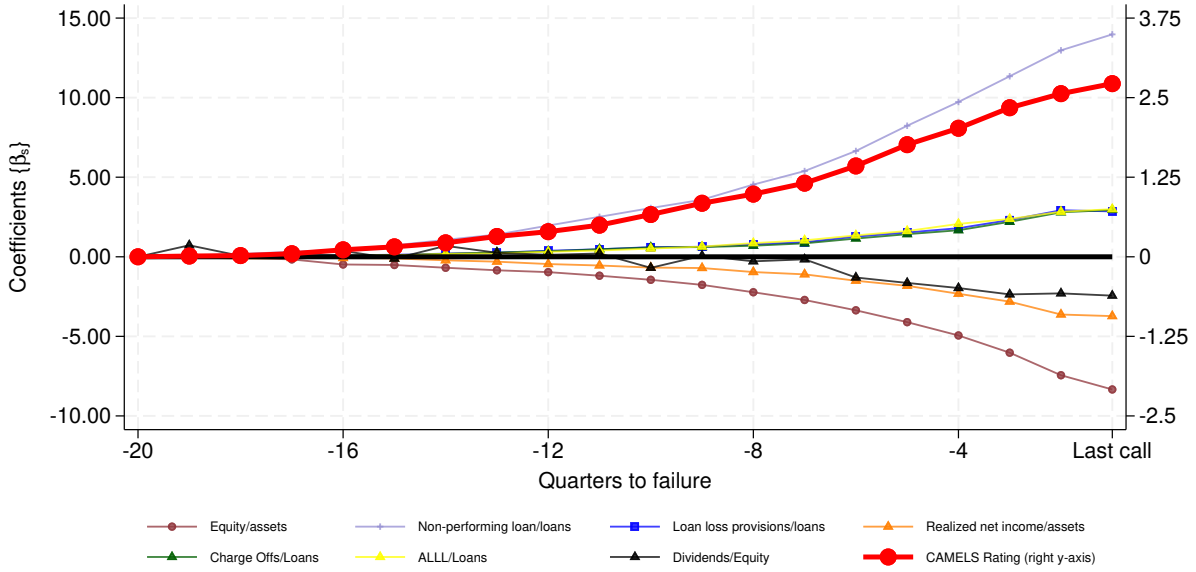
$$y_{b,t} = \alpha_b + \sum_{j=-20}^{0} \beta_j \times \mathbf{1}_{j=t} + \epsilon_{b,t}, \tag{1}$$

where $y_{b,t}$ is a bank-level outcome in quarter t such as a bank's composite CAMELS rating or other ratios constructed from a bank's financial statement such as the equity-to-assets

[5] Of the around 10,000 unique banks, roughly 25% are national bank, 60% are non-member state banks, and around 15% are FRS-member state banks.

ratio, j measures the number of quarters to failure, and α_b is a bank fixed effect. The sequence of coefficients $\{\beta_j\}$ measures the evolution of a given outcome in the 20 quarters before failure. The coefficient is normalized to zero twenty quarters before failure. The sample is restricted to failing banks.

Figure 1: ***Losses and Solvency and CAMELS ratings of Failing Banks: 2000-2023***



Notes: The figure presents the sequence of coefficients from estimating Equation (1), where the dependent variable is the ratio indicated in the figure legend. The specification includes a set of bank fixed effects. The sample is restricted to failing banks that fail between 2000 and 2023 and to the five years before they fail.

Figure 1 shows that failing banks tend to see a slow erosion of their capitalization before they fail, primarily as a result of realized credit risk. In particular, failing banks experience a slow but steady increase in the share of non-performing loans. Given that banks are required to provision once a loan becomes non-performing, bank net income falls.[6] The increased provisioning also leads to an increase in allowances for loan and lease losses (ALLL), which are also increasingly likely to be charged off as failure approaches. The fall in income, in turn, leads to a reduction in dividends and induces a

[6]Until recently, banks were required to use the incurred loss methodology (ILM). Under the ILM methodology, banks recognize loan losses only if they are probable under current economic conditions. This implies that a loss resulting from provisioning has to be supported by observable evidence, such as the borrower already being delinquent or in default. Since 2020, the ILM has been replaced with the current expected credit losses methodology (CECL) under which banks estimate and recognize expected credit losses over the life of a loan from the point of origination.

bank's capitalization to fall (see also Correia et al., 2024).

Failing banks show clear signs of deteriorating fundamentals in their publicly available financial statements. Do supervisors also assess these banks as being relatively riskier? Figure 1 reveals that, over the same period, the CAMELS composite ratings in failing banks rises by 2.7 points. This is a considerable increase.[7] As a benchmark, the unconditional average CAMELS rating is around 1.8 (see Table 1). In our sample of all bank-quarter observations from 2000 through 2023, 32% of observations have a rating of 1, 57% a rating of 2, and 7% a rating of 3. Only 3% of all bank-year observations have a CAMELS rating of either 4 or 5. Failing banks are thus assessed as being much riskier than the average bank. Failing banks are on average rated with 3 over the last 5 years before they fail; and on average with 4.5 in the last year before failure—with 70% of banks having a rating of 5 and only 7% with either a 1 or 2 (see Table 1). Thus, the rating of failing banks more than doubles as they increase from an average of 1.8 to an average of 4.5 in the year leading up to failure.

The spike in the CAMELS rating is a clear indication that a bank failure is typically no surprise to bank supervisors. Almost all failing banks are assessed as posing a significant risk to the deposit insurance fund and supervisors find that failure is highly probable before their actual closure.

Predicting Bank Failures

The patterns documented in Figure 1 are subject to the concern that they are driven by time trends. Banks might be more likely to fail when supervisory ratings increase and bank capitalization falls. That is, CAMELS ratings may increase during times of economic distress for all banks when some banks are also more likely to fail, but the increase may

[7] Figure C.3 in the Appendix further shows that the sub-components of the composite CAMELS ratings increase across the board. In line with a bank's solvency deteriorating due to realized credit risk, the increases are most common in the CAMELS ratings for capital, asset quality, and earnings. Liquidity ratings increase somewhat more slowly. Further, note that the increase in the CAMELS rating is about the same across different size categories, as shown in Figure C.5.

Table 1: *Distribution of CAMELS ratings across failing and surviving banks.*

Average	Share with CAMELS = X				
CAMELS	X=1	X=2	X=3	X=4	X=5
A. All banks					
1.83	0.32	0.57	0.07	0.02	0.01
B. Failing banks (within 5 years of failure)					
3.03	0.06	0.46	0.12	0.13	0.24
C. Failing banks (within 1 year of failure)					
4.50	0.01	0.06	0.06	0.17	0.70
D. Surviving banks					
1.81	0.33	0.57	0.07	0.02	0.01

Notes: This table shows the average CAMELS rating and the distribution of CAMELS ratings for our main sample from 2000-2023 (Panel A), failing banks within 5 years of failure (Panel B), failing banks within 1 year of failure (Panel C), banks that have not failed before the end of the sample (Panel D).

not necessarily be larger in failing banks.[8]

To address this concern, we next test whether failures be predicted using confidential bank ratings with a high degree of accuracy. Moreover, we test whether failures are more precisely predicted when using confidential supervisory ratings than when using publicly available financial statements. This allows us to study whether supervisory ratings contain additional information beyond the information contained in financial statements.

We conduct a formal prediction exercise to quantify the extent to which fundamentals and supervisory ratings can predict future failures, both in-sample and out-of-sample. We estimate simple predictive regression models of the following form:

$$\text{Failure}_{b,t+1\to t+h} = \alpha + \sum_{k=1}^{5} \beta_k \times \mathbf{1}[\text{CAMELS}_{bt} = k] + \epsilon_{b,t+1\to t+h}, \tag{2}$$

[8]Indeed, average CAMELS ratings reflect rising aggregate failure rates in the banking sector, see Figure C.2 in the Appendix.

where $\text{Failure}_{b,t+1\to t+s}$ is an indicator variable equal to one if bank b fails between year $t+1$ and $t+h$ and $\mathbf{1}[\text{CAMELS}_{bt} = k]$ indicates that bank b has a CAMELS rating of k at time t.

In additional specifications, we include information from banks' publicly available financial statements to predict failure. To proxy for a bank's insolvency, we include a bank's income-to-assets ratio. To proxy for a bank's funding vulnerabilities, we include the time deposits-to-assets ratio. Moreover, we also consider the interaction between the insolvency and funding vulnerability measures, as well as interactions of all of the variables from financial statements with the CAMELS rating.

To quantify the power of these observables for predicting bank failure, we construct the receiver operating characteristic curve (ROC), a standard tool used to evaluate binary classification ability. The ROC curve traces out the true positive rate against the false positive rate as we vary the classification threshold. We then calculate the area under the ROC curve (AUC). An uninformative predictor has an AUC of 0.5, while an informative predictor has an AUC of greater than 0.5. The AUC metric is commonly used in the literature on predicting financial crises.[9] Furthermore, we test both in-sample and pseudo-out-of-sample classification performance. The pseudo-out-of-sample AUC is constructing by estimating Equation (2) iteratively on an expanding sample and predicting the probability of failure for each bank in $t+1 \to t+h$ using only data up to year t.

Table 2 reports the results. Bank failures are highly predictable based on CAMELS bank supervisory ratings. The AUC is between 96-98% at the one-year horizon and remains north of 80% even at the 5-year horizon (see column (1)). Figure 2 plots the ROC curve for predicting failure at the 1-year horizon—corresponding to Panel C of Table 2. A model based on confidential CAMELS ratings can identify around 75% of true positives

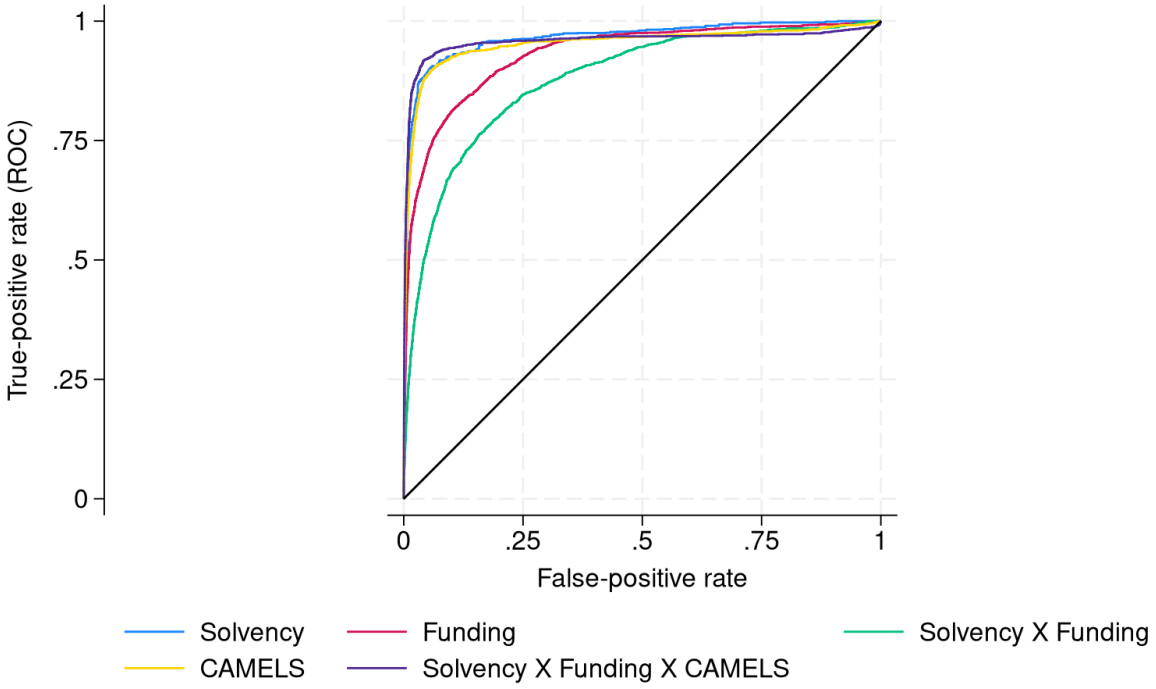
[9]For reference, the in-sample AUC for predicting financial crises in aggregate data based on credit and asset price growth is typically in the range 0.65-0.75 (e.g., Schularick and Taylor, 2012; Drehmann and Juselius, 2014; Baron et al., 2021; Greenwood et al., 2022; Müller and Verner, 2023). Correia et al. (2024) further show that the AUC when predicting individual bank failures is around 0.85 for the historical, pre-FDIC U.S. banking system and 0.95 for the contemporary U.S. banking system.

Table 2: ***Predicting Bank Failures with Supervisory Ratings and Bank Fundamentals*** .

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Prediction horizon $h = 5$						
AUC (in-sample)	0.831	0.780	0.808	0.817	0.861	0.817
AUC (out-of-sample)	0.823	0.721	0.803	0.825	0.861	0.798
N	616313	616313	616313	616313	616313	616313
No of Banks	11030	11030	11030	11030	11030	11030
Mean of dep. var.	1.38	1.38	1.38	1.38	1.38	1.38
Panel B: Prediction horizon $h = 3$						
AUC (in-sample)	0.885	0.834	0.855	0.879	0.909	0.877
AUC (out-of-sample)	0.958	0.891	0.868	0.934	0.956	0.930
N	460089	460089	460089	460089	460089	460089
No of Banks	9370	9370	9370	9370	9370	9370
Mean of dep. var.	1.12	1.12	1.12	1.12	1.12	1.12
Panel C: Prediction horizon $h = 1$						
AUC (in-sample)	0.965	0.932	0.879	0.953	0.958	0.951
AUC (out-of-sample)	0.981	0.948	0.883	0.958	0.956	0.958
N	460089	460089	460089	460089	460089	460089
No of Banks	9370	9370	9370	9370	9370	9370
Mean of dep. var.	.37	.37	.37	.37	.37	.37
Specification details						
CAMELS	✓				✓	
Insolvency		✓		✓	✓	✓
Funding vulnerability			✓	✓	✓	✓
Insolvency × Funding vuln.				✓	✓	✓
Insolvency × Funding vuln. × CAMELS				✓		
Age controls	✓	✓	✓	✓	✓	✓
Excluding data revisions						✓

Notes: This table reports the area under the receiver operating characteristic curve (AUC) across different specifications and horizons using in-sample and pseudo-out-of-sample classification. The regression coefficients underlying the estimation of column (1) through (4) are reported in Table B.4 (for Panel A), Table B.5 (Panel B), and Table B.6 (Panel C) in the Appendix.

Figure 2: *ROC Curves: 2000-2023*



Notes: This figure plots the receiver operating characteristic (ROC) curve for the estimates based on Panel C of columns (1) through (4) of Table 2.

with less than 1 % false positives, and close to 90% of true positives with around 5% false positives.

Previous work has established that bank failures in the contemporary U.S. banking system are substantially predictable based on publicly available financial statements (see, e.g., Cole and Gunther, 1998; Wheelock and Wilson, 2000; Cole and White, 2012; Correia et al., 2024). We find that the AUC (both in- and out-of-sample) is marginally higher when using a bank's supervisory rating as the explanatory variable compared to when using measures of bank solvency and funding vulnerabilities (see columns (2) through (3)). Moreover, interacting measures of bank solvency and funding and the CAMELS rating can improve the AUC further, especially at longer prediction horizons. These findings suggest that supervisory ratings contain some soft information that is not yet reflected in such financial statements, in addition to capturing the information in public

financial statements.[10]

A bank's probability of failure is strongly rising in the CAMELS rating, consistent with the strong predictability based on CAMELS ratings. Figure C.1 in the appendix plots failure probabilities (over a three-year horizon) as a function of a bank's CAMELS ratings. A bank with a CAMELS rating of 5 has a 35% probability of failing over the next three years. Hence, a bank with a CAMELS rating of 5 is more than 80 times more likely to fail than a bank with a CAMELS rating of 1.

3.2 What actions do supervisors undertake in failing banks?

Given that supervisors identify troubled bank with a high degree of precision, we next ask: what action to supervisors take when they realize a bank is in trouble and at risk of failure? We first document that supervisors pay more attention to troubled banks. Second, we show that supervisors take an active role in shaping banks' financial statements, especially for troubled banks. Third, we document enforcement actions. And, finally, we show that supervisors tend to be decisive in deciding when a failing bank is closed.

On-site Examinations

We start out by analyzing whether supervisors attribute additional attention to troubled or failing banks. As noted above, banks chartered under state law are supervised by either the Federal Reserve (SMBs) or the FDIC (NMBs), as well as by state regulatory agencies. Federal guidelines require banks to be subject to a scheduled on-site examination every 12 months or 18 months.[11] To reduce the regulatory burden on banks under the dual

[10]Note that when we merge CAMELS ratings onto Call Report data and carry CAMELS ratings forward until an examination leads to a change in a CAMELS rating. This gives rise to the potential concern that because financial data are updated quarterly and supervisory ratings are only updated every 12 months or 18 months, the informational value of CAMELS ratings may be lower outside of examination dates (see, e.g., Cole and Gunther, 1998; Hirtle and Lopez, 1999). In additional an specification that restrict the regression to examination dates only, we found similar levels and differences in the AUC across specifications.

[11]Federal bank supervisors are required to conduct on-site examinations every 12 months unless their assets fall below a minimum threshold (which has evolved over time and as of 2023 is at $3 billion), in which case the exams are conducted every 18 months. Further, note that larger banks ($10 billion or more

supervision system, federal supervisors can substitute a federal examination with a state examination. Thus, these state-chartered banks can be on a "rotating" schedule under which a federal exam is followed by a state exam and vice versa.[12]

Figure 3 plots the time elapsed between two consecutive exams in the sample of banks that are supervised by both federal and state agencies. The figure confirms that banks eligible to be on the rotating schedule are typically subject to an exam every 12 or 18 months. However, Figure 3 further shows that failing banks are subject to more frequent exams than other banks. The distribution of days elapsed between exams shifts to the left for banks that are approaching failure.

Table 3 shows that the average on-site examination starts around 400 days after the previous examination. In contrast, exams in failing banks that are within the last 5 years of their existence take place 250 days after the most recent previous exam; if a bank is within the last year of its existence, exams tend to take place every 177 days. Thus, while the average bank is subject to less than one exam per year, failing banks can expect around two exams per year right before they fail.

Moreover, for failing banks supervised by both federal and state agencies, federal agencies are more likely to become the lead examiner in the years leading up to failure (see Figure C.4). Table 3 shows that, across all banks, around 35% of bank exams are led by state bank regulators. However, only 14% of all exams in banks that are within one year of failure are led by a state supervisor, while 86% are led by a federal agency.[13] This

in assets) are subject to regular joint examinations or continuous examinations. National banks supervised by the OCC are on a different schedule with exams typically taking place at a higher frequency, often twice within the same year.

[12]According to the FDIC examination manual, "Examinations may be conducted in alternate 12- or 18-month periods if the FDIC determines that a full-scope, on-site examination completed by the appropriate state supervisory authority during the interim period is acceptable. However, such alternate examinations should be accepted only for the following institutions: composite 1- or 2-rated institutions, and stable and improving composite 3-rated institutions if the composite rating is confirmed by an offsite review and no adverse trends are noted from other available information. The length of time between the end of one examination and the start of the next (whether one or both of the examinations are conducted by a state supervisory agency or the FDIC) should not exceed 12- or 18-months."

[13]In addition, see Figure C.4 in the Appendix for results when estimating Equation (1) when using indicators for federal-led or state-led exams, which shows how federal-led exam become more frequent as failure approaches.

evidence suggests that, as banks become troubled, federal supervisors lead exams more often in part because they stop substituting state exams. That is, troubled banks stop being on the rotating schedule and hence become subject to additional examinations and supervisory scrutiny. Federal supervisors tend to be tougher supervisors (Agarwal et al., 2014). Thus, the fact that they are more often leading an exam in troubled banks, also implies that conditional on being subject to an exam, banks also face relatively tougher supervisors.

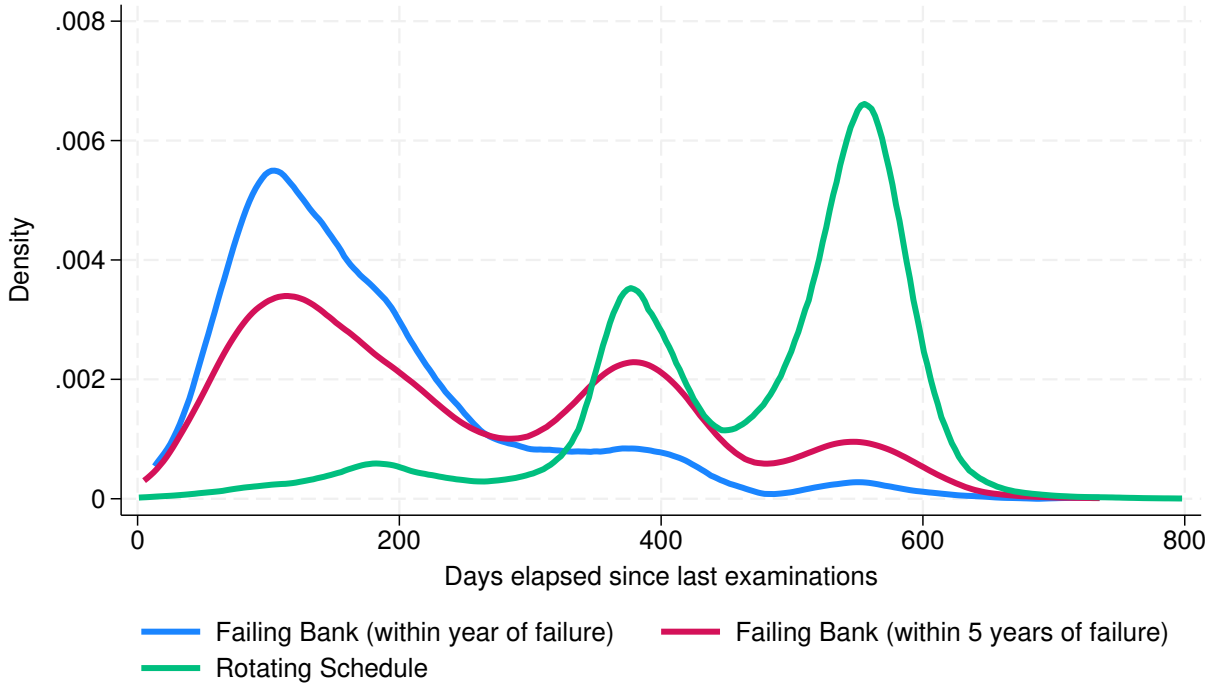
Finally, we document that, for failing banks, routine exams become less likely and exams are more likely to be classified as "Advisory/Visitation." Table 3 shows that the share of unscheduled exams increased from more than 5% in all banks to around 14% in failing banks in the year before they fail. Taken together, our evidence thus suggests that failing banks receive considerable additional scrutiny from supervisors. Supervisors conduct more on-site examinations and are more commonly having exam led by relatively tougher federal agencies.

Table 3: *Exam Frequencies, Lead Examiners, and Types of Exams.*

Days between exams		Examiner		Type of exam		
Median	Average	FDIC/FRS	State	Routine	Advisory/Visitation	Other
A. All banks						
448	415	0.60	0.40	0.94	0.05	0.01
B. Failing banks (within 5 years of failure)						
210	256	0.75	0.25	0.90	0.09	0.01
C. Failing banks (within 1 year of failure)						
145	177	0.87	0.13	0.85	0.14	0.01
D. Surviving banks						
462	420	0.59	0.41	0.95	0.05	0.01
E. Bank eligible for rotating schedule						
518	470	0.54	0.46	0.98	0.01	0.01

Notes: This table shows the average CAMELS rating, the distribution of CAMELS ratings, the average number of exams, and the lead agency for our main sample from 2000-2023 (Panel A), failing banks within 5 years of failure (Panel B), failing banks within 1 year of failure (Panel C) and banks that have not failed before the end of the sample (Panel D). We restrict the sample to SMBs and NMBs and drop national banks that are supervised by the OCC.

Figure 3: *Examination Frequency, 2000-2023*



Notes: This figure plots the distribution of the number of days elapsed since a bank was subject to its last commercial bank examination. We restrict the sample to SMBs and NMBs. We split the sample into exam for banks that currently qualify for being on the rotating schedule and and exams in banks that end up failing that are conducted either within 5 years or the year leading up to failure.

Shaping Public Financial Statements

We next document that supervisors take an active role in shaping the publicly available financial statements of banks through on-site examinations

Commercial banks in the U.S. follow the guidance from Generally Accepted Accounting Principles (GAAP) when producing their financial statements. However, banks face both complex incentives and discretion when providing their financial information (Dahl et al., 1998). For instance, banks have discretion when provisioning for potential loan losses or when deciding to charge off loans that have been provisioned for already. This type of discretion, in turn, increases the scope for supervision to ensure the accuracy of their financial statements.

One way to understand both the role of banks' discretion in their financial reporting

and the role of bank supervision that results from this discretion is to study the revisions of previously submitted financial statements (see, e.g., Costello et al., 2019; Passalacqua et al., 2021). Table 4 shows that banks commonly revise their originally submitted call report. Using all Call Reports from 2007 through 2023, we find that the probability of a revision to at least one line item is almost 30%. A revision of a balance sheet item occurs in 26% of cases, and a revision to an income statement item in 12% of cases. Revisions can affect crucial line items such as assets, net income, equity, or loan loss provisions. For instance, net income is revised in 4.6% of all cases and equity in around 5% of all cases. These revisions happen on average 120 after the original call due date.

Table 4: *Summary Statistics: Call Report Data Revisions from 2007 through 2024.*

	Probability of revision	Days to first revision		Numbers of revisions	
		Mean	Median	Mean	Median
Report:					
Entire call report	0.296	114	64	1.4	1.0
Balance sheet	0.266	116	65	1.4	1.0
Income statement	0.123	116	90	1.2	1.0
Line items:					
Total assets	0.052	122	87	1.1	1.0
Non-performing loans	0.018	106	75	1.1	1.0
Loan-loss provisions	0.019	112	88	1.1	1.0
Total equity capital	0.050	124	89	1.1	1.0
Net income	0.046	120	87	1.1	1.0

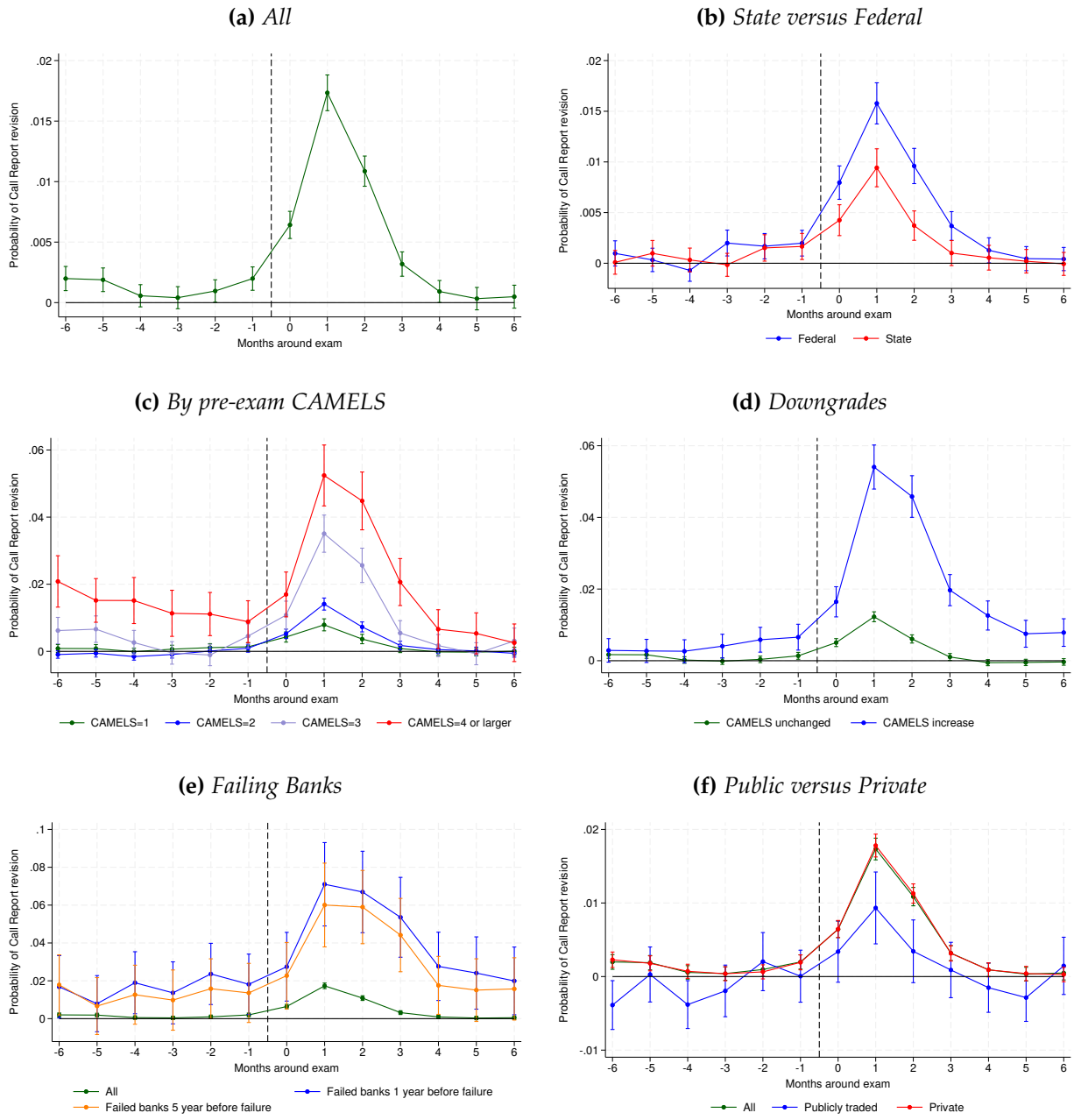
Notes: This table reports summary statistics on FFIEC Call Report data corrections between 2007Q2 (the first quarter where this information is broadly available) and 2024Q3. The "Days to first revision" and "Number of revisions" columns are conditional on at least one revision.

To test whether banks are more likely to revise their original call report submission after on-site examinations, we estimate a model of the following form:

$$y_{b,t} = \alpha_b + \tau_t + \sum_{j=-6}^{6} \beta_{t+j} \times \text{Exam}_{b,t+j} + \epsilon_{b,t}, \tag{3}$$

where $y_{b,t}$ is an indicator for whether bank b revises either its net income or book equity

Figure 4: ***Revisions of Net Income and Equity Reported in the Call Reports around Examinations Dates***



Notes: The figure presents the sequence of coefficients from estimating Equation (1), in which the dependent variable a is a dummy that indicates whether in a given month a bank is revising its previously submitted call report line items for net income or equity, or both. The specification includes a set of bank fixed effects. The sample is restricted to all commercial banks and to 2007-2023.

(from a call report submitted before t) in month t, $\text{Exam}_{b,t+j}$ is an indicator whether a bank was subject to an examination that started in month $t+j$, α_b is a set of bank fixed

effects, and τ_t a set of calendar-month fixed effects.

Figure 4 plots the set of coefficients $\{\beta_{t+j}\}$ from estimating Equation (3) for the six months around an on-site examination. We find that the probability of a revision of a previously submitted call report increases slightly in the two months before an examination and then shoots up in the month and right after an examination (panel (a)). This pattern suggests that banks in part anticipate the scrutiny from examiners and exams (recall that exams are announced far ahead), explaining the slight increase in the revisions probability before the exam. However, the examination itself is associated with a much higher propensity to revise original submissions. Around 6 months after the exam, the probability of revisions is again low.

An important challenge in interpreting the patterns in panel (a) in Figure 4 results from the fact that it is unclear whether one can attribute the revision of a previously submitted financial statement to actions taken by supervisors. Revisions may be coincidental to exams rather than caused by them. For instance, banks could be planning on revising their call report independent of the on-site examination but hold back with resubmissions until the weeks right after the exam when all types of paperwork need to be processed.

To address this type of identification concern, we consider differences in the revision probability for banks that are on the rotating schedule across exams led by a federal agency or a state agency, similar to the identification in (Costello et al., 2019). As mentioned above, existing evidence suggests that state supervisors tend to be less strict than supervisors from federal agencies (Agarwal et al., 2014). Given that the exams on the rotating schedule are fully anticipated, if there are differences in the revision probability following state and federal, this would allow for a casual interpretation in which actions taken by the supervisors are causing the banks to revise their financial statement. Indeed, Figure 4 shows that the effect is stronger for exams led by federal examiners compared to state examiners when restricting the sample to banks that are on the rotating schedule.

Thus, at least some revisions can be attributed to actions by supervisors.[14]

Figure 4 also shows that revisions are more likely in troubled banks. Panel (c) shows that revisions after exams are more likely in banks with higher CAMELS ratings. Panel (d) shows that revisions are also more likely if an exam resulted in a bank getting downgraded in the CAMELS system. Finally, panel (e) shows that revisions are more common in banks that end up failing, especially close to failure—although these banks are also generally more likely to revise their financial statements at other points in time.

Further, panel (f) shows that there are considerable differences across publicly traded and private banks. Publicly traded banks are subject to disclosure rules from the SEC and face much higher costs in revising their previously submitted and published financial statements. The audit function of supervisors via exams is thus arguably more valuable in smaller, more opaque banks.

Table 5: ***Probability of Revising Call Report in the Quarter Following an On-Site Examination***

Call Report line items											
ALLL		Provisions		Charge-Off		Net Income		Equity		NPL	
Direction of revision											
Up	Down	Up	Down	Up	Down	Up	Down	Up	Down	Up	Down
A. All banks											
0.03	0.02	0.04	0.01	0.02	0.01	0.02	0.07	0.01	0.08	0.02	0.02
B. Failing banks (within 5 years of failure)											
0.18	0.05	0.18	0.03	0.11	0.03	0.05	0.24	0.02	0.29	0.06	0.09
C. Failing banks (within 1 year of failure)											
0.20	0.06	0.21	0.04	0.14	0.04	0.07	0.27	0.02	0.31	0.08	0.12
D. Surviving banks											
0.01	0.01	0.01	0.00	0.01	0.00	0.01	0.03	0.00	0.04	0.01	0.01

Notes: This table shows the probability of a Call Report revision our main sample from 2000-2023 (Panel A), failing banks within 5 years of failure (Panel B), failing banks within 1 year of failure (Panel C) and banks that have not failed before the end of the sample (Panel D).

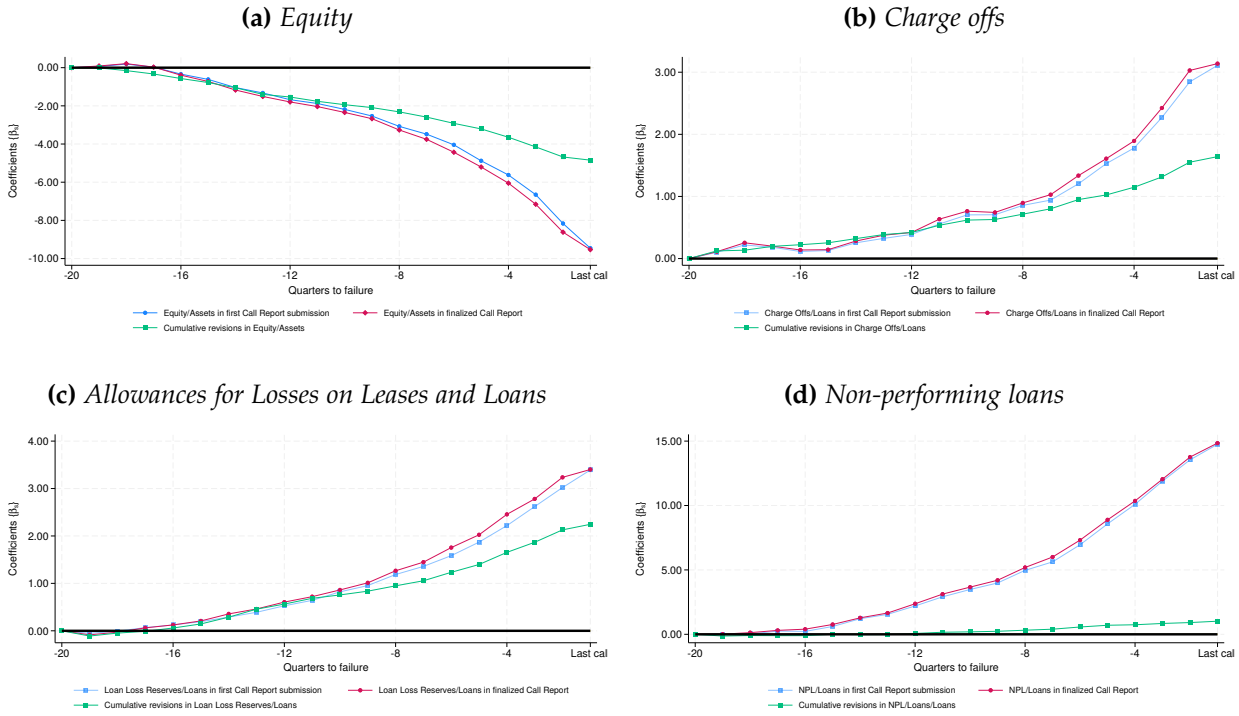
[14]The evidence Figure 4 panel (b) does not distinguish between whether supervisors are only preventing banks from delaying their statements (and thus the revisions were unavoidable eventually) or whether supervisory actions are causing revisions that would otherwise never happen.

Thus far, we have only considered revisions of previously submitted line items but not the sign of the revision. Table 5 shows the probability of revising call reports in any quarter for which a bank examination has taken place in the previous quarter. We distinguish between banks that end up failing during our sample period and those that do not fail. We confirm that revisions are considerably more likely in failing banks than in non-failing banks, in line with evidence in panel (e) of Figure 4. Further, Table 5 also shows that when failing banks submit revisions, they are more likely to revise their loan loss provisions, ALLL, and charge-off upwards and their book equity or net income downwards. Remarkably, a bank that will end up failing within the next year will revise its Call Report in a way that its equity and income are lower after the revision with a 30% and 27% chance, but only higher with a 2% and 7% chance, respectively. Likewise, these banks will revise their loan loss provisions upwards with a 18% chance, while downwards only with a 3% chance. This reinforces the idea that increases in provisions are a key driver of the reduction in bank income. Notably, the same is not true for non-performing loans, which are more likely to decrease after a revision, possibly reflecting supervisors forcing banks to charge off non-performing loans.

The revisions of previously submitted financial statements can be material in troubled banks. Figure 5 plots the dynamics of revisions in failing banks in the 5 years before they fail. Failing banks see a considerable increase in the probability of revising their equity and loan loss provisions before failure. Importantly, panel (a) shows that the cumulative implied changes are material. For instance, the equity-to-assets ratio tends to fall by around 9 ppt in failing banks in the 5 years before they fail. Around 4 ppt of the decline comes after revisions of original call report submissions.

Taken together, the findings presented in this section suggest that banks have a lot of discretion in their provisioning practices, which gives supervisors a crucial role in auditing banks and ensuring the accuracy of their financial statements.

Figure 5: ***Call Report Revisions in Failing Banks***



Notes: The figure presents the sequence of coefficients from estimating

$$y_{b,t} = \alpha_b + \sum_{j=-10}^{0} \beta_j \times \mathbf{1}_{j=t} + \epsilon_{b,t}$$

where $y_{b,t}$ is a bank-level outcome such as the bank's equity-to-assets ratio, j measures the number of years to failure, and α_b is a bank fixed effect. The sample is restricted to failing banks, to the five years before they fail, and to banks that fail after 2007.

Public Enforcement Actions

An important supervisory tool is to take enforcement actions. Supervisors can take formal, publicly posted enforcement actions if an entity is in violation of laws, rules, and regulations or engaging "unsafe and unsound" practices.[15] Formal enforcement actions range from "Written Agreements" and "Cease and Desist Orders", to more drastic measures such as "Prompt Corrective Action" (see, e.g., Curry et al., 1999).[16] As noted

[15]Supervisors may also undertake less formal forms action by issuing Matters Requiring (Immediate) Attention (MR(I)As) (see Eisenbach et al., 2017). These actions are confidential and thus do not affect a bank's business model in a way public enforcement action would.

[16]PCA requires a bank to issue new equity. It also restricts activities banks can undertake more broadly, including restrictions on interest rates banks can offer on deposits.

above, formal enforcement action taken by federal supervisors are made public once they become effective. We next study whether supervisors are more likely to take enforcement actions in troubled banks.

Figure 6 shows the probability of being subject to public enforcement action across failing and surviving banks from anytime between 2000 and 2023. We find that, of all banks that end up failing at some point over that period, at least 80% were subject to some form of public enforcement action before they failed.[17] This probability is considerably lower for banks that have not failed during the same time, of which only around 35% were subject to some form of enforcement action. Enforcement action is more than twice as likely in banks that end up failing. Hence, supervisors act on some of the information they have about troubled banks.

Further, the difference across failing and surviving banks is even more striking when considering the most drastic forms of enforcement. We find that around 25% of all banks that failed between 2000 and 2023 were subject to PCA before they failed, whereas almost no surviving bank was subject to PCA. Notably, even though PCA is considerably more likely in failing banks, the majority failing banks, even if subject to some formal enforcement action, are not subject to PCA before they fail.

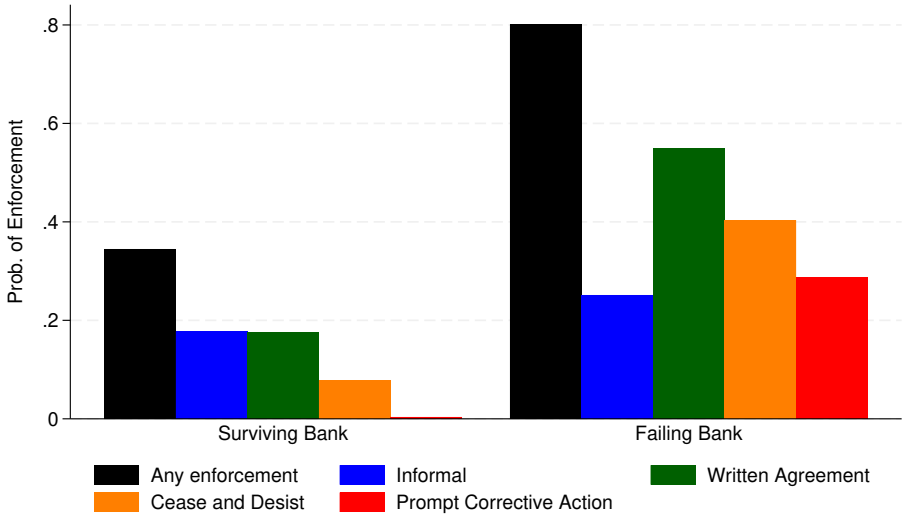
What determines whether a bank is subject to enforcement action? What drives the absence of drastic enforcement action prior to failure in most failing banks? These questions are especially important in light of the fact that supervisors can anticipate when banks are in trouble, but yet they seem not to make use of the most drastic form of enforcement action. In principle, supervisors may hold back on taking enforcement actions even in banks have they identified as problematic due to political economic constraints (Brown and Dinç, 2005) or distorted incentives (see, e.g., Lucca et al., 2014).

One potential explanation for the lack of enforcement action, especially the most drastic forms of enforcement, is that enforcement actions require banks to be undercapitalized in a

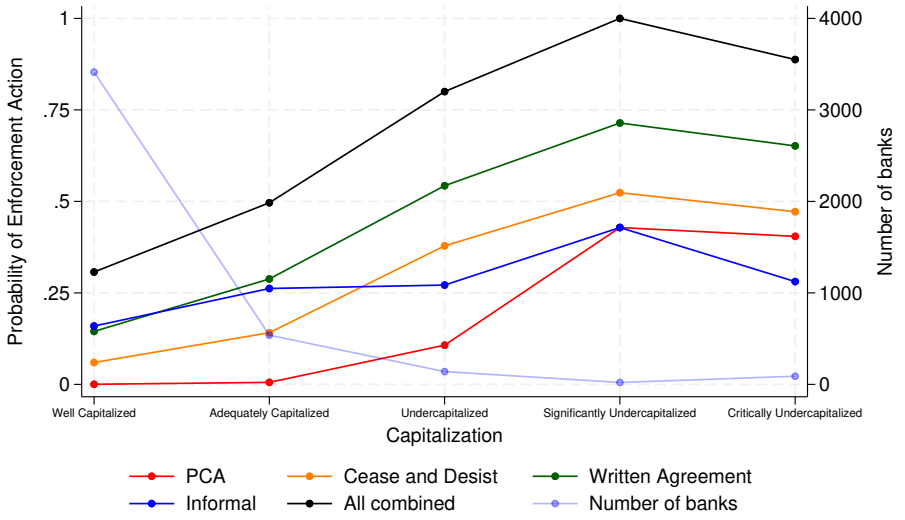
[17] Note that we do not observe formal enforcement actions taken by state regulatory agencies, which makes our estimates of the probability public enforcement action a lower bound.

Figure 6: ***Enforcement Actions for Failing and Surviving Banks***

(a) *Enforcement across failing and surviving banks*



(b) *Enforcement by capitalization*



Notes: Panel (a) plots the probability of a bank being at least once subject to public enforcement action between 2000 and 2023, distinguishing between banks that end up failing over the same time period and those that don't fail. Panel (b) plots the probability of a bank being at least once subject to public enforcement action between 2000 and 2023 across banks' minimum level of capitalization ever reported before the enforcement action was taken.

legal sense. For instance, PCA is only advised when a bank is "critically undercapitalized," which is triggered when its tangible common equity (TCE) falls short of 2% (see, e.g., Ivanov and Karolyi, 2023). However, failing banks, even as their solvency deteriorates

for many years in the run-up to failure, may only become critically under-capitalized right before failure. Thus, there may not be sufficient time between a bank becoming undercapitalized and its ultimate failure for supervisors to undertake enforcement action.

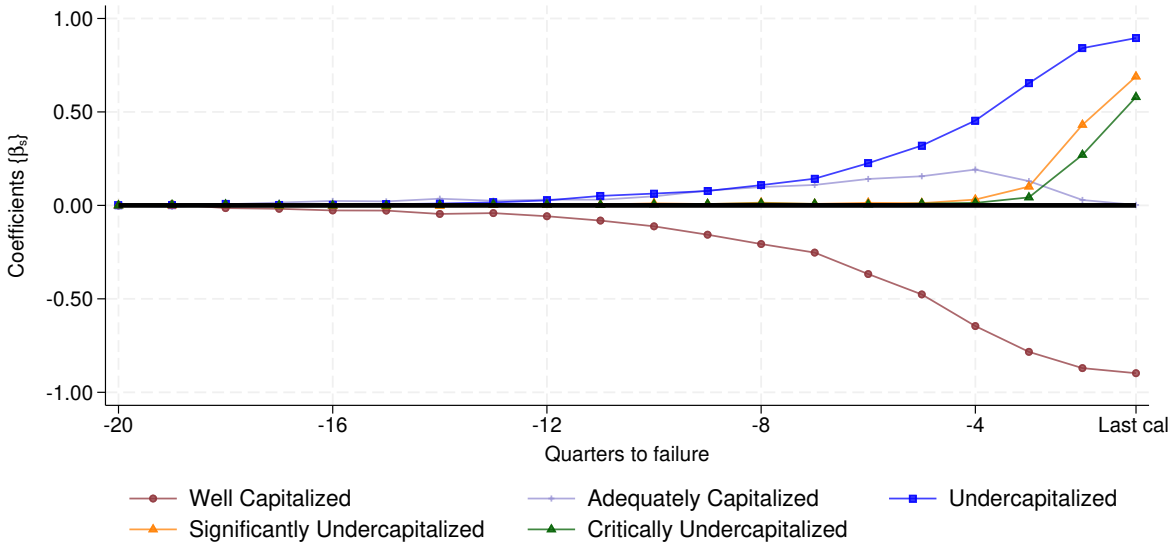
Indeed, we find that a key determinant of enforcement action is a bank's capitalization. Figure C.6 shows the probability of three types of enforcement actions conditional on a bank's capitalization. Banks that are significantly under-capitalized or critically under-capitalized are almost surely subject to some form of enforcement action. For instance, a significantly under-capitalized bank has a 75% chance of being subject to a "written agreement" and 50% chance of being subject to a "cease and desist" order. Moreover, the probability of PCA is just shy of 50% once a bank is under-capitalized but close to zero otherwise.

Moreover, we also find that failing banks tend to cross the legal thresholds that trigger drastic enforcement action such as PCA relatively late. Figure 7 plots results from estimating Equation (1) when using a dummy that indicated whether a bank is "well," "adequately," or "under-capitalized"; and if under-capitalized whether its "significantly" or "critically" under-capitalized.[18] Figure 7 reveals that failing banks only become under-capitalized to an extent that requires formal legal action by supervisors in the months right before failure. This leaves little time for enforcement action to be formalized. For instance, Table B.7 shows that on average only 20% of all failing banks are critically under-capitalized within one year of failure, and only around 57% are critically under-capitalized within one quarter of failure.

Thus, one potential explanation for the lack of enforcement action, especially the most drastic forms of enforcement, is that failing banks, even as their solvency deteriorates for many years before failure, only become substantially under-capitalized right before failure, leaving little time for formal enforcement action.

[18]Definitions here: https://www.ecfr.gov/current/title-12/chapter-II/subchapter-A/part-208/subpart-D.

Figure 7: ***Capitalization in Failing Banks***

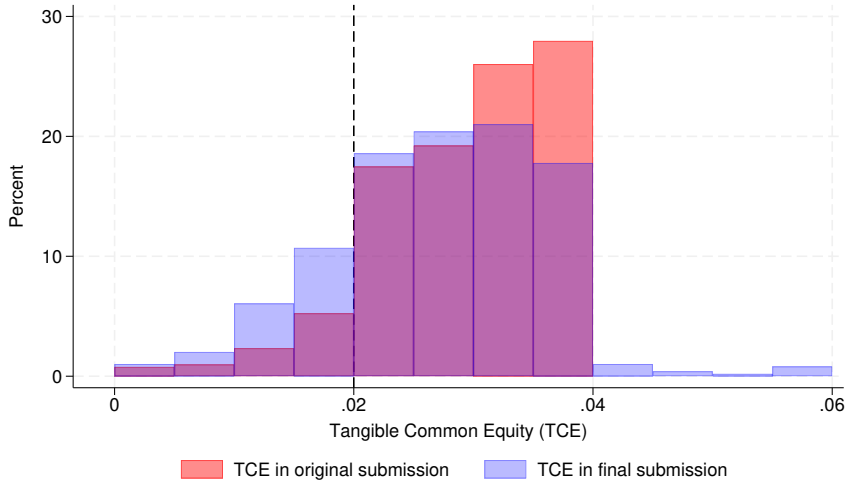


Notes: This figure plots the set of coefficients $\{\beta_t\}$ from estimating Equation (1) when using a dummy that indicated whether a bank is well, adequately, or under-capitalized; and if under-capitalized whether its significantly or critically under-capitalized.

Call Report Revisions and Enforcement Actions Enforcement action is often formalized only when a bank is classified as either significantly or critically under-capitalized. This implies a potential interaction between supervisory audits, which require banks to restate their previously submitted financial statements, and legal supervisory intervention. As mentioned above, PCA is triggered when a bank becomes critically under-capitalized, defined as when Tangible Common Equity (TCE) falls short of 2 percent. If banks want to avoid triggering PCA, they may have incentives to report a financial statement with a TCE ratio exceeding 2%.

To shed light on whether banks actively try to avoid crossing the cutoff that triggers PCA, Figure 8 plots the distribution of TCE in banks with TCE less than 4% both before and after a resubmission of their call report during which income and equity-to-assets were restated. The figure suggests that there is a clear shift of banks' TCE moving below the 2 percent cutoff after resubmission. This shift of mass of banks with a TCE above 2% to banks with TCE under 2% is in line with some banks taking advantage of their discretion in reporting financial statements, which allows them to maintain an official

Figure 8: ***Call Report Revisions around the Prompt Corrective Action Cutoff***



Notes: This figure plots the distribution of Tangible Common Equity (TCE) as reported in both the first submitted and the final Call Report, conditional on a bank having TCE below 4% and conditional on the bank subsequently revising its original submission. The vertical line indicates the 2% cutoff at which a bank becomes formally "critically under-capitalized" and PCA is triggered.

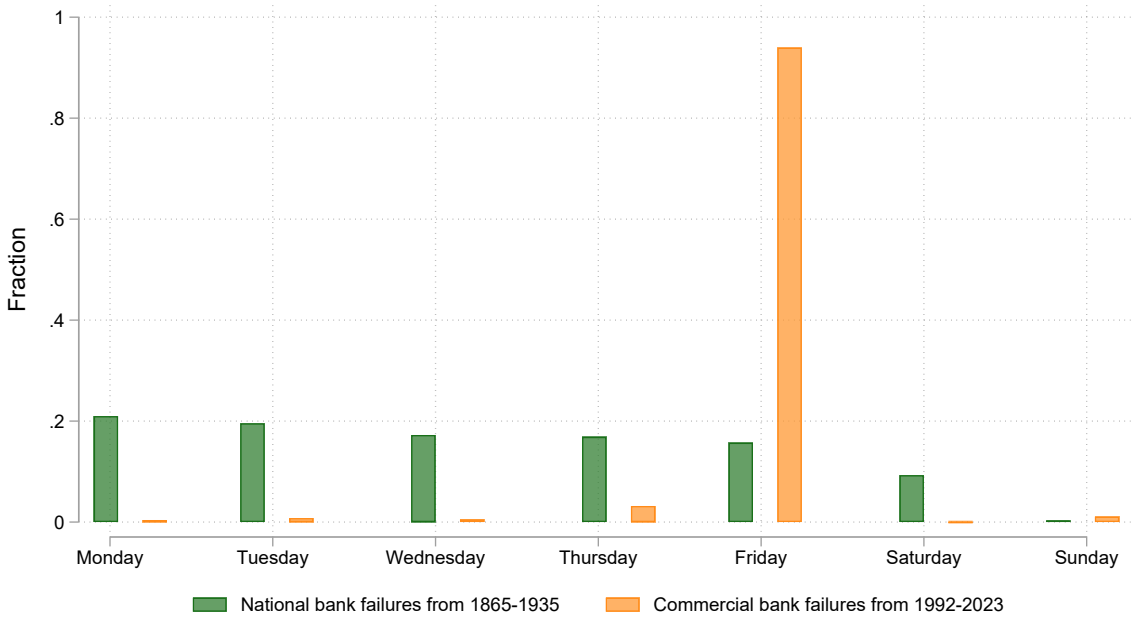
TCE-ratio of above 2% and thus avoid PCA. However, following a supervisory on-site exam, some of these banks then report a TCE that crosses the threshold whereby PCA can be triggered. Thus, there is evidence of an interaction between the auditing function and enforcement function of supervisors, with on-site examinations leading to changes in banks' financial statements that pave the way for public enforcement action.

Bank resolution

Finally, we provide evidence on the role of bank supervisors in bank resolution. First, in line with the fact that supervisors are typically not surprised by bank failure, we document that the timing of bank closures typically involves a supervisory decision. To illustrate this point, Figure 9 shows the distribution of failure dates across weekdays. The figure reveals that banks seldom fail on days other than Friday, the FDIC's preferred bank closure day (see, e.g., Walter, 2004). This pattern reinforces that supervisory action almost always determines the timing of a bank closure. Market forces such as deposit withdrawals typically do not trigger the immediate cause of a bank closure, in line with

the absence of market discipline in closing banks along the lines of theories such as Diamond and Rajan (2001). Notably, this pattern is in strong contrast to pre-FDIC failures. Using data on bank failures between 1865 and 1935, which includes both the pre-FRS and pre-FDIC eras, provided by Correia et al. (2024), Figure 9 shows that failure dates were effectively uniformly distributed across weekdays. This re-emphasizes that, while the decision of exactly when to close a bank was typically made by bank owners or depositors before the existence of deposit insurance, bank closures are usually a supervisory decision in the contemporary U.S. banking system.[19]

Figure 9: ***Weekday of Bank Failures Pre- and Post-FDIC***



Notes: This figure plots the fraction of bank failures by weekday for both a pre-FDIC sample consisting of failed national banks from 1865 through 1935 and a sample of failed FDIC member banks from 1992 through 2023. Data on national bank failures are from Correia et al. (2024).

Second, we find that when banks are closed, they are almost always purchased by another bank. Figure 10 shows that more than 500 of the 550 bank failures since 2000 resulted in the purchase of the failing bank by another bank. The purchasing bank, in turn, assumed all deposits, including uninsured deposits. Failures where only insured

[19] Before deposit insurance, insolvent banks were often closed by depositor runs, though Correia et al. (2024) show that runs rarely caused the failure of solvent banks.

deposits were assumed or the deposit insurance fund required a payout account for less than 10% of failures since 2000.

The fact that most failing banks' entire deposit franchise is purchased by another bank implies, in turn, that loss rates on uninsured deposits have been very low in the recent history of the U.S., see Table 6. For instance, since 2008, the unconditional loss rate on uninsured deposits has been on average 3 cents on the dollar. Again, this is in contrast to the pre-FDIC era for which Correia et al. (2024) estimate depositor loss rates of over 30 cents on the dollar in bank failures.

These findings here, however, do not imply that bank closing are not costly. The FDIC itself tends to realize losses during the resolution. These losses can be either due to losses from the resolved bank's investments but also inefficiency associated with the process of selling failed banks (Granja, 2013; Granja et al., 2022; Allen et al., 2023).

Table 6: ***Loss Rates for Uninsured Depositors in Bank Failures***

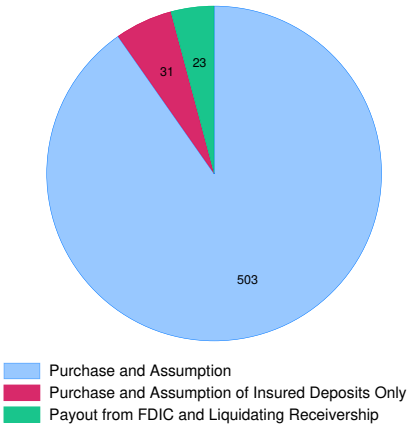
Era	Number of failures	Failures with losses to depositors	Conditional loss rate	Unconditional loss rate
1992-2008	302	0.43	0.24	0.10
2008-2022	536	0.06	0.43	0.03
All	838	0.2	0.28	0.06

Notes: This table reports the loss rates on uninsured deposits for failures of commercial banks in the U.S. between 1992 and 2022. The data are as reported in FDIC (2023).

4 Casual Effect of Bank Supervision on Financial Stability

Supervisors often anticipate problems in weak banks, and supervisory ratings strongly predict bank failures. Moreover, supervisors increasingly monitor troubled banks and influence their financial statements to make banks recognize losses. They are also likely to take all but the strongest enforcement action, and supervisors usually determine when failing banks are closed. In this section, we ask: How does stricter supervisory scrutiny

Figure 10: ***Resolution of Failing Banks by Resolution Type: 2000-2023***



Notes: This figure shows the count of resolution types of FDIC member banks that failed between 2000 and 2023. There are three type of failures. PA: "Purchase and Assumption", where the insured and uninsured deposits, certain other liabilities and a portion of the assets were sold to an acquirer. PI: "Purchase and Assumption of the insured deposits only", where the traditional P&A was modified so that only the insured deposits were assumed by the acquiring institution. And, PO: "Payout", where the insurer paid the depositors directly and placed the assets in a liquidating receivership.

impact bank-level outcomes in a crisis? We present evidence from a natural experiment that allows us to assess the causal impact of supervisory scrutiny on bank-level outcomes.

The counterfactual we would like to estimate is how banks would fare if they were subject to more or less supervisory attention and action. Empirically, the effect of the presence of supervisory action on bank outcomes is difficult to assess. Supervisory scrutiny and supervisory actions are endogenous and typically—as documented in Section 3—a response to a bank's financial conditions. For instance, as discussed above, troubled banks are subject to more frequent examinations and more likely to be subject to an on-site exam led by relatively tougher federal supervisors.

To address this identification challenge, we exploit differences across supervisors from federal and state agencies. We exploit that state-agency-led exams tend to be more lenient than federal supervisors. Moreover, we make use of the institutional fact that there is a quasi-random assignment of examiners via the rotating schedule of supervisors (Agarwal et al., 2014) at the onset of the GFC. Non-member banks (NMBs) and state-member banks (SMBs) that were on the rotating schedule before the GFC and had a state-led exam right

before the start of the GFC were relatively more likely to be subject to a federal-led exam early on in the GFC for reasons that are unrelated to their underlying financial conditions.

Specifically, we estimate a bank-level regression model of the following form:

$$y_b = \beta \times \text{FDIC/FRS exam early in GFC}_b + \gamma \times X_b + \epsilon_b, \tag{4}$$

where y_b is a bank-level outcome realized sometime during the GFC (measured as between 2008 and 2013) or after the GFC (measured from 2014 through 2018). We consider various outcomes variables. y_b can either the probability of failing during GFC, the probability of enforcement action during GFC, the speed of failure (days passed between 01 October 2008 and failure date), the probability of revising a previously published financial statement during the GFC, capitalization during and after the GFC, or the scope of and efficiency of a bank operation both during and after the GFC.

FDIC/FRS exam early in GFC_b is a dummy that takes the value one if bank b is subject to an exam by federal supervisors early in the GFC. We define "early GFC" as the 18 months between January 2008 and June 2009.[20] As mentioned above, whether a bank is subject to an exam led by a federal supervisor is endogenous, as federal supervisors are more likely to lead exams in troubled banks. Therefore, we instrument having a FDIC/FRS-led exam early in the GFC with being on the rotating schedule and having a state-led exam *before* January 2008.

The identifying assumption is that the assignment of a relatively stricter federal supervisor early on in the GFC, right as banks and supervisors were learning about the broader distress in the U.S. financial sector, is exogenous to banks that were previously on the rotating schedule and subject to a state-led exam before the GFC. Importantly, initial supervisory scrutiny during the GFC is crucial as it gives rise to a potential path-

[20]We choose an 18-month window as most banks are on an 18-month rotating schedule. Further, we choose January 2008 as the starting point (as opposed to August 2007 and the run on the ABCP market) as the bank failure rate only starts to pick up in 2008, peaking in 2010 (see Figure C.2 in the Appendix). Our results are broadly robust to defining "early GFC" as an 18-month period starting in August 2007 through December 2007.

dependency in which banks identified as troubled early on are more likely to receive more scrutiny throughout the entire crisis. This notion of path-dependency is supported by the evidence provided above, which shows that once a bank stops qualifying for the rotating schedule, it is likely to receive additional scrutiny. In that sense, additional scrutiny early in the GFC begs additional scrutiny throughout the GFC. This view, which we reinforce below, is also supported by the evidence that examiners were resource constraint during the GFC (see, e.g., Eisenbach et al., 2022). Thus, banks that were identified as troubled before the spike of bank failures that required supervisors to "triage" were more likely to get additional scrutiny as the GFC played out, as supervisors were naturally prioritizing dealing with banks that had already been labeled as troubled.

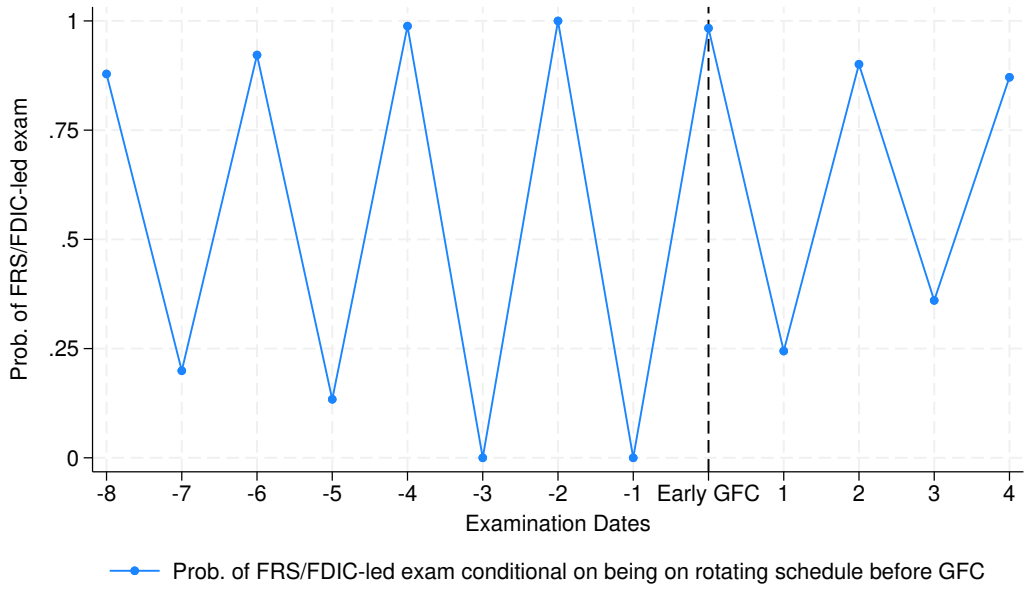
4.1 First-stage

We first verify the viability of the first stage. We start by showing banks on the rotating schedule whose last exam before the GFC was led by a state agency are significantly more likely to be subject to a federal exam in the early GFC. There is no variable reported that indicates whether a given exam is part of a rotating pattern. We thus define a bank as being on the rotating schedule before the GFC if the last three exams before January 2008 had a rotating pattern. For example, if the bank's last exam before the GFC was state-led, then the bank's second-to-last exam before the GFC was led by a federal agency, and the exam prior to that exam was state-led. Moreover, we restrict the sample to banks that generally qualify for the rotating schedule.[21]

Figure 11 plots the probability of a FDIC/FRS-led exam by bank conditional on the the last exam before January 2008 being a state-led exam and the two exams before that exam having a rotating pattern. Thus, the coefficients for the three exams leading up to the GFC are mechanically 0, 1, and 0. As is clear from Figure 11, the rotating pattern is quite

[21]We define a bank as qualifying for the rotating schedule if it is a SMB or NMB that has a CAMELS rating of either 1 or 2 and has less than $10 billion in assets.

Figure 11: *Probability of FRS/FDIC Exam Early in GFC for Banks on the Rotating Schedule Before the Crisis*



Notes: This figure plots the probability of a federal exam conditional on having the last three consecutive exams before January 2008 rotating between federal and state supervisors, with the last exam before January 2008 being a state-led exam. The date "Early GFC" is the first exam a bank is subject to after January 2008.

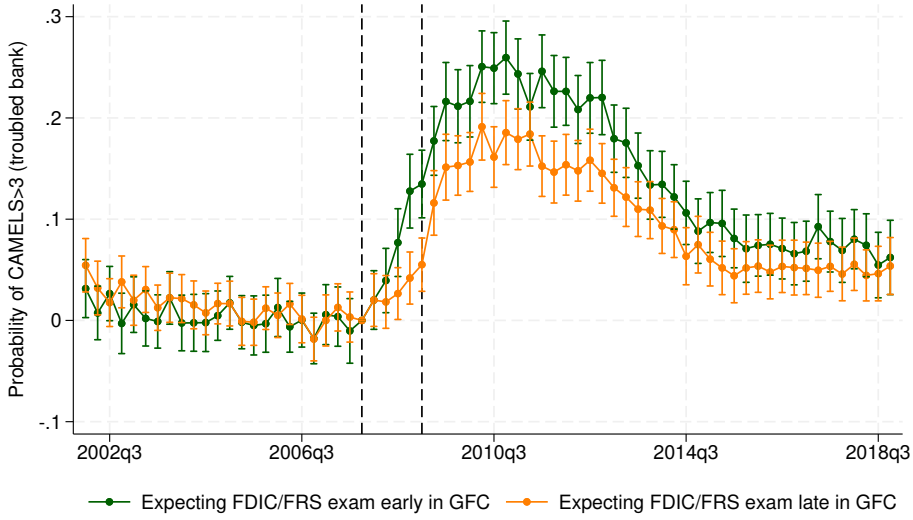
robust across time. Banks that were on the rotating schedule before the GFC are highly likely to have a federal-led exam early in the GFC if their last exam before the GFC was state-led. That is, the first stage is very strong. Over time, the rotating pattern becomes less pronounced, in line with banks dropping off the schedule when they disqualify—for instance after being downgraded.

4.2 Findings

Probability of Being Labeled a Troubled Bank and Supervisor Scrutiny

We start by tracing the evolution of the probability of being a troubled bank (defined as a CAMELS rating above 3) throughout the GFC for banks that were on the rotating schedule before the GFC, distinguishing between banks that were likely to have a federal exam early in the GFC and those likely to have a state exam early in the GFC—the intent to treat. This outcome variable of being rated with a CAMELS of 4 or 5 is informative,

Figure 12: *Probability of Being Rated a Troubled Bank (CAMELS>3) by Type of Examiner Expected Early in the GFC*



Notes: This figure shows the sequence of coefficients $\{\beta_k\}$ from estimating:

$$y_{bt} = \alpha_b + \sum_{k \neq 2007q4} \beta_k \times \mathbb{I}_{k=t} + \epsilon_{bt},$$

where y_{bt} is bank b's CAMELS rating and α_b is a set of bank fixed effects. Standard errors are clustered at the bank level. Error bars represent 95% confidence bands.

as it is a key input into whether a bank is considered troubled and thus likely to receive additional supervisory scrutiny.

Figure 12 plots the within-bank dynamics of the probability of receiving a CAMELS rating of 4 or 5, normalized to the level in summer 2007 for banks on the rotating schedule that had their last exam before January 2008 led by a state examiner and were thus expecting a federal exam next (green line) and banks that were subject to a federal exam and were thus expecting a state-led exam next (orange). By construction, there is no differential pre-trend in Figure 12. After all, banks on the rotating schedule are required to have a CAMELS rating of either 1 or 2 in the last three exams before January 2008, allowing for little variation before 2008. Thus, unsurprisingly, the probability of having a rating above 3 follows the same trajectory before the GFC. Right after January 2008, however, the probability of being rated with a 4 or 5 increases for both groups, in line with rising asset losses and broader distress in the banking sector. Notably, however, banks

that were more likely to be subject to a federal-led exam see a faster increase around this time. Thus, in line with federal examiners being relatively tougher, banks that expected a federal exam early in the GFC saw a larger increase in the probability of being rated as a troubled bank. The banks expected to receive a state-led examination early in the crisis see some catch-up throughout the second half of 2009—exactly when these banks were likely to be scheduled for a federal exam according to the rotation principle. However, the overall difference in the CAMELS rating is persistent and disappears only around 2016, after the GFC is over. Thus, the pattern in Figure 12 indicates that banks subject to additional supervisory scrutiny early in the GFC were also subject to more supervisory scrutiny throughout the GFC, consistent with path-dependence based on initial scrutiny.

Table 7: *CAMELS, Probability of CAMELS>3, and number of on-site examinations during the GFC.*

Dependent Variable	CAMELS		Prob of CAMELS>3		No. of FRS/FDIC exam		No. of Exams	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FDIC/FRS exam early in GFC	0.19***	0.12***	0.090***	0.085***	0.90***	0.71***	0.55***	0.46***
	(0.021)	(0.027)	(0.011)	(0.014)	(0.065)	(0.086)	(0.072)	(0.095)
Observations	4544	4544	4544	4544	4544	4544	4544	4544
Mean dep. var	2.19	2.19	0.21	0.21	3.45	3.45	5.34	5.34
R^2	0.25	0.051	0.16	0.034	0.24	0.083	0.18	0.057
State FE	✓	✓	✓	✓	✓	✓	✓	✓
Baseline Controls	✓	✓	✓	✓	✓	✓	✓	✓
First-stage F-stat		7329.2		7329.2		7329.2		7329.2

Notes: This table reports results from estimating a model of the following form:

$$y_b = \beta \times \text{FDIC/FRS exam early in GFC}_b + \gamma \times X_b + \epsilon_b,$$

where y_b is either the banks average CAMELS rating, the probability of being rated with a 3 or higher, the number of total exams and the number of exam led by a federal agency from 2008 through 2013. FDIC/FRS exam early in GFC_b is a dummy that indicates whether bank b was subject to at least one exam led by a federal agency in the early phase of the GFC, defined as the 18 month between January 1, 2008 and July 1, 2009. We provide both OLS and 2SLS estimates. In the 2SLS model, we instrument whether a bank is subject to a federal exam in the early phase of the GFC with whether it was having rotating exams in the three previous exams. The sample is restricted to state-member banks and non-member banks that are supervised by either the Federal Reserve, the FDIC, or state regulatory agencies. Baseline controls are a bank's leverage and bank assets (in log) as of 2007q4. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

This pattern is confirmed when estimating our main regression model Equation (4). Table 7 shows that banks subject to an examination led by a federal agency early in

the GFC received a 0.12 higher CAMELS rating on average and had a 8.5 percentage point higher chance of being rated as a troubled bank. These banks also underwent 0.71 more exams led by a federal agency and 0.46 additional overall exams from 2008 to 2013. Importantly, all estimates are larger when estimating the model using OLS, compared to applying the instrumental variable approach. This indicates that the OLS estimates are likely biased, as federal examiners select into examining more troubled banks. However, reassuringly for our purposes, the difference between banks that were subject to a federal exam early in the GFC and those that were later remains when instrumenting with having been on the rotating schedule before the GFC.

Supervisory Scrutiny and Bank Outcomes

We next study how additional supervisory scrutiny affects bank-level outcomes. Table 8 shows results when estimating the effect of supervisory scrutiny early in the GFC on the probability of bank closure, the speed of failure, and the likelihood of enforcement action throughout the GFC. Again, we report both OLS and 2SLS estimates. Column (1) shows that banks subject to at least one federal-led exam early in the GFC were 3.5 percentage points more likely to fail from 2008 through 2013. This is a considerable difference given a failure rate of 6.2% for the entire sample. The difference is slightly smaller in the IV reported in column (2), where we find that a bank that receives additional scrutiny has a 2.7 percentage point higher chance of failing. The slightly smaller coefficient is again consistent with the OLS being biased and federal examiners in part selecting to examine more troubled banks.

Further, columns (3) through (8) of Table 8 show that banks that receive supervisory scrutiny early in the GFC are—conditional on failing—likely to fail faster and more likely to be subject to enforcement action. For instance, we find that supervisory scrutiny early in the GFC leads to a 4 percentage point higher chance of being subject to some type of enforcement action and a 0.9 percentage point higher chance of being subject to PCA

sometime between 2008 and 2013—both differences are considerable in terms of their magnitude given that the overall chance enforcement action is 24% and that of PCA 2.5%. Taken together, our findings thus suggest that those banks subject to a federal-led exam early on in the GFC are more likely to be subject to enforcement action and to be closed.

Table 8: *Failure, speed of failure, and enforcement actions*

Dependent Variable	Probabiliy of Failure		Speed of Failure (days)		Enforcement		PCA	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FDIC/FRS exam early in GFC	0.035***	0.027***	-230.0***	-125.6	0.080***	0.039**	0.011***	0.0090*
	(0.0057)	(0.0080)	(78.2)	(119.0)	(0.012)	(0.015)	(0.0039)	(0.0054)
Observations	4546	4546	224	224	4544	4544	4544	4544
Mean dep. var	0.062	0.062	986.2	986.2	0.24	0.24	0.025	0.025
R^2	0.11	0.0062	0.24	0.036	0.098	0.0069	0.055	0.0013
State FE	✓	✓	✓	✓	✓	✓	✓	✓
Baseline Controls	✓	✓	✓	✓	✓	✓	✓	✓
First-stage F-stat		7496.8		71.9		7484.3		7484.3

Notes: This table reports results from estimating a model of the following form:

$$y_b = \beta \times \text{FDIC/FRS exam early in GFC}_b + \gamma \times X_b + \epsilon_b,$$

where y_b is either a dummy whether the bank failed during the GFC, the speed of failure (how many passed between January 1, 2008 and failure), whether the bank was subject to any public enforcement action, or whether the bank was subject to Prompt Corrective Action (PCA) (any point in time between 2008 and 2013). FDIC/FRS exam early in GFC_b is a dummy that indicates whether bank b was subject to at least one exam led by a federal agency in the early phase of the GFC, defined as the 18 month between January 1, 2008 and July 1, 2009. We provide both OLS and 2SLS estimates. In the 2SLS model, we instrument whether a bank is subject to a federal exam in the early phase of the GFC with whether it was having rotating exams in the three previous exams. The sample is restricted to state-member banks and non-member banks that are supervised by either the Federal Reserve, the FDIC, or state regulatory agencies. Baseline controls are a bank's leverage and bank assets (in log) as of 2007q4. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

In Section 3, we saw that supervisors potentially play a crucial role in ensuring the accuracy of a bank's financial statements. We next estimate Equation (4), instrumenting using the rotating schedule, using a dummy of whether a bank revised selected line items in the Call Report after its initial submission. Specifically, we ask whether banks that are subject to additional supervisory scrutiny early in the GFC are more likely to revise their net income or book equity downwards and their loan loss provisions and charge-offs upwards during the GFC. Table 9 shows the results. Banks that were subject to a federal-led exam early in the GFC were generally more likely to revise their financial

statements to reflect increased realized credit risk. For instance, banks subject to a federal exam early in the GFC have a 1.4 percentage point higher probability of revising their net income downwards (see column (2)) and a 1.8 percentage point higher probability of revising their equity downwards (see column (4)) sometime between 2008 and 2013. These downward revision are at least in part driven by an an increase in loan loss provisions which are 1% more likely to be revised upwards in banks subject to more regulatory scrutiny (see column (6)). Taken together, our findings suggest that additional supervisory scrutiny leads banks to recognize losses that would otherwise go unnoticed or be only recognized much later.

Table 9: *Supervisory Scrutiny and Revisions of Previously Submitted Call Reports during the GFC*

Dependent Variable	Prob. of downward revision		Prob. of upward revisions	
	Income/Assets	Equity/Assets	LLP/Loans	Charge-Offs/Loans
	(1)	(2)	(3)	(4)
FDIC/FRS exam early in GFC	0.014***	0.018***	0.010***	0.0055***
	(0.0030)	(0.0035)	(0.0022)	(0.0016)
Observations	4544	4544	4544	4544
Mean dep. var	0.054	0.061	0.032	0.017
R^2	0.0071	0.0066	0.0052	0.0028
State FE	✓	✓	✓	✓
Baseline Controls	✓	✓	✓	✓
First-stage F-stat	7484.3	7484.3	7484.3	7484.3

Notes: This table reports results from estimating a model of the following form:

$$y_b = \beta \times \text{FDIC/FRS exam early in GFC}_b + \gamma \times X_b + \epsilon_b,$$

where y_b is a dummy indicating whether a bank b revised the line item indicated in the table header at least once between 2008 and 2013. In columns (1) through (4) we consider downwards revisions of either net income or bank equity. In columns (5) through (8), we consider upwards revisions in either loan loss provisions or charge-offs. FDIC/FRS exam early in GFC_b is a dummy that indicates whether bank b was subject to at least one exam led by a federal agency in the early phase of the GFC, defined as the 18 month between January 1, 2008 and July 1, 2009. We provide both OLS and 2SLS estimates. In the 2SLS model, we instrument whether a bank is subject to a federal exam in the early phase of the GFC with whether it was having rotating exams in the three previous exams. The sample is restricted to state-member banks and non-member banks that are supervised by either the Federal Reserve, the FDIC, or state regulatory agencies. Baseline controls are a bank's leverage and bank assets (in log) as of 2007q4. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

How does higher supervisory scrutiny affect a bank's capitalization? First, we consider capitalization during the GFC. Table 10 shows that banks subject to more supervisory

scrutiny early in the GFC have a similar level of equity-to-assets as banks subject to less scrutiny during the GFC. Second, we study the average capitalization after the GFC, between 2014 and 2018. Column (2) shows that banks subject to additional supervisory scrutiny early in the GFC end up with a 56 bps higher equity-to-assets ratio after the GFC. This increase in capitalization is not driven by an increase in retained earnings, but rather a decline in the bank loans and assets. Specifically, column (4) shows that bank with higher supervisory scrutiny end up with a 1.3% lower loans-lo-assets ratio after the GFC. At the same time, we find no evidence that banks that are subject to additional supervisory scrutiny reduce their dividend payment either during the GFC (column (5)), though they have slightly lower dividends after the GFC. The latter is in line with restrictions on dividend payments being quite rare and requiring drastic enforcement action such as PCA.

Table 11 confirms this pattern of a decline in the overall business size of banks that are subject to additional supervisory scrutiny early on in the GFC. We find that banks subject to additional supervisory scrutiny see a decline in their total number of employees relative to their pre-GFC employment level of around 4% during the GFC and by around 7% after the GFC. At the same time, these banks are likely to reduce the size of their branch network and close on average around 0.75 branches relative to their pre-GFC branch network.

Finally, Table 12 provides some additional details on the margins of adjustment. Specifically, we find that banks subject to additional supervisory scrutiny have a more efficient compensation-to-employees ratio. Columns (1) and (2) show that banks subject to additional supervisory scrutiny pay around $900 less in annual average salaries than those that receive less scrutiny. This finding can be driven by both these banks laying off relatively better compensated employees (recall that we find that these banks reduce their total head count, see Table 11) but also potentially by reducing variable pay. Interestingly, we do not find any differences in the probability of the CFO being replaced (columns (3)

Table 10: *Supervisory Scrutiny and Capitalization, Loan-to-Assets, and Dividends During and After the GFC*

Dependent Variable	Equity/Assets		Loans/Assets		Dividends/Assets	
	during GFC	after GFC	during GFC	after GFC	during GFC	after GFC
	(1)	(2)	(3)	(4)	(5)	(6)
FDIC/FRS exam early in GFC	0.0015	0.0056***	-0.0028	-0.013**	-0.00062	-0.0031*
	(0.0013)	(0.0016)	(0.0055)	(0.0065)	(0.0016)	(0.0019)
Observations	4544	3703	4544	3703	4543	3702
Mean dep. var	0.087	0.11	0.64	0.63	0.039	0.046
R^2	0.44	0.35	0.081	0.047	0.014	0.025
State FE	✓	✓	✓	✓	✓	✓
Baseline Controls	✓	✓	✓	✓	✓	✓
First-stage F-stat	7329.2	6858.0	7329.2	6858.0	7332.2	6857.8

Notes: This table reports results from estimating a model of the following form:

$$y_b = \beta \times \text{FDIC/FRS exam early in GFC}_b + \gamma \times X_b + \epsilon_b,$$

where y_b is either a bank's equity-to-assets, loans-to-assets or dividens-to-assets ratio during the GFC or after the GFC (defined as sometime between 2014 an 2018). FDIC/FRS exam early in GFC_b is a dummy that indicates whether bank b was subject to at least one exam led by a federal agency in the early phase of the GFC, defined as the 18 month between January 1, 2008 and July 1, 2009. We provide both OLS and 2SLS estimates. In the 2SLS model, we instrument whether a bank is subject to a federal exam in the early phase of the GFC with whether it was having rotating exams in the three previous exams. The sample is restricted to state-member banks and non-member banks that are supervised by either the Federal Reserve, the FDIC, or state regulatory agencies. Baseline controls are a bank's leverage and bank assets (in log) as of 2007q4. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

and (4)).

5 Discussion

We study the role of supervision in failing banks to understand how banking supervision contributes to financial stability. Supervisory ratings have strong predictability for future bank failures, over-and-above information in financial statements. We find that a key role of supervision is to ensure that banks' financial statements are accurate and banks that are in financial distress are closed. Thus, our paper highlights a more basic contribution of banking supervision than previous work which emphasizes the effects on lending (Granja et al., 2017) and risk taking Hirtle et al. (2020); Kandrac and Schlusche (2020).

Table 11: *Supervisory Scrutiny and Employees, Branches, and Compensation During and After the GFC*

Dependent Variable	Num. of Emp.		Branches	
	during GFC	after GFC	during GFC	after GFC
	(1)	(2)	(3)	(4)
FDIC/FRS exam early in GFC	-0.039***	-0.069***	-0.72**	-0.65
	(0.011)	(0.018)	(0.29)	(0.53)
Observations	4536	3696	4530	3665
Mean dep. var	3.67	3.75	7.96	9.10
R^2	0.94	0.84	0.97	0.91
State FE	✓	✓	✓	✓
Baseline Controls	✓	✓	✓	✓
First-stage F-stat	7222.9	6729.5	7216.7	6714.3

Notes: This table reports results from estimating a model of the following form:

$$y_b = \beta \times \text{FDIC/FRS exam early in GFC}_b + \gamma \times X_b + \epsilon_b,$$

where y_b is either the number of total employees (in logs) or the number of total branches, during or after the GFC. FDIC/FRS exam early in GFC_b is a dummy that indicates whether bank b was subject to at least one exam led by a federal agency in the early phase of the GFC, defined as the 18 month between January 1, 2008 and July 1, 2009. We provide both OLS and 2SLS estimates. In the 2SLS model, we instrument whether a bank is subject to a federal exam in the early phase of the GFC with whether it was having rotating exams in the three previous exams. The sample is restricted to state-member banks and non-member banks that are supervised by either the Federal Reserve, the FDIC, or state regulatory agencies. Baseline controls are a bank's leverage and bank assets (in log) as of 2007q4. We include the pre-GFC level of employees and branches as controls on the RHS. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

There are some important caveats to keep in mind when interpreting our findings. First, most bank failures we consider are due to realized credit risk rather than interest rate risk (Gopalan and Granja, 2024). Second, most banks in our sample are small community banks and the role of supervisions may be different in large and complex banking institutions (Hirtle et al., 2020; Eisenbach et al., 2022). Third, our findings have no obvious normative implications and we cannot assess whether supervisors are too aggressive or too lenient when it comes to closing troubled banks. If one takes the view that supervision is too lenient, then our findings suggest an impediment to stronger enforcement is that the tangible common equity threshold for triggering prompt corrective action is relatively low, implying that PCE often cannot be triggered sufficiently early in

Table 12: *Supervisory Scrutiny, Employee Compensation, and CFO turnover*

Dependent Variable	Comp./Emp.		Prob. of CFO turnover	
	during GFC	after GFC	during GFC	after GFC
	(1)	(2)	(3)	(4)
FDIC/FRS exam early in GFC	-938.5**	-904.7*	-0.020	0.015
	(459.9)	(509.8)	(0.019)	(0.020)
Size in 2007	2540.6***	3112.8***	0.030***	0.012
	(250.6)	(315.8)	(0.0069)	(0.0075)
Equity/Assets in 2007	58926.6***	63030.1***	0.39***	0.016
	(10872.9)	(14823.1)	(0.13)	(0.15)
Observations	4536	3696	4544	3703
Mean dep. var	38832.0	44121.1	0.43	0.33
R^2	0.082	0.077	0.0041	0.00072
State FE	✓	✓	✓	✓
Baseline Controls	✓	✓	✓	✓
First-stage F-stat	7335.2	6872.2	7329.2	6858.0

Notes: This table reports results from estimating a model of the following form:

$$y_b = \beta \times \text{FDIC/FRS exam early in GFC}_b + \gamma \times X_b + \epsilon_b,$$

where y_b is either the ratio of total compensation to total number of employees or a dummy that indicates whether the CFO changed over the time period considered—and both can either as observed during the GFC or after the GFC. FDIC/FRS exam early in GFC_b is a dummy that indicates whether bank b was subject to at least one exam led by a federal agency in the early phase of the GFC, defined as the 18 month between January 1, 2008 and July 1, 2009. We provide both OLS and 2SLS estimates. In the 2SLS model, we instrument whether a bank is subject to a federal exam in the early phase of the GFC with whether it was having rotating exams in the three previous exams. The sample is restricted to state-member banks and non-member banks that are supervised by either the Federal Reserve, the FDIC, or state regulatory agencies. Baseline controls are a bank's leverage and bank assets (in log) as of 2007q4. *,**, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

failing banks.

Based on the evidence we provide, our preferred analogy for how supervision operates in failing banks is that of a city health official that conducts food inspections in restaurants and provides grades and ratings on the hygiene standards. Such health officials are not able to consult a restaurant with a failing business model on how to turn the business around. Rather, they can simply provide guidance to customers whether an establishment is safe to eat at or not. Moreover, if it becomes unsafe to dine, they can mandate a temporary or permanent closing and by that contribute to public safety.

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Supervising Failing Banks
Online Appendix

- Appendix A: Data
- Appendix B: Additional Tables
- Appendix C: Additional Figures

A Data Appendix

A.1 CAMELS Rating System

More background can be found here.

- Composite 1: Financial institutions in this group are sound in every respect and generally have components rated 1 or 2. Any weaknesses are minor and can be handled in a routine manner by the board of directors and management. These financial institutions are the most capable of withstanding the vagaries of business conditions and are resistant to outside influences such as economic instability in their trade area. These financial institutions are in substantial compliance with laws and regulations. As a result, these financial institutions exhibit the strongest performance and risk management practices relative to the institution's size, complexity, and risk profile, and give no cause for supervisory concern

- Composite 2: Financial institutions in this group are fundamentally sound. For a financial institution to receive this rating, generally no component rating should be more severe than 3. Only moderate weaknesses are present and are well within the board of directors' and management's capabilities and willingness to correct. These financial institutions are stable and are capable of withstanding business fluctuations. These financial institutions are in substantial compliance with laws and regulations. Overall risk management practices are satisfactory relative to the institution's size, complexity, and risk profile. There are no material supervisory concerns and, as a result, the supervisory response is informal and limited.

- Composite 3: Financial institutions in this group exhibit some degree of supervisory concern in one or more of the component areas. These financial institutions exhibit a combination of weaknesses that may range from moderate to severe; however, the magnitude of the deficiencies generally will not cause a component to be rated more severely than 4. Management may lack the ability or willingness to effectively address weaknesses within appropriate time frames. Financial institutions in this group generally are less capable of withstanding business fluctuations and are more vulnerable to outside influences than those institutions rated a composite 1 or 2. Additionally, these financial institutions may be in significant noncompliance with laws and regulations. Risk management practices may be less than satisfactory relative to the institution's size, complexity, and risk profile. These financial institutions require more than normal supervision, which may include formal or informal enforcement actions. Failure appears unlikely, however, given the overall strength and financial capacity of these institutions.

- Composite 4: Financial institutions in this group generally exhibit unsafe and unsound practices or conditions. There are serious financial or managerial deficiencies that result in unsatisfactory performance. The problems range from severe to critically deficient. The weaknesses and problems are not being satisfactorily addressed or resolved by the board of directors and management. Financial institutions in

this group generally are not capable of withstanding business fluctuations. There may be significant noncompliance with laws and regulations. Risk management practices are generally unacceptable relative to the institution's size, complexity, and risk profile. Close supervisory attention is required, which means, in most cases, formal enforcement action is necessary to address the problems. Institutions in this group pose a risk to the deposit insurance fund. Failure is a distinct possibility if the problems and weaknesses are not satisfactorily addressed and resolved.

- Composite 5: Financial institutions in this group exhibit extremely unsafe and unsound practices or conditions; exhibit a critically deficient performance; often contain inadequate risk management practices relative to the institution's size, complexity, and risk profile; and are of the greatest supervisory concern. The volume and severity of problems are beyond management's ability or willingness to control or correct. Immediate outside financial or other assistance is needed in order for the financial institution to be viable. Ongoing supervisory attention is necessary. Institutions in this group pose a significant risk to the deposit insurance fund and failure is highly probable.

A.2 FFIEC 010 and FFIEC 013: 1959 through 2023

For the modern, contemporary banking system, we use the Federal Financial Institutions Examination Council (FFIEC) Consolidated Reports of Condition and Income ("Call Report"). These data provide quarterly information on balance sheets (FFIEC010) and income statements (FFFIEC013) on a consolidated basis for all commercial banks operating in the United States and regulated by the FRS, the FDIC, and the OCC.

We document the construction of our variables from the various line items in table Table A.1.

Table A.1: ***Definitions of FFIEC 010 and 013 line items.***

Item	Series	Item Number	Valid Period
Assets	RCON	2170	1959–12–31 to present
Equity	RCON	3210	1959–12–31 to present
Deposits	RCON	2200	1959–12–31 to present
Loans	RCON	1400	1959–12–31 to present
		2122	1976–03–31 to present
Cash	RCON	0010	1959–12–31 to present
Securities	RCON	0400 + 0600 + 0900 + 0950	1959–06–10 to 1976–03–31
		0390	1976–03–31 to 1993–12–31
		1754 + 1773	1994–03–31 to present
C&I loans	RCON	1600	1959–12–31 to 1984–03–31
		1766	1984–03–31 to present
Real Estate Loans	RCON	1410	1959–12–31 to present
Consumer Loans	RCON	1975	1959–12–31 to present
Credit Card Loans	RCON	2008	1967–12–31 to 2000–12–31
		B538	2001–03–31 to present
Financial Loans	RCON	1495	1959–06–10 to 1983–12–31
		1505 + 1510 + 1517 + 1756 +1757	1976–03–31 to 2000–12–31
		B531 + B534 + B535	2001–03–31 to present
Time Deposits	RCON	2514	1961–04–12 to 1983–12–31
	RCON	2604 + 6648	1984–03–31 to 2009–12–31
	RCON	J473 + J474 + 6648	2010–03–31 to present
Demand Deposits	RCON	2210	1959–12–31 to present
Brokered Deposits	RCON	2365	1983–09–30 to present
Insured Deposits	RCON	2702	1983–06–30 to 2006–03–31
	RCON	F045 + F049	2006–06–30 to present
Uninsured Deposits	RCON	2710 - (2722*100)	1983–06–30 to 1992–12–31
	RCON	5597	1993–03–31 to present
Loan Loss Provisions	RIAD	4230	1969–12–31 to present
Net Income	IADX	5106	1960–12–31 to 1968–12–31
	RIAD	4340	1969–12–31 to present
Non-Performing Loans	RCON	1403 + 1407	1982–12–31 to present
Total Interest Income	RIAD	4107	1984–03–31 to present
Total Interest Expenses	RIAD	4170 + 4180 + 4190 + 4200	1969–12–31 to 1978–09–30
	RIAD	4170 + 4180 + 4185 + 4200	1978–12–31 to 1983–12–31
	RIAD	4073	1984–03–31 to present
Total Charge-offs	IADX	5154 + 5170	1960q4 to 1968q4
	RIAD	4630 + 4690	1969q4 to 1975q4
	RIAD	4635	1976q1 to present
Loan Loss Reserve	RCON	3120	1959q2 to 1968q4
	RCFD	3120 + 3130	1969q2 to 1975q4
	RCFD	3123	1976q1 to present
Salaries and Employee Benefits	RIAD	4135	1969–12–31 to present
Number of Full-Time Employees	RIAD	4150	1969–12–31 to present

A.3 Call Revision Data

Banks submit their Call Report data quarterly through the FFIEC's Central Data Repository (CDR). Their submission msut be processed (and accepted) at most 30 calendar days after the end of each quarter.[1] In order for a submission to be accepted by the CDR, it must pass a series of validity and quality checks, known as the "FFIEC Edit Criteria", which help to ensure the report is internally consistent and accounting identities hold. Only once a submission passes the edit criteria and is accepted it will enter the FFIEC's internal system. See the inter-agency "Guidelines for Resolving Edits" for more information.

FFIEC 031 and 041 instructions:

> A bank's primary federal bank supervisory authority may require the filing of an amended Call Report if reports as previously submitted contain significant errors, as determined by the supervisory authority, in how the reporting bank classified or categorized items in the reports, i.e., on what line of the report an item has been reported.
>
> When dealing with the recognition and measurement of events and transactions in the Call Report, amended reports may be required if a bank's primary federal bank supervisory authority determines that the reports as previously submitted contain errors that are material for the reporting bank. Materiality is a qualitative characteristic of accounting information that is addressed in FASB Concepts Statement No. 8, "Conceptual Framework for Financial Reporting," as follows: "Information is material if omitting it or misstating it could influence decisions that users make on the basis of the financial information of a specific reporting entity. In other words, materiality is an entity-specific aspect of relevance based on the nature or magnitude or both of the items to which the information relates in the context of an individual entity's financial report."

Data corrections are allowed after a submission is accepted, including for prior periods. This can occur for multiple reasons, such as if there a new call report flags inconsistencies across time in reported amounts.

[1] Banks with multiple non-shell foreign offices are allowed a longer period of 35 calendar days.

B Additional Tables

Table B.2: *Summary Statistics: Bank-level data from 2000 through 2023.*

	N	Mean	Std. dev.	1st	10th	25th	Median	75th	90th	99th
Assets (in million)	637,180	1,559.20	26,128.70	13.89	48.98	93.91	199.27	466.23	1,169.53	15,681.90
Number of Employees	637,179	202.36	2,942.31	4.00	10.00	19.00	38.00	84.00	196.00	1,775.00
Age	637,182	36.73	18.83	1.00	7.00	19.00	43.00	51.00	58.00	63.00
CET 1/RWA	574,581	0.22	2.02	0.07	0.10	0.12	0.14	0.19	0.27	1.54
Tier 1 Capital/RWA	609,338	0.22	1.76	0.08	0.10	0.12	0.14	0.19	0.27	1.50
Equity/RWA	609,338	0.23	1.76	0.09	0.11	0.13	0.15	0.20	0.28	1.50
TCE/assets	634,939	0.11	0.09	0.05	0.07	0.08	0.10	0.12	0.15	0.41
Equity/assets	637,180	0.12	0.16	0.06	0.08	0.09	0.10	0.12	0.15	0.74
Net income/assets	637,175	0.01	0.02	-0.02	0.00	0.00	0.00	0.01	0.01	0.03
Liquid assets/assets	636,842	0.30	0.17	0.03	0.11	0.18	0.27	0.39	0.53	0.83
Deposits/loans	637,176	0.82	0.12	0.01	0.73	0.80	0.85	0.88	0.90	0.93
Time deposits/assets	637,176	0.33	0.15	0.00	0.13	0.22	0.34	0.44	0.53	0.69
Compensation/empl.	635,665	40,728.02	32,238.92	8,232.14	13,219.51	20,833.33	35,357.14	53,141.30	73,316.24	130771.43

Notes: This table reports summary statistics for the bank-level data based the FFIEC Call Report.

Table B.3: *Summary Statistics: Bank-level data from 2000 through 2023 for failing banks.*

	N	Mean	Std. dev.	1st	10th	25th	Median	75th	90th	99th
Assets (in million)	18,310	3,041.76	34,190.30	16.36	49.46	109.14	240.52	554.55	1,508.55	52,833.29
Number of Employees	18,310	488.64	7,032.51	5.00	12.00	21.00	42.00	94.00	226.00	2,096.00
Age	18,310	22.36	17.37	1.00	3.00	6.00	17.00	41.00	47.00	54.00
CET 1/RWA	16,902	0.12	0.11	0.01	0.06	0.09	0.10	0.13	0.18	0.43
Tier 1 Capital/RWA	18,310	0.12	0.11	0.01	0.07	0.09	0.11	0.13	0.18	0.45
Equity/RWA	18,310	0.14	0.11	0.03	0.08	0.10	0.12	0.14	0.20	0.46
TCE/assets	18,310	0.09	0.05	0.01	0.05	0.07	0.08	0.10	0.13	0.29
Equity/assets	18,310	0.09	0.06	0.01	0.05	0.07	0.09	0.10	0.13	0.31
Net income/assets	18,310	-0.00	0.02	-0.07	-0.02	-0.00	0.00	0.01	0.01	0.02
Liquid assets/assets	18,310	0.19	0.12	0.02	0.06	0.11	0.17	0.25	0.37	0.61
Deposits/loans	18,310	0.83	0.11	0.40	0.72	0.80	0.85	0.89	0.92	0.97
Time deposits/assets	18,310	0.47	0.16	0.03	0.26	0.36	0.47	0.58	0.67	0.82
Compensation/empl.	18,301	38,017.47	24,779.59	7,689.19	13,052.17	19,783.78	33,888.89	50,035.71	66,214.29	116308.52

Notes: This table reports summary statistics for the bank-level data based the FFIEC Call Report.

Table B.4: ***Predicting Bank Failures: 2000-2023***

Horizon h	Fail within next five years			
	(1)	(2)	(3)	(4)
Regulatory Rating:	ref.			
- CAMELS = 2	0.58***			
	(0.00)			
- CAMELS = 3	1.78***			
	(0.00)			
- CAMELS = 4	7.43***			
	(0.00)			
- CAMELS = 5	31.60***			
	(0.00)			
Solvency:		ref.		ref.
- Net Income/Assets		-61.66***		16.86***
		(0.01)		(0.01)
Funding:			ref.	ref.
- Time Deposits/Deposits			9.53***	11.93***
			(0.00)	(0.00)
Solvency $\times$ ***Funding:***				ref.
- NI/Assets $\times$ TD/Dep.				-631.10***
				(0.04)
N	616313	616313	616313	616313
No of Banks	11030	11030	11030	11030
Mean of dep. var.	1.4	1.4	1.4	1.4

Notes: This table presents OLS estimates of (2) with failure between $t+1$ and $t+5$ as the dependent variables for the 2000-2023 sample. In addition to the reported predictor variables, we also include the log of a bank's age. Standard errors in parentheses are clustered at the bank level; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table B.5: ***Predicting Bank Failures: 2000-2023***

Horizon h	Fail within next three years			
	(1)	(2)	(3)	(4)
Regulatory Rating:	ref.			
- CAMELS = 2	0.26***			
	(0.00)			
- CAMELS = 3	1.41***			
	(0.00)			
- CAMELS = 4	6.66***			
	(0.00)			
- CAMELS = 5	30.76***			
	(0.00)			
Solvency:		ref.		ref.
- Net Income/Assets		-67.42***		19.42***
		(0.01)		(0.01)
Funding:			ref.	ref.
- Time Deposits/Deposits			10.02***	12.01***
			(0.00)	(0.00)
Solvency $\times$ ***Funding:***				ref.
- NI/Assets $\times$ TD/Dep.				-732.22***
				(0.04)
N	460089	460089	460089	460089
No of Banks	9370	9370	9370	9370
Mean of dep. var.	1.1	1.1	1.1	1.1

Notes: This table presents OLS estimates of (2) with failure between $t+1$ and $t+3$ as the dependent variables for the 2000-2023 sample. In addition to the reported predictor variables, we also include the log of a bank's age. Standard errors in parentheses are clustered at the bank level; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table B.6: *Predicting Bank Failures: 2000-2023*

Horizon h	Fail within next year			
	(1)	(2)	(3)	(4)
Regulatory Rating:	ref.			
- CAMELS = 2	-0.00			
	(0.00)			
- CAMELS = 3	0.22***			
	(0.00)			
- CAMELS = 4	2.05***			
	(0.00)			
- CAMELS = 5	19.87***			
	(0.00)			
Solvency:		ref.		ref.
- Net Income/Assets		-40.07***		13.31***
		(0.01)		(0.01)
Funding:			ref.	ref.
- Time Deposits/Deposits			4.03***	5.34***
			(0.00)	(0.00)
Solvency $\times$ ***Funding:***				ref.
- NI/Assets $\times$ TD/Dep.				-481.11***
				(0.03)
N	460089	460089	460089	460089
No of Banks	9370	9370	9370	9370
Mean of dep. var.	.37	.37	.37	.37

Notes: This table presents OLS estimates of (2) with failure between $t+1$ and $t+1$ as the dependent variables for the 2000-2023 sample. In addition to the reported predictor variables, we also include the log of a bank's age. Standard errors in parentheses are clustered at the bank level; *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

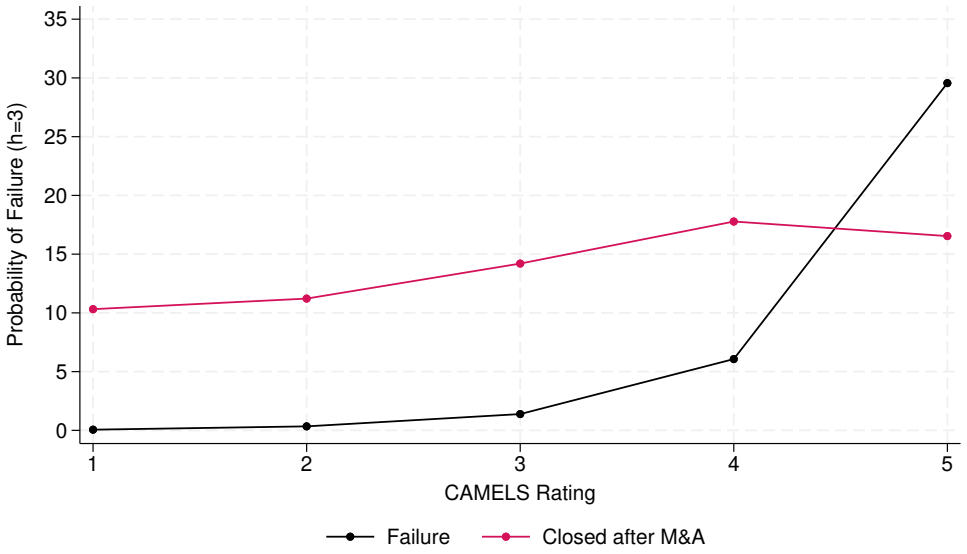
Table B.7: *Bank Capitalization Before Failure.*

Well Capitalized	Adequately Capitalized	Undercapitalized		
		Total	Significantly	Critically
A. All banks				
0.98	0.01	0.01	0.00	0.00
B. Failing banks (within 5 years of failure)				
0.70	0.09	0.20	0.06	0.04
C. Failing banks (within 1 year of failure)				
0.18	0.12	0.70	0.29	0.20
C. Failing banks (within 1 quarter of failure)				
0.07	0.03	0.90	0.68	0.57

Notes: This table report the share of banks by capitalization, distinguishing by whether a bank is well, adequately, or under-capitalized; and if under-capitalized whether its significantly or critically under-capitalized.

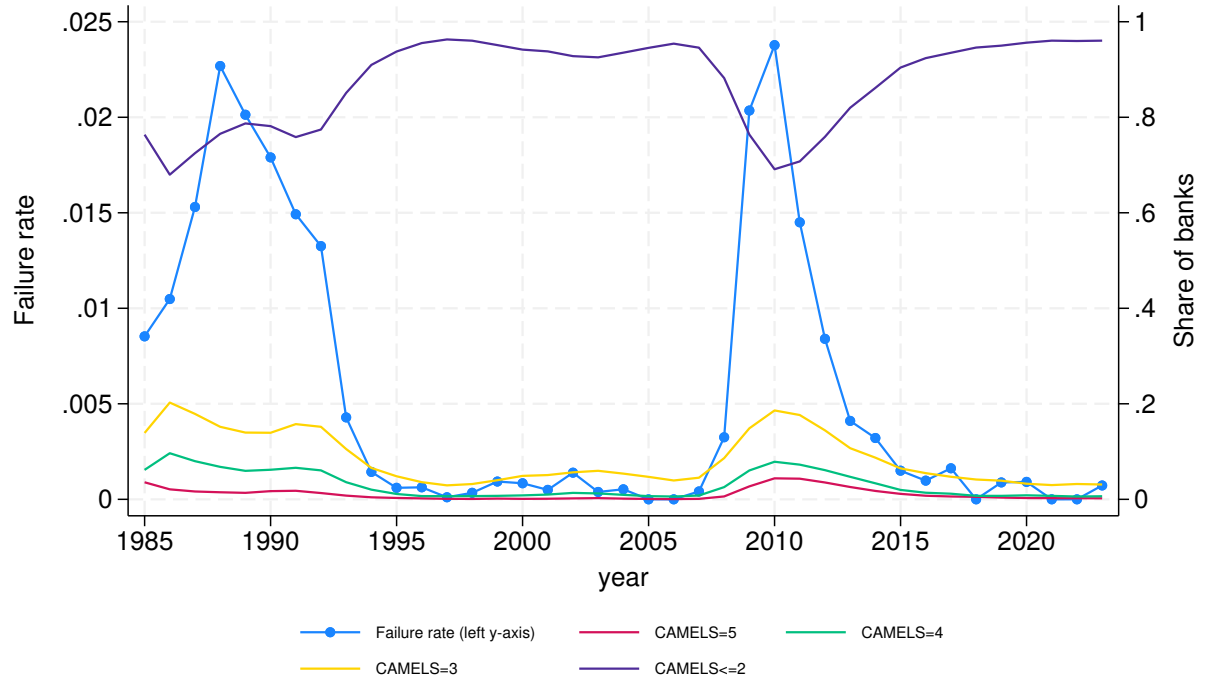
C Additional Figures

Figure C.1: *CAMELS ratings and Future Bank Failures*



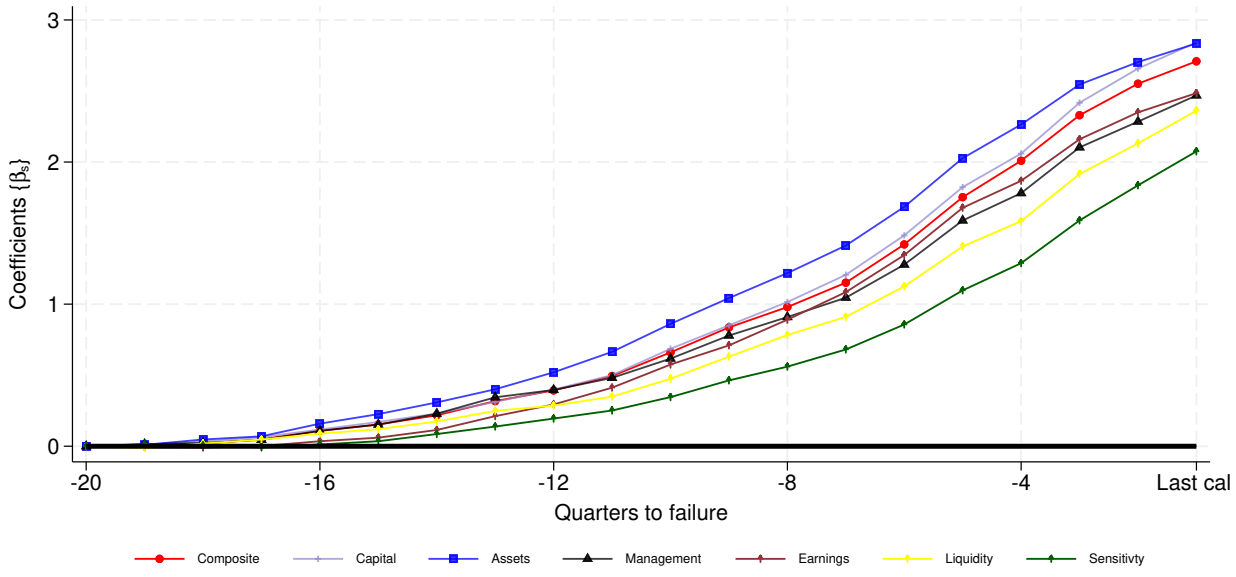
Notes: This figure plots the probability of bank failure and the probability of bank closure due to a merger some time from $t+1$ to $t+3$ against a bank's supervisory CAMELS rating at time t.

Figure C.2: *CAMELS ratings and bank failure rates*



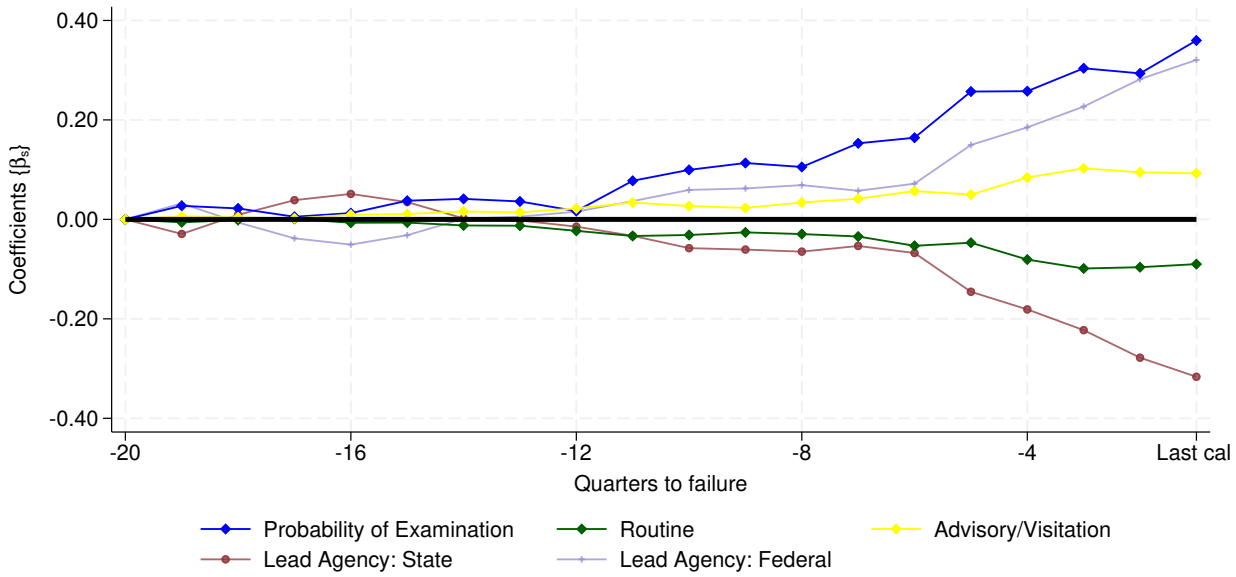
Notes: This figure shows the distribution of CAMELS ratings (right y-axis) and the realized rate of bank failures (left y-axis) from 1985 through 2023.

Figure C.3: *CAMELS ratings by type in Failing Banks: 2000-2023*



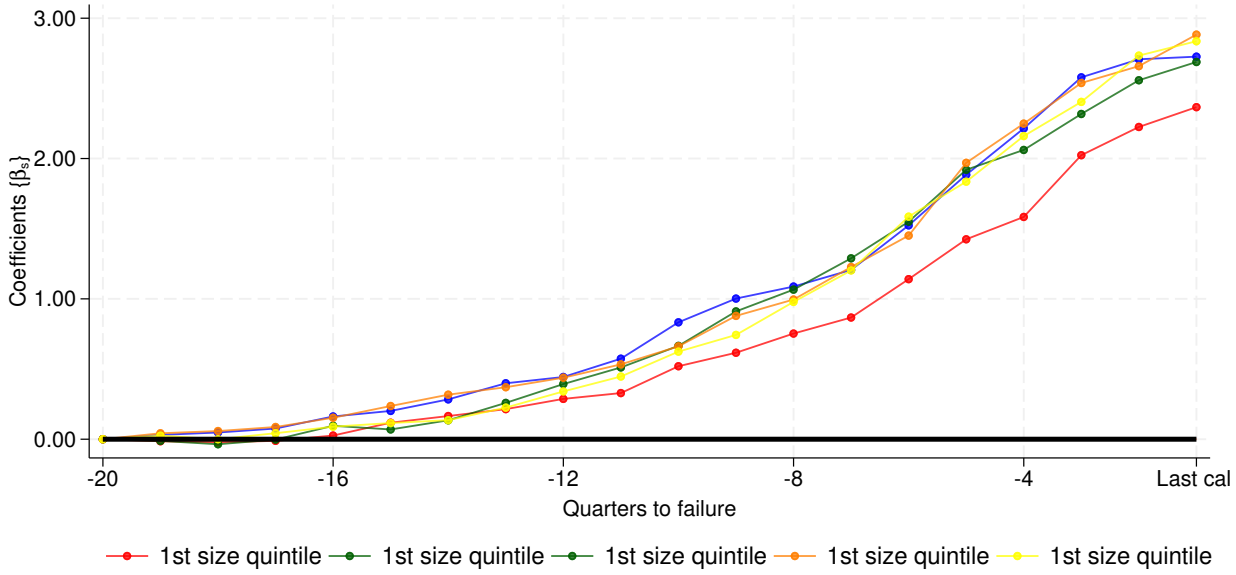
Notes: The figure presents the sequence of coefficients from estimating Equation (1), where the dependent variable is the ratio indicated in the figure legend. The specification includes a set of bank fixed effects. The sample is restricted 524 failing banks that fail sometime between 2000 and 2023 and includes data for the 5 years before failure.

Figure C.4: *Examination Frequency, Exam Types, and Lead Agency in Failing Banks: 2000-2023*



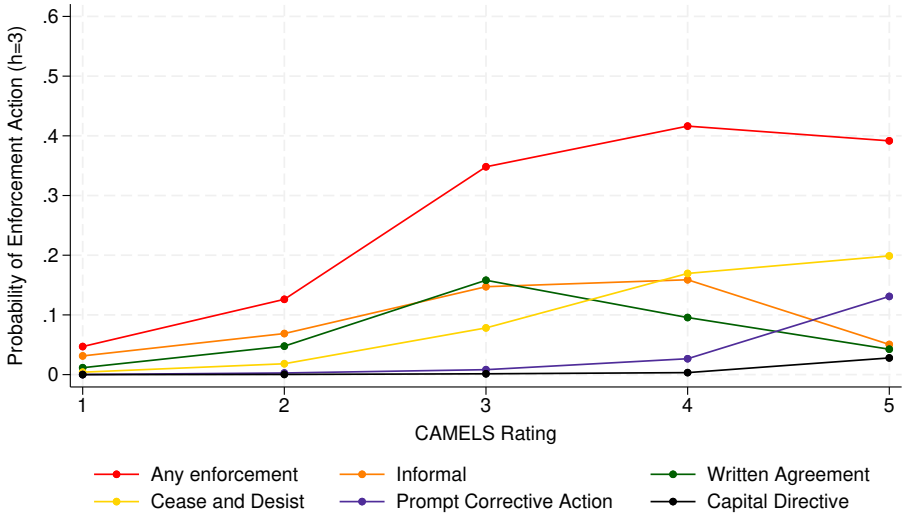
Notes: The figure presents the sequence of coefficients from estimating Equation (1), where the dependent variable is an indicator which agency is leading the exam. The specification includes a set of bank fixed effects. The sample is restricted to failing banks, to the ten years before they fail, and to banks that fail after 2000.

Figure C.5: *CAMELS ratings by bank size: 2000-2023*



Notes: The figure presents the sequence of coefficients from estimating Equation (1), where the dependent variable is the ratio indicated in the figure legend. The specification includes a set of bank fixed effects. The sample is restricted to failing banks, to the ten years before they fail, and to banks that fail after 2000.

Figure C.6: ***CAMELS ratings and Enforcement Actions***



Notes: This figure plots the probability of enforcement actions from t to $t+4$ by CAMELS rating in t.