Market concentration and commercial bank loan portfolios

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Abstract

This paper estimates the relationship between banking market concentration and high-risk portfolio strategies at commercial banks. I use the unprecedented changes in the degree of competition in local banking markets that occurred after 1980 to estimate the impact of market competition on the risk profile of commercial bank lending. I find evidence that increasing concentration has been associated with reductions in the flow of bank capital to construction and land development loans, the highest-risk category of commercial bank loans. The magnitude of this effect is large: an increase in concentration from the 25^{th} to the 75^{th} percentile of the sample distribution is associated with a 15 percent drop in the share of bank lending going to construction loans. Robustness to a variety of econometric strategies supports a causal interpretation of this empirical relationship. Increasing concentration also appears to increase average bank capitalization, raise the average share of assets loaned out to borrowers, and reduce bank failure rates during this period. Because the Federal Deposit Insurance Corporation assumes the assets and liabilities of failing banks, changes in bank portfolio risk affect the value of the government's contingent liability to the banking sector, as well as the health and stability of the larger economy.

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Recent years have seen large changes in the degree of competition in local banking markets. These changes stemmed in part from more permissive government policy toward mergers and geographic expansion in the banking sector, increases in the rate at which new banks were chartered, and rising rates of bank failure. Across local banking markets, concentration moved in different directions, increasing in some metropolitan areas and falling in others. The relevance of observed market concentration as a measure of competition may also have fallen during this period, as almost all states enacted legislation that eased long-standing restrictions on the geographic expansion of banks and expanded the scope for potential competition to impact incumbent banks in local markets.

I use this recent historical record to estimate the relationship between market concentration and the risk profile of commercial bank lending. I find evidence that increasing competition, while reducing the overall share of assets that banks lend out, leads banks to shift lending toward the types of loans that have historically been most risky. This shift is associated with increasing overall portfolio risk and risk of bank failure. These changes in banking market concentration affect local economic activity in the real estate and construction sectors, sectors that are particularly dependent on construction lending. Because the federal government, through the Federal Deposit Insurance Corporation, assumes the assets and liabilities of failing banks, government policy that affects market concentration thus affects the value of the deposit insurance contingent liability from the government to the banking sector. Merton (1977), Kane (1985), and Boskin (1988) have pointed out that this contingent liability represents a very real and measurable cost borne by the federal government, though it is not explicitly accounted for in the government budget.

This empirical relationship between market power and risk-taking relates more generally to the asset substitution problem in corporate finance. Jensen and Meckling (1976) propose a channel through which a firm’s capital structure might affect its appetite for risky projects: because equity is a residual claim (a call option on the value of the firm), increasing leverage can make increasingly risky projects attractive to a manager compensated through the return to the firm’s equity. Finding convincing empirical tests of the asset substitution hypothesis has been difficult because firms jointly choose leverage and risk, a situation that hampers empirical identification of the impact of leverage on risk-taking. For this reason, variation in the value of bank equity due to changes in their market power provides a particularly useful test of the asset substitution hypothesis. These changes, because they are not determined by the bank itself, provide a more robust econometric test of the asset substitution hypothesis than tests using leverage measures that are directly determined by a firm's choice of debt versus equity issuance.

The paper proceeds in six sections. The first section documents changing local banking market concentration, and briefly describes the changing legislation governing entry. The second section reviews the existing empirical literature on the impact of competition on bank risk-taking and on bank behavior more generally. The third section describes aggregate banking portfolios and the characteristics of the sample used in the empirical analysis: 85,481 bank-year observations from FDIC Call Report data. The fourth section evaluates the empirical evidence from the 1980s and early 1990s, and finds that reductions in market concentration are associated with increasing investment in construction lending, the riskiest class of loans, and decreasing bank equity ratios. This section also aggregates data to the MSA-year level and presents evidence that changes in construction lending affect MSA-level employment in the construction and real estate sectors.

A fifth section discusses the implications of these empirical findings for the magnitude of the FDIC's implicit liability to the banking sector, finding evidence that changes in banking market concentration during the sample period affected the cost of the FDIC's guarantee to bank depositors. Bank regulatory policies that affected market concentration had an indirect but important impact on the cost of FDIC guarantee. A brief final section concludes.

1. Changing market concentration since 1980

The period since 1980 has seen enormous changes in the market structure of the American commercial banking industry. These changes have been caused by more permissive legislation for geographic expansion, a shift in the regulatory environment for new bank chartering, an increase in merger activity, and a wave of bank failures in the late 1980s and early 1990s. Measured at the national level, banking market concentration has increased dramatically over this period.[1] Between 1980 and 1998 the share of assets held at the twenty-five largest banking organizations increased from 29.1 percent to 51.2 percent, and the share of assets at the 100 largest banks increased from 46.8 percent to 62.6 percent (Rhoades, 2000). By 1998, more than one-third of the assets of the banking sector were held at the ten largest banks.

This increasing concentration at the national level has often obscured the more varied experiences of individual local banking markets, where concentration, on average, has been almost constant. Market concentration has increased in about half of Metropolitan Statistical Areas (MSAs) and decreased in the remaining half. Tables 1 and 2 describe the changing market concentration at the MSA level using the Herfindahl-Hirschman Index of market concentration.[2] Data in these tables are based on the sample of MSAs used in the analysis throughout this paper; the sample has 4376 separate MSA-years of data; the number of MSAs represented in the data vary from a low of 254 in 1980 to a high of 309 in 1994.[3] Table 1 shows that in this sample, with metropolitan areas weighted equally, the median Herfindahl Index was 1968.2. Half of the MSA-year observations are within the 1394-2445 interquartile range.

Across MSAs, the mean and medians of the concentration measures are almost constant through the sample period. The median Herfindahl Index in 1980 was 1794, 25 percent of the observations had scores less than 1294, and 25 percent had scores greater than 2465. The median in 1994 was 1854, an increase of 60 index points from 14 years earlier. While the mean and median have changed little, the variation across MSAs has decreased substantially. The standard deviation fell by 7.5 percent, from 821 in 1980 to 760 in 1994, and the interquartile range fell from 1170 to 881.

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[1] For a comprehensive review of the changes in banking regulation between 1979 and 1994 see Berger, Kashyap, and Scalise (1995).

[2] The Herfindahl-Hirschman Index is constructed from individual firms' market shares according to the following formula: HHI = $10000 * \Sigma_i (share_i^2)$. A market with two equal-size firms, for example, would have an index value of 5000. The U.S. Justice Department uses a HHI of 1800 to divide moderately from highly concentrated markets. I am grateful to Philip Strahan for providing these data, which are also the basis for the analysis of sections 4 and 5.

[3] This sample excludes MSAs that are merged into other MSAs during the sample period.

The steady mean level of concentration in this sample of MSAs conceals a great deal of variation in the experiences of individual markets, with some markets becoming substantially more concentrated and some becoming substantially less concentrated. Table 2 shows the variation in the experiences of different metropolitan areas. On an unweighted basis, the mean change in concentration over the 14 years is 45.7 Herfindahl Index points. But 25 percent of MSAs saw decreases in concentration of greater than 294 Herfindahl Index points, and 25 percent saw increases in concentration of more than 421 points.

During this period, the relaxation of long-standing restrictions on bank expansion changed the relationship between observed market concentration and true market power. In an environment where entry by outsider banks is restricted, as it was in almost all states well into the 1980s, market concentration implies a great deal of market power. This is because potential competitors are prevented from entering the market; with entry restricted, incumbents are free to exercise monopoly power. As Table 3 documents, however, during the 1980s and 1990s these restrictions on bank expansion were swept away. In 1980, all but one state restricted entry by interstate bank holding companies, and only 15 states allowed full intra-state bank branching. The lifting of these restrictions reduced the correlation between observed market concentration and true market power; in an environment with free entry, banks that attempt to exploit apparent monopoly power will inspire entry by outside competitors.

The varied paths of market structure across local MSAs during the 1980s and 1990s and the state-by-state variation in the relaxation of entry restrictions provide a laboratory for testing the relationship between market structure and risk-taking activity at those banks. The empirical tests of sections 4 and 5 are designed to use this unique source of variation to evaluate this relationship.

2. Banking market concentration: existing empirical literature

Merton (1977) formalizes the notion that deposit insurance gives banks a put option; if the value of a bank's assets falls below the value of its insured deposits, a bank whose deposits are insured can put these assets and liabilities onto the government. If bank deposits are considered fixed, the underlying asset for this put option is the bank's asset portfolio; increasing the riskiness of the bank's asset portfolio increases the value of this put option. Marcus (1984) augments this model by considering another asset that a bank puts at risk if it gambles: its charter, which gives it the right to continue operating. In an environment with high monopoly profits, the opportunity to continue earning these profits is very valuable. Marcus' model formalizes the relationship between market structure and risk-taking: banks whose charters are made valuable by market power are discouraged from taking on risk by the potential cost of losing this valuable charter.[4]

The relationship between market power and risk-taking in banking relates to the more general asset substitution problem in finance. Jensen and Meckling (1976) and Galai and Masulis (1976) show that a firm's equity holders own a call option on the firm's assets, with a strike price equal to the value of the firm's debt. Increasing the riskiness of the underlying asset increases the value of the firm's equity at the expense of its bondholders, hence the potential asset substitution problem. Because leverage and risk are chosen jointly, however, empirical evaluation of the magnitude of asset substitution problems has been difficult. Focus on banking markets provides a solution: changes in banks' market power are not determined directly by the banks' own behavior. This market power creates monopoly rents that increase the value of bank equity and thereby reduce effective leverage. In this way analysis of banking markets can provide robust evidence on the asset substitution hypothesis.

Keeley (1990) examines relationship between bank market power and risk-taking. Analyzing a sample of the 150 largest bank holding companies, he finds evidence that the relaxation of state branching restrictions reduces the market-to-book ratios and equity ratios of incumbent commercial banks. These banks, newly exposed to potential competition, also pay higher interest rates on uninsured CDs. He concludes that banks with reduced market power have increased portfolio risk, and pay higher default premia on these uninsured deposits.[5] Gan (2003) examines the experience of savings and loans in Texas during that state's oil/banking/real estate crisis of the 1980s and finds that exposure to competition

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[4] See Appendix A for an illustration of this principle.

[5] Keeley argues that the interest rates for large uninsured CDs are determined at the national level, so that local market competition exerts no effect on these rates independent of the effect of competition on risk. For earlier work on the relationship between market structure and risk-taking in banking, see also Rhoades and Rutz (1982) and Edwards and Heggestad (1973)

increased risk-taking in this sample of financial institutions during this period. Demsetz, Saidenberg, and Strahan (1996) find evidence that firms with higher market-book ratios, associated with higher franchise value, have higher book capital-asset ratios, less volatile equity prices, and less concentrated loan portfolios.

This paper offers several innovations to the literature on market concentration and risk. First, the sample is relatively comprehensive, including all commercial banks in metropolitan areas over the period between 1980 and 1994. By comparison, Keeley's study focuses on only the very largest banks, and Gan's study focuses on Texas savings and loans. Second, the focus is on a new measure of risk-taking; the share of assets invested in the riskiest category of lending. Using this measure of risk complements the existing literature and allows the extension of the sample to banks without publicly traded securities. Finally, this study exploits variation in the impact of market concentration that was induced by changing entry restrictions over the period. Exploiting this source of variation provides additional evidence that the relationship between market concentration and risk-taking is not just spurious.

It is important to put this work into the larger context of the work on banking deregulation surveyed in Strahan (2003). The work surveyed there suggests that the removal of restrictions on entry in banking markets increased economic growth rates by as much as 0.5 percent per year, while at the same time reducing the amplitude of local macroeconomic fluctuations[6]. In spite of the competition-risk relationship documented here, banking markets with free entry appear to be associated with much better overall economic performance. Jayaratne and Strahan (1998) and Stiroh and Strahan (2002) document that the lifting of the types of entry restrictions that in the past created monopoly rents vastly improves bank efficiency by accelerating the entry of well-managed banks and the exit of inefficient banks. Recent work by Berger and Hannan (1998) also evaluates the welfare costs of market power in commercial banking. They show that because market power allows inefficient banks to survive, the costs of monopoly are much greater than measured by simple reductions in output and higher markups. In a

[6] See in particular Stiroh and Strahan (2002) and Morgan, Rime, and Strahan (2003).

sample of 5000 banks, they find that banks in more concentrated markets have less operating efficiency; Berger and Hannan derive high estimates of the welfare cost of market power. On net, the costs of government-sponsored banking market power due to entry restrictions seem to have outweighed the benefits coming from discouraging excessive risk-taking.

3. Empirical approach

The risk of banks' loan portfolios is difficult to observe, both ex-ante and ex-post. Loans are seldom publicly traded and reliable measures of their risk are difficult to find. My approach is to analyze portfolio allocation across sectors, and in particular the share of loans going to the riskiest sectors. I also focus directly on bank capitalization and failure rates.

The empirical analysis uses data from the FDIC Reports of Condition and Income (Call Reports) over the period between 1980 and 1994. All banks regulated by the Federal Reserve, FDIC, or OCC are required to submit quarterly reports detailing their assets, liabilities, and income. This paper uses the fourth quarter reports and excludes observations outside of MSAs and observations that are missing data, leaving a sample of 85,481 commercial bank-year observations.

I end the sample in 1994 for two reasons. First, 1994 marks the passage of the Riegle-Neal Interstate Banking and Branching Efficiency Act. Following the passage of this Act, there is more dispute about whether the Metropolitan Statistical Area (MSA) is the appropriate definition of a banking market. In addition, it is likely that the increasing use of financial engineering in the period after 1994 has reduced the link between observable characteristics of bank balance sheets and their true risk levels. Appendix C compares results based on a sample that ends in 2000 to a sample that ends in 1994; the broad results of the paper are not affected by this choice of a cutoff date.

I merge the FDIC Call Report data with the annual MSA-level Herfindahl Index numbers, and with a dataset giving the year in which each state relaxed restrictions on bank branching activity. The aggregate Herfindahl Index numbers are constructed from underlying branch and office level data from the FDIC's Summary of Deposits database. While it would be preferable to use a measure that captures banks' market power in both lending and deposit markets, a deposit-based measure of market power is the only option available. For banks with operations in multiple MSAs, Call Report data on lending are aggregated to the bank headquarters level, making the assignment of loans to locations impossible. Summary of Deposit information, however, are available at the branch level, allowing viable deposit-based measures of local market concentration. Where MSAs stretch across state boundaries, I assign that MSA to the state with the bulk of the population.

Table 4 describes portfolio holdings in my sample of 85,481 bank-year observations. The largest loan classes are commercial loans, consumer loans, and real estate loans. Loans to these different sectors have different risk characteristics; traditionally, lending for construction and land development projects has been a relatively risky activity. Construction loans between 1980 and 1994 were risky foremost because they were generally not secured by existing assets, unlike home and nonresidential mortgages, which are secured by existing property. Construction loans also involve lags between lending and project completion that expose banks to interim market fluctuations. Below I present more detailed evidence about the contribution of construction loans to bank portfolio risk.

The first line of Table 4 shows the range of bank size, in terms of assets, and in current-dollar amounts. The mean bank-year observation in the sample has $442.4 million in assets. The median is substantially lower, reflecting the skewed nature of the distribution of bank size. The average bank in the sample lends out 56.2 percent of its assets, and the interquartile range runs from 47.5 percent to 66.2 percent. In the individual years that make up the sample, the average ranges from just below 54 percent early on to above 58 percent through the middle and late 1980s and again in 1994. At the sample mean, loans to construction projects amount to 4.7 percent of the total portfolio of loans. There is a tail of observations for which these types of loans are very important: for the 90th percentile bank, these types of loans amount to 12.5 percent of the loan portfolio. Among the other types of loans, commercial loans, home mortgage loans, and consumer loans all make up between 20 and 25 percent of loans at the mean bank; nonresidential loans account for somewhat less.

Table 5 shows the share of banks that failed over the period. The sample in 1980 contains 5843 banks, of which 0.07 percent fail in the next year and 0.26 percent in the next two years. Of these banks, 8.32 percent eventually fail, and these failing banks manage 4.31 percent of the assets in the sample that year. Table 5 shows the growth in bank failures during the period; 2.43 percent of the 5756 banks in the sample in 1988 fail within the next year.

Table 6 presents the first evidence in this paper on the relationship between exposure to the commercial real estate sector and bank failure. The first three rows of the table show construction lending as a share of total lending for all banks, and then for banks that will eventually fail and for banks that will not fail. Throughout the period, banks that will eventually fail have on average about twice the exposure to construction of banks that will not fail. The second three rows of the table are similar to the first, except that construction lending is normalized not by total loans but by assets. The final three rows of the table show capitalization levels of all banks, banks that eventually fail, and banks that do not fail, in 1980, 1985, and 1990. In 1980 and 1985, both banks that fail and those that survive report approximately the same capitalization, although by 1990, the banks that will eventually fail are reporting substantially lower capitalizations than the surviving banks.

Table 7 moves further to motivate differences in bank portfolio weights as a signal for risky behavior. These results use the pooled data from 1980 to 1994; results for individual years estimated separately are consistent with the pooled data and are available upon request. The first column estimates a linear probability model (equation 8, below) with a dummy dependent variable equal to one if the bank fails between that year and 1998 and zero otherwise. The independent variables ($SHR_{j,i,t}^{MSA}$) are the shares of bank i's loans at time t devoted to asset class j. Asset classes include construction and land development loans, nonresidential mortgages, residential mortgages, commercial and industrial loans, and loans to individuals. This approach creates an empirical measure of the risk contribution from each of the different asset classes.

(8) $$I(\textit{ever fail})_{i,t}^{MSA} = \alpha + \Sigma\, \beta_1 * SHR_{j,i,t}^{MSA} + \varepsilon_{i,t}$$

The second and third columns estimate probit and logit regressions of the same model. As with other regression results in this paper, three sets of standard errors are included. The first standard error is uncorrected for clustering, and effectively treats the 85481 observations in the sample as entirely independent observations. Because these observations reflect both repeated snapshots of particular banks, the assumption of independence is difficult to defend. The second standard error reported corrects for clustering by bank; this correction adjusts the standard error to take into account correlation across the year observations for the different banks in the sample. The third standard error reported is calculated using a different clustering assumption; this standard error is corrected for clustering by MSA-year combination[7]. This adjustment takes into account the correlation across different banks in the same MSA-year cell.

The results in Table 7 are large in economic magnitude, and reflect the outsize risk associated with construction lending. Over the entire sample, increasing construction lending by one percentage point is associated with a 0.457 percentage point increase in a bank's probability of eventual failure. Comparable figures for commercial and home mortgage lending are 0.210 and –0.06 percentage points, respectively. With each coefficient there are three standard errors reported. Regardless of the clustering procedure used, and consistent with the popular wisdom, construction lending appears to be a risky sector for bank lending. This empirical regularity motivates the use of construction lending as a proxy for risky behavior in section 4.

4. Results

Using the FDIC Call Report dataset from section 3, I analyze the relationship between banking market concentration and the characteristics of bank portfolios. The section begins with reduced-form analysis of market concentration and portfolio characteristics and continues through a variety of econometric strategies designed to assess whether the relationship between market power and risky lending is causal or merely reflects spurious correlation. On the whole, the evidence supports the hypothesis that changes in market concentration during the sample period caused changes in lending to risky sectors.

4.1 Concentration and portfolio shares

[7] The independent variables in the regressions reported in Table 7 include only loan portfolio shares. Appendix B reports the results of regressions that include a wider set of controls and fixed effects.

The first regressions, presented in Table 8, are reduced form, and assess the relationship between the MSA Herfindahl indexes of banking market concentration and individual banks' portfolio shares devoted to construction lending (equation 9 below). As motivated in the earlier sections, these regressions assess whether banks exposed to more competition shift their lending towards the riskiest class of loans. $CONS_{i,t}^{MSA}$ is the share of bank i's portfolio that at time t is devoted to construction loans. HHI_t^{MSA} is the Herfindahl-Hirschmann Index, which measures the concentration of the MSA banking sector at time t.

(9) $$CONS_{i,t}^{MSA} = \alpha + \beta * HHI_t^{MSA} + X_{i,t}^{MSA}\,\Gamma + \varepsilon_{i,t}^{MSA}$$

$X_{i,t}^{MSA}$, a vector of control variables, includes dummy variables for bank size, a linear variable for the bank's reported equity as a share of assets (this control is omitted when bank equity is used as the dependent variable), the share of the bank's capital structure that is accounted for by subordinated debt, the share of the bank's deposits that are brokered deposits, MSA size, county-level employment growth, county-level employment sectoral concentration, and MSA-level employment growth and sectoral concentration. These local-level controls account for patterns of local growth and decline across MSAs, as well as for fixed differences by MSA size. The vector of controls also at times includes year, MSA, and region-year dummies, state-by-state fixed effects and trends, and MSA-specific linear trends. Table 8 shows empirical results based on equation (9). In Table 8 each row presents results for a different dependent variable, and reading along the row gives the coefficients on market concentration for a different set of controls and fixed effects. The first row is based on construction lending as a share of total lending, and the second row is based on construction lending as a share of total bank assets. The third row is based on total lending as a share of bank assets (the residual is mostly liquid securities) and the fourth row is based on banks' reported book equity, again as a share of assets. As in Table 7, there are three different standard errors reported. The first is uncorrected, the second corrects for bank-level clustering, and the third corrects for MSA-year level clustering.

The variety of fixed-effect strategies illustrates the cross-sectional and time series relationships between concentration and portfolio allocation. Column (1) has neither control variables nor fixed effects of any kind. Column (2) has no fixed effects, but includes the control variables listed above. Column (3) adds region-by-year fixed effects. These fixed effects control for the different patterns over time across the 9 census-defined regions in the US. Column (4) has both MSA and year fixed effects, which allow for different fixed patterns by MSA and different patterns by year. Column (5) has bank-level fixed effects, in addition to year fixed effects. Finally, column (6) has MSA and year fixed effects, as well as MSA-specific linear trends.

The bottom line of the results in Table 8 is that increasing concentration of the banking sector reduces the share of bank assets loaned to construction projects. This is true whether the dependent variable is construction lending as a share of total lending, or construction lending as a share of total assets. These results are statistically significant regardless of the correlation structure assumed for the errors. Also robust is the relationship between concentration and bank capitalization. A 500-point increase in the MSA Herfindahl Index is associated with a 35 to 40 basis point increase in the ratio of equity to assets. The finding that increasing concentration increases the total share of assets loaned out, as opposed to invested in liquid securities and cash, is robust until MSA and year fixed effects and MSA-specific time trends are added. While columns (1) through (5) support the notion that increasing concentration and increased total lending are linked, column (6) reveals that this relationship is not robust to the inclusion of MSA-specific trend variables. This difference may reflect the different time horizon of effects picked up by the regressions reported in columns (4) and (6). Column (4), without MSA trends, picks up long-horizon empirical correlation between concentration and portfolio shares, while column (6), with trends removed, picks up shorter-horizon shifts than column (4).

Again, the coefficients of Table 8 are large in economic magnitude. Focusing on the point estimate from column (4), an increase in market concentration of 500 Herfindahl Index points is associated with a 22 basis-point reduction in construction loans as a share of assets, and a 36 basis-point reduction in construction lending as a share of loans. With total construction lending in 1990 accounting for 3.97 percent of $3.4 trillion in commercial bank assets, a 22-basis point reduction would amount to a

$7 billion reduction in construction loans outstanding, or somewhat less than 10 percent of the $108 billion in private nonresidental construction spending reported by the Census Bureau in that year.

The first two rows of Table 8 present results based on construction lending, the first normalized by total loans and the second normalized by assets. The estimated coefficients on the Herfindahl Index variable are larger when construction lending is normalized by total loans than when construction lending is normalized by assets, suggesting that total lending as a share of assets is positively related to the Herfindahl measure of market concentration. The third row largely confirms this, showing that total loans as a share of bank assets are increasing in market concentration.

4.2 Concentration and portfolio shares among different types of banks

This section evaluates the relationship between concentration and the share of loans going to the riskiest category across different types of banks. These results help assess whether the strong reduced-form relationship between market power and construction lending reflects a true causal relationship or spurious statistical correlation.

Columns (1) and (2) of Table 9 reflect concern about possible reverse causation or spurious correlation by highlighting a sample of banks whose activities had relatively limited effects on changes in market concentration in their local areas. The first column is based on a sample of banks that are never involved in mergers, and whose size ranks them in the bottom 95 percent of banks in the sample. While these banks' activities have less effect on observed market concentration than larger or actively merging banks, the moral hazard model of section 3 suggests that changes in concentration will affect their behavior. The results in column (1) are consistent with those in Table 8 and help support a causal interpretation of the relationship between concentration and risk. Among this sample of smaller and non-merging banks, a 500 point Herfindahl Index increase is associated with a 36 basis point change in construction lending as a share of total loans.

Column (2) focuses on a sample of 34360 bank-year observations drawn from MSA-years in which no banks have yet failed. For each MSA, all banks are included until the year in which the first bank fails, after which all of that MSA's banks are excluded from the sample. Splitting the sample in this fashion addresses a particular concern about a possible spurious relationship between market concentration and construction shares. This potential concern is that the observed negative relationship between concentration and construction lending may arise because banks in a market area where a competitor bank has failed react to the failure of their competitor by shifting away from risky lending, at the same time that concentration is increasing due to the failure of this competitor. Among the pre-failure sample, column (2) again shows a negative relationship between concentration and construction lending; in this sample a 500 point increase in the Herfindahl Index is associated with a 25 basis point drop in the construction lending share.

Columns (3) and (4) evaluate the relationship between concentration and portfolio shares across different levels of banks' book equity capitalization, measured as the ratio of book equity to assets. Behind this exercise is the idea that banks' total equity value consists of both the book equity value, and the value of equity coming from the opportunity to earn profits due to market power in the future. The part of the equity value based on future profits, this 'implicit capital', is only observed when equity ownership changes hands. Equivalent changes in the level of this 'implicit' capital, stemming from changes in market concentration, represent a larger percentage change in the total capital of banks with lower book equity. While one would not a priori expect a spurious correlation between construction lending and market structure to affect better (explicit) capitalized banks differently from their undercapitalized competitors, columns (3) and (4) provide some evidence that construction lending by banks with lower levels of explicit capital is more sensitive to market power than for banks with higher levels of explicit capital. Dividing the sample at 8 percent capitalization, for banks in the lower-capitalization group, the coefficient point estimate is –0.79, while for the more highly capitalized banks the coefficient estimate is –0.58.

Columns (5) through (6) of Table 10 focus on the concentration-portfolio share relationships across different levels of market concentration. The results here are mixed, especially for construction lending. The relationship between concentration and construction lending is negative for the 61988 MSA-year observations corresponding to Herfindahl Indexes in excess of 1000. A Herfindahl Index of

1000 corresponds to a hypothetical market with 10 equal-size banks, and Herfindahl Indexes below 1000 correspond to highly competitive commercial banking markets. Among these most concentrated markets, there appears to be a *positive* relationship between concentration and construction lending. In these highly competitive markets, there is no evidence that small reductions in concentration are associated with increases in construction lending. If anything, the relationship in this small sample appears to go in the other direction.

4.3 Concentration and portfolio shares, before and after deregulation

In addition to changing observed concentration, many places in the 1980s saw the repeal of restrictions on banks' geographic expansion. As discussed earlier, the repeal of these restrictions exposed banking markets to potential competition, which can affect behavior even in markets that remain concentrated. In these deregulated markets, potential competition reduces the quality of observed concentration as a measure of the true competitiveness of the local market area. For example, when entry is restricted by regulation, a local monopolist can exploit its market power. With entry allowed, a bank that attempts to exploit its position as the sole bank in a market encourages entry from potential competitors. Thus, following deregulation and the repeal of branching restrictions, observed local market concentration becomes a less relevant measure of market power.

Table 10 reports regressions that separately estimate the impact of concentration before and after the repeal of branching restrictions. Equation (10) below gives the functional form for these regressions:

$$(10) \quad CONS_{j,i,t}^{MSA} = \alpha + \beta^{R} * HHI_t^{MSA} * NOBRANCH_t^{MSA} + \beta^{NR} * HHI_t^{MSA} * (1\text{-}NOBRANCH_t^{MSA}) + \delta * (1\text{-}NOBRANCH_t^{MSA}) + X_{i,t}^{MSA}\,\Gamma + \varepsilon_{i,t}^{MSA}$$

$NOBRANCH_t^{MSA}$ is a dummy variable equal to one for bank-year observations in periods when branching was restricted. The coefficient β^R gives the slope of the concentration-portfolio relationship before the repeal of branching restrictions, the coefficient β^{NR} gives the slope afterwards.

As Table 3 shows, different types of restrictions affected branching, and these barriers were generally lifted at different times. In most states, the legalization of branching by interstate multi-bank holding companies, the legalization of intra-state branching through the purchase of existing banks, and the legalization of "full branching" (where banks can open entirely new branches throughout the state) occurred in different years. A slightly different version of equation (10) corresponds to each type of branching restriction.

Columns (1) and (2) of Table 10 show regressions where the NOBRANCH variable identifies the periods before and after the legalization of branching by merger and assumption (corresponding to the second column of table 3); columns (3) and (4) correspond to de novo branching, and (5) and (6) correspond to the legalization of multi-state bank holding companies. Column (2) of Table 13 shows that prior to the repeal of branching restrictions, a 1000 point drop in the Herfindahl Index raised the expected value of the construction loan/total loan ratio by about 101 basis points. After deregulation, which may have reduced the link between concentration and market power, the same fall in Herfindahl Index raises the ratio by only 49 basis points.

The results in this section provide more evidence that the relationship between market concentration and the share of loans going to construction projects is causal, rather than reflecting either the influence of some unobserved third factor or reverse causation from portfolio choice to market concentration. In the period prior to the repeal of branching restrictions, when observed concentration is a better proxy for the true competitiveness of the local market area, the impact of concentration on portfolio choice is much greater than in the later periods, when potential competition from outsiders makes observed concentration a worse proxy for the competitiveness of the environment. Additional work, not included in this version of the paper but available from the author upon request, pushed further by using banking market deregulation as an instrumental variable for concentration. These results are consistent with (and if anything, stronger than) the results presented above. The implicit assumption behind this instrumental variable analysis would be that deregulation causes a change in the Herfindahl index but does not change the relationship between the Herfindahl and the true market power enjoyed by banks in that market.

4.4 MSA-level regression analysis

The previous section shows that increasing banking sector concentration reduces the flow of bank capital to construction loans. This section presents evidence that this relationship has a measurable real effect on macroeconomic variables at the MSA level: increases in MSA banking market concentration are associated with decreasing employment shares in both the real estate and construction sectors.

A 15-year sample of 300 MSAs forms the basis for the analysis that follows. Bank-level observations of total loans, assets, and loan types are aggregated to the MSA level. Employment variables are constructed from Census County Business Pattern data; county-level employment observations are aggregated to the MSA level using the bank shares within each county. Table 11 details results from regression analysis at the level of the individual MSA. For the banking-sector variables, I run regressions such as equation (12) below, where CONS is the share of bank loans (or bank assets) in the MSA devoted to construction various banking sector balance sheet items:

(11) $$CONS_{j,t}^{MSA} = \alpha + \beta * HHI_t^{MSA} + X_t^{MSA\prime}\,\Gamma + \varepsilon_t^{MSA}$$

The first two rows of Table 11 show the results of regressions such as equation (11) above. At the aggregate level, there is still strong evidence that increasing banking sector concentration reduces the flow of capital to the commercial real estate sector, both as a share of banking assets and as a share of total loans. The results in columns (4) and (5) suggest that a 500 point increase in an MSA Herfindahl Index is associated with a 30-40 basis point increase in the aggregate share of loans going to construction projects.

The results above suggest a relationship between concentration and aggregate lending shares: changes in concentration are associated with shifting bank activity toward construction lending. I now assess whether there is evidence of a relationship between local market concentration and the share of employment in sectors that are sensitive to construction activity. I use annual Census County Business Pattern data, aggregated to MSA level, which breaks out employment to the 2-digit SIC code level. I focus in particular on the share of MSA employment in construction and real estate sectors, two sectors particularly sensitive to bank construction lending activity. The final two rows of Table 11 document the results of this exercise. For real estate employment as a share of total employment, a 500 Herfindahl point increase in concentration is associated with a 4 basis point drop in real estate employment, or about 3.1 percent of the sample mean. For construction employment, the result in column (7) suggests that the same concentration change is associated with a 10 basis point drop in construction employment, or about 1.8 percent of the sample mean. While these estimated impacts are not enormous, they are consistent with shifts in bank capital having some impact on aggregate macroeconomic activity.

5. Implications for the FDIC

Because the Federal Deposit Insurance Corporation assumes the assets and liabilities of failing banking institutions, the impact of concentration on banks' demand for the riskiest of assets that they hold has implications for the FDIC's implicit liability to the banking sector, and thus on the financial position of the federal government. The following section uses the analysis of the previous sections to estimate the impact of changing concentration on the implicit liability of the FDIC.

The aggregate direct cost of bank failure to the FDIC is the product of the number of banks failing and the cost to the FDIC of each failure. The regression results reported in Table 12 are designed to assess the relationship between market structure and the probability of eventual bank failure. The first three rows of Table 12 report the results a linear probability model fit on the entire sample. In the first row, the dependent variable is a dummy, set equal to one if the bank fails in the next year. In the second row, the dummy is set to one if the bank fails in the next 4 years. The third row presents results based on a specification where the dependent variable is equal to one if the bank observed in that year will eventually fail. These models are based on equations like equation (12) below:

$$(12) \qquad I(\textit{ever fail})_{i,t}^{MSA} = \alpha + \beta * HHI_t^{MSA} + X_{i,t}^{MSA}\,\Gamma + \varepsilon_{i,t}$$

$I(\textit{ever fail})_{i,t}^{MSA}$ is a dummy variable, set equal to one of the bank observed in that year will ever fail. The remaining rows of Table 12 report regressions based on data aggregated to the MSA level. The first three rows fit equations similar to (13) below:

(13) $SHR\_BANKS\_EVER\_FAIL_t^{MSA} = \alpha + \beta * HHI_t^{MSA} + X_t^{MSA} \Gamma + \varepsilon_t$

In this specification the dependent variable is the share of banks, for each MSA-year combination, that will ever fail. Finally, the last 3 rows are based on a slightly different dependent variable: the share of assets at banks that will fail:

(14) $SHR\_ASSETS\_FAIL\_EVER_t^{MSA} = \alpha + \beta * HHI_t^{MSA} + X_t^{MSA\prime} \Gamma + \varepsilon_t^{MSA}$

Across columns, different sets of control variables added to the regression. For example, column (4) suggests that an increase of 1000 Herfindahl Index points is associated with a 0.23 percent decrease in the share of assets held at banks that will fail in the next year, a 1.10 percent decrease in the share of assets held at banks that will fail in the next four years, and a 1.95 percent decrease in the share of assets held at banks that will fail ever. Column (7), which controls for MSA and year fixed effects, as well as MSA-specific trends, suggests that an increase of 500 Herfindahl Index points is associated with a 0.73 percent decrease in the share of assets held at banks that will fail ever.

6. Conclusion

There is strong evidence that increasing concentration has been associated with reductions in the flow of bank capital to construction and land development loans, which are the highest-risk category of commercial bank loans. Robustness to a variety of control strategies supports a causal interpretation of this empirical relationship. In particular, the empirical relationship between market structure and construction lending is highly robust to controlling for time-specific and MSA-specific patterns in construction lending. In addition, the marginal impact of market concentration on construction lending is highest when entry is restricted, exactly the periods in which market concentration conveys the most information about underlying market power.

The magnitude of this effect is large: an increase in concentration from the 25^{th} to the 75^{th} percentile is associated with a 20 percent drop in the share of bank lending going to construction loans. Increasing concentration also appears to increase average bank capitalization, raise the average share of assets loaned out to borrowers, and reduce bank failure rates during this period. Because the Federal

Deposit Insurance Corporation assumes the assets and liabilities of failing banks, changes in bank portfolio risk affect the value of the government's contingent liability to the banking sector, as well as the health of the entire financial sector.

While the reduction of monopoly rents led to a noticeable increase in commercial bank risk-taking during this sample period, this is not to argue that consumers and markets were better served by the entry restrictions which until recently protected the market position of both efficient and inefficient banks. Jayaratne and Strahan (1998) show that banks become much more efficient after the removal of branching restrictions. Jayaratne and Strahan and Stiroh and Strahan (2002) document that this improvement in bank performance is based on the exit of under-performing banks and the expansion of well-managed banks. The welfare cost of retarding the natural process of expansion and decay in banking markets seems very likely to dominate the cost of effectively monitoring risk-taking by banks in markets that allow free entry and exit.

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Appendix A: A simple exposition of the relationship between market concentration and risk appetitite.

The following model, based on Merton (1977), Marcus (1984), and Keeley (1990), and illustrated in Figure 1, illustrates the intuition that increasing market power may reduce bank's taste for risk. A bank pays deposit interest rate D, and has the opportunity to invest in one of three assets. Each of the assets has the same expected return. There is a safe asset, which pays S with certainty, a risky asset, which pays $S + K_S$ with probability ½ and $S – K_S$ with probability ½, and an extremely risky asset, which pays $S + K_L$ with probability ½ and $S – K_L$ ($K_L > K_S$) with probability ½. As the figure shows, very small additions of risk to the safe asset's return do not increase the bank's expected return; because the bank will remain in operation regardless of which state is realized, the pain of the bad state balances the profits of the good state. Beyond a certain point, however, increases in risk increase the bank's expected profit because the limited liability constraint places an upper bound on the "pain" of the bad-state outcome. Because of this nonlinearity in the bank's return to its portfolio, the expected one-period profit to the bank increases in the scale of risk that the bank takes on.

Equations (1) and (2) describe the value of banks investing this period in safe and very risky assets, and thereafter investing in only the safe asset (V_S and V_R, respectively).

(1) $V_S = (S – D) + (S – D) * [\beta/(1 – \beta)]$

(2) $V_R = ½ * (S + K – D) + (S – D) * ½ * [\beta/(1 – \beta)]$

The discount rate is β, meaning that profits of X one period hence are valued at βX today, and a perpetuity of X starting today is valued at X/(1-β). The first part of each expression gives the one-period expected profit from the strategy, and the second part gives the discounted flow of expected profits from investing in the safe asset.

K represents the size of the gamble available to a bank choosing the risky strategy. Because the bank enjoys both the entire upside of a successful gamble and the ability to put its assets and liabilities onto the FDIC in the event of bankruptcy, the private value of the risky bank (V_R) is everywhere increasing in K. The increase in V_R from the mean-preserving increase in the variance of the risky asset is mirrored by a reduction in the value of the FDIC, which must take on the bank's assets and liabilities in the event of default.

Define a level of K, as a function of the other parameters, such that the monopolist is indifferent between safe and risky assets. This value K* represents the minimal attractiveness of the risky asset necessary to induce a bank to gamble. If we think of banks occasionally observing draws of K from some distribution, then a reduction in K* means that banks opt to gamble more frequently than before. Equation (3) below shows that this level of K is decreasing in the competitiveness of the marketplace:

(3) $V_S(K^*) = V_R(K^*)$

Equation (3) above represents the solution when equations (1) and (2) above are set equal to each other. This solution defines implicitly a level K* as a function of the other parameters of the model:

(3') $K^* = (S – D) / (1 – \beta)$

This level K* is decreasing in the deposit interest rate D, which is the proxy for the level of competitiveness in the bank's market.

(3'') $dK^*/dD = – 1 / (1 – \beta) \quad < \quad 0$

From equations (1) and (2), increasing competition, proxied by increases in D, reduces V_S by more than V_R; increases in competition reduce the value of the safe bank more than the risky bank. This difference is the basis for the intuition that monopolist banks will invest in safe assets; the risk of losing monopoly profits can be a deterrent to risky behavior. Increasing competition, by reducing the future profit streams of safely-managed banks, erodes incentives to invest in safe assets. Thus increasing competition, by this reasoning, may shift bank portfolios towards riskier types of loans.

Appendix B: Alternative specifications for Table 7.

Table 7 includes no covariates; failure dummies are regressed on portfolio shares alone. Each column below presents coefficients from a regression model with a different set of independent variables. All regression models include dummy variables for bank size, a variable for the share of the capital structure accounted for by subordinated debt, brokered deposits as a share of total deposits, MSA size, and county and MSA employment growth and employment concentration. Three standard errors are presented: the first is uncorrected, the second corrects for clustering by bank, and the third for clustering by MSA-year

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Fixed effects	None	Region	Year	Region by Year	MSA
Controls	Yes	Yes	Yes		
1980-1994					
Construction loans	**0.456**	**0.322**	**0.473**	**0.265**	**0.288**
/Total Loans	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)
	(0.041)	(0.040)	(0.041)	(0.041)	(0.041)
	(0.050)	(0.038)	(0.048)	(0.036)	(0.035)
Commercial loans	**0.222**	**0.160**	**0.197**	**0.117**	**0.151**
/Total loans	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	(0.017)	(0.017)	(0.017)	(0.016)	(0.017)
	(0.017)	(0.015)	(0.016)	(0.014)	(0.015)
Home mtg. Loans	**-0.058**	**-0.019**	**-0.032**	**0.006**	**-0.029**
/Total loans	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	(0.014)	(0.014)	(0.014)	(0.014)	(0.015)
	(0.013)	(0.012)	(0.012)	(0.011)	(0.013)
Nonres mtg. Loans	**0.033**	**-0.042**	**0.112**	**0.039**	**-0.049**
/Total loans	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
	(0.019)	(0.019)	(0.020)	(0.020)	(0.020)
	(0.020)	(0.018)	(0.019)	(0.014)	(0.017)
Consumer loans	**0.069**	**0.015**	**0.049**	**-0.003**	**-0.006**
/Total loans	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
	(0.014)	(0.014)	(0.014)	(0.014)	(0.016)
	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)
Constant	**-0.078**	**-0.015**	**0.052**	**-0.209**	**0.023**
	(0.036)	(0.035)	(0.109)	(0.110)	(0.035)
	(0.032)	(0.031)	(0.136)	(0.138)	(0.030)
	(0.095)	(0.062)	(0.312)	(0.178)	(0.043)

Appendix C: Market structure and construction lending, 1980-2000.

The empirical work in the paper restricts the sample to the period from 1980 to 1994. The results in this appendix compare empirical results based on this restricted sample to results based on the longer period between 1980 and 2000. The table below reports the coefficient on the Herfindahl Index variable in a regression of construction lending as a share of total lending, for different control specifications. The control set is the same as for the regressions in the text, with the exception that the MSA-specific employment variables are not included. Three standard errors are presented: the first is uncorrected, the second corrects for clustering by bank, and the third for clustering by MSA-year. The branching variable is based on intrastate branching by M&A.

	(1)	**(2)**	**(3)**
Fixed effects	None	MSA,year	MSA,year
Controls	Yes	Yes	Yes
Trends	None	None	None
1980-1994			
HHI	**-0.47**	**-0.79**	
	(0.03)	(0.09)	
	(0.07)	(0.12)	
	(0.18)	(0.22)	
HHI*(1-NOBRANCH)			**-1.03**
			(0.10)
			(0.12)
			(0.23)
HHI*NOBRANCH			**-0.56**
			(0.10)
			(0.13)
			(0.24)
1980-2000			
HHI	**-0.14**	**-0.74**	
	(0.03)	(0.04)	
	(0.06)	(0.08)	
	(0.14)	(0.13)	
HHI*(1-NOBRANCH)			**-1.13**
			(0.07)
			(0.11)
			(0.17)
HHI*NOBRANCH			**-0.70**
			(0.04)
			(0.07)
			(0.14)

Table 1
Local commercial bank deposit Herfindahl-Hirschman indexes, by MSA. Herfindahl-Hirschman Index (HHI) figures are computed from the sum of the squared market shares within a local market area according to the formula HHI = $10000*\Sigma s_i^2$,where s_i is the share of a local market's deposits held at bank i. Data provided by Phil Strahan

Year	Number of MSAs	Mean (MSA-weighted)	Standard Deviation (MSA-weighted)	Percentiles 25th (MSA-weighted)	Percentiles 50th (MSA-weighted)	Percentiles 75th (MSA-weighted)	Mean Asset-weighted	Mean Bank-weighted
1980	254	1913.5	820.6	1294.2	1793.6	2464.5	1457.0	1416.9
1981	285	1941.2	816.0	1330.7	1807.2	2498.4	1525.9	1443.0
1982	284	1936.9	842.4	1297.6	1776.3	2472.2	1555.9	1440.2
1983	284	1908.2	814.0	1286.4	1783.8	2392.8	1418.3	1432.0
1984	292	1944.1	789.4	1346.0	1823.2	2388.0	1524.8	1469.7
1985	296	1963.5	808.9	1335.3	1824.0	2419.1	1522.2	1451.9
1986	297	2040.7	795.8	1460.5	1930.4	2543.2	1600.8	1517.2
1987	297	2024.5	748.2	1444.9	1930.6	2541.7	1557.2	1536.3
1988	299	1962.8	766.5	1400.9	1872.0	2472.1	1506.2	1446.2
1989	298	1959.6	767.4	1367.1	1844.4	2431.4	1511.1	1470.9
1990	300	1991.7	778.6	1428.9	1852.3	2456.7	1550.9	1506.9
1991	299	1953.9	792.4	1394.6	1818.5	2400.9	1549.7	1467.1
1992	286	2005.4	778.7	1503.0	1856.1	2510.1	1676.7	1526.8
1993	296	1978.7	790.3	1440.2	1885.9	2335.3	1565.8	1526.6
1994	309	1985.8	759.5	1480.7	1853.5	2361.2	1711.5	1587.5
1980-1994	3540	1968.2	790.5	1393.9	1854.9	2445.0	1559.9	1480.0

Table 2
Distribution of changes in local commercial bank deposit Herfindahl-Hirschman Indexes, 1980-1994. Summary statistics are computed at the MSA level, and are based on the change in the local HHI. Data provided by Phil Strahan.

Change in local MSA HHI, 1980-1994	Unweighted	Weighted by MSA deposits
MSA	45.7	117.3
Standard Deviation	651.0	525.4
Percentiles		
10th	-744.2	-500.6
25th	-298.4	-228.9
50th	50.5	85.2
75th	420.7	527.8
90th	860.6	724.8
Inter-quartile range	719.1	756.7

Table 3
Deregulation of branching restrictions, 1980-1994. Figure in each cell shows the number of states that have by year listed in row allowed banks to branch according to the means listed in the column headings. Data provided by Phil Strahan.

	Number of states that allow branching or multistate bank holding companies			
Year	By single-state bank holding companies (MBHC)	By merger and assumption (M&A)	Full branching (De novo)	By interstate bank holding companies (Interstate)
1980	38	19	15	1
1981	39	21	16	1
1982	42	22	16	3
1983	44	23	16	5
1984	46	24	17	8
1985	50	28	19	18
1986	50	30	20	28
1987	50	35	23	37
1988	50	41	28	43
1989	50	42	30	45
1990	51	46	36	46
1991	51	48	38	48
1992	51	48	38	49
1993	51	49	39	50
1994	51	50	39	50

Table 4
Descriptive statistics for sample of bank-year observations, 1980-1994. Data come from 1980-1994 fourth-quarter FDIC Reports of Condition and Income. These data are available at the Chicago Fed website, http://www.chicagofed.org.

			Percentiles				
Variable	Mean	Stand. Dev.	10^{th}	25^{th}	50^{th}	75^{th}	90^{th}
Bank assets ($M)	442.4	3577.9	14.1	26.3	56.8	140.9	420.9
Total loans/Assets (percent)	56.2	14.9	36.6	47.5	57.6	66.2	73.2
Construction loans/Total loans	4.7	6.7	0	0.4	2.3	6.3	12.5
Commercial loans /Total loans	25.4	16.2	6.2	13.4	22.7	34.4	47.2
Home mrtg. loans /Total loans	24.1	16.3	5.3	11.8	21.4	33.5	46.1
Nonres. mrtg. loans/Total loans	12.8	10.5	1.1	5.0	10.8	18.2	26.8
Consumer loans/Total loans	22.8	15.9	6.2	11.6	19.8	30.3	42.3
Equity/Assets	8.8	5.9	5.6	6.5	7.7	9.4	12.3

Table 5
Commercial bank failure rates, 1980-1994. Data come from FDIC Call Reports.

Year	Number of banks	Share of banks failing (in percent): Unweighted — Next year	Next 2 years	Ever	Weighted by assets — Ever
1980	5843	0.07	0.26	8.32	4.31
1981	6034	0.18	0.60	8.52	4.85
1982	6090	0.41	0.89	8.95	5.00
1983	6009	0.52	1.03	9.52	5.15
1984	6360	0.47	1.27	10.06	5.48
1985	6434	0.73	2.02	9.99	5.31
1986	6408	1.26	3.28	9.64	4.92
1987	6105	1.98	4.44	8.89	5.07
1988	5756	2.43	4.26	7.35	3.65
1989	5533	1.83	3.02	5.01	2.87
1990	5352	1.20	2.26	3.33	2.27
1991	5101	1.06	1.61	2.18	0.69
1992	5109	0.51	0.67	1.04	0.15
1993	4748	0.19	0.27	0.59	0.09
1994	4599	0.09	0.13	0.41	0.05

Table 6
Characteristics of failing and surviving banks. Data come from FDIC Call Reports.

Characteristic	Year	All banks: Count	All banks: Mean	Banks that fail eventually: Percent of total	Banks that fail eventually: Mean	Banks that do not fail: Percent of total	Banks that do not fail: Mean
Construction loans/Total loans	1980	5843	3.2	8.3	5.6	91.7	3.1
	1985	6434	5.2	10.0	9.0	90.0	4.7
	1990	5352	5.2	3.3	8.9	96.7	5.2
Construction loans/Assets	1980	5843	1.8	8.3	3.1	91.7	1.7
	1985	6434	3.2	10.0	6.1	90.0	2.9
	1990	5352	3.3	3.3	6.4	96.7	3.2
Equity /Total assets	1980	5843	8.8	8.3	8.9	91.7	8.8
	1985	6434	8.8	10.0	8.4	90.0	8.8
	1990	5352	8.8	3.3	4.4	96.7	9.0

Table 7

Contribution of portfolio components to bank failure probabilities. First column shows estimated coefficients based on equation (8): $I(\textit{ever fail})_{i,t}^{MSA} = \alpha + \Sigma\, \beta_1 * SHR_{j,i,t}^{MSA} + \varepsilon_{i,t}$, where $I(\textit{ever fail})_{i,t}^{MSA}$ is an indicator variable set equal to 1 if bank i, observed at time t, eventually fails, and $SHR_{j,i,t}^{MSA}$ is the share of bank i's total loans at time t, held in asset class j (asset classes are listed along the row headings). The second and third columns show results from probit and logit models with the same set of independent variables. Three different sets of standard errors are reported in parentheses. The first is not corrected for clustering, the second is corrected for clustering by bank, and the third is corrected for clustering by MSA and year.

	Linear probability model	Probit regression	Logit regression
Construction loans	**0.457**	**2.850**	**5.362**
/Total Loans	(0.014)	(0.098)	(0.190)
	(0.041)	(0.214)	(0.408)
	(0.052)	(0.221)	(0.416)
Commercial loans	**0.210**	**1.652**	**3.217**
/Total loans	(0.008)	(0.070)	(0.146)
	(0.017)	(0.148)	(0.309)
	(0.018)	(0.112)	(0.237)
Home mtg. Loans	**-0.058**	**-0.813**	**-1.900**
/Total loans	(0.008)	(0.079)	(0.176)
	(0.014)	(0.190)	(0.417)
	(0.013)	(0.178)	(0.399)
Nonres mtg. Loans	**0.006**	**0.472**	**1.141**
/Total loans	(0.009)	(0.086)	(0.181)
	(0.018)	(0.184)	(0.385)
	(0.020)	(0.197)	(0.412)
Consumer loans	**0.074**	**0.769**	**1.623**
/Total loans	(0.008)	(0.070)	(0.148)
	(0.014)	(0.149)	(0.311)
	(0.012)	(0.113)	(0.237)
Constant	**-0.012**	**-2.223**	**-4.066**
	(0.006)	(0.058)	(0.126)
	(0.010)	(0.126)	(0.272)
	(0.008)	(0.107)	(0.240)
N	85481	85481	85481
R2	0.042	0.084	0.082

Table 8

Regressions of portfolio shares on local commercial banking market concentration. Entries in table show regression coefficient on MSA Herfindahl Index in equation (9): $CONS_{i,t}^{MSA} = \alpha + \beta * HHI_t^{MSA} + X_{i,t}^{MSA}\,\Gamma + \varepsilon_{i,t}^{MSA}$, where $CONS_{i,t}^{MSA}$ is the share of bank i's assets (or loans), at time t, devoted to construction lending. In the final two rows, the dependent variables are total loans as a share of assets and book equity as a share of assets. The vector of controls $X_{i,t}^{MSA}$ includes bank size, the bank's reported equity as a share of assets, the share of the bank's capital structure that is accounted for by subordinated debt, the share of bank deposits that are brokered deposits, MSA size, MSA employment growth (predicted using lagged MSA employment shares at 2-digit SIC level and national growth rates in employment for those 2-digit SIC level employment components), and the concentration (measured by Herfindahl Index) of employment shares in the MSA. Three different sets of standard errors are reported in parentheses. The first is not corrected for clustering, the second is corrected for clustering by bank, and the third is corrected for clustering by MSA and year.

	(1)	(2)	(3)	(4)	(5)	(6)
Fixed effects	None	None	Region by year	MSA, year	Bank, year	MSA, year
Controls	None	Yes	Yes	Yes	Yes	Yes
Trends	None	None	None	None	None	MSA
Dependent variable						
Construction loans	**-0.47**	**-0.51**	**-0.73**	**-0.73**	**-0.64**	**-0.89**
/Total loans	(0.03)	(0.04)	(0.04)	(0.09)	(0.07)	(0.12)
	(0.07)	(0.08)	(0.08)	(0.11)	(0.11)	(0.13)
	(0.18)	(0.18)	(0.12)	(0.22)	(0.21)	(0.27)
Construction loans	**-0.21**	**-0.22**	**-0.43**	**-0.44**	**-0.38**	**-0.64**
/Assets	(0.02)	(0.02)	(0.02)	(0.06)	(0.05)	(0.08)
	(0.05)	(0.05)	(0.05)	(0.07)	(0.07)	(0.09)
	(0.12)	(0.12)	(0.08)	(0.15)	(0.15)	(0.19)
Total loans	**1.89**	**1.85**	**0.60**	**1.74**	**1.64**	**-0.58**
/Assets	(0.08)	(0.08)	(0.08)	(0.20)	(0.15)	(0.27)
	(0.20)	(0.20)	(0.20)	(0.28)	(0.27)	(0.27)
	(0.34)	(0.36)	(0.27)	(0.61)	(0.48)	(0.52)
Equity	**0.21**	**0.42**	**0.25**	**0.56**	**0.35**	**0.46**
/Assets	(0.03)	(0.03)	(0.03)	(0.08)	(0.07)	(0.11)
	(0.06)	(0.06)	(0.06)	(0.10)	(0.09)	(0.12)
	(0.08)	(0.09)	(0.06)	(0.15)	(0.15)	(0.17)

Table 9
Regressions of portfolio shares on local commercial banking market concentration. Entries in table show regression coefficient on MSA Herfindahl Index in equation (9): $CONS_{i,t}^{MSA} = \alpha + \beta * HHI_t^{MSA} + X_{i,t}^{MSA}\,\Gamma + \varepsilon_{i,t}^{MSA}$, where $CONS_{i,t}^{MSA}$ is the share of bank i's assets (or loans), at time t, devoted to construction lending. In the final two rows, the dependent variables are total loans as a share of assets and book equity as a share of assets. The vector of controls $X_{i,t}^{MSA}$ includes bank size, the bank's reported equity as a share of assets, the share of the bank's capital structure that is accounted for by subordinated debt, the share of bank deposits that are brokered deposits, MSA size, MSA employment growth (predicted using lagged MSA employment shares at 2-digit SIC level and national growth rates in employment for those 2-digit SIC level employment components), and the concentration (measured by Herfindahl Index) of employment shares in the MSA. Three different sets of standard errors are reported in parentheses. The first is not corrected for clustering, the second is corrected for clustering by bank, and the third is corrected for clustering by MSA and year.

	(1)	(2)	(3)	(4)	(5)	(6)
Sample	Small, never merging	No failures in MSA yet	Well-capitalized	Poorly capitalized	HHI >= 1000	HHI < 1000
Fixed effects	MSA, year	MSA, year	MSA, year	MSA, year	MSA, year	MSA, year
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Trends	None	None	None	None	None	None
N	21387	43733	38488	46935	61988	23435
Dependent variable						
Construction loans	**-0.73**	**-0.49**	**-0.58**	**-0.79**	**-1.06**	**1.10**
/Total loans	(0.16)	(0.12)	(0.13)	(0.12)	(0.10)	(0.37)
	(0.20)	(0.14)	(0.16)	(0.15)	(0.12)	(0.41)
	(0.27)	(0.20)	(0.23)	(0.24)	(0.22)	(0.91)
Construction loans	**-0.43**	**-0.39**	**-0.34**	**-0.47**	**-0.72**	**1.23**
/Assets	(0.10)	(0.07)	(0.08)	(0.08)	(0.06)	(0.23)
	(0.13)	(0.09)	(0.10)	(0.10)	(0.08)	(0.25)
	(0.18)	(0.14)	(0.15)	(0.17)	(0.15)	(0.58)
Total loans	**1.06**	**0.27**	**1.30**	**2.14**	**0.49**	**11.12**
/Assets	(0.42)	(0.27)	(0.31)	(0.26)	(0.22)	(0.09)
	(0.54)	(0.36)	(0.42)	(0.34)	(0.29)	(1.06)
	(0.66)	(0.52)	(0.61)	(0.69)	(0.44)	(2.95)
Equity	**0.51**	**0.61**	**0.78**	**0.07**	**0.40**	**1.60**
/Assets	(0.18)	(0.11)	(0.14)	(0.03)	(0.09)	(0.31)
	(0.22)	(0.13)	(0.20)	(0.03)	(0.11)	(0.36)
	(0.27)	(0.15)	(0.22)	(0.06)	(0.14)	(0.60)

Table 10

Regressions of portfolio shares on market concentration, before and after deregulation. Entries in table show regression coefficients β^R, β^{NR}, and δ from equation (11): $CONS_{i,t}^{MSA} = \alpha + \beta^R * HHI_t^{MSA} * NOBRANCH_t^{MSA} + \beta^{NR} * HHI_t^{MSA} * (1-NOBRANCH_t^{MSA}) + \delta * (1-NOBRANCH_t^{MSA}) + X_{i,t}^{MSA}\, \Gamma + \varepsilon_{i,t}^{MSA}$, where $CONS_{i,t}^{MSA}$ is the share of bank i's assets (or loans), at time t, devoted to construction lending. The vector of controls $X_{i,t}^{MSA}$ includes bank size, the bank's reported equity as a share of assets, the share of the bank's capital structure that is accounted for by subordinated debt, the share of bank deposits that are brokered deposits, MSA size, MSA employment growth (predicted using lagged MSA employment shares at 2-digit SIC level and national growth rates in employment for those 2-digit SIC level employment components), and the concentration (measured by Herfindahl Index) of employment shares in the MSA. All regressions include controls including bank and MSA size, (predicted) MSA employment growth, and the concentration of employment shares in the MSA. Three different sets of standard errors are reported in parentheses. The first is not corrected for clustering, the second is corrected for clustering by bank, and the third is corrected for clustering by MSA and year.

	(1)	(2)	(3)	(4)	(5)	(6)
Branching deregulation measure	Intrastate branching by merger allowed		Intrastate de novo branching allowed		Interstate bank holding companies allowed	
Fixed effects	None	MSA, year	None	MSA, year	None	MSA, year
Controls	No	Yes	No	Yes	No	Yes
Dependent variable						
Construction Loans/Total Loans						
HHI*NOBRANCH	**-0.97**	**-1.01**	**-0.85**	**-0.89**	**-0.60**	**-1.05**
	(0.05)	(0.10)	(0.04)	(0.10)	(0.05)	(0.09)
	(0.09)	(0.12)	(0.08)	(0.12)	(0.08)	(0.12)
	(0.25)	(0.24)	(0.20)	(0.22)	(0.26)	(0.24)
HHI	**-0.19**	**-0.49**	**-0.22**	**-0.35**	**-0.36**	**-0.43**
*(1-NOBRANCH)	(0.05)	(0.10)	(0.06)	(0.10)	(0.05)	(0.10)
	(0.10)	(0.13)	(0.13)	(0.14)	(0.09)	(0.12)
	(0.23)	(0.25)	(0.30)	(0.27)	(0.23)	(0.25)
NOBRANCH	**0.22**	**1.22**	**-0.68**	**1.47**	**-0.39**	**0.43**
	(0.11)	(0.14)	(0.12)	(0.16)	(0.11)	(0.13)
	(0.21)	(0.18)	(0.26)	(0.21)	(0.17)	(0.17)
	(0.72)	(0.38)	(0.79)	(0.42)	(0.69)	(0.36)
Construction Loans/Assets						
HHI*NOBRANCH	**-0.57**	**-0.69**	**-0.48**	**-0.59**	**-0.32**	**-0.71**
	(0.03)	(0.06)	(0.03)	(0.06)	(0.03)	(0.06)
	(0.05)	(0.08)	(0.05)	(0.08)	(0.05)	(0.08)
	(0.16)	(0.16)	(0.13)	(0.15)	(0.16)	(0.16)
HHI	**-0.02**	**-0.25**	**-0.07**	**-0.16**	**-0.12**	**-0.21**
*(1-NOBRANCH)	(0.03)	(0.06)	(0.04)	(0.07)	(0.03)	(0.06)
	(0.07)	(0.08)	(0.09)	(0.09)	(0.06)	(0.08)
	(0.15)	(0.17)	(0.21)	(0.19)	(0.16)	(0.17)
NOBRANCH	**0.08**	**1.01**	**-0.57**	**1.05**	**-0.25**	**0.43**
	(0.07)	(0.09)	(0.08)	(0.10)	(0.07)	(0.08)
	(0.14)	(0.11)	(0.17)	(0.13)	(0.11)	(0.11)
	(0.47)	(0.26)	(0.54)	(0.30)	(0.45)	(0.25)

Table 11

MSA-level regressions of portfolio shares on market concentration. Entries in table show regression coefficient on MSA Herfindahl Index in equation (12): $CONS_t^{MSA} = \alpha + \beta * HHI_t^{MSA} + X_t^{MSA\prime}\,\Gamma + \varepsilon_t^{MSA}$, where $CONS_t^{MSA}$ is the share of the MSA's banking sector assets (or loans), at time t, devoted to construction lending. In the final two rows the dependent variables are real estate employment and construction employment, each as a share of total employment. The vector of controls X_t^{MSA} includes MSA size, MSA employment growth (predicted using lagged MSA employment shares at 2-digit SIC level and national growth rates in employment for those 2-digit SIC level employment components), and the concentration (measured by Herfindahl Index) of employment shares in the MSA. Data come from fourth quarter FDIC Call Reports, 1980-1994; MSA totals constructed by summing individual bank observations. Employment data from Census County Business Patterns, available at http://fisher.lib.virginia.edu.

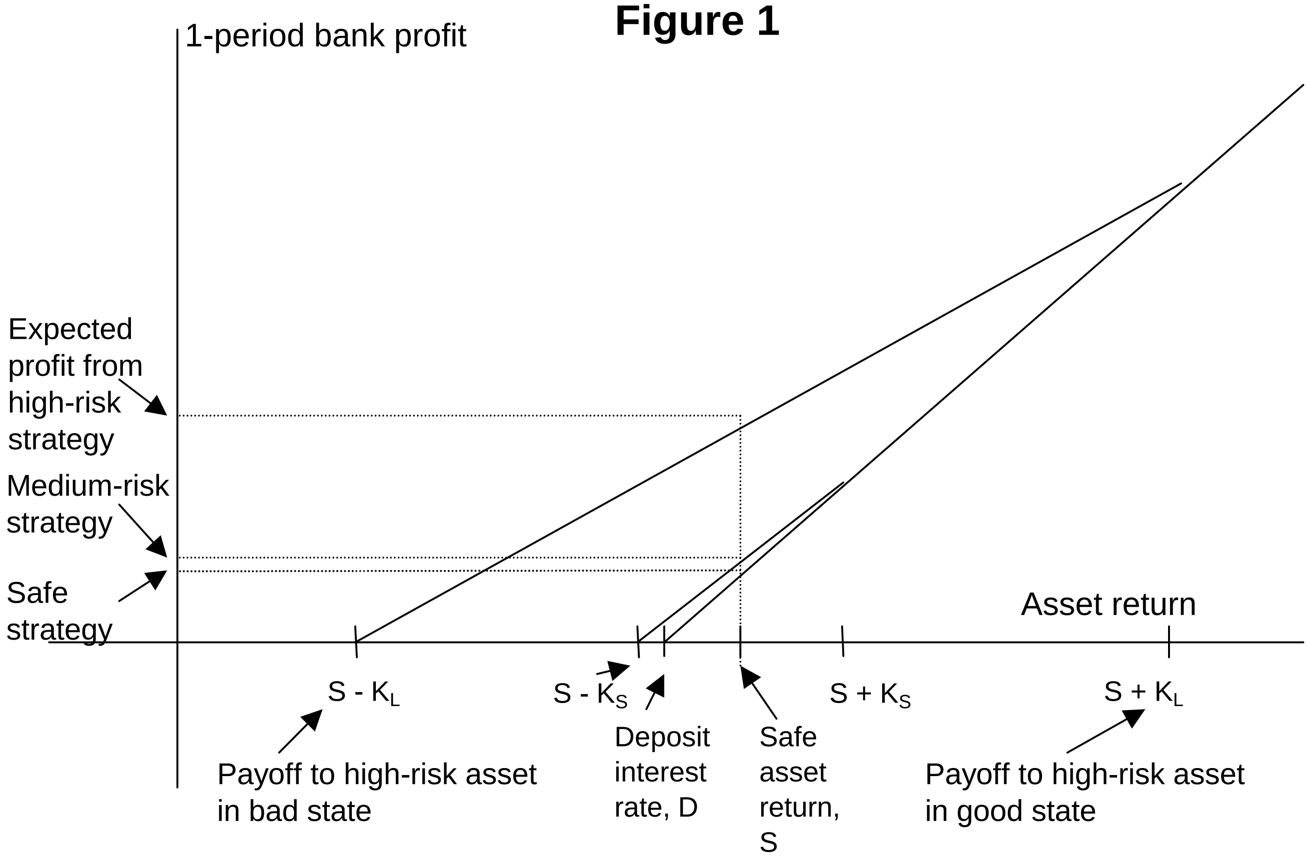
	(1)	(2)	(3)	(4)	(5)
Fixed effects	No	No	Region by year	MSA, year	MSA, year
Controls	No	Yes	Yes	Yes	Yes
Trends	None	None	None	None	MSA
Dependent variable					
Construction loans /Total loans	**-0.81** (0.08)	**-0.75** (0.08)	**-0.73** (0.07)	**-0.63** (0.13)	**-0.80** (0.15)
Construction loans /Assets	**-0.44** (0.05)	**-0.40** (0.05)	**-0.42** (0.05)	**-0.42** (0.09)	**-0.59** (0.10)
Real estate employment /Total employment	**-0.14** (0.01)	**-0.08** (0.01)	**-0.04** (0.01)]	**-0.04** (0.01)	**-0.06** (0.01)
Construction employment /Total employment	**-0.29** (0.07)	**-0.38** (0.07)	**-0.23** (0.07)	**-0.10** (0.12)	**-0.23** (0.10)

Table 12

Regressions of failure rates on market concentration. Reported coefficients based on equations (14) through (19) in the text. Controls include bank and MSA size. Equation (14) is a linear probability model regression at the bank level of a dummy for failing on market structure I(*fail in next year*)$_{i,t}^{MSA}$ = $\alpha + \beta * HHI_t^{MSA} + X_t^{MSA\prime}\, \Gamma + \varepsilon_t^{MSA}$. Equation (15) is a regression at the MSA level of the share of banks failing on market structure: $SHR\_FAIL\_NEXTYEAR_t^{MSA} = \alpha + \beta * HHI_t^{MSA} + X_t^{MSA\prime}\, \Gamma + \varepsilon_t^{MSA}$. Data come from fourth quarter FDIC Call Reports. For bank-year observations, three different sets of standard errors are reported in parentheses. The first is not corrected for clustering, the second is corrected for clustering by bank, and the third is corrected for clustering by MSA and year.

	(1)	(2)	(3)	(4)	(5)
Fixed effects	None	None	Region by year	MSA, year	MSA, Year
Controls	None	Yes	Yes	Yes	Yes
Trends	None	None	None	None	MSA
Dependent variable					
	Unit of observation is the bank-year				
Bank fails in next year?	**-0.26**	**-0.16**	**-0.09**	**0.09**	**-0.12**
	(0.05)	(0.05)	(0.05)	(0.14)	(0.19)
	(0.04)	(0.05)	(0.05)	(0.12)	(0.21)
	(0.11)	(0.10)	(0.07)	(0.20)	(0.31)
Bank fails in next 4 years?	**-1.40**	**-1.28**	**-0.60**	**-1.15**	**-2.70**
	(0.10)	(0.11)	(0.11)	(0.28)	(0.38)
	(0.18)	(0.20)	(0.20)	(0.35)	(0.43)
	(0.46)	(0.44)	(0.22)	(0.68)	(0.65)
Bank fails ever?	**-2.10**	**-1.96**	**-0.98**	**-1.17**	**-1.86**
	(0.13)	(0.13)	(0.13)	(0.34)	(0.46)
	(0.29)	(0.32)	(0.32)	(0.42)	(0.35)
	(0.63)	(0.63)	(0.31)	(0.69)	(0.45)
	Unit of observation is the MSA-year				
Share of banks failing next year	**-0.16**	**-0.15**	**-0.11**	**-0.06**	**-0.05**
	(0.06)	(0.06)	(0.05)	(0.15)	(0.20)
Share of banks failing in next 4 years	**-0.90**	**-0.88**	**-0.64**	**-1.43**	**-2.37**
	(0.15)	(0.15)	(0.12)	(0.32)	(0.41)
Share of banks failing ever	**-1.50**	**-1.47**	**-1.10**	**-1.33**	**-1.63**
	(0.20)	(0.20)	(0.15)	(0.36)	(0.29)
Share of assets held at banks failing in next year	**-0.25**	**-0.25**	**-0.21**	**-0.10**	**0.01**
	(0.07)	(0.07)	(0.07)	(0.19)	(0.27)
Share of assets held at banks failing in next 4 years	**-1.23**	**-1.28**	**-0.95**	**-0.44**	**-1.66**
	(0.19)	(0.19)	(0.16)	(0.40)	(0.52)
Share of assets held at banks failing ever	**-2.08**	**-2.16**	**-1.65**	**-0.24**	**-1.06**
	(0.25)	(0.26)	(0.20)	(0.44)	(0.33)

Figure 1


1-period bank profit
Expected profit from high-risk strategy
Medium-risk strategy
Safe strategy
Asset return
S - K_L
S - K_S
S + K_S
S + K_L
Payoff to high-risk asset in bad state
Deposit interest rate, D
Safe asset return, S
Payoff to high-risk asset in good state