Too-Many-to-Ignore: Regional Banks and CRE Risks*

Franz J. Hinzen Felipe Severino Stijn Van Nieuwerburgh

January, 2026

Abstract. Almost one-third of U.S. commercial mortgage dollars sits on regional bank balance sheets. Recent commercial property revaluations have sparked concerns that this substantial exposure may create fractures in the banking system and spill over to the wider economy. To assess commercial real estate (CRE) risks in regional banks, we construct a novel loan-level dataset from county records. While many regional banks have benefited from exposure to better-performing markets thus far, reported delinquencies understate risks from undercollateralized loans by a factor of four. Under realistic further stress scenarios, many regional banks become undercapitalized. High geographic and sectoral portfolio concentrations create vulnerabilities even to localized shocks. We document that regional banks are already lowering lending standards to roll over distressed loans, which may amplify downside risks.

Keywords: Commercial Real Estate, Regional Banks, Stress Tests.
JEL Classification: G21, G23, R33.

*The authors are grateful for support received under the joint NBER and OFR Initiative on Market Frictions and Financial Risks and for support from the Real Estate Research Institute. We thank our discussants, Elliot Anenberg, Greg Buchak, Nuno Clara, and Alexei Tchistyi, as well as Mariya Letdin, Anthony Saunders, and Eva Steiner, for their helpful suggestions. We also thank conference participants at SFS Cavalcade North America, the Real Estate Research Institute Conference, RAPS/RCFS Europe Conference Cambridge, NBER Financial Market Frictions and Systemic Risk conference, Wharton Conference on Liquidity and Financial Fragility, Jackson Hole Finance Group Conference, and seminar participants at the Frankfurt School of Finance & Management, the Deutsche Bundesbank, and the Mortgage Bankers Association for many helpful comments and discussions. Franz Hinzen and Felipe Severino are affiliated with the Tuck School of Business at Dartmouth. Stijn Van Nieuwerburgh is affiliated with Columbia Business School and the NBER. Please send correspondence to Franz Hinzen at franz.hinzen@tuck.dartmouth.edu, to Felipe Severino at felipe.severino@tuck.dartmouth.edu, or to Stijn Van Nieuwerburgh at svnieuwe@gsb.columbia.edu.

Over the last decade, regional banks have nearly tripled their commercial real estate (CRE) lending. Today, commercial mortgages dominate regional bank loan portfolios. Collectively, over $1.6 trillion of CRE loans sit on the balance sheets of these banks. Three of four regional banks report commercial mortgages as their largest loan category, and for nearly half, their high CRE concentration exceeds thresholds of potential regulatory concern.

Amidst sharp commercial property revaluations, these outsized exposures have drawn regional banks into the spotlight. In a recent Financial Stability Report, the Federal Reserve Board (2023) notes: "*a correction in office property valuations [...] could result in significant losses for a range of financial institutions with sizable exposures, including some regional and community banks.*"

Indeed, large banks and commercial mortgage-backed securities (CMBS) have begun to report a substantial worsening in loan performance. Yet surprisingly, regional banks appear so far largely insulated from the stress affecting other market participants as regional banks report few signs of credit deterioration. Figure 1 shows that large banks saw delinquency rates triple since 2019. In contrast, delinquency rates at regional banks have remained stable at low levels below 1%. On other credit performance measures, like modifications of distressed loan (Figure A1), charge-off rates (Figure A2), loan loss allowances and real estate owned (Figure A3), regional bank CRE loans exhibit a similar divergence from those of large banks.

Possibly, these numbers accurately reflect differences in the fundamental health of CRE loan portfolios. Regional bank loan books could be concentrated in areas and sectors with limited commercial property price declines. Maybe, regional banks enforced tighter loan origination standards, and therefore, property owners have absorbed losses up to now. The concerning alternative is that these banks may have only avoided recognizing loan losses, for example through loan extensions, and that substantial losses are hiding behind regional banks' official figures.

Unfortunately, banks' consolidated public filings lack sufficient detail to distinguish between these alternatives. Such analysis requires loan-specific information which only the largest banks disclose to regulators. To overcome this limitation, we assemble a new loan-level dataset using county mortgage and deed filings. Since these filings are universally recorded for real estate-secured loans, we can reconstruct portfolios across the entire banking sector, including for institutions that otherwise provide minimal disclosure.

With this dataset, we first examine the extent of potential unrealized losses. To assess if commercial property revaluations have left a loan undercollateralized requires us to estimate current property valuations. Thus, we project a property's most recent transaction price forward through a set of granular price indices for 240 distinct location-property sector pairs. Our resulting valuations allow us to identify distress at the individual loan level. Specifically, we classify a loan as distressed if its commercial property value were to fall short of the loan amount in the case of foreclosure. We term this "latent distress" since credit deterioration may not yet have materialized in loan cash flows. Rather, we base our measure on expected loan losses at current valuations. For example, a loan that locked in a low interest rate after the 2020 crisis may remain current on interest payments despite being deeply undercollateralized. We still classify this loan as distressed because losses would likely materialize if the bank were to offload the loan by selling it today or upon loan maturity if valuations remain unchanged.

We find that reported performance measures substantially understate distress in bank loan portfolios. Latent distress exceeds delinquencies by a factor of four. Like the reported numbers, regional bank loan portfolios show significantly less latent distress than those of their large peers. Furthermore, latent distress occurs at a similar ratio to delinquencies for both regional and large banks. Since our latent distress measure is independent of any bank input, this suggests that regional banks' lower realized distress at least partially reflects better fundamentals.

To understand why CRE distress differs between regional and large banks, we decompose their latent distress. Once we compare loans within a location-property sector market, we no longer find any discernible difference between regional and large bank loans. This indicates that regional banks benefit from their greater exposure to better-performing CRE markets rather than tighter origination standards or loan timing. For illustration, regional banks in Northern California are more likely to have lent in Sacramento, while large banks have been more active in San Francisco — one of the worst-hit commercial property markets in the United States. Similarly, regional banks tend to finance industrial properties, which have performed well overall, while large banks hold greater exposures to the struggling office sector.

A limitation of our index-based valuation is that we can only capture changes at the index level. Thus, our approach cannot uncover performance heterogeneity below our indices' level of aggregation. However, we find some evidence of potential masked risks: regional banks are significantly more likely to be exposed to low-quality properties. Within a market, regional banks disproportionately hold loans secured by the oldest properties in that market and properties in low-rent neighborhoods.

Next, we assess bank resilience to unrealized losses under current conditions and under stress test scenarios of further CRE price declines. We first evaluate regulatory capital if current latent distress materializes. Most institutions remain adequately capitalized under this baseline. Subsequently, we consider a severe CRE distress scenario. Under this scenario, a significant subset of regional banks becomes undercapitalized. These vulnerable institutions share common traits: strong geographic or sectoral concentration in markets that have already seen declines, most frequently in multifamily and retail. This concentration means that even localized market stress quickly threatens regional bank capital adequacy and potentially leads to failures.

Having identified vulnerable banks raises the question whether risks already impact regional

bank lending. In our CRE sample, regional banks are less likely to require additional equity contributions from owners of undercollateralized properties. Furthermore, when undercollateralization is more severe, additional equity contributions tend to be smaller.

Taken together, regional banks currently benefit from their greater exposure to more benign commercial property markets. Yet, high concentration in regional bank portfolios means that even localized distress can quickly amplify into bank failures. Detailed information on property-level valuations and loan-level portfolio composition allows us to pinpoint where such fragility is most likely to surface.

We document systematic heterogeneity in the refinancing terms offered by regional banks to distressed CRE borrowers. Relative to large banks, regional banks are more likely to refinance loans near maturity and, conditional on refinancing, require smaller equity contributions. This leniency does not vary with bank capitalization, but it does vary with banks' local market shares and the importance of those markets within their portfolios. These patterns characterize how regional banks adjust lending terms in distress and help frame competing interpretations of their refinancing behavior.

Literature Review. Among contemporaneous related work, Crosignani and Prazad (2024) show that undercapitalized banks extend loan maturities of distressed CRE borrowers to avoid recognizing losses. Their findings are made possible by rich regulatory disclosures that only the largest banks provide as part of their annual stress-tests. Like us, Glancy and Kurtzman (2024) and Anenberg, Kim, and Moszkowski (2025) broaden the set of institutions by constructing datasets based on county records. Their studies complement ours by highlighting the work-from-home trends as an important driver for commercial property price changes for bank-funded properties. At the core of this change has been a pandemic-induced demand shift away from dense urban centers which has reduced the premium on city real estate as Gupta, Mittal, Peeters, and Van Nieuwerburgh (2022) and Gupta, Mittal, and Van Nieuwerburgh (2025) document for the housing and the office sector, respectively.

Jiang, Matvos, Piskorski, and Seru (2025) show that commercial property revaluations have increased bank run risks.

1 The Rise of Regional Banks in CRE Loan Markets

Since its recovery after the Global Financial Crisis, the CRE market has seen a remarkable credit boom. Over the last decade, the amount of outstanding CRE loans has increased by 80.1% to over $6 trillion, which has made CRE loans one of the fastest-growing credit markets in the United States. CRE loans outpaced growth rates in single-family mortgage, consumer, and corporate loans (Figure 2).

Underneath this expansion lies a notable pattern in the composition of lenders. Across most loan markets, banks have ceded market share to nonbank financial institutions after the Financial Crisis (Buchak, Matvos, Piskorski, and Seru, 2024). Yet, in the CRE loan market, banks have defied this rise of nonbank lenders. Here, banks have gained nearly 5 percentage points of market share from their nonbank competitors since 2015 and now account for two-thirds of financial sector credit exposure (Figure A4).

However, this broad trend masks considerable heterogeneity across banks. Figure 3 shows that within the banking sector, regional banks have continuously increased their market share since 2012. Now, regional banks account for 55% and 49% of mortgage holdings in the non-residential and multifamily market segments, respectively. This represents an almost 20 percentage point increase in each segment relative to 2012. Moreover, regional banks have overtaken large banks in undrawn credit lines secured with commercial properties. This is important because recent work by Acharya, Gopal, Jager, and Steffen (2025) has highlighted potential risks from credit line provisions to the CRE sector. Only in non-real estate secured CRE loans, large banks maintain a dominant position (Figure A5). However, Figure A6 shows that banks in total hold merely $230 billion of these loans, in comparison to $2,880 billion in mortgages and $410 billion in undrawn credit lines.

The regional bank shift into CRE is the outcome of a strikingly uniform allocation of banks' balance sheet expansion. Figure 4 highlights that regional banks cluster tightly along a steep trajectory that links their CRE expansion to their growth in assets. Conversely, large banks display significant heterogeneity and follow a flatter path.[1] In total, large banks increased their CRE loan holdings by only a modest $260 billion over the last 10 years. Over this period, their balance sheets expanded by $7,830 billion. In contrast, regional banks balance sheets grew by $2,330 billion[2] of which $870 billion was put towards increased CRE loan holdings. Put differently, for $100 in aggregate asset growth, regional banks put $37.30 towards CRE loans while large banks only allocated $3.32. This pattern echoes the findings from Berg, Haselmann, Kick, and Schreiber (2024) who document that German banks similarly channeled liquidity obtained in quantitative easing programs primarily into real estate markets.

This large expansion has pushed regional banks toward high levels of CRE concentration. Figure 5 documents the shift in the distribution of CRE-to-total-capital ratios. At the end of 2014, the median regional bank had a concentration ratio of 266% and 37.5% of institutions exceeded the 300%-threshold that can prompt heightened supervisory scrutiny. By September 30, 2025, the distribution has shifted rightward. Now, 53.0% of regional banks exceed this threshold and the median concentration ratio is at 310%. Simultaneously, large banks have moved in the opposite direction. Their distribution of CRE concentration ratios has shifted markedly to the left. By September 30, 2025, most large banks maintain exposures below 100% of total capital. The most notable exception is New York Community Bank (NYCB), now rebranded to Flagstar Bank. In 2023, NYCB exceeded the $100 billion threshold for the first time and has up to then largely behaved like a regional rather than a large bank. Despite a reduction, NYCB's CRE concentration still exceeds 400% which is

[1] We find a similar pattern when we scale CRE growth figures by assets in Figure A7.

[2] If anything, regional banks expanded their balance sheets at a slightly higher rate than large banks. In 2015, large and regional banks accounted for 78.4% and 15.6% of the banking sector's total assets, respectively. By the end of 2024, those numbers were 77.1% and 18.0%.

more than double that of the next highly concentrated large bank. NYCB's recent distress due to its extreme concentration in rent-regulated multifamily properties may offer a preview of the vulnerabilities that can arise from this concentration.

2 Data Sources

Our main analysis combines data from three sources: property and loan-level commercial property data from Intercontinental Exchange, bank financial data from call reports and FR Y-9C, and commercial property price index data from MSCI. We reference data from other sources within the analysis.

First, detailed data on commercial property transactions are key to our analysis. We obtain such data from from Intercontinental Exchange (ICE), formerly Black Knight Financial Services. In turn, ICE constructs these data from public records at county registers. In total, their data cover records from more than 99% of U.S. counties.

In the United States, a lender must make their interest public to be considered a secured party. For a loan secured by real estate, this occurs through the recording of a mortgage at the local county register. Important to our study, these records provide information on the associated loan including the lender, borrower and property identities, and the loan amount. In addition to mortgage records, ICE collects data on the assignments of mortgages to other lenders and the release of mortgages. Jointly, this information allows us to assign new CRE loans to their respective lenders, track loan ownership over time, and capture its ultimate repayment.

Furthermore, ICE collects data on property ownership changes from deeds records. For ownership changes as the result of a sale, these records will state the buyer, the seller, and identify the property. We also obtain the date at which the sale took place as well as the sales price.

Lastly, ICE obtains property information from assessment rolls. Commonly, these records include information on lot size, building area, number of units for multifamily buildings, assessed value and market value estimated by the assessor.

The use of public records data in this project provides a significant innovation to the literature. The majority of research on CRE lending is based on data from reports by securitization conduits such as CMBS (e.g., Glancy, Kurtzman, and Loewenstein, 2022), insurers' regulatory filings with the National Association of Insurance Commissioners (e.g., Glancy, Krainer, Kurtzman, and Nichols, 2022), or capital assessment and stress testing reports made by the very largest banks via Form FR Y-14Q (e.g., Black, Krainer, and Nichols, 2020; Crosignani and Prazad, 2024). An exception is Ghent and Valkanov (2016), who use transaction-level data on real estate transactions in Boston, Las Vegas, Los Angeles, and New York City. Contemporaneously, Anenberg et al. (2025) and Glancy and Kurtzman (2024) have constructed similar data sets to ours based on county records. Overall, research on regional banks has been scarce due to limited data availability. Given regional banks' position as the largest lender category in the CRE market, this constitutes a significant gap in the literature.

Second, we employ bank financial data from the Consolidated Reports of Condition and Income (Forms FFIEC 031, 041, and 051), also referred to as "call reports," and from the Consolidated Financial Statements for Holding Companies (Form FR Y-9C). The former forms are filed by all commercial banks with offices in the United States, while the latter is filed by any U.S. bank holding company with consolidated assets above $3 billion. Both forms closely mirror each other and provide balance sheet, income statement and further supplemental information. As call reports and FR Y-9C constitute standard data sources for researchers, we refrain from a more detailed discussion here.

Third, Real Capital Analytics, now part of MSCI, provides us with commercial property price indices. MSCI constructs indices for sixty geographies and four commercial property sectors — office, retail, industrial, and multifamily. Multifamily indices describe prices per

apartment unit based on all real estate transactions over $2.5 million. For the other three sectors, the indices capture prices per square foot. With 4 sectors and 60 geographies, we have up to 240 possible combinations, which we call markets. For each index, we use the quarterly, hedonic-adjusted index series. Koijen, Shah, and Van Nieuwerburgh (2025) provide further details on the index data.

Summary Statistics. Table 1 summarizes our loan-level database as of the third quarter of 2024. This table presents statistics on bank- and loan-level variables for all, regional, and large banks. We classify a bank as "large" if it has total assets of at least $100 billion at any time over the sample period. We define other banks as regional if their assets exceed $1.564 billion, the 2024 Community Reinvestment Act threshold. The sample includes data on total assets, CRE loans, and key metrics that capture market participation, portfolio allocation, and financial health.

For all banks, the average amount of total assets was $85.03 billion. As is well known, this distribution is highly skewed which contributes to the high standard deviation of $345.50 billion. Because of their systemic importance, many large banks face higher regulatory capital requirements. Bank capitalization reflects this. Large bank total capital ratios averaged 16.02% which exceeds the average of regional banks at 14.19%.

On bank portfolio composition, we find significant differences across bank type groups. For example, large banks allocated 26.23% of their portfolio to Offices compared to 18.11% at regional banks.

3 CRE Distress in Bank Loan Portfolios

To assess distress in bank CRE loan portfolios, we aggregate distress measured at the loan level. We identify distressed loans based on whether a loan is undercollateralized due to property revaluations. To this end, we estimate loan-to-value (LTV) ratios for all bank

loans at a given date. For the outstanding loan amount, we assume an interest-only loan structure and take the loan principal at origination as current loan balance. To estimate a property's current valuation, we project the sales price of its most recent arms-length transaction forward using the return of the corresponding commercial property price index over the intervening period. Thus, we assume that a property's valuation changes in line with those of other properties in the same sector-location market.

For our baseline, we classify loans with an LTV above 95% as distressed. This cutoff flags loans for which a bank would likely incur a loss if held-to-maturity absent any subsequent property price recovery, or if the bank were to sell the loan today. Our measure includes distress that may still be latent where credit deterioration has not yet materialized in a loan's cash flows. For instance, even property owners with underwater mortgages may optimally continue to make interest payments until maturity if properties have declined in value due to higher capitalization rates provided that net operating incomes remain stable.

Figure 6 compares the aggregate dollar-share of loans with latent distress to realized delinquency rates for regional and large banks from 2017 through 2024. These two metrics tracked each other closely at low levels until 2021, after which they diverged. For both non-residential and multifamily properties, latent distress substantially exceeds contemporaneous delinquencies by approximately four to one. The gap is 4.5 and 8 percentage points for regional and large banks, respectively. This indicates that bank loan portfolios contain far greater distress than reported loan performance figures suggest.

However, regional banks exhibit substantially less latent distress than large banks, as in the reported numbers. We arrive at our distress measures independent of any bank-reported inputs. Therefore, the fact that latent distress occurs at a similar ratio to delinquencies for large and regional banks suggests that regional banks' lower reported delinquencies do not reflect underreporting alone. Rather, this finding points to property fundamentals as an important contributing factor.

To formally investigate which factors explain the difference between regional and large bank distress, we estimate the linear probability model

$$Distress_l = \beta Regional_{b(l)} + \mu_{m(l)\tau(l)} + \varepsilon_l. \tag{1}$$

We estimate this cross-sectional specification on a sample including any loan l held by a bank b as of the third quarter of 2024. Each loan is secured by a commercial property in market m and was originated in quarter *tau*. *Distress* is an indicator that equals 1 for loans with current LTV above 95%. Our variable of interest, *Regional*, identifies loans on regional bank balance sheets. We include a set of fixed effects, μ, defined up to the market-origination quarter level. To decompose aggregate portfolio distress, we employ a weighted-least squares estimator that weights loan observations by outstanding amounts.[3] Standard errors are two-way clustered at the bank and market levels.

Table 2 presents our results. The intercept-only model in Column 1 shows that distressed loans account for 7.2% of the combined large and regional bank aggregate loan portfolio. The inclusion of our *Regional* indicator in Column 2 shows that distressed loans make up 4.8% of the aggregate regional bank portfolio. This is almost half the share in the large bank portfolio, which is 9.5%. The difference of 4.7 percentage points is economically large and strongly statistically significant.

The subsequent columns sequentially introduce fixed effects to decompose β, the differential distress between regional and large bank CRE loan portfolios. Column 3 through Column 5 include fixed effects one-by-one. First, the addition of origination quarter fixed effects in Column 3 changes our estimate only slightly to 4.9 percentage points. Thus, differences in the timing of originated loans play no meaningful role in explaining the distress differential. Second, when we include property sector fixed effects in Column 4, the absolute loan distress

[3]Distress occurs disproportionately in high price markets where loans are larger. Therefore, ordinary least squares does not converge to our estimand of interest because it assigns equal weights to all loans.

differential falls to 2.9 percentage points. This means that the property sector explains about two fifth of the loan distress differential. Third, the impact of property location is even more pronounced. Column 5's model with location fixed effects shows that regional bank CRE loan portfolios have only 1.9 percentage points less distress. This estimate is statistically significant at the 10% level. Relative to the baseline without fixed effects, location fixed effects explain about three-fifth of the differential.

Lastly, we interact our set of fixed effects. When we compare regional bank loans to large bank loans in the same sector-location market (Column 6), or loans originated in the same quarter within a market (Column 7), we no longer find any distress differential despite high estimate precision. Since we estimate property valuations using returns of market-level price indices, within-market differences in loan performance must reflect factors other than property price changes. Therefore, these results imply that lower distress in regional bank loans does not result from tighter lending standards as measured by lower origination LTVs. Instead, regional banks have benefited from their greater exposure to markets that have performed better thus far.

3.1 Property Quality

Conditional on market-loan vintage, we have found no discernible differences in distress between regional and large bank loans. This implies that potential heterogeneity in loan origination standards as measured by original LTV does not explain distress. Some loan risk may derive from other within-market factors such as building quality. For example, if low-quality buildings disproportionately secure regional bank loans and those buildings experienced sharper revaluations, regional bank portfolios would contain additional distress. However, the definition of our indices at the market level means that such performance differences are undetectable in our analysis.

To show that such differences may be relevant, we estimate variants of our previous model

in Equation 1 where we replace *Distress* with two measures of building quality as outcomes. Specifically, we investigate differences in age and neighborhood rents among properties securing regional and large bank loans. For the former, we define the indicator *Old* to equal 1 if a building's age adjusted for major renovations is in the oldest decile of buildings within its market. For the latter, we classify properties in the bottom decile by neighborhood net effective rent per square foot within their market, *Low Rent*. We obtain net effective rent information from Koijen et al. (2025).

Table 3 displays our estimates. Based on our most saturated specification in Column 3, loans secured by old properties account for a 1.6 percentage points higher portfolio share for regional than large banks. Additionally, Column 6 shows that portfolio weight of loans secured by properties in low rent neighborhoods is 1.6 percentage points higher for regional banks after we control for property market and loan vintage. Together, these results show that regional banks have a higher concentration in older and lower-rent properties.

3.2 Bank Capitalization

Next, we study how CRE loan portfolio distress varies with bank loss absorbing capacity. We estimate a specification analogous to Equation 1:

$$Distress_l = \beta\, Total\ Capital\ Ratio_{b(l)} + \mu_{m(l)\tau(l)} + \varepsilon_l. \tag{2}$$

We provide separate estimates for our regional and large bank loan samples. *Total Capital Ratio* is a bank's total capital ratio. We measure regulatory capital in the fourth quarter of 2019, before the onset of CRE distress, to avoid distress having already affected bank capital.

Table 4 Column 1 through Column 3 show results for regional banks. Once we control for loan market and vintage, the coefficient on *Total Capital Ratio* is negative and statistically significant. Thus, latent distress is larger for low capital regional banks. Column 4 through

Column 6 show results for large banks. Here, the effect of bank capital is positive but statistically insignificant.

Overall, we find CRE loan distress materially above realized delinquencies and other reported credit deterioration metrics. Regional banks' lower distress relative to large banks mostly reflects their exposure to more benign commercial property markets. However, among regional banks distress is more concentrated in the portfolios of banks with weaker capitalization.

4 CRE Stress Tests

We evaluate bank resilience under stress test scenarios with further CRE price declines. To assess bank capitalization under these scenarios, we aggregate losses computed at the loan level. This allows us to account for banks' portfolio distributions across markets, existing stress, and origination lending standards. Our approach highlights where fragility is most likely to surface and which portfolio attributes identify at-risk banks.

We apply a relative price shock $\xi \in (0, 1)$ to the current value of each property p that secures loan l in the CRE loan portfolio $\mathcal{L}_b$ of bank b:

$$Stressed\ Value_p = Value_p\,(1 - \xi)\,. \tag{3}$$

As our baseline, we consider a 30% decline in commercial property prices, i.e., $\xi = 0.3$. We consider this scenario a severe but plausible downside case for analysis. The size of this shock matches CRE price declines in the adverse supervisory stress test scenario used by the Federal Reserve in 2025 (Federal Reserve Board, 2025). For comparison, the 2024 supervisory stress test assumed a larger 40% fall in prices (Federal Reserve Board, 2024).

Next, we translate collateral shortfalls into loan losses after netting out a deadweight loss,

ϕ, associated with foreclosure or bankruptcy:

$$Scenario\ Loss_l = \max\left\{Loan\ Amount_l - (1-\phi) \times Stressed\ Value_{p(l)},\quad 0\right\}. \tag{4}$$

We assume a deadweight loss of 5%, i.e., $\phi = 0.05$. We consider our assumption conservative. Brown, Ciochetti, and Riddiough (2006) found that life insurers sold distressed commercial properties at average price discounts of 20% to 30%. Even transfer taxes alone often approach our assumed deadweight loss.[4]

We compute a bank's portfolio loss rate as

$$Portfolio\ Loss\ Rate_b = \left(\sum_{l\in\mathcal{L}_b} Scenario\ Loss_l\right) / \left(\sum_{l\in\mathcal{L}_b} Loan\ Amount_l\right). \tag{5}$$

We use the loss rate to calculate a bank's total capital ratio in our stress scenario:

$$Scenario\ Total\ Capital\ Ratio_b = \frac{Total\ Capital_b - Total\ CRE\ Loans_b \times Portfolio\ Loss\ Rate_b}{RWA_b - Total\ CRE\ Loans_b \times Portfolio\ Loss\ Rate_b}. \tag{6}$$

In the numerator, a bank's scenario total capital equals its previous total capital net of CRE loan losses. The denominator of Equation 6 calculates a bank's scenario risk-weighted assets (RWA). Under the standardized approach, banks generally apply risk weights of 100% to CRE loans.[5] Our calculation assumes that banks apply the 100% risk weight to all CRE loans. We further assume that banks reinvest recovered amounts into new CRE loans. Together, these assumptions imply that risk-weighted assets fall one-to-one with CRE loan losses.

Figure 7 shows the distribution of bank total capital ratios as currently reported and under

[4]For example, common transfer or recording tax rates in New York City, Washington DC, and Los Angeles are 3.025%, 2.9%, and 4.56%. In foreclosure, transfer taxes often have to be paid twice.

[5]High volatility commercial real estate acquisition, development, or construction (HVCRE ADC) loans, i.e., loans that primarily fund commercial construction projects, are risk-weighted at 150%. CRE loan delinquencies can also lead to higher required risk weights at 150%.

our 30%-revaluation scenario. Despite substantial distress in their CRE loan portfolios, Panel B shows that most large banks experience only a modest impact on their capital positions. This outcome reflects most large banks' limited CRE exposure relative to the size of their balance sheets. The only notable exception to this is Flagstar Bank, formerly New York Community Bancorp. In our previous discussion of bank CRE exposures, we highlighted Flagstar Bank's outlier CRE loans-to-total capital ratio above 500% among large banks. Moreover, Flagstar Bank suffers from already already low loan collateralization due to the underperformance of New York City commercial properties and its local multifamily market in particular. Combined, these factors lead Flagstar Bank to become undercapitalized.

In contrast, Panel A shows a substantial leftward shift in the capital distribution of regional banks. A large share of regional banks sees a decline in their prompt corrective action category, and a meaningful share of regional banks become undercapitalized.

Table 5 profiles the institutions that breach undercapitalization thresholds in the stress test scenario. For those at-risk banks, we show their CRE intensity, current and stressed total capital ratios, as well as largest sector and geographic exposures. Vulnerable banks have notably concentrated CRE loan portfolios. For many banks, their top geographic markets account for more than half of their loan book. Sectoral concentration is similarly high. Multifamily and retail feature most frequently as main exposures, while a few institutions concentrate in office. These features underscore that even localized stress quickly pushes many regional banks into undercapitalization.

The stress test results reconcile two facts established earlier: first, regional banks currently show lower realized and latent distress on average due to their portfolio composition; yet second, a non-trivial portion of banks is vulnerable to declines in the values of their commercial property collateral.

5 Bank Lending Response

Our stress test quantifies losses if loans are recognized at fair value today, or at maturity at today's valuations. However, loss realization also depends on a borrower's ability to roll over their debt financing. If a distressed borrower can refinance their loan, the bank may be able to avoid having to recognize a loss. Thus, we examine how refinancing responds to distress. We form a quarterly panel of outstanding bank loans from March 2018 through June 2024 and estimate the linear probability model,

$$Refinanced_{lt+1} = \beta_1 Distress_{lt} \times Regional_{b(l)} + \beta_2 Distress_{lt} + \mu_{b(l)m(l)t} + \varepsilon_{lt}. \tag{7}$$

Refinanced is an indicator, scaled by 100, that identifies if loan l secured by a property in location-sector market m made by bank b is refinanced between quarter t and quarter $t+1$. *Distress* is our previously defined indicator that flags distressed loans, i.e., loans with a current LTV ratio above 95%. *Regional* is an indicator that equals 1 if the loan is held by a regional bank. Lastly, we include bank-market-quarter fixed effects. Standard errors are two-way clustered at the bank and location-sector levels.

Table 6 tabulates our results. Column 1 and Column 2 study refinancing among all banks. Because we include bank-market-quarter fixed effects, our estimates on *Distress* compare the refinancing propensity of distressed to undistressed loans by a given bank within the same market in a given quarter. Consequently, our specification controls for time-varying bank-specific loan demand within a market. Neither estimate is statistically significant. Therefore, we do not find an effect of loan distress on refinancing propensities in general.

Column 3 further includes the *Distress* × *Regional* interaction. The coefficient β_1 captures the difference between regional and large banks' within-bank-market-quarter refinancing propensity of distressed relative to undistressed loans. Again, we do not find any discernible effect. Overall, the results in Column 1 through Column 3 are consistent with predetermined

refinancing schedules due to limited prepayment optionality of CRE loans.

Close to maturity, CRE loans are more frequently callable. Thus, an effect may exist for these loans. To test this hypothesis, we restrict our loan sample to loans within one year of their maturity date. Columns 4 through 6 present the results. We do not find a statistically significant effect in Columns 4 and 5.

Column 6 distinguishes between large and regional banks. Now, our estimate of β_2 becomes negative and statistically significant. This indicates that large banks are less likely to refinance distressed loans as they approach maturity. Interestingly, β_1, the coefficient estimate on the interaction term is positive and statistically significant. In magnitude, this coefficient offsets β_2. This result suggests that regional banks are more lenient in funding distressed borrowers than large banks.

Having analyzed banks' propensity to lend to distressed borrowers, we next investigate the terms at which refinancing occurs. Specifically, we ask if banks require landlords to provide additional equity to refinance distressed loans, thereby reducing the risk faced by the bank. For the sample of refinanced loans, we estimate

$$Equity\ Contribution_l = \beta_1 Distress_l \times Regional_{b(l)} + \beta_2 Distress_l + \mu_{b(l)m(l)t(l)} + \varepsilon_l. \quad (8)$$

We classify a refinancing of loan l as an equity contribution if the new loan amount is less than the outstanding balance being refinanced. We estimate two specifications. For the extensive margin, *Equity Contribution* is an indicator that equals 1 for equity contributions and zero otherwise. For the intensive margin, *Equity Contribution* measures the percentage reduction in loan amount for equity contributions and zero otherwise. For our intensive margin specification, we let *Distress* measure the amount by which the loan's LTV exceeds 95%, or zero if LTV is below 95%. All other variables are defined as before.

Table 7 presents our results. Column 1 through Column 3 show our extensive margin re-

sults, while Column 4 through Column 6 show intensive margin results. While our previous findings do not show a strong bank response on whether refinancing is provided, we find a substantial effect on refinancing terms. Column 1 and Column 2 show that landlords with distressed loans are approximately 17 percentage points more likely to provide additional equity contributions when refinancing. Column 3 distinguishes between large and regional banks. We find that borrowers at regional banks are more than 50% less likely to provide additional equity contributions relative to borrowers at large banks.

Column 4 and Column 5 show that landlords deeper in distress provide more additional equity when refinancing. However, Column 6 reveals that this relationship only holds for large banks. For regional banks, we do not find that more distress is associated with larger equity contributions.

5.1 Heterogeneous Lending Responses Among Regional Banks

To summarize, our results document systematic differences between regional and large banks in their lending behavior toward distressed borrowers. Regional banks are more likely to refinance distressed loans near maturity and, conditional on refinancing, are less likely to require additional equity contributions from borrowers. In contrast, large banks adjust equity contribution requirements more strongly with the severity of borrower distress, a pattern that is not observed among regional banks.

Taken together, these findings are consistent with multiple interpretations. One possibility is that regional banks relax lending standards to delay the recognition of losses on distressed CRE loans — often referred to as evergreening or extend-and-pretend behavior — which could increase downside risk if property values do not recover. An alternative interpretation is that regional banks may be more willing to accommodate distressed borrowers in an effort to support recovery, particularly when defaults would generate adverse spillovers in their local markets. Our results do not allow us to conclusively distinguish between these

mechanisms, but help characterize the conditions under which regional banks exhibit greater leniency.

We next examine in Table 8 heterogeneity in the equity contribution-response across alternative measures of bank capitalization for regional banks. If lenient refinancing were primarily driven by evergreening behavior associated with weaker balance sheets, one might expect stronger effects among less-capitalized banks. However, Columns 4 and 5 of Table 8 show limited evidence of differential behavior by bank capital within regional banks. While this pattern does not rule out evergreening, it does not support a mechanism concentrated among more weakly capitalized institutions.

We then explore heterogeneity by banks' local loan shares and by the importance of a market within a bank's overall portfolio. Columns 4 through 6 of Table 9 show that regional banks are less lenient when their local market share is larger, consistent with market power considerations, but that this effect is attenuated in markets that represent a larger fraction of the bank's total portfolio. These patterns suggest that regional banks' refinancing behavior varies systematically with the economic importance of local markets, but they do not definitively identify whether such behavior reflects inefficient risk-shifting or efficient internalization of local default costs.

6 Conclusion

Over the last decade, regional banks have become the largest providers of CRE credit. Both by total dollar value and as a share of assets, regional banks' exposure to this asset class has become material. To measure present risks, we build a novel loan-level dataset on regional bank CRE loan books from county records. We identify distress in those books by estimating current commercial property valuations using a set of granular sector–location indices.

Currently reported realized performance metrics substantially understate risks present in

the banking sector. By the end of 2024, distress vastly exceeds delinquencies. Both realized and unrealized distress are more pronounced in large bank portfolios. The outperformance of regional banks' CRE loans relative to those of large banks is compositional. Regional banks tend to have more exposure to markets and sectors that have seen prices contract less sharply. Within markets, however, regional banks rely more on lower quality properties as collateral.

We subject bank CRE books to stress tests to assess their resilience. Under an adverse scenario, most large banks remain adequately capitalized. For regional banks, a substantial share of institutions become undercapitalized. Common to those banks is a high degree of portfolio concentration. Frequently, more than half of their CRE book is concentrated in a single sector or geography, often in markets that have already experienced significant repricing. This lack of diversification creates fault lines where even local shocks may quickly lead to bank failures.

We show that differences in refinancing behavior between regional and large banks extend beyond average effects and vary across bank and market characteristics. Among regional banks, leniency in equity contribution requirements does not differ meaningfully by capitalization but is systematically related to local market positions and portfolio exposure. While these findings do not allow us to distinguish conclusively between alternative mechanisms, they highlight how regional banks' organizational scope and local exposure shape lending terms in periods of borrower distress. In the best case, this lending behavior may help regional bank borrowers recover; in the worst case, it may amplify downside risks should valuations fall further.

References

Acharya, V. V., Gopal, M., Jager, M., and Steffen, S. (2025). Shadow Always Touches the Feet: Implications of Bank Credit Lines to Non-Bank Financial Intermediaries. *Working Paper*.

Anenberg, E., Kim, Y. S., and Moszkowski, E. (2025). Work-from-home, commercial real estate risk and credit supply: Evidence from a large sample of bank loan portfolios. *Working Paper*.

Berg, T., Haselmann, R. F. H., Kick, T. K., and Schreiber, S. (2024). Unintended Consequences of QE: Real Estate Prices and Financial Stability. *Working Paper*.

Black, L. K., Krainer, J. R., and Nichols, J. B. (2020). Safe Collateral, Arm's-Length Credit: Evidence from the Commercial Real Estate Market. *The Review of Financial Studies*, *33*(11), 5173-5211.

Brown, D. T., Ciochetti, B. A., and Riddiough, T. J. (2006, 02). Theory and evidence on the resolution of financial distress. *The Review of Financial Studies*, *19*(4), 1357-1397.

Buchak, G., Matvos, G., Piskorski, T., and Seru, A. (2024). The secular decline of bank balance sheet lending. *Working Paper*.

Crosignani, M., and Prazad, S. (2024). Extend-and-Pretend in the U.S. CRE Market. *Working Paper*.

Federal Reserve Board. (2023, 10). *Financial stability report.*

Federal Reserve Board. (2024, February). *2024 Stress Test Scenarios.* Retrieved 9/30/2025, from https://www.federalreserve.gov/publications/files/2024-stress-test-scenarios-20240215.pdf

Federal Reserve Board. (2025, February). *2025 Stress Test Scenarios.* Retrieved 9/30/2025, from https://www.federalreserve.gov/publications/files/2025-stress-test-scenarios-20250205.pdf

Ghent, A., and Valkanov, R. (2016). Comparing securitized and balance sheet loans: Size matters. *Management Science*, *62*(10), 2784–2803.

Glancy, D., Krainer, J. R., Kurtzman, R. J., and Nichols, J. B. (2022). Intermediary segmentation in the commercial real estate market. *Journal of Money, Credit and Banking*, *54*(7), 2029-2080.

Glancy, D., and Kurtzman, R. (2024). Determinants of recent CRE distress: Implications for the banking sector. *Working Paper*.

Glancy, D., Kurtzman, R. J., and Loewenstein, L. (2022). Loan modifications and the commercial real estate market. *Working Paper*.

Gupta, A., Mittal, V., Peeters, J., and Van Nieuwerburgh, S. (2022). Flattening the curve: Pandemic-induced revaluation of urban real estate. *Journal of Financial Economics*, *146*(2), 594-636.

Gupta, A., Mittal, V., and Van Nieuwerburgh, S. (2025). Work from home and the office real estate apocalypse. *American Economic Review*, *forthcoming*.

Jiang, E., Matvos, G., Piskorski, T., and Seru, A. (2025). Monetary Tightening, Commercial Real Estate Distress, and US Bank Fragility. *Journal of Political Economy: Macroeconomics*, *accepted*.

Koijen, R. S., Shah, N., and Van Nieuwerburgh, S. (2025). The commercial real estate ecosystem. *Working Paper*.

Figure 1: Aggregate Delinquency Rates on CRE Mortgages.

These figures show aggregate delinquency rates on nonresidential and multifamily mortgages by bank type from December 31, 2016 through September 30, 2025. Large banks have at least $100bn in assets at any time over the displayed period. Other banks are defined as regional if their assets exceed $1.564bn, the 2024 Community Reinvestment Act small bank cutoff. Nonresidential and multifamily mortgage classifications follow the FRB Z.1.

Source: FFIEC 031/041/051, FR Y-9C.

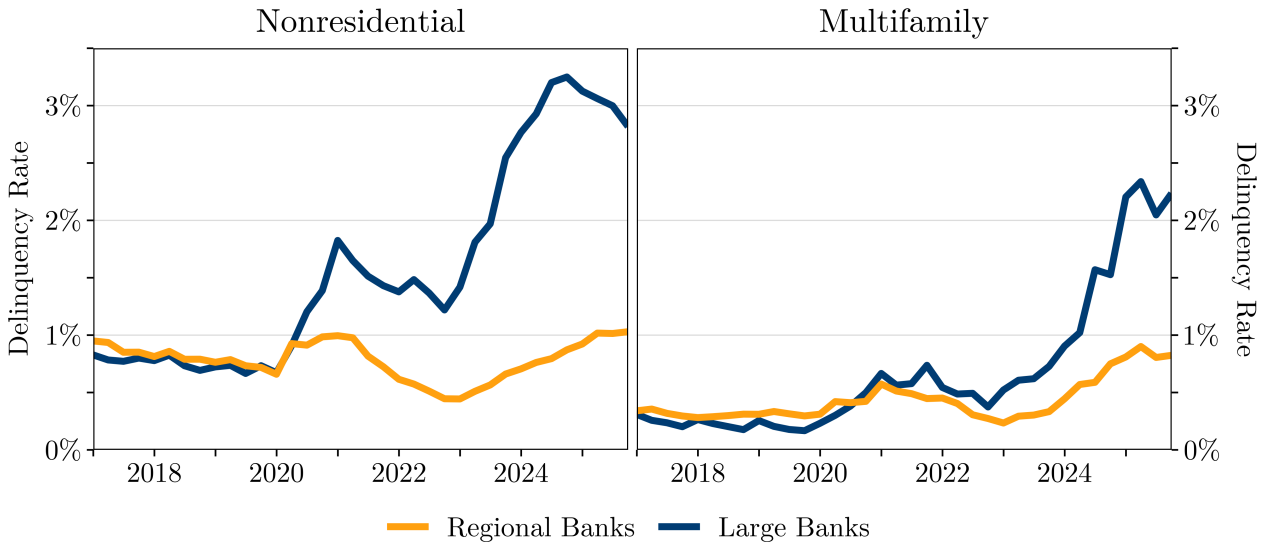


Figure 2: CRE Credit Growth.

These figures describe the growth in CRE credit. The left panel, shows the total outstanding dollar amount for nonresidential and multifamily mortgages from December 31, 2008 through September 30, 2025. The right panel shows the outstanding balance of CRE mortgages, corporate loans, consumer loans, and home loan mortgages, relative to their 2015 balance over the decade from December 31, 2014 through September 30, 2025.

Source: FRB Z.1.

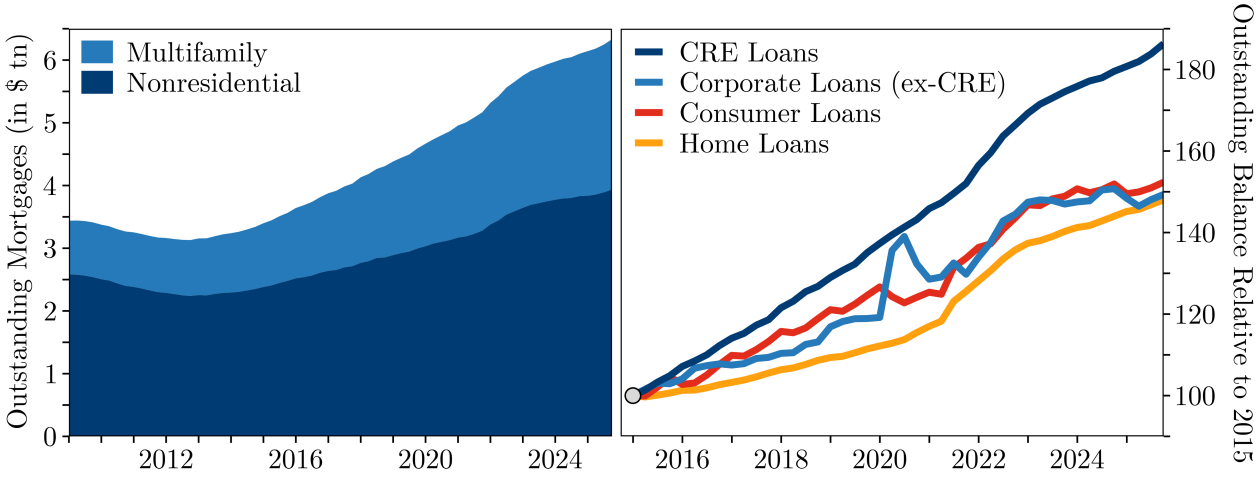


Figure 3: Bank CRE Mortgage Market Shares.

These figures partition the banking sector's CRE mortgage holdings into the fractions on large, regional, and community bank balance sheets. Large banks have at least $100bn in assets at any time over the displayed period. Other banks are defined as regional if their assets exceed $1.564bn, and community bank otherwise. Non-residential commercial and multifamily mortgage classifications follow the FRB Z.1.
Source: FFIEC 031/041/051, FR Y-9C.

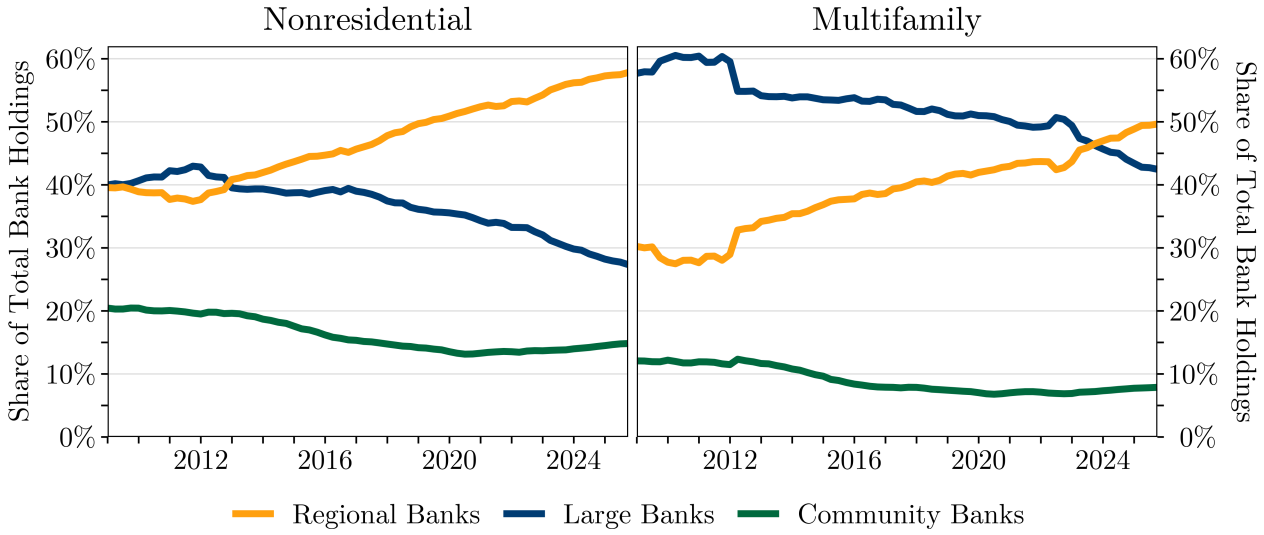


Figure 4: Bank Balance Sheet Expansion and CRE Lending Growth.

These scatter plots display banks' changes in assets against changes in their CRE mortgage holdings from the December 31, 2014 to September 30, 2025. Dollar changes are given in billions. Orange circles and blue crosses symbolize individual regional and large banks, respectively. Lines of best fit are shown in corresponding colors. For visual clarity, these figures truncate one outlier observation, which is included in the estimation of the large bank fitted line and shown in Figure A8. Figure 1 describes bank types and mortgage classifications.

Source: FFIEC 031/041/051, FR Y-9C.

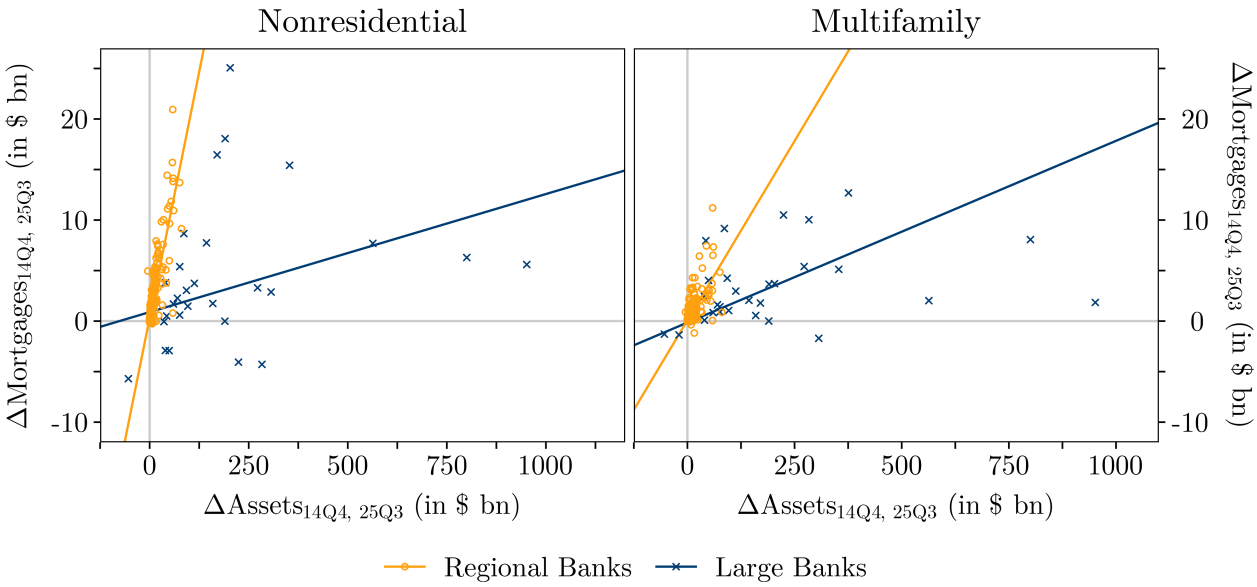


Figure 5: The Distribution of Bank CRE Exposure.

These histograms compare regional and large banks' CRE exposure distributions on December 31, 2014 to that on September 30, 2025. CRE exposure is measured by the ratio of a bank's CRE loans to its total capital. In each panel, a black line indicates the regulatory relevant threshold of 300%. Figure 1 defines regional and large banks.

Source: FFIEC 031/041/051, FR Y-9C.

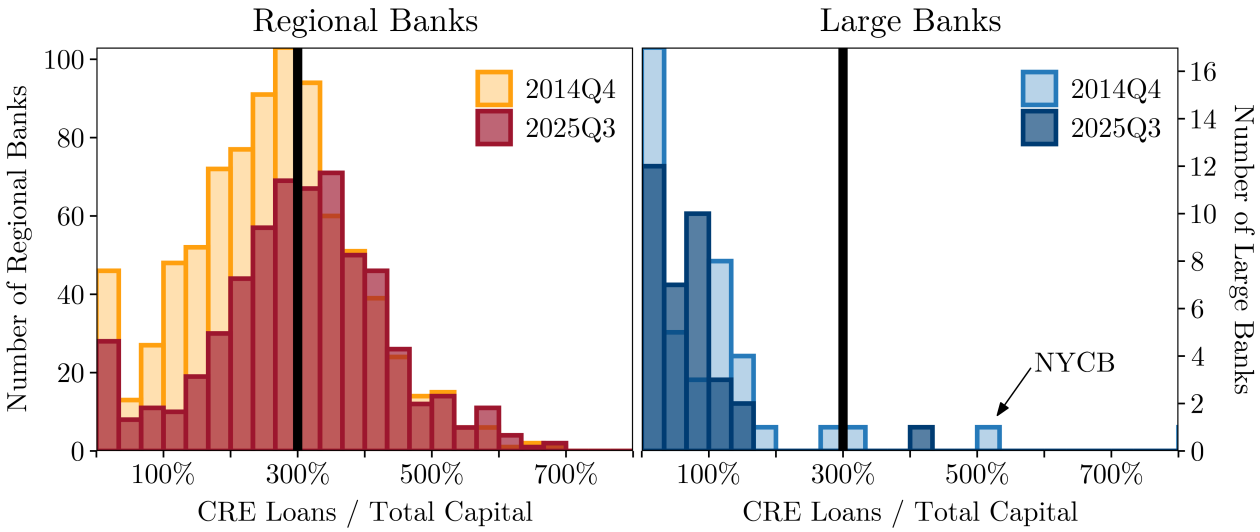


Figure 6: Latent and Realized CRE Loan Distress on Bank Balance Sheets.

The left panel displays the aggregate share of nonresidential mortgages that face latent distress for regional and large banks and contrasts it with their delinquency rates from December 31, 2016 through September 30, 2024. The right panel shows the corresponding numbers for multifamily mortgages. A property is classified to be in latent distress if its loan-to-value ratio based on current property price estimates exceeds 95%. Figure 1 describes bank types and mortgage classifications.

Source: FFIEC 031/041/051, FR Y-9C, Black Knight data and authors construction

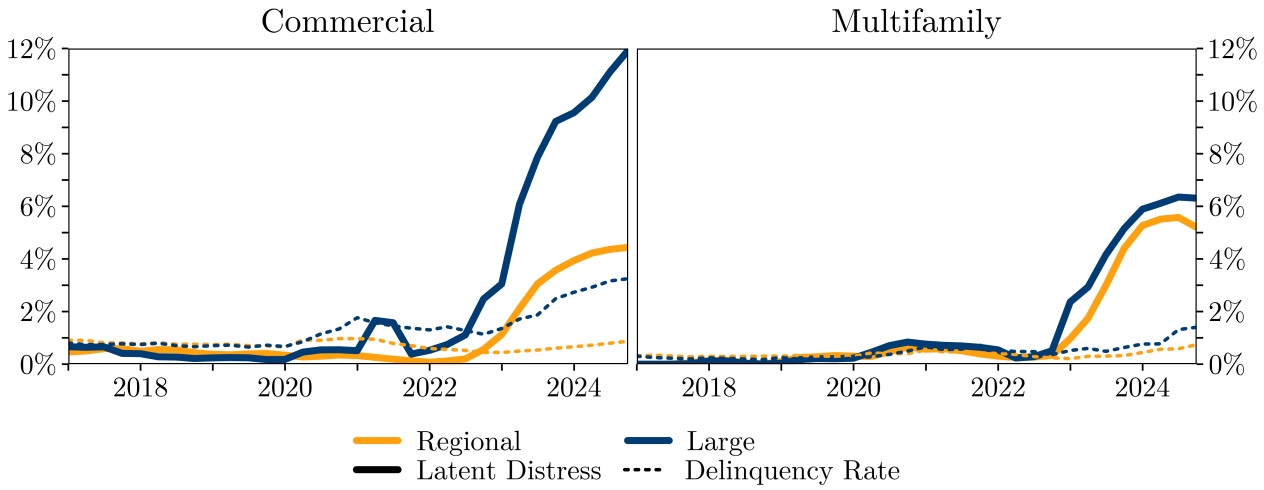
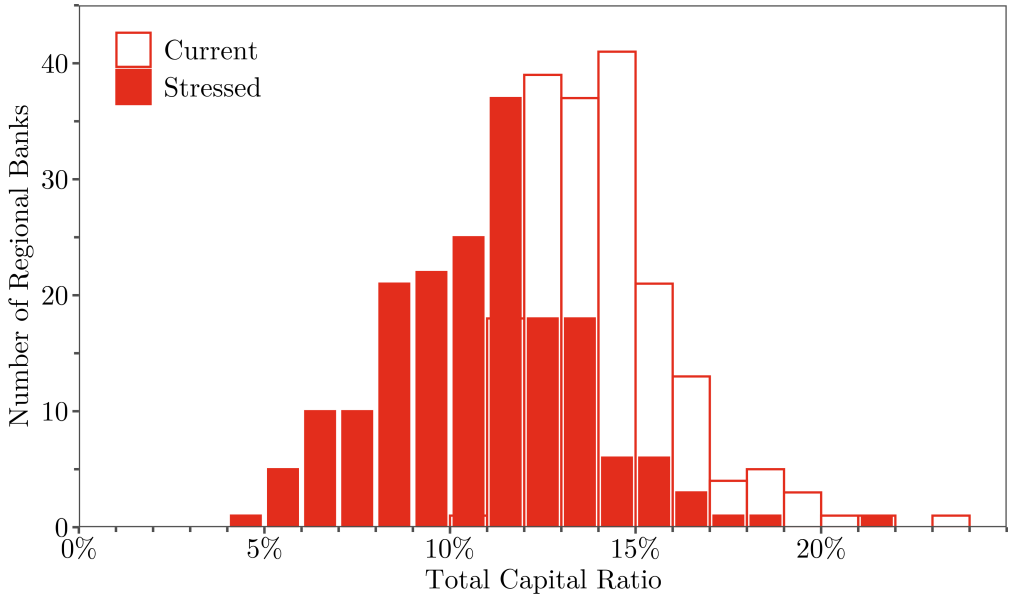


Figure 7: Bank Capitalization Under Further CRE Stress.

These histograms compare the distribution of total capital ratios as of September 30, 2024, to the distribution under a CRE stress scenario for regional and large banks. "Simulated" ratios are obtained under a scenario that exposes properties securing a banks' CRE portfolio to a 30% devaluation from current prices. *Source: FFIEC 031/041/051, FR Y-9C, Black Knight data, and authors' construction.*

Panel A: Regional Banks



Panel B: Large Banks

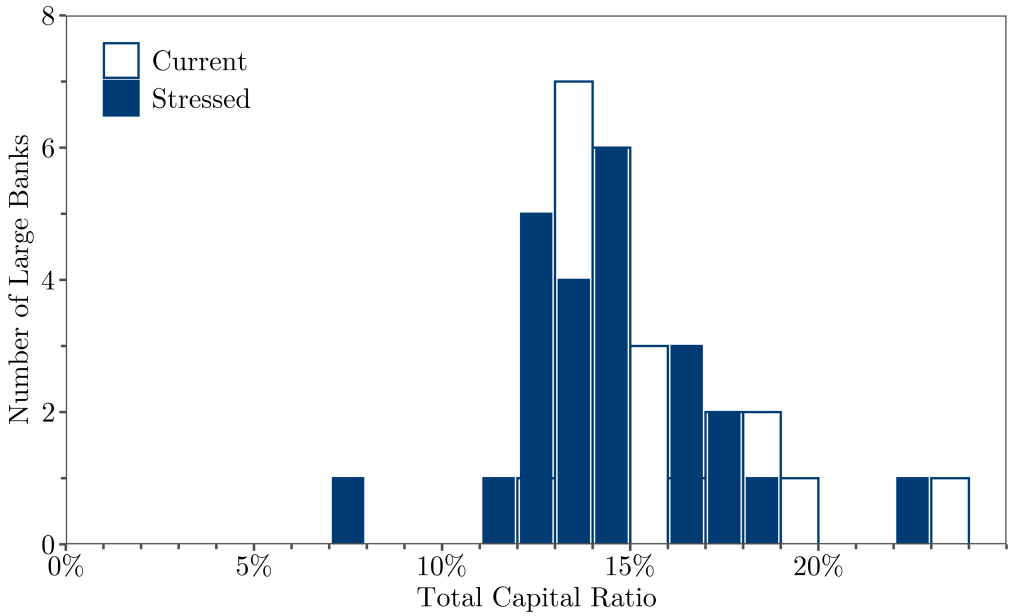


Table 1: Summary Statistics

This table provides summary statistics as of September 30, 2024. Large banks have total assets of at least $100bn at any time since 2017. Other banks are defined as regional if their assets exceed $1.564 billion. Columns 3 through 5 refer to both regional and large banks. Columns 6 through 8, and 9 through 11 refer to regional and large banks. In Panel A, *Total CRE Loans* measures the sum of nonresidential and multifamily real estate (CRE) loans. *Number of Locations* and *Number of Sectors* show the number of locations and sectors, in a which a bank holds CRE loans, respectively. *Ptf. Share* variables summarize banks' CRE loan portfolio shares secured by each of the four sectors, their largest location and sector allocation, and in distressed loans. Panel B shows aggregate statistics for loans and their securing properties. *Age* is the number of years since construction or renovation of a securing property. *Old* indicates properties in the oldest decile within a market. *Low Rent* indicates properties in the bottom decile by neighborhood net effective rent per unit.

		All			Regional			Large		
Variable	Unit	Median	Mean	SD	Median	Mean	SD	Median	Mean	SD
Panel A: Bank-level										
Total Assets	$ bn	9.73	85.03	345.50	7.90	15.94	18.37	220.38	623.94	863.24
Total CRE Loans	$ bn	3.75	8.74	17.00	3.17	5.14	5.12	27.94	36.79	38.73
CRE Loans/Assets	%	36.40	34.94	14.77	37.89	38.25	11.87	7.80	9.09	8.11
Total Capital Ratio	%	14.08	14.40	2.32	13.82	14.19	2.03	14.65	16.02	3.52
Delinquency Rate	%	0.58	0.98	1.18	0.53	0.73	0.76	2.37	2.87	1.96
No. Locations		15.00	17.70	12.27	13.00	14.86	9.29	40.00	39.88	9.90
No. Sectors		4.00	4.00	0.07	4.00	3.99	0.07	4.00	4.00	0.00
Portfolio Shares:										
Max. Location	%	43.76	45.69	21.12	48.14	48.70	20.15	17.92	22.19	11.83
Max. Sector	%	39.97	45.09	14.62	40.03	44.72	13.96	39.90	48.01	19.11
Office	%	18.29	19.04	10.74	17.58	18.12	9.72	23.92	26.23	15.13
Industrial	%	27.04	27.90	12.48	27.93	28.75	12.30	22.91	21.28	12.07
Retail	%	25.22	25.52	14.20	26.68	26.96	14.15	15.64	14.28	8.48
Multifamily	%	20.81	27.54	21.78	18.36	26.17	21.15	32.71	38.21	23.99
Distressed	%	4.28	5.50	6.16	3.96	4.88	4.19	6.54	10.31	13.28
Panel B: Loan-level (Aggregate)										
Issue LTV	%	66.77	64.38	18.17	67.81	65.26	17.21	66.04	63.53	19.01
Current LTV	%	62.94	62.91	22.96	63.72	62.80	20.68	61.91	63.03	24.97
Loan Amount	$ mn	3.74	28.34	89.31	2.92	7.80	17.55	5.50	48.18	120.76
Time Since Issue	qts	14.00	17.09	11.08	13.00	15.78	10.34	16.00	18.36	11.60
Distressed	0/1	0.00	0.07	0.26	0.00	0.05	0.22	0.00	0.10	0.29
Near Maturity	0/1	0.00	0.10	0.30	0.00	0.09	0.28	0.00	0.12	0.32
Building Age	yrs	39.00	44.33	29.73	40.00	45.53	29.39	38.00	43.19	30.01
Old	0/1	0.00	0.05	0.23	0.00	0.07	0.25	0.00	0.04	0.20
Low Rent	0/1	0.00	0.07	0.26	0.00	0.09	0.29	0.00	0.06	0.24

Table 2: CRE Loan Distress by Bank Type.

This table examines the distress exposure at the loan level by bank type. $Distress_{24Q3}$ is an indicator equal to 1 if loan i has a current LTV > 95%. *Regional* is an indicator equal to 1 if a bank is a regional bank. Observations are weighted by loan amount. Standard errors are two-way clustered at the bank and market level and reported in parentheses below their corresponding point estimates. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

	$\mathbb{1}\{\text{Distress} > 0\}$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	0.072***	0.095***					
	(0.007)	(0.011)					
Regional		-0.047***	-0.049***	-0.029***	-0.019*	-0.001	0.000
		(0.012)	(0.011)	(0.009)	(0.011)	(0.006)	(0.004)
Orig. Quarter FE	–	–	Yes	–	–	–	–
Sector FE	–	–	–	Yes	–	–	–
Location FE	–	–	–	–	Yes	–	–
Sector-Location FE	–	–	–	–	–	Yes	–
Orig. Quarter-Sector-Location FE	–	–	–	–	–	–	Yes
Observations	142,053	142,053	142,053	142,053	142,053	142,052	140,080
R^2		0.008	0.037	0.094	0.143	0.287	0.571

Table 3: Property Characteristics.

This table examines property characteristics of commercial properties that secure the CRE loan portfoliso of regional and large banks. The dependent variable *Old* is a dummy variable that equals one for properties in the oldest age decile in their market. *Low Rent* is a dummy variable that equals one for properties that are in the bottom decile by neighborhood net effective rent in their market. Observations are weighted by loan amount. Standard errors are two-way clustered at the bank and market level and reported in parentheses below their corresponding point estimates. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

	Old			Low Rent		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.054***	0.043***		0.073***	0.061***	
	(0.002)	(0.002)		(0.004)	(0.004)	
Regional		0.023***	0.016***		0.029***	0.016***
		(0.003)	(0.003)		(0.005)	(0.005)
Orig. Quarter-Sector-Location FE	–	–	Yes	–	–	Yes
Observations	129,041	129,041	127,045	48,389	48,389	46,420
R^2		0.002	0.141		0.003	0.238

Table 4: CRE Loan Distress and Bank Capitalization.

This table examines the relationship between banks' distressed CRE loan exposure and their total capital for regional and large banks. Column 1 through Column 3 estimates are obtained on the regional bank CRE loan sample as of September 30, 2024. Column 4 through Colum 6 estimates are obtained on the large bank CRE loan sample as of the same date. Total Capital Ratio is measured as of December 31, 2019. Observations are weighted by loan amount. Standard errors are two-way clustered at the bank and market level and reported in parentheses below their corresponding point estimates. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

	$\mathbb{1}\{\text{Distress} > 0\}$					
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	0.049***	0.047***		0.095***	-0.081	
	(0.003)	(0.015)		(0.011)	(0.135)	
Total Capital Ratio$_{19Q4}$		0.014	-0.168**		1.223	0.159
		(0.104)	(0.072)		(0.977)	(0.189)
Orig. Quarter-Sector-Location FE	–	–	Yes	–	–	Yes
Bank Sample	Regional	Regional	Regional	Large	Large	Large
Observations	76,862	76,862	75,000	65,191	65,191	62,882
R^2		0.000	0.435		0.007	0.713

Table 5: Characteristics of Banks at Risk of Becoming Undercapitalized.

This table describes the banks identified in Figure 7. *Top Location* shows the geography that represents the bank portfolio's largest share, which is shown in parentheses. *Top Sector* is the CRE sector with the largest share of the bank's portfolio. Bank names have been changed for anonymity

Bank	Type	Assets (in $ bn)	CRE Loans (in $ bn)	Total Capital Ratio (in %)		Top Location	Top Sector
				Current	Stressed		
Bank A	Regional	5.5	2.6	11.7	4.5	Tertiary Mid-Atlantic (63.3%)	Office
Bank B	Regional	3.9	1.7	11.2	5.3	Tertiary Southeast (56.1%)	Retail
Bank C	Regional	2.3	1.1	14.2	5.3	NYC/Long Island (77.7%)	Multifamily
Bank D	Regional	5.9	2.7	11.8	5.5	DC (46.2%)	Retail
Bank E	Regional	5.4	2.1	11.7	5.9	Tertiary Mid-Atlantic (52.1%)	Retail
Bank F	Regional	4.7	2.3	13.1	6.0	Boston (75.1%)	Industrial
Bank G	Regional	3.2	1.4	12.0	6.0	Tertiary Southeast (33.4%)	Office
Bank H	Regional	2.2	1.4	17.0	6.5	DC (54.3%)	Office
Bank I	Regional	4.9	2.1	11.7	6.6	Tertiary Southeast (75.1%)	Retail
Bank J	Regional	4.2	1.6	12.5	6.6	Tertiary Southeast (63.8%)	Retail
Bank K	Regional	2.2	1.3	11.6	6.7	Atlanta (68.8%)	Retail
Bank L	Regional	5.5	2.3	12.2	6.8	Tertiary Mid-Atlantic (58.0%)	Retail
Bank M	Regional	7.7	3.9	14.3	6.8	Los Angeles/OC (39.5%)	Retail
Bank N	Regional	3.4	1.6	11.6	6.8	Tertiary Northeast (54.5%)	Retail
Bank O	Regional	2.5	1.5	11.5	7.0	Los Angeles/OC (61.0%)	Multifamily
Bank P	Regional	9.2	5.0	13.4	7.0	Los Angeles/OC (61.9%)	Multifamily
Bank Q	Regional	9.3	3.9	12.4	7.2	Chicago (48.1%)	Multifamily
Bank R	Regional	13.7	8.7	14.4	7.2	NYC/Long Island (67.3%)	Multifamily
Bank S	Regional	11.2	6.2	15.6	7.2	DC (77.9%)	Office
Bank T	Large	114.3	46.6	13.2	7.3	NYC/Long Island (38.4%)	Multifamily
Bank U	Regional	4.1	1.9	13.0	7.4	Tertiary Midwest (36.4%)	Retail
Bank V	Regional	2.8	1.7	13.6	7.4	Atlanta (68.3%)	Industrial
Bank W	Regional	2.3	1.1	10.5	7.4	Columbus (45.8%)	Multifamily
Bank X	Regional	14.9	5.6	13.6	7.6	Los Angeles/OC (23.1%)	Industrial
Bank Y	Regional	4.7	2.6	14.3	7.7	Minneapolis (89.7%)	Multifamily
Bank Z	Regional	3.0	1.0	11.7	7.8	Philadelphia (55.0%)	Multifamily
Bank AA	Regional	16.4	5.3	12.2	7.9	Tertiary Southwest (65.5%)	Retail

Table 6: Mortgage Distress and Refinancing.

This table examines how refinancing responds to loan distress. The sample consists of CRE loans outstanding in a given quarter from March 2018 through June 2024. *Refinanced* equals 100 if a loan is refinanced in a given quarter and zero otherwise. Loan Distress is the larger of zero and the difference between a loan's current loan-to-value ratio. Standard errors are two-way clustered at the bank-level and the market (location-sector)-level. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

	Refinanced					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{\text{Distress} > 0\}$	-0.088	-0.022	-0.070	-0.215	-0.361	-1.133***
	(0.068)	(0.053)	(0.132)	(0.357)	(0.297)	(0.403)
$\mathbb{1}\{\text{Distress} > 0\} \times$ Regional			0.089			1.334**
			(0.183)			(0.527)
Sample: Time to Maturity	Any	Any	Any	Near	Near	Near
Quarter FE	Yes	–	–	Yes	–	–
Bank-Location-Sector-Quarter FE	–	Yes	Yes	–	Yes	Yes
Observations	4,047,673	3,932,669	3,932,669	528,827	474,581	474,581
R^2	0.003	0.060	0.060	0.002	0.161	0.161

Table 7: Mortgage Distress and Additional Equity Contributions.

This table examines how additional equity contributions provided by borrowers in loan refinancings respond to loan distress. The sample consists of CRE loans refinanced between March 2018 through June 2024. *Equity Contribution* measures the absolute relative change in the loan amount when less than the outstanding loan is refinanced. Loan Distress is the larger of zero and the difference between a loan's current loan-to-value ratio. Standard errors are two-way clustered at the bank-level and the market (location-sector)-level. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

	$\mathbb{1}\{\text{Equity Contribution} > 0\}$			Equity Contribution		
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{\text{Distress} > 0\}$	0.215***	0.169***	0.215***			
	(0.034)	(0.048)	(0.038)			
$\mathbb{1}\{\text{Distress} > 0\} \times$ Regional			-0.105*			
			(0.055)			
Distress				1.537***	1.155*	1.883***
				(0.451)	(0.667)	(0.349)
Distress × Regional						-2.264***
						(0.699)
Quarter FE	Yes	–	–	Yes	–	–
Bank-Location-Sector-Quarter FE	–	Yes	Yes	–	Yes	Yes
Observations	77,361	48,379	48,379	77,361	48,379	48,379
R^2	0.003	0.305	0.305	0.005	0.328	0.329

Table 8: Mortgage Distress and Bank Capital.

This table examines how additional equity contributions provided by borrowers in loan refinancings respond to loan distress, and the heterogeneity of the effect with respect to bank capital. The sample consists of CRE loans refinanced between March 2018 through June 2024. *Equity Contribution* measures the absolute relative change in the loan amount when less than the outstanding loan is refinanced. Loan Distress is the larger of zero and the difference between a loan's current loan-to-value ratio. Standard errors are two-way clustered at the bank-level and the market (location-sector)-level. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

	Equity Contribution				
	(1)	(2)	(3)	(4)	(5)
Distress	0.169***	0.215***	0.111*	0.156*	0.062
	(0.048)	(0.038)	(0.064)	(0.077)	(0.086)
Distress × Regional		-0.105*			
		(0.055)			
Distress × High Total Capital Ratio				-0.092	
				(0.132)	
Distress × High Tier 1 Ratio					0.143
					(0.121)
Sample	All	All	Regional	Regional	Regional
Bank–Market–Quarter FE	Yes	Yes	Yes	Yes	Yes
Observations	48,379	48,379	21,764	21,764	21,764
R^2	0.305	0.305	0.389	0.388	0.388

Table 9: Mortgage Distress and Market Participation.

This table examines how additional equity contributions provided by borrowers in loan refinancings respond to loan distress, and the heterogeneity with respect to bank market share, the share of loans in a market owned by a bank, and the bank's portfolio share, the share of loans that this bank has in that market. The sample consists of CRE loans refinanced between March 2018 through June 2024. *Equity Contribution* measures the absolute relative change in the loan amount when less than the outstanding loan is refinanced. Loan Distress is the larger of zero and the difference between a loan's current loan-to-value ratio. Standard errors are two-way clustered at the bank-level and the market (location-sector)-level. ***, **, and * denote statistical significance at the 1%-, 5%-, and 10%-level, respectively.

	Equity Contribution					
	(1)	(2)	(3)	(4)	(5)	(6)
Distress	0.169***	0.215***	0.111*	-0.036	-0.077	-0.333
	(0.048)	(0.038)	(0.064)	(0.154)	(0.280)	(0.315)
Distress × Regional		-0.105*				
		(0.055)				
Distress × High Mkt Share				0.160		0.833***
				(0.190)		(0.315)
Distress × High Ptf Share					0.196	0.462
					(0.298)	(0.317)
Distress × High Mkt Share × High Ptf Share						-0.843**
						(0.318)
Sample	All	All	Regional	Regional	Regional	Regional
Bank–Market–Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	48,379	48,379	21,764	21,764	21,764	21,764
R^2	0.305	0.305	0.389	0.389	0.389	0.389

Appendix

A Appendix Figures

Figure A1: Aggregate Troubled CRE Mortgage Restructurings.

These figures show the aggregate dollar share of commercial and multifamily mortgages that were restructured due to borrower distress by bank type from December 31, 2016 through September 30, 2025. Figure 1 describes bank types and mortgage classifications.

Source: FFIEC 031/041/051, FR Y-9C.

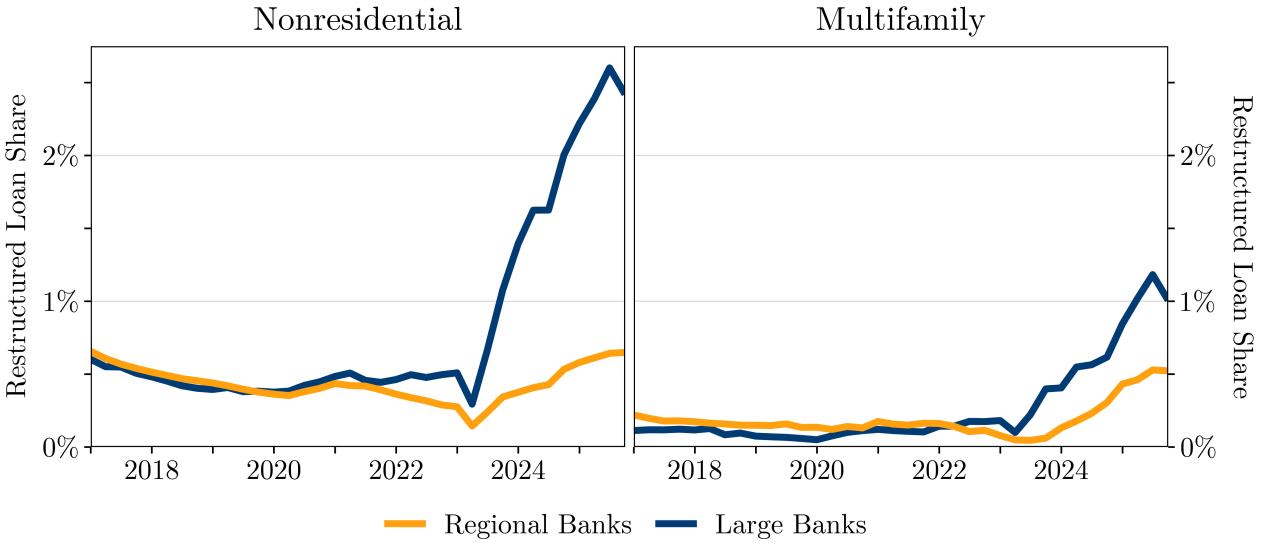


Figure A2: Aggregate Annual CRE Mortgage Charge-off Rate.

These figures show the annualized aggregate charge-off rate, net of recoveries, on commercial and multifamily mortgages by bank type from December 31, 2016 through September 30, 2025. Figure 1 describes bank types and mortgage classifications.

Source: FFIEC 031/041/051, FR Y-9C.

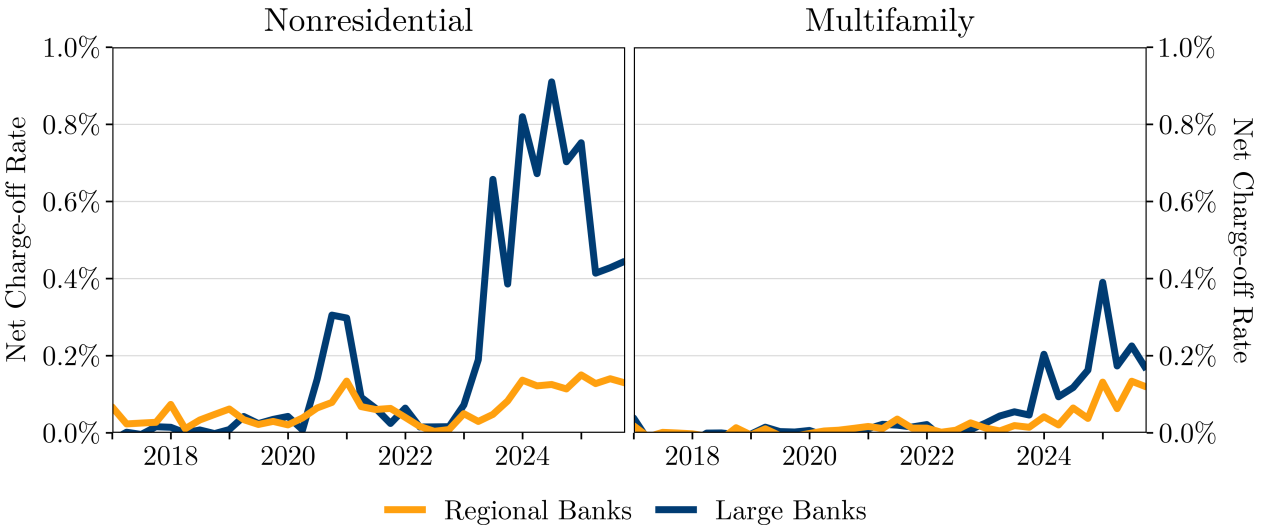


Figure A3: Loan Loss Allowances and Real Estate Owned.

These figures show aggregate loan loss allowances on CRE mortgages and CRE real estate owned relative to the total CRE mortgage balance by bank type from December 31, 2016 through September 30, 2025. Figure 1 describes bank types and mortgage classifications.

Source: FFIEC 031/041/051, FR Y-9C.

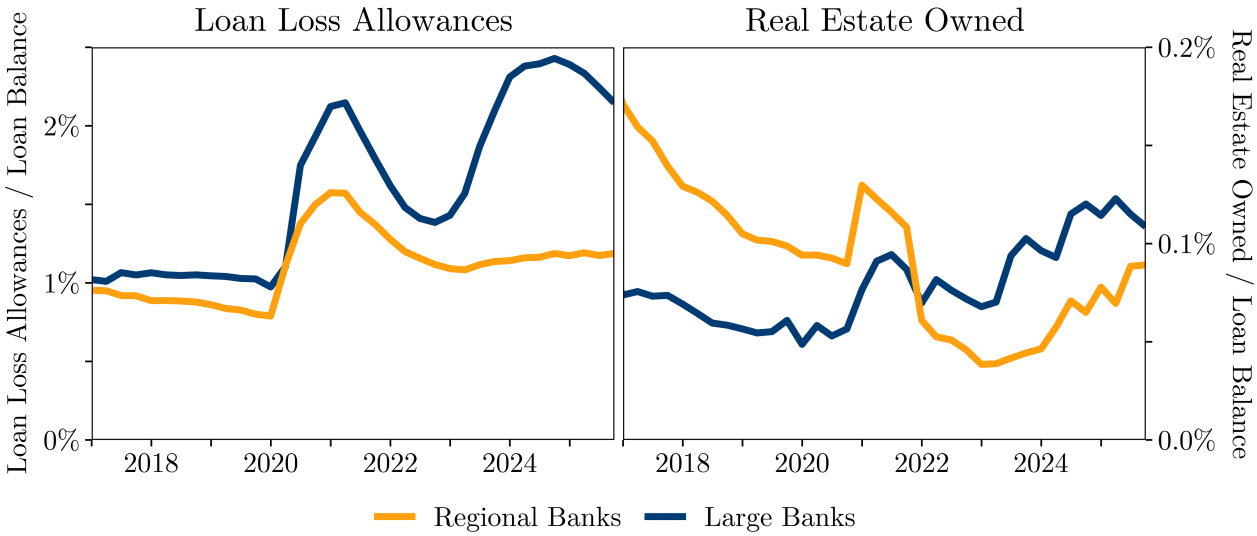


Figure A4: Private Sector CRE Mortgage Holdings.

This figure shows outstanding non-residential commercial and multifamily mortgages held by banks relative to the total credit held by the financial sector from December 31, 2004 through September 30, 2025.
Source: FRB Z.1.

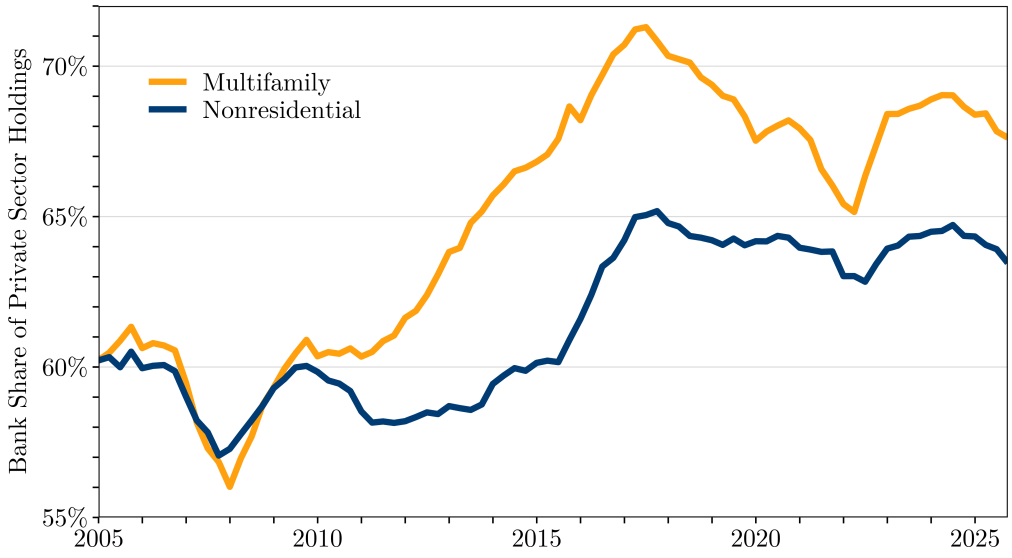


Figure A5: Bank CRE Credit Market Shares: Other Loan Types.

The right panel partitions the banking sector's CRE-secured undrawn credit lines into the fractions on large, regional, and community bank balance sheets. The left panel partitions the banking sector's CRE loans that are not secured by real estate correspondingly. Figure 3 describes bank types.

Source: FFIEC 031/041/051, FR Y-9C.

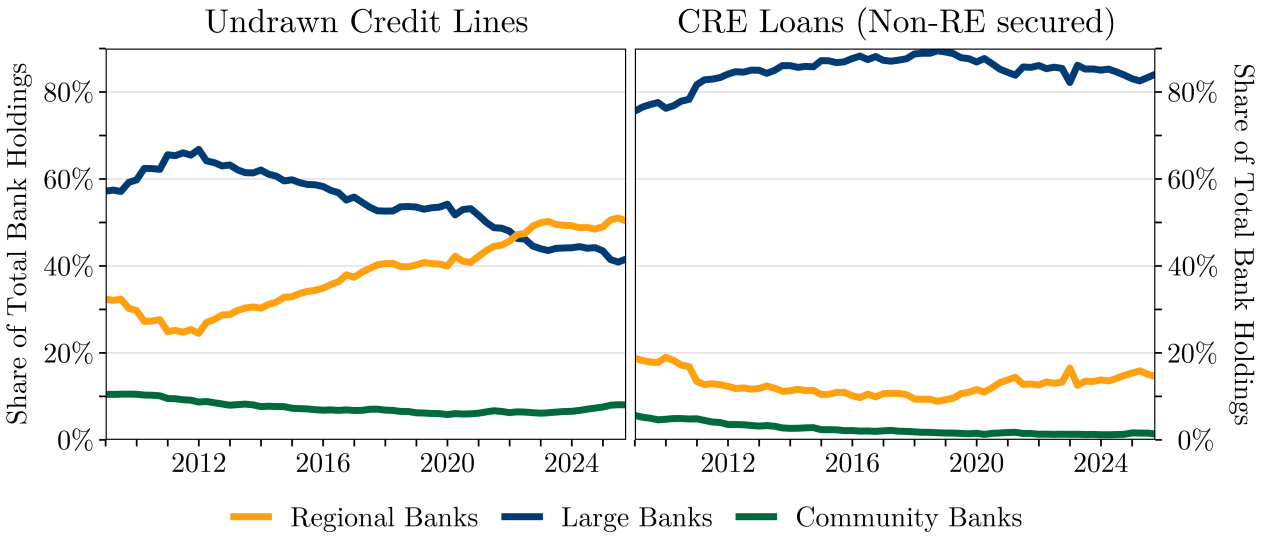


Figure A6: Outstanding Bank CRE Loans.

This figure shows the aggregate dollar amount of CRE loans on bank balance sheets by loan type from December 31, 2008 through September 30, 2025. The shown loan types are CRE mortgages, i.e., funded loans secured with commercial properties, undrawn credit lines secured with commercial properties, and CRE loans that are not secured with commercial real estate.

Source: FFIEC 031/041/051, FR Y-9C.

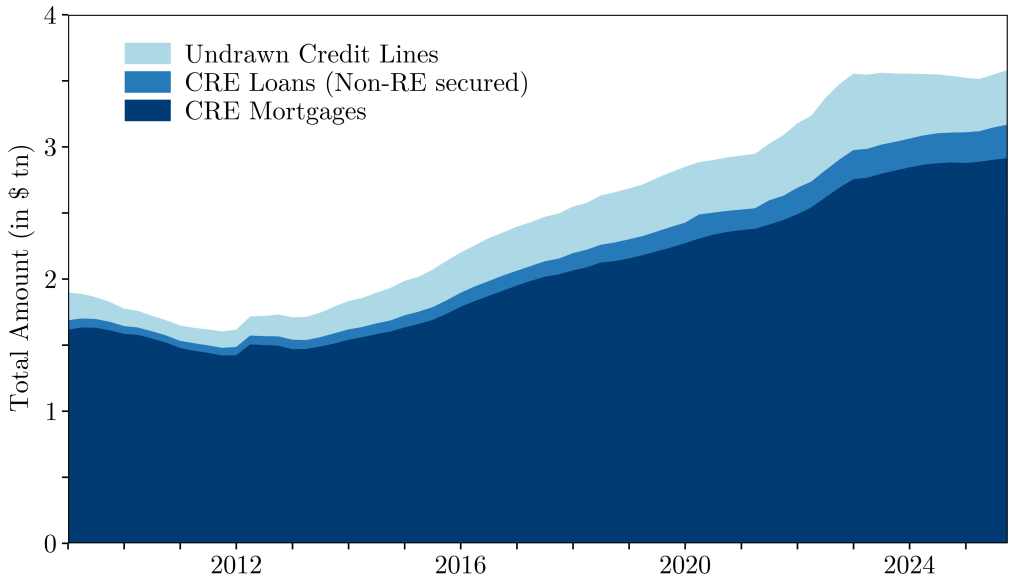


Figure A7: Bank Balance Sheet Expansion and CRE Lending Growth: Scaled.

These scatter plots display banks' changes in assets against changes in their CRE mortgage holdings, both scaled by a banks average assets, between December 31, 2014 and September 30, 2025. Changes are given in percent. Orange circles and blue crosses symbolize individual regional and large banks, respectively. Lines of best fit are shown in corresponding colors. Figure 1 describes bank types and mortgage classifications.
Source: FFIEC 031/041/051, FR Y-9C.

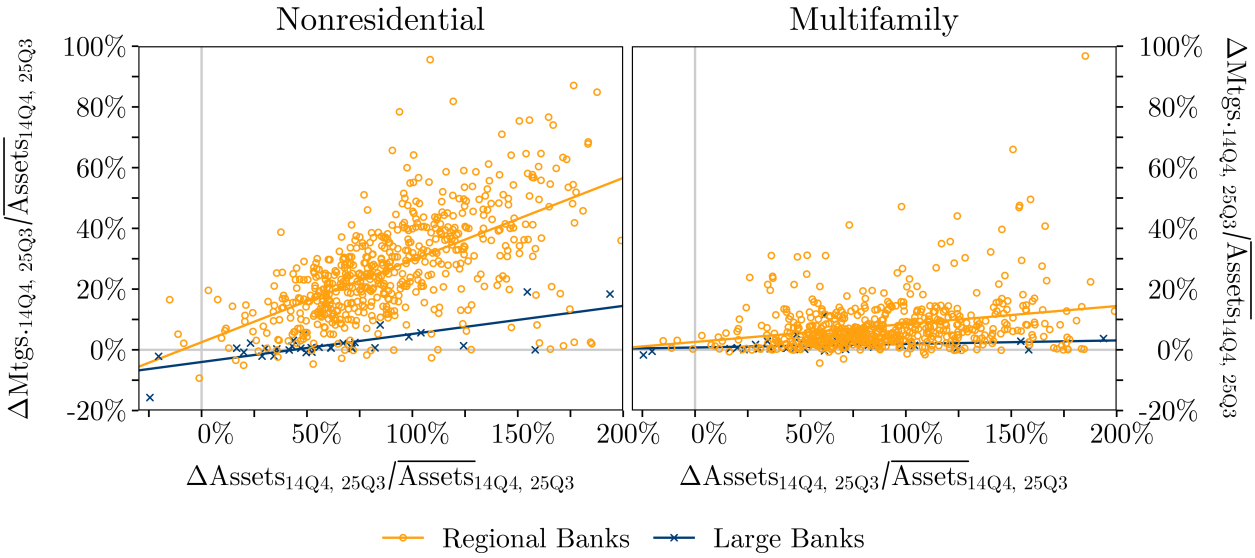
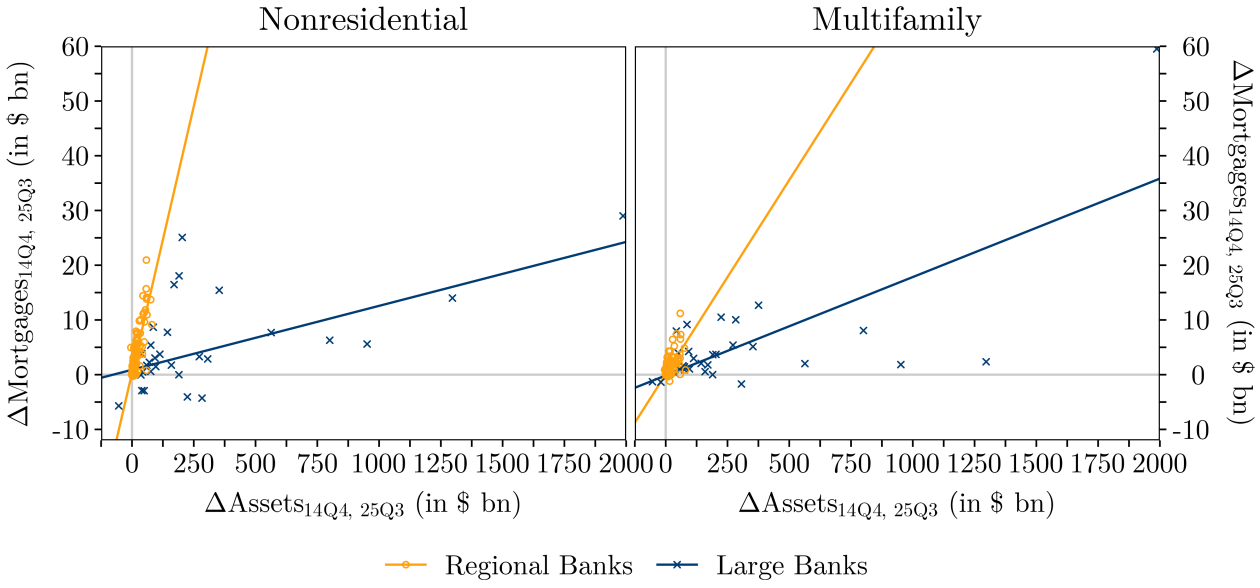


Figure A8: Bank Balance Sheet Expansion and CRE Lending Growth: Sample.

These scatter plots display banks' changes in assets against changes in their CRE mortgage holdings from December 31, 2014 to September 30, 2025. Dollar changes are given in billions. Orange circles and blue crosses symbolize individual regional and large banks, respectively. Lines of best fit are shown in corresponding colors. Figure 1 describes bank types and mortgage classifications.

Source: FFIEC 031/041/051, FR Y-9C.



B Mortgage and Real Estate Transaction Data

B.1 Sample Construction

We call the combination of all stand-alone mortgage and deed records the transaction sample.

Preparation

1. We begin by restricting the transaction sample to the main records (main record ID = M)

2. Next, we impute missing values for key date variables that are used in the subsequent analysis:

   - Assignment date: the date on which an assignment becomes effective is missing for 7.6% of CRE sample assignments. When missing, we fill in the effective date with the recording date. The median of the difference between the assignment recording date and the assignment effective date is 12 days.

   - Release date: the date on which a mortgage is paid off is missing for 95.8% of CRE sample mortgage releases, and the release effective date is missing in 4.32% cases. When missing, we fill in the mortgage payoff date with the effective date. When both these dates are missing, we use the release recording date. For the median release, the release is effective 9 days after the mortgage is paid off and the recording date is 6 days after the effective date.

   - Default date: The payment default date is missing for 47.5% of CRE sample mortgage defaults. When unavailable, we use the lowest of (2) the recording date, (3) the original notice of default recording date, and (4) the auction date.

3. We classify a transaction as a loan if it is from the stand-alone mortgage sample. We classify deed transactions as a loan, i.e., containing a deed of trust, if the transaction has any of the following: (1) positive loan amount, (2) non-missing lender name, (3)

non-missing due date, (4) match with assignment data, (5) match with mortgage release data, or (6) match with default data. Otherwise, we classify the transaction as a deed without a concurrent loan.

4. We clean the transaction contract date and the loan due date variables as follows:

   - The original transaction contract date is missing for 6.3% of the transaction sample. When missing, we impute this date by taking the day three weeks prior to the recording date. For comparison, the 75th percentile of the difference between these two dates is 20 days.

   - We set the due date to missing if the due date is before the original contract date. The due date is missing for 52.1% of loans in the transaction sample. For loans with missing due dates, we impute the due date by adding the average time to maturity of all loans with the same original contract date quarter to the original contract date.

Sample Construction

To construct the sample of outstanding loans at date t, we proceed as follows:

1. We begin with the set of all transactions with *original contract date* $\leqslant t$.

2. Keep only the observation with the latest recording date for each property ($DPID$) – original contract date – transaction type to remove transaction duplicates due to re-recording

3. Remove all loans with *release date* $\leqslant t$.

4. Remove loans without release date if *due date* $\leqslant t$.

5. For a given property, remove all transaction that occur before the last deed if any is available.

6. Remove all non-loan observations

7. Variable adjustments and auxiliary variable creation:

- Adjust lender for assignments: For each transaction, use the last assignment with *assignment date* $\leqslant t$ to change the lender to the assignee.
- Last transaction flag: For each property, mark a transaction as last transaction if it has the latest original contract date. If more than one transaction satisfies this criterion, mark only one with the highest loan amount.
- Defaulted flag: For each loan, mark the loan as defaulted if *default date* $\leqslant t$.

B.2 Black Knight - Regulatory Data Match

To match lenders from Black Knight mortgage records to banks' regulatory filings, we take banks' legal title (RSSD9017) from call report filings (FFIEC 031, FFIEC 041, FFIEC 051). To clean both Black Knight and call report names, we perform the following steps:

1. Convert to all caps

2. Replace *&* with " *AND* "

3. Replace all punctuation marks with space

4. Remove leading or trailing word *THE*

5. Remove repeated spaces, and leading and trailing spaces

6. Convert the following words:

(a) *BK*, and *BNK* to *BANK*

(b) *ASSN*, *ASSOC*, *ASSC*, and *ASSO* to *ASSOCIATION*

(c) *NAT*, *NTL*, and *NATL* to *NATIONAL*

(d) *CO* to *COMPANY*

(e) *TR* to *TRUST*

7. Remove trailing *NATIONAL ASSOCIATION*, *NA*, or *N A*

8. Remove spaces between standalone letters, as well as leading and trailing spaces

Next, we match banks in the Black Knight data to their call report RSSD ID using a fuzzy string match. We compute two similarity scores based on the Levenshtein distance between the bank name in the Black Knight data and the bank name in the call reports. First, for two bank names, $Name_A$ and $Name_B$, with c_A and c_B characters, respectively, and Levenshtein distance $\mathcal{L}$ we calculate

$$Total\ Similarity\ Ratio = 1 - \frac{2\mathcal{L}}{c_A + c_B}.$$

Second, without loss of generality assume that $c_A \leqslant c_B$. Let $\overline{Name_B}$ be the c_A-character substring of $Name_B$ with the lowest Levenshtein distance to $Name_A$, $\overline{\mathcal{L}}$. Then, we calculate

$$Partial\ Similarity\ Ratio = 1 - \frac{\overline{\mathcal{L}}}{c_A}.$$

We let the similarity score between two names be the average of their total similarity ratio and their partial similarity ratio. For a bank name in the Black Knight data, we take from the set of bank names in the call report data with similarity of at least 90%, with replacement, the name with the highest similarity ratio.

C Regulatory Data Construction

Federal Reserve Board Z.1. Sector-wide holdings of CRE mortgages come from the Federal Reserve Board Financial Accounts of the United States Z.1. Multifamily mortgages come from L.219 Multifamily Residential Mortgages and commercial mortgage holdings come from Table L.220 Commercial Mortgages. We aggregate (1) *Banks* to include "U.S.-chartered depository institutions" and "Foreign banking offices in the U.S."; (2) *GSE & Agency-backed*

Pools to include "Agency-and GSE-backed mortgage pools," and "Government-sponsored enterprises"; (3) *Insurers* to include "Life insurance companies," "Property-casualty insurance companies"; (4) *Finance Cos, MBS, & REITS* to include "Finance companies", "Issuers of asset-backed securities," "Mortgage real estate investment trusts"; (5) *Other* to include all remaining categories.

Bank-level Data. We collect quarterly bank-level data from Forms FFIEC 031, FFIEC 041, and FFIEC 051. We further collect quarterly consolidated bank holding company (BHC)-level data from Form FR Y-9C. We map banks and BHCs to their parents using the National Information Center relationship files. We take variables from FR Y-9C if available. When consolidated BHC-level accounts are unavailable, we aggregate variables to the parent-level.[6] We define variables as follows, expressed using domestic call report series:

Commercial mortgages. Sum of owner-occupied, non-owner occupied, and pro rated CRE construction mortgages following the definition of the Federal Reserve Board Z.1 Table L.220 U.S.-chartered depository institutions; commercial mortgages; asset.

$$\text{RCONF160} + \text{RCONF161} + 0.8447 \times (\text{RCONF159} + \text{RCONHT67})$$

Multifamily mortgages. Sum of multifamily (5 or more), and pro rated CRE construction mortgages following the definition of the Federal Reserve Board Z.1 Table L.219 U.S.-chartered depository institutions; multifamily residential mortgages; asset.

$$\text{RCON1460} + 0.1553 \times (\text{RCONF159} + \text{RCONHT67})$$

[6]Consolidated BHC-level accounts can be unavailable for three reasons: first, some banks are not part of a bank holding company and are therefore not captured by FR Y-9 reports. An example is Bank OZK. Some banks are part of BHCs that fall below the reporting threshold for the FR Y-9C and report unconsolidated parent company only statements. In 2024 this threshold is at $3bn. Third, some variables are only included in call reports. For example, figures on small business lending are not reported in FR Y-9C.

Delinquent commercial mortgages. We consider mortgages delinquent that are 30 through 89 days, or past 90 days and still accruing, or nonaccruing. Delinquent commercial mortgages are the sum of delinquent owner-occupied, non-owner occupied, and pro rated CRE construction mortgages.

$$\begin{aligned}&\text{RCONF178} + \text{RCONF180} + \text{RCONF182}\\ &+\text{RCONF179} + \text{RCONF181} + \text{RCONF183}\\ &+0.8447 \times (\text{RCONF173} + \text{RCONF175} + \text{RCONF177})\end{aligned}$$

Delinquent multifamily mortgages. We consider mortgages delinquent that are 30 through 89 days, or past 90 days and still accruing, or nonaccruing. Delinquent commercial mortgages are the sum of delinquent multifamily (5 or more), and pro rated CRE construction mortgages.

$$\begin{aligned}&\text{RCON3499} + \text{RCON3500} + \text{RCON3501}\\ &+0.1553 \times (\text{RCONF173} + \text{RCONF175} + \text{RCONF177})\end{aligned}$$

Distressed amended commercial mortgages. Sum of both compliant and delinquent, owner-occupied, non-owner-occupied, and pro rated construction CRE mortgages restructured in troubled debt restructurings.

$$\begin{aligned}&\text{RCONK161} + \text{RCONK114} + \text{RCONK115} + \text{RCONK116}\\ &+\text{RCONK162} + \text{RCONK117} + \text{RCONK118} + \text{RCONK119}\\ &+0.8447 \times (\text{RCONK162} + \text{RCONK108} + \text{RCONK109} + \text{RCONK110})\end{aligned}$$

Distressed amended multifamily mortgages. Sum of both compliant and delinquent, multifamily (5 or more) and pro rated CRE construction mortgages restructured in troubled debt

restructurings.

$$\text{RCONK160} + \text{RCONK111} + \text{RCONK112} + \text{RCONK113}$$
$$+0.1553 \times (\text{RCONK162} + \text{RCONK108} + \text{RCONK109} + \text{RCONK110})$$

Annual commercial mortgage charge-off rate. We calculate year-to-date commercial mortgage chargeoffs as the sum of year-to-date chargeoffs on owner-occupied, non-owner-occupied, and pro rated construction CRE mortgages:

$$\text{RIADC895} + \text{RIADC897} + 0.8447 \times \text{RIADC893}$$

To get the annual charge-off rate, we calculate quarterly chargeoffs by taking the March report values as well as the first difference to the previous quarter for the June, September and December reports. Then, we sum over the last four quarters.

Annual multifamily mortgage charge-off rate. We calculate year-to-date commercial mortgage chargeoffs as the sum of year-to-date chargeoffs on owner-occupied, non-owner-occupied, and pro rated construction CRE mortgages:

$$\text{RIAD3588} + 0.1553 \times \text{RIADC893}$$

To get the annual charge-off rate, we calculate quarterly chargeoffs by taking the March report values as well as the first difference to the previous quarter for the June, September and December reports. Then, we sum over the last four quarters.

Commercial mortgages up to \$1m in size. For banks for which "substantially all of [the] bank's 'Loans secured by nonfarm nonresidential properties' [...] and 'Commercial and industrial loans' [...] have original amounts of \$100,000 or less" we take the currently outstanding

amount of loans secured by nonfarm nonresidential properties

RCON5562

For all other banks, we take the currently outstanding amount of loans with original amounts less than \$100,000, between \$100,000 through \$250,000, and between \$250,001 through \$1,000,000.

RCON5565 + RCON5567 + RCON5569

Note: A corresponding category does not exist for multifamily mortgages.