

Bank Lending Fragility After Mergers

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Motivation

- Over four decades, U.S. banking consolidated sharply, with banks falling from 14,000 to under 4,000 and assets concentrating in larger institutions.
- Many large banks required extraordinary government support during the 2007–08 financial crisis.
- The 2023 panic involving large regional banks reignited the debate.
- *Do mergers enhance stability or amplify lending fragility?*

FINANCE & TAX

Elizabeth Warren to Janet Yellen: You're wrong on bank mergers

Warren's rebuke revealed a major new rift with top Biden administration officials over economic policy.



Sen. Elizabeth Warren said Yellen and Hsu appear to be taking "the wrong lessons" from the failures of SVB, Signature Bank and First Republic. | Joe Raedle/Getty Images

- Former Treasury Secretary Janet Yellen said **more mergers could be healthy**.
- Sen. Elizabeth Warren argued additional consolidation may reduce competition and **threaten financial stability**.

- Robust literature examining the impact of bank mergers on borrowers and corporate lending.
(Jayaratne and Strahan 1996; Berger et al. 1998; Peek and Rosengren 1998; Huang 2008; Chava et al. 2013)
- However, there is little empirical evidence of how bank mergers affect bank fragility under severe economic conditions.
- Opposing theories:
 - Integrating large, dissimilar banks could *amplify* risks by increasing complexity, straining operational capacity, and weakening risk management. (Laeven and Levine 2007; Correa and Goldberg 2022)

- We aim to bridge the knowledge gap by utilizing a forward-looking framework to assess the risk perspectives related to bank mergers in the United States.
- Research questions:
 - Do banks become more or more fragile to shocks after mergers?
 - Does this effect differ across banks along size and diversification channels?
- What do we find?
 - On average, mergers worsen the risk sensitivities of merged banks relative to their non-merged counterpart banks.
 - Adverse effects is concentrated among large mergers.
 - Diversification does not mitigate the increase in lending fragility; instead, too much diversification worsens the effect.

- We want to observe how banks loan portfolios perform under periods of severe economic stress, but crises are rare.
- While an intuitive approach would be to use the GFC to assess post-merger fragility, this setting is limited to only a small subset of banks that experienced the crisis and also engaged in mergers shortly before the crisis.
- We therefore estimate the sensitivity of banks loan performance to macroeconomic conditions and calculate **projected** losses under a hypothetical stress scenario designed to mimic crisis-like economic conditions.

Forward-Looking Framework to Measure Bank Fragility

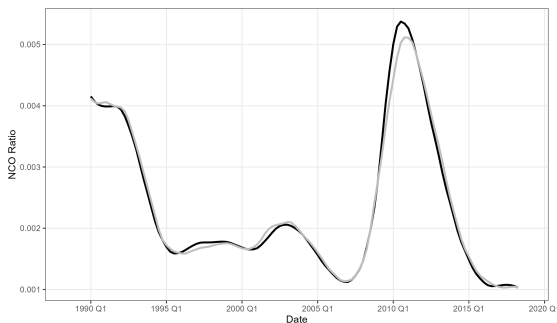
- We construct the measure of bank fragility by assessing bank loan portfolio performance during economic stress in a forward-looking framework.
- We regress historical NCO ratios on macroeconomic conditions to estimate the sensitivity of the bank's loan portfolio performance across time:

$$NCO_{b,\tau} = \alpha_{b,t} + \beta_{1,t}NCO_{b,\tau-1} + \beta_{2,t}BBB_{\tau} + \beta_{3,t}\Delta UE_{\tau,\tau-2} + \varepsilon_{b,\tau} \quad (1)$$

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- We then apply these estimates along with bank characteristics to the hypothetical economic stress scenario to obtain the forward-looking measure of bank lending fragility:

$$Lending\ Fragility_{b,t}(h) = \hat{\alpha}_{b,t} + \hat{\beta}_{1,t}NCO_{b,t-1} + \hat{\beta}_{2,t}\overline{BBB}_{t+h} + \hat{\beta}_{3,t}\overline{\Delta UE}_{t+h,t+h-2} \quad (2)$$

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- Then we apply the stacked DID approach and estimate:

$$\begin{aligned} Lending\ Fragility_{b,e} = & \beta_1 M\&A_b + \beta_2 Post_e + \beta_3 M\&A_b \times Post_e \\ & + \beta_4 X_{b,e-1} + \gamma_b + \theta_e + \varepsilon_{b,e}. \end{aligned} \quad (3)$$

Lending Fragility Index

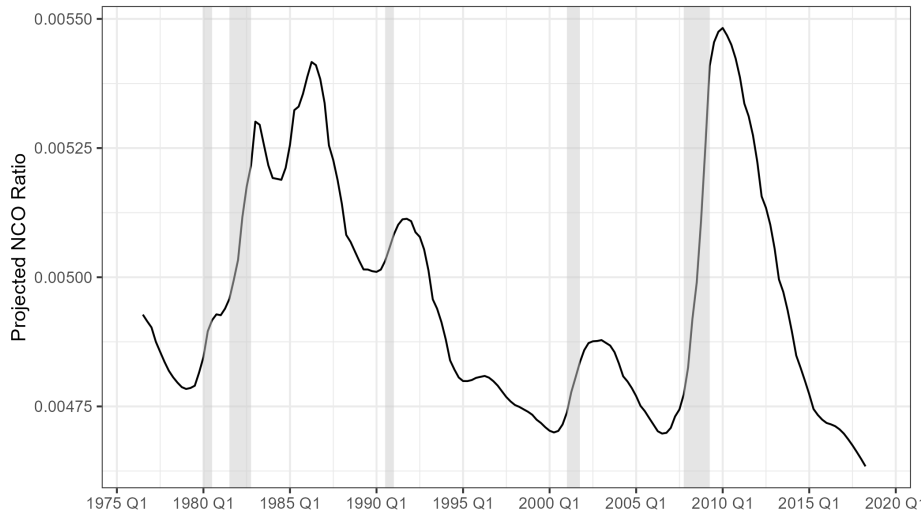


Figure 1. Lending Fragility Index

Lending Fragility Index & SRISK

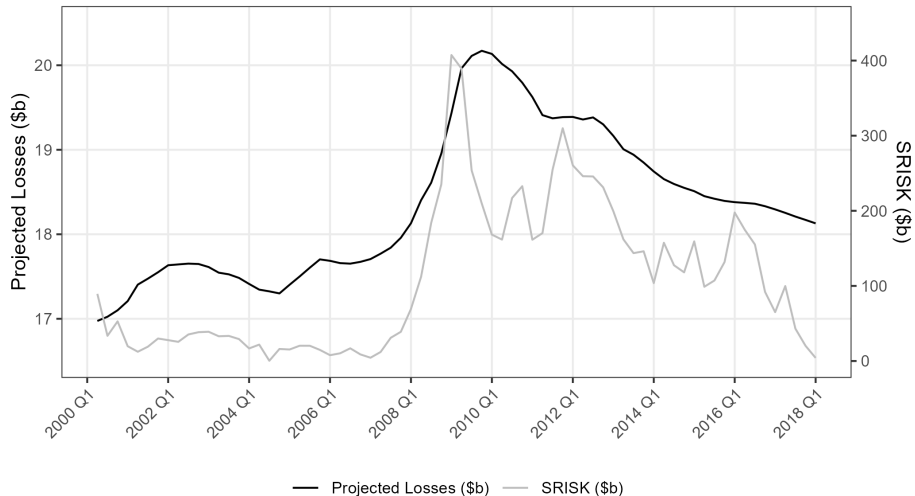


Figure 2. Lending Fragility Index & SRISK

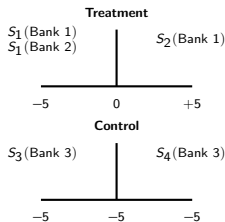
- It would be ideal to compare lending portfolio outcomes of banks that merge to a perfect counterfactual world where the banks did not merge.

Stylized Methodology

- It would be ideal to compare lending portfolio outcomes of banks that merge to a perfect counterfactual world where the banks did not merge.
- In practice, we match a set of 10 nearest neighbor propensity score matches to serve as control banks for each merger event.
 - Match banks on size, business model, profitability and regulatory capital.
 - Control banks are the ones that were not engaged in merger activity around the window.

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- In practice, we match a set of **10 nearest neighbor propensity score matches** to serve as control banks for each merger event.
 - Match banks on size, business model, profitability and regulatory capital.
 - Control banks are the ones that were not engaged in merger activity around the window.
- Compare projected losses of merged banks to non-merged banks, before and after the merger events in a **stacked difference-in-differences** design. (Gormley and Matsa 2011; Cengiz et al. 2019; Deshpande and Li 2019; Baker, Larcker, and Wang 2022)

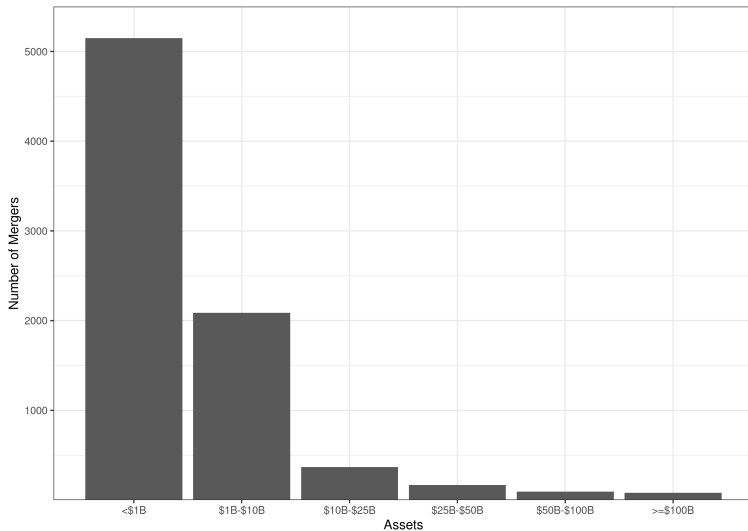


Merged and Non-merged Banks

- We identify merger transactions using data from the Federal Financial Examination Council's (FFIEC) National Information Center (NIC) spanning 1984 to 2013.
- In total, there are nearly 8,000 mergers beginning 1984 Q1 and ending 2013 Q4.
- Control banks must not have engaged in merger activity five years before to one year after the treatment merger transaction quarter.

M&A	log(Assets)	Loan/Assets	Noninterest Income/Assets	T1 Ratio	N
0	13.04	0.63	0.01	0.07	79,470
1	13.35	0.62	0.01	0.07	7,947

Distribution of Mergers by Assets

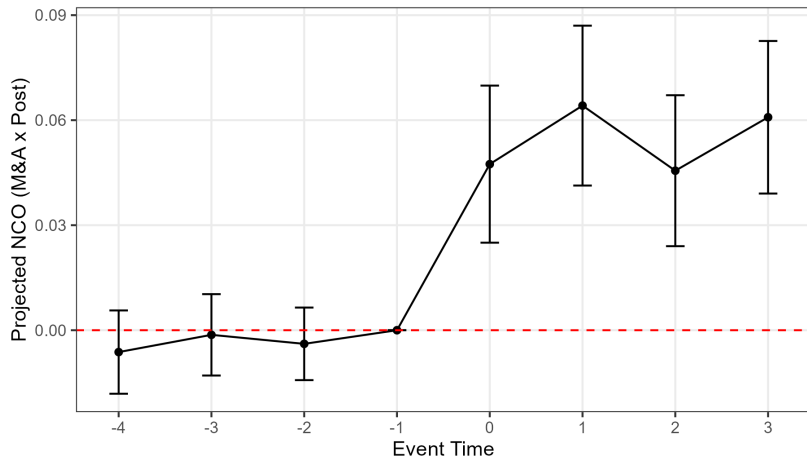


Effect of Bank Mergers on Lending Fragility

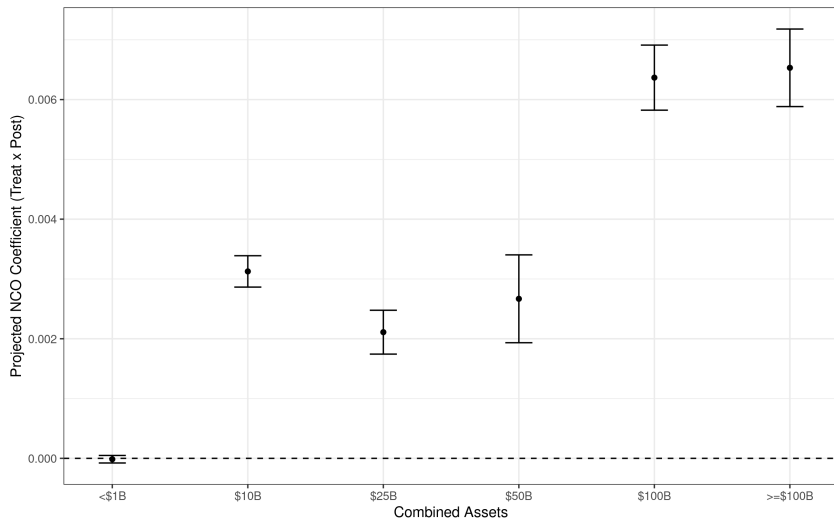
	Financial Fragility				
	All Mergers	Combined ≥ \$50B	Combined < \$50B	Acquirer ≥ \$50B	Acquirer < \$50B
	(1)	(2)	(3)	(4)	(5)
M&A	0.002*** (0.000)	0.007* (0.004)	0.002*** (0.000)	0.003*** (0.001)	0.002*** (0.000)
Post	0.001*** (0.000)	0.000 (0.000)	0.001*** (0.000)	0.000 (0.000)	0.001*** (0.000)
M&A x Post	0.002*** (0.001)	0.004** (0.002)	0.001** (0.001)	0.003*** (0.001)	0.001** (0.001)
Bank Controls	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Observations	1,158,495	39,832	1,118,663	37,856	1,120,639
Adjusted R ²	0.088	0.322	0.089	0.410	0.089

- On average, banks became more fragile after mergers as evidenced by higher projected losses.
- For the 50th, 75th, 90th, and 95th percentiles in our sample, this translates into projected losses of \$2.3 million, \$10 million, \$49.6 million, and \$146.6 million, respectively, over 13 quarters.

Parallel Trends

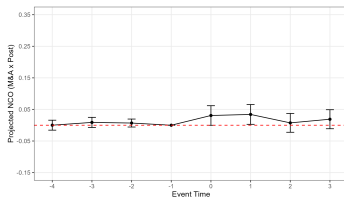


Results by Bank Merger Size

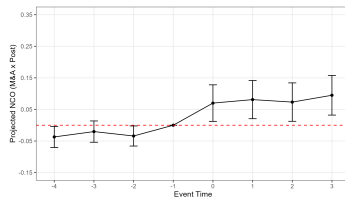


Results by Bank Merger Size

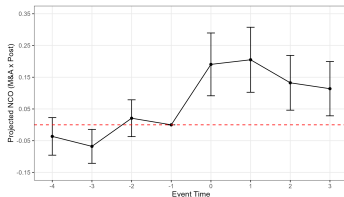
Figure 3. Dynamic Effect of Financial Fragility by Merger Size



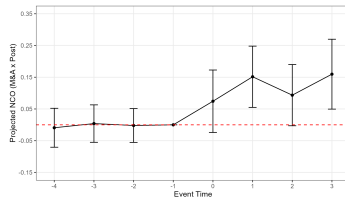
(a) <\$1B



(b) \$1B–\$10B



(c) \$10B–\$50B

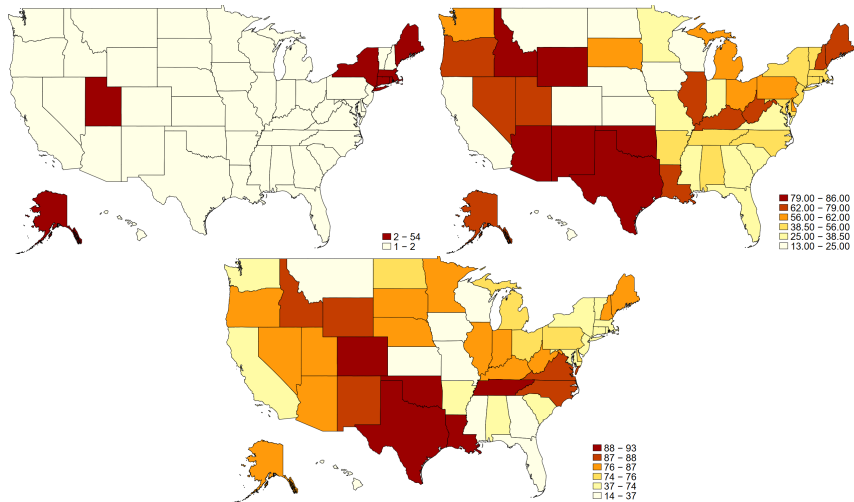


(d) ≥\$50B

Addressing Endogeneity: The Adoption of Riegle-Neal Act

- Merger events are intrinsically endogenous decisions made by banks.
- Factors that affect merger decisions can also influence risk outcomes.
- We use the implementation of the [Riegle-Neal Act of 1994](#) as a quasi-natural experiment to predict merger events. (Jayaratne and Strahan 1996; Huang 2008)
- The Act removed restrictions on interstate bank acquisitions and branching, generating a regulatory shock that expanded banks ability to merge across state lines.
- In other words, it expanded banks' opportunities to merge that were unrelated to a bank's own risk-taking or loan portfolios.

Addressing Endogeneity: The Adoption of Riegle-Neal Act



Effects on Lending Fragility using IV

	M&A (1)	Lending Fragility				
		All Mergers (2)	Combined ≥ \$50B (3)	Combined < \$50B (4)	Acquirer ≥ \$50B (5)	Acquirer < \$50B (6)
Liberalization score	0.001** (0.000)					
$\widehat{M\&A}$		0.007 (0.006)	0.018** (0.008)	0.008 (0.005)	0.016** (0.008)	0.008 (0.005)
Post		0.001** (0.000)	0.000 (0.001)	0.001** (0.000)	0.000 (0.001)	0.001** (0.000)
$\widehat{M\&A} \times \text{Post}$		0.001* (0.001)	0.005*** (0.001)	0.001 (0.001)	0.005*** (0.001)	0.001 (0.001)
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	94,663	1,151,592	39,832	1,111,760	37,856	1,113,736
Adjusted R ²	0.527	0.087	0.298	0.089	0.409	0.089
F-statistic	36.304					

- Results showing increased fragility remain are robust to IV design.

Portfolio Heterogeneity

	Financial Fragility		
	<p25 Div. Score (1)	p25-p75 Div. Score (2)	>p75 Div. Score (3)
M&A	0.002*** (0.001)	0.002*** (0.000)	0.003*** (0.001)
Post	0.000** (0.000)	0.001*** (0.000)	0.001** (0.000)
M&A × Post	0.002** (0.001)	0.001* (0.001)	0.003** (0.001)
Bank Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Observations	283,114	562,887	287,664
Adjusted R ²	0.159	0.098	0.117

- No evidence that portfolio diversification mitigates post-merger adverse effects on lending fragility.

Portfolio Heterogeneity - continued

	Financial Fragility		
	<p25 Div. Score (1)	p25-p75 Div. Score (2)	>p75 Div. Score (3)
M&A	0.002*** (0.000)	0.002*** (0.000)	0.003*** (0.001)
Post	0.000** (0.000)	0.001*** (0.000)	0.000** (0.000)
M&A × Post	0.001 (0.001)	0.001 (0.001)	0.002* (0.001)
Bank Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Observations	248,404	493,402	252,941
Adjusted R ²	0.167	0.102	0.119

- Among mergers of <\$1B, portfolio diversification does not move the needle much.

Portfolio Heterogeneity - continued

	Financial Fragility		
	<p25 Div. Score (1)	p25-p75 Div. Score (2)	>p75 Div. Score (3)
M&A	0.081*** (0.014)	-0.002 (0.003)	-0.002 (0.002)
Post	0.003 (0.004)	-0.001 (0.001)	0.001 (0.001)
M&A × Post	0.007 (0.006)	0.000 (0.002)	0.011** (0.005)
Bank Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Observations	5,239	10,257	5,876
Adjusted R ²	0.547	0.483	0.450

- Evidence of increased risk resulting from complexity within mergers between \$50 and \$100 billion.

Portfolio Heterogeneity - continued

	Financial Fragility		
	<p25 Div. Score (1)	p25-p75 Div. Score (2)	>p75 Div. Score (3)
M&A	0.003** (0.001)	0.001 (0.001)	0.004** (0.002)
Post	0.001 (0.001)	-0.001* (0.000)	0.001 (0.001)
M&A × Post	0.003*** (0.001)	0.004*** (0.001)	0.002** (0.001)
Bank Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Observations	4,784	8,970	4,706
Adjusted R ²	0.588	0.535	0.488

- For mergers $\geq \$100\text{B}$, potential diversification benefits are not present.

Geographic Diversification

	Financial Fragility		
	<p25 Distance (1)	p25-p75 Distance (2)	>p75 Distance (3)
M&A	0.002*** (0.000)	0.002*** (0.000)	0.005** (0.002)
Post	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
M&A × Post	0.003** (0.001)	0.002*** (0.001)	0.005*** (0.002)
Bank Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Observations	142,610	285,441	141,089
Adjusted R ²	0.360	0.320	0.321

- Geographic diversification does not attenuate the increase in lending fragility.

Liquidity Measures

	Lending Fragility		
	Liquidity Ratio	Cash Ratio	Treasury+MBS Ratio
	(1)	(2)	(3)
M&A	0.001*** (0.000)	0.001*** (0.000)	0.002*** (0.000)
Post	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Liquidity Measure	0.000 (0.000)	-0.001 (0.001)	-0.001*** (0.000)
M&A × Post	0.004*** (0.001)	0.004*** (0.001)	0.003*** (0.001)
M&A × Liquidity Measure	0.013** (0.005)	0.008 (0.005)	-0.071*** (0.023)
Post × Liquidity Measure	0.000 (0.000)	-0.002* (0.001)	0.248 (0.218)
M&A × Post × Liquidity Measure	-0.020*** (0.007)	-0.018** (0.008)	-0.217 (0.199)
Bank Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Observations	605,163	605,163	605,163
Adjusted R ²	0.243	0.243	0.242

Regulatory Capital Measures

	Lending Fragility		
	Leverage Ratio	Tier 1 Capital Ratio	Total Capital Ratio
	(1)	(2)	(3)
M&A	0.002*** (0.000)	0.001 (0.001)	0.001 (0.001)
Post	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Regulatory Capital Measure	-0.002 (0.001)	0.000 (0.000)	0.000 (0.000)
M&A × Post	0.003*** (0.001)	0.006*** (0.002)	0.006*** (0.002)
M&A × Regulatory Capital Measure	0.003 (0.003)	0.004 (0.010)	0.004 (0.010)
Post × Regulatory Capital Measure	-0.001 (0.001)	0.000 (0.000)	0.000 (0.000)
M&A × Post × Regulatory Capital Measure	0.000 (0.005)	-0.028* (0.015)	-0.027* (0.015)
Bank Controls	Yes	Yes	Yes
Year-Quarter FE	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes
Observations	605,163	605,163	605,163
Adjusted R ²	0.242	0.242	0.242

- 1 Excluding Failed Mergers
- 2 Macroeconomic Conditions
- 3 Alternative Projection Scenario
- 4 Loan Interest Rates

- Using nearly 8,000 U.S. bank mergers, we construct a forward-looking measure of lending fragility based on projected loan losses under crisis scenarios.
- Mergers increase fragility in severe downturns, with effects driven primarily by **largest deals**.
- Evidence is consistent with a **complexity channel**: greater portfolio dissimilarity amplifies fragility, while geographic diversification offers limited mitigation.
- Although stronger capital and liquidity buffers attenuate the impact, consolidation ultimately raises vulnerability by creating larger and more complex institutions.

Bank mergers trade off scale benefits against greater downside risk in stress states.