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The Increasing Trend in Commercial Real Estate Lending by Community Banks: The Role of Deliberate Risk-Taking, 2001-2017

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Abstract

Much attention focuses on the role of real estate lending by banks as a precipitating factor in past financial crises, and especially with respect to the 2007-2008 crisis. Over the past five years, U.S. banks have increased their commercial real estate lending dramatically, raising concern among regulators about the potential for another financial crisis. In this paper, we analyze post-recessionary trends to determine whether the same dangerous pre-recessionary risk-taking trends are emerging. Regulators devote most of their attention to the banking sector with little regard to the role played by its various subgroups. This may explain why there is little research analyzing the specific role of community banks in sparking a financial crisis. In this study, we present a disaggregated analysis that focuses on the potential risks of increased commercial real estate lending from a comparative perspective, examining community banks vis-a-vis larger banking institutions, paying particular attention to the role of deliberate bank risk-taking as a causal factor in increased community bank commercial real estate CRE lending since the Great Recession.

Keywords

bank risk-taking, deliberate risk-taking, commercial real estate lending, community bank risks, community bank risk measurement

1. Introduction

Most U. S. bank lending categories have seen only modest growth since the end of the Great Recession. An exception is Commercial Real Estate (CRE) lending (Note 1) (Regehr & Sengupta, 2016). As CRE loan growth has surged in recent years (see Appendix A, Figure 1), the total volume of CRE loans outstanding, which declined significantly during and in the immediate aftermath of the Great Recession, has rebounded sharply, especially since 2013. If this trend continues, some banks could be vulnerable should economic conditions deteriorate, particularly those with high concentrations of CRE loans and reliance on risky funding sources. Regulators today fear a repeat of the widespread commercial real estate failures that roiled the banking sector in the 1980s, 1990s, and late 2000s. As a result, they encourage lending institutions to maintain strong risk management oversight, especially regarding their CRE lending risk-taking practices (Federal Reserve Board of Governors, 2017).

The Boards of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, and Office of the Comptroller of the Currency issued two guidelines in 2006 to address their concern that financial institutions were over-extended in the CRE loan market (Bassett & March, 2006). In particular, their concern was that concentration in CRE loans had reached a level that could lead to unstable outcomes in the event of a significant economic downturn. More recently, the same federal agencies once again urged caution in a December 2015 interagency statement that noted substantial growth in many CRE loan markets. Spurred by increased competitive pressures, the report portended an easing of CRE loan underwriting standards (Note 2). Such exposure to the real estate sector is a legitimate cause for concern, especially when it coincides with rapidly changing property prices (Kiyotaki & Moore, 1997). Guidelines emphasize the banking sector overall and pay less attention to the roles played by its various subgroups. Over-weighting by the largest national institutions tends to obscure impacts of smaller banks from aggregate statistics, leaving open many questions. An unintended consequence is but a scant amount of extant research analyzing the specific role of community banks (Note 3) in this regard.

Our research aims to help move this oversight in a different direction by exploring two main concerns. The first is the degree to which increased CRE lending has exposed community banks to financial risks associated with a potential downturn in the commercial restate market. The second is whether we observe the same disturbing CRE lending pre-recession trends emerging in the post-recession era. Our inquiry, guided by primary consideration of the role of deliberate community bank risk-taking as a causal factor in increased CRE lending, presents a comparative perspective of the potential risks of increased CRE lending by analyzing differences in the risk orientations of community banks versus their larger, non-community bank counterparts, focusing on two distinct periods: the pre-recessionary period of 2001-2006 and the post-recessionary period of 2011-2017 (see Appendix A, Figure 2).

The focal point of our analysis is the role of risk, as a deliberate choice of action, in the loan composition of commercial banks (Note 4). If the hypotheses set forth in this study are correct, then

banks that exhibit a higher tolerance for risk should not only be willing to make higher risk loans such as commercial real estate loans, but should also be willing to incur other forms of concurrent risk as well. We contend that risk orientation is an inherent trait. Consequently, we expect a high degree of correlation between a bank's decision to invest higher portions of their assets in CRE loans and desires to engage in other forms of risk. Bank risk-taking involves decisions about the riskiness of the bank's loan portfolio relative to the quantity and type of funds used to make loans and capital reserve constraints. Given that riskier loan portfolios result from the discretionary actions of bank managers, we contend that such decisions are the result of deliberate risk-taking.

While risk is important to consider, bank risk management should not focus exclusively on reducing exposure. Banks should take on good risks by undertaking activities that have an expected positive return on a standalone basis (Stulz, 2016). Broadly speaking, banks must address four risk categories: operational, business, event, and financial (Van Greuning & Brajovic Bratanovic, 2009).

Yet, it is not always easy to categorize some types of risk. For example, nontraditional risks such as ATM failures or employee fraud come under the rubric of operational risks (DeYoung & Torna, 2013; Lopez, 2002). Similarly, the Basel Committee on Banking Supervision defines operational risk as the risk of monetary losses resulting from failed internal processes, people, and systems (Basel Committee on Banking Supervision, 2015b) (Note 5).

Taking actions that reduce risk can be costly. Taking lower risks means avoiding potentially profitable investments that may come with higher risks (Note 6). Banks differ from nonfinancial firms in general because they can create value through their liabilities, yet each does so differently, depending on their particular risk-taking profiles (DeAngelo & Stulz, 2015). Bank managers, along with bank regulators, have long sought to understand the determinants of risk-taking, which often proves difficult due to the many types of risks banks face (Apelado & Gies, 1972; Asea & Blomberg, 1998; Christoffesen, 2011; Cohen, 1970; Van Greuning & Bratanovic Brajovic, 2003; Kaplan & Mikes, 2012).

Business risks stem from a bank's business environment and exposure to external regulatory policies and macroeconomic factors (Acharya & Naqvi, 2012). Event risks occur exogenously. A military conflict for example, could jeopardize a bank's operations (Bessis, 2011). In any one year, Business and event risks impact all banks simultaneously and are therefore not likely to account for any resulting variation in realized financial ratios among banks.

Our study, however, focuses specifically on financial risks. Altman and Saunders (1997) highlight three critical financial risks: credit, liquidity, and interest rate. A bank's primary business is to generate returns on its assets which it does through the loans it makes. To accomplish this, banks must strike a delicate balance between investing in high- and low-risk loans, managing credit risk proactively. Banks must not overlook liquidity risk because their abilities to meet demand obligations can influence customer and shareholder confidence about not just profitability but continued viability. Because loaning money depletes liquid assets, bank managers must consider how liquidity risk impacts relate to

potential increased interest rate exposure risks (Rosenberg & Schuermann, 2006).

Credit risk relates to a bank's inability to recoup the money it loans or invests. It is a direct function of the quality of a bank's loan portfolio. Alternatively put, credit risk is the risk that a borrower will fail to repay its loan in part or in full, resulting in diminished bank asset value.

Liquidity risk rises as liquid assets decrease. Sharp decreases can place banks in the untenable positions of forced liquidation or acquisition to meet obligations. Liquidity risk results from a mismatch in size and maturity of assets and liabilities (for an in-depth discussion on liquidity policies and their implications for systemic risk, see Adrian & Boyarchenko, 2013) (Note 7).

Interest rate risk occurs when an unexpected interest rate change affects the market value of a bank's assets, potentially threatening solvency (Feldman & Schmidt, 2000). Interest rate risk is particularly important to bank regulators, who place great emphasis on the evaluation of interest rate risk associated with individual banks. Arguably, emphasis has increased in importance since the implementation of risk-based capital charges recommended by the Basel Committee (Van Greuning & Brajovic Bratanovic, 2009).

Managing the level of bank risk-taking involves numerous decisions manifesting themselves in objective bank financial measures. Though we have discussed each of the risks separately, there is an inherent interaction between all forms of risk which means that banks need to manage all of them simultaneously (Stulz, 2016). All the while banks must be aware that efforts to reduce one kind of risk may increase another. For example, loan sales can reduce interest rate and credit risk, but this could force banks to rely more heavily on income from off-balance sheet activities.

A generalized method to measure a bank's overall level of realized risk-taking is the risk-weighted asset ratio. This composite measure incorporates credit, liquidity, and interest rate risks (Das & Sy, 2012). Banks with higher ratios tend to invest more money in loans and comparatively less in safe, short-term liquid assets such as U.S. Treasury securities. Higher risk-weighted asset ratios typically reflect riskier asset composition. Banks would also tend to rely more on volatile sources of funds and would be less willing to back their assets with equity capital.

The percentage of bank assets invested in loans and government securities are two important measures of asset risk exposure (Shrieves & Dahl, 1992). Widely considered to be risk-free, U.S. Treasury securities provide banks with both safety and liquidity while loans held expose banks to the highest risks. Intuitively, risk-taking decisions leading to higher loan-asset ratios and correspondingly lower security-asset ratios suggest a bank's preference for taking higher risks with their assets. Because negative effects on liquidity can be critical, ensuring adequate liquidity is one of the most important tasks in the management of a bank. Recent research indicates that inadequate liquidity is often one of the most important signals that a bank is in serious financial trouble (Duttweiler, 2011). To be sure, there are trade-offs between ensuring adequate liquidity and seeking high profitability. The more resources a bank devotes to its liquidity needs, the lower its expected profitability.

Storing liquidity in the form of short-term assets and relying on borrowed liquidity to meet cash demands are two strategies available banks to meet short-term liquidity needs. Achieving liquidity by investing in short-term assets is a less risky strategy than relying on borrowed funds; however, lower risks are also less profitable (Adrian & Shin, 2009). Borrowing as a source of liquidity is the riskiest approach to solving a bank's liquidity problems (Darrat et al., 2004); higher yields await, but money market interest rate volatilities can prove problematic. Banks which rely on large, volatile sources of funds such as negotiable certificates of deposit, and other liabilities with short-term maturities, are more likely to have unanticipated deposit outflows (Matz, 2007). It follows that banks whose strategies are to accept lower net liquidity ratios, either because they hold a smaller fraction of liquid assets or because they rely more heavily on volatile sources of funds are those which also should be inclined to accept higher levels of risk.

Another common risk estimation measure examines the ratio of core deposits to total deposits. Core deposits are total deposits less time deposits over $100,000 (Sheehan, 2013). They are not particularly interest rate sensitive and consist of small-denomination accounts from local customers who are unlikely to withdraw on short notice. The risks of withdrawal for large negotiable certificates of deposit and other open market-purchased funds are much greater than for core deposits obtained from local customers (Horcher, 2011).

It may be possible for a bank to acquire more assets and earn higher average profits by relying more on volatile funds and less on core deposits (Dam, Escrihuela-Villar, & Sanchez-Pages, 2015). However, purchased funds tend to be more responsive to changes in interest rates and, hence, may provide a less stable source of funds to banks than do demand deposits. For that reason, banks with high ratios of core deposits to total assets, and conversely, low ratios of volatile funds to total assets are more likely to be risk-averse than banks with low core deposit to total asset ratios.

Our study utilizes the ratio of net liquid assets to total assets to determine a bank's ability to meet unanticipated cash demands. Net liquid assets are the difference between short-term liquid assets and highly volatile borrowed funds. Although a bank can strengthen its liquidity position by holding more liquid assets, it will not necessarily be in a strong position if the demands for liquidity made against it are excessive.

A final form of concurrent risk stems from decisions to adopt low capital-asset ratios (Peek & Resengren, 1995). Lower ratios provide less cushion against any potential loss and create incentives for banks to make loans with higher probabilities of default. The incentive to increase asset and bankruptcy risk as capital-asset ratios decline can explain why banks may very well choose to hold much riskier loan portfolios than they would have with higher capital-asset ratios. Bank owners have less to lose in the event their investments perform poorly if capital ratios fall. At the same time, they also have much to gain if the higher risk loans perform well. Several studies suggest that poorly capitalized institutions actively seek to take additional risk (Belsky & Richardson, 2010; Cole & White, 2012; Hendrickson &

Nichols, 2011). It follows then that those banks anxious to avoid losses should also be averse to making higher risk loans and investments.

Regulatory agencies specify acceptable capital-asset ratios and pressure banks to maintain them, even in face of external pressures beyond their control. Problems occur when it appears the capital-asset ratio is a result of managerial choice. Banks have certain flexibilities under current risk-based capital guidelines; they can reduce their ratios by pursuing safer investments, and vice versa. Either way, because banks have more freedom in deciding how to meet their capital requirements, their risk-taking activities are of interest. Our risk-taking profile measure takes into consideration the riskiness of a bank's investment activities.

2. Method

To examine the increasing trend in CRE lending, we focus on two periods: 1) a pre-recessionary period, from 2001 to 2006; and, 2) a post-recessionary period, from 2011 to 2017. It is particularly important to gauge the current climate with the hindsight of history that led up to the 2007-2008 financial crisis. We are concerned primarily with the question of whether we now observe the same dangerous CRE lending risk-taking trends in the post-recessionary period witnessed in pre-recessionary years. More specifically, we ask whether significant risk-taking trend differences exist between community and non-community banks during each period.

We use both univariate and multivariate procedures to examine the role of deliberate risk-taking as a casual factor in differing levels of CRE lending among banks. In our univariate analysis, we use a series of financial ratios constructed from a bank's balance sheet to determine the extent to which risk-taking tendencies influence the prevailing levels of CRE lending (see Appendix B, Table 1). We select 16 financial ratios as proxies for concurrent risk measures. We test for mean differences in our set of concurrent risk measures between bank groups across two distinct time-periods (see Appendix B, Table 2).

We use principle component analysis to avoid multicollinearity problems between the financial ratios. We develop a single principle component that serves as our risk-taking profile measure. By using principle component analysis, we can determine how the various financial ratios correlate with our risk-taking profile measure. By examining the eigenvector scores for each ratio (see Appendix B, Table 3). Higher scores represent higher degrees of correlation with a given principle component. For any variable, a positively related score indicates that higher financial ratios are associated with higher levels of risk. Thus, heavier reliance on brokered deposits (positive loading) would indicate higher levels of risk-taking. A negatively related score indicates the opposite. For example, heavier reliance on core deposits (negative loading) would indicate lower levels of risk-taking.

Our procedure reduces our 16 financial ratios to four principle components as predictors of CRE lending. The first, (PosUse), is composed of ratios representing uses of funds that are positively associated with

our risk-taking profile measure. The second, (NegUse), is composed of ratios representing uses of funds that are negatively associated with our risk-taking profile measure. The third and fourth measures, (PosSou) and (NegSou), represent variables that load positively and negatively on our risk-taking profile measure, respectively.

We estimate the following equation for each set of banks within and across each time-period:

$$Y = b_0 + b_1*X + b_2*M + b_3*T + e \quad \text{[Equation 1]}$$

Specifically, we test the following hypotheses:

H-1_o: $\beta_i = 0$; the individual coefficients are not significant predictors of Y

H-1_a: $\beta_i \neq 0$; the individual coefficients are significant predictors of Y

where,

Y = N x 1 vector of observations measuring CRE loan levels; B_o = estimated intercept coefficient; X = N x k matrix of observations measuring concurrent risk (Note 8); b_1 = k x 1 vector of estimated coefficients; M = N x h matrix of binary observations defining Federal Reserve Bank geographical regions; b_2 = h x 1 vector of estimated coefficients; T = N x t matrix of binary observations defining time period; b_3 = t x 1 vector of estimated coefficients; and, e = N x 1 vector of normally distributed random errors with zero mean, constant variance, and zero covariance over time and geographic region.

Next, we test differences in coefficients across two specific equations for community banks and non-community banks. We estimate two equations, one each for community and non-community banks over each specific interval of time. We then test across both equations to determine differences in the corresponding coefficients (see Appendix A, Figure 3).

Specifically, we test the following hypotheses:

H-2_o: $\beta_i = \beta_i$; the individual coefficients are equal across both equations

H-2_a: $\beta_i \neq \beta_i$; the individual coefficients are not equal across both equations

All testing procedures are robust. To reduce any potential problems associated with heteroscedasticity in the residual terms, we divide all financial variables (other than those that are binary-coded) by total assets. To avoid multicollinearity problems, we use principle component analysis as a data reduction technique with each principle component representing a set of CRE lending predictors. To determine if variances are equal across the different geographic regions as well as across the different time-intervals, we use multiple testing procedures.

3. Result

3.1 Ratio of CRE loans to risk-based capital

Regulators use a bank's Risk-based Capital ratio (RBC) to assess how much capital a bank has on hand to protect itself against operating losses (Shrieves & Dahl, 1992). A study by the Richmond Federal Reserve Bank looks at banks with especially high concentrations of CRE loans, defined as having a CRE loan to RBC ratio (CRE/RBC) of more than 400% (Fessenden & Muething, 2017). This subgroup is important to

regulators because high CRE/RBC ratio banks experienced a higher likelihood of failure or forced acquisition. The study notes that during the 2008-2012 period, 35% of those banks with CRE/RBC ratios higher than 400% experienced either failure or forced acquisition. Nationwide during the same period, failure and acquisition rates were 5% and 13%, respectively. In recent years, only a handful of community banks have had ratios exceeding 400%.

Another question the Richmond Fed study considers is whether certain characteristics within this group (+400% banks) can help predict its probability of survival or failure (Fessenden & Muething, 2017). It finds that that those banks that failed in the recession following the 2007-2008 financial crisis had significantly higher CRE loan growth rates in the years leading up to the recession than was the case for the banks that survived. The study shows that banks holding between $1 billion and $10 billion in assets not only maintained the highest concentrations of CRE loans but also had the fastest growth rates. It also reports that 50% of community banks have mean CRE/RBC ratios below 130% in the post-recession era while only 5% have ratios above 400% (see Appendix A, Figure 4). In stark contrast, the respective ratios for non-community banks are just over 200% and 395%.

3.2 Effects of Geographical Region

Given that the financial crisis was more severe in certain areas of the country, we also examine the effect of geographical region on the CRE/RBC ratio during the three periods of our study using each of the 12 Federal Reserve Districts as proxies (see Appendix A, Figures 5-7). With a lone exception, in every period, non-community banks have higher CRE/RBC ratios. In the San Francisco region community banks have higher ratios than do their larger bank counterparts.

3.3 Differences in Individual Ratios

Our univariate analysis aligns with the theoretical basis for using concurrent risk measures as proxies for inherent risk tendencies. Remarkably, results are consistent across all three time periods (see Appendix B, Tables 2-6). Community banks hold significantly more investments in stable, non-risky sources of funds such as demand deposits and core deposits and significantly less in riskier sources of funds such as volatile liabilities, short-term liabilities, and brokered deposits. They also have significantly higher capital ratios as indicated by higher equity ratios and higher ratios of core capital. It is also clear that relative to non-community banks, community banks invest higher portions of their assets in less risky assets and lower portions in riskier assets.

With significantly higher levels of short-term assets and lower levels of short-term liabilities, community banks take on less liquidity risk than do non-community banks. However, as measured by their higher negative interest rate gap (Note 9), community banks take on significantly more interest rate risk than do their non-community bank counterparts. While community bank loan loss provision ratios are much less than for non-community banks, community banks also have significantly lower rates of noncurrent loans and leases.

Whether analyzing sources or uses of funds, community banks appear to take on less risk than do non-community banks. Community banks hold significantly less of their assets in CRE loans than non-community banks in all three periods. They also hold fewer CRE loans in the post-recession period than in the pre-recession period.

Regarding community bank post-recession risk-taking activities relative to their performance in the pre-recession era we find no consistent disturbing trends. In the post-recession era, community banks do hold more brokered deposits, but they also hold higher proportions of safer sources such as demand deposits and core deposits as well. Yet at the same time, community banks also hold significantly higher proportions of risky assets such as commercial and industrial loans but lower proportions of CRE loans (see Appendix B, Table 5-6).

3.4 Principle Component Analysis

We use principle component analysis to provide robust, objective analysis of our set of concurrent risk measures. This method allows us to determine how the various financial ratios correlate with an overall risk profile. Eigenvector scores indicate how each ratio loads on our risk-taking profile measure (see Appendix B, Table 7). Higher absolute scores, whether positive or negative, represent higher loadings and thus higher degrees of correlation with a given principle component.

Some of the financial variables represent sources or uses of funds and load either positively or negatively in our risk profile analysis. Positive loading indicates a higher degree of bank risk-taking. For instance, a positively correlated loan ratio means that banks holding a higher portion of CRE loans are undertaking more risk. The opposite is true for U.S. Treasuries; a negative loading indicates a lower risk orientation. In the same vein, banks that rely more heavily on core deposits (negative loading) and less so on brokered deposits (positive loading) are those with lower risk profiles. As most all the variables load in the expected direction, these results give us confidence in our various measures of concurrent risk.

3.5 Regression Analysis

Our regression results indicate that all principle component variables are significant predictors of CRE lending for both community and non-community banks. Banks that devote proportionately more funds to the various categories of loans (PosUse) tend to have higher levels of CRE lending. The same is true for those that have higher proportions of risk-weighted assets. However, banks that direct proportionately more investments to safer assets such as U.S. Treasuries (NegUse) tend to have lower levels of CRE loans. Banks relying more on unstable sources of funds (PosSou) hold significantly more CRE loans while those utilizing more stable sources (NegSou) invest significantly less in CRE loans.

In our initial regression runs, we include all study period years and all Federal Reserve geographical regions. However, most of the individual years and geographical regions were not statistically significant. Consequently, we focus on periods of years to capture the effects of time. Since our focus is on the current post-recession period (2011-2017), we use a dummy variable, where the value of 1

represents the 2011-17 period and the value of 0 represents all prior years. Using stepwise regression procedures, the only significant geographical region is San Francisco, which we then test in isolation and as we expect, the result is a positive and significant coefficient. Surprisingly, the coefficient for the post-recessionary period is also positive and significant. Relative to the pre- and post-recessionary time periods, the estimated coefficient indicates that after controlling for all other variables, there were more CRE loans made in the post-recessionary period.

Tests for differences in coefficients across both sets of equations reveal significant differences in the risk orientation between the two groups of banks. Community banks tend to make safer investments than do non-community banks. However, our regression results show that an equal percentage increase in risky investments for both sets of banks will cause a significantly larger percentage increase in CRE loans among community banks. Community banks also rely less on volatile and unstable sources of funds than do non-community banks. Nonetheless, again, results indicate that an equal percentage increase in unstable funding sources will cause a significantly larger percentage increase in CRE loans among community banks.

Thus, our single- and multi-variate results give us somewhat of a mixed reading. Community banks hold significantly less risky investments and rely on less risky sources of funds than do non-community banks. However, it seems clear that community banks also need close monitoring. As measured by the risk-weighted asset ratio, community banks hold significantly less risky assets than do non-community banks as a percentage of their assets. At the same time, however, they also invest more heavily in longer-term assets and unstable funding sources.

4. Discussion

Despite the regulatory concerns expressed in late 2015, the concentrations of CRE loans continued to rise at many banks across the nation in 2016 and 2017. Regulators use the risk-based capital CRE/RBC ratio to assess how much capital a bank has on hand to protect itself against operating losses. A study by the Richmond Federal Reserve Bank looked at banks with especially high concentrations of CRE loans, defined as having a CRE/RBC ratio of more than 400% (Fessenden & Muething, 2017).

For community banks, we find that these rates are much lower than is the case with the nation's largest banks. Compared to the pre-recession period, we find that after the recession CRE lending community banks only increased their mean CRE/RBC ratios by an average of 12 percentage points from 144% to 166%. For non-community banks, ratios increased over two and a half times more, rising from 170% to 200% over the same period.

Given the recent rise in CRE lending and in loan concentrations nationally, a key question becomes how bank risk-taking trends today compared to the years before the financial crisis. The Richmond Fed study found that banks' CRE loan exposures are still not as elevated as they were in 2007-2008. For example, 2016's average CRE loan ratio remains well below its 2008 peak. These findings point to the fact that

while banks' CRE loan exposures are not as high as they were before the Great Recession, the CRE loan sector remains a potential source of problems due to its unique risk factors.

Nonetheless, even if current levels of CRE lending provide no cause for concern among either community or non-community banks, we suggest a cautious approach. CRE lending can play an important role during a downturn because banks that rely heavily on these loans are likely to experience an especially sharp shock should underlying property asset values fall. These initial downward forces can amplify an economic downturn as institutions suffering a decline in their CRE loan portfolio might be less willing or less able to lend more broadly. This type of credit contraction could hit small businesses particularly hard because they historically have relied heavily on community banks for their borrowing needs. In this way, problems in the CRE loan sector, especially among community banks, can cause a mild slump to become much more severe for the overall economy.

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Notes

Note 1. CRE lending is a broad term encompassing financing for income-producing real property (DiSalvo & Johnston, 2016).

Note 2. For a more detailed discussion, see Board of Governors of the Federal Reserve System, "SR 15-17: Interagency Statement on Prudent Risk Management for Commercial Real Estate Lending," December 18, 2015; and, "SR 07-1: Interagency Guidance on Concentrations in Commercial Real Estate," Footnote 1, January 4, 2007.

Note 3. For purposes of this study, we define community bank as any bank with less than $1 billion in assets.

Note 4. Some researchers point to excessive risk-taking rather than the lack of diversification as the primary factor. See Seballos and Thomson (1990) for a general discussion of the role of managerial factors in the failure of commercial banks. See also Keeton and Morris (1987), the seminal work in risk-taking and its role as a causal factor in loan loss problems.

Note 5. For an extensive discussion of operational risk, see Rosenberg, 2016.

Note 6. For a related useful taxonomy, see Kaplan and Mikes (2012).

Note 7. Chen et al. (2010) find that liquidity risk is an endogenous determinant of bank performance while Alper and Anbar (2011) determine that liquidity and interest income have a positive effect on a bank's profitability.

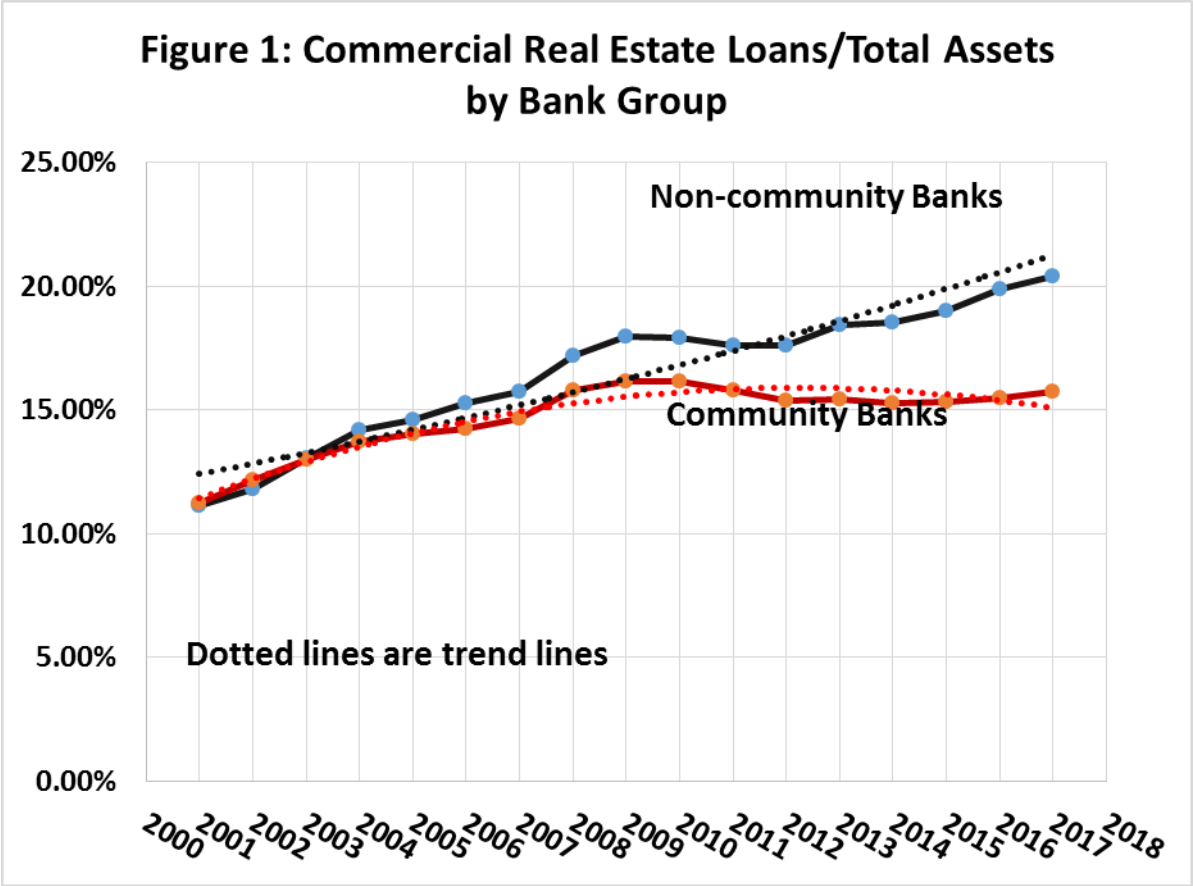
Note 8. Principle components serve as proxies for many of the independent variables.

Note 9. Gap analysis is a well-known interest rate risk method that analyzes the gap between interest rate sensitive assets and liabilities over a specific time. When there is a mismatch, a change in interest rates can have a detrimental effect on net interest income. Interest rate risk is currently part of the Basel capital framework (Basel Committee on Banking Supervision, 2015a).

Appendices

Appendix A

(Figures 1-7)



Source: Statistics on Depository Institutions, Federal Deposit Insurance Corporation, and authors' calculations.

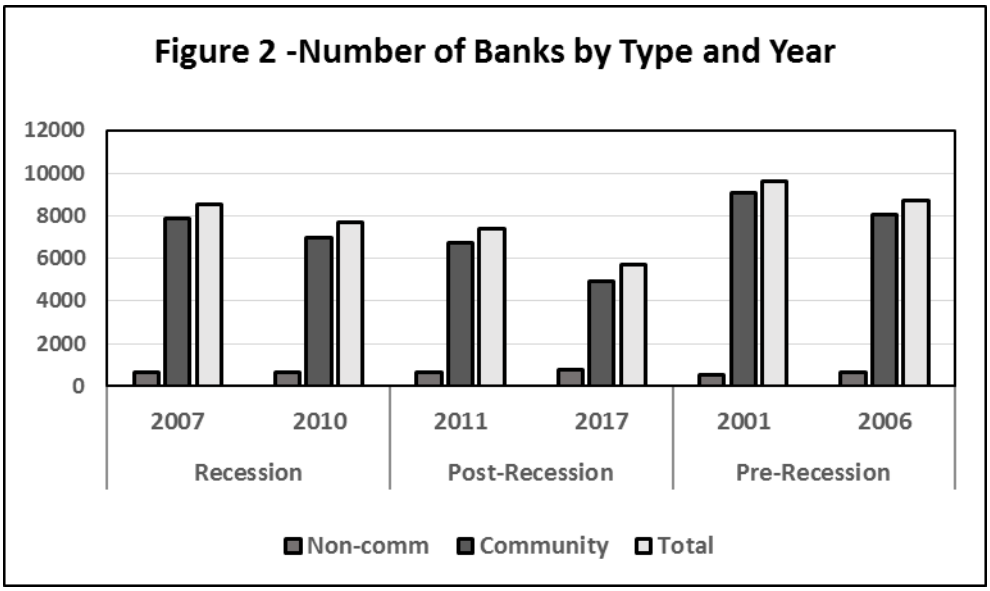


FIGURE 3 - TESTING FOR DIFFERENCES IN COEFFICIENTS ACROSS EQUATIONS		
Eq1:		Eq2:
CB=1		CB=0
Y		Y
b_0	⟷	b_0
b_1	⟷	b_1
b_2	⟷	b_2
b_i	⟷	b_i

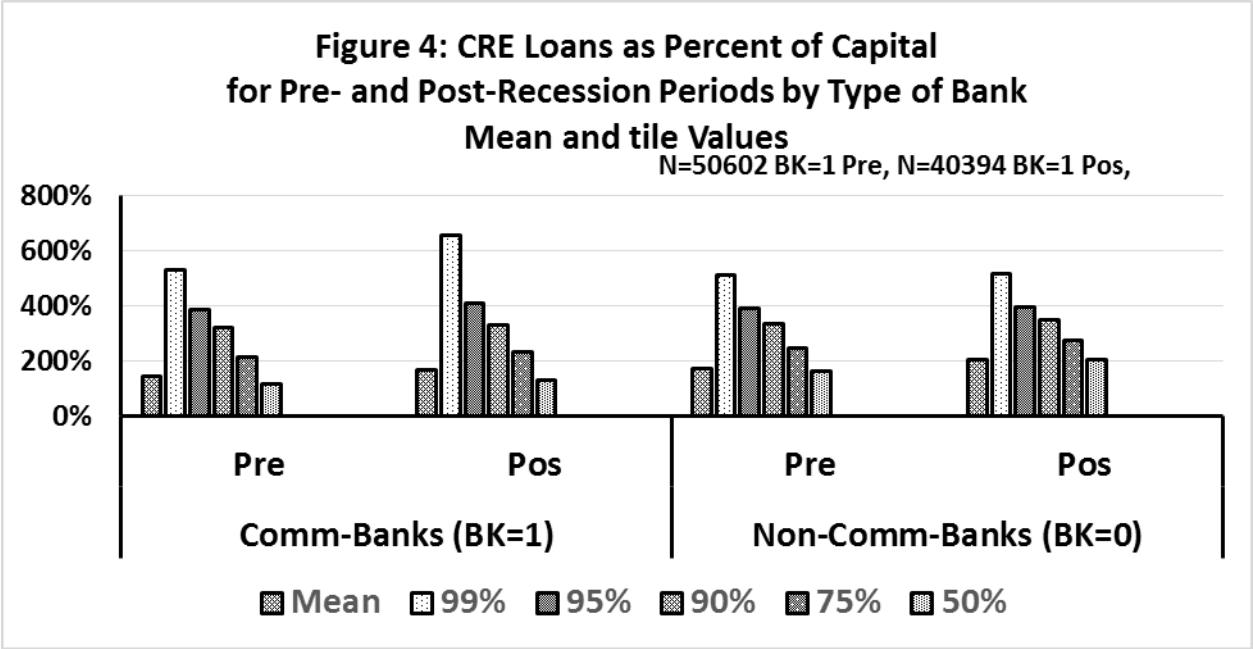


Figure 4: CRE Loans as Percent of Capital
for Pre- and Post-Recession Periods by Type of Bank
Mean and tile Values
N=50602 BK=1 Pre, N=40394 BK=1 Pos,
800%
600%
400%
200%
0%
Pre
Pos
Pre
Pos
Comm-Banks (BK=1)
Non-Comm-Banks (BK=0)
Mean
99%
95%
90%
75%
50%

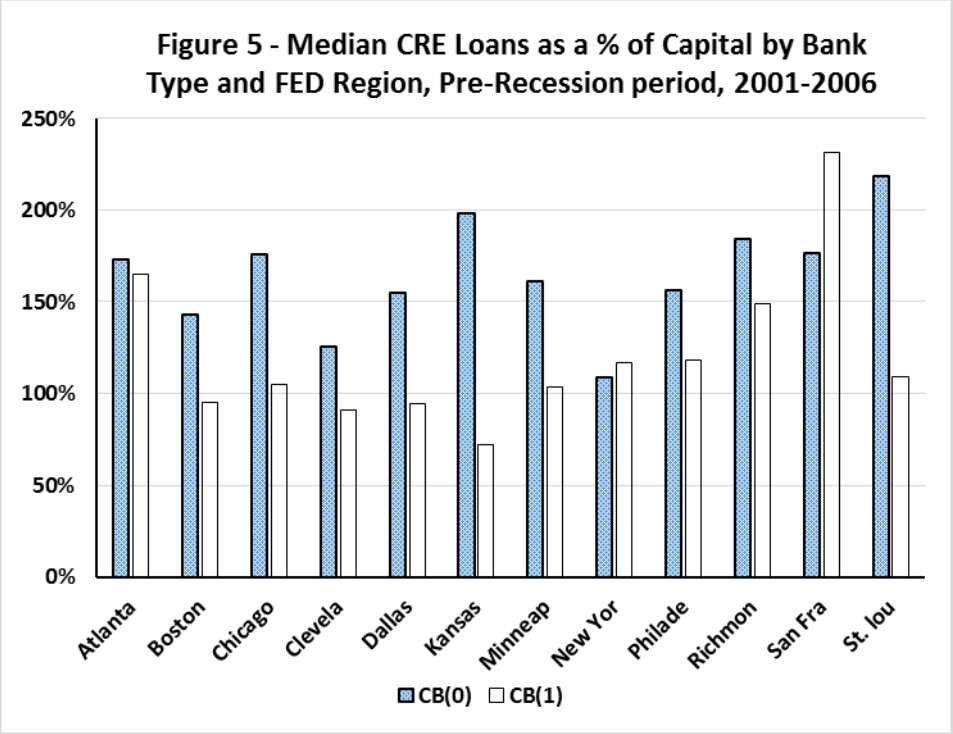


Figure 5 - Median CRE Loans as a % of Capital by Bank
Type and FED Region, Pre-Recession period, 2001-2006
250%
200%
150%
100%
50%
0%
Atlanta
Boston
Chicago
Clevela
Dallas
Kansas
Minneap
New Yor
Philade
Richmon
San Fra
St. lou
CB(0)
CB(1)

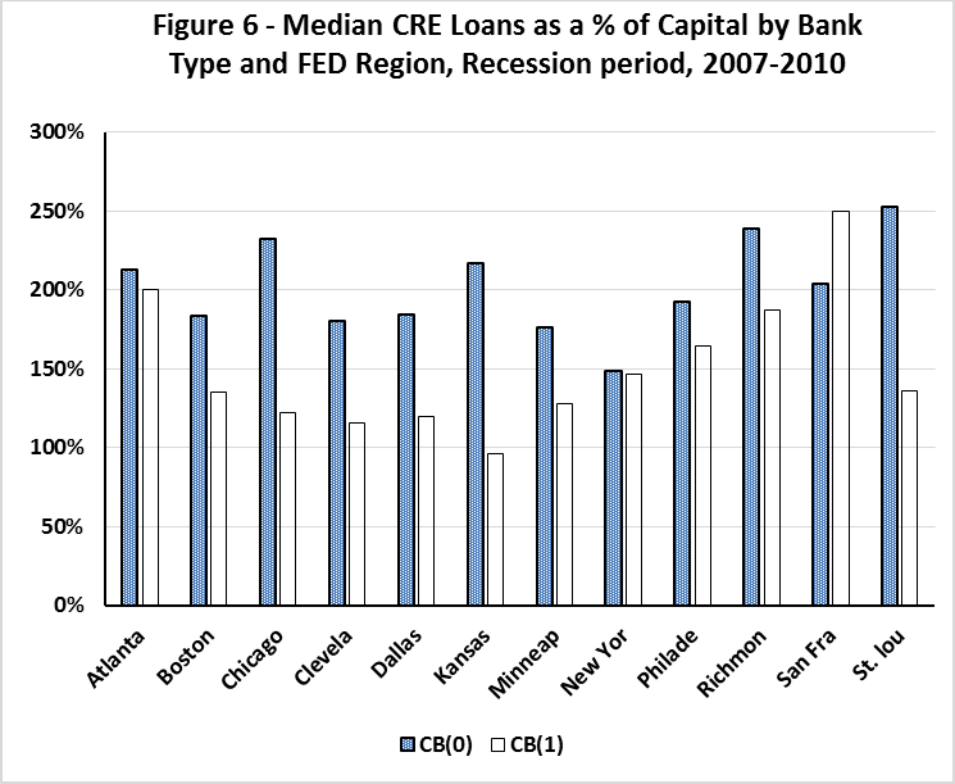
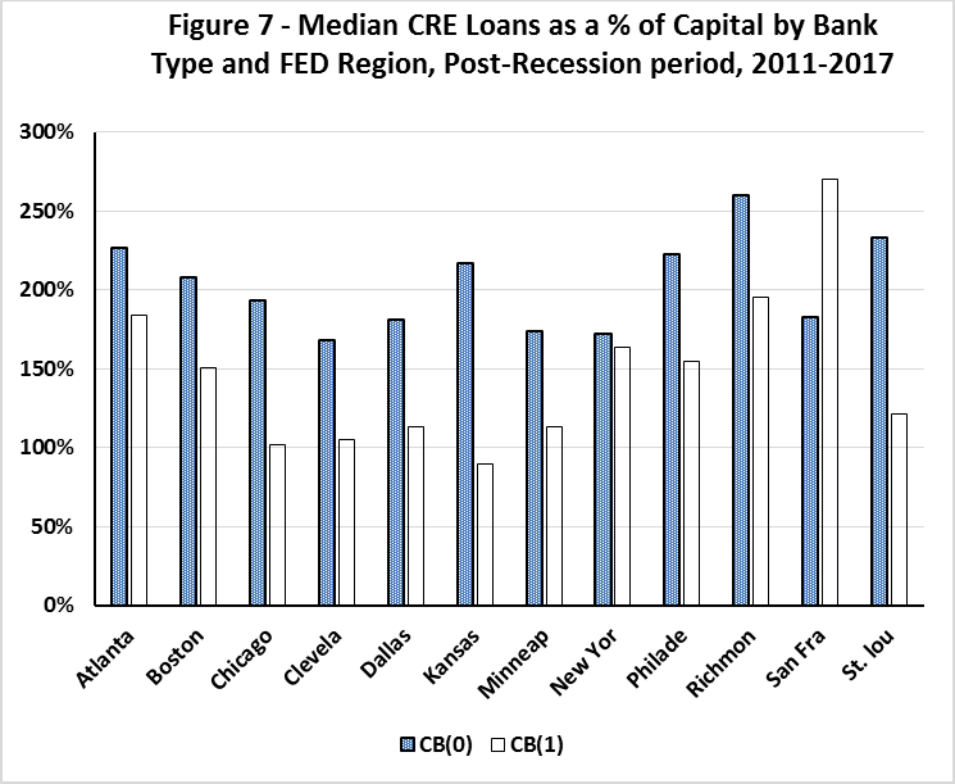


Figure 6 - Median CRE Loans as a % of Capital by Bank Type and FED Region, Recession period, 2007-2010
300%
250%
200%
150%
100%
50%
0%
Atlanta
Boston
Chicago
Clevela
Dallas
Kansas
Minneap
New Yor
Philade
Richmon
San Fra
St. lou
CB(0)
CB(1)



Appendix B

(Tables 1-8)

Table 1 - Variable definitions

Financial Ratios	Var	Definition
Total assets	asset	The sum of all assets owned by the institution including cash, loans, securities, bank premises and other assets. This total does not include off-balance-sheet accounts.
Total risk weighted assets adjusted	rwajt	Total risk weighted assets are assets adjusted for risk-based capital definitions which include on-balance-sheet as well as off-balance-sheet items multiplied by specified risk-weights. A conversion factor is used to assign a balance sheet equivalent amount for selected off-balance-sheet accounts.
Net loans and leases	lnlsnet	Total loans and lease financing receivables minus unearned income and loan loss allowances.
Commercial real estate other nonfarm nonresidential	lnrenres	The amount of nonfarm nonresidential real estate loans that are not secured by owner-occupied nonfarm nonresidential properties.
Commercial and industrial loans	lnci	Commercial and industrial loans. Excludes all loans secured by real estate, loans to individuals, loans to depository institutions and foreign governments, loans to states and political subdivisions and lease financing receivables.
Total securities	sc	Total investment securities (excludes securities held in trading accounts).
U.S. Treasury securities	scust	Total U.S. Treasury securities held-to-maturity at amortized cost and available-for-sale at fair value not held in trading accounts.
Asset-Backed Securities	scabs	The amortized cost of held-to-maturity of available-for-sale for all asset-backed securities (other than mortgage-backed securities), including asset-backed commercial paper, not held for trading.
Loan loss allowance	lnatres	Each bank must maintain an allowance (reserve) for loan and lease losses that is adequate to absorb estimated credit losses associated with its loan and lease portfolio (which also includes off-balance-sheet credit instruments).
Noncurrent loans and leases	nclnls	Assets past due 90 days or more, plus assets placed in nonaccrual status.
Short-run Liquid assets	asset_st	(1) Cash and balances due (chbal) (2) Federal funds sold (frepo) (3) Other short-term assets (idoa)
Short-term liabilities	liab_st	Volatile liabilities on a consolidated basis includes: (1) Federal funds purchased and securities sold under agreements to repurchase, (2) Demand notes issued to the US Treasury and other borrowed money with remaining maturity of 1 year or less. (3) Time deposits over $250,000 held in domestic offices. (4) Foreign office deposits (5) Trading liabilities less trading liabilities revaluation losses on interest rate, foreign exchange rate, and other commodity and equity contracts.
Net liquid assets	netlq_asst	Short-run liquid assets minus Short-run liquid liabilities
Interest sensitive assets	int_sen_asst	U.S. Treasury Securities (scust) plus Interest bearing balances (chbali)
Interest sensitive lialibilities	int_sen_liab	Interest-bearing deposits (depi)
Interest rate gap	int_gap	Interest-sensitive assets minus Interest-sensitive liabilities
Bank equity capital	eqv	Total bank equity capital (includes preferred and common stock, surplus and undivided profits).
Tier one (core) capital	rbct1j	Tier 1 (core) capital includes: common equity plus noncumulative perpetual preferred stock plus minority interests in consolidated subsidiaries less goodwill and other ineligible intangible assets.
Total risk weighted assets adjusted	rwajt	Total risk weighted assets are assets adjusted for risk-based capital definitions which include on-balance-sheet as well as off-balance-sheet items multiplied by specified risk-weights. A conversion factor is used to assign a balance sheet equivalent amount for selected off-balance-sheet accounts.
Brokered deposits	bro	Brokered deposits represent funds which the reporting bank obtains, directly or indirectly, by or through any deposit broker for deposit into one or more deposit accounts. Fully insured brokered deposits are brokered deposits that are issued in denominations of $100,000
Demand deposits	ddt	Total demand deposits included in transaction accounts held in domestic offices.
Retail deposits	coredep	Core deposits held in domestic offices now includes: total domestic office deposits minus (1) time deposits of more than $250,000 held in domestic offices (2) brokered deposits of $250,000 or less held in domestic offices.

Table 2 - Recession Period t-test Results for Selected Financial Ratios Mean Differences between Community(1) and Non-community Banks(0), 2007-2010

Ratio (expressed as % of assets)	Var	CB=1	CB=0	t Value	Pr > |t|
Total assets ($bi.)	assets	$ 0.201	$ 17.6	-29.06	<.0001
Short-Term Assets	asst_st	0.1248	0.1081	9.08	<.0001
Brokered deposits	bro	0.0331	0.0747	-25.17	<.0001
Retail deposits	coredep	0.6533	0.5972	23.6	<.0001
Demand deposits	ddt	0.1079	0.0508	39.19	<.0001
eqv	eqv	0.1146	0.1065	6.42	<.0001
Interest-sensitive assets	int_sen_asst	0.2373	0.2197	5.74	<.0001
Interest-sensitive liabilities	in_sen_liab	0.6992	0.6430	25.36	<.0001
Short-Term Liabilities	liab_st	0.1969	0.2377	-19.96	<.0001
Loan loss allowance	lnatres	0.0098	0.0129	-20.99	<.0001
Commercial and industrial loans	lnci	0.0876	0.1023	-9.91	<.0001
Net loans and leases	lnlsnet	0.6465	0.6664	-6.25	<.0001
Commercial real estate loans	lnrenres	0.1579	0.1737	-6.69	<.0001
Noncurrent loans and leases	nclnlsr	0.0223	0.0316	-13.41	<.0001
Tier one (core) capital	rbct1j	0.1094	0.0912	14.8	<.0001
Risk weighted assets adjusted	rwaj_asst	0.6626	0.6562	1.44	0.1505
Total securities	sc	0.1989	0.1847	4.81	<.0001
Asset-backed securities	scabs	0.0003	0.0029	-16.82	<.0001
U.S. Treasury securities	scust	0.0052	0.0052	0.02	0.981
Volatile liabilities	voliab	0.1969	0.2377	-19.96	<.0001

Table 3 - Post-recession t-test Results for Selected Financial Ratios Differences between Community(1) and Non-community Banks(0), 2011-2017

Ratio (expressed as % of assets)	Var	CB=1	CB=0	t Value	Pr > |t|
Total assets ($bi.)	assets	$ 0.230	$ 20.5	-32.29	<.0001
Short-Term Assets	asst_st	0.1419	0.1083	23	<.0001
Brokered deposits	bro	0.0207	0.0561	-36.65	<.0001
Retail deposits	coredep	0.7815	0.6998	51.33	<.0001
Demand deposits	ddt	0.1538	0.0846	48.14	<.0001
eqv	eqv	0.1136	0.1134	0.2	0.8405
Interest-sensitive assets	int_sen_asst	0.2943	0.2562	15.58	<.0001
Interest-sensitive liabilities	in_sen_liab	0.6777	0.6302	30.7	<.0001
Short-Term Liabilities	liab_st	0.0614	0.0940	-37.91	<.0001
Loan loss allowance	lnatres	0.0096	0.0097	-1.43	0.1515
Commercial and industrial loans	lnci	0.0765	0.1086	-31.14	<.0001
Net loans and leases	lnlsnet	0.6103	0.6553	-18.39	<.0001
Commercial real estate loans	lnrenres	0.1560	0.1894	-18.52	<.0001
Noncurrent loans and leases	nclnlsr	0.0172	0.0178	-1.33	0.1829
Tier one (core) capital	rbct1j	0.1096	0.1008	13.54	<.0001
Risk weighted assets adjusted	rwaj_asst	0.6508	0.6475	1.01	0.314
Total securities	sc	0.2212	0.2042	7.18	<.0001
Asset-backed securities	scabs	0.0007	0.0038	-19.76	<.0001
U.S. Treasury securities	scust	0.0064	0.0078	-3.17	0.0015
Volatile liabilities	voliab	0.0614	0.0940	-37.91	<.0001

Table 4 - Pre-recession t-test Results for Selected Financial Ratios Differences between Community(1) and Non-community Banks(0), 2001-2006

Ratio (expressed as % of assets)	Var	CB=1	CB=0	t Value	Pr > |t|
Total assets ($bi.)	asset	$0.166	$14.0	-49.05	<.0001
Short-Term Assets	asst_st	0.1209	0.1012	12.37	<.0001
Brokered deposits	bro	0.0179	0.0439	-24.34	<.0001
Retail deposits	coredep	0.6822	0.5448	60.14	<.0001
Demand deposits	ddt	0.1210	0.0665	41.56	<.0001
eqv	eqv	0.1131	0.1031	8.86	<.0001
Interest-sensitive assets	int_sen_asst	0.2472	0.2275	7.36	<.0001
Interest-sensitive liabilities	int_sen_liab	0.6994	0.5973	52.86	<.0001
Short-Term Liabilities	liab_st	0.1727	0.2854	-57.43	<.0001
Loan loss allowance	lnatres	0.0085	0.0092	-6.3	<.0001
Commercial and industrial loans	lnci	0.0910	0.0978	-5.04	<.0001
Net loans and leases	lnlsnet	0.6276	0.6456	-6.34	<.0001
Commercial real estate loans	lnrenres	0.1315	0.1348	-1.77	0.0766
Noncurrent loans and leases	nclnlsr	0.0097	0.0086	3.28	0.001
Tier one (core) capital	rbct1j	0.1083	0.0876	19.14	<.0001
Risk weighted assets adjusted	rwaj_asst	0.6680	0.6717	-0.92	0.3581
Total securities	sc	0.2278	0.2176	3.87	0.0001
Asset-backed securities	scabs	0.0004	0.0054	-27.98	<.0001
U.S. Treasury securities	scust	0.0139	0.0123	1.98	0.0474
Volatile liabilities	voliab	0.1727	0.2854	-57.43	<.0001

Table 5 - Pre- and Post-recession Mean Differences for Community Banks t-test results for Selected Financial Ratios					
Ratio (expressed as % of assets)	Var	Pos (1)	Pre (0)	t Value	Pr > |t|
Total assets ($bi.)	assets	$ 0.230	$ 0.166	50.29	<.0001
Short-Term Assets	asst_st	0.1419	0.1209	33.73	<.0001
Brokered deposits	bro	0.0207	0.0179	7.69	<.0001
Retail deposits	coredep	0.7815	0.6822	130.51	<.0001
Demand deposits	ddt	0.1538	0.1210	57.73	<.0001
Equity capital	eqv	0.1136	0.1131	1.4	0.1621
Interest-sensitive assets	int_sen_asst	0.2943	0.2472	44.81	<.0001
Interest-sensitive liabilities	in_sen_liab	0.6777	0.6994	-31.63	<.0001
Short-Term Liabilities	liab_st	0.0614	0.1727	-191.48	<.0001
Loan loss allowance	lnatres	0.0096	0.0085	28.79	<.0001
Commercial and industrial loans	lnci	0.0765	0.0910	-30.19	<.0001
Net loans and leases	lnlsnet	0.6103	0.6276	-15.92	<.0001
Commercial real estate loans	lnrenres	0.1560	0.1315	32.51	<.0001
Noncurrent loans and leases	nclnlsr	0.0172	0.0097	50.36	<.0001
Tier one (core) capital	rbct1j	0.1096	0.1083	3.3	0.001
Risk weighted assets adjusted	rwaj_asst	0.6508	0.6680	-11.88	<.0001
Total securities	sc	0.2212	0.2278	-6.38	<.0001
Asset-backed securities	scabs	0.0007	0.0004	6.03	<.0001
U.S. Treasury securities	scust	0.0064	0.0139	-28.17	<.0001
Volatile liabilities	voliab	0.0614	0.1727	-191.48	<.0001

Table 6 - Pre- and Post-recession Mean Differences for Non-Community Banks t-test results for Selected Financial Ratios					
Ratio expressed as % of assets)	Var	Pos (1)	Pre (0)	t Value	Pr > |t|
Total assets ($bi.)	asset	$ 20.510	$ 14.000	2.83	0.0047
Short-Term Assets	asst_st	0.1083	0.1012	3.32	0.0009
Brokered deposits	bro	0.0561	0.0439	4.79	<.0001
Retail deposits	coredep	0.6998	0.5448	40.43	<.0001
Demand deposits	ddt	0.0846	0.0665	10.73	<.0001
Equity capital	eqv	0.1134	0.1031	10.28	<.0001
Interest-sensitive assets	int_sen_asst	0.2562	0.2275	8.47	<.0001
Interest-sensitive liabilities	int_sen_liab	0.6302	0.5973	10.53	<.0001
Short-Term Liabilities	liab_st	0.0940	0.2854	-66.03	<.0001
Loan loss allowance	lnatres	0.0097	0.0092	2.86	0.0043
Commercial and industrial loans	lnci	0.1086	0.0978	5.12	<.0001
Net loans and leases	lnlsnet	0.6553	0.6456	2.73	0.0063
Commercial real estate loans	lnrenres	0.1894	0.1348	22.99	<.0001
Noncurrent loans and leases	nclnlsr	0.0178	0.0086	15.55	<.0001
Tier one (core) capital	rbct1j	0.1008	0.0876	14.81	<.0001
Risk weighted assets adjusted	rwaj_asst	0.6475	0.6717	-4.69	<.0001
Total securities	sc	0.2042	0.2176	-4.2	<.0001
Asset-backed securities	scabs	0.0038	0.0054	-2.72	0.0066
U.S. Treasury securities	scust	0.0078	0.0123	-6.48	<.0001
Volatile liabilities	voliab	0.0940	0.2854	-66.03	<.0001

Table 7 - Sources and Uses of Funds - Correlation with Risk Profile (PrinComp)				
Correlation with PrinComp	Sources and Uses of Funds	PC Name	Eigenvector Financial Ratio	Risk Profile PrinComp
Positively	Use of Funds	Pos_Use	lnlsnet	0.4108
Positively	Use of Funds	Pos_Use	lnci	0.2114
Positively	Use of Funds	Pos_Use	scabs	-0.0141
Positively	Use of Funds	Pos_Use	lnatres	0.1757
Negatively	Use of Funds	Neg_Use	sc	-0.3472
Negatively	Use of Funds	Neg_Use	scust	-0.1118
Negatively	Use of Funds	Neg_Use	asst_st	-0.1604
Negatively	Use of Funds	Neg_Use	int_sen_asst	-0.4015
Positively	Source of Funds	Pos_Sou	bro	0.2217
Positively	Source of Funds	Pos_Sou	voliab	0.3449
Positively	Source of Funds	Pos_Sou	liab_st	0.3449
Positively	Source of Funds	Pos_Sou	int_sen_liab	0.0710
Negatively	Source of Funds	Neg_Sou	ddt	-0.1890
Negatively	Source of Funds	Neg_Sou	coredep	-0.2845
Negatively	Source of Funds	Neg_Sou	eqv	-0.1127
Negatively	Source of Funds	Neg_Sou	rbct1j	-0.1186

Table 8 - Pre- and Post-Recession Regression Results Differences between Community Banks (CB=1) and Non-community Banks (CB=0)									
Parameter (% of Assets)	Estimate (BK=1))	t Value	Pr > |t|	Estimate (BK=0)	t Value	Pr > |t|	Diff (1-0)	t Value	Pr > |t|
Rwaj/Asst	0.1290	190.12	<.0001	0.1375	42.37	<.0001	-0.0085	-2.65	0.0080
PC_PosUse	0.0105	18.49	<.0001	0.0046	3.20	0.0014	0.0059	3.88	0.0001
PC_NegUse	-0.0187	-34.28	<.0001	-0.0183	-9.64	<.0001	-0.0004	-0.22	0.8280
PC_PosSou	0.0327	64.56	<.0001	0.0075	5.66	<.0001	0.0252	18.26	<.0001
PC_Negsou	-0.0096	-24.89	<.0001	-0.0443	-24.34	<.0001	0.0347	19.29	<.0001
PostRec	0.0894	101.62	<.0001	0.0945	32.07	<.0001	-0.0052	-1.73	0.0831
SanFran	0.1487	95.00	<.0001	0.0712	20.09	<.0001	0.0775	20.58	<.0001
	R-Sq=56.7%	Pr > F	<.0001	R-Sq=61.5%	Pr > F	<.0001	R-Sq=57.2%	Pr > F	<.0001