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Does bank supervision impact bank loan growth?

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ABSTRACT

We estimate the impact of a poor bank examination rating on the growth rates of individual bank loan portfolios. We use a novel approach to control for loan demand variation and estimate a fixed-effect model using an unbalanced panel with over 381,000 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, even 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 effect is consistent with the hypothesis that the bank supervision process successfully constrains the lending activities of banks operating in an unsafe and unsound manner.

1. 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 write (Litan and Hawke, 2012):

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, with poorly-rated institutions examined more frequently. Supervisors assess quantitative and qualitative aspects of capital adequacy (C), asset quality (A), bank management control systems and competency (M), earnings (E), liquidity (L), and sensitivity to market and interest rate risks (S), to assign a "CAMELS" rating.[2,3]

Banks that examiners judge to be healthy and well-managed receive a CAMELS 1 or 2 rating, while banks with inadequacies receive a CAMELS rating of 3, 4, or 5. A CAMELS 5 rating is reserved for banks with the most serious safety and soundness issues. Banks assigned CAMELS ratings of 3, 4, or 5 also receive specific examiner guidance on measures that must be taken to improve the safety and soundness of the bank's operations. Should a financial institution fail to meet supervisory expectations, under Prompt Corrective

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[2] See Federal Deposit Insurance Corporation (2016) for further discussion of the bank examination process.

[3] The CAMELS rating system was modified slightly in 1995 to explicitly include 'S,' a sensitivity rating. 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.

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Action guidelines, the supervisor may require a bank to take a wide range of remedial actions.[4] If the institution is unable to rectify identified deficiencies, supervisors can restrict a bank's activities or require investments in new processes, systems and personnel, or, in extreme cases, revoke an institution's charter.

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 or high lending concentrations—supervisory recommendations may restrict loan growth or other bank investment activities until a bank addresses the underlying weakness.

In this paper we seek to quantify the impact of a poor bank supervisory CAMELS rating on a bank's loan growth. Using a novel strategy to control for local economic conditions that impact loan demand, we evaluate the impact of the *level* of a bank examination rating on a bank's loan growth.[5] 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 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.[6] We contribute to the existing literature by directly analyzing the effect of confidential supervisory CAMELS ratings, both strong and weak, on loan growth for the majority of U.S. banks over a long time horizon.

The idea that bank supervision can constrain bank lending is not novel. 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. Despite the paucity of evidence, the efficacy of the bank supervision process is clearly important. It will be difficult to argue that bank examiners are effective monitors if the data fail to show that examiners intervene and restrict the lending of the banks they have identified to be operating in an unsafe and unsound manner.

The most recent study that concludes that supervisory downgrades do not have a negative impact on bank loan growth is Kiser et al. (2015).[7] They evaluate the impact of CAMELS ratings transitions on small business loan growth during the 2008–2010 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, as we detail in Section II.A, this claim cannot be supported by their analysis because their CAMELS downgrade methodology is unable to accurately identify the loan growth impact of a CAMELS downgrade at frequencies higher than the annual data they use in their study.

In our study we use bank total loan growth as our outcome of interest, and explore alternative outcome measures that account for changes in loan commitments and loan securitizations, in addition to balance sheet loans. Our main explanatory variables of interest are dummy variables that measure one-quarter-lagged bank supervisory CAMELS ratings. We used one-quarter lagged CAMELS ratings to assure that we are capturing loan growth subsequent to supervisory examination feedback.[8] Moreover, 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 changes in unobserved bank factors that induce a bank to endogenously reduce loan growth in the current quarter.

We use quarterly 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, while controlling for a comprehensive set of other important bank characteristics. Importantly, 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, as measured by the share of their branch deposits. To be included in our sample, there must be at least two banks that have at least 50 percent of their deposits in a single county in that quarter. This restriction is imposed to ensure that these banks face nearly identical local market demand conditions in a given quarter.[9] As a consequence, for any bank that experiences a low CAMELS rating, there will be at least one other matched bank in the same location as a control. We provide descriptive evidence that shows that our approach to defining our sample produces adequate variation of bank CAMELS ratings within county-quarters. We further control for banks' local market demand conditions by including quarterly dummy variables and multiple quarterly county-level measures of economic activity in our regression model.

In addition to controlling for individual bank examination ratings, 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 time-varying controls include the bank's capital, its average cost of liabilities, past loan portfolio performance, liquidity positions, and past profitability, as well as a measure of the degree

[4] 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.

[5] Our analysis separates the effects of endogenous factors that impact bank loan growth from the impact of constraints imposed by a poor supervisory CAMELS ratings. For example, banks are likely to endogenously slow their lending when economic conditions deteriorate, but they are also more likely to receive a poor CAMELS rating under these conditions as well. Without adequate controls for bank demand variation, a significantly negative estimate associated with a poor CAMELS rating could simply reflect inadequate controls for bank demand variation.

[6] In Section V, we analyze the effect of a ratings downgrade transition in addition to the level effect we document throughout this study.

[7] Other papers that specifically examine the effect of supervisory actions on bank loan growth include Peek and Rosengren (1995b) and Berger et al. (2001).

[8] 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 using our methodology, that decrease in loan growth would be assigned to the CAMELS score of 2, rather than 3. On the upswing, a low-rated CAMELS 4 or 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 or 5 rating in our specification. That we find strong supervisory effects given this potential possible bias underscores the robustness of our results.

[9] 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, few if any very 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 competition in the bank's local market. Besides controlling for these time-varying individual bank factors, we estimate the determinants of bank loan growth using an unbalanced panel regression model that includes bank fixed-effects to control for unobserved time-invariant differences across banks. Our bank fixed-effects specification allows us to measure loan growth variation generated when individual bank characteristics deviate from each individual bank's own long-run sample average values.

Among our bank-specific controls, a bank's supervisory CAMELS rating has by far the greatest impact on the bank's loan growth. Our baseline estimates suggest that, compared to banks with a CAMELS 1 or 2 rating, other things equal, quarterly loan growth at a CAMELS 3-rated bank is 1.22 percentage points lower on average, while quarterly loan growth at a bank with a CAMELS rating of 4 or 5 is 2.04 percentage points lower.[10] Our estimates also suggest that when a bank suffers losses, on average the bank will react by curtailing lending, regardless of its examination rating or its capital and liquidity positions.

The CAMELS supervisory effect on bank loan growth is robust to various sample constraints and alternative loan growth outcomes. We also estimate models that can differentiate between the within-quarter loan growth impact of a CAMELS downgrade versus the impact of continuing loan growth restrictions that accompany a poor CAMELS ratings. We also investigate the time consistency of our results by examining the impact of a poor CAMELS rating during the Great Recession crisis years relative to pre-crisis years. Finally, we explore the possibility that our results are driven by omitted time-varying county controls. All of the evidence and analysis suggests that bank examiners are effective in restricting the lending activity of those banks they consider to be unsafe and unsound.

The remainder of our paper is organized as follows: Section II discusses the 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 Section V explores the robustness of our findings. Section VI concludes the paper.

2. Relevant literature on the determinants of bank loan growth

While relatively few papers have addressed the effect of supervisory ratings on loan growth, a number of studies have explored a myriad of factors that explain the observed variation in individual banks' loan growth. We will discuss these different strands below and use the existing literature to guide the inclusion of our explanatory variables.

2.1. The supervisor monitoring channel

A number of studies focus on systematic variation in the intensity of bank supervisor monitoring.[11] Overall, the literature concludes that the criteria used by bank examiners to categorize an 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.[12]

Three studies, Peek and Rosengren (1995b), Berger et al. (2001), and Kiser et al. (2015) are the most closely related to our work. Peek and Rosengren (1995b), analyze the effect of supervisory interventions for 68 large New England banks over the period 1989–1992. They find that supervisory enforcement actions significantly decreased bank lending compared to banks that were not constrained by a formal supervisory action. They also found that higher bank capital ratios tended to mitigate the negative growth effects associated with enforcement actions. Their estimates suggest that a supervisory enforcement action at a bank with a leverage ratio of 4 percent will reduce bank loans by about 1.4 percentage points the subsequent quarter. The authors 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 et al. (2001) re-examine explanations for weak bank loan growth during the credit crunch period. They 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. While they do not find evidence of harsher supervisory standards during the credit crunch, the authors do find big improvements in bank supervisory ratings over the 1993–1998 period. They attribute the improvement in ratings, at least in part, to a change in the frequency of bank examinations over this period. More frequent examinations alter the composition of the sample toward better-run institutions. Overall, the authors 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 et al. (2015) examine the effect of CAMELS transitions on annual small business loan growth (small commercial and industrial loans and small commercial real estate loans) during the period 2007–2010. They find that CAMELS downgrades to a 3, or to a 4 or 5, has a significantly negative impact on small business lending, and a maintained CAMELS 3, or 4 or 5 rating significantly reduces small business loan growth. However, the authors argue that if there is a true CAMELS ratings effect, then the 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 statistically insignificant, which lead them to conclude, "that the ratings changes themselves did not directly influence small C&I loan growth" (p.20).

However, the empirical methodology used does not appear to be able to support their conclusions. In a regression model that explains annual bank loan growth, Kiser, Prager, and Scott use dummy variables to indicate specific examination ratings transitions during the year when loan growth is measured. The authors then interact these ratings transition dummy variables with a variable that measures the portion of the year over which the CAMELS 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 independent examination rating

[10] For economic interpretation, we compare the magnitude of the CAMELS coefficients to mean loan growth. Evaluated at the sample mean loan growth of 1.3 percent per quarter, loan growth decreases by 93.9 percent for banks with a CAMELS 3 rating and by 157 percent for banks with a CAMELS 4 or 5 rating, relative to a bank with a CAMELS 1 or 2 rating. In contrast, a one standard deviation increase in our next strongest bank-level explanatory variable, cost of funds, yields a decrease in loan growth of 51 percent.

[11] See for example, Peek and Rosengren (1995b), Bergeret al. (2001), Curry et al. (2008), Krainer and Lopez (2009), and Bassett et al. (2012).

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

downgrade effect. However, this interpretation requires knowledge of the quarterly pattern of loan growth over the year—data that is not used by the authors. Our empirical approach takes advantage of quarterly-level data for total bank lending over a much longer sample period in order to credibly identify the level effect of supervision. In addition, we examine the supervisory effect on true total loan growth rather than on only a small subset of a bank's total lending activity.[13]

A specific example will help to clarify the weakness of the Kiser, Prager, and Scott methodology. Assume that a bank's loans were $195 million as of June 30, 2008, $200 million as of December 31, 2009, and back to $195 million at June 30, 2009. On a semiannual basis, from December 2009 to June 2009, loans decreased, but on an annual basis, loans were unchanged from June 30, 2008 to June 30, 2009. Now, suppose that this bank experienced a CAMELS downgrade from 2 to 3 in January 2009. The Kiser, Prager, and Scott methodology identifies this bank as the recipient of a CAMELS downgrade "treatment" (from 2 to 3) for a six month period, but because the methodology measures loan growth between June 2008 and June 2009, it finds no loan growth impact from 6 months of the CAMELS "treatment," even though bank lending actually decreased after the CAMELS downgrade. Because Kiser, Prager, and Scott measure small business loans an annual basis every June, the authors are unable to identify the sequence of the loan decay and supervisory rating downgrades that occur over the course or the year.

2.2. 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.[14] 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.[15] Some studies find that binding or near-binding regulatory 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.[16]

2.3. The credit channel

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.[17] Bank loan rates are typically modeled as a mark-up over bank cost of funds, so the cost of bank funds are an important determinant of bank credit supply.[18] Asymmetric information imperfections tie a bank's funding access and cost to the strength of both banks' and borrowers' balance sheets and the value of collateral.[19] In this literature, monetary policy has two impacts: (1) it changes banks' cost of funds on their rate-sensitive liabilities and these costs 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.[20] The literature finds empirical support for both channels of influence.[21]

2.4. Other factors

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.[22] 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.[23] Competitive conditions in a bank's lending market have also been shown to influence a bank's willingness to extend credit.[24]

A number of forensic studies[25] 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.[26] 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.[27] Overall, this literature suggests that banks' funding mix and the liquidity of its investments influenced bank lending behavior during the crisis.

3. Methodology and data

The purpose of this paper is to estimate the effect of bank supervisory CAMELS ratings on loan growth. An important limitation in empirical studies of bank loan growth is that researchers do not

[13] Evaluating total lending instead of small business lending eliminates from the sample the endogenous shifting of lending portfolio allocations across loan categories when banks react to economic and regulatory conditions.

[14] See for example Bernanke and Lown (1991), Berger and Udell (1994), Hancock and Wilcox (1994), Gambacorta and 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 et al. (2013).

[15] 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.

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

[17] 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 et al. (1995), Kashyap and Stein (1995, 2000). See Oliner and Rudebusch (1996), Ashcraft (2006), and Black et al. (2007) for alternative perspectives.

[18] 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.

[19] 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 et al. (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.

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

[21] 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 et al. (1988), Bernanke and Gertler (1989), Whited (1992), or Hubbard and Glenn (1995).

[22] 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.

[23] See Santos (2011) or Puri et al. (2010).

[24] See, for example, Petersen and Rajan (1995) or Boot and Thakor (2002).

[25] These include Ivashina and Scharfstein (2010), Ashcraft et al. (2010), Cornett et al. (2011), Bord and Santos (2014), and Acharya et al. (forthcoming).

[26] Cornett et al. (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 (2014) 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.

[27] See Ivashina and Scharfstein (2010) or Cornett et al. (2011).

directly observe bank loan supply and loan demand, so they must develop a methodology to identify the individual impacts of supply and demand factors. Our identification strategy is to restrict our sample to peer institutions that operate in a common limited geographic region—in our case, primarily within a single county—and then control for economic factors that produce demand variation in these specific counties.

Our data is comprised of county-quarter observations of the loan growth rates of individual banks that operate primarily in a single county, where that county-quarter also includes at least one other peer institution that shares the single county as its primary market. By examining multiple banks facing the same economic conditions and incorporating county economic control variables, we can isolate and appropriately estimate the impact of different supervisory CAMELS ratings. In Section III, we document that our sample has ample variation in bank supervisory ratings within its included county-quarters to justify this strategy.

3.1. Econometric model

Our baseline regression model specification is:

$$loangrowth_{it} = \alpha_i + \sum_{j=1}^{J}\beta_j Sup_{jit-1} + \gamma Capital_{it-1} + \sum_{k=1}^{K}\eta_k FundCost_{kit} + \sum_{l=1}^{L}\lambda_l AQual_{lit-1} + \sum_{m=1}^{M}\delta_m Liq_{mit-1} + \sum_{n=1}^{N}\kappa_n ROA_{nit-1} + \mu Size_{it-1} + \sum_{p=1}^{P}\nu_p Mkt_{pit-1} + \sum_{q=1}^{T}\rho_q Q_q + \tilde{\varepsilon}_{it} \quad (1)$$

In this 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,[28] *FundCost* denotes bank funding costs, *AQual* refers to measures of bank asset quality, *Liq* refers to liquidity controls, *ROA* is the bank's return on assets, *Size* refers to bank size, *Mkt* represents variables that measure the bank's local market conditions, and Q_q, $\{q = 1, 2, \ldots, T\}$ are T quarterly time dummy variables that control for national conditions that may affect loan growth of all banks within a specific quarter.

The model uses bank fixed-effects to control for time-invariant bank-specific factors that are not explicitly captured by our bank-level controls.[29] 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 between the variable value and the bank's sample average variable value. Using the same notation as in Eq. (1), the bank fixed-effect regression model specification is:

$$\begin{aligned}(loangrowth_{it} - \overline{loangrowth_i}) = {} & \sum_{j=1}^{J}\beta_j(Sup_{jit-1} - \overline{Sup_{ji}}) + \gamma(Capital_{it-1} - \overline{Capital_i}) + \\ & \sum_{k=1}^{K}\eta_k(FundCost_{kit} - \overline{FundCost_{ki}}) + \sum_{l=1}^{L}\lambda_l(AQual_{lit-1} - \overline{AQual_{li}}) + \sum_{m=1}^{M}\delta_m(Liq_{mit-1} - \\ & \overline{Liq_{mi}}) + \sum_{n=1}^{N}\kappa_n(ROA_{nit-1} - \overline{ROA_{ni}}) + \mu(Size_{it-1} - \overline{Size_i}) + \sum_{p=1}^{P}\nu_p(Mkt_{pit} - \overline{Mkt_{pi}}) + \\ & \sum_{q=1}^{T}\rho_q Q_q + \tilde{\varepsilon}_{it}\end{aligned} \quad (2)$$

3.2. Data and sample selection

To estimate the model, we use bank balance sheet and income statement items from quarterly regulatory Reports of Condition and Income (CALL reports) combined with proprietary FDIC examinations rating data, county-level deposit data from the FDIC's annual Summary of Deposits (SOD), and macroeconomic controls from the U.S. Bureau of Labor Statistics, Trendata, and the Case-Shiller Index. We also use bank branch-level data from the FDIC's SOD data to determine local markets. In analyzing the robustness of our estimates, we later use Thomson Reuters LPC DealScan data to identify banks that participated in syndicated lending. Detailed data definitions and sources are listed on Table 1.

Our sample period begins when the FDIC initiated its SOD branch-level coverage in June 1994, and ends in December 2011 before the implementation of regulatory changes resulting from the passage of the Dodd-Frank Act. This sample period includes 680,588 bank-quarter observations of insured commercial and savings banks. Because new banks exhibit very different loan growth and other patterns than established banks, we omit institutions classified by the FDIC as *de novo* banks, or banks seven years old or less during our sample period. This restriction removes 69,136 bank-quarter observations.[30] Further, we omit specialty lenders, foreign lenders, and lenders whose data is missing a county identifier. After these restrictions, 567,161 bank-quarter observations remain.

Next, we use SOD data as a proxy for the location of a bank's lending activities. 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 that the distance between the bor-

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

[29] 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.

[57] Reports of Condition and Income.

[58] FDIC annualizes by multiplying quarterly figures by 4.

[59] 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 intermediate 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.)

[60] We access the Case Shiller Index via Moody's Analytic's Data Buffet. The file covers 456 county fips codes.

[61] With a correctly specified model, we expect this coefficient to be insignificantly different from 0.

[30] See, for example, DeYoung (1999) and Lee and Yom (2016).

Table 1
Variable Definitions.

Variable Name	Variable Definition	Variable Name	Source	Anticipated Sign
Loan Growth				
Quarter-to-Quarter Loan Growth (Pct)	100*Quarterly bank-level growth in balance sheet Gross Loans and Leases adjusted for Unearned Income during period *t*	LNLSGR	CALL[57]	
Quarter-to-Quarter Loan Growth including Unused Commitments (Pct)	100*Quarterly bank-level growth in (balance sheet Gross Loans and Leases adjusted for Unearned Income + Unused Commitments) during period *t*	LNLSGR + UCLN	CALL	
Quarter-to-Quarter Loan Growth including Various Other Credit (Pct)	100*Quarterly bank-level growth in (loans and leases including unearned income + Unused Commitments + Securities Sold) during period *t*	LNLS + UCLN + SZLNTOT	CALL	
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	–
= 1 if Composite CAMELS Rating Transitioned from 1 or 2, to 3, in Qtr	Indicator that CAMELS at *t-1* was a 1 or 2 but CAMELS was downgraded to a 3 during period *t*		FDIC Proprietary	–
= 1 if Composite CAMELS Rating Transitioned from 1 or 2, to 4 or 5, in Qtr	Indicator that CAMELS at *t-1* was a 1 or 2 but CAMELS was downgraded to a 4 or 5 during period *t*		FDIC Proprietary	–
= 1 if Composite CAMELS Rating Transitioned from 3, to 4 or 5, in Qtr	Indicator that CAMELS at *t-1* was a 3 but CAMELS was downgraded to a 4 or 5 during period *t*		FDIC Proprietary	–
Regulatory Capital				
Leverage Capital Ratio, 1-Qtr Lag (Pct)	(100*Tier 1 Capital)/(Average Total Assets − Disallowed Intangibles)	RBCT1/ AVASSETJ	CALL	+/–
Tier 1 Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	(100* Tier 1 Capital)/Total Risk-Weighted Assets	RBCT1J/ RWAJ	CALL	+/–
Total Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	(100*Total Risk-Based Capital)/Total Risk-Weighted Assets	RBC/ RWAJ	CALL	+/–
Funding Cost				
Cost of Funds to Interest Earning Assets (Pct)	100*Total Interest Expense/Total Interest-Earning Assets	EINTEXP/ ERNAST	CALL	–
Asset Quality				
Past Due to Assets, 1-Qtr Lag (Pct)	100*Total Assets Past Due 30 through 89 days and still accruing interest/Total Assets	P3LNLS/ ASSET	CALL	–
Non-Current to Assets, 1-Qtr Lag (Pct)	100*Total Loans and Lease Financing Receivables 90 days or more past due and nonaccrual/Total Assets	NCLNLS/ ASSET	CALL	–
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	NTLNLSQ/ LNLSGR	CALL	–
Liquidity				
Liquid Assets to Assets, 1-Qtr Lag (Pct)	100*(Total Cash & Balances Due from Depository Institutions + Federal Funds Sold & Securities Purchased Under Agreement to Re-Sell + Securities Available for Sale)/Total Assets	(CHBAL+ FREPO+ SCAF)/ ASSET	CALL	+
Hot Money to Assets, 1-Qtr Lag (Pct)	100*(Purchased Federal Funds and Repo Agreements + Brokered Deposits over deposit insurance limit that mature in less than one year + Interest-Bearing Foreign Deposits + Non-Interest-Bearing Foreign Deposits + Trading Liabilities + Other Borrowed Money)/Total Assets	(FREPP+BROLG1YR+DEPIFOR+ DEPNIFOR+ TRADEL +OTHBOR)/ASSET	CALL	–
Core Deposits to Assets, 1-Qtr Lag (Pct)	100*Core Deposits/Total Assets	COREDEP/ ASSET	CALL	+
ROA				

Table 1 (*Continued*)

Variable Name	Variable Definition	Variable Name	Source	Anticipated Sign
Before Tax Return-on-Assets (ROA), 1-Qtr Lag (Pct)	100*De-Annualized Pre-Tax Net Income[58]/Assets	(NETIBXQA/4)/ASSET	CALL	+
=1 if ROA before tax < County Average, 1-Qtr Lag	Indicator that bank ROA is less than county-quarter average ROA		CALL	+
Size				
Log Real Assets, 1-Qtr Lag	Log of bank's Total Assets measured in thousands of constant 2000 dollars	ASSET	CALL	
Local Market				
Cert Share of County's Deposits (Pct)	100*Share of bank's deposits in county as percentage of all deposits in that county		SOD[59]	
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 Shiller Index[60]	+
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	+
County Unemployment Rate (Pct)	County Unemployment rate		US BLS	–
Average County Cost of Funds to Interest Earning Assets (Pct)	County-wide average cost of funds for sample banks		CALL	–
=1 if Cert Appeared in DealScan	Indicator that bank appeared on DealScan as a lender in any role		DealScan	
=1 if Any Bank in County Downgraded in Quarter	Indicator that at least one bank within the county had their CAMELS downgraded in the period *t-1*		FDIC Proprietary	0[61]

rower and its local bank branch is an important factor explaining bank lending patterns.[31,32] Using SOD data, we identify banks that have at least fifty percent of their deposits in one county and we include only these institutions in the sample (we later consider alternative, higher, deposit thresholds).

The FDIC SOD data provides an annual June 30 "snapshot" of each institution's deposit-taking activity at the bank branch-level. Using branch data, we calculate the fraction of the bank's total deposits in each county. Absent a merger, for each intervening quarter between annual data releases, we assume a bank's deposits are spread across each of its active counties in the same proportion as observed in the most recent SOD release. If we find from the FDIC's Research Information System (RIS) warehouse that there is a merger, we merger-adjust each involved bank's county-level deposit shares by aggregating to the acquiring institution the county-level and bank-level deposits across all acquired institutions for each quarter between the merger and the next June SOD collection.[33] With these synthetic bank-county deposits, we retain only the institutions that had at least 50 percent of their deposits in a given county. This restriction resulted in a sample of 519,683 quarterly observations. We then retain only bank-quarter observations for which there is a peer bank which also has at least fifty percent of its deposits in that same county in that quarter. This additional peer restriction leaves 468,412 observations in the sample.

Next we add bank-specific control variables from CALL reports and supervisory ratings from proprietary FDIC data. Following that, we add in macroeconomic controls. We omit observations with missing variables and implausible variable values. We consider variables having implausible values if, for example, liquid assets or core deposits as a proportion of assets is negative, or core deposits as a proportion of assets exceeds 100 percent. These additional filters reduce the sample to 460,325 bank-quarter observations. These observations include 12,192 unique banks and 2222 unique counties. On average, the sample has 4.06 banks per county-quarter.

We further edit the sample to exclude bank-quarter observations with negative capital ratios or negative cost of funds, and capital ratios or cost of funds values exceeding their respective 95th population percentiles.[34] Following the practices of the FDIC's Uniform Bank Performance Report, we exclude bank-quarter observations with loan growth values in the upper and lower five percent tails of the quarterly loan growth population distribution.[35] After

[31] See for example Petersen and Rajan (1994, 2002), Cole et al. (1996), Boot (1999), Berlin and Mester (1999), Cole et al. (2004), Avery and Samolyk (2004), Dahiya et al. (2003), Elyasiani and Goldberg (2004), Heitfield and Prager (2004), DeYoung et al. (2008), and Brevoort et al. (2010).

[32] Still, 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. We address this issue along with other robustness measures in Section V.B.

[33] The vast majority of observations were not involved in any acquisitions. In our final sample of 381,867 observations, there were 2499 bank-quarter observations where at least one acquisition took place, involving 3285 acquired banks.

[34] Without these restrictions, leverage capital, Tier 1 risk-based capital, and total risk-based capital would span up to 90%, 100%, and 102%, respectively, while Cost of Funds would range to 892%. Summary statistics presented on Table 2A shows that trimming the upper bound of these values to the 95th percentile still leaves a tremendous range in the capital and cost of funds values.

[35] It is common to exclude outliers in studies using CALL report data. 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. Cornett et al. (2011) exclude bank observations with change in assets in excess of 10 percent per quarter as a mechanism to identify mergers. Even with our trimming of merger-adjusted values, the maximum quarterly loan growth

imposing these edits, we then exclude bank-quarter observations that lack a peer institution in the county-quarter as a result of the edits. Our final baseline sample includes 381,867 bank-quarter observations, made up of 11,803 unique banks and 2181 unique counties, with an average of 3.8 banks per county-quarter.

3.3. Dependent variable

We estimate quarterly loan growth as the change in value of bank-level total loans and leases from last quarter to the current quarter divided by the last quarter's value and express it as a percentage. As for all our included variables, except for the CAMELS indicators, we merger-adjust our observations and measure all variables in constant 2000 dollars. The details of our merger adjustment procedure appear in the Appendix.

Table 2A Panel A presents summary statistics for our baseline sample that uses a 50 percent SOD deposit threshold. Our sample quarterly loan growth ranges from −11.34 percent to 18.71 percent and has a mean value of 1.30 percent. For later robustness analysis, Panels B and C of Table 2A present summary statistics for alternate samples that impose a higher single-county deposit threshold of at least 75 or 100 percent of the bank's deposits are in one county, respectively.

3.4. Key independent variables: CAMELS ratings

Our key variables of interest are two dummy variables that indicate whether a bank's supervisory rating is a CAMELS 3 or a CAMELS 4 or 5. At the conclusion of an onsite examination, supervisors assign a bank a CAMELS grade of 1–5. A 1-rating is the strongest, and a 5-rating is the weakest. A CAMELS 5 rating represents an institution with serious safety and soundness deficiencies. A bank receiving a CAMELS rating of 3, 4 or 5 is also normally required to abide by an informal memorandum of understanding and sometimes a more formal cease and desist order. These supervisory actions typically require a bank to improve its underwriting standards, its risk management processes, or raise regulatory capital above minimum required levels. In many cases, the supervisory constraints associated with a poor CAMELS rating will affect a bank's ability to grow its loan portfolio. We expect, therefore, that a CAMELS ratings of 3 or a rating of 4 or 5, to be associated with reduced bank loan growth.

To account for the implications of a poor supervisory rating, we utilize confidential FDIC supervisory data on banks' composite CAMELS ratings. Specifically, for each bank, the CAMELS dummy variables reflect the most recent supervisor CAMELS rating available at the end of the prior quarter.[36] In the case of a merger during the prior quarter, we adopt the acquiring institution's CAMELS rating, since in the overwhelming majority of cases, the acquirer has an equal or better CAMELS rating than the target.[37] Table 2A shows that a small percentage our sample banks experienced a low CAMELS rating. Only 6 percent of our baseline bank-quarter observations had a CAMELS rating of 3, and only 2 percent had a CAMELS rating of 4 or 5.

We achieve identification through analyzing multiple bank observations per county-quarter, so it is important that CAMELS ratings do not move in lock step across banks within a county. Table 2B shows summary statistics for our baseline sample by county-quarter, rather than by bank-quarter. Panel A shows that, of the unique 100,547 county-quarter combinations represented in our baseline sample, on average, 5.46 percent of the banks in each county were rated CAMELS 3 and 1.31 percent were rated 4 or 5. Further, if we consider only the county-quarters where at least one bank has a CAMELS rating of 3, we see from Panel B that these counties had, on average, 5.99 sample banks per county-quarter, as compared to 3.8 banks for the whole sample.

Table 2B panel B also shows that, if at least one bank in the county has a CAMELS rating of 3, on average 33.34 percent of the sample banks in the county also have a CAMELS rating of 3, and 2.86 percent of the sample banks in the county have a CAMELS rating of 4 or 5. Taken together, this means that if at least one sample bank in the county had a CAMELS 3-rating, then over those quarters, on average 36 percent of the banks in these counties were low-rated, while about two-thirds of the sample banks in those county-quarters were healthy. Table 2B Panel C shows that a similar pattern holds when we evaluate only counties with at least one CAMELS 4 or 5-rated bank. Thus, our methodology of evaluating loan growth in banks that operate primarily in one county also captures variation in bank supervisory ratings across banks.

3.5. Other independent variables

Other variables that can affect a bank's ability to grow loans, and including variables that may be simultaneously correlated with a bank's CAMELS rating, are included in our estimations and presented in the remainder of Table 2A.[38] For example, a bank's capital adequacy may influence loan growth but capital adequacy is also a key component of a CAMELS rating, and therefore it must be included in our model specification. We consider the three different capital adequacy measures: Leverage, Tier 1 and total risk-based capital ratios. Leverage capital ranges from 21 basis points to 25.97 percent and averages 9.89 percent. Tier 1 and total risk-based capital are much higher, on average, with mean values of 15.71 percent and 16.83 percent, respectively. Their ranges span from less than one percent to over 46 percent.

Minimum regulatory standards for bank capital and liquidity requirements are fixed for our sample period.[39] Thus, 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.

The expected sign of the coefficient on bank regulatory capital measures is not uniquely determined by economic theory. Higher capital compared to the bank's long-run average could reflect a temporary shift in the bank's risk appetite and proxy for stricter underwriting standards and a reduction in the bank's willingness to lend. Alternatively, credit crunch theories argue that binding or

in our sample is 18.71%; nonetheless, we consider alternative, less restrictive, levels of trimming in Section V.E.

[36] In Section V, we estimate the loan growth impact of a CAMELS transitions during the quarter in which a bank receives a supervisory ratings change.

[37] Of the 3285 banks acquired by our sample institutions, there were historic CAMELS data available for 3124. Using our three buckets of 1 or 2-rated, 3-rated, or 4 or 5-rated, 98.5 percent of these acquired banks were absorbed by equally- or higher-rated institutions.

[38] Of the 18 correlation coefficients between each CAMELS dummy and the remaining independent variables, 14 have an absolute value less than 10 percent. Almost all variables have a correlation below an absolute value of 20 percent. The exceptions for the CAMELS 4 or 5 dummy are the share of non-current loans, standard deviation of charge-offs, and ROA, which have correlations of 35.99 percent, 25.91 percent, and −21.92 percent, respectively. The exception for the CAMELS 3 dummy is the share of non-current loans, which has a correlation of 21.60 percent.

[39] 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.

Table 2A
Summary Statistics, Bank-Quarter Level, 1994 Q3 to 2011 Q4, Banks with at Least One Other Sample Bank in Same County-Quarter.

	A. 50% of Deposits in County				B. 75% of Deposits in County				C. 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)	1.30	3.76	−11.34	18.71	1.31	3.78	−11.34	18.71	1.33	3.85	−11.32	18.71
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag	0.06	0.23	0.00	1.00	0.05	0.23	0.00	1.00	0.05	0.22	0.00	1.00
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag	0.02	0.12	0.00	1.00	0.02	0.12	0.00	1.00	0.01	0.12	0.00	1.00
Leverage Capital Ratio, 1-Qtr Lag (Pct)	9.89	2.66	0.21	25.97	10.04	2.72	0.21	25.97	10.25	2.79	0.51	25.97
Tier 1 Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	15.71	5.92	0.28	46.78	16.13	6.05	0.28	46.48	16.51	6.07	0.79	46.48
Total Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	16.83	5.90	0.56	47.78	17.26	6.04	0.56	47.78	17.64	6.07	1.59	47.78
Past Due to Assets, 1-Qtr Lag (Pct)	0.92	0.91	0.00	59.89	0.93	0.93	0.00	59.89	0.93	0.93	0.00	59.89
Non-Current to Assets, 1-Qtr Lag (Pct)	0.77	1.10	0.00	51.73	0.76	1.09	0.00	51.73	0.73	1.07	0.00	51.73
Charge-off Rate, 8-Quarter Standard Deviation, 1-Qtr Lag (Pct)	0.11	0.21	0.00	18.50	0.12	0.21	0.00	18.50	0.12	0.21	0.00	18.50
Liquid Assets to Total Assets, 1-Qtr Lag (Pct)	26.10	13.41	0.01	97.21	26.52	13.67	0.01	97.21	27.70	13.87	0.01	97.21
Hot Money to Total Assets, 1-Qtr Lag (Pct)	5.29	7.47	0.00	93.81	4.92	7.31	0.00	93.81	4.09	6.57	0.00	93.81
Core Deposits to Total Assets, 1-Qtr Lag (Pct)	72.91	10.22	0.00	97.52	73.30	10.14	0.00	97.52	74.29	9.60	0.00	96.29
Cost of Funds, (Pct)	1.77	1.05	0.00	4.92	1.80	1.06	0.00	4.92	1.80	1.04	0.00	4.92
Cost of Funds, 1-Qtr Lag (Pct)	1.77	1.04	0.00	4.92	1.79	1.04	0.00	4.92	1.79	1.04	0.00	4.91
ROA Before Tax, 1-Qtr Lag (Pct)	0.34	0.33	−18.17	11.65	0.34	0.33	−18.17	11.65	0.35	0.32	−18.17	11.65
=1 if ROA Before Tax < County Average, 1-Qtr Lag	0.49	0.50	0.00	1.00	0.48	0.50	0.00	1.00	0.47	0.50	0.00	1.00
Log Real Assets, 1-Qtr Lag	11.51	1.17	7.23	20.72	11.37	1.12	7.23	20.32	11.09	1.00	7.23	19.17
Cert Share of County's Deposits, 1-Qtr Lag (Pct)	13.28	13.86	0.00	96.02	12.53	13.49	0.00	96.02	11.68	13.04	0.00	96.02
County Credit Card 60 days Delinquency Rate, 1-Qtr Lag (Pct)	2.61	1.24	0.00	13.50	2.61	1.23	0.00	13.50	2.56	1.24	0.00	13.50
County HPI Growth Rate (Pct)	0.30	2.15	−21.32	18.99	0.32	2.09	−21.32	18.99	0.34	2.05	−21.32	18.99
County Total Real Wage Growth Rate (Pct)	0.93	9.03	−61.83	158.87	0.93	9.01	−61.83	158.87	0.96	9.15	−61.83	158.87
County Deposit Share HHI, 1-Qtr Lag	0.19	0.10	0.03	0.93	0.18	0.10	0.03	0.93	0.18	0.10	0.03	0.93
County Unemployment Rate, 1-Qtr Lag (Pct)	5.39	2.30	0.60	31.90	5.33	2.27	0.60	31.90	5.20	2.25	0.60	31.90
Average County Cost of Funds (Pct)	1.82	1.04	0.09	5.66	1.85	1.04	0.09	5.66	1.88	1.04	0.09	5.66
Average County Cost of Funds, 1-Qtr Lag (Pct)	1.82	1.04	0.09	7.90	1.85	1.04	0.09	7.90	1.87	1.05	0.09	7.90
=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
	381,867				***300,938***				***194,777***			

Notes: Observations are defined by bank and quarter; variables are at the bank level unless otherwise noted. The sample is trimmed of observations where Leverage Capital or Cost of Funds values are negative or greater than the 95th percentile population values for the quarter, or where Loan Growth values are at the top or bottom 5 percent of population tail values for the quarter. All dollar amounts are adjusted to year 2000 Q4 dollars. A county is included for the quarter only if there are at least two banks with a share of their deposits in the county-quarter of at least the specified deposit threshold.

Table 2B
Summary Statistics, County-Quarter Level, 1994 Q3 to 2011 Q4, 50 Percent Deposit Threshold, Counties with at Least Two Sample Banks.

Variable	N (County-Qtr)	Mean	Std. Dev.	Min	Max
A. All County-Quarters					
Number of Certs per County-Quarter	100,547	3.80	4.42	2.00	148.00
Share of Certs in County CAMELS 3 Rated, Last Qtr (Pct)		5.46	14.38	0.00	100.00
Share of Certs in County CAMELS 4/5 Rated, Last Qtr (Pct)		1.31	7.32	0.00	100.00
=1 if Any Cert in County Experienced a CAMELS Downgrade Transition		0.03	0.17	0.00	1.00
B. County-Quarters with at Least One CAMELS 3-Rated Bank					
Number of Certs per County-Quarter, County has At Least One CAMELS 3 Rated Bank	16,466	5.99	9.26	2.00	148.00
Share of Certs in County CAMELS 3 Rated, Last Qtr (Pct)		33.34	18.26	1.42	100.00
Share of Certs in County CAMELS 4/5 Rated, Last Qtr (Pct)		2.86	9.51	0.00	80.00
=1 if Any Cert in County Experienced a CAMELS Downgrade Transition		0.08	0.26	0.00	1.00
C. County-Quarters with at Least One CAMELS 4- or 5-Rated Bank					
Number of Certs per County-Quarter, County has At Least One CAMELS 4/5 Rated Bank	4267	7.78	13.23	2.00	148.00
Share of Certs in County CAMELS 3 Rated, Last Qtr (Pct)		12.50	17.41	0.00	83.33
Share of Certs in County CAMELS 4/5 Rated, Last Qtr (Pct)		30.95	18.58	0.68	100.00
=1 if Any Cert in County Experienced a CAMELS Downgrade Transition		0.11	0.31	0.00	1.00
Number of Unique Certs	11,803				
Number of Unique Counties	2181				

Notes: Observations are defined by county and quarter, for the sample where an included bank has at least 50 percent of its deposits in the county, and there are least two such banks in the county. Essentially, the sample with 381,867 bank-quarter observations shown on Table 2A, Panel A, is aggregated to the county-quarter level.

near-binding regulatory capital requirements may constrain the lending growth of weakly-capitalized banks, but have little or no effect on well-capitalized institutions. If low capital is a constraint on bank lending growth, bank deviations from its long-run regulatory capital position should be positively related to loan growth.

The credit channel literature predicts a negative relationship between banks' average cost of funds 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 each bank's specific average cost of liabilities as well as the average cost of bank liabilities in its local market as separate determinants of bank credit.

This credit channel effect of cost of bank funds is contemporaneous—a bank's need for funding is determined jointly with its loan growth. Further, loan growth itself can affect

the cost of funding if a bank faces an upward sloping supply of funds schedule in its local market. In light of this endogeneity, we instrument for bank-specific and county average cost of funds using a lagged value for each variable. Bank-specific cost of funds ranges from 0 to 4.92 percent and averages 1.77 percent.

Prior research has also 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. We also include the eight-quarter standard deviation of charge-offs as a control variable to capture variability in the bank's defunct assets.[40] We ensure that we merger-adjust each of the eight quarters to accurately portray this variation. On average, past due assets account for 92 basis points of a sample bank's assets, and non-current assets account for 77 basis points. These variables exhibit extensive variation, as they range from 0 to over 50 percent. The average standard deviation of charge-offs is 11 basis points, but it ranges to as high as 18.50 percent.

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 (retail) deposits to assets.[41] 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 occasionally be forced to curtail lending and sell assets to manage negative liquidity shocks. Both effects suggest a positive liquidity coefficient.

Hot money measures the importance of the portion of bank liabilities that may run should investors lose confidence in the bank. Excessive 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.[42] Table 2A Panel A shows that our sample banks hold an average of 26 percent of their assets as liquid assets, and fund 5.29 percent of their assets using hot money, and 72.91 percent using core deposits. Again, these numbers show tremendous variation, ranging from 0 to over 93 percent.

The literature also suggests 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 a bank 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 complex ROA effects associated with strategic underwriting behavior, we include two ROA factors: bank-specific ROA and an indicator of whether the bank's ROA is below the county population average ROA. Table 2A Panel A shows that ROA averages 34 basis points per quarter and ranges from −18.17 to 11.65 percent. On average, 49 percent of our sample banks have ROAs that are below their county population averages.

We include two final bank-specific controls. One is the log of the bank's total assets, where assets are measured in thousands of constant 2000 dollars. Our sample has an average asset size of $99,322,757.[43] To measure an individual bank's potential market power, we also estimate and include each bank's share of the county's total deposits in the county-quarter.

For each county-quarter in our sample we include quarterly dummy variables to control for macroeconomic factors that impact all banks in the sample. We also calculate county-level Herfindahl-Hirschman indices (HHI) for deposits as a measure of competition in the local bank market.,[44] Our county-level controls for local bank loan demand include the percentage of credit card accounts more than 60 days delinquent (from Trendata), house price growth rates (calculated using the Case Shiller index)[45] total real wage growth (from the U.S. Bureau of Labor Statistics), and the unemployment rate. For counties without reported house price index values, we substitute state-level values.

4. Main results

Our baseline model uses the sample of banks that have at least 50 percent of their deposits in one county and at least two sample banks in each county-quarter. The estimation results are presented in Table 3. The estimates reported are the second stage regression results where contemporaneous cost of funds and county average cost of funds are first instrumented for using their lagged values, and bank fixed-effects are estimated using the "within" method.[46] Three different regression specifications are presented, each using a different regulatory capital measure: The leverage ratio, the Tier 1 capital ratio, or the total risk-based capital ratio. The three specifications produce quantitatively and qualitatively similar coefficient estimates. Regression standard errors are clustered at the county level.

Across the three regressions, elevated CAMELS ratings have a strong and significantly negative effect on loan growth. Specifically, on average, having a CAMELS rating of 3 decreases quarterly loan growth by 1.22 percent, and having a CAMELS rating of 4 or 5 decreases loan growth by 2.04 percent.[47] Both estimates are statistically significant at the one percent level.[48] When we compare

[40] We require that our banks have more than seven years of historical financial data through our *de novo* exclusion.

[41] 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.

[42] See Ivashina and Scharfstein (2010) or Cornett et al. (2011).

[43] Our mean log of real assets is 11.50613, and e$\hat{1}$1.50613 = 99,322.7572 (measured in thousands). In Section V.B we eliminate lenders that are active in syndicated lending, as reflected by DealScan. This exclusion also removes from the sample any large banks that may be present initially.

[44] 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.

[45] We use the Case Shiller Index accessed via Moody's Analytics' Data Buffet. This index covers 456 counties.

[46] Both bank-specific and county-average costs of funds are determined by bank conditions at the time of measurement. Therefore, the lagged values of each cost of funds should not affect the current value of cost of funds. Our specifications yield just-identified models, for which we test instrument validity using the first stage's F-test. The model predicting bank-specific cost of funds has an *F*-statistic of 31,959, which has a p-value of 0.0000, while the model predicting county-average cost of funds has an *F*-statistic of 111,265, which also has a p-value of 0.0000. Thus, we have evidence that our instruments are valid.

[47] Evaluating these effects at the sample mean value for quarterly loan growth of 1.30 percent implies that, relative to a CAMELS 1- or 2-rated bank, having a CAMELS 3-rating decreases loan growth by 93.9 percent, and having a CAMELS 4 or 5 rating decreases loan growth by 157 percent.

[48] 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.

Table 3
Estimates of Bank Loan Growth, Alternate Capital Ratios, 50 Percent Deposit Threshold.

	(1)	(2)	(3)
	Leverage	*Tier1*	*RBC*
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag	−1.22***	−1.22***	−1.22***
	(0.04)	(0.04)	(0.04)
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag	−2.04***	−2.00***	−2.00***
	(0.08)	(0.07)	(0.07)
Capital Ratio, 1-Qtr Lag (Pct)	−0.06***	−0.02***	−0.02***
	(0.01)	(0.00)	(0.00)
Past Due to Assets, 1-Qtr Lag (Pct)	−0.07***	−0.07***	−0.07***
	(0.01)	(0.01)	(0.01)
Non-Current to Assets, 1-Qtr Lag (Pct)	−0.36***	−0.37***	−0.37***
	(0.01)	(0.01)	(0.01)
Charge-off Rate, 8-Quarter Standard Deviation, 1-Qtr Lag (Pct)	−0.37***	−0.36***	−0.35***
	(0.09)	(0.09)	(0.09)
Liquid Assets to Total Assets, 1-Qtr Lag (Pct)	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
Hot Money to Total Assets, 1-Qtr Lag (Pct)	−0.02***	−0.01***	−0.01***
	(0.00)	(0.00)	(0.00)
Core Deposits to Total Assets, 1-Qtr Lag (Pct)	−0.01***	−0.01***	−0.01***
	(0.00)	(0.00)	(0.00)
Cost of Funds to Interest Earning Assets (Pct)	−0.63***	−0.56***	−0.57***
	(0.16)	(0.16)	(0.16)
ROA before tax, 1-Qtr Lag (Pct)	0.09***	0.07**	0.07**
	(0.03)	(0.03)	(0.03)
=1 if ROA before tax < County Average, 1-Qtr Lag	0.08***	0.08***	0.08***
	(0.02)	(0.02)	(0.02)
Log Real Assets, 1-Qtr Lag	−0.28***	−0.27***	−0.27***
	(0.05)	(0.05)	(0.05)
Cert Share of County's Deposits, 1-Qtr Lag (Pct)	−0.03***	−0.02***	−0.02***
	(0.00)	(0.00)	(0.00)
County Credit Card 60 days Delinquency Rate, 1-Qtr Lag (Pct)	−0.04***	−0.04***	−0.04***
	(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)	0.02***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)
County Deposit Share HHI, 1-Qtr Lag	0.54**	0.53**	0.53**
	(0.23)	(0.23)	(0.23)
County Unemployment Rate, 1-Qtr Lag (Pct)	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)
Average County Cost of Funds to Interest Earning Assets (Pct)	−0.90***	−0.91***	−0.91***
	(0.18)	(0.18)	(0.18)
Quarter Fixed Effects	Y	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y	Y
Standard Errors Clustered By County	Y	Y	Y
N	381,867	381,867	381,867
R-sq	0.19	0.19	0.19

Notes: Contemporanous individual bank cost of funds to interest earning assets and county average bank cost of funds to interest earning assets are instrumented for using one quarter-lagged values of these same variables. Standard errors clustered on county are in parentheses. * indicates the estimate is significantly different than zero at the 10 percent level; ** five percent; *** one percent. See Table 2A for additional notes.

the magnitude of the CAMELS effects estimates to a one standard deviation increase in the mean values of the other bank-level control variables, we find that, by far, CAMELS ratings have the largest economic impact on loan growth.

In contrast, capital, regardless of measure, has a statistically significant, but economically small impact on loan growth. For every one percentage point increase in a bank's leverage capital ratio from its mean, bank loan growth decreases by 6 basis points, on average. A one standard deviation increase in the leverage ratio (2.66 percentage points) will result in a negative impact on average loan growth of 16 basis points. Evaluated relative to the sample mean loan growth rate of 1.3 percent, this impact translates into a 12.3 percent decrease in the average bank's loan growth rate.

Our capital coefficient estimates are opposite in sign to what we expect under the credit crunch hypothesis. To us, these estimates suggest that, in many instances, bank capital is only indirectly linked to loan growth. Capital may be acting like a proxy for other strategic bank operating decisions that are taken to manage banks' loan risk profiles. For example, our coefficient sign could indicate that many banks temporarily increase their capital ratios at the same time they temporarily strengthen their loan underwriting standards or undertake other unmeasured decisions to temporarily limit the pace of loan their growth. While this explanation is merely speculative, the sign of bank capital in our regression estimates is not critically important for purposes of our analysis. Regardless of the sign of the capital coefficient estimate, we need to retain a capital measure in our estimations, since a bank's capital level should be correlated with its CAMELS ratings.

Because the leverage ratio has the largest economic impact of the three capital ratios, we will continue to use that ratio as our capital control in all remaining estimations. Going forward, for the remainder of the paper, we will consider the estimation results presented in Table 3 Column 1 to be our 'baseline' estimates to which robustness results will be compared.

A bank's cost of funding has both a statistically and economically significant effect on loan growth. In terms of economic importance, its impact is second following CAMELS rating controls. A one percentage point increase in bank cost of funds decreases loan

growth by 63 basis points, on average, while a one percentage point increase in county average cost of funds decreases loan growth by 90 basis points. Evaluated at the sample mean loan growth rate, a one standard deviation increase in cost of funds decreases the average loan growth rate by 51 percent, while a one standard deviation increase in county average cost of funds reduces loan growth rates by 71.8 percent. These effects are large but still less than the effect of a CAMELS rating of a 3 or of a CAMELS 4 or 5 rating

Consistent with the existing literature, poor performance of a bank's existing loan portfolio is associated with lower subsequent loan growth. Again, these effects are statistically significant, but economically smaller than the impact of a poor CAMELS rating. A one percentage point increase from the sample mean of banks' past due loans-to-assets, non-current loans-to-assets, and the charge off rate 8-quarter standard deviation, results in predicted decreases in the sample average loan growth by 7, 36, and 37 basis points, respectively. A one standard deviation increase in these variables, evaluated at the sample mean loan growth rate would decrease the average loan growth rate by 4.9, 30.6, and 5.9 percent, respectively. Among our set of loan performance controls, non-current loans-to-assets has the strongest economic effect, but this effect still only has about one-third the impact of a CAMELS 3-rating, and one-fifth the impact of a being rated a CAMELS 4 or 5.

Our regression estimates suggest that bank liquidity has a statistically significant effect on loan growth, but in terms of economic importance, these effects are minor. On average, a one percentage point increase in a bank's liquid-to-total-asset ratio is associated with a 3 basis points increase in its subsequent quarterly loan growth, while one percentage point increases in a bank's hot-money ratio (a proxy for a bank's lack of liquidity) or its core deposit ratio is associated with a 2 and a 1 basis point decline in subsequent quarterly loan growth, respectively. Similar to the effect of non-current loans-to-assets, the economic effect on loan growth of a bank's liquid-to-total assets is about one-third of the CAMELS 3-rating effect, and about one-fifth of the CAMELS 4 or 5 effect.[49] While our results for liquid assets and hot money are consistent with the predictions stated in the literature, our results for core deposits are not. While the reason for this difference is unclear and not central to our analysis, it may arise because our estimates include controls for many factors that are often omitted in earlier studies.

Our regression specification allows for two different effects of ROA on loan growth: a direct effect, as measured by ROA itself, and a strategic effect, as captured by an indicator for whether the bank's ROA is below the county population average ROA. Results show that both coefficients are significantly positive. While a positive ROA is associated with increased loan growth, being below county average ROA amplifies that positive effect. The coefficient of 9 basis points on ROA itself implies that a one standard deviation increase would increase loan growth from its mean value by 2.3 percent. The coefficient of 8 basis points on the indicator that ROA is below county average suggests that a bank with an ROA below county average ROA will increase loan growth from its mean value by 6.2 percent. When a bank has an ROA below its county average, we add these two effects and find an increase in loan growth of 8.5 percent from its mean value. These results are consistent with the Rajan (1994) prediction that poorly performing banks face incentives to accelerate loan growth.

In all regressions, with the exception for unemployment, all controls for county-level economic activity enter with the anticipated sign, and all controls are statistically significant at the one percent level except for county deposit share HHI, which is significant at the five percent level. Higher home price appreciation and real wage growth are associated with faster loan growth, and higher credit card delinquency rates are associated with reduced loan growth. The HHI deposit share is positive and large in magnitude.

5. Robustness

5.1. Alternative deposit thresholds

In order to control for time-varying local factors that may both affect loan demand and be correlated with CAMELS ratings, in our baseline sample we retained only those banks that held at least 50 percent of their deposits in a single county and had at least one other peer bank that also raised at least 50 percent of its deposits in the county. To test whether our deposit threshold is too low to effectively control for local market demand conditions, we increase the sample deposit threshold to 75 percent and then 100 percent, to increase the certainty that our sample banks operate within a single county. However, the cost of tighter geographic focus is a smaller sample size. Table 2A Panels B and C present summary statistics for these two alternative samples and shows that the sample size decreases to 300,938 bank-quarter observations for the 75 percent deposit share sample, and to 194,777 for the 100 percent deposit share sample.

Table 4 reports our baseline estimation results for the 50 percent deposit threshold sample, followed by estimates using the more restrictive 75 and 100 percent threshold samples. These estimates show that the effect of poor CAMELS ratings is consistent regardless of the county deposit threshold used to restrict the sample. All bank-specific control variables maintain statistical significance and the same sign, though some variables, including, core deposits, bank-specific cost of funds, and the indicator for whether ROA is below the county's, decrease in statistical significance for the 100 percent deposit threshold sample. In contrast, the coefficient for county average cost of funds increases in magnitude for both the 75 and 100 percent deposit threshold samples.

These results suggest that the baseline 50 percent deposit share criterion does a reasonably good job of controlling for the market variation in bank loan demand that might be correlated with our CAMELS ratings controls, and little is gained by further restricting the sample through increasing the deposit threshold.[50]

5.2. Local banks and alternative measures of loan growth

Our next set of robustness analysis is presented on Table 5A. Again, for ease of comparison, we repeat our baseline CAMELS results.

The first additional restriction drops those sample banks that participated in the syndicated loan market, since these banks 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 primary market county, our county-specific controls for economic conditions and our strategy of restricting our sample to banks with a local deposit footprint may be inadequate to control for local loan demand. We use Thomson Reuters LPC's DealScan data to identify and exclude all the banks in our baseline sample that took part in syndicated lending at any time, either as leads or participants. This additional restriction requires us to

[49] Evaluating the effects on mean loan growth of a one standard deviation increase in these three liquidity variables yields an increase of 31.0 percent, and decreases of 11.5 and 7.9 percent, respectively.

[50] 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.

Table 4
Estimates of Bank Loan Growth, Alternate Deposit Share Thresholds.

Share of Bank's Deposits in County	*50%*	*75%*	*100%*
	Baseline	(1)	(2)
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag	−1.22***	−1.23***	−1.22***
	(0.04)	(0.05)	(0.06)
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag	−2.04***	−2.07***	−2.22***
	(0.08)	(0.09)	(0.12)
Leverage Capital Ratio, 1-Qtr Lag (Pct)	−0.06***	−0.06***	−0.06***
	(0.01)	(0.01)	(0.01)
Past Due to Assets, 1-Qtr Lag (Pct)	−0.07***	−0.06***	−0.04***
	(0.01)	(0.01)	(0.02)
Non-Current to Assets, 1-Qtr Lag (Pct)	−0.36***	−0.35***	−0.33***
	(0.01)	(0.01)	(0.02)
Charge-off Rate, 8-Quarter Standard Deviation, 1-Qtr Lag (Pct)	−0.37***	−0.30***	−0.26***
	(0.09)	(0.09)	(0.09)
Liquid Assets to Total Assets, 1-Qtr Lag (Pct)	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
Hot Money to Total Assets, 1-Qtr Lag (Pct)	−0.02***	−0.02***	−0.02***
	(0.00)	(0.00)	(0.00)
Core Deposits to Total Assets, 1-Qtr Lag (Pct)	−0.01***	−0.01***	−0.01**
	(0.00)	(0.00)	(0.00)
Cost of Funds to Interest Earning Assets (Pct)	−0.63***	−0.53***	−0.43*
	(0.16)	(0.19)	(0.25)
ROA before tax, 1-Qtr Lag (Pct)	0.09***	0.10***	0.11***
	(0.03)	(0.03)	(0.04)
=1 if ROA before tax < County Average, 1-Qtr Lag	0.08***	0.07***	0.04
	(0.02)	(0.02)	(0.03)
Log Real Assets, 1-Qtr Lag	−0.28***	−0.24***	−0.21**
	(0.05)	(0.06)	(0.08)
Cert Share of County's Deposits, 1-Qtr Lag (Pct)	−0.03***	−0.04***	−0.04***
	(0.00)	(0.00)	(0.01)
County Credit Card 60 days Delinquency Rate, 1-Qtr Lag (Pct)	−0.04***	−0.05***	−0.04**
	(0.01)	(0.02)	(0.02)
County HPI Growth Rate (Pct)	0.04***	0.03***	0.03***
	(0.01)	(0.01)	(0.01)
County Total Real Wage Growth Rate (Pct)	0.02***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)
County Deposit Share HHI, 1-Qtr Lag	0.54**	0.73**	0.52*
	(0.23)	(0.29)	(0.29)
County Unemployment Rate, 1-Qtr Lag (Pct)	0.01	0.02*	0.02*
	(0.01)	(0.01)	(0.01)
Average County Cost of Funds to Interest Earning Assets (Pct)	−0.90***	−1.10***	−1.50***
	(0.18)	(0.20)	(0.25)
Quarter Fixed Effects	Y	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y	Y
Standard Errors Clustered By County	Y	Y	Y
N	381,867	300,938	194,777
R-sq	0.19	0.18	0.17

Notes: The coefficients reported in the 'Baseline' Column repeat estimates from Table 3, Column 1. Column 1 of this table reports coefficients from an estimation where only banks with a share of their deposits in the county-quarter of at least 75 percent are included in the sample, while Column 2 reports coefficients from an estimation where only banks with a share of their deposits in the county-quarter of 100 percent are included. In both estimations there is at least one other remaining bank that meet the specified deposit threshold in that county-quarter for the bank to be included in the sample. See Tables 2A and 3 for additional notes.

exclude about 20,000 observations from the 50 percent deposit threshold sample.[51]

Table 5A Column 1 reports estimation results for the sample of banks that omits institutions that participated, at any time, in syndicating lending activities. All explanatory variables that appear in the baseline estimations are included in these regressions, but we report only the coefficient estimates for our key variables of interest. The estimates in Table 5A show that the dummy variables for a CAMELS rating of 3, or 4 or 5, are little changed from our baseline results, so our initial estimates do not appear to be biased by out-of-market bank lending.

Our next two sets of adjustments take into account broader measures of credit, where our first adjustment includes unused loan commitments in our loan growth measure, in addition to total balance sheet loans.[52] When a bank extends credit, it can do so with on-the-books loans or by extending lines of credit that give rise to unused loan commitments. Once drawn upon, unused loan commitments become balance sheet loans. If the extension of commitments or the take downs of unused commitments are impacted by a poor bank supervisory CAMELS rating, then excluding data on unused commitments will provide an incomplete picture of the impact of a CAMELS 3, or CAMELS 4 or 5 rating.

Table 5B presents summary statistics for our original loan growth measure, and for an alternate measure that includes unused commitments (as well as its component parts). The estimation sam-

[51] The exclusion also serves as a robustness check to ensure that results hold when omitting from the sample the larger lenders, which typically participate in syndicated lending. The maximum bank size in our baseline sample as measured in 2000 dollars was $997 million; with the DealScan restriction, maximum bank size falls to $121 million.

[52] In contrast to Cole (2012) and Cornett et al. (2011), who use unused commitments as a determinant of bank loan growth, we use unused commitments as a component of credit.

Table 5A
Dropping DealScan Banks, Loan Growth Including Unused Commitments, Loan Growth Including Various Other Credit, 50 Percent Deposit Threshold.

	1994 Q3 to 2011 Q4				2001 Q3 to 2011 Q4	
Loan Growth Outcome	*Original Loan Growth (LG)*	*Original LG, Dropping DealScan Banks*	*Original LG*	*Alternate LG, Including Unused Commitments*	*Original LG*	*Alternate LG, Including Various Other Credit*
	Baseline	(1)	(2)	(3)	(4)	(5)
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag	−1.22***	−1.23***	−1.17***	−1.14***	−1.30***	−1.26***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag	−2.04***	−2.07***	−1.91***	−1.81***	−2.24***	−2.09***
	(0.08)	(0.08)	(0.07)	(0.07)	(0.09)	(0.09)
Quarter Fixed Effects	Y	Y	Y	Y	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y	Y	Y	Y	Y
Standard Errors Clustered By County	Y	Y	Y	Y	Y	Y
N	381,867	362,111	368,578	368,578	188,499	188,499
R-sq	0.19	0.19	0.19	0.15	0.24	0.20

Notes: The coefficients reported in the 'Baseline' Column repeat estimates from Table 3, Column 1. Column 1 of this table reports coefficients from an estimation where banks that appear in the DealScan database are dropped from the sample. The coefficients presented on Columns 2 and 3 of this table are from estimations that use a slightly smaller sample, where an alternate loan growth measure is used that also includes unused commitments and is first trimmed of the top and bottom 5 percent of population tail values for the quarter. The estimation shown on Column 3 uses this alternative loan growth outcome that includes unused commitments, in addition to loans. Columns 4 and 5 show coefficients from estimations that use the sample for the shorter time period of 2001 Q3 to 2011 Q4, when security sales are reported. The alternate loan growth outcome used for the estimation shown on Column 5 includes unearned income and securities sold, in addition to loans and unused commitments. All estimations shown on this table also include the remaining explanatory variables of the estimations presented on Table 3. See Tables 2A, 3, 5B and Table 5C for additional notes.

Table 5B
Summary Statistics, Loan Growth including Unused Commitments, 1994 Q3 to 2011 Q4, 50 Percent Deposit Threshold.

Variable	Mean	Std. Dev.	Min	Max
Quarter-to-Quarter Loan Growth (Pct)	1.31	3.67	−11.30	18.71
Quarter-to-Quarter Loan Growth, including Unused Commitments (Pct)	1.34	3.70	−9.80	17.21
Loans (Thousands of 2000 Q4 Dollars)	223,702	3,380,234	820	532,000,000
Unused Commitment	119,716	4,747,450	0	681,000,000
Total Credit	343,418	8,012,921	820	1,140,000,000
N	***368,578***			

Notes: Statistics for the first loan growth measure shown is the same loan growth outcome presented on Table 2A, but for the slightly smaller sample where an alternate loan growth measure that also includes unused commitments is first trimmed of the top and bottom 5 percent of population tail values for the quarter. Statistics for this alternate loan growth outcome, and its component parts, are presented below our usual loan growth measure. See Tables 1 and 2A for additional notes.

ple is slightly smaller than our baseline sample because we exclude observations in the top and bottom 5 percent of the quarterly population tails for this alternative credit measure. As with the baseline, sample banks are limited to those with at least 50 percent of their deposits in one county, and with at least one peer bank that also raises at least 50 percent of its deposits in that county. The estimates reported on Table 5A Columns 2 and 3 both use this alternate sample.

A comparison of the estimates in Table 5A Column 2 with those in Column 3 shows that the effect of the poor CAMELS ratings on bank loan growth including unused commitments remains strongly negative and statistically and economically significant. The CAMELS ratings coefficient estimates, −1.14 and −1.81, are little changed from the estimated impact when bank loan growth is measured using only the change in the bank balance sheet value of loans and leases.

In our next set of robustness results, we further broaden our measure of credit to include unearned income and securities sold, in addition to loans and unused commitments.[53] We include securities sold because they contain loans that were extended by a bank but removed from the bank's balance sheet through securitization. However, because data for securities sold are not available until 2001 Q3, the sample period is reduced accordingly.

Table 5C provides summary statistics for the sample using our broadest definition of credit extended, for the shorter period of 2001 Q3 to 2011 Q4, again using a 50 percent county deposit threshold. Table 5A Columns 4 and 5 report results using this smaller sample, where the estimation presented on Column 4 uses our original loan growth definition, and Column 5 uses our broadest definition of loan growth. Using the more inclusive measure of loan growth changes the sample size both because the data is available for a shorter period and the trimming of outliers excludes a different set of bank-quarter observations.

The estimates in Columns 4 and 5 of Table 5A show that CAMELS effects using the alternate loan growth measure are slightly smaller than the effects using our original balance sheet loan growth measure, but both estimates are larger in magnitude than our CAMELS coefficient estimates in our baseline results. The data clearly show that a poor CAMELS rating restricts loan growth regardless of how we measure bank lending growth.

5.3. Analysis of a CAMELS downgrade

We first present descriptive statistics on the frequency of CAMELS rating changes as they relate to bank examinations. Then we provide separate estimates of the loan growth rate impact of a CAMELS downgrade event from the continuing effect of a poor CAMELS rating.

Table 6A contains information on CAMELS transitions for our baseline sample of 381,867 bank-quarter observations. The first column shows the five possible CAMELS ratings for our sample bank-quarter combinations as of the end of the prior quarter. Columns 2 through 6 show the possible CAMELS ratings states in the current quarter, conditional on the bank experiencing an examination during that quarter. For all five ratings, the vast majority of banks retained the same CAMELS rating after experiencing a new

[53] Unearned income includes items such as loan origination fees and prepaid interest that are amortized over the life of the loan.

Table 5C
Summary Statistics, Loan Growth including Unearned Income, Unused Commitments and Securities Sold, 2001 Q3 to 2011 Q4, 50 Percent Deposit Threshold.

Variable	Mean	Std. Dev.	Min	Max
Quarter-to-Quarter Loan Growth (Pct)	0.87	3.69	−11.30	17.28
Quarter-to-Quarter Loan Growth, including Other Credit (Pct)	0.84	3.72	−9.80	16.75
Net Loans + Unearned Income (Thousands of 2000 Q4 Dollars)	261,767	4,044,953	823	533,000,000
Unused Commitments	153,168	6,081,727	0.00	681,000,000
Securities Sold	12,874	1,274,357	0.00	444,000,000
Total Credit	427,809	10,900,000	913	1,440,000,000
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag	0.07	0.26	0.00	1.00
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag	0.02	0.14	0.00	1.00
Leverage Capital Ratio, 1-Qtr Lag (Pct)	10.00	2.71	0.21	25.97
Tier 1 Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	15.24	5.76	0.28	46.78
Total Risk-Based Capital Ratio, 1-Qtr Lag (Pct)	16.36	5.74	0.56	47.78
Past Due to Assets, 1-Qtr Lag (Pct)	0.90	0.93	0.00	59.89
Non-Current to Assets, 1-Qtr Lag (Pct)	0.90	1.29	0.00	24.77
Charge-off Rate, 8-Quarter Standard Deviation, 1-Qtr Lag (Pct)	0.12	0.24	0.00	18.50
Liquid Assets to Total Assets, 1-Qtr Lag (Pct)	26.59	13.63	0.01	97.21
Hot Money to Total Assets, 1-Qtr Lag (Pct)	6.63	8.00	0.00	93.81
Core Deposits to Total Assets, 1-Qtr Lag (Pct)	70.10	10.70	0.00	97.52
Cost of Funds, (Pct)	1.34	0.86	0.00	4.68
Cost of Funds, 1-Qtr Lag (Pct)	1.36	0.86	0.00	4.68
ROA before tax, 1-Qtr Lag (Pct)	0.28	0.37	−18.17	11.65
=1 if ROA before tax < County Average, 1-Qtr Lag	0.50	0.50	0.00	1.00
Log Real Assets, 1-Qtr Lag	11.64	1.18	7.72	20.72
Cert Share of County's Deposits, 1-Qtr Lag (Pct)	13.17	13.74	0.00	94.67
County Credit Card 60 days Delinquency Rate, 1-Qtr Lag (Pct)	2.41	1.14	0.00	12.37
County HPI Growth Rate (Pct)	0.08	2.69	−21.32	17.79
County Total Real Wage Growth Rate (Pct)	0.76	8.86	−58.04	123.56
County Deposit Share HHI, 1-Qtr Lag	0.19	0.10	0.04	0.93
County Unemployment Rate, 1-Qtr Lag (Pct)	5.97	2.30	0.90	25.30
Average County Cost of Funds (Pct)	1.38	0.83	0.10	5.66
Average County Cost of Funds, 1-Qtr Lag (Pct)	1.39	0.82	0.09	4.64
=1 if Cert Appeared in DealScan	0.05	0.21	0.00	1.00
N	***188,499***			

Notes: We calculate a second alternative loan growth measure where unearned income and securities sold are included in addition to loans and unused commitments. Because security sales were not collected by regulatory CALL Reports until 2001 Q3, this sample using the alternative outcome variable is for the shorter time period of 2001 Q3 to 2011 Q4. Statistics for the alternate loan growth outcome, and its component parts, are presented below our usual loan growth measure, using this much smaller sample. The alternate loan growth measure is trimmed of the top and bottom 5 percent of population tail values for the quarter. See Tables 1 and 2A for additional notes.

Table 6A
CAMELS Rating Transitions and Examination Frequencies, 1994 Q3 to 2011 Q4, 50 Percent Deposit Threshold.

(1)	CAMELS Rating This Quarter, Exam This Quarter					(7)	(8)	(9)	(10)
CAMELS Rating Last Quarter	(2)	(3)	(4)	(5)	(6)	*Exam This Quarter*	*No Exam This Quarter*	*Total*	*Percent with Exams*
	1	2	3	4	5				
1	*82.14*	*17.11*	*0.69*	*0.05*	*0.01*	*100.00*	121,730	149,276	18.45
	22,625	4713	189	15	4	27,546			
2	*12.10*	*80.71*	*6.22*	*0.88*	*0.10*	*100.01*	165,744	204,486	18.95
	4686	31,270	2409	339	38	38,742			
3	*0.41*	*35.34*	*55.77*	*7.71*	*0.77*	*100.00*	16,043	22,116	27.46
	25	2146	3,387	468	47	2,441			
4	*0.33*	*4.01*	*15.73*	*73.25*	*6.68*	*100.00*	2548	4,989	48.93
	8	98	384	1,788	163	2,441			
5	*0.21*	*1.65*	*4.13*	*11.57*	*82.44*	*100.00*	516	1000	48.40
	1	8	20	56	399	484			
Bank-Quarters in Sample	27,345	38,235	6,389	2,666	651	75,286	306,581	381,867	19.72

Notes: CAMELS rating transitions and examination frequencies are shown for the sample presented on Table 2A, Panel A, where an included bank has at least 50 percent of its deposits in the county-quarter, and there is at least one other remaining bank that met that deposit threshold. The first column lists the CAMELS rating that each sample bank had at the end of the observation's previous quarter, while the subsequent five columns show the possible CAMELS ratings that the bank transitioned to if it experienced an examination in the current quarter. For each CAMELS rating from last quarter, the total number of bank-quarters that experienced an examination in the current quarter is then shown, followed by the total number of bank-quarters that did not experience an examination. Lastly, by CAMELS rating in the last quarter, the total number of sample bank-quarters and the share that experienced an examination, are presented.

examination. For example, 82.14 percent of 1-rated banks remain 1-rated, and 82.44 percent of 5-rated banks remain 5-rated. However, while 55.77 percent of 3-rated banks retained the same rating, 35.75 percent improved to a 2 or 1-rating.

Table 6A Column 7 shows the total number of bank-quarters that experienced an examination, while Column 8 shows the total number that did not. Column 9 shows the total number of bank-quarters observations in the sample for each CAMELS rating, and Column 10 shows the share of the Column 9 values that experienced an examination during the quarter. Consistent with regulatory standards, the data show an almost monotonic increase in the frequency of bank examinations as CAMELS ratings deteriorate. CAMELS 1 and 2-rated banks have the smallest share of sample bank-quarters experiencing an examination, with 18.45 and 18.95 percent, respectively, while 27.46 percent of 3-rated, 48.93 percent

Table 6B
Summary Statistics, Additional CAMELS Variables, 1994 Q3 to 2011 Q4, 50 Percent Deposit Threshold.

Variable	Mean	Std. Dev.	Min	Max
=1 if CAMELS Rating Transitioned from 1/2 to 3	0.007	0.082	0.00	1.00
=1 if CAMELS Rating Transitioned from 1/2 to 4/5	0.001	0.032	0.00	1.00
=1 if CAMELS Rating Transitioned from 3 to 4/5	0.001	0.037	0.00	1.00
N (Bank-Qtr)	***381,867***			

Notes: Summary statistics are presented for additional variables of the sample presented on Table 2A, Panel A, where an included bank has at least 50 percent of its deposits in the county-quarter, and there is at least one other such bank.

Table 6C
Additional CAMELS Variables, 50 Percent Deposit Threshold.

	Baseline	(1)
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag	−1.22***	−1.26***
	(0.04)	(0.04)
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag	−2.04***	−2.17***
	(0.08)	(0.08)
= 1 if Composite CAMELS Rating Transitioned from 1 or 2, to 3, in Qtr		−0.86***
		(0.07)
= 1 if Composite CAMELS Rating Transitioned from 1 or 2, to 4 or 5, in Qtr		−1.72***
		(0.16)
= 1 if Composite CAMELS Rating Transitioned from 3, to 4 or 5, in Qtr		−0.81***
		(0.15)
Quarter Fixed Effects	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y
Standard Errors Clustered By County	Y	Y
N	381,867	381,867
R-sq	0.19	0.19

Notes: The coefficients reported in the 'Baseline' Column repeat estimates from Table 3, Column 1. Column 1 of this table reports coefficients from an estimation where dummy variables for quarters when CAMELS ratings transition downward are included. The estimations shown on this table also include the remaining explanatory variables of the estimations presented on Table 3. See Tables 2A and 3 for additional notes.

of 4-rated, and 48.40 percent of 5-rated bank-quarters included a bank examination.

To analyze the immediate impact of a CAMELS downgrade in the examination quarter, we create three indicator variables. The first captures whether a 1 or 2-rated bank was downgraded to a 3 during the current quarter, the second whether a 1 or 2-rated bank was downgraded to a 4 or 5, and the third whether a 3-rated bank was downgraded to a 4 or 5. Summary statistics presented in Table 6B for the baseline sample show that a very small percentage of our sample banks experience such CAMELS rating downgrades.

Column 1 of Table 6C reports estimates for our baseline sample that includes these additional downgrade controls. We see that transitioning to a lower rating has large and statistically significant negative consequences for loan growth. In particular, highly-rated CAMELS 1 or 2 banks that transition to the worst-rating (a 4 or 5 CAMELS rating) experience the largest reductions, with a decrease in loan growth of 1.72 percentage points, compared to banks that experienced no downgrade transition. However, including these transition variables also results in an increase in the magnitude of the coefficient estimates for our main CAMELS variables of interest.

It is important to recall that our estimation of the impact of a poor CAMELS rating measured loan growth changes in the quarters

Table 7A
Including Crisis Year Interactions, 50 Percent Deposit Threshold.

	Baseline	(1)
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag	−1.22***	−1.31***
	(0.04)	(0.05)
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag	−2.04***	−1.97***
	(0.08)	(0.12)
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag		0.15
* *Year = 2008*		(0.14)
* *Year = 2009*		0.19*
		(0.10)
* *Year = 2010*		0.27***
		(0.09)
* *Year = 2011*		0.30***
		(0.09)
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag		−0.91***
* *Year = 2008*		(0.30)
* *Year = 2009*		−0.30
		(0.20)
* *Year = 2010*		−0.03
		(0.18)
* *Year = 2011*		0.15
		(0.18)
Quarter Fixed Effects	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y
Standard Errors Clustered By County	Y	Y
N	381,867	381,867
R-sq	0.19	0.19

Notes: The coefficients reported in the 'Baseline' Column repeat estimates from Table 3, Column 1. Column 1 of this table reports coefficients from estimations where the CAMELS rating dummies are further interacted with dummies for the four Great Recession financial crisis years. All estimations shown on this table also include the remaining explanatory variables of the estimations presented on Table 3. See Tables 2A and 3 for additional notes.

Table 7B
Quarter Fixed Effect Statistics, for Table 8A Column (1).

	Pre-Crisis	*Crisis*
	1994 Q4 to 2007 Q4	*2008 Q1 to 2011 Q4*
Mean	−0.61	−2.71
Min	−3.93	−6.23
Max	1.71	4.01
# Quarters	53	16
# Negative Quarters	33	15

Notes: The statistics reported are for the quarter dummy coefficients of the estimation shown on Table 9A Column 1, where the coefficients are stratified by whether the quarter was before or during the Great Recession financial crisis.

after the bank received its poor CAMELS rating. Thus, our original analysis began measuring the CAMELS effect after banks had partially contracted their lending during the quarter in which they received the subpar CAMELS grade. Earlier we had speculated that our CAMELS *levels* approach likely understated the loan growth impact of a poor CAMELS rating, and, indeed, these result confirm

Table 8A
Summary Statistics, Additional CAMELS Variables, 1994 Q3 to 2011 Q4, 50 Percent Deposit Threshold, No CAMELS Transition-Qtrs.

Variable	Mean	Std. Dev.	Min	Max
=1 if Any Bank in County Downgraded in Quarter	0.05	0.22	0.00	1.00
N (Bank-Qtr)	***377,556***			

Notes: Summary statistics are presented for a slightly smaller alternative sample that excludes bank-quarter observations that experienced a downgrade that quarter. See Table 2A for additional notes.

Table 8B
Additional County-Quarter Control, 50 percent deposit threshold.

	Dropping Transition −Qtr Observations	
	(1)	(2)
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag	−1.26***	−1.26***
	(0.04)	(0.04)
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag	−2.17***	−2.17***
	(0.08)	(0.08)
=1 if Any Bank in County Downgraded in Quarter		−0.00
		(0.04)
Quarter Fixed Effects	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y
Standard Errors Clustered By County	Y	Y
N	377,556	377,556
R-sq	0.19	0.19

Notes: The estimates reported in Column 1 show the baseline regression repeated on a sample excluding bank-quarter observations where the bank was downgraded that quarter. Column 2 of this table reports coefficients from an estimation on the same sample where an indicator variable for whether any bank in the county-quarter experienced a CAMELS downgrade is also included. Both estimations shown on this table also include the remaining explanatory variables of the estimations presented on Table 3. See Tables 2A and 3 for additional notes.

the accuracy of that speculation. Our conclusion, therefore, is that sustained low CAMELS ratings have their own economically and statistically significant negative impact on loan growth beyond the initial quarter when a bank is first downgraded.

Table 8A shows that 5 percent of the bank-quarters in the adjusted sample include a county where at least one bank that was downgraded in the quarter. Column 1 of Table 8B

5.4. CAMELS and crisis years

When we analyzed a shorter time horizon in Table 5A, we found a slightly higher magnitude for the negative impact of a poor CAMELS ratings on loan growth. To investigate the possibility that our results are driven by differential supervisory enforcement levels during the recent Great Recession financial crisis, we interact our two indicators for low CAMELS ratings with an indicator for years 2008, 2009, 2010, and 2011. Results from this analysis are presented on Table 7A. First, we note that the estimated negative magnitude of the effects of the two indicators for poor CAMELS ratings over the period 1994–2007 are now slightly greater for the CAMELS 3 rating, and slightly smaller for the CAMELS 4 or 5 rating. The coefficients for the CAMELS 3 interactions terms are positive, while the coefficients for the CAMELS 4 or 5 interactions are either strongly negative or insignificantly different from 0 depending on the year.

To properly interpret these results, we must consider the coefficients on the quarterly dummy variables for crisis versus non-crisis years. Summary statistics for these quarterly dummy coefficients are presented on Table 7B. Pre-crisis, there are 53 quarters (the first quarter is omitted); 33 of these quarters have negative coefficients. In contrast, the crisis period has 16 quarters, of which 15 have significantly negative coefficients. The mean value for the crisis quarter indicator coefficients is −2.71 compared to an average of −0.61 for non-crisis quarters.[54] Thus, during all but one of the financial crisis quarters, controlling for other factors, on average, banks in the sample, including highly-rated banks, had lower loan growth than the average loan growth in quarters prior to the financial crisis.

Combining these statistics with our results from Table 7B, our main result holds: Across all quarters, CAMELS 3-rated banks had lower loan growth on average than CAMELS 1 or 2-rated banks, and this negative pattern was even stronger for CAMELS 4 or 5-rated banks. During the crisis years, except for 2008 Q4, average loan growth for all banks was depressed relative to the first quarter of the sample. However, the large negative effects on loan growth in financial crisis quarters were mitigated somewhat for CAMELS 3-rated banks, relative to 1 or 2-rated banks. On the other hand, for CAMELS 4 or 5-rated banks, there was no such respite from decreased loan growth relative to other banks during crisis years.

5.5. Omitted time-varying county control variables

In this section we explore the possibility that omitted variables are biasing our result that poor supervisory ratings significantly adversely affect loan growth. In a quarter in which a bank experiences a CAMELS downgrade, the bank's loan growth could decline because of supervisory restrictions, as we claim, or because something else we are not observing in the local banking market has changed and caused the downgraded bank to endogenously reduce its loan growth. To address this issue, we estimate an additional regression model in which we analyze the effect of a county-quarter-peer-bank downgrade on non-downgraded banks.

It is important to remember that the CAMELS downgrade event is not public information, so banks that are not being downgraded cannot be reacting to information that one of their local competitor banks is being downgraded. The actual downgrade event is only observed by the bank that is downgraded. Moreover, a bank's CAMELS rating, viewed in isolation, can only convey new information when the CAMELS rating changes. Taken together, this suggests that, if we are to design a diagnostic test to determine whether important omitted factors are biasing our CAMELS impact estimates, we have to focus on instances when CAMELS ratings change.

Consider a situation in which an unobserved time-varying county-level attribute endogenously impacts the loan growth of all banks in a county. When this unobserved county-specific factor experiences a negative shock, all county banks endogenously choose to reduce their loan growth. Now suppose that a single bank in a county is examined in a quarter, and that bank examiners can observe the omitted county factor that is unobservable to the econometrician. Further, assume that bank examiners know that the realization of a negative county factor has negative implications for the examined bank's performance, so they downgrade the bank's CAMELS rating accordingly if they observe a negative shock in the examination quarter.

In this setting, the examined bank will have reduced loan growth in the quarter it experiences a CAMELS downgrade. Peer banks will also have reduced loan growth, but because they are not examined, they will not experience a change in their CAMELS rating. Looking at data on the downgraded bank alone, it is impossible to identify whether the reduced loan growth is caused by the omitted time-varying county factor or by the CAMELS downgrade. In

[54] The one quarter with a positive indicator is the fourth quarter of 2008, which has a coefficient of 4.01. This comparative surge in lending coincides with the announced Troubled Asset Relief Program.

Table 9
Estimates of Bank Loan Growth, Alternate Samples, 50 Percent Deposit Threshold.

	Loan Growth Trimmed			*Loan Growth Winsorized*		
	5.0%	*2.5%*	*1.0%*	*5.0%*	*2.5%*	*1.0%*
	Baseline	(1)	(2)	(3)	(4)	(5)
=1 if Composite CAMELS Rating = 3, 1-Qtr Lag	−1.22***	−1.46***	−1.63***	−1.51***	−1.61***	−1.65***
	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)
=1 if Composite CAMELS Rating = 4 or 5, 1-Qtr Lag	−2.04***	−2.55***	−2.89***	−2.65***	−2.91***	−3.07***
	(0.08)	(0.10)	(0.11)	(0.09)	(0.11)	(0.12)
Quarter Fixed Effects	Y	Y	Y	Y	Y	Y
Bank Fixed Effects (Bank Level Within Estimation)	Y	Y	Y	Y	Y	Y
Standard Errors Clustered By County	Y	Y	Y	Y	Y	Y
N	381867	401025	410070	413452	413452	413452
R-sq	0.19	0.16	0.14	0.17	0.15	0.13

Notes: The coefficients reported in the 'Baseline' Column repeat estimates from Table 3, Column 1. Column 1 of this table shows estimates when the sample is trimmed of observations where loan growth is at the top or bottom 2.5 percent of populations values for the quarter; Column 2 shows estimates where the sample is trimmed of observation at the top and bottom 1 percent of population values. For the estimations presented in Columns 3 through 5, instead of trimming the sample of tail observations, loan growth values of tail observations are replaced by the loan growth values observed at the top and bottom 5, 2.5 and 1 percentiles, respectively. All estimations shown on this table also include the remaining explanatory variables of the estimations presented on Table 3. See Tables 2A and 3 for additional notes.

this instance, our baseline regression model estimates will almost certainly attribute the reduction in loan growth at the downgraded bank to the CAMELS downgrade. For non-downgraded banks, it will produce biased estimates for variables that are correlated with the omitted county controls.

We can construct a test that can identify whether our baseline model estimates are likely to be biased by an omitted county control problem. The test is constructed using an indicator variable for a CAMELS downgrade event. The downgrade event indicator is introduced as an additional control variable in the baseline regression model for the banks that are not downgraded in a county-quarter. If the reduction in loan growth at the downgraded bank actually transpires because of a negative shock to an important omitted county control variable, then non-downgraded banks should also reduce their loan growth in quarters in which a peer institution is downgraded. If they do, the non-downgraded peer institutions are endogenously reducing loan growth as reaction to the negative change in the lending environment, not to a peer institution's CAMELS downgrade. Alternatively, an insignificant CAMELS downgrade event indicator suggests that the poor CAMELS rating effects we previously estimated are real and not a consequence on an omitted unobserved time-varying county control factor.

To test this hypothesis, we create an indicator variable denoting whether any bank in the county-quarter was downgraded from a CAMELS 1 or 2 rating to a CAMELS 3 rating, from a CAMELS 1 or 2 rating to a CAMELS 4 rating or from a CAMELS 3 rating to a CAMELS 4 or 5 rating. As we showed in previous analysis, downgraded banks experience negative loan growth, so we exclude all downgraded banks from the modified sample. This elimination allows the county-quarter downgrade indicator to capture the effect of a same-county bank downgrade on only the non-downgraded banks, so any observed negative loan growth concurrent with a same-county bank downgrade will be attributed to only those banks that were not downgraded in each county-quarter.[55] We re-estimate our baseline model on the modified sample adding the county-quarter downgrade indicator control variable.

shows estimation results where we repeat our baseline estimation on the revised sample that omits all banks experiencing a downgrade that quarter, but still have 50 percent of their deposits in one county and have a county-peer sample bank that quarter. The results in Column 1 show that on this revised sample, a poor CAMELS rating has a significantly negative effect on loan growth that is slightly stronger economically than in our baseline estimation.

Column 2 of Table 8B reports the estimation results for the model that includes all the control variables in our baseline estimation along with an indicator for whether any bank in the county received a CAMELS downgrade. The coefficient estimate on the CAMELS downgrade event indicator is statistically insignificant indicating that the examiner downgrade of a peer institution did not reflect any county-level information that also endogenously impacted the loan growth of peer banks in the county. These results provide evidence that our baseline model estimates of the impact of poor CAMELS ratings are attributable to supervisory restrictions and not to unobserved economic factors that endogenously impact bank loan growth.

5.6. Alternative loan growth trimming and winsorization

In our last set of robustness estimations, we relax the "outlier" constraints placed on our baseline sample. Instead of omitting observations in the 5 percent upper and lower population tails of loan growth, we analyze the effect of lower trimming thresholds, specifically, by omitting observations in the 2.5 and 1 percent population tails, and then by winsorizing loan growth values instead of excluding the observations.[56]

Table 2B shows that when omitting observations with loan growth rates in the 5 percent population tails, quarterly loan growth ranges from −11.34 to 18.71 percent. When the trimming threshold is set at the 2.5 percent population tails, quarterly loan growth ranges from −14.53 to 31.86 percent. When the threshold is set at the 1 percent population tails, quarterly loan growth ranges from −20.23 to 86.16 percent.

As more observations with extreme loan growth values are included in the sample, the proportion of CAMELS 3-rated observations increases from 5.80 in the baseline sample to 5.93 percent in the 2.5 percent-trimmed sample, and 6.04 percent in the 1 percent-trimmed sample. Likewise, the proportion of CAMELS 4 or 5-rated observations increases from 1.57 percent in the baseline sample to 1.71 percent in the 2.5 percent-trimmed sample and 1.81 percent in the 1 percent-trimmed sample. The other control variables remain quite similar to the baseline sample. Thus, we anticipate that a broader range of loan growth values may yield coefficients of larger

[55] This restriction eliminates 3509 bank-quarter observations that were downgraded and eliminates an additional 802 bank-quarter observations that no longer have a county-quarter sample peer bank.

[56] All trimming and winsorizing is executed by quarter so as to best represent loan growth variation over time.

magnitude for our CAMELS rating indicators. Table 9 shows the estimation results for the new samples that include more banks with more extreme loan growth values. In these less restricted samples, the coefficients for our CAMELS indicators remain negative and statistically significant, and they increase in magnitude as larger loan growth outliers are included.

Next, we replicate this analysis on a sample where loan growth is winsorized at the 5 percent, 2.5 percent, and 1 percent upper and lower population tails instead of omitting extreme observations. Winsorizing retains all bank-quarter observations with the loan growth outliers, but replaces these loan growth values with the value of loan growth at the respective trim threshold. Table 9 Columns 3 through (5) show that when outlier loan growth values are winsorized rather than trimmed, the magnitudes of the CAMELS 3, and 4 or 5-rated coefficients again increase. We therefore conclude from our alternative results, using both trimmed and winsorized samples, that our estimations using our baseline sample trimmed at the 5 percent upper and lower loan growth population tails reflect conservative estimates of the impact of a poor CAMELS on bank loan growth.

6. Conclusion

In this paper we estimate the individual bank loan growth effects associated with a poor bank CAMELS examination rating. We estimate the impact using quarterly regulatory data over a long sample period, 1994–2011. Our econometric model includes controls suggested by the existing literature as well as data on time-varying bank-specific characteristics that may impact bank loan supply. We use a novel identification strategy that controls for variation in individual bank loan demand by analyzing the loan growth of banks that operate primarily in a single geographic market, and also have peer institutions that operate primarily in the same location in the same quarter. We document that our specially-selected sample of banks exhibits the necessary variation in their supervisory CAMELS ratings within the county-quarter observations to identify the loan growth impacts of a poor CAMELS rating.

Using an unbalanced panel regression model that accounts for time-invariant bank fixed-effects, we find that poor examination ratings do indeed have a strong negative impact on bank loan growth. In fact, a poor CAMELS rating has a stronger impact than any of our other explanatory variables examined. In our baseline results we find that, on average, relative to highly-rated CAMELS 1 or 2 banks, quarterly loan growth was more than 1.22 percentage points lower at CAMELS 3-rated banks, and more than 2.04 percentage points lower at CAMELS 4 or 5-rated banks. Evaluating these estimates at the sample mean loan growth rate implies a decrease of 93.9 percent for CAMELS 3-rated banks, and a decrease of 157 percent for CAMELS 4 or 5-rated banks, compared to those with 1 or 2 ratings. The estimated CAMELS effects are considerably larger than the impact of a one standard deviation increase in the next strongest set of explanatory variables.

Our estimation results are robust against a number of alternative methods for defining a bank's local market, against alternative definitions of bank loan growth, and against varying thresholds for trimming and winsorization of outlier observations. We augment our findings by estimating the loan growth impact of a CAMELS downgrade within the downgrade quarter in addition to measuring the continuing loan growth effects of a poor CAMELS rating in subsequent quarters. We also test whether the impact of a poor CAMELS rating varies over time by examining the effects of a poor rating in Great Recession crisis years relative to pre-crisis years. Finally, we construct a test to determine the potential importance of omitted time-varying county controls and find little evidence that unobserved variation in county-level conditions compromise the integrity of our poor CAMELS rating impact estimates.

Individually, each of the many analyses we perform shows that poor CAMELS ratings have a significantly negative effect on loan growth. Taken together, the evidence we present is consistent with the hypothesis that bank supervisors are effective delegated monitors and restrict the loan growth of banks that are identified as operating in an unsafe and unsound manner.

Appendix A.

A1 The Merger Adjustment Process

To merger-adjust, we first identify whether a merger occurred using merger histories available at the FDIC's RIS warehouse. We create synthetic 'merger-adjusted' variable values by aggregating to the acquired institution, values of all acquired institutions, for the quarter previous to the acquisitions. Then we calculate ratios based upon these synthetic components. This approach ensures that loan growth values are not mechanically increased due to acquiring loans from merged institutions. Specifically, for bank-quarter observations without a merger, we use the quarterly CALL Report variable for total loans and leases, LNLSGR, to calculate loan growth as the change $(\text{LNLSGR}_t - \text{LNLSGR}_{t-1})/\text{LNLSGR}_{t-1}$. However, if there is a merger between banks, say Banks 1 and 2, where Bank 2 is the acquiring entity, we calculate the synthetic *t-1* value of loans for Bank 2 as:

$$\hat{LNLSGR}^2_{t-1} = LNLSGR^1_{t-1} + LNLSGR^2_{t-1} \quad \text{(A1)}$$

Then we use this synthetic *t-1* loan value as our basis in our loan growth rate for the remaining Bank 2. We are careful to adjust for all the mergers that occurred in the previous quarter.

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