The Bank Lending Channel of Monetary Policy and Its Effect on Mortgage Lending

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ABSTRACT

The bank lending channel of monetary policy suggests that banks play a special role in the transmission of monetary policy. We look for this special role by examining the business strategies of banks as it relates to mortgage funding and mortgage lending. "Traditional banks" have a large supply of excess core deposits and specialize in information-intensive lending to borrowers (which is proxied here using mortgage lending in subprime communities), whereas "market-based banks" are funded with managed liabilities and mainly lend to relatively easy-to-evaluate borrowers. We predict that only "transition banks" operating between these business strategies are likely to increase their loan rate spreads substantially in response to monetary tightening. To fund ongoing mortgage originations, these banks must substitute from core deposits to managed liabilities, which have a large external finance premium due to these banks' information-intensive lending. Consistent with this prediction, we find evidence of a bank lending channel only among transition banks – they significantly reduce mortgage lending in response to monetary contractions.

I. INTRODUCTION

The bank lending channel suggests that banks play a special role in the transmission of monetary policy. In this theory, monetary policy has an effect on banks' cost of funds in addition to the change in the risk-free rate, leading to an additional response in bank lending. The supply of intermediated credit therefore has a unique response to monetary policy. To analyze the bank lending channel, we study the response of banks to monetary policy in the context of mortgage funding and mortgage lending. We focus on lending in subprime communities, because it is a form of information-intensive lending which affects banks' choices in funding sources and their response to changes in funding costs. Our paper helps explain how mortgage loan supply responds to monetary policy by addressing the role of banks in the transmission of monetary policy.

We consider how two functions of banks – deposit-taking and mortgage lending – are interrelated. In our analysis, banks' business strategies are characterized by how they fund mortgages and which types of mortgages they originate. "Traditional banks" use insured retail deposits, which we refer to as core deposits, to fund information-intensive loans. Consistent with this view, we find that traditional banks tend to extensively lend in communities with high proportions of subprime households, where public information about borrowers is limited. Alternatively, "market-based banks" use market debt such as brokered deposits, which we refer to as managed liabilities, to fund loans that are easier to evaluate. These banks tend to originate mortgages in communities of mostly prime borrowers, where more borrower information is publicly available. We define a bank's core lending capacity as its ability to fund loans with core deposits; therefore, traditional banks have a large core lending capacity whereas market-based banks have already exhausted their core lending capacity. "Transition banks" are banks that operate between these two business strategies, where extensive lending is done in subprime communities but core lending capacity is sometimes exhausted.

One of the key differences between banks using these two business strategies is in their external finance premium. Banks that must borrow uninsured funds in order to

make loans will have to pay an external finance premium.[1] This is problematic for banks that lend extensively in subprime communities due to the information-intensive nature of this type of lending. Whereas prime mortgages tend to be underwritten based on a few quantifiable factors, subprime mortgages tend to be underwritten more so on non-quantifiable factors. This private information collected by the bank in the subprime lending process is not available to outside investors, making the value of the balance sheet of such lenders more difficult to evaluate. This implies that investors will charge a larger external finance premium for lenders that extensively lend in subprime communities.

For banks about to exhaust their core lending capacity, ongoing mortgage lending may require the payment of an external finance premium. Deposits are limited, which means that banks may have to switch from insured deposits to managed liabilities if they want to continue funding new mortgages (Jayaratne and Morgan, 2000).[2] For these banks, shifting from insured retail deposits to managed liabilities creates an external finance premium. Therefore, when banks that lend in subprime communities need to switch from insured retail deposits to managed liabilities, their cost of funding can quickly increase.

A significant change in banks' cost of funds can be brought about by a change in monetary policy, which is the basis for identifying the bank lending channel. A monetary tightening shrinks banks' core deposits, forcing banks to rely more on managed liabilities and increasing their cost of funds. Our two differentiating factors, core lending capacity and lending in subprime communities, can be combined to predict which banks are likely to have the largest change in cost of funds due to monetary policy. Banks lending in subprime communities will likely face a larger external finance premium if they are required to borrow in the market and banks facing the limit of their core lending capacity are most likely to switch from deposit funding to market funding. If the bank lending channel exists, it most likely operates through transition banks.

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[1] Banks do not have to pay an external finance premium on core deposits because core deposits are insured by the government.
[2] Deposits are limited because raising new deposits requires opening new branches or paying higher deposit rates.

Our empirical approach to identifying the bank lending channel is based on cross-sectional variation in banks' core lending capacity and the extent of their lending in subprime communities. Using a model similar to the one in Kashyap and Stein (2000), we estimate the effects of these two bank characteristics on the response of lending to monetary policy. Whereas Kashyap and Stein focus on cross-sectional variation among banks in their size and the liquidity of their balance sheets, we focus on banks' core lending capacity and lending in subprime communities as the differentiating factors in the bank lending channel. Our approach is similar to that of Black, Hancock and Passmore (2007) which addresses the same issue in the context of small business lending. Mortgage lending in subprime communities is a form of "relationship lending" similar to small business lending due to the informational opacity of the borrowers.

To set up our analysis, we stratify banks by the degree of their lending in subprime communities and their loan-to-core deposit ratio. Our measure of subprime lending is constructed using credit score data by census tract and the amount of each bank's mortgage lending by census tract. This measure is one of the paper's contributions, because it serves as an alternative to the HUD subprime-lender list or the use of HMDA high-rate mortgages. Next, for each subsample of banks, we analyze the response of mortgage lending to the federal funds rate (as a measure of monetary policy), including interaction terms between the loan-to-core deposit ratios and the funds rate. We identify the bank lending channel by focusing on lenders who lend in subprime communities and likely switch into managed liabilities with an external finance premium in response to monetary contractions. Therefore, our theoretical framework provides the prediction that the mortgage loan growth of banks that lend in subprime communities and have a loan-to-core deposit ratio around one should change more than that of other lenders in response to changes in monetary policy.

Our findings are consistent with our predictions. The results indicate that banks with core deposit funding tend to do more information-intensive mortgage lending in subprime communities. We also find evidence that banks which extensively lend in subprime communities and have a loan-to-core deposit ratio around one significantly reduce lending in response to a monetary contraction. This suggests that the bank lending channel for monetary policy applies to these banks. Additionally, these results

are strongest when we analyze banks' lending to communities with a large proportion of borrowers at the bottom of the credit score distribution. We do not find similar evidence of a mortgage lending reduction for other banks, so we find no support for the bank lending channel among traditional banks and market-based banks. Lastly, we consider bank capitalization and find that, within the group of banks that have limited core lending capacity and are originating mortgages in subprime communities, the lending response to monetary policy is primarily among low-capitalized banks.

The remainder of our paper is organized as follows: Section II is a description of our approach to identifying a bank lending channel. Section III describes our empirical analysis, including a discussion of data sources, descriptive statistics, and methodology. Section IV provides an interpretation of our results, and Section V concludes with both a summary and policy implications for the availability of credit in subprime communities.

II. IDENTIFICATION STRATEGY

For each of the three groups of banks described above, we consider how the spread between the loan rate and the risk-free rate would respond to a rise in the risk-free rate. Kashyap and Stein (1995) argue that this change in spread is a measure of the bank lending channel. When the spread remains constant (i.e. loan rates increase one-for-one with the risk-free rate), there is no bank lending channel, but when the spread increases, this suggests that a bank lending channel exists. The theoretical model in Black, Hancock, and Passmore (2007) provides one explanation for why loan rates might increase more than one-for-one with an increase in the risk-free rate due to higher loan defaults.[3] This is useful for identifying the bank lending channel, because the model explains why the bank lending channel may exist for certain types of banks, depending on the informational complexity of their borrowers.

In this paper, we apply the Black, Hancock, and Passmore model to test for the presence of a bank lending channel that operates through traditional banks, market-based banks, and transition banks. We focus on transition banks, because the impact of

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[3] Our identification strategy differentiates this explanation from the balance sheet channel. In the balance sheet channel, an increase in the risk-free rate causes the value of borrower collateral to fall and, perhaps, their cash flows to diminish. In response to this deterioration in credit quality, the bank would also raise loan rates more than one-for-one in response to the increase in the risk-free rate.

monetary policy on the loan rates of these lenders that extensively lend in subprime communities should depend on their core lending capacity. When a transition bank switches from core deposits to managed liabilities, the bank will pay an external finance premium which it will pass through to its borrowers by raising loan rates. Therefore, we predict that transition banks are the most likely to raise their interest rates (i.e., loan rate spreads) substantially in response to a monetary tightening.

Figures 1 and 2 provide a graphical representation of the theoretical predictions based on the model. In these figures, we differentiate between lenders with a high proportion of lending in subprime communities and lenders with a low proportion of lending in subprime communities. As for bank funding, we use the term "loan-to-core deposit ratio" as the more technical version of core lending capacity.

Figure 1 shows the loan supply functions of banks according to their lending in subprime communities and their loan-to-core deposit ratio. Lenders with a high proportion of lending in subprime communities charge higher loan rates than lenders with a low proportion of lending in subprime communities in order to cover their borrowers' higher expected costs. To the degree that such banks have low loan-to-core deposit ratios (i.e., large core lending capacities), these higher rates can be substantially mitigated because of the economies of scope between branch deposit collection and local loan monitoring. However, as loan-to-core deposit ratios rise, lenders with a high proportion of subprime lending increase their loan rates more quickly because of rapidly rising costs. In contrast, lenders that do relatively little lending in subprime communities would increase their loan rates only slightly.

Figure 2 shows how the loan rates of each lender group respond to a shock to the risk-free interest rate. In this figure, the vertical axis describes the multiple of the change in the loan rate relative to a change in the risk free rate. For example, 1.2 means that a 100 basis point increase in the risk-free rate increases the loan rate 120 basis points. Overall, lenders with a high proportion of subprime lending have a larger response to interest rate shocks. But more importantly, this figure shows where the responses depend most on core lending capacity. At relatively low loan-to-core deposit ratios, neither group responds much to a shock to the risk-free interest rate because deposit funding for new loans is readily available (securities holdings are simply decreased to free up the

deposits for funding loans). Similarly, at relatively high loan-to-core deposit ratios, the responses to interest rate shocks do not depend on the banks' loan-to-core deposit ratios because the banks are funding loans with managed liabilities, which are readily available for all banks.[4]

The responses of loan rates to an interest rate shock depend most on core lending capacity when the loan-to-core deposit ratio is near one. As banks diminish their core lending capacity (i.e., approach a loan-to-core deposit ratio of one from below), the banks' cost of supporting lending in subprime communities increases. The interaction of these effects causes the banks to raise their loan rates all the more as the risk-free rate rises. Close to the core lending threshold, where the loan-to-core deposit ratio equals one, both groups of lenders show an upward tilt in how much they increase loan rates in response to an interest rate shock. However, this upward tilt is steeper for lenders with a high proportion of lending in subprime communities, which implies that the largest response in loan rates should be among such banks with a loan-to-core deposit ratio close to one.

The theory has the following predictions:

1. Lenders with a high proportion of lending in subprime communities should have a larger core lending capacity (lower loan-to-core deposit ratio) than lenders with a low proportion of subprime lending. Lending in subprime communities imposes higher market premiums on these banks if they need to switch to funding mortgages with managed liabilities.

2. Among lenders with a high proportion of lending in subprime communities, the lenders close to exhausting their core lending capacity should raise loan rates more sharply than the others in response to changes in monetary policy.

3. Among lenders with a large amount of core lending capacity, the amount of deposit capacity should not affect how loan rates change in response to monetary policy. These banks' marginal funding does not depend on market rates.

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[4] In contrast to Kashyap and Stein (2000), we assume that all banks have access to uninsured sources of finance. This assumption seems valid, because, at a minimum, most banks have access to Federal Home Loan Bank advances. Therefore, rather than focusing on the liquidity of bank assets, we focus on the cost of managed liabilities.

4. Among lenders that have already exhausted their core lending capacity, the amount of deposit capacity should not affect how loan rates change in response to monetary policy. These banks' marginal funding is already determined by market rates and market rate increases are simply passed through to borrowers.

III. EMPIRICAL APPROACH

In this section, we describe the data sources, the grouping of banks, and the estimation of the empirical model. All variables are constructed from 1995:Q1 to 2005:Q4, inclusive. We focus on this period prior to the dramatic increase in securitization in 2006 and 2007 because many banks were still funding a significant percentage of their mortgage originations using their balance sheets.

1. Data Sources

Our bank balance sheet data come from the quarterly Reports of Condition and Income (Call Reports) for federally-insured, domestically-chartered commercial banks. These publicly-available data provide quarterly financial statements on the banks' assets and liabilities. The data appendix provides details on the construction of our bank balance sheet variables from the Call Report as well as an explanation of several filters based on the bank data which are applied to the final sample.

We construct two measures of loans on banks' balance sheets. To measure each bank's total loan portfolio in a quarter, we define total loans (LOANS) as the aggregate book value of all loans made by the bank before the deduction of valuation reserves. Total loans are measured on a consolidated basis (i.e., both domestic and foreign loans are included) to provide the broadest, most comprehensive measure of each bank's lending. Our measure of each bank's domestic residential mortgage lending (MORT) includes loans secured by 1-to-4 family properties and loans extended under home equity lines.

The main variable of interest on the liability side of the balance sheet is our measure of core deposit funding. Core deposits (DEP) consist of the total dollar amount of all deposits in deposit accounts of $100,000 or less. These deposits are limited to deposits in domestic offices and include applicable accounts of transaction deposits, non-

transaction savings deposits, and total time deposits. Our definition of core deposits is the same as Berlin and Mester (1999). Although the Call Report does not specifically record the amount of insured deposits, the $100,000 threshold at the account level is a good proxy for an account being insured by the Federal Deposit Insurance Corporation.

We also analyze the amount of securities on each bank's balance sheet, as used by Kashyap and Stein (2000) to measure balance sheet liquidity. Securities (SEC) include balance sheet assets that were booked as trading assets, federal funds sold, and securities purchased under agreement to resell. We combine these securities regardless of whether they are classified by the bank as "held-to-maturity" or "available-for-sale." Like total loans, we measure securities on a consolidated basis, since either domestic or foreign securities could potentially be liquidated by a bank to fund its lending activities.

We consider the total size of each bank and the amount of the balance sheet funded with capital as our final balance sheet measures. Total assets (A) provide a measure of the size of each bank's balance sheet. Equity capital (K) includes common stock, perpetual preferred stock, surpluses, undivided profits and capital reserves. Total assets and equity capital, both measured on a consolidated basis, are used to calculate bank-specific capital-to-asset ratios.

Our analysis of banking organizations is done at the top holder level to capture the response of each organization's overall mortgage lending to monetary policy. Considerable evidence suggests that bank holding companies allocate capital among their subsidiaries through the use of internal capital markets. For example, the loan growth of banks within a bank holding company is less sensitive to cash-flow and capital (Houston and James, 1998) as well as to monetary policy (Ashcraft, 2006) than stand-alone banks. Given this evidence, we sum across individual bank balance sheet data (both assets and liabilities) to construct domestic top holder balance sheet data for our analysis.[5] For any bank in a bank holding company, which is comprised of at least one bank and possibly several banks, the bank holding company is the top holder of the banking organization. On the other hand, a bank that is unaffiliated with any other bank is considered to be its

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[5] We identify the top holder of each bank using information from the National Information Center (NIC), which is the central repository containing information about all U.S. banking organizations and their domestic and foreign affiliates. Further details of the topholder construction are provided in the data appendix.

own top holder organization. For ease of exposition, henceforth we will refer to top holder organizations as "banks."

To construct measures of subprime communities, we use credit score data from TransUnion that contains information on the credit quality of mortgage borrowers in most U.S. census tracts. The TransUnion score of 490 is roughly comparable to a FICO score of 600 and the TransUnion score of 600 is comparable to a FICO score of 660. We use these data to calculate the proportion of mortgage borrowers in each census tract with a TransUnion score below 490, which is a narrow measure of subprime borrowers, and the proportion below 600, which is a broad measure of subprime borrowers including Alt-A. These thresholds for subprime lending are just above and below the FICO score of 620, which Keys et al. (2008) argue is a "rule of thumb" for subprime lending. Although we only have the credit score distribution for 2004, we assume that the credit score distribution for each census tract was relatively stable over the 1995 to 2005 period.

The Home Mortgage Disclosure Act (HMDA) data contain loan-level information on the majority of mortgage lending in the United States. Under federal requirements, almost every mortgage lender in the U.S. is required to report HMDA data on a number of characteristics about each of their mortgage originations including the census tract of the property and the date of origination.[6] Only very small institutions, institutions that do minimal mortgage lending, and institutions located solely in rural areas are exempt from this requirement. For the purposes of time and product consistency, we limit our sample to owner-occupied, conventional (non-government guaranteed), first-lien, home-purchase mortgages, which should be relatively standard across different lenders.[7] Although the data are available beginning in 1990, the quality of the data is not as high in the early years, so we begin our sample in 1995.

By combining the credit score data and the HMDA data, we can show the aggregate change in subprime lending over time. Figure 3 depicts the growth of subprime lending relative to total lending, where total lending equals our full sample of HMDA originations and subprime lending is measured as HMDA lending within census tracts in which the proportion of mortgage borrowers with a credit score of less than 600

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[6] The date stamp is only available in the confidential HMDA data.
[7] The removal of government-guaranteed loans from the sample includes the removal of FHA loans.

is greater than 25 percent. For this figure, we include the year 2006 to illustrate that total lending increased continuously until 2005 and then decreased in 2006. From 1995 to 2005, the number of mortgage originations increased from under 2 million to over 4.5 million and the dollar amount of mortgage originations increased from $200 billion to $1 trillion. Subprime lending followed a similar trajectory, but grew at a faster rate from 1995 to 2005 and did not decline in 2006. Therefore, from 1995 to 2006, the proportion of mortgage lending in subprime areas increased. The proportion of mortgages by number in low credit score tracts increased from under 0.3 to over 0.4 and the proportion of mortgages by dollar in low credit score tracts increased from under 0.2 to over 0.3. This shows that aggregate bank lending in subprime areas grew significantly over this period.

Combining the TransUnion and HMDA data also allows us to generate a time-varying measure of subprime mortgage lending for each bank. Using the HMDA data to identify *where* a lender is lending (by census tract) and *when* a lender is lending (by quarter), we know each bank's geography of lending over time. This information can be used to construct a "subprime lending intensity score" for each bank based on the credit score distributions of the census tracts where the bank lends. We prefer this measure to the U.S. Department of Housing and Urban Development (HUD) list of subprime lenders because it is derived directly from our data. Additionally, our measure can be constructed from the beginning of our sample in 1995, unlike measures of subprime lending based on HMDA "high rate" loans, which are only available beginning in 2004.

The construction of our baseline subprime lending intensity score begins with the proportion of mortgage borrowers with a credit score below 600 in each census tract, which we hold fixed at 2004 levels.[8] In a robustness test, we replicate the analysis using the 490 credit score threshold. Using the credit score distribution, we then calculate an average proportion of low credit score borrowers for each bank by weighting the proportions in the census tracts where the bank lends by the dollar amount of the bank's quarterly lending in each census tract. This results in a quarterly, bank-level proportion of mortgage borrowers with a credit score below 600. Therefore, a bank's subprime

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[8] Some census tracts changed between the 1990 and 2000 Census. We use a centroid mapping of 2000 to 1990 census tracts in order to apply the appropriate credit score distribution for 1990 census tracts.

lending intensity score is a bank-level, weighted-average proportion of borrowers with low credit scores at the quarterly frequency. Essentially, banks that originated mortgages primarily in census tracts with a high proportion of subprime borrowers have a relatively high subprime lending intensity score.

To measure changes in monetary policy that influence banks' cost of funds, we use the nominal federal funds rate (FFR).[9] This measure has been used by a variety of researchers (e.g., Bernanke and Blinder, 1992; Kashyap and Stein, 2000). In regard to policy regime, Bernanke and Mihov (1998) propose that the funds rate be considered as an appropriate measure of policy during the period we examine. In using this measure, we associate higher values of the federal funds rate with tighter monetary policy. Although there may be some concern about the endogeneity of the funds rate to economic conditions, in our model the lender is responding to movements in its cost of funds. If such changes are important, then the channel exists even if it sometimes transmits endogenous federal funds rate changes that do not reflect the true stance of monetary policy.

As a control for each bank's cost of deposit funding, we use deposit market competition, which might influence the size of the external finance premium faced by a bank as it moves from core deposits to managed liabilities. Previous research has shown that changes in the federal funds rate have a greater effect on bank lending in less concentrated deposit markets (Adams and Amel, 2005; Jayaratne and Morgan, 2000). For each bank, we construct a deposit-weighted Herfindahl-Hirshmann index (HHI) to proxy for deposit market competition. First, branch level deposit data are used to construct an HHI for each U.S. geographic banking market.[10] We define geographic banking markets as Metropolitan Statistical Areas (MSAs) for urban markets and as counties for rural markets. The HHI for each market, which is calculated as the sum of market deposit shares, increases as the concentration of banks' deposit-taking in the geographic market rises.[11] Second, an HHI is constructed for each bank using the bank's

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[9] Because our bank balance sheet data is quarterly, we use the average federal funds rate for the last month of each quarter for the value of the quarterly federal funds rate as was done in Kashyap and Stein (2000).
[10] See Black, Hancock, and Passmore (2008) for details on the construction of the geographic banking market HHI.
[11] For the analysis presented below, commercial bank deposits received a 100% weight and thrift deposits received a 50% weight in this calculation.

allocation of deposits across the markets. Each bank's HHI is a deposit-weighted average of the HHIs in the markets where the bank has branches.

Finally, we include information on aggregate output and regional variation to control for loan demand. National economic conditions are measured using seasonally-adjusted real GDP.[12] To allow average economic conditions to differ across geographic regions, we include 12 Federal Reserve-district fixed effects.

2. Lender Stratification and Descriptive Statistics

Next, we rank-order banks from the lowest to the highest subprime lending intensity score in each quarter and stratify banks into three subprime lending groups. Our stratification of the sample in each quarter is at the fifth and tenth percentiles of the distribution of banks' subprime lending intensity scores. We split the sample at these thresholds in order to analyze the banks that lend a significant amount in subprime areas and to compare these banks with those that do not lend very much in subprime areas. Banks with the highest subprime lending intensity score are labeled as the "high subprime-community lender" group and banks with the lowest subprime lending intensity score are labeled as the "low subprime-community lender" group. The remaining banks are labeled as the "medium subprime-community lender" group. We use the term "subprime community," because the score is based on lending in subprime communities.

Figure 4 shows the subprime lending intensity score thresholds in each quarter. High subprime-community lenders have a subprime lending intensity score of more than 0.14 by the end of the sample period. This means that, on average, these lenders lend in census tracts where more than 14 percent of the mortgage borrowers have a TransUnion credit score of less than 600. In contrast, low subprime-community lenders have a subprime lending intensity score of less than 0.12 by the end of the sample period. This means that, on average, these lenders lend in census tracts where less than 12 percent of the mortgage borrowers have a TransUnion credit score of less than 600.

Figure 5 shows the median of total assets (measured in nominal dollars) each year for each of the three lender groups stratified by subprime lending intensity score. In some years of the sample period, the high subprime-community lender group has greater

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[12] We use the chained index for real GDP in year 2000 dollars.

median assets than the low subprime-community lender group, and in some years it has less. Therefore, the size of the balance sheets of banks that do a small or large proportion of subprime lending do not appear to systematically differ, which implies that subprime lending is not primarily associated with either small or large banks.

For each of the three lender groups, figure 6 presents a quarterly time-series plot of the distribution of core lending capacities – measured by the loan-to-core deposit ratios. The three panels of figure 6 show the 25th, 50th, and 75th percentiles of the distribution of loan-to-core deposit ratios, respectively. A loan-to-core deposit ratio less than 1 implies that the bank can fund its entire loan portfolio with core deposits. However, when the loan-to-core deposit ratio is greater than one, the bank cannot fund all of its loans with core deposits. These banks must use managed liabilities to fund their loan portfolios.

Each of the panels of figure 6 shows a pattern consistent with what we would predict. At each of the percentiles, the loan-to-core deposit ratio for the high subprime-community lenders (represented by the light blue lines with triangles) is almost always less than the loan-to-core deposit ratio for both the medium subprime-community lenders (represented by the pink lines with squares) and low subprime-community lenders (represented by the dark blue lines with diamonds). At the 75th percentile, the loan-to-core deposit ratio for the low subprime-community lenders is also consistently greater than the loan-to-core deposit ratio for the medium subprime-community lenders. Each of the panels shows that loan-to-core deposit ratios have been trending upward over the sample period, which is likely due to the falling cost of managed liabilities.[13] The median ratio for each group began below one in 1995 and trended above one over the course of ten years. By 2005:Q4, lenders above the 75th percentile of the loan-to-core deposit ratio for the low subprime-community lenders group had a loan-to-core deposit ratio greater than 2.3. This means that for 25 percent of the low subprime-community lender group in that quarter, less than a half of the loan portfolio was funded by core deposits.

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[13] Membership in the Federal Home Loan Bank (FHLB) system grew substantially over our sample period, giving banks access to low-cost FHLB advances. See Frame, Hancock, and Passmore (2007).

To differentiate between lenders based on their core lending capacities, we group banks according to their loan-to-core deposit ratios. As described earlier, traditional banks have a strategy of maintaining a large core lending capacity(i.e., a low loan-to-core deposit ratio). On the other hand, market-based banks tend to have a large loan-to-core deposit ratio, because they have already exhausted their core deposits. We stratify banks again by applying two thresholds to the distribution of loan-to-core deposit ratios. We place the first threshold at 0.9, because banks with a loan-to-core deposit ratio less than 0.9 can probably continue to lend without turning to managed liabilities. The appropriate threshold for the switching point to managed liabilities is more difficult to determine because loan-to-core deposit ratios have been trending upward over time. Therefore, we set the threshold at the 90th percentile of the loan-to-core deposit ratio for the full sample, which is 1.7174 (for readability, we will sometimes refer to this threshold as 1.7). Banks with a loan-to-core deposit ratio above this threshold have likely exhausted their core deposits and are using managed liabilities as the marginal source of funding for loan originations. Between the two thresholds, where loan-to-core deposit ratios fall between 0.9 and 1.7, banks are probably close to exhausting their core lending capacity and may have to switch to managed liabilities in order to continue funding mortgages.

Table 1 presents the two-way split of banks grouped by subprime lending intensity score and loan-to-core deposit ratio. The full panel dataset contains 84, 770 bank-quarter observations.[14] In the top panel, each cell indicates the proportion of the observations in our sample that fall within each grouping of banks. The far right column shows the distributional splits by subprime lending at the 5 percent and 10 percent levels. The fourth row shows the distribution of observations by loan-to-core deposit ratio. About 25 percent of these observations are banks with a loan-to-core deposit ratio less than 0.9 and, by construction, 10 percent of the observations are banks that have a loan-to-core deposit ratio above 1.7. This leaves almost 65 percent of the observations as banks with a loan-to-core deposit ratio in the middle range (top panel, fourth row, second column) and most of these banks are included in the high subprime-community group. Based on these percentages, it is clear that the groupings are such that we have

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[14] Observations in our panel dataset are comprised of a cross-section of banks being observed at a quarterly frequency.

maintained a large sample of banks in the group of greatest interest – high subprime-community lenders with loan-to-core deposit ratios around one – while still differentiating a significant proportion of other banks.

The bottom panel of table 1 shows the proportion of observations within each grouping by subprime lending. Almost 26 percent of the high subprime-community lenders had a loan-to-core deposit ratio below 0.9 and 9 percent of these lenders had a loan-to-core deposit ratio above 1.7. In contrast, less than 18 percent of the low subprime-community lenders had a loan-to-core deposit ratio below 0.9 and 21 percent of these lenders – more than twice the proportion of high subprime-community lenders – had a loan-to-core deposit ratio above the 1.7 threshold. Columns 1 and 3 provide additional evidence consistent with our prediction that high subprime-community lenders have lower loan-to-core deposit ratios than low subprime-community lenders. The proportion of lenders with a loan-to-core deposit ratio less than 0.9 falls monotonically as one looks down the first column from high to low subprime-community lenders, whereas the proportion of lenders with a loan-to-core deposit ratio greater than 1.7 *increases* monotonically from high to low subprime-community lenders in the third column.

3. Empirical Methodology

Our empirical approach for identifying the bank lending channel is similar to that of Kashyap and Stein (2000). We estimate a panel regression with a cross-section of banks and a time-series of quarters from 1995 to 2005. Let L_{it} be the bank-level Call Report measure of mortgage lending (MORT) at bank i at time t, let C_{it} be the level of the loan-to-core deposit ratio at bank i at time t ($C_{it} = LOANS_{it} / DEP_{it}$), and let R_t be the measure of monetary policy (with higher values of R_t corresponding to tighter policy at time t). After stratifying the data into groups based on lending to subprime communities (high, medium, and low) and core lending capacity ($C_{it} < 0.9$, $0.9 \leq C_{it} \leq 1.7174$, $C_{it} > 1.7174$), we estimate the following relationship:

$$\Delta \log\left(L_{it}\right) = \sum_{j=1}^{4} \alpha_j \Delta \log\left(L_{i,t-j}\right) + \sum_{j=0}^{4} \mu_j \Delta R_{-j} + \sum_{j=0}^{4} \pi_j \Delta GDP_{t-j} + \Theta TIME_t + \sum_{k=1}^{3} \rho_k QUARTER_k$$

$$+ \sum_{k=1}^{12} \psi_k FRB_k + HHI_{i,t} + C_{i,t-1}\left\{\eta + \delta TIME_t + \sum_{j=0}^{4} \phi_j \Delta R_{-j} + \sum_{j=0}^{4} \gamma_j \Delta GDP_{t-j}\right\} + \varepsilon_{it}$$

where GDP_t is real gross domestic product at time t, $TIME$ is a time trend, $QUARTER_k$ (k=1,2,3) are quarterly indicator variables, FRB_k (k=1,…,12) are Federal Reserve regional indicator variables, and HHI_{it} is the deposit market concentration measure for bank i at time t.

The derivatives of our regression equation depend on the cross-sectional and time-series relationships within the data. The cross-sectional derivative $\partial L_{it}/\partial C_{i,t-1}$ captures the sensitivity of bank i's mortgage lending to its core lending capacity. The time-series derivative $\partial L_{it}/\partial R_t$ measures the sensitivity of mortgage lending at bank i to monetary policy. This derivative captures the average, direct responsiveness of bank lending to monetary policy apart from individual bank characteristics.

We are most interested in how the sensitivity of bank lending to monetary policy depends on each bank's core lending capacity. Our theoretical framework implies that the sensitivity of lending to monetary policy will depend on core lending capacity for only a subset of banks. As in the descriptive statistics, we differentiate this group from other banks by stratifying banks according to their subprime lending intensity score and their loan-to-core deposit ratio.

The derivative $\partial^2 L_{it}/\partial C_{i,t-1}\partial R_t$ identifies how the sensitivity of bank lending to monetary policy depends on each bank's core lending capacity. Unlike the direct measure of the lending response to monetary policy, $\partial L_{it}/\partial R_t$, this derivative exploits both the cross-sectional and time-series aspects of the data. Suppose two high subprime-community lenders are alike except that one is closer to exhausting its capacity to fund loans with deposits (i.e., $C_{i,t} \to 1$). Now suppose that these lenders are hit by a contractionary monetary shock. In response to that shock, our model predicts that the lender that is closer to exhausting its core lending capacity will reduce its lending more

than the other lender. Therefore, for high subprime-community lenders close to exhausting their core lending capacity, the sensitivity of their lending to monetary policy is expected to be greater than for other high subprime-community lenders with a smaller loan-to-core deposit ratio (i.e., $\partial^2 L_{it} / \partial C_{i,t-1} \partial R_t < 0$).

To test our theory, we compare within each stratified group the banks' responses to monetary policy given their loan-to-core deposit ratios. This is similar to Kashyap and Stein (2000) whose strategy for identifying the bank lending channel is based on grouping large and small banks. Their difference-in-difference approach examines how small banks differ in response to monetary shocks based on different securities holdings. In contrast, our approach tests the bank lending channel by examining how banks that do a large proportion of lending in subprime communities differ from other banks in their response to monetary policy, conditional on their loan-to-core deposit ratios.

In our framework, securities holdings are simply a place to "park" excess deposits. A bank may draw down its securities holdings in response to a monetary shock, but this drawdown of securities is to access core deposits and to avoid an external finance premium, rather than to obtain cash to fund loans. This implies that a low loan-to-core deposit ratio tends to be associated with a high securities-to-asset ratio (the balance sheet measure used by Kashyap and Stein, 2000). As shown in table 2, loan-to-core deposit ratios are highly negatively correlated with securities-to-asset ratios for most groups of banks. The only exceptions are banks with high loan-to-core deposit ratios (greater than 1.7) that are also high or medium subprime-community lenders.

Bank capitalization is likely to be a contributing factor in banks' availability of funds and the responsiveness of their lending to monetary policy. Several authors have found that banks with low regulatory capital are most affected by monetary contractions (Kishan and Opiela, 2000; Kishan and Opiela, 2006). Moreover, a bank's capitalization seems to significantly influence the pricing of individual loans, suggesting that some bank dependent borrowers face significant costs in switching lenders (Hubbard, Kutter, and Palia, 2002). Bank capitalization fits easily into our analysis, as banks with low capitalization would face an even higher external finance premium if they had to shift from core deposits to managed liabilities. Thus, banks with a loan-to-core deposit ratio around one would be most affected by a relatively low level of capital-to-assets. In our

final test, we expand our analysis by stratifying the high subprime-community lenders by their capitalization.

We believe that our empirical approach uniquely identifies a bank loan supply effect distinct from changes in the financial conditions of borrowers. The financial condition of subprime borrowers may be more or less sensitive to monetary policy than that of prime borrowers, which makes it difficult to identify a bank lending channel where a contraction of lending reflects rising funding costs for banks and not a deterioration of borrower balance sheets. However, we rule out this alternative explanation because borrowers who are more prone to financial distress are not likely to sort themselves by banks' loan-to-core deposit ratios.

IV. EMPIRICAL RESULTS

1. Main Results

Table 3 presents estimates of the partial cross-derivatives of mortgage lending with respect to each bank's loan-to-core deposit ratio and monetary policy, i.e., $\partial^2 L_{it} / \partial C_{i,t-1} \partial R_t$, for nine subsamples of lenders stratified by subprime-community lender group (high, medium, and low) and by core lending capacity ($C_{it} < 0.9$, $0.9 \leq C_{it} \leq 1.7174$, $C_{it} > 1.7174$). Each cell represents the degree to which a bank's loan-to-core deposit ratio modifies the direct effect of monetary policy on mortgage lending, $\partial L_{it} / \partial R_t$. A negative value indicates that the lending of banks with a larger loan-to-core deposit ratio is more sensitive to monetary policy.

The first column of table 3 reports the partial cross-derivatives of bank mortgage lending with respect to each bank's loan-to-core deposit ratio and the federal funds rate for banks with a large core lending capacity ($C_{it} < 0.9$). None of these derivatives is statistically different from zero, regardless of whether the lender is a high-, medium-, or low- subprime-community lender. These results are consistent with our prediction that the amount of core lending capacity should not affect how loan rates change in response to monetary policy among lenders with a large core lending capacity.

The second column of table 3 reports the partial cross-derivatives of bank mortgage lending with respect to each bank's loan-to-core deposit ratio and the federal

funds rate for banks that have loan-to-core deposit ratios in a range around one ($0.9 \leq C_{it} \leq 1.7174$). These are the lenders which will most likely need to switch from core deposit funding to managed-liability funding in order to continue funding mortgages following a monetary contraction. In this column only the partial cross-derivative for the high subprime-community lenders is negative and it is statistically significant at the ten percent level. This relationship conforms to expectations: The sensitivity of lending volume to monetary policy is greater for the high subprime-community lenders with less core lending capacity, i.e., $\partial^2 L_{it} / \partial C_{i,t-1} \partial R_t < 0$.

The third column of table 3 reports the partial cross-derivatives of bank mortgage lending with respect to each bank's loan-to-core deposit ratio and the federal funds rate for banks that have already exhausted their core lending capacity ($C_{it} > 1.7174$). Consistent with our theory, it is difficult to detect the presence of a bank lending channel for these lenders, regardless of the proportion of their mortgage lending done in subprime communities. These banks are likely already funding new mortgages with managed liabilities, which implies that the change in their cost of funding should not depend on their loan-to-core deposit ratio. In this column, none of the partial cross-derivatives for the three categories of subprime lending are significant at conventional levels of significance.

2. Robustness

As discussed in section III, the TransUnion data also have the distribution of each census tract's credit scores split at the TransUnion score of 490. Using this alternative threshold, we can check the robustness of our findings to a narrower definition of subprime lending. In this case, the subprime lending intensity score for each lender is constructed based on the proportion of mortgage borrowers in each census tract with a TransUnion credit score below 490 (equivalent to a FICO score of 600). For the stratification of banks in each quarter into three subprime lending groups, we also lower the distribution thresholds and stratify the sample at the first and fifth percentiles of the distribution of subprime lending intensity scores. We now run an identical set of

regressions using our narrower definition of subprime lending along with our original loan-to-core deposit thresholds of 0.9 and 1.7.

Table 4 shows the results for our empirical analysis based on the credit score splits at 490. The results are qualitatively similar to the previous results shown in Table 3 for the TransUnion credit score split at 600. The negative coefficient for our main group of interest – high subprime-community lenders with a loan-to-core deposit ratio around one – shows that, even under this narrower definition of subprime lending, we still find evidence for the bank lending channel. The only significant difference under the alternative definition is the positive coefficient for the group of high subprime-community lenders that have already exhausted their core lending capacity. This result indicates that, among these lenders, the lending volume of banks with larger loan-to-core deposit ratios is less sensitive to monetary policy. This might be due to some of the lenders at the bottom of this loan-to-core deposit range transitioning from core deposit funding to managed-liability funding.

In our final set of results, we test for the effect of bank capitalization on the bank lending channel. We have shown that, among high subprime-community lenders with a loan-to-core deposit ratio around one, banks with a larger loan-to-core deposit ratio have a greater sensitivity of lending to monetary policy. It is likely that, among these banks, those that are less well-capitalized adjust lending the most in response to monetary contractions. To analyze this additional effect, we use a simple construction of bank capitalization from the Call Report data, defined as capital divided by assets (K/A). We then stratify this subset of banks (high subprime-community lender, $0.9 \leq C_{it} \leq 1.7174$) at the first quartile of bank capitalization to see whether our loan-to-core deposit effect is greatest among the least well-capitalized banks. Table 5 shows the results for both our baseline definition of subprime lending using the credit score of 600 and the narrower definition of subprime lending at the credit score of 490. As shown in the table, the results are nearly identical for the alternative definitions. Only low-capital, high subprime-community lenders (those banks that have capital-to-asset ratios in the bottom quartile and do a large proportion of lending to subprime communities) exhibit significant

evidence of a bank lending channel.[15] This implies that the effect of core lending capacity on the sensitivity of loan supply among high subprime-community lenders is primarily among low-capitalized banks.

Based on our analysis using both a broad and narrow definition of subprime lending, the overall results appear to be slightly stronger for banks lending to the bottom of the credit score distribution. Our analysis focuses on high subprime-community lenders who are about to exhaust their core lending capacity. When this group is defined as lending to borrowers with credit scores of less than 490, the results are even stronger than when they are defined by the broader credit score of 600. In other words, subprime mortgage loan supply is especially sensitive to monetary policy when the borrowers are at the bottom of the credit score distribution. This can be inferred based on the coefficients in the middle column of the first row of both tables 3 and 4, where the coefficients are identical, but the standard error is smaller for the narrower definition of subprime lending. Likewise, in table 5, the coefficients are nearly identical for low-capitalized, high subprime-community lenders, yet the standard errors are smaller for this group of lenders based on credit scores of 490. As a caveat to this inference, the group of high subprime-community lenders under the narrow definition is slightly larger than the baseline group due to the lender threshold being set at the fifth percentile rather than the tenth percentile, which could narrow the standard errors. However, the smaller standard errors are consistent with our theoretical framework, indicating that lending to lower credit score borrowers is more information-intensive, potentially making this type of loan supply more sensitive to monetary policy.

V. CONCLUSION

In this paper, we analyze the bank lending channel in the context of mortgage funding and mortgage lending. The bank lending channel suggests that banks play a special role in the transmission of monetary policy because monetary policy has an effect on banks' cost of funds in addition to changes in the risk-free rate. This leads to a unique response in bank lending among certain types of banks whose funding costs change the most in response to monetary policy.

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[15] Cut-offs for bank capitalization quartiles were computed on a quarter-by-quarter basis.

We characterize banks as "traditional banks" and "market-based banks" based on their business strategies. Traditional banks have a large supply of excess core deposits and specialize in information-intensive lending to borrowers, whereas market-based banks are funded with managed liabilities and mainly lend to relatively easy-to-evaluate borrowers. We refer to banks that operate between these two strategies as "transition banks" because they do an extensive amount of information-intensive lending even though their ability to continue funding mortgages with core deposits is sometimes exhausted.

Our proxy for information-intensive lending is the amount of a bank's mortgage lending in subprime communities. Due to the informational opacity of such loans, banks that extensively lend in subprime communities will likely pay a larger external finance premium on managed liabilities. This suggests that these banks will rely more on core deposits. However, monetary contractions can reduce banks' supply of core deposits and, consequently, their ability to continue funding mortgages with core deposits.

The cost of funds for transition banks will likely be the most sensitive to changes in monetary policy due to their limited core deposits. When transition banks exhaust their ability to fund mortgages with core deposits, they must switch to managed liabilities and pay a large external finance premium. Therefore, it is among these banks that we expect to find evidence for the bank lending channel of monetary policy.

Consistent with our predictions, we show that banks with an excess supply of core deposits tend to lend more in subprime communities. We also find evidence of a bank lending channel for banks that extensively lend in subprime communities and have a loan-to-core deposit ratio near one. These banks significantly reduce their mortgage lending in response to a monetary contraction. In contrast, we do not find any evidence of a bank lending channel among traditional banks with a large core lending capacity and among market-based banks with a large proportion of funding in managed liabilities. This result is robust to both a broad and a narrow definition of subprime lending and appears to be strongest among banks with low levels of capitalization. Thus, monetary policy does seem to have a bank lending channel, which is strongest among banks that do the most information intensive lending but have an inadequate core deposit base for managing the costs associated with such lending.

DATA APPENDIX

This appendix shows the details of our variable construction using the quarterly Reports of Condition and Income (Call Reports) for federally-insured, domestically-chartered commercial banks. It also provides further details on the topholder construction using Call Report and HMDA data and several filters applied to the final sample.

Details of Call Report variables (RCON and RCFD) for each variable in our analysis:

Total Loans:
LOANS = RCFD1400.

Residential Mortgages:
MORT = RCON1797 + RCON1798.

Core Deposits:
DEP = RCON2702.

Securities:
The time-series for securities holdings is measured on a comparable basis through time as follows: Prior to March 2002 (SEC = RCFD8641 + RCFD3545 + RCFD1350), between March 2002 and March 2003 (SEC = RCFD8641 + RCFD3545 + RCONb987 + RCFDb989) and after March 2003 (SEC = RCFD8641 + RCFD3545 + RCFDb987 + RCFDb989). The Call Report follows generally accepted accounting principles (GAAP) by reporting securities that are "held-to-maturity" at their amortized cost and securities "available-for-sale" at their fair value.

Total Assets:
A = RCFD2170.

Equity Capital:
K = RCFD3210. Also included in equity capital are cumulative foreign currency translation adjustments less net unrealized loss on marketable equity securities.

Details of Topholder Construction:

Call Report filers are combined up to the topholder level. To prevent double counting of assets or liabilities when constructing top holder values, we remove banks whose Call Reports are consolidated upward.

As with the Call Report data, individual HMDA filers are combined up to the topholder level to capture overall mortgage lending at the organization level. For purposes of the merge with the Call Report data, our top holders include foreign holding companies. If a

domestic top holder from our Call Report roll-up is part of a foreign holding company, we merge the HMDA and Call Report data at the foreign-holding-company level.

Details of Sample Filters:

We apply similar sample filters as those used by Kashyap and Stein (2000). Our filters are applied to Call Report data rolled up to the topholder level. First, we only keep topholders with positive assets. Second, we omit any topholders for which the ratio of mortgage loans to total loans is less than five percent. Third, we drop observations for which mortgage growth is more or less than five standard deviations from its average trend over the sample period. Lastly, we drop the observations of topholders for any quarter in which the topholders are involved in a merger.

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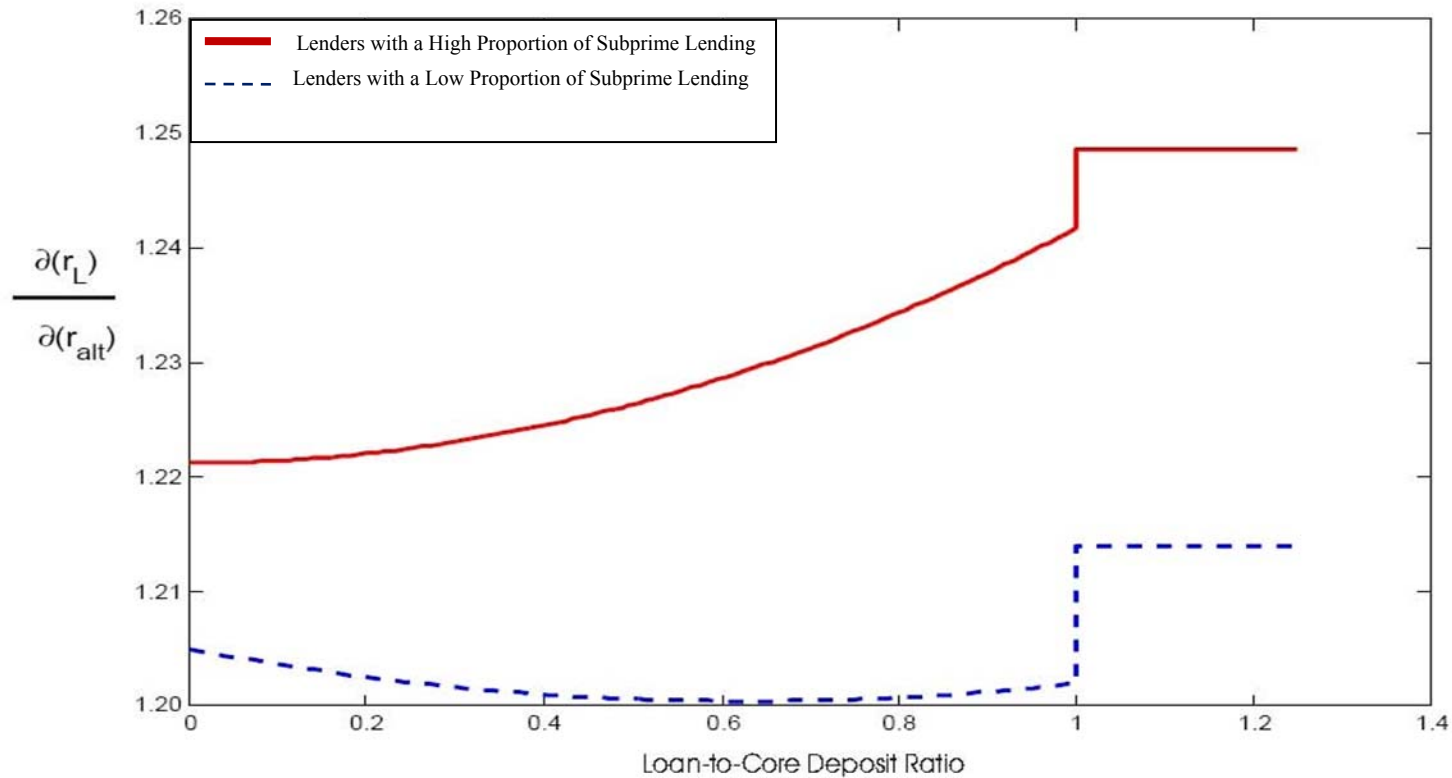
Figure 1

Core Lending Capacity and Its Effect on Loan Rates
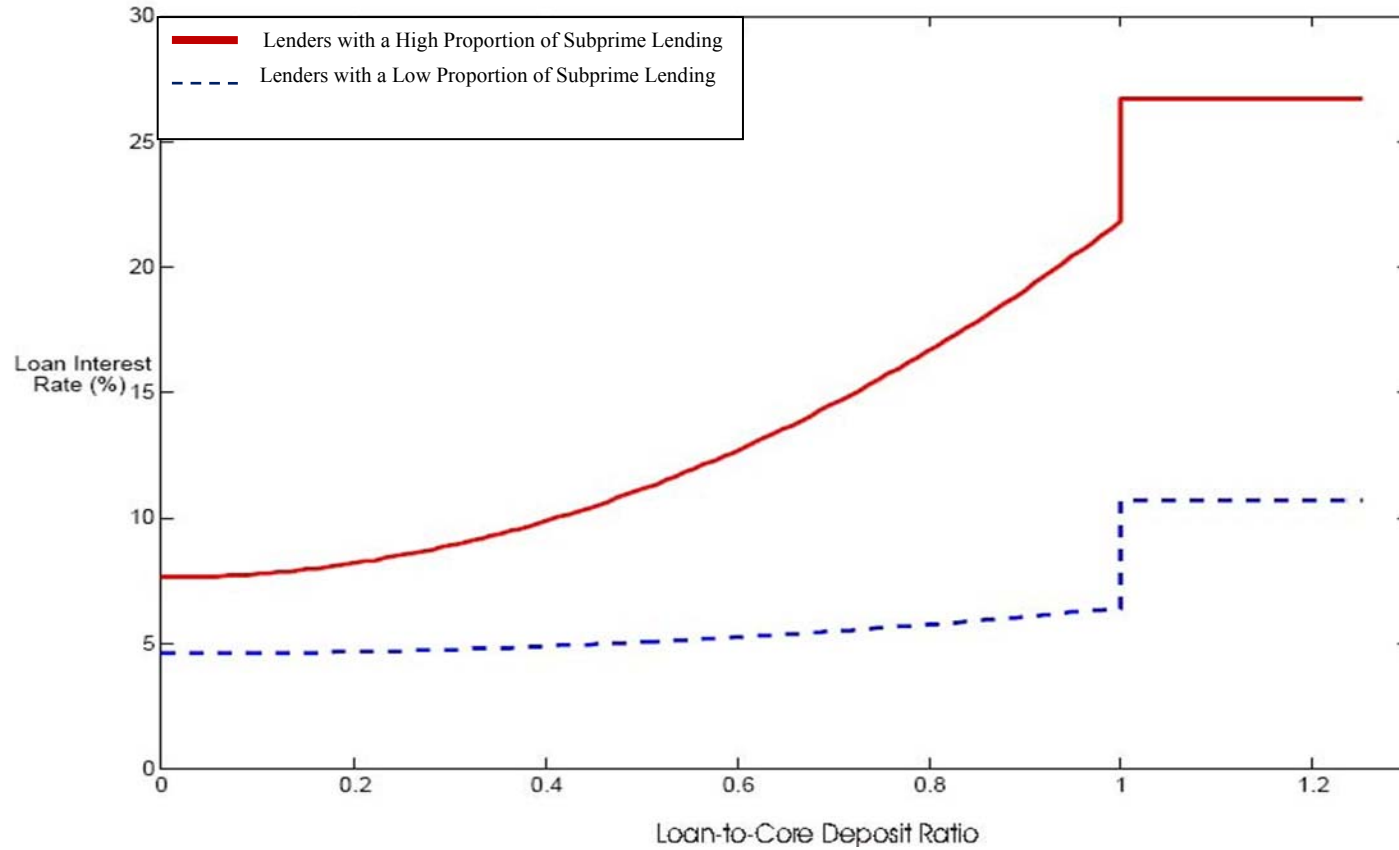
* Assumptions based on the theory developed in Black, Hancock, and Passmore (2007) using a lognormal distribution of returns for the borrowers: For the lenders with a high proportion of subprime lending and a loan-to-core deposit ratio less than 100 percent, $\rho = 0.075$, $\delta = 0.80$, $\varphi = 0.00$, $\sigma = 2.25$, $\mu = 2.25$. For the lenders with a high proportion of subprime lending and a loan-to-core deposit ratio greater than 100 percent, the same parameters hold, except $\varphi = 0.15$. For lenders with a low proportion of subprime lending and a loan-to-core deposit ratio less than 100 percent, $\rho = 0.010$, $\delta = 0.95$, $\varphi = 0.00$, $\sigma = 2.25$, $\mu = 2.25$. For lenders with a low proportion of subprime lending and a loan-to-core deposit ratio greater than 100 percent, the same parameters hold, except that $\varphi = 0.05$. For both types of lenders, loan demand is assumed to be linear ($L^D = c - \beta \cdot r_L$). However, equilibrium loan rates can also be derived (as well as similar charts) for $L^D = (\alpha \cdot q - r_L)/\beta$, which is a non-linear demand function that is dependent on the payoff and probability of success of the firm's project.

Figure 2

Effect of Core Lending Capacity on the Spread

* Assumptions based on the theory developed in Black, Hancock, and Passmore (2007) using a lognormal distribution of returns for the borrowers: For the lenders with a high proportion of subprime lending and a loan-to-core deposit ratio less than 100 percent, $\rho = 0.075$, $\varphi = 0.80$, $\sigma = 2.25$, $\mu = 2.25$. For the lenders with a high proportion of subprime lending and a loan-to-core deposit ratio greater than 100 percent, the same parameters hold, except $\varphi = 0.15$. For the lenders with a low proportion of subprime lending and a loan-to-core deposit ratio less than 100 percent, $\rho = 0.010$, $\delta = 0.95$, $\varphi = 0.00$, $\sigma = 2.25$, $\mu = 2.25$. For the lenders with a high proportion of subprime lending, $\beta = -0.01$, and for the lenders with a low proportion of subprime lending, $\beta = -2.00$. For the lenders with a low proportion of subprime lending and a loan-to-core deposit ratio greater than 100 percent, the same parameters hold, except that $\varphi = 0.05$. For both types of lenders, loan demand is assumed to be linear ($L^D = c - \beta*r_L$). However, equilibrium loan rates can also be derived (as well as similar charts) for $L^D = (\alpha*q - r_L)/\beta$, which is a non-linear demand function that is dependent on the payoff and probability of success of the firm's project.

Figure 3
Aggregate Mortgage Lending in Low Credit Score Tracts, 1995 to 2006
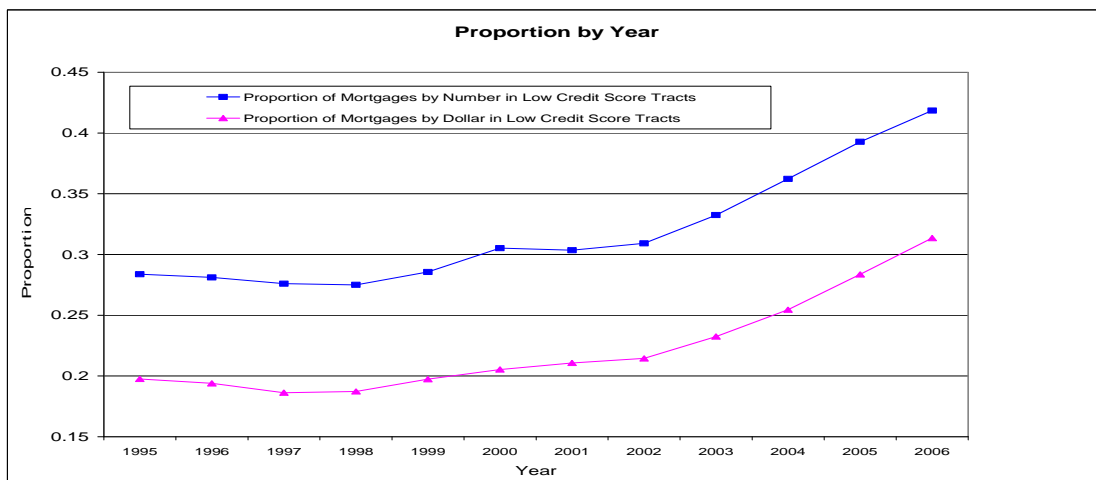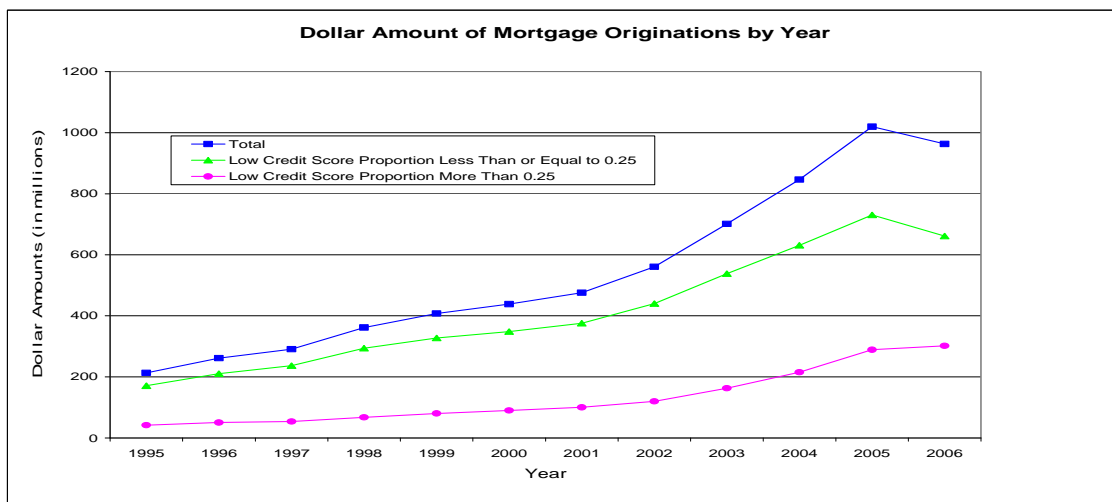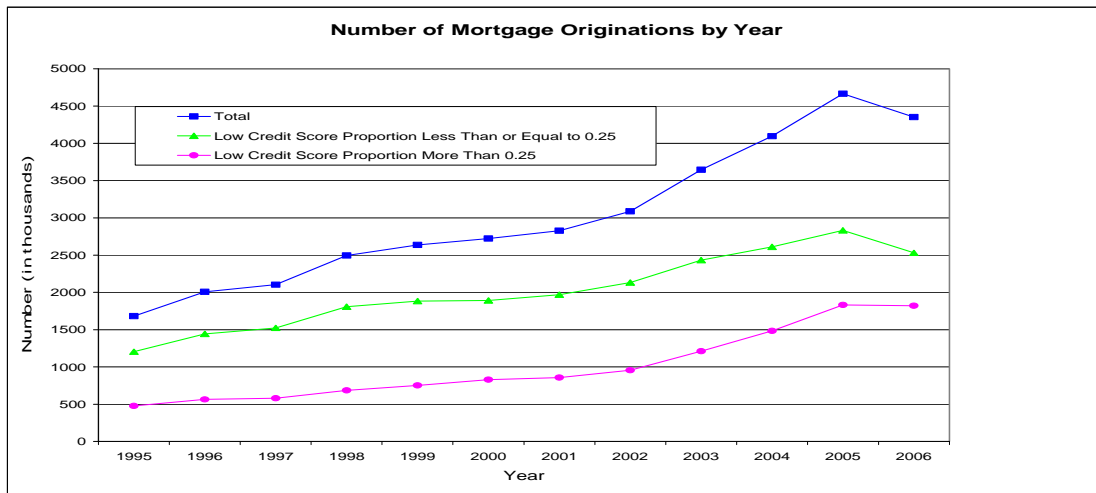**(600)**

Number of Mortgage Originations by Year

Dollar Amount of Mortgage Originations by Year

Proportion by Year

Figure 4
Subprime Intensity Score Cut-offs
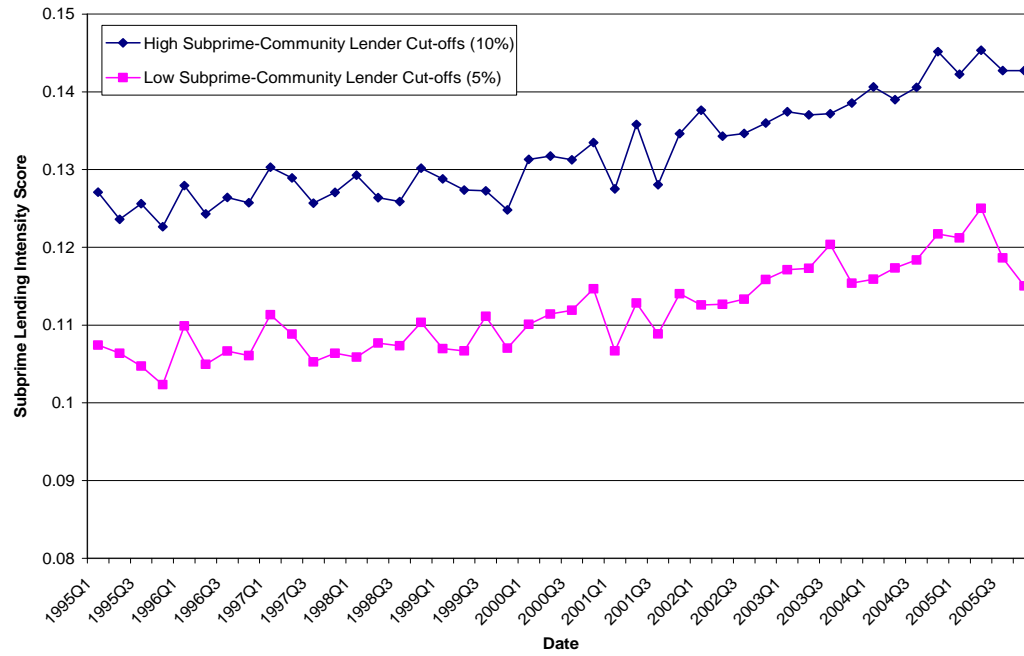**(600)**

Figure 5
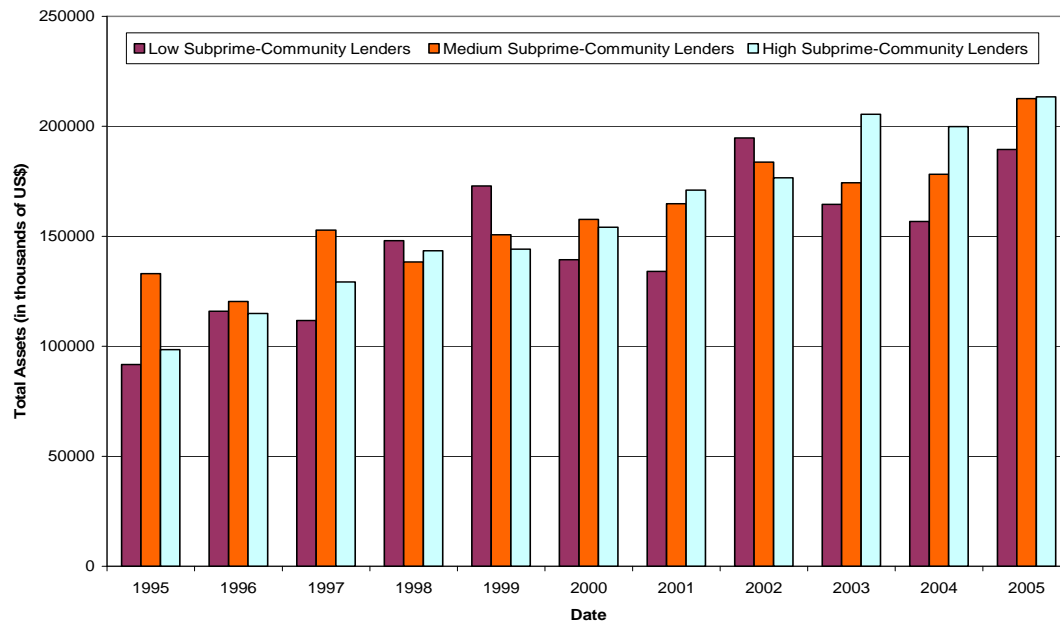Median of Total Assets by Subprime-Community Lender Group, 1995:Q1 – 2005:Q1
(600)

Figure 6
Loan-to-Core Deposit Ratios by Subprime-Community Lender Group
(600)

25th Percentiles
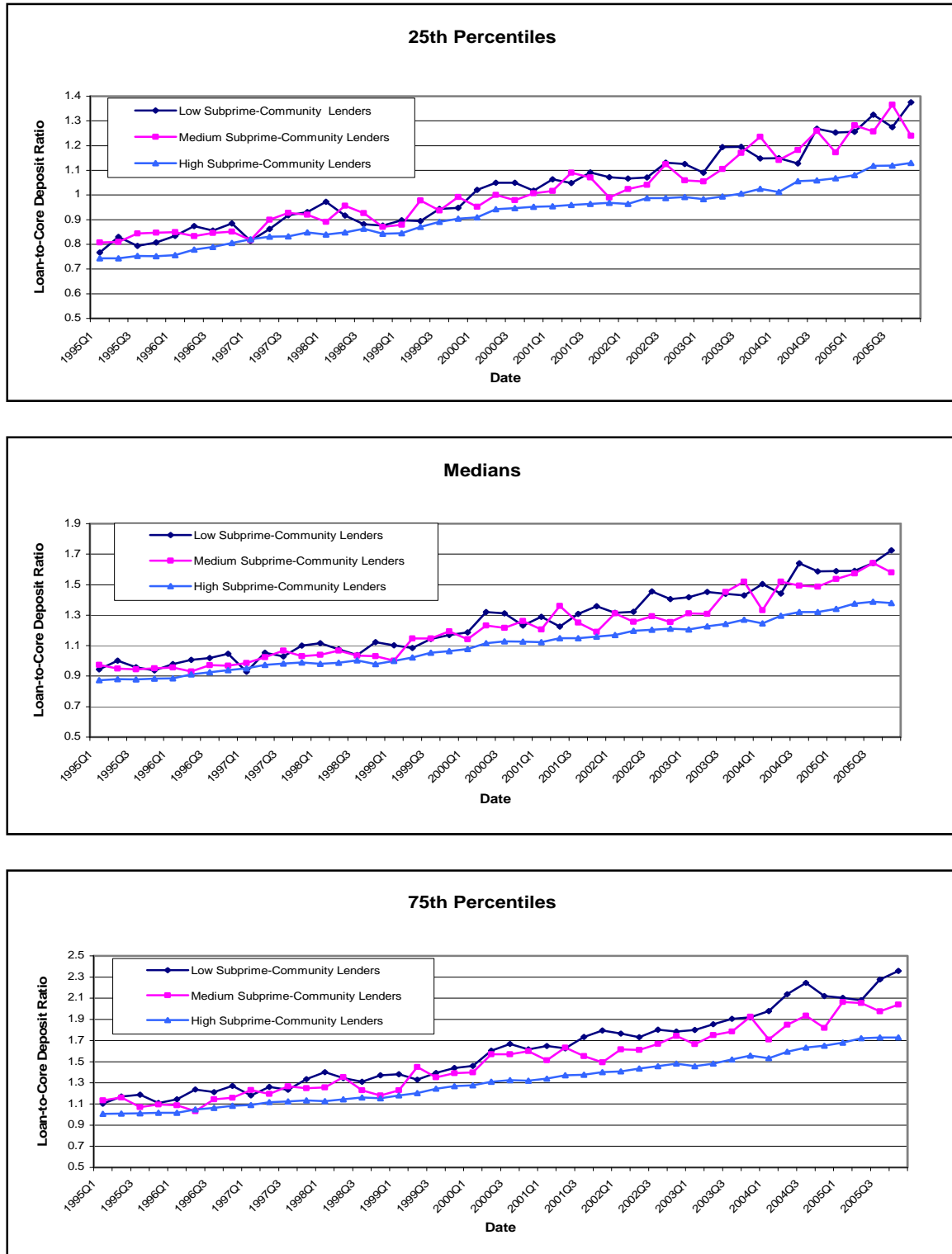

Medians

75th Percentiles

Table 1
How Many Banks Are Core Lending Capacity Constrained?
Proportion of Bank-Quarter Observations by Subprime-Community Lender Group and by Range of Loan-to-Core Deposit Ratio
(Subprime Lending Intensity Score Cut-offs at 5% and 10%)
(600)

Proportional Basis: Subprime-Community Lender Group	Loan-to-Core Deposit Ratio Range			
	Less than .9	.9 to 1.7174	Greater than 1.7174	Total
Proportion of All Observations				
High Subprime	0.234	0.586	0.081	**0.900**
Medium Subprime	0.009	0.032	0.009	**0.050**
Low Subprime	0.009	0.030	0.010	**0.050**
Total	**0.252**	**0.648**	**0.100**	**1.000**
Proportion of Each Group				
High Subprime	0.259	0.651	0.090	**1.000**
Medium Subprime	0.183	0.639	0.178	**1.000**
Low Subprime	0.178	0.611	0.211	**1.000**

Table 2
The Relationship between Loan-to-Core Deposit Ratios and Securities-to-Assets Ratios
Pearson Correlation Coefficients
(P-values in parentheses)
(600)

Subprime-Community Lender Group	Loan-to-Core Deposit Ratio Range		
	Less than 0.9	0.9 to 1.7174	Greater than 1.7174
High Subprime	-0.724 (<0.001)	-0.435 (<0.001)	0.025 (0.036)
Medium Subprime	-0.650 (<0.001)	-0.346 (<0.001)	0.213 (<0.001)
Low Subprime	-0.605 (<0.001)	-0.349 (<0.001)	-0.028 (0.401)

Table 3
Partial Derivatives of Bank Mortgage Lending Growth
With Respect to the Monetary Policy (R) and Core Lending Capacity (C)
(P-Values in parentheses)
(Subprime Thresholds Defined at Credit Score of 600)

Subprime-Community Lender Group	Loan-to-Core Deposit Ratio Range		
	Less than 0.9	0.9 to 1.7174	Greater than 1.7174
High Subprime (above 10%)	0.023 (0.215)	**-0.020** **(0.009)**	-0.001 (0.854)
Medium Subprime	0.062 (0.572)	-0.033 (0.344)	-0.008 (0.483)
Low Subprime (below 5%)	0.072 (0.592)	-0.027 (0.368)	-0.010 (0.369)
Difference (High minus Low)	-0.048 (0.713)	0.008 (0.801)	0.009 (0.523)

Table 4
Partial Derivatives of Bank Mortgage Lending Growth
With Respect to the Monetary Policy (R) and Core Lending Capacity (C)
(P-Values in parentheses)
(Subprime Thresholds Defined at Credit Score of 490)

Subprime-Community Lender Group	Loan-to-Core Deposit Ratio Range		
	Less than 0.9	0.9 to 1.7174	Greater than 1.7174
High Subprime (above 5%)	0.026 (0.166)	**-0.020 (0.006)**	**0.007 (0.022)**
Medium Subprime	0.181 (0.241)	-0.027 (0.448)	0.013 (0.414)
Low Subprime (below 1%)	-0.237 (0.407)	0.022 (0.804)	-0.025 (0.489)
Difference (High minus Low)	0.263 (0.279)	-0.042 (0.617)	0.031 (0.332)

Table 5
Does Bank Capitalization Matter for Banks That Are Core Lending Capacity Constrained?
Partial Derivatives of Bank Mortgage Lending Growth
With Respect to the Monetary Policy (R) and Loan-to-Core Deposit Ratio (C)
For Banks with a Loan-to-Core Deposit Ratio around One ($0.9 < C < 1.7174$)
(P-Values in parentheses)

Subprime-Community Lender Group	**Level of Capitalization**	
	Capital-to-Asset Ratio in the Bottom Quartile	Capital-to-Asset Ratio in the Top Three Quartiles
High Subprime (based on credit score of 600)	**-0.048** **(0.0039)**	-0.008 (0.3268)
High Subprime (based on credit score of 490)	**-0.049** **(0.0021)**	-0.008 (0.2918)