Elsevier Editorial System(tm) for Journal of Financial Stability

Manuscript Draft

Manuscript Number: JFS-D-15-00488

Title: Does Bank Supervision Impact Bank Loan Growth?

Article Type: Research Paper

Keywords: Bank supervision; bank loan growth; bank capital; bank liquidity

Corresponding Author: Dr. Claire Rosenfeld, Phd

Corresponding Author's Institution: College of William and Mary

First Author: Paul Kupiec, PhD

Order of Authors: Paul Kupiec, PhD; Yan Lee, PhD; Claire Rosenfeld, Phd

Abstract: We estimate the impact on individual bank loan growth caused by supervisory restrictions associated with a poor bank examination rating. We use a novel approach to control for bank loan demand variation and estimate a fixed-effect model using an unbalanced panel with over 443,000 bank-quarter observations from the period 1994-2011. Our estimates show that a poor examination rating has a large negative impact on bank loan growth after controlling for the impact of monetary policy, bank capital and liquidity conditions and any voluntary reduction in lending triggered by weak legacy loan portfolio performance or other bank losses. This previously unidentified examination rating effect is consistent with the hypothesis that the bank supervision process successfully constrains banks operating in an unsafe and unsound manner from expanding their lending activities.

Raymond A. Mason
School of Business
WILLIAM & MARY

December 15, 2015

To Whom It May Concern:

Please consider for publication in the *Journal of Financial Stability* the following paper titled, "Does Bank Supervision Impact Bank Loan Growth?" by Paul Kupiec (AEI), Yan Lee (FDIC) and me. In this paper we find a new, important result that a bank's supervisor examination rating significantly affects the bank's loan growth.

Thank you,

Claire M. Rosenfeld

CLAIRE M. ROSENFELD • ASST. PROFESSOR OF FINANCE • P. O. BOX 8795, WILLIAMSBURG, VA 23187-8795 • T 757.221.4713

Does Bank Supervision Impact Bank Loan Growth?

by

Paul Kupiec, Yan Lee and Claire Rosenfeld[1]

This Draft: December 15, 2015

ABSTRACT

We estimate the impact on individual bank loan growth caused by supervisory restrictions associated with a poor bank examination rating. We use a novel approach to control for bank loan demand variation and estimate a fixed-effect model using an unbalanced panel with over 443,000 bank-quarter observations from the period 1994-2011. Our estimates show that a poor examination rating has a large negative impact on bank loan growth after controlling for the impact of monetary policy, bank capital and liquidity conditions and any voluntary reduction in lending triggered by weak legacy loan portfolio performance or other bank losses. This previously unidentified examination rating effect is consistent with the hypothesis that the bank supervision process successfully constrains banks operating in an unsafe and unsound manner from expanding their lending activities.

Key Words: Bank supervision, bank loan growth, bank capital, bank liquidity

[1] The authors' affiliations, respectively, are The American Enterprise Institute, the Federal Deposit Insurance Corporation, and The College of William & Mary's Mason School of Business. The views and opinions expressed are those of the authors and not official views of The American Enterprise Institute or the Federal Deposit Insurance Corporation. We are grateful to Andy Winton, Mark Flannery, Ed Kane, George Pennacchi, Rebel Cole, João Santos, Carlos Ramirez, Larry Wall, Myron Kwast, Abby McCloskey, Ryan Goodstein, Paul Hanouna and participants at the Carefin Conference at Bocconi University, and seminars at the FDIC, Boğaziçi University and the Federal Reserve Bank of Atlanta for comments on a much earlier draft of this paper. Corresponding author: Paul Kupiec, email paul.kupiec@aei.org .

*Manuscript, excluding Author Details
Click here to download Manuscript, excluding Author Details: Bank lending blind.docx Click here to view linked References

Does Bank Supervision Impact Bank Loan Growth?

This Draft: December 15, 2015

ABSTRACT

We estimate the impact on individual bank loan growth caused by supervisory restrictions associated with a poor bank examination rating. We use a novel approach to control for bank loan demand variation and estimate a fixed-effect model using an unbalanced panel with over 443,000 bank-quarter observations from the period 1994-2011. Our estimates show that a poor examination rating has a large negative impact on bank loan growth after controlling for the impact of monetary policy, bank capital and liquidity conditions and any voluntary reduction in lending triggered by weak legacy loan portfolio performance or other bank losses. This previously unidentified examination rating effect is consistent with the hypothesis that the bank supervision process successfully constrains banks operating in an unsafe and unsound manner from expanding their lending activities.

Key Words: Bank supervision, bank loan growth, bank capital, bank liquidity

I. Introduction

Supervision is a distinct component of bank regulation that involves more than monitoring compliance with minimum capital, liquidity or other quantitative regulations. Bank examinations identify weaknesses in bank operations that lead to supervisory recommendations to improve bank safety and soundness. As Robert Litan and former Comptroller of the Currency John Hawke (2012) write,

> Examiners are experts who are specially trained to look beyond the numbers, seeking to determine whether the processes that banks use to gather deposits, extend loans, manage risk, and keep track of all this information and to ensure its security, are appropriate. To carry out their jobs, examiners ask questions—of bank employees, executives and directors—all with an eye to ensuring that the bank is well managed and appropriately managing risks (p. 9).

In the U.S., bank supervisors have a continuous physical presence at the largest banks and conduct onsite examinations of every bank at least every 18 months. Supervisors assess quantitative and qualitative aspects of bank management and performance including asset quality, earnings, bank sensitivity to market and interest rate risks, as well as the adequacy of bank management control systems and management competency.[1] Should a financial institution fail to meet supervisory expectations, under Prompt Corrective Action guidelines, the supervisor may require a bank to take a wide range of remedial actions.[2] If the institution is unable to rectify identified deficiencies, supervisors can restrict a bank's activities or require investments in new process, systems and personnel, or, in extreme cases, revoke an institution's charter or deposit insurance coverage for operating in an unsafe and unsound manner.

One potential side effect of supervisory intervention is slower bank loan growth. When proactive examinations identify bank weaknesses that must be corrected―for example, in lax bank underwriting standards, high lending concentrations, or poor records and information systems―supervisory recommendations may restrict loan growth or other bank investment activities until a bank addresses the underlying weakness.[3] Moreover, at various times in the past, often following recessions or high-profile

[1] See Berger, Kyle and Scalise (2001) for further discussion of the bank examination process.

[2] U.S. Prompt Corrective Action requirements were codified in 1991 as part of the Federal Deposit Insurance Corporation Improvement Act. 12 U.S. Code §16(g) allows that, should a Federal banking agency determine that an insured depository institution is in an unsafe or unsound condition or engaging in an unsafe or unsound practice, the agency may use its prompt corrective action powers to require the bank to take remedial actions.

[3] In response to rapid growth in Commercial Real Estate (CRE) Loan concentrations and widespread weaknesses in bank risk management practices, in December 2006, the banking agencies issued, "Joint Guidance on

bank losses or failures, the financial news has included reports claiming that bank examination practices were discouraging banks from lending to creditworthy borrowers.[4,5] For example, in February 2010, before the U.S. House of Representatives Committee on Financial Services and Committee on Small Business, Federal Reserve Board Governor Duke testified,

> Some banks may be overly conservative in their small business lending because of concerns that they will be subject to criticism from their examiners. While prudence is warranted in all bank lending, especially in an uncertain economic environment, some potentially profitable loans to creditworthy small businesses may have been lost because of these concerns, particularly on the part of small banks. Indeed, there may be instances in which individual examiners have criticized small business loans in an overly reflexive fashion.

The idea that bank supervision can constrain bank lending is not novel—indeed, a core goal of bank supervision is to stop banks from making high risk loans that would have questionable value absent a government safety net subsidy. If bank supervisors are effective delegated monitors, then we should expect supervisory actions to have measurable effects on the lending behavior of poorly run institutions. However, unlike the relatively large literature that discusses the expected loan growth impact of other changes in the regulatory environment, such as a change in bank minimum capital requirements, there is only a small segment of the banking literature focused on measuring the effect of bank supervision on loan growth, none of which systematically examines the impact of a poor bank examination rating on subsequent bank loan growth.[6]

Paradoxically, the thrust of the existing literature finds that a poor bank examination rating does not itself generate a negative impact on subsequent bank loan growth. When estimates suggest that loan growth declines after a supervisory downgrade, the effect has been attributed to correlation between

---

Concentrations in Commercial Real Estate Lending, Sound Risk Management Practices," which codified supervisory expectations for stricter loan underwriting standards and concentration limits on CRE loans. In a subsequent joint supervisory agency study, Friend, Glenos, and Nicholas (2013) find that the 2006 interagency guidance led to substantial declines in CRE lending at targeted institutions.

[4] See for example, Davidson (2010).

[5] Bank loan growth was especially sluggish in the early 1990s following supervisory and regulatory changes in reaction to the S&L and banking crisis. At the time, this "credit crunch" was in part attributed to overly strict supervision. In reaction to this criticism, on March 30, 1993, the banking supervisors issued an interagency rule that exempted well- or adequately capitalized institutions from examiner criticism of loan documentation standards on small- and medium sized business loans and farms provided the loans were fully performing, under $900,000, and in total comprised less than 20 percent of the institution's capital.

[6] Papers that specifically examine the effect of supervisory actions on bank loan growth include Peek and Rosengren (1995b) and Berger, Kyle and Scalise (2001), and Kiser, Prager and Scott (2015).

supervisory ratings changes and unobserved bank-specific factors that are the true cause of the bank's endogenous decline in loan growth. An implication of this interpretation is that widespread bank examination ratings downgrades that often occur during recessions are not a factor that amplifies the recession or forestalls the recovery. Our concern with this explanation is that it seems to rule out a proactive role for bank supervisors. If bank examiners do not intervene to prevent banks operating in an unsafe and unsound manner from making risky loans, what is the purpose of bank examinations?

The most recent study that concludes that supervisory downgrades do not have a negative impact on bank loan growth is Kiser, Prager, and Scott (2015). They evaluate the impact of CAMELS ratings transitions on small business loan growth during the 2008-1010 financial crisis period. Using annual data on small business lending from 2007 to 2010, they conclude that supervisory "downgrades themselves did not directly influence bank lending to small businesses during this period" (p. 1). However, these claims are based upon a methodology that cannot identify the supervision effect the authors seek to measure.[7]

In this paper, we provide new evidence on the importance of a bank supervisory rating for a bank's subsequent loan growth. We evaluate the impact of the *level* of a bank examination rating on a bank's loan growth. In our model, a bank supervisory rating has a level effect on a bank's loan growth, not just a transitory impact at the time of the ratings downgrade. We prefer this specification because we

[7] Kiser, Prager and Scott measure the impact of a supervisory downgrade by the statistical significance of an interaction term in a regression model that explains annual bank loan growth. Dummy variables indicate specific examination ratings transitions during the year when loan growth is measured. The authors then include an interactive explanatory variable where the examination ratings transition dummy variables are interacted with a variable that measures the portion of the year over which the downgrade was effective. The authors argue that lack of statistical significance on the coefficient of this interactive variable (the result they find) is evidence against an examination rating downgrade effect. However, this interpretation requires knowledge of the quarterly pattern of loan growth over the year—data that is not available to the authors. For example, say bank loans were $200 million as of June 30, 2008, $190 million as of December 31, 2009, and $195 million at June 30, 2009. On annual basis, loans declined from June 30, 2008 to June 30, 2009. However, on a semiannual basis, from December 2009 to June 2009, loans increased. Suppose a CAMELS downgrade from a 2 to a 3 occurred in January, 2009. The Kaiser, Prager, and Scott methodology would attribute the $5 million decline in bank loans to the 6-month effect of a CAMELS downgrade from 2 to 3, whereas, in this example, bank lending actually increased after the CAMELS downgrade. Because their sector loan growth is only reported on an annual basis, the authors are unable to identify the sequence of the loan decay and supervisory rating downgrade.

believe that bank examiners will continue to impose supervisory restrictions that limit a bank's loan growth until the bank's condition improves sufficiently to merit an upgrade. [8]

Specifically, in this study, we use U.S. regulatory data over the period 1994-2011 to estimate the sensitivities of banks' quarterly loan growth rates to variation in bank examination ratings as well as variation in bank capital and liquidity conditions, while controlling for a comprehensive set of other important bank characteristics. We measure total bank loan growth a number of ways including measures that account for changes in loan commitments and loan securitizations. Our loan growth models include dummy variables that measure one-quarter-lagged bank supervisory CAMELS ratings. We used lagged CAMELS ratings to assure that we are capturing loan growth subsequent to supervisory examination feedback.[9] Since we are measuring the impact of the level of a bank's CAMELS ratings in the prior quarter, and not the impact of a CAMELS rating downgrade within a quarter, it is less likely that predetermined CAMELS levels are serving as a proxy for unobserved bank factors that induce a bank to endogenously reduce loan growth. We estimate the determinants of bank loan growth using an unbalanced panel regression model that includes bank fixed-effects in addition to controls for bank-level loan supply and demand factors.

Our bank fixed-effects specification allows us to measure loan growth variation attributable to specific bank-level characteristics. The regression model coefficient estimates measure the loan growth variation generated when individual bank characteristics deviate from each individual bank's long-run sample average characteristic values. The sample average values of specific bank attributes can be

[8] The purpose of this study is *not* to assess the macroeconomic impact of supervision on bank lending but rather to quantify the bank-specific impact of supervisory interventions that are typically associated with a poor supervisory examination rating. Thus, our goal is distinct from the literature that assesses whether time-variation in supervisory assessment standards can, in part, explain the large variation in aggregate bank loan growth variation [*inter alia*, Berger, Kyle and Scalise (2001)].

[9] This specification induces a bias *against* finding a significant bank examination rating level effect. Consider a bank that is downgraded from a 2 to a 3 during the previous examination. Loan growth will likely decrease in that quarter, but that decrease in loan growth would be assigned to the CAMELS score of 2, rather than 3. On the upswing, a CAMELS 4/5 bank would likely see an expansion in loan growth in the quarter it is upgraded, but that expansion would be attributed to the 4/5 rating. Moreover, research suggests that bank examination ratings are more likely to be lagging indicators of a bank's conditions [Berger, Davies and Flannery (2000)]. That we find supervisory effects given this possible bias underscores the strength of our results.

interpreted as an approximation for the individual bank's optimal attribute level during our sample period.[10]

We control for variation in individual bank loan demand by first selecting a sample of banks that operate in a tightly-constrained geographic market and then controlling for economic conditions in that specific market. For our analysis, we only include groups of banks that operate primarily in a single county and thereby face nearly identical local market demand conditions in a given quarter.[11] We control for banks' local market demand conditions by including multiple quarterly county-level measures of economic activity in our regression model.

In addition to controlling for individual bank examination ratings, capital and liquidity positions, our methodology controls for cross-section and time-series variation in a comprehensive set of bank attributes that the literature has shown to be important determinants of a bank's loan supply. These controls include a bank's average cost of liabilities, a bank's past profitability, its past loan portfolio performance, and measures of the degree of competition in the bank's local market. Our estimates show that most of these factors are statistically significant with the expected signs and with coefficient magnitudes that are consistent with the results of prior studies.

Our results show that the factor that generates the greatest bank-specific impact on loan growth is the bank's examination rating. Our estimates suggest that compared to a CAMELS 1- or 2-rated bank (our control group), other things equal, quarterly loan growth at a CAMELS 3-rated bank is more than 1.36 percentage points lower on average, while quarterly loan growth at a bank with a CAMELS rating of 4 or

[10] The CAMEL(S) supervisory rating system was in place the entire period. The rating system was modified slightly in 1995 to explicitly include 'S', a sensitivity rating for a bank's market and interest rate risk. Prior to 1995, the 'S' component was implicit in a bank's composite supervisory CAMEL rating. Beginning in 1998, banks with more than $1 billion in trading book assets became subject to new market risk capital requirements. Our sample does not include any banks that were required to meet market risk capital requirements.

[11] Though some may argue that eliminating very large institutions from the sample by way of imposing the concentration of deposits requirement on our sample banks would diminish the relevance of our study, this is the mechanism we use for identification. Moreover, our analysis is focused on bank loan growth rates and not on the level of a bank's outstanding loans. Historically, very few large institutions have ever received a CAMELS 3 or CAMELS 4-5 supervisory rating, so excluding large institutions does not create any obvious biases in our estimates of the effect of a CAMELS rating downgrade on an individual bank's subsequent loan growth rate.

5 is more than 2.07 percentage points lower, on average.[12] Further, the examination ratings effects are durable and specific to the CAMELS level; regardless of how long a bank has been categorized as a CAMELS 3 and regardless of its previous CAMELS score, our estimates suggest that its loans are expected to grow 1.36 percentage points lower, on average, than if it was categorized as a CAMELS 1 or 2.

Our interpretation is that bank examiner remedial recommendations that accompany a poor examination rating have a very pronounced direct impact on a bank's loan growth. By way of comparison, variation in bank capital and liquidity positions have statistically significant but economically minor impacts on loan growth.[13] Our estimates also suggest that when a bank suffers losses—from their existing loan portfolios or otherwise—on average the bank will endogenously react by curtailing lending regardless of its examination rating or its capital and liquidity positions. The tendency for banks to reduce lending in the face of losses is compounded tremendously if bank losses coincide with an examination rating of 3 or below.

The remainder of our paper is organized as follows: Section II discusses related literature. Section III discusses the methodology and data that we use to measure the importance of examination ratings for determining a banks' subsequent loan growth. Section IV presents our estimation results and extensive analysis that supports the robustness of our findings. Section V concludes the paper.

II. Relevant Literature on the Determinants of Bank Loan Growth[14]

A. The Supervisor Monitoring Channel

A number of studies focus on systematic variation in the intensity of bank supervisor monitoring.[15] Overall, the literature concludes that the criteria used by bank examiners to categorize an

[12] The coefficient estimates we report in this overview section are the estimates from Table 3, which uses sample banks that meet a 50 percent deposit threshold within one county. Estimates from our more restrictive 75 and 100 percent deposit threshold samples are very similar and are reported in the paper.

[13] Even annualizing the effects of the control variables on loan growth, we do not find economically important effects for bank capital and liquidity ratios.

[14] An appendix includes an additional, more detailed review of related literature.

[15] See for example, Peek and Rosengren (1995b), Berger, Kyle and Scalise (2001), Curry, Fissel and Hanweck (2008), Krainer and Lopez (2009), and Bassett, Lee and Spiller (2012).

institution as high- or low-quality (from a safety and soundness perspective) vary over time. When bank profits are cyclically high and nonperforming assets are low, supervisors seemingly lower the standards needed to achieve a favorable safety and soundness regulatory rating. Banks respond to relaxed supervisory standards by weakening their own underwriting standards and increasing loan growth. In contrast, when bank profits are cyclically weak and nonperforming assets are large, supervisors strengthen the criteria needed to achieve a favorable safety and soundness rating, requiring banks to tighten underwriting standards and reduce loan growth.[16]

Three studies, Peek and Rosengren (1995b) (PR), Berger, Kyle, and Scalise (2001), and Kiser, Prager and Scott (2015) (KPS) are the most closely related to our work. PR analyze the effect of supervisory interventions for 68 large New England banks over the period 1989-1992. They find that banks subject to supervisory enforcement actions significantly decreased lending the following quarter compared to banks without any formal supervisory actions. PR's model includes an interaction between supervisory actions and bank capitalization rates. Higher bank capital ratios tend to mitigate the negative growth effects associated with enforcement actions. PR estimate that, for a bank with a leverage ratio of 4 percent, a supervisory enforcement action will reduce bank loans by about 1.4 percentage points the subsequent quarter. PR discount the hypothesis that bank capital shortages caused the 1989-1992 "credit crunch" in the New England region in favor of a causal role for bank supervisory enforcement actions.

Berger, Kyle and Scalise (2001) (BKS) re-examine explanations for the bank loan growth deficit during the credit crunch period. BKS attempt to assess whether the rigor of supervisory examination standards varied systematically over the 1989-1998 period and whether this variation could, in part, explain the slowdown in bank lending growth during the 1989-1992 credit crunch and the acceleration in bank lending growth over the period 1993-1998. BKS do not find evidence of harsher supervisory standards during the credit crunch. They find big improvements in banks supervisory ratings over the 1993-1998 period but attribute this, at least in part, to higher frequency examinations over this period.

[16] Rajan (1994) provides an alternative explanation for time variation in bank underwriting standards which is not driven by supervision.

More frequent examinations alters the composition of the sample toward better-run institutions. Overall, BKS find some evidence of a moderation in supervisory standards in the 1993-1998 period, but they find that this moderation had little impact on aggregate bank lending.

Kiser, Prager and Scott (2015) (KPS) examine the effect of CAMELS transitions on annual small business loan growth (small C&I loans and small CRE loans) during the period 2007-2010. They find that CAMELS downgrades to a 3 or 4/5 are associated with significantly negative small business loan growth. KPS also find that maintaining a CAMELS 3 or 4/5 is associated with significantly negative small business loan growth. The authors argue that if there is a true ratings effect, then portion of the year that a new rating is in effect should be significant when that variable is added as an interactive term to the regression. Their estimates of these timing variables are insignificant which leads KPS to conclude, "that the ratings changes themselves did not directly influence small C&I loan growth" (p.20). However, as we discussed earlier, the KPS findings are inconclusive given the flaw in their methodology.[17]

Bank Capital Regulation and Loan Growth

Many studies evaluate the role of minimum bank capital regulations on bank lending. The early credit crunch literature focuses on the effects of binding or near-binding bank regulatory requirements on the supply of bank credit.[18] This literature argues that banks restrict, or even contract, their loan growth if they perceive they are at risk of violating any of the three minimum regulatory capital requirements set by U.S. Prompt Corrective Action guidelines.[19] Some studies find that binding or near-binding regulatory

[17] Footnote 8 explains the issue inherent in their approach for identifying the examination channel.
[18] See for example Bernanke and Lown (1991), Berger and Udell (1994), Hancock and Wilcox (1994), Gambacorta, L., and P. Mistrulli (2004), Peek and Rosengren (1995a), Brinkmann and Horvitz (1995), Shrieves and Dahl (1995), Sharpe (1995), Valencia (2008), Berrospide and Edge (2010), Gambacorta and Marques-Ibanez (2011), Mora and Logan (2010), Rice and Rose (2012), or Carlson, Shan and Warusawitharana (2013).
[19] The leverage ratio places a regulatory floor on the ratio of bank Tier 1 capital to average admissible assets. Two risk-based capital ratios, (1) tier 1, and (2) total risk-based, constrain, respectively, the ratio of a bank's tier 1 capital to its risk-weighted assets and the ratio of a bank's total regulatory capital to its risk-weighted assets.

risk-based constraints reduced bank lending while others find that banks adjusted to new regulations by rebalancing their securities holdings without much effect on lending.[20]

B. The Credit Channel Literature

The credit channel literature focuses on explaining how individual bank and borrower characteristics interact with Federal Reserve monetary policy to affect the supply of bank credit and ultimately GDP growth.[21] Bank loan rates are typically modeled as a mark-up over bank cost of funds—primarily the cost of bank liabilities—and so the cost of bank liabilities are an important determinant of bank credit supply.[22] Asymmetric information imperfections tie funding access and cost to the strength of both banks' and borrowers' balance sheets and the value of collateral.[23] In this literature, monetary policy has two impacts: (1) it changes banks' cost of funds on their rate-sensitive liabilities that are passed on to bank customers through bank loan rates; and, (2) higher interest rates reduce the value of both bank and bank-customer collateral which may reduce bank access to non-deposit sources of funding and reduce bank customers' ability to meet bank underwriting standards.[24] The literature finds empirical support for both channels of influence.[25]

C. Other Factors

[20] See for example, Berger and Udell (1994), Hancock and Wilcox (1994), Brinkmann and Horvitz (1995) or Shrieves and Dahl (1995).

[21] See for example Tobin and Brainard (1963), Brunner and Meltzer (1963), and Brainard (1964), Bernanke and Blinder (1988), Bernanke and Lown (1991), Bernanke and Gertler (1989, 1995) and Hubbard (1995), Kashyap and Stein (1995, 2000). See Oliner and Rudebusch (1996), Ashcraft (2006), and Black, Hancock and Passmore (2007) for alternative perspectives.

[22] The dynamics of the pass-through of bank funding costs to loan rates may be affected by bank manager strategic behavior similar to Rajan (1994). We discuss this issue in more detail in Section III.

[23] Bank capital is treated as a quasi-fixed input due to asymmetric information costs of outside equity issuance. Bernanke and Gertler (1989), Kiyotaki and Moore (1997), and Bernanke, Gertler, and Gilchrist (1999) argues that a bank's cost of new non-insured external funds should be determined by the strength of the bank's financial condition.

[24] Lower interest rates increase collateral value and improve both bank and customer access to credit.

[25] Kashyap and Stein (1995) find that smaller banks are more affected by tight monetary policy because information asymmetries limit their access to uninsured sources of funding. A vast literature finds that asymmetric information inhibits borrower's ability to obtain credit to invest optimally. See for example Stiglitz and Weiss (1981), Myers and Majiuf (1984), Fazzari, Hubbard and Petersen (1988), Bernanke and Gertler (1989), Whited (1992), or Hubbard, Kashyap and Whited (1995).

The literature identifies a number of other important factors that must be accounted for when analyzing the determinants of bank loan growth. These include the performance of a bank's legacy loan portfolio.[26] Overall bank profitability also determines bank lending behavior as bank losses suffered on investments outside of their loan portfolios have been shown to reduce a bank's subsequent willingness to extend credit to customers even if the bank is well-capitalized.[27] Competitive conditions in a bank's lending market have also been shown to influence a bank's willingness to extend credit.[28]

A number of forensic studies[29] of the financial crisis find that banks' pre-crisis liquidity positions affected the amount of bank credit and the rates charged by banks following the liquidity shock.[30] Banks that derived a greater share of their funding from so-called core deposits were more likely to extend credit following the crisis and less likely to increase their lending rates.[31] Overall, this literature suggests that banks' funding mix and the liquidity of its investments influenced bank lending behavior during the crisis.

III. Methodology and Data

A. Overview of Methodology

Bank loan growth is generated through the interaction of customer loan demand and bank loan supply decisions. However, loan demand and loan supply are not independently unobservable. We control for variation in individual banks' loan demand by focusing on banks that conduct a majority of their

[26] See for example, Berger and Udell (2004) or Chava and Purnanandam (2011). Murfin (2011) finds that banks tighten loan covenants following poor loan portfolio performance.
[27] See Santos (2011) or Puri, Rocholl and Steffen (2010).
[28] See, for example, Petersen and Rajan (1995) or Boot and Thakor (2002).
[29] These include Ivashina and Scharfstein (2010), Ashcraft, Bech, and Frame (2010), Cornett, McNutt, Strahan, and Tehranian (2011), Bord and Santos (forthcoming), and Acharya, Afonso and Kovner (2013).
[30] Cornett, McNutt, Strahan and Tehranian (2011) find that banks with relatively illiquid asset holding at the time of the crisis tended to cut lending and increase their holding of liquid assets during the crisis. Bord and Santos (2013) find that banks that were heavy users of Federal Reserve or Federal Home Loan Bank liquidity facilities during the crisis tended to increase the charges (both access fees and spreads) corporations paid for credit lines during the crisis.
[31] See Ivashina and Scharfstein (2010) or Cornett, McNutt, Strahan and Tehranian (2011).

business in a single county and then control for variation in county-level economic activity with variables that should be correlated with variation in individual bank loan demand.[32]

First, we identify each bank's geographic market using FDIC Summary of Deposits (SOD) data. SOD data provides an annual June 30 "snapshot" of each institution's deposit-taking activity at bank branch level. Each bank's county-level deposit shares in the three intervening quarters are estimated by merger-adjusting the prior June's SOD data.[33,34] Our data sample period begins when SOD data becomes available in 1994Q2 and ends in 2011Q4.

We use SOD data as a proxy for the location of a bank's lending activities. However, banks need not lend exclusively in the locations in which they collect deposits. Syndicated lending, for example, may enable banks to geographically diversify their lending into markets in which they do not take deposits. Still there are reasons to expect bank lending to be concentrated in the communities in which they raise deposits. For example, since 1977, the Community Reinvestment Act (CRA) has mandated that institutions support the credit needs of the local communities from which they collect deposits and federal supervisory agencies regularly monitor compliance with CRA provisions. In addition, the literature shows the distance between the borrower and its local bank branch is an important factor explaining bank lending patterns.[35] We adopt the geographic lending concentration assumption as a means for controlling for bank loan demand and assess the robustness of our approach in Section IV part D where we consider alternative criteria for sample selection, alternative definitions of loan growth, and explicitly account for bank syndicated lending.

[32] This sample selection criterion does not permit us to include some banks that operate primarily in large metropolitan areas that span multiple counties. We ran our analysis using a CBSA-level market definition and found results very similar to those reported in this paper which indicates that our county-level market definition is not an important limitation of our approach.

[33] Data on bank mergers are from the FDIC's Research Information System (RIS) warehouse.

[34] We merger adjust by retroactively summing the appropriate fields for each legacy institution for each quarter following the effective merger date.

[35] See for example Petersen and Rajan (1994, 2002), Cole, Wolken and Woodburn (1996), Boot (1999), Berlin and Mester (1999), Cole, Goldberg and White (2004), Avery and Samolyk (2004), Dahiya, Saunders and Srinivassan (2003), Elyasiani and Goldberg (2004), Heitfield and Prager (2004), DeYoung, Glennon and Nigro (2008), and Brevoort, Holmes, and Wolken (2010).

Our benchmark sample for analysis includes all banks that raise at least 50 percent of their deposits in a single county in a quarter. Identification of the common county-wide effects of bank cost of funds and bank profitability requires that we include only observations for which there are at least two banks that meet the required deposit threshold in the county-quarter.[36]

We exclude from our analysis institutions with a specialization in credit card lending, with a specialization in non-lending activities, *de novo* banks, foreign banks, and institutions with zero loan activity. We also exclude bank observations with loan growth values that are in the 5 percent tails of the loan growth distribution.[37] We eliminate banks that report negative capital, negative average cost of liabilities, or extremely high capitalization ratios. After applying these filters, the sample size associated with a 50 percent deposit threshold and at least two banks in a county-quarter is over 443,000 bank-quarter observations.[38]

B. Econometric Model

Our baseline regression model specification is:

$$loan\ growth_{it} =$$

$$\alpha_i + \sum_{j=1}^{J} \beta_j Sup_{jit-1} + \gamma Capital_{it-1} + \sum_{k=1}^{K} \delta_k Liq_{kit-1} + \sum_{l=1}^{L} \eta_l FundCost_{lit-1} +$$

$$\sum_{m=1}^{M} \kappa_m ROA_{mit-1} + \sum_{n=1}^{N} \lambda_n AQual_{nit-1}\ \mu Size_{it-1} + \sum_{p=1}^{P} \nu_p Mkt_{pit-1} + \sum_{q=1}^{T} \rho_q Q_q + \tilde{\varepsilon}_{it} \qquad (1)$$

[36] Including a restriction on the location of the bank's primary deposits eliminates most of the largest banks from our sample. Subsequently, when we exclude banks that lend using syndicated loans, we eliminate the few large banks that might remain in the less restricted 50 percent sample. While it is unfortunate that our methodology eliminates the largest banks, it is necessary to identify the magnitude of the impact of a change in supervisory intensity of bank loan growth. Still, the largest banks rarely, if ever, receive CAMELS scores of 3 or 4/5, so their elimination from the sample should not bias our results.

[37] It is common to exclude outliers is studies using CALL report data. For example, the FDIC's Uniform Bank Performance Report excludes data in the upper and lower 5 percent tails. Berger and Udell (1994) exclude observations when loan balances change by more than 25 percent or when a bank's 0 or 100 percent risk weighted asset categories change by more than 75 percent.

[38] For the entire sample period, there are 706,238 unique bank-quarter observations. Of these, 203,090 observations were dropped because the cert was a non-bank, a credit card lender, a foreign bank, or a de novo bank, or if the cert had missing values, implausible values, or had loan growth in the 5 percent tails of the loan grow distribution. The application of these filters left 500,173 bank-quarter observations. Out of these banks, 443,578 observations also satisfy the 50 percent deposit threshold with at least two banks in a county-quarter. Thus, our 50 percent threshold sample represents 88.7 percent of the eligible population of bank observations.

In this model specification, i identifies a particular bank, t identifies a particular quarter, and other subscripts indicate that there are multiple variables that measure the indicated property. Specifically, $loan\ growth_{it}$ is bank *i*'s loan growth over quarter *t*, α_i is a bank-specific constant (bank *i*'s fixed-effect), *Sup* represents indicators for bank supervisor examination ratings, *Capital* refers to regulatory capital adequacy[39], *Liq* refers to liquidity controls, *FundCost* denotes bank funding costs, *ROA* is the bank's return on assets, *AQual* refers to measures of bank asset quality, *Size* refers to bank size, *Mkt* represents variables that measure the bank's local market conditions, and $Q_q, \{q = 1, 2, ..., T\}$ are *T* quarterly dummy variables that control for national conditions that may affect loan growth of all banks within in a specific quarter. The model includes bank fixed-effects to control for bank-specific factors that are not explicitly captured by our bank-level controls.[40] We use merger-adjusted quarterly values over the period 1994 to 2011. Table 1 provides detailed definitions of the variables used in our analysis.

Bank fixed-effects are accounted for using the so-called "within" estimator. The within estimator removes bank fixed effects by estimating the model in difference form, where each bank observation is transformed as the difference from the bank's sample average value for the variable. Using the same notation as in Equation 1, the bank fixed-effect regression model specification is,

$$(loan\ growth_{it} - \overline{loan\ growth_i}) = \sum_{j=1}^{J} \beta_j \left(Sup_{jit-1} - \overline{Sup_{ji}}\right) + \gamma\left(Capital_{it-1} - \overline{Capital_i}\right) + \sum_{k=1}^{K} \delta_k \left(Liq_{kit-1} - \overline{Liq_{ki}}\right) + \sum_{l=1}^{L} \eta_l \left(FundCost_{lit-1} - \overline{FundCost_{li}}\right) + \sum_{m=1}^{M} \kappa_m \left(ROA_{mit-1} - ROAmi + n=1N\lambda n(AQualnit-1-AQualni) + \mu Sizeit-1-Sizei + \sum_{p=1}^{P} \nu_p \left(Mkt_{pit} - \overline{Mkt_{pi}}\right) + \sum_{q=1}^{T} \rho_q Q_q + \tilde{\varepsilon}_{it} \quad (2)$$

Banks prefer a CAMELS rating of 1 or 2, as either rating indicates an acceptably safe and sound institution without significant weakness. Banks rated CAMELS 1 or 2 face no additional supervisory restrictions other than meeting minimum regulatory standards that are applicable to all banks. The sample average value for the two CAMELS dummy variables in the equation (CAMELS =3 and CAMELS=4-5)

[39] A single measure of bank capital will be included in separate regressions.

[40] For example, in some studies bank holding company (BHC) status has been shown to be an important determinant of bank behavior. Since BHC status rarely changes over time, BHC status is accounted for by bank fixed effects.

should be very small for most banks, as few banks are rated CAMELS 3 or CAMELS 4 or 5 for an extended period.[41]

Our hypothesis is that the examiner restrictions that accompany a poor examination rating reduce a bank's subsequent loan growth. In the bank fixed-effect specification, a CAMELS 3 or CAMELS 4-5 rating will appear as a large deviation from a bank's sample average CAMELS dummy variable value. If our hypothesis is true, this aberration will also coincide with abnormally slow bank loan growth.

Standards for bank regulatory capital and liquidity requirements are fixed for our sample period.[42] We interpret each bank's sample average capital and liquidity characteristics as approximations for the bank's desired optimal capital and liquidity position under the prevailing regulatory standards. In our fixed effect model specification, a significant coefficient on a bank's capital or liquidity ratio has the interpretation that a deviation of the bank's capital or liquidity, relative to its long run optimal position, causes the bank to endogenously alter its lending growth.

All bank-specific control variables other than a bank's average cost of funds and the average costs of funds for banks in a county-quarter are predetermined variables (i.e., lagged 1 quarter). We use instrumental variables estimation with lagged values of a bank's cost of funds and lagged values of the county-quarter average cost of bank funds serving as instruments for these variables.[43] Table 2 reports summary statistics for our baseline sample.

C. Key Variables

[41] Only about 5 percent of our sample bank-quarter observations prior to 2009 are rated CAMELS 3 and about 1 percent had CAMELS 4 or 5 rating. In addition, the banks in our sample are relatively small institutions. The macroeconomic importance of this supervision effect is likely to be much larger in 2009-2011 when the share of CAMELS 4 and 5 rated banks was closer to 12 percent, and over 25 percent of banks were rated CAMELS 3. As mentioned earlier, very few, if any, of the largest institutions have ever received a CAMELS 4 or 5 rating so this channel has not been important for the largest institutions.

[42] The regulatory changes included in the Dodd-Frank Act had not been implemented by 2011. Since our sample includes primarily small banks with trading assets well below regulatory thresholds, none were impacted by the 1997 Market Risk Amendment to the Basel Capital Accord and none were subject to the advanced credit risk approach of Basel II.

[43] We have estimated our models using cost of funds lagged two quarters as instruments. The results are qualitatively similar to those we report in this paper.

Our key variables of interest are dummy variables for a bank's supervisory CAMELS rating.[44] At the conclusion of an onsite examination, supervisors assign a bank a CAMELS grade of 1 to 5. In the CAMELS rating system, a rating of 1 indicates the strongest rating, while 5 is the weakest. A CAMELS 5 rating represents an institution with serious safety and soundness deficiencies.[45]

A CAMELS of 1 or 2 is not expected to have any impact on a bank's loan growth. A CAMELS rating of 3, 4, or 5 will often be associated with the imposition of supervisory constraints that may affect a bank's ability to grow its loan portfolio. Along with a CAMELS 3, 4 or 5 rating, the bank may also receive an informal memorandum of understanding and sometimes a more formal cease and desist order. These supervisory orders may require the bank to improve its underwriting standards, its risk management processes, or raise regulatory capital above minimum required levels. To account for the implications of a poor supervisory rating, we include two separate dummy variables that indicate whether a bank's CAMELS rating was 3, or 4 or 5 in the prior quarter. We expect CAMELS ratings of 3, 4 or 5 to be associated with reduced bank loan growth.

There are many theories that suggest that bank capitalization rates should be positively associated with bank loan growth. Credit crunch theories argue that binding or near-binding regulatory capital requirements constrain the lending growth of weakly-capitalized banks but have little or no effect on well-capitalized institutions. While a positive bank capital coefficient is consistent with credit crunch arguments, other hypotheses also predict a positive relationship between bank capital and loan growth. For example, higher capital (through retained earnings) could reduce the marginal cost of the liabilities that a bank subsequently issues to fund new loans.

We measure bank liquidity positions using three different ratios: (1) the ratio of a bank's liquid assets to total assets; (2) the ratio of so-called "hot money" to assets; and, (3) the ratio of a bank's core

[44]CAMELS ratings are composite ratings derived from individual supervisory ratings for a bank's: (C) Capital adequacy, (A) Asset quality, (M) Management, (E) Earnings, (L) Liquidity, and (S) Supervision.

[45] By statute, smaller banks must be examined at least every 18 months, and so CAMELS ratings may be up to 18 months old for some banks in some quarters. Large banks and problem banks must be examined more frequently. We emphasize the temporal relationship between a CAMELS rating and the regression dependent variable to stress that the bank's CAMELS rating is not endogenous in the regression model specification.

(retail) deposits to assets.[46] Hot money measures the importance of the portion of bank liabilities that may run should investors lose confidence in the bank. The use of hot money is an indication that the bank lacks adequate liquidity from its stable core deposit base. Core deposits provide a bank with stable low-cost funding and some studies have shown that core deposits facilitated bank lending in the crisis.[47]

Arguments that justify minimum regulatory standards for bank liquidity suggest that liquidity variables will enter the regression with a positive sign. Banks with abundant liquidity can easily fund new lending. Banks with insufficient liquidity relative to their desired optimal liquidity may be occasionally forced to curtail lending and sell assets to manage negative liquidity shocks. Both effects suggest a positive liquidity coefficient. Other theories may also suggest a positive relationship between bank liquidity and loan growth. For example, banks may hold a buffer stock of liquid assets to liquidate in order to fund new profitable loan investments when they face local market competitive limits on raising core deposits.[48]

The credit channel literature predicts a negative relationship between banks' average cost of liabilities and loan growth. However, a bank may react differently to a general increase in funding costs uniformly experienced both by itself and its competitors, as compared to a specific increase in its own funding costs that is not experienced by its competitors. When information is imperfect, bank stakeholders may use bank average cost of liabilities as a proxy for bank risk. In the face of an idiosyncratic increase in the bank's average cost of liabilities, bank managers may more aggressively reduce the bank's loan growth to dampen the increase in the cost of its liabilities to avoid signaling an increase in bank risk to its stakeholders. To account for this possibility, we include both the average cost of bank liabilities in the local market as well as each bank's specific average cost of liabilities as separate determinants of bank credit.

[46] Two minimum liquidity regulations will be phased in under Basel III: a liquidity coverage ratio and a net stable funding ratio. Unfortunately, these specific ratios cannot be calculated from historical bank regulatory data.
[47] See Ivashina and Scharfstein (2010) or Cornett, McNutt, Strahan and Tehranian (2011).
[48] See, for example Fama (2013).

Prior research has shown that banks reduce lending when they experience an increase in their loan portfolio's rate of delinquent and nonperforming loans, so we expect past-due and non-current assets to be negatively related to subsequent bank loan growth. Outside of loan portfolio performance, the literature has also found that banks reduce lending when banks experience non-credit related losses. We measure these effects by including banks' pre-tax return on assets (ROA) as a determinant of loan growth.

The relationship between bank loan growth and ROA shock may be complicated by strategic behavior on the part of bank managers. When there is asymmetric information about the quality of bank management, Rajan (1994) predicts that a bank's lending growth should be strategically related to the average ROA of its competitor banks. Should a bank's ROA compare unfavorably to its competitors, the bank may accelerate loan growth to generate upfront fees and related charges to help mask the poor performance of the bank's existing investments.

To allow for possible nonlinear ROA effects associated with strategic underwriting behavior, we include three ROA factors: (1) the average ROA for banks that operate in a county and meet the deposit threshold requirement in a quarter; (2) the bank's ROA interacted with a dummy variable that takes the value 1 when the bank's own ROA exceeds the county average; and (3), the bank's ROA interacted with a dummy variable that takes the value of 1 when the bank's own ROA is below the county average.

D. Data

Our variable definitions and source data are reported in Table 1. Sample summary statistics are reported in Table 2.

County-level controls for local bank loan demand include the unemployment rate, total real wage growth (from the U.S. Bureau of Labor Statistics), house price growth rates (calculated using the Case Schiller index), and the percentage of credit card accounts more than 60 days delinquent (from Trendata). For counties without reported house price index (HPI) values, we substitute state-level HPI values.

Most of our data on bank attributes are taken from Reports of Condition and Income (CALL reports), the quarterly regulatory bank filings of insured commercial and savings banks. Our bank-specific controls include: leverage, tier 1, and total risk-based capital ratios; average cost of liabilities; before-tax

return on assets (ROA); the ratio of bank liquid assets to total assets; the ratio of bank core deposits to assets; the ratio of bank hot money to bank assets; the log of bank assets adjusted to constant 2000 dollars; the ratio of assets 30 to 89 days delinquent but still accruing interest to total assets (past due assets to total assets); the ratio of assets 90 days or more past due and not accruing interest to total assets (non-current assets to total assets); and the standard deviation of the bank's charge off rate over the prior eight quarters.

At the bank-level we also use confidential supervisory data on banks' composite CAMELS ratings. For each bank, the CAMELS variable reflects the most recent supervisor CAMELS rating available at the end of the prior quarter.

In our baseline analysis, we measure bank loan growth using quarterly data on the growth in gross bank loans and leases adjusted for unearned income. We consider a more comprehensive measure of bank loan growth in Section IV Part D(2).

For each county-quarter in our sample we calculate county-level Herfindahl-Hirschman indices (HHI) for deposits as a measure of competition in the local bank market.[49] To measure an individual bank's potential market power, we estimate and include each bank's share of the county's total deposits in the county-quarter. We also calculate and include the county average ROA and average cost of funds for the sample banks in each county-quarter.

IV. Results

A. Baseline Model Results

Bank fixed-effect within regression estimation results are reported in Table 3. Three different regression specifications are presented; the only difference in the specifications is the regulatory capital measure used in the regression. Regression standard errors are clustered at the county level.

[49] Literature suggests that the HHI deposit concentration rate is likely to be positively related to bank loan growth as bank market power is associated with the expectation of long-standing relationships that allow banks to extract a higher share of the profits on future bank-funded investments (Petersen and Rajan (1995) and Boot and Thakor (2002)). The deposit HHI was calculated using the deposits of all banks in a county.

In all regressions, the controls for county-level economic activity enter with the anticipated sign and all controls except for the county credit card delinquency rate are statistically significant at the 1 percent level. Higher county unemployment is associated with slower loan growth, higher home price appreciation and real wage growth are associated with faster loan growth, and higher credit card delinquency rates are associated with slightly reduced loan growth, but the last effect is not statistically significant. The HHI deposit share is positive, large in magnitude, and statistically significant at the 1 percent level. Average county ROA is positive and statistically significant, while average county cost of funds to liabilities is negative and statistically significant.

Among bank-specific factors that impact loan growth, our estimates suggest that the supervisory examination ratings have the largest impact. A supervisory CAMELS rating of 3 is estimated to shrink quarterly bank lending growth by 1.36 percentage points while a CAMELS rating of 4 or 5 decreases quarterly loan growth by an estimated 2.07 percentage points.[50] These are extremely large effects relative to the average sample quarterly loan growth of 1.4 percentage points. However, only a small percentage of our bank-quarter observations exhibited these poor CAMELS ratings.

The cost of a bank's funds is the second most important determinant of bank lending growth. Holding constant the average county cost of funds, a 1 percentage point increase in the bank's own cost of funds decreases quarterly bank loan growth by 99 bps. Holding all else constant, a county-wide increase in bank cost of funds reduces quarterly bank lending growth by 77 bps on average.

Consistent with the existing literature, poor performance on a bank's existing loan portfolio is associated with lower subsequent loan growth. Our estimates suggest that a 1 percentage point increase in the ratio of assets 30 through 89 days delinquent to total assets (past due asset ratio) will decrease a bank's quarterly loan growth by 11 bps the following quarter. An increase of 1 percentage point in the ratio of assets 90 days or more past due to total assets (non-current asset ratio) reduces a bank's subsequent quarterly loan growth by an estimated 37 basis points.

[50] Most banks have a CAMELS rating of 1 or 2 which is the control group. A supervisory CAMELS 1 or 2 rating is not anticipated to have any detrimental effect on a bank's ability to grow its loan portfolio.

Our model specification for ROA allows for the possibility that banks strategically manage their loan growth to avoid signaling management weakness. Evaluating the regression estimates at the mean values of the independent variables, when a bank's ROA is below the county average ROA, the bank will accelerate its quarterly loan growth by about 10 bps on average.[51] In contrast, when a bank's ROA is above the county average, its quarterly loan growth will increase by only about 1.4 bps on average.[52] These results are consistent with the Rajan (1994) prediction that poorly performing banks face incentives to accelerate loan growth.

All three measures of bank capital adequacy are positive and statistically significant at the one percent level. Among these alternative capital measures, the leverage ratio has the largest effect. A one percentage point increase in a bank's leverage capital ratio is associated with an increase of 4 bps in subsequent quarterly loan growth; the estimated coefficients for the two risk-based regulatory minimum capital ratios are smaller still. Since the leverage ratio is the most important measure of capital in terms of economic significance, we will use this measure in our subsequent analysis.

Our regression estimates suggest that bank liquidity has a positive and statistically significant effect on loan growth, but measured in terms of economic importance, liquidity effects are minor. A 1 percentage point increase in a bank's liquid asset to total asset ratio on average is associated with a 3 bps increase in its subsequent quarterly loan growth. A 1 percentage point increase in a bank's hot money ratio (a decrease in bank liquidity) on average is associated with a 2 bps decline in subsequent quarterly loan growth. Holding other factors constant, a 1 percentage point increase in a bank's core deposit ratio is associated in a 1 bps decrease in the subsequent quarter's loan growth. Our core deposit funding result differs from our expectations based on the existing literature, but this difference may arise because our estimates include controls for many factors that are often omitted in earlier studies.

[51] The average effect of ROA on bank loan growth for banks with ROA below their county average ROA is the sum of the products of the mean values reported in Table 1 and their associated coefficients, or: 0.31 * 0.33-0.04*0.08 = 0.0991 percent. The coefficient on the interactive terms is not statistically different from 0, and if that coefficient is taken to be 0, the loan growth impact is 0.1023 percent.

[52] Evaluated at the means, the impact is .33*.31-.37*.24=.0135 percent.

B. Robustness

D(1). Controlling for Loan Demand

We test the robustness of our identification scheme by selecting new samples with additional restrictions to further ensure that we are controlling for variation in banks' loan demand. The first additional restriction is related to participation in the syndicated loan market. If banks participate in the syndicated loan market, they can easily supplement county-level loan growth with lending outside their home county. If bank loan growth is driven by loan demand outside of the bank's home county, our county-specific controls for economic conditions may be inadequate to control for bank loan demand.

We use Reuters Loan Pricing Corporation's DealScan data to identify all banks in our 50 percent deposit threshold sample that took part in syndicated lending. We create a new sample that excludes banks that lent funds, either as leads or participants, at any time, in the syndicated loan market.[53] This additional restriction requires us to exclude about 23,000 observations from the original 50 percent threshold sample.

Table 4 reports the estimation results when banks that were active at any time in the syndicated loan market are removed from the sample. These estimates are little changed from those reported in Table 3, so our initial estimates do not appear to be biased by out-of-market bank lending.

In a second robustness check, we increase the threshold of bank deposits that must be raised in a single county to gain membership into our analysis sample to 75 percent, and then to 100 percent. The higher thresholds increase the certainty that our sample banks operate within a single county. However, the cost for tighter geographic focus is smaller sample size. The estimation results for the 50 percent threshold are repeated and estimates for the more restricted 75 and 100 percent threshold samples are presented in Table 5. The estimated coefficient values are very stable across these alternative samples. The importance of the leverage capital ratio and the deposit HHI concentration index both increase as the deposit threshold becomes more restrictive. The importance of the average county ROA also increases

[53] This additional exclusion also serves as a robustness check to ensure that results hold when omitting from the sample the larger lenders, which usually participate in syndicated lending.

slightly, but the remaining coefficient estimates are largely unchanged by the heightened sample restrictions. These results suggest that the baseline 50 percent deposit threshold regressions do a reasonably good job of controlling for the variation in individual bank loan demand and little is gained by further restricting the sample.[54]

D(2). Alternative Measures of Loan Growth

As an additional robustness check, we consider an alternative measure of bank loan growth. In the previous analysis, we measured bank loan growth as the quarterly change in banks' reported loan balance sheet values (gross of provisions). This measure of loan growth excludes any quarter-to-quarter change in a bank's loan commitment activity, which may be an important channel for credit extension. For example, a decrease in bank credit supply could still be associated with balance sheet loan growth if outstanding commitment lines are frozen (or reduced), but customers draw on their outstanding bank commitments. In addition, changes in reported balance sheet gross loan amounts will be a distorted measure of bank lending if banks sell loans within a quarter.

We eliminate these possible sources of measurement error by redefining bank credit as the sum of loans, unused commitments and securities sold.[55] Because data on securities sold are not available until 2001Q3, the sample period must be reduced accordingly. Table 6 provides summary statistics for the 50 percent deposit threshold sample under the new definition for loan growth that restricts the time period of spanned by the sample.

Table 7 reports the estimation results using the previous definition of loan growth and the alternative definition that accounts for commitments and loan sales, over the common (shorter) sample period. We run the bank fixed-effects regression specification using the new loan growth measure as dependent variables over the shortened sample period. The magnitude of the estimates in Table 7 differ

[54] We also investigated using an additional specification that uses county-quarter fixed-effects to control for local demand conditions. Because the primary county locations for the vast majority of banks in our sample are fixed over time, we cannot include both county-quarter fixed effects and bank fixed-effects in the regression model.

[55] For completeness, this alternative measure of loan growth is the quarterly change in the sum of balance sheet gross loans, unused loan commitments, securities sold and unearned income. Unearned income includes items such as loan origination fees and prepaid interest that are amortized over the life of the loan.

slightly from those reported in Table 3, however the coefficient estimates for the two loan growth measures are similar when compared over the identical sample period reported in Table 7. More importantly, the pattern of coefficient estimates for the alternative loan growth definition is virtually identical to the pattern reported in Table 3.

Bank examination ratings and bank cost of funds are more important in this shorter sample period compared to our baseline sample period. The effect of bank capital and liquidity are also larger, but they still are estimated to have only minor economic importance. While there is some variation in the coefficient estimates for bank-specific and county-wide cost of funds between the alternative measures of loan growth, overall, the results in Table 7 support the robustness of our baseline model results.

V. Conclusion

We estimate the individual bank loan growth effects that are associated with variation in a bank's supervision examination rating after carefully controlling for bank loan demand and a large array of bank-specific characteristics. Our estimation results are robust against a number of alternative methods for defining a bank's local market and against an alternative definition of bank loan growth.

Our analysis suggests that a supervisory examination rating or CAMELS score is a very important determinant of bank loan growth. The supervisory restrictions that typically are associated with a poor bank examination rating have a large negative impact on bank loan growth. In addition to CAMELS ratings, we find strong evidence that a bank's loan growth is related to the performance of its legacy loan portfolio. When a bank's troubled loans increase, on average, the bank will reduce its lending growth in the subsequent quarter. We also find evidence that a bank's overall profitability is an important determinant of its subsequent loan growth. Our estimates also suggest that a bank's cost funds, capital and liquidity positions are also statistically significant factor affecting loan growth. Our estimates for bank capital and liquidity ratios are positive and statistically significant, but the magnitudes are small, indicating that these factors are of second-order economic importance.

References

Aiyar, S., C. W. Calomiris, and T. Wieladek, (2014), "Does Macro-Prudential Regulation Leak? Evidence from a UK Policy Experiment," *Journal of Money, Credit and Banking*, 46(1) pp. 181-214.

Ashcraft, A., (2006). "New Evidence on the Lending Channel," *Journal of Money, Credit and Banking, Vol. 38, No.3.* pp. 751-775.

Ashcraft, Adam, Morten Bech, and Scott Frame, (2010). "The Federal Home Loan Bank System: the Lender of Next-to-Last Resort?" *Journal of Money, Credit and Banking*, June, 42(4), 551-83.

Avery, Robert B., and Katherine A. Samolyk, (2004). "Bank Consolidation and the Provision of Banking Services: Small Commercial Loans," *Journal of Financial Services Research*, vol. 25 (April), pp. 291-325.

Bassett, William F., Seung Jung Le, and Thomas W. Spiller (2012). "Estimating Changes in Supervisory Standards and Their Economic Effects," Finance and Economics Discussion Series No. 2012-55, Federal Reserve Board, Washington D.C.

BCBS, (2011). "The transmission channels between the financial and real sectors: a critical survey of the literature," Basle Committee on Banking Supervision Working paper No. 18, February, http://www.bis.org/publ/bcbs_wp18.htm

Berger, A. and G. Udell (1994). "Did Risk-based Capital Allocate Bank Credit and Cause a "Credit Crunch" in the United States?" *Journal of Money, Credit and Banking* 26(3), pp. 585-628.

Berger, Allen N., Davies, Sally, M., and Mark J. Flannery (2000) "Comparing Market and Regulatory Assessments of Bank Performance: Who Knows What When?" *Journal of Money, Credit and Banking*, 32, 641-667.

Berger, Allen N. and Gregory F. Udell (2004). "The Institutional Memory Hypothesis and the Procyclicality of Bank Lending Behavior," *Journal of Financial Intermediation*, Vol. 13 (October), pp. 458-495.

Berger, Allen N., Margaret K. Kyle and Joseph M. Scalise. "Did U.S. Bank Supervisors Get Tougher during the Credit Crunch? Did They Get Easier during the Banking Boom? Did It Matter to Bank Lending?" In *Prudential Supervision: What Works and What Doesn't,* edited by Frederic S. Mishkin. University of Chicago Press (2001), pp. 301 – 356.

Berlin, M. and L. Mester (1999). "Deposits and Relationship Lending," *Review of Financial Studies* 12, pp. 579-607.

Bernanke, Ben S., and Alan S. Blinder (1988). "Credit, Money, and Aggregate Demand," *American Economic Review*, vol. 78, Papers and Proceedings of the 100th Annual Meeting of the American Economic Association, May, pp. 435-39.

Bernanke, Ben S., and Mark Gertler (1989). "Agency Costs, Net Worth, and Business Fluctuations," *American Economic Review*, vol. 79 (March), pp. 14-31.

Bernanke, Ben S., and Mark Gertler (1995). "Inside the Black Box: The Credit Channel of Monetary Policy Transmission," *Journal of Economic Perspectives*, vol. 9 (Fall), pp. 27-48.

Bernanke, Ben S., Mark Gertler, and Simon Gilchrist (1999). "The Financial Accelerator in a Quantitative Business Cycle Framework," in *Handbook of Macroeconomics*, Volume 1C, Handbooks in Economics, vol. 15. Amsterdam: Elsevier, pp. 1341-93.

Bernanke, B. and C. Lown (1991). "The Credit Crunch," *Brookings Papers on Economic Activity* 2, pp. 205-247.

Berrospide, J. and R. Edge (2010). "The Effects of Capital on Bank Lending: What Do We Know and What Does it Mean?" Finance and Economics Discussion Series No. 2010-44, Federal Reserve Board, Washington D.C.

Black, L., D. Hancock, W. Passmore (2007). "Bank Core Deposits and the Mitigation on Monetary Policy," Finance and Economics Discussion Series No. 2007-65, Federal Reserve Board, Washington D.C.

Boot, Arnoud (1999). "Relationship Banking: What Do We Know?" *Journal of Financial Intermediation* 9, pp. 7-25.

Boot, A., and A. Thakor (2002). "Can Relationship Banking Survive Competition?" *Journal of Finance* Vo. 55, No. 2, pp. 679-713.

Bord, Vitaly and Santos, João, (2013). "Banks' Liquidity and the Cost of Liquidity to Corporations," *Journal of Money, Credit, and Banking*, forthcoming.

Brainard, W. (1964). "Financial intermediaries and a theory of monetary control," *Yale Economic Essays, Vol 4, No.* 43, pp. 1-82.

Brevoort, Kenneth B., John A. Holmes and John D. Wolken (2010). "Distance Still Matters: The Information Revolution in Small Business Lending and the Persistent Role of Location, 1993-2003," Finance and Economics Discussion Series 2010-08, Board of Governors of the Federal Reserve System.

Brunner, K., and A. Meltzer. (1963). "The place of financial intermediaries in the transmission of monetary policy," *American Economic Review Vol.* 53, pp. 372-82.

Brinkmann, J. and P. Horvitz (1995). "Risk-Based Capital Standards and the Credit Crunch," *Journal of Money, Credit and Banking* 27 (3), pp. 848-863.

Carlson, M., H. Shan, H. and M. Warusawitharana, (2013). "Capital ratios and Bank Lending: A Matched Bank Approach," Journal of Financial Intermediation 22, pp. 663-687.\

Chava, Sudheer and Amiyatosh Purnanandam (2011). "The Effect of Banking Crisis on Bank-Dependent Borrowers," *Journal of Financial Economics*, Vol 99, pp. 116-135.

Cole, R., L. Goldberg, and L. White (2004). "Cookie Cutter vs. Character: The Micro Structure of Small Business Lending by Large and Small Banks, *Journal of Financial and Quantitative Analysis, Vol. 29,* pp. 227-251.

Cole, R., J. Wolken and L. Woodburn (1996). "Bank and Nonbank Competition for Small Business Credit: Evidence from the 1987 and 1993 Surveys of Small Business Finance," *Federal Reserve Bulletin.*

Cornett, Marcia, Jamie McNutt, Philip Strahan, and Hassan Tehranian, (2011). "Liquidity Risk Management and Credit Supply in the Financial Crisis," *Journal of Financial Economics*, 101(2) 297-312.

Curry, T., G. Fissel and G. Hanweck, (2008) "Is there cyclical bias in bank holding company risk ratings?" *Journal of Banking and Finance,* Vol. 32, pp. 1297 – 1309.

Curry, T., G. Fissel, and C. Ramirez, (2006). "The Effect of Bank Supervision on Loan Growth," FDIC Center for Financial Research Working Paper No. 2006-12.

Dahiya, S., A Saunders, and A. Srinivassan, (2003). "Financial Distress and Bank Lending Relationships," *The Journal of Finance* 58(1), pp. 375-399.

Davidson, Paul, (2010). "Small banks say they can't win in small-business lending," *USA Today*, March 29, 2010.

De Young, R., D. Glennon and P. Nigro, (2008). "Borrower–lender distance, credit scoring, and loan performance: Evidence from informational-opaque small business borrowers," *Journal of Financial Intermediation,* Vol. 17, No.1, pp. 113-143.

Duke, Elizabeth, (2010). "Small Business Lending," Testimony before the Committee on Financial Services and Committee on Small Business, U.S. House of Representatives, Washington, D.C. (February 26). http://www.federalreserve.gov/newsevents/testimony/duke20100226a.htm

Elyasiani, E. and L. Goldberg, (2004). Relationship Lending: A survey of the literature," *Journal of Economics and Business* 56, pp. 314-330.

Fama, E., (2013). "Was There Ever a Lending Channel?" *European Financial Management*, Vol. 19, No. 5, pp.837–851.

Fazzari, Steven, ft. Glenn Hubbard, and Bruce Petersen, (1988). "Finance Constraints and Corporate Investment," *Brookings Papers on Economic Activity* 1, pp. 141-195.

Friend, Keith, Harry Glenos, and Joseph Nichols (2013). "An Analysis of the Impact of the Commercial Real Estate Concentration Guidance, Washington, D.C. http://www.federalreserve.gov/bankinginforeg/cre-20130403a.pdf

Gambacorta, Leonardo, (2005). "Inside the Bank Lending Channel," *European Economic Review*, vol. 49 (October), pp. 1737-59.

Gambacorta, Leonardo and David Marques-Ibanez, (2011). "The Bank Lending Channel: Lessons from the Crisis," *Economic Policy*, Vol. 26, pp. 135-182.

Gambacorta, L., and P. Mistrulli, (2004). "Does bank capital affect lending behavior?" *Journal of Financial Intermediation Vol.* pp. 436-457.

Goetz, Martin Richard and Gozzi, Juan Carlos, (2010). "Liquidity Shocks, Local Banks, and Economic Activity: Evidence from the 2007-2009 Crisis," (November 12, 2010). Available at SSRN: http://ssrn.com/abstract=1709677 or http://dx.doi.org/10.2139/ssrn.1709677.

Hale, G. and J. Santos, (2009). "Do banks price their informational monopoly?" *Journal of Financial Economics, Vol. 93, No. 2,* pp. 185-206.

Hancock, D. and J. Wilcox, (1994). "Bank Capital and the Credit Crunch: the Roles of Risk-Weighted and Unweighted Capital Regulations," *Journal of the American Real Estate and Urban Economics Association* 22, pp. 59-94.

Heitfield, E. and R. Prager, (2004). "The Geographic Scope of Retail Deposit Markets," *Journal of Financial Services Research, Vol. 25, No.1,* pp. 37-55.

Hubbard, R. Glenn, (1995). "Is There a "Credit Channel" for Monerary Policy?" Federal Reserve Bank of St. Louis Review, May/June 1995, pp. 63-77.

Hubbard, R. Glenn, Anil K. Kashyap, and Toni M. Whited, (1995). "Internal finance and firm investment," *Journal of Money, Credit, and Banking* 27, pp. 683-701.

Ivashina, Victoria, and David Scharfstein, (2010). "Bank Lending During the Financial Crisis of 2008," *Journal of Financial Economics,* 97(3): 319–38.

Jimenez, Gabriel, Steven Ongena, Jose-Luis Peydro, and Jesus Saurina, (2014), "Macroprudential Policy, Countercyclical Bank Capital Buffers and Credit Supply: Evidence from the Spanish Dynamic Provisioning Experiments" *Working Paper*. Available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2049284.

Kashyap, Anil, and Jeremy Stein, (1995). "The Impact of Monetary Policy on Bank Balance Sheets," *Carnegie-Rochester Conference Series on Public Policy,* Vol. 42(June), pp. 151-195.

Kashyap, Anil K, and Jeremy C. Stein, (2000). "What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?" *American Economic Review*, vol. 90 (June), pp. 407-28.

O'Keefe, John and James Wilcox, (2011). Understanding Bank Supervisors' Risk Assessments: The Influences of Market Conditions and Supervisory Standards.

Kiser, Elizabeth K. Robin A. Prager and Jason R. Scott, (2015). "Supervisory Ratings and Bank Lending to Small Businesses During the Financial Crisis and Great Recession," *Journal of Financial Services Research,* forthcoming.

Kishan, R. and T. Opiela, (2000). "Bank Size, Bank Capital, and the Bank Lending Channel," *Journal of Money, Credit and Banking* 32(1), pp.121-141.

Kishan, R. and T. Opiela, (2006). "Bank Capital and Loan Asymmetry in the Transmission of Monetary Policy," *Journal of Banking and Finance*, vol. 30 (January), pp. 259-85.

Krainer, J. and J. Lopez, (2009). "Do Supervisory Rating Standards Change Over Time?" *FRBS Economic Review,* pp. 13-24.

Litan, Robert, and John Hawke, (2012). Value-Added Bank Supervision: A Framework for Safely Fostering Economic Growth. Washington, D.C., American Bankers Association.

Laeven, L. and R. Levine, (2009). "Bank Governance, Regulation, and Risk Taking," *Journal of Financial Economics*, 93: 259-75.

Mora, Nada and Andrew Logan, (2010). "Shocks to Bank Capital: Evidence from UK Banks at Home and Away," Bank of England Working Paper No. 387.

Murfin, Justin, (2011). "The Supply-Side Determinants of Loan Contract Strictness." FDIC CFR Working Paper No 2012-10. http://www.fdic.gov/bank/analytical/cfr/workingpapers.html#01

Myers, Stewart C., and Nicholas S. Majiuf, (1984). "Corporate Financing Decisions When Firms Have Investment Information that Investors Do Not," *Journal of Financial Economics* 13, pp. 187-220.

Oliner, S. and G. Rudebusch, (1996). "Monetary Policy and Credit Conditions: Evidence from External Finance: Comment," *The American Economic Review, Vol. 86, No.1,* pp. 300-309.

Peek, J. and E. Rosengren, (1995a). "The Capital Crunch: Neither a Borrower nor a Lender Be," Journal *of Money, Credit and Banking* 27, pp. 625-638.

Peek, J. and E. Rosengren, (1995b). "Bank Regulation and the Credit Crunch," *Journal of Banking and Finance* 19, pp. 679-692.

Petersen, M., and R. Rajan, (1994). "The Benefits of Lending Relationships: Evidence from Small Business Data," *Journal of Finance,* Vol. 49, No. 1, pp. 3-37.

Petersen M., and R. Rajan, (1995). "The Effect of Credit market Competition on Lending Reationships," *Quarterly Journal of Economics* Vol. 110, No. 2, pp. 407-443.

Petersen, M., and R. Rajan, (2002). "Does Distance Still Matter? The Information Revolution in Small Business Lending," *Journal of Finance* Vol. 57, No, 6, pp. 2533-2570.

Puri, Manju, Jorg Rocholl and Sascha Steffen, (2010). "Global retail lending in the Aftermath of the US Financial Crisis: Distinguishing between Supply and Demand Effects". SSRN Working Paper No. 1397557 and FDIC CFR Working Paper No. 2011-05 http://www.fdic.gov/bank/analytical/CFR/2011/wp2011/workingpapers_2011.html#05

Rajan, Raghuram, (1994). "Why Bank Credit Policies Fluctuate: A Theory and Simple Evidence." *The Quarterly Journal of Economics*, Vol. 109, No. 2, pp. 399-441.

Rice, Tara and Jonathan D. Rose, (2012). "When Good Investments Go Bad: The Contraction in Community Bank Lending after the 2008 GSE Takeover," International Finance Discussion Papers 1045. Board of Governors of the Federal Reserve System.

Santos, João, (2011). "Bank Corporate Loan Pricing Following the Subprime Crisis," *The Review of Financial Studies,* Vol. 24, No. 6, pp. 1916-1943.

Santos, A.E. and D. Elliott, (2012). "Estimating the Costs of Financial Regulation," IMF Staff Discussion Note, SDN/12/11 (September 11).

Santos, João, and Andrew Winton, (2009). "Bank Capital, Borrower Power, and Loan Rates," AFA 2010 Atlanta Meetings Paper. Available at SSRN: http://ssrn.com/abstract=1343897

Sharpe, Steven (1995). "Bank Capitalization, Regulations, and the Credit Crunch: A Critical Review of the Research Findings." FEDS Working Paper No. 95-20. Board of Governors of the Federal Reserve System.

Shrieves, R., and D. Dahl (1995). "Regulation, Recession, and Bank lending Behavior: The 1990 Credit Crunch." *Journal of Financial Services Research* 9, pp. 5-30.

Slovik, P. and B. Cournède (2011), "Macroeconomic Impact of Basel III", OECD Economics Department Working Papers, No. 844, OECD Publishing.

Stein, Jeremy, (2011). "Monetary Policy as Financial Stability Regulation." Working paper, Harvard University.

Stiglitz, Joseph E. and Andrew Weiss (1981). "Credit Rationing in Markets with Imperfect Information," The American Economic Review Vol. 71, No. 3, pp. 393-410.

Tobin, J., and W. Brainard. (1963). "Financial intermediaries and the effectiveness of monetary control," *American Economic Review, Vol.* 53, pp.383-400.

Valencia, Fabian (2008). "Banks' Precautionary Capital and Persistent Credit Crunches," IMF Working Paper, WP/08/248.

Wagster, J. (1999). "The Basel Accord of 1988 and the International Credit Crunch of 1989-1992. *Journal of Financial Services Research* 15 (2), pp. 123.

Whited, Toni M. (1992). "Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data," *Journal of Finance* 47, pp. 1425-1460.

Office of the Comptroller of the Currency, Federal Deposit Insurance Corporation, Federal Reserve Board, Office of Thrift Supervision, March 30, 1993. Interagency Policy Statement on Documentation for Loans to Small- and Medium-sized Businesses and Farms. http://www.occ.gov/static/news-issuances/bulletins/pre-1994/banking-bulletins/bb-1993-1

"Concentrations in Commercial Real Estate Lending, Sound Risk Management Practices," Federal Register 238, December 12, 2006, pp. 74580-74588. http://www.occ.gov/news-issuances/federal-register/71fr74580.pdf

Table 1: Variable Definitions

Variable Name	Variable Definition	Source	Anticipated Sign
Quarter-to-Quarter Loan Growth (Pct)	Quarterly bank-level growth in balance sheet gross loans and leases adjusted for unearned income during period *t*	CALL[56]	
Supervision Intensity			
=1 if Composite Rating = 3, 1-Qtr Lag	Indicator that CAMELS most recent composite score is 3	FDIC Proprietary	-
=1 if Composite Rating = 4 or 5, 1-Qtr Lag	Indicator that CAMELS most recent composite score is 4 or 5	FDIC Proprietary	-
Regulatory Capital			
Leverage Capital Ratio, 1-Qtr Lag (Pct)	(100*Tier 1 Capital)/(Average Total Assets – Disallowed Intangibles)	CALL	+
Tier 1 Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	(100* Tier 1 Capital)/Total Risk-Weighted Assets	CALL	+
Total Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	(100*Total Risk-Based Capital)/Total Risk-Weighted Assets	CALL	+
Liquidity			
Liquid Assets to Assets, 1-Qtr Lag (Pct)	Liquid Assets/Total Assets	CALL	+
Hot Money to Assets, 1-Qtr Lag (Pct)	(Purchased Federal Funds and Repo Agreements + Brokered Deposits over deposit insurance limit that mature in less than one year + Domestic Deposits + Trading Liabilities + Other Borrowed Money)/Total Assets	CALL	-
Core Deposits to Assets , 1-Qtr Lag (Pct)	Core Deposits/Total Assets	CALL	+
Funding Cost			
Cost of Funds to Liabilities (Pct)	(Net Interest Expense excluding interest on bank's own mortgage liability)/ Total Liabilities excluding bank's own mortgage liability	CALL	-
County Average Cost of Funds	County-wide average cost of funds/liabilities for sample banks	CALL	-
ROA			
Before Tax Return-on-Assets (ROA) , 1-Qtr Lag (Pct)	Annualized Pre-Tax Net Income/Average Assets	CALL	
=1 if ROA 1-Qtr Lag Below County-Qtr Average	Indicator that bank ROA is less than county-quarter average ROA	CALL	

[56] Reports of Condition and Income

=1 if ROA 1-Qtr Lag Above County-Qtr Average	Indicator that bank ROA is greater than county-quarter average ROA	CALL	
Asset Quality			
Charge-off Rate, 8-Quarter Standard Deviation, 1-Qtr Lag (Pct)	Eight-quarter standard deviation of Annualized Total Net Charged-Off Loans and Lease Financing Receivables/Loans and Lease Financing Receivables	CALL	-
Past Due to Assets, 1-Qtr Lag (Pct)	Total Assets Past Due 30 through 89 Days and still accruing interest / Total Assets	CALL	-
Non-Current to Assets, 1-Qtr Lag (Pct)	Total Loans and Lease Financing Receivables 90 Days or more past due and nonaccrual / Total Assets	CALL	-
Size			
Log Real Assets	Log of bank's Total Assets measured in thousands of constant 2000 dollars	CALL	
Local Market			
Cert Share of County's Deposits (Pct)	Share of bank's deposits in county as percentage of all deposits in that county	SOD[57]	
County Average Before Tax ROA, 1-Qtr Lag (Pct)	Average Pre-Tax ROA for the sample banks	CALL	
County Unemployment Rate (Pct)	County Unemployment rate	US BLS	-
County Credit Card 60 Days DQ Rate (Pct)	Percentage of county credit card accounts more than 60 days delinquent	Trendata	-
County HPI Growth Rate (Pct)	Growth rate of House Price Index where Index is adjusted for inflation using CPI series less Shelter for All Urban Consumers; Substitute state-level HPI values for counties without reported HPI values	Case Schiller Index	+
County Total Real Wage Growth Rate (Pct)	County growth in Total Real Wages	US BLS	+
County Deposit Share HHI	Herfindalhl-Hirschman Index of county deposit concentration calculated using all county banks	SOD	+
=1 if Cert Appeared in DealScan	Indicator that bank appeared on DealScan as a lender in any role	DealScan	

[57] SOD data provides an annual June 30 "snapshot" of each institution's deposit-taking activity at bank branch level. For each bank, the share of their total deposits in a county is calculated from annual SOD data. Each bank's county-level deposit shares in the three intervening quarters are then estimated by merger-adjusting the prior June's SOD data. (Data on bank mergers are from the FDIC's Research Information System (RIS) warehouse.)

Table 2: Summary Statistics, at Least Two Sample Banks in Each County

	50% of Deposits in County				*75% of Deposits in County*				*100% of Deposits in County*			
Variable	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
Quarter-to-Quarter Loan Growth (Pct)	1.45	3.91	-11.32	18.76	1.48	3.93	-11.32	18.71	1.50	3.99	-11.32	18.71
Leverage Capital Ratio, 1-Qtr Lag (Pct)	9.81	2.66	0.16	26.05	9.96	2.72	0.16	26.05	10.14	2.80	0.26	26.05
Tier 1 Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	15.44	5.81	0.22	46.78	15.83	5.94	0.22	46.48	16.33	6.11	0.32	46.48
Total Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	16.56	5.79	0.45	47.78	16.95	5.93	0.45	47.78	17.45	6.10	0.63	47.78
Liquid Assets to Assets, 1-Qtr Lag (Pct)	25.53	13.13	1.24	85.10	25.86	13.37	1.24	85.07	26.22	13.66	1.26	83.80
Hot Money to Assets, 1-Qtr Lag (Pct)	5.57	7.94	0.00	93.83	5.20	7.74	0.00	93.83	4.50	7.24	0.00	93.83
Core Deposits to Assets, 1-Qtr Lag (Pct)	72.36	10.83	0.00	102.95	72.72	10.78	0.00	102.95	73.51	10.48	0.00	102.95
Cost of Funds to Liabilities (Pct)	0.74	0.29	0.01	6.50	0.76	0.29	0.01	6.50	0.77	0.28	0.01	6.50
=1 if Cost-of-Funds Above County-Qtr Average	0.49	0.50	0.00	1.00	0.49	0.50	0.00	1.00	0.50	0.50	0.00	1.00
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct)	0.31	0.22	-6.41	3.76	0.32	0.22	-6.41	3.76	0.32	0.23	-6.61	2.44
Before Tax Return-on-Assets (ROA) if Above County Average , 1-Qtr Lag (Pct)	0.24	0.28	-4.06	11.65	0.24	0.28	-4.06	11.65	0.24	0.28	-4.06	11.65
Before Tax Return-on-Assets (ROA) if Below County Average , 1-Qtr Lag (Pct)	0.08	0.31	-18.17	1.09	0.08	0.31	-18.17	1.20	0.08	0.30	-18.17	1.22
=1 if Composite Rating = 3, 1-Qtr Lag	0.07	0.25	0.00	1.00	0.06	0.24	0.00	1.00	0.06	0.24	0.00	1.00
=1 if Composite Rating = 4 or 5, 1-Qtr Lag	0.02	0.15	0.00	1.00	0.02	0.14	0.00	1.00	0.02	0.14	0.00	1.00
Charge-off Rate, 8-Quarter Standard Deviation, 1-Qtr Lag (Pct)	0.12	0.21	0.00	18.50	0.12	0.22	0.00	18.50	0.12	0.22	0.00	18.50
Log Real Assets	11.52	1.16	7.23	20.72	11.38	1.09	7.23	20.37	11.14	0.98	7.23	19.22
Cert Share of County's Deposits (Pct)	12.67	13.76	0.00	99.87	11.91	13.38	0.00	99.87	10.78	12.80	0.00	99.87
Past Due to Assets, 1-Qtr Lag (Pct)	0.93	0.95	0.00	59.89	0.94	0.97	0.00	59.89	0.95	1.00	0.00	59.89
Non-current to Assets, 1-Qtr Lag (Pct)	0.80	1.26	0.00	52.40	0.79	1.25	0.00	52.40	0.77	1.23	0.00	52.40
County Average Cost of Funds (Pct)	0.74	0.26	0.05	3.64	0.76	0.26	0.05	3.64	0.77	0.26	0.07	3.64
County Average Before Tax ROA, 1-Qtr Lag (Pct)	0.31	0.22	-6.41	3.76	0.32	0.22	-6.41	3.76	0.32	0.23	-6.41	2.44
County Unemployment Rate (Pct)	5.48	2.33	0.60	30.60	5.42	2.31	0.60	30.60	5.32	2.29	0.60	30.60
County Credit Card 60 Days DQ Rate (Pct)	2.62	1.23	0.15	15.72	2.62	1.23	0.15	15.72	2.61	1.23	0.16	15.72
County HPI Growth Rate (Pct)	0.22	2.32	-21.32	18.99	0.25	2.28	-21.32	18.99	0.28	2.22	-21.32	18.99
County Total Real Wage Growth Rate (Pct)	0.74	8.93	-50.80	88.20	0.74	8.89	-50.80	88.20	0.75	8.94	-50.80	88.20
County Deposit Share HHI	0.19	0.10	0.03	1.00	0.18	0.10	0.03	1.00	0.18	0.10	0.03	1.00
=1 if Cert Appeared in DealScan	0.05	0.21	0.00	1.00	0.04	0.20	0.00	1.00	0.03	0.16	0.00	1.00
N	443,576				352,566				248,609			

Notes: Observations are defined by bank and quarter. The sample spans 1994 through 2011. Variables are at the bank-level unless otherwise noted. All dollar amounts adjusted to year 2000 Q4 dollars. A county has data for a quarter if there are banks that meet the deposit specific threshold requirement in the quarter.

Table 3: Estimates of Bank Loan Growth, 50 Percent Deposit Threshold

	(1) *Lev*	(2) *Tier1*	(3) *RBC*
=1 if Composite Rating = 3, 1-Qtr Lag	-1.36***	-1.37***	-1.37***
	(0.04)	(0.04)	(0.04)
=1 if Composite Rating = 4 or 5, 1-Qtr Lag	-2.07***	-2.11***	-2.12***
	(0.07)	(0.07)	(0.07)
Capital Ratio, 1-Qtr Lag	0.04***	0.01***	0.01**
	(0.01)	(0.00)	(0.00)
Liquid Assets to Assets, 1-Qtr Lag (Pct)	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
Hot Money to Assets, 1-Qtr Lag (Pct)	-0.02***	-0.03***	-0.03***
	(0.00)	(0.00)	(0.00)
Core Deposits to Assets, 1-Qtr Lag (Pct)	-0.01***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)
Cost of Funds to Liabilities (Pct)	-0.99***	-1.11***	-1.12***
	(0.19)	(0.18)	(0.18)
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct), if Below County Average	-0.04	-0.03	-0.03
	(0.03)	(0.03)	(0.03)
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct), if Above County Average	-0.37***	-0.36***	-0.36***
	(0.04)	(0.04)	(0.04)
Past Due to Assets, 1-Qtr Lag (Pct)	-0.11***	-0.11***	-0.11***
	(0.01)	(0.01)	(0.01)
Non-current to Assets, 1-Qtr Lag (Pct)	-0.37***	-0.37***	-0.37***
	(0.02)	(0.02)	(0.02)
Charge-off Rate Standard Deviation over 8-Qtrs (Pct)	-0.40***	-0.41***	-0.41***
	(0.09)	(0.09)	(0.09)
Log Real Assets	-0.08*	-0.11**	-0.11**
	(0.04)	(0.05)	(0.05)
Cert Share of County Deposits (Pct)	-0.03***	-0.03***	-0.03***
	(0.00)	(0.00)	(0.00)
County Unemployment Rate (Pct)	-0.09***	-0.09***	-0.09***
	(0.01)	(0.01)	(0.01)
County Credit Card 60 Days DQ Rate (Pct)	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)
County HPI Growth Rate (Pct)	0.04***	0.04***	0.04***
	(0.01)	(0.01)	(0.01)
County Total Real Wage Growth Rate (Pct)	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)
County Deposit Share HHI	0.92***	0.93***	0.93***
	(0.28)	(0.29)	(0.28)
County Average Cost of Funds to Liabilities (Pct)	-0.77***	-0.71***	-0.70***
	(0.21)	(0.21)	(0.21)
County Average Before Tax ROA, 1-Qtr Lag (Pct)	0.33***	0.33***	0.33***
	(0.05)	(0.05)	(0.05)
Constant	3.77***	4.61***	4.77***
	(0.57)	(0.58)	(0.58)
Quarterly Fixed Effects	Y	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y	Y
IV (2) Cost-of-Funds Variables with 1-Qtr Lag	Y	Y	Y
Standard Errors Clustered by County	Y	Y	Y
N	443576	443576	443576
R-sq	0.20	0.20	0.20

Notes: Lagged values of individual bank cost of funds and county-average bank cost of funds are used as instruments for contemporaneous individual bank cost of funds and county-average bank cost of funds

Table 4: Estimates of Bank Loan Growth Dropping DealScan Banks (50 percent Threshold)

Leverage Capital Ratio, 1-Qtr Lag (Pct)	0.06***
	(0.01)
Liquid Assets to Assets, 1-Qtr Lag (Pct)	0.03***
	(0.00)
Cost of Funds to Liabilities (Pct)	-1.10***
	(0.18)
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct),	-0.05
if Below County Average	(0.03)
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct),	-0.40***
if Above County Average	(0.04)
=1 if Composite Rating = 3, 1-Qtr Lag	-1.36***
	(0.04)
=1 if Composite Rating = 4 or 5, 1-Qtr Lag	-2.09***
	(0.07)
Past Due to Assets, 1-Qtr Lag (Pct)	-0.11***
	(0.01)
Non-current to Assets, 1-Qtr Lag (Pct)	-0.38***
	(0.02)
Charge-off Rate Standard Deviation over 8-Qtrs (Pct)	-0.37***
	(0.09)
Log Real Assets	-0.11**
	(0.05)
Cert Share of County Deposits (Pct)	-0.03***
	(0.00)
County Unemployment Rate (Pct)	-0.09***
	(0.01)
County Credit Card 60 Days DQ Rate (Pct)	-0.00
	(0.01)
County HPI Growth Rate (Pct)	0.04***
	(0.01)
County Total Real Wage Growth Rate (Pct)	0.01***
	(0.00)
County Deposit Share HHI	0.89***
	(0.29)
County Average Cost of Funds to Liabilities (Pct)	-0.78***
	(0.22)
County Average Before Tax ROA, 1-Qtr Lag (Pct)	0.32***
	(0.05)
Constant	2.92***
	(0.53)
Quarterly Fixed Effects	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y
IV (2) Cost-of-Funds Variables with 1-Qtr Lag	Y
Standard Errors Clustered by County	Y
R-sq	0.20
N	420886

Notes: Lagged values of individual bank costs of funds and county-average bank costs of funds are used as instruments for contemporaneous individual bank cost of funds and county-average bank cost of funds.

Table 5: Alternate Deposit Share Threshold Samples

Share of Deposits in County	*50%*	*75%*	*100%*
Leverage Capital Ratio, 1-Qtr Lag	0.04***	0.05***	0.06***
	(0.01)	(0.01)	(0.01)
Liquid Assets to Assets, 1-Qtr Lag (Pct)	0.03***	0.03***	0.04***
	(0.00)	(0.00)	(0.00)
Hot Money to Assets, 1-Qtr Lag (Pct)	-0.02***	-0.02***	-0.03***
	(0.00)	(0.00)	(0.00)
Core Deposits to Assets, 1-Qtr Lag (Pct)	-0.01***	-0.01***	-0.01**
	(0.00)	(0.00)	(0.00)
Cost of Funds to Liabilities (Pct)	-0.99***	-0.95***	-0.93***
	(0.19)	(0.21)	(0.24)
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct),	-0.04	-0.07**	-0.05
if Below County Average	(0.03)	(0.03)	(0.04)
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct),	-0.37***	-0.41***	-0.35***
if Above County Average	(0.04)	(0.04)	(0.05)
=1 if Composite Rating = 3, 1-Qtr Lag	-1.36***	-1.35***	-1.32***
	(0.04)	(0.05)	(0.05)
=1 if Composite Rating = 4 or 5, 1-Qtr Lag	-2.07***	-2.07***	-2.18***
	(0.07)	(0.08)	(0.09)
Past Due to Assets, 1-Qtr Lag (Pct)	-0.11***	-0.11***	-0.09***
	(0.01)	(0.01)	(0.01)
Non-current to Assets, 1-Qtr Lag (Pct)	-0.37***	-0.37***	-0.33***
	(0.02)	(0.02)	(0.02)
Charge-off Rate Standard Deviation over 8-Qtrs (Pct)	-0.40***	-0.33***	-0.36***
	(0.09)	(0.09)	(0.08)
Log Real Assets	-0.08*	-0.04	0.01
	(0.04)	(0.06)	(0.09)
Cert Share of County Deposits (Pct)	-0.03***	-0.04***	-0.05***
	(0.00)	(0.00)	(0.01)
County Unemployment Rate (Pct)	-0.09***	-0.09***	-0.10***
	(0.01)	(0.01)	(0.01)
County Credit Card 60 Days DQ Rate (Pct)	-0.01	-0.00	-0.00
	(0.01)	(0.02)	(0.02)
County HPI Growth Rate (Pct)	0.04***	0.04***	0.04***
	(0.01)	(0.01)	(0.01)
County Total Real Wage Growth Rate (Pct)	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)
County Deposit Share HHI	0.92***	0.98***	1.01**
	(0.28)	(0.36)	(0.39)
County Average Cost of Funds to Liabilities (Pct)	-0.77***	-0.84***	-0.79***
	(0.21)	(0.25)	(0.28)
County Average Before Tax ROA, 1-Qtr Lag (Pct)	0.33***	0.43***	0.39***
	(0.05)	(0.06)	(0.06)
Constant	3.77***	3.10***	2.07**
	(0.57)	(0.69)	(0.98)
Quarterly Fixed Effects	Y	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y	Y
IV Cost-of-Funds Variables with 1-Qtr Lag	Y	Y	Y
Standard Errors Clustered by County	Y	Y	Y
N	443576	352566	248609
R-sq	0.20	0.20	0.18

Notes: Lagged values of individual bank costs of funds and county-average bank costs of funds are used as instruments for contemporaneous individual bank cost of funds and county-average bank cost of funds

Table 6: Alternative Loan Growth Measures Sample Summary Statistics, At Least Two Sample Banks in Each County, 2001Q3-2011Q4 50 Percent Deposit Threshold

Variable	Mean	Std. Dev.	Min	Max
Quarter-to-Quarter Loan Growth (Pct)	1.1	4.0	-11.3	17.4
Qtr-to-Qtr Loan Growth, Including Unearned Income (Pct)	1.1	4.0	-11.3	17.4
Qtr-to-Qtr Loan Growth, Including Unearned Inc, Unused Commitments, Securities Sold (Pct)	1.0	4.2	-9.8	16.6
Leverage Capital Ratio, 1-Qtr Lag (Pct)	10.0	2.7	0.2	26.1
Tier 1 Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	15.0	5.7	0.3	46.8
Total Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	16.1	5.6	0.6	47.8
Liquid Assets to Assets, 1-Qtr Lag (Pct)	26.2	13.3	1.9	85.1
Hot Money to Assets, 1-Qtr Lag (Pct)	7.0	8.4	0.0	93.8
Core Deposits to Assets, 1-Qtr Lag (Pct)	69.2	11.3	0.0	103.0
Cost of Funds to Liabilities (Pct)	0.6	0.2	0.0	2.2
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct)	0.3	0.4	-18.2	11.6
=1 if Composite Rating = 3, 1-Qtr Lag	0.08	0.27	0	1
=1 if Composite Rating = 4 or 5, 1-Qtr Lag	0.03	0.17	0	1
Charge-off Rate, 8-Quarter Standard Deviation, 1-Qtr Lag (I	0.1	0.2	0.0	18.5
Log Real Assets	11.6	1.2	7.7	20.7
Past Due to Assets, 1-Qtr Lag (Pct)	0.9	1.0	0.0	59.9
Non-current to Assets, 1-Qtr Lag (Pct)	0.9	1.5	0.0	34.0
Cert Share of County's Deposits (Pct)	12.3	13.6	0.0	99.9
County Average Cost of Funds (Pct)	0.6	0.2	0.1	1.3
County Average Before Tax ROA, 1-Qtr Lag (Pct)	0.3	0.3	-6.4	3.8
County Unemployment Rate (Pct)	6.1	2.3	0.9	25.3
County Credit Card 60 Days DQ Rate (Pct)	2.4	1.1	0.2	13.3
County HPI Growth Rate (Pct)	-0.1	2.9	-21.3	17.8
County Total Real Wage Growth Rate (Pct)	0.6	8.9	-46.5	83.0
County Deposit Share HHI	0.2	0.1	0.0	1.0
=1 if Cert Appeared in DealScan	0.05	0.21	0	1
N		227,482		

Table 7: Estimates of Bank Loan Growth, Alternative Loan Growth Measures, 50 Percent Threshold

	(1)	(2)
	LG	**LG ALT**
Leverage Capital Ratio, 1-Qtr Lag	0.11***	0.11***
	(0.01)	(0.01)
Liquid Assets to Assets, 1-Qtr Lag (Pct)	0.05***	0.05***
	(0.00)	(0.00)
Hot Money to Assets, 1-Qtr Lag (Pct)	-0.02***	-0.02***
	(0.00)	(0.00)
Core Deposits to Assets, 1-Qtr Lag (Pct)	-0.01***	-0.01***
	(0.00)	(0.00)
Cost of Funds to Liabilities (Pct)	-1.41***	-1.17***
	(0.23)	(0.25)
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct),	-0.07**	0.01
if Below County Average	(0.03)	(0.03)
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct),	-0.39***	-0.28***
if Above County Average	(0.05)	(0.05)
=1 if Composite Rating = 3, 1-Qtr Lag	-1.53***	-1.55***
	(0.05)	(0.05)
=1 if Composite Rating = 4 or 5, 1-Qtr Lag	-2.48***	-2.43***
	(0.08)	(0.08)
Past Due to Assets, 1-Qtr Lag (Pct)	-0.14***	-0.16***
	(0.01)	(0.01)
Non-current to Assets, 1-Qtr Lag (Pct)	-0.35***	-0.36***
	(0.02)	(0.02)
Charge-off Rate Standard Deviation over 8-Qtrs (Pct)	-0.34***	-0.25***
	(0.10)	(0.08)
Log Real Assets	-0.59***	-0.92***
	(0.08)	(0.09)
Cert Share of County Deposits (Pct)	-0.04***	-0.04***
	(0.01)	(0.01)
County Unemployment Rate (Pct)	-0.11***	-0.09***
	(0.01)	(0.01)
County Credit Card 60 Days DQ Rate (Pct)	0.03	-0.03
	(0.02)	(0.02)
County HPI Growth Rate (Pct)	0.04***	0.05***
	(0.01)	(0.01)
County Total Real Wage Growth Rate (Pct)	0.01***	0.00**
	(0.00)	(0.00)
County Deposit Share HHI	0.08	0.22
	(0.28)	(0.30)
County Average Cost of Funds to Liabilities (Pct)	-0.89***	-1.47***
	(0.30)	(0.30)
County Average Before Tax ROA, 1-Qtr Lag (Pct)	0.34***	0.34***
	(0.05)	(0.06)
Constant	8.99***	12.92***
	(1.00)	(1.06)
Quarterly Fixed Effects	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y
IV (2) Cost-of-Funds Variables with 1-Qtr Lag	Y	Y
Standard Errors Clustered by County	Y	Y
N	227482	227482
R-sq	0.26	0.20

Notes: *LG* is the quarterly growth in bank balance sheet loans gross of provisions. *LG ALT* is the quarterly change in the sum of bank gross balance sheet loans, unused commitments, security sales, and unearned income. Lagged values of individual bank costs of funds and county-average bank costs of funds are used as instruments for contemporaneous individual bank cost of funds and county-average bank cost of funds.

***Highlights (for review)**

- Poor bank exam ratings bring remedial recommendations that may reduce loan growth
- Existing literature discounts the importance of bank examination ratings
- Use large unbalanced panel data, and carefully control for demand variation
- Control for an exhaustive set of bank specific factors
- Find that a poor exam rating significantly reduces a bank's subsequent loan growth