Does Securitization Affect Bank Lending?
Evidence from Bank Responses
to Funding Shocks

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ABSTRACT

This paper studies the effect of securitization on bank lending. I propose a new index of "securitizability of a bank portfolio" that can be thought of as a weighted average of the potential to securitize loans of a given type, where the weights reflect the composition of a bank loan portfolio. I use this new index to show that securitization makes bank lending less sensitive to cost of fund shocks because it provides banks with an additional source of funding. Securitization thus weakens the link from monetary policy to bank lending activity. Furthermore, by allowing banks to convert illiquid loans into liquid funds, securitization reduces banks' holdings of liquid securities and increases their loan portfolios.

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1. Introduction

Since the 1970s, the market for securitized loans in the United States has grown to dominate the mortgage market and has become an increasingly important factor in lending to both consumers and businesses (Figure 1). In 2003, for example, $5.5 trillion of loans were securitized, or about 40% of all loans outstanding. Today, the securitization market exceeds the size of the corporate bond market. Despite its importance, there is little research on how securitization has changed the behavior of banks.[1] This paper examines how securitization is changing the way individual banks manage their funding and liquidity and how these changes have in turn altered the traditional links between bank cost of funds and loan supply. I show, first, that securitization creates a new source of liquidity by allowing banks to convert illiquid, hard-to-sell loans into marketable securities. Second, by allowing banks to substitute cash and securities for loans, securitization reduces the sensitivity of bank lending to the availability of the external sources of funds and thus weakens the ability of the monetary authority to affect bank lending through open market operations.

I start by proposing a new bank-specific index of "securitizability of a bank's loan portfolios" (S_{it}) that effectively captures bank loan liquidity. The index is a weighted average of the potential to securitize loans of a given type (based on market-wide averages), where the weights reflect the composition of an individual bank's loan portfolio. Thus, market trends generate time variation in the index, whereas differences in bank loan portfolio structures generate variation across institutions. I use this new measure to evaluate my hypotheses.

[1] For analysis of the issue of changing mortgage rates under the condition of the evolving market for ABSs see e.g., Black, Garbade, and Silber (1981), Kolary, Fraser, and Anari (1998), and Heuson, Passmore, and Sparks (2000). For analysis of the role of the government sponsored enterprises (GSEs) and the effect of government subsidies to GSEs, see Passmore (2004), Ambrose and Warga (2002), and Nothaft, Pearce, and Stevanovic (2002). For the analysis of the effect of securitization on the efficacy of the monetary policy in influencing real output, see Estrella (2002).

I first analyze whether securitization has reduced banks' need to carry liquid assets to meet unexpected demands from depositors and borrowers. Using the new securitizability index (S_{it}), I show that securitization acts as a substitute for traditional liquid funds on banks' balance sheets. Since banks choose liquidity levels and lending jointly, I adjust for this endogeneity by constructing an instrument for the securitizability index (S_{it}) where I use fixed bank portfolio choices at beginning-of-period values.[2] This fixed loan portfolio structure removes the effect of the managers' discretion, and ensures that the instrument varies only as a result of the deepening of the securitization market. The results suggest that as banks' ability to securitize loans has increased, their holding of liquid assets on balance sheet has decreased.[3] The magnitude of this decline is not only statistically but also economically significant (Figure 2). For example, from 1976 to 2003, the percentage of total assets held as liquid securities decreased on average by 6.11 percentage points due to expanding market for securitizable loans. This decline is equivalent to roughly 65 percent of bank capital.[4] Thus, securitization seems to have increased the supply of bank lending per dollar of capital in the industry.

The increasing liquidity of bank loans ought to change the link from bank funding availability (e.g. deposits) to their willingness to supply credit. The existing literature documents that the availability of additional internal and external sources of funds partially alleviates the effect of restrictions in availability of funds on bank loan supply. Kashyap and Stein (2000) find that more liquid banks are less susceptible to shocks to costs of external financing than less liquid ones. Campello (2002) shows that internal capital markets help to shield banks from the impact of funding shocks. Since securitization provides banks with

[2] For example, banks that prefer more liquid assets are likely to have both more liquid funds and more securitizable loan portfolio (which can be achieved by, e.g., issuing more mortgages and less C&I loans), thus creating a positive bias in the relationship between traditional liquidity levels and securitizability of a bank loan portfolio.

[3] I use the traditional approach to measuring the on-balance-sheet liquid securities and compute this measure as the sum of securities and federal funds sold divided by total assets.

[4] Note that this decline *cannot* be explained by any time trends such as the increase in average bank size over time and changes in banking regulation.

an additional source of *both* loan financing and liquidity, it should also shield banks' willingness to supply credit from external cost of funds shocks.[5]

To test this argument, I follow the regression framework of Kashyap and Stein (2000), which allows me to take advantage of both time-series and cross-sectional variation in the securitizability index (S_{it}) and its interaction with the cost of external funds. I exploit the Federal Reserve's ability to affect bank cost of funds via open market operations to construct shocks to bank funding costs that are exogenous to financial intermediaries' decisions.[6] Considering the relationship between bank liquidity, lending, and loan securitizability under these *exogenous* shocks allows me to adjust for the potential endogeneity that arise due to managerial discretion.

I find that securitization has indeed made total loan growth (especially growth in business loans) *less sensitive* to monetary policy shocks. For example, a bank with more liquid loan portfolio (e.g., one that holds significant amount of mortgages) incurs a smaller decrease in lending under a monetary tightening than a bank with a less liquid loan portfolio (e.g., a bank focused on business lending). Figure 3 illustrates the result intuitively by plotting average loan growth during tight and loose monetary regimes for banks with high and low loan securitizability index (S_{it}).[7] One can see that during the period of monetary tightening, banks with more liquid loan portfolios exhibit significantly higher business loan growth than banks with illiquid loan portfolios. Securitization thus seems to alleviate the effect of the monetary policy on loan supply, and this weakening varies across banks.[8]

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[5] Consider two small banks, both facing limited ability to raise external finance. The banks are alike except that the first has more opportunities to securitize its loans, perhaps because it holds most of its portfolio in mortgages, whereas the second bank holds many business loans (commercial and industrial (C&I) loans) which continue to be difficult to securitize. Under a funding shock, which causes them to lose cheap sources of funds (e.g., insured deposits), each bank is likely to contract its assets by either selling liquid securities or shrinking its loan portfolio. With securitization, however, banks may also choose to pool and securitize existing loans. Since the first bank holds more mortgages initially, it has better ability to insulate its lending from these shocks through securitization than the second bank.

[6] The Federal Reserve's ability to affect bank lending behavior via open market operations is called the bank lending view of the monetary policy transmission. For a review of this literature, see Bernanke and Blinder (1992), Bernanke and Gertler (1995), and Kashyap and Stein (1994). The empirical evidence is shown in Kashyap and Stein (1995, 2000), Jayaratne and Morgan (2000), and Krishnan and Opiela (2000).

[7] Note that in contrast to the multivariate panel model, this simple univariate comparison does not control for loan demand; hence, loan growth is higher during the period of tightening than during the period of loosening.

[8] Estrella (2002) argues that securitization, in principle, may reduce the potency of monetary policy. His research uses aggregate data to illustrate that the growing trend toward securitization in the U.S. has weakened the extent to which a given change in monetary policy affects real output. I extend this idea by exploiting not only aggregate trends but also differences across banks.

The results of more rigorous regression analysis indicate that a 100 basis point increase in the federal funds rate would reduce loan growth by 0.7% to 1.3% *less* at a bank with a more liquid loan portfolio (S_{it} at 90th percentile) compared to one with a less liquid loan portfolio (S_{it} at 10th percentile). The effect is significantly more pronounced for C&I loans, reaching 5.25% *smaller* decline for the first bank. The ability to securitize their existing loans insulates banks' willingness to supply credit from a monetary policy induced shock to the availability of external financing.[9]

This paper illustrates three ways that advancements in financial services have changed the nature of banking. First, securitization has become an integral part of bank liquidity-risk management. Bank loan liquidity should now be considered along traditional balance-sheet measures of liquidity, such as the share of cash or marketable securities in total assets. Second, securitization increases banks credit supply across sectors. Banks' ability to securitize liquid mortgages increases their willingness to supply illiquid business loans. Finally, securitization weakens the ability of monetary authority to affect bank lending activity. With securitization, it might be necessary to make a larger policy moves to achieve a significant contraction in banks' lending.

The remainder of the paper is organized as follows. Section 2 describes the structure and magnitude of the market for securitized loans as well as possible channels of its influence on banks' operations. Section 3 describes data and sample selection. Section 4 presents the intuition and methodology behind the bank-specific index of securitizability of a bank loan portfolio (S_{it}). Section 5 presents the empirical tests and results for the hypothesis of substitutability between liquid funds and securitizable loans on banks' balance sheets. Section 6 describes empirical evidence for the argument that securitization alleviates sensitivity of banks lending to the cost of funds shocks. Section 7 concludes the paper.

[9] For comparison, two equal-sized banks with the same access to the securitization market but with levels of on-balance-sheet liquidity around 10th and 90th percentiles of the level of liquidity distribution will have 0.4% to 0.7% loan growth differential four quarters after a 100 basis points increase in the federal funds rate.

2. The Securitization Market

Securitization is a process of creating new financial instruments by pooling the cash flows from a number of similar assets such as mortgages or credit card accounts, and putting them into a separate legal entity (or special purpose vehicle, SPV) often with some additional implicit or explicit guarantee or extra collateral. Creating this separate SPV isolates the cash flow generating assets and/or collateral so that the security is not a general claim against the issuer, just against those assets. The pooling process results in a *diversified* portfolio of cash flows that can be further stripped and repackaged based on various characteristics (e.g., the prepayment behavior), thereby reducing the need to monitor each underlying payment stream.[10]

The US economy has seen an enormous expansion of the securitization market. Table 1 presents the amount of loans outstanding and loans securitized for various loan categories over the sample period 1976:I to 2003:IV. Consider, for example, home mortgages. In 1976:I, the amount of securitized home mortgages was $27.7 billion. By the end of 2003, the total amount of securitized home mortgages grew 150 times, reaching $4.25 trillion. At the same time, the amount of home mortgages outstanding grew only 15 times, from $489 billion to $7,283 billion. In 1976, neither commercial mortgages, nor C&I loans, nor consumer credit were securitizable types of loans. By the end of 2003, the securitized loan volume totaled $294 billion of commercial mortgages, $104 billion of C&I loans, and $658 billion of consumer credit. Through the years C&I loans remain least securitizable loan category due to their heterogeneity which complicates pooling and pricing processes.

Figure 1 shows how the aggregate, economy-wide share of securitized loans in total loans outstanding has been changing over the years. The share of securitized home mortgages climbed from around 5% in 1976:I to almost 60% in 2003. In 2003:IV, 20% of the commercial mortgages outstanding, 6% of C&I loans, and 30% of consumer credit were securitized. On the aggregate level securitization has dramatically expanded from 2.2% of the total loans outstanding securitized in 1976:I to 40% in 2003:IV.

[10] For detailed discussion of the securitization process and the role of SPVs see Gorton and Souleles (2004).

The major contributors to the development of bank loan securitization have been the so-called Government-Sponsored Enterprises (GSEs) that were created by the US Congress to provide stability and ongoing assistance to the secondary market for residential mortgages and to promote access to mortgage credit and home ownership in the US.[11] GSEs foster securitization by being the largest buyers of mortgages in the US. Fannie Mae and Freddie Mac, combined, purchase almost one-half of all conventional single-family mortgage loans originated each year. More importantly, GSEs facilitate small bank access to the securitization market by standing by to purchase *individual* mortgages as well as mortgage *pools*. They create an environment where the ability to securitize mortgages is similar across banks of different size. This "equality" is further enhanced by mortgage companies that perform functions similar to GSEs but on a much smaller scale. Nevertheless, large banks continue to have economies of scale in accessing other sectors of the securitization market where there are few or no intermediaries willing to pool and securitize loans from multiple lenders (e.g., C&I loans securitization).

It is hard to overstate the importance of securitization in shaping bank's operations. It provides banks with a *new source of financing* their investment opportunities. Today, banks can fund new loans by securitizing them (or other outstanding loans). It changes the traditional view on the deposit institutions *assets liquidity*. Loan portfolios that were considered to be too cumbersome and expensive to sell 25 to 30 years ago are becoming more and more liquid. In this paper I concentrate on liquidity and funding implications of securitization.[12]

[11] The biggest among GSEs are the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac).

[12] There are other channels through which securitization significantly affects the nature of banking. First, securitization provides an opportunity for banks to hold more diversified loan portfolios, thus protecting them against local economic shocks. Although deregulation has eliminated most of the legal restraints on geographic segmentation, many banks continue to originate loans in the regions or industries where they have a superior knowledge of market conditions. With securitization, these loans can be bundled with others, bought and sold all around the country. Money can flow from the regions with excess deposits to the regions with the unsatisfied loan demand. Second, securitization gives banks an additional flexibility in terms of the maturity of their assets. Now banks can adjust their portfolios so that the maturity of the assets matches the maturity of the deposits more closely. Finally, it allows banks to easily move assets off their balance sheets and provides a means to mitigate the regulatory capital requirements. All these factors together have significantly reshaped the way the deposit institutions do business and are interesting to look at in the later studies.

3. Data and Sample Selection

3.1. Bank-Level Data

Bank-level data come from the Federal Reserve's Report of Condition and Income ("Call Reports") submitted by insured banks each quarter. I compile a dataset with quarterly income statements and balance sheet information for all reporting banks over the period 1976:I through 2003:IV. Appendix I describes the construction of the key series in detail. When analyzing the dataset, I first exclude all the bank-quarters with missing information on total assets, total loans, and liquid funds. I exclude banks in any quarter in which they go through a merger using bank mergers data from the Federal Reserve National Information Center (NIC). Specifically, I exclude the acquiring bank in the quarters before and after a merger. To prevent the possibility of outliers driving the results, I eliminate all bank-quarters with asset growth over the last quarter in excess of 50 percent, those with total loan growth exceeding 100 percent, those with total loans-to-asset ratio below 10 percent, and those with the share of credit card loans in the loan portfolio above 50 percent.[13] The final dataset contains 1,344,696 bank-quarters. To analyze differences in the securitization effects across banks of different size, I separate the sample into two groups: large banks and small banks.[14] I measure the size of a bank as a log of the real total assets. I assign bank-quarter to the group of small banks if its real total assets are in the bottom 75% of the size distribution, and to the group of large banks if its real total assets are in the top 5% of the size distribution.

Table 2 presents summary statistics of various balance sheet items for the obtained sample. It reports the means and medians for the full sample and for the sub-samples of small and large banks. It also presents how the composition of banks' balance sheets has changed over time. When comparing small and large banks, one can see that small banks tend to hold more liquid assets (35.0% versus 27.5% of

[13] The credit card loans have experienced a significant increase in securitization over last 10-15 years. I, however, can account for credit card loans securitization only as part of the consumer credit securitization. Hence, I believe that my securitizability index does not carefully capture the degree of securitizabililty of loan portfolios for banks heavily involved in the credit card business. Consequently, I exclude these banks from the considered sample to avoid possible distortions due to unobservable degree of securitizability of the credit card accounts.

[14] As I have already discussed in Section 2, size does not significantly affects banks' ability to access the mortgage securitization market but might be a significant factor determining banks' ability to securitize other types of loans (e.g., C&I loans). Only the largest banks in the US (I consider top 5% of banks' size distribution) can have sufficient number and homogeneity of loans to be able to securitize them independently of other lenders and/or financial intermediaries.

total assets) and less loans (54.8% versus 60.86% of total assets) in their portfolios relative to large banks. This is consistent with small banks having more trouble raising external finance and thus needing a bigger liquidity buffer as protection against cost of funds shocks. On the liability side, small banks are mostly financed by deposits (88% of total assets) and equity (9.6%), in contrast to large banks, who use deposits and equity to a smaller extent (82.15% and 7.76% correspondingly).

When comparing statistics for bank-quarters in 1976 and in 2003, several patterns emerge on the asset side of banks' balance sheets. First, over time, the level of on-balance-sheet liquidity fell significantly not only for small banks (from 34.3% to 26.7%), but also for large banks (from 28.3% to 25.4%). Second, the on-balance-sheet liquidity differential between large and small banks decreased dramatically. This might be attributed to increasing availability over time of the external financing to small banks and the evolution of the securitization market. Today there is less need for small banks to maintain thick liquidity buffers if they can easily obtain funds by securitizing their loan portfolios. Third, the share of loan portfolios in total assets increased for both small and large banks. Finally, there is a decrease in the share of business loans (C&I loans) in bank loan portfolios. This decrease might be caused by the development of the commercial paper market as well as the junk bonds market.[15]

3.2. Monetary Policy Proxies

To proxy the cost of external financing for banks, I use three different monetary policy indicators: (i) the federal funds rate (*Fed Funds*); (ii) the difference between the rates paid on six-month prime-rated commercial papers and 180-day Treasury bills (*Paper-bill*); and (iii) the Strongin measure of monetary policy (*Strongin*). These indicators of monetary policy are constructed using time series data available from the Federal Reserve and are described in detail in Appendix II.[16] All policy measures are transformed so that increases in their levels represent Fed tightening. They are also normalized to have the same standard deviation.

[15] Since the emergence of the commercial paper market in 1970, many large businesses switched from banks lines of credit to the commercial paper to finance their working capital.

[16] For detailed discussion of these three proxies see Kashyap and Stein (2000) and Bernanke and Blinder (1992).

4. Measuring Bank-Level Securitizability of a Loan Portfolio (S_{it})

In this paper I propose a new index of "securitizability of a bank's loan portfolio" that captures bank loan liquidity. The individual bank portfolio structure and economy wide securitization are the crucial factors to be considered in constructing the index. Consider two banks: Bank A and Bank B. Assume that Bank A holds 80% of its loan portfolio in home mortgages and 20% in C&I loans, whereas, Bank B holds 20% of its loans in home mortgages and 80% in C&I loans. Since home mortgages have been more liquid than C&I loans over the years, Bank A will face less frictions in liquidating its loans than Bank B. Following this intuition, I construct an index to proxy each bank's potential to securitize (sell) its loans (S_{it}) in a way that captures both the composition of a bank's loan portfolio and the growth in the depth of the securitization market over time. The proposed measure is computed as follows:

$$S_{it} = \sum_{j=1}^{6} \left(\frac{\text{Economy-wide Securitized Loans of Type } j \text{ at Time } t}{\text{Economy-wide Total Loans Outstanding of Type } j \text{ at Time } t} \right) * \left(\begin{array}{c} \text{Share of Type } j \text{ Loans} \\ \text{in Bank } i \text{ Portfolio at Time } t \end{array} \right) \quad (1)$$

The index can be thought of as a weighted average of the potential to securitize loans of a given type (based on market-wide averages), where the weights reflect the composition of an individual bank's loan portfolio. Thus, market trends generate time variation in the index, whereas the differences in bank loan portfolios generate variation across institutions. I construct this measure by breaking down a bank loan portfolio into six categories: (i) home mortgages, (ii) multi-family residential mortgages, (iii) commercial mortgages, (iv) consumer credit, (v) business loans not secured by real estate (commercial and industrial loans), and (vi) farm mortgages. The index can be computed using market-level data from the U.S. Flow of Funds and individual bank-level data on loans from the Reports of Income and Condition.[17]

Table 2 presents average S_{it} for the full sample of bank-quarters, large and small banks sub-samples, and for the beginning and ending points of the considered sample. The average securitizability of a bank loan portfolio in my sample is 10.89%. Over the sample period of 1976 to 2003 the average S_{it} has

[17] Appendix III discusses in detail the construction of the economy-wide time-series components of formula (1). Appendix I provides exact definitions of a bank loan portfolio components.

increased from about 1.8% to roughly 25.4%. This increase in the securitizability of a loan portfolio is economically significant, which once again calls for careful analysis of securitization effects on a bank's operations.

5. Securitization and the On-Balance-Sheet Liquidity

This section presents analysis of the hypothesis of substitutability between securitized loans and liquid funds on banks' balance sheets. I propose the set of empirical predictions and test them in univariate and multivariate frameworks.

5.1. Testable Predictions

Securitization is a process of creating liquid financial instruments out of assets that could be too cumbersome or expensive to sell individually. Consider an extreme case when a bank can securitize the existing loans as easily as it can convert liquid assets into cash. In this case, there is no need for a bank to hold liquid assets because liquid securities offer less return than loan intermediation. When facing a new lending opportunity and/or deposit withdrawal, this bank will convert a necessary amount of the existing loans into cash. The process of securitizing loans, however, is time consuming and costly. Consequently, a bank needs to hold enough liquid funds to finance the unexpected demand from borrowers and depositors that might occur during this time span. In the absence of the market for securitized loans, however, in choosing the optimal level of liquidity, a bank should consider potential lending opportunities and deposit withdrawals over much longer horizon, and, consequently, hold a larger position in liquid securities. This argument suggests potential substitutability between liquid securities and securitizable loans on a bank's balance sheet that should be an increasing function of bank loan liquidity (securitizability).

What about large banks and small banks? Does the expanding securitization market affect those two groups differently? There exists a dynamic trade-off. The process of securitization involves pooling a diversified loan portfolio and packaging securities and, hence, requires significant services from the

government agencies (FNMA, GNMA, Freddie MAC) and/or another pooling agencies (e.g., the investment banks). Large banks tend to have a much tighter relationships with the investment banks which provides them a direct route to the derivatives markets. These long-lasting relationships are likely to decrease the costs of securitization as well as the time it takes to securitize loans for large banks relative to small banks. While small banks are forced to attract other banks and/or pooling agencies to the securitization process, large banks can issue securities backed by a pool of their own loans.

Even though large banks have significant advantages accessing the securitization market, the marginal benefit of securitization as liquidity substitute might be smaller for large banks because they tend to be more efficient in managing their liquid funds even in the absence of securitization. Large banks can afford to maintain less liquid assets on their balance sheet for a number of reasons.[18] First, they usually face less severe principal-agent problem while trying to raise the uninsured funds (e.g., CDs) compared to the small banks. Second, large deposit institutions have more diversified depositors' base that makes the deposit withdrawals less volatile and more predictable. Finally, large banks are more likely to have an access to significant internal capital markets.[19]

5.2. Univariate Tests

In this sub-section, I present the results of the univariate analysis of the relationship between securitizability of bank loan portfolios (S_{it}), levels of on-balance-sheet liquidity (B_{it}), and bank size. Panel A of Figure 2 graphically presents the relationship between average S_{it} and average B_{it} over time. The evolution of the securitization market coincides with decreasing amount of liquid funds on bank balance sheets. The time-series correlation between average S_{it} and average B_{it} in my sample is -0.52, significant at the 1% level. Thus, aggregate trends support the substitutability hypothesis.

The level of liquidity maintained by banks, however, can be affected by numerous economy wide factors such as deregulation, consolidation in the banking industry, and technological advancements. Table 3 presents the cross-sectional analysis of bank liquid funds holdings for various sub-periods of the

[18] Similar arguments are empirically tested in Kashyap and Stein (2000) and Jayaratne and Morgan (2000).

[19] See, e.g., Campello (2002) and Houston, James and Marcus (1997).

sample. In Panel A of Table 3, I separate the sample of bank-quarters into four quartiles based on the distribution of the on-balance-sheet liquidity measure B_{it} and compute the average securitizability of bank loan portfolios S_{it} in each quartile. The results suggest that banks with lower securitizability of their loan portfolios have more liquid funds on their balance sheets. The difference in securitizability of bank loan portfolio S_{it} between banks in the least liquid quartile and banks in the most liquid quartile is significant at the 1% level for the full sample as well as its various sub-samples. This cross-sectional evidence thus also supports the idea that banks substitute liquid funds for securitizable loans.

As discussed earlier, large and small banks maintain different levels of liquid funds due to differences in their ability to access capital markets. Panel B of Table 3 evaluates the relationship between the level of on-balance-sheet liquidity and bank size in the cross-sectional framework. It presents the average liquidity measure B_{it} across size quartiles for the full sample of bank-quarters as well as for various sub-samples. I find that, over the years, large banks tend to maintain lower levels of on-balance-sheet liquidity than small banks. Panel B of Figure 2 graphically illustrates this relationship. Banks in the highest size quartile have around 6.6% less total assets held as liquid securities compared to lowest size quartile banks. This is equivalent to roughly 18% less liquid funds in total assets for banks in the largest size quartile relative to the banks in the lowest size quartile. The results are economically and statistically significant at the 1% level. The evidence is consistent with the argument that large banks are more efficient in managing their liquid funds.

5.3. Multivariate Tests

To control for factors potentially affecting the liquid securities maintained by banks (e.g., regulatory changes, technological advancements, etc.), I next conduct a more rigorous regression analysis with the following set of independent variables: (i) securitizability of a bank loan portfolio (S_{it}); (ii) bank size measured by the log of real total assets; (iii) bank reputation measured by the ratio of letters of credit to total assets. Additional control variables include the ratio of net income to total assets, the level of capitalization measured as the ratio of equity capital to total assets, and the share of non-performing loans

in the total loan portfolio. I also include time dummies for each quarter to account for changes in the regulation, business cycle effects, and other trends.

Under the substitutability hypotheses, the coefficient of securitizability of a bank loan portfolio is expected to be negative. Since large banks and more reputable banks experience less information frictions in accessing capital markets and hence can maintain less liquid funds, I anticipate the coefficients of bank size and reputation to be negative. Furthermore, if the marginal benefit of the securitizability index on liquidity level decreases with increasing bank size and/or reputation, I anticipate the coefficient on S_{it}*$Size$ (or S_{it}*$Letters\ of\ Credit$) to be positive.

There exists a potential endogeneity between on-balance-sheet liquidity and the securitizability of a bank loan portfolio due to the ability of banks' management to choose the on-balance-sheet liquidity level and structure of a bank loan portfolio simultaneously. Specifically, there might be a positive bias in the relationship between B_{it} and S_{it} because banks that prefer more liquid assets are likely to have both more liquid funds and more securitizable loan portfolio (which can be achieved by, e.g., issuing more mortgages and less C&I loans). To adjust for this endogeneity due to managerial discretion, I adopt two approaches. First, I implement the ordinary regression analysis with lagged independent bank-specific variables. Second, I use instrumental variable approach where the instrumental for S_{it} equals:

$$Instrument_{it} = \sum_{j=1}^{6}\left[\left(\frac{\text{Economy-wide Securitized Loans of Type } j \text{ at Time } t}{\text{Economy-wide Total Loans Outstanding of Type } j \text{ at Time } t}\right) * Avg_i\left(\begin{array}{c}\text{Share of Type } j \text{ Loans}\\ \text{in Bank } i \text{ Portfolio at Time t}\end{array}\right)\right] \quad (1a)$$

In constructing this instrument I use a fixed portfolio structure computed for each bank as the average portfolio structure over the first four quarters available in my sample.[20] This fixed loan portfolio structure captures an individual bank's loan specialization, and at the same time eliminates the source of endogeneity (managerial discretion) as well as the effect of securitization on the composition of a bank

[20] Similarly I instrument the interaction terms between loan securizability (S_{it}) and Size (and S_{it} * Letters of $Credit_{it}$) using instrument from formula (1a) and it is interaction with Size (Letters of Credit).

loan portfolio. The constructed instrumental variable captures the changes in the securitizability index for a bank that does not change its loan portfolio structure in response to changing depth of the securitization market.[21] Since I include time fixed effects in the instrumental variable regressions, the coefficient of S_{it} is driven by the within time variation in the instrumental variable.

Panel A of Table 4 presents the results of the ordinary regressions and Panel B of Table 4 presents the results of the instrumental variable regressions. The results are consistent across Panel A and Panel B. I find that the level of on-balance-sheet liquidity is indeed negatively correlated with the widening of the securitization market. The coefficients of S_{it} have significantly higher magnitude in Panel B than in Panel A due to the positive bias in the relationship between B_{it} and S_{it} that is not accounted for in the ordinary regressions of Panel A.

The evidence suggests that as the securitizability of a bank loan portfolio increases by 1%, the level of on-balance-sheet liquidity maintained by a bank decreases on average by around 26 basis points. As I have shown in Table 2, the average securitizability of a bank loan portfolio increased from around 1.5% in the 1970s to around 25% in 2000-2003 period. This corresponds to around 6.11% decrease in the total assets held as liquid securities, which is in turn equivalent to roughly a 65% decrease in the amount of liquid funds per dollar of equity held by banks. The average level of on-balance-sheet liquidity held by banks decreased on by 12% from around 36% in 1976 to around 24% in 2003. Thus, securitization is responsible for roughly one half of this decline in banks' liquid funds holdings. One can look at these results from a different perspective. Since the liquid funds and loans are two dominant components of the asset side of a bank balance sheet, a 6.1% decrease in the share of liquid funds in total assets is likely to lead to an increase in the share of the loan portfolio of a similar magnitude.

The results of the regression analysis also indicate that the amount of liquid assets tends to decrease with an increase in bank size or reputation. The marginal benefit of securitization on bank on-balance-

[21] The average loan portfolio structure for the first four bank-quarters available for each bank in my sample alleviates the effect of securitization on a bank loan portfolio composition. A bank loan portfolio structure is less likely to be affected by securitization in early bank-quarters than in recent years. For robustness, I also construct the instrumental variable using the average bank portfolio composition over all available quarters for each individual bank. The results of the instrumental variable regressions in this case are similar to those presented above.

sheet liquidity is smaller for large, more reputable banks than for small banks. Thus securitization is likely to be responsible for a significant decrease in liquid securities held by small banks (from 33% in the 1970th to 26% in 2000-2003) versus smaller change observable for large banks (from 27% in the 1970th to 24% in 2000-2003). The results imply that securitization bridges the gap in liquidity levels between large and small banks.

6. The Effect of Securitization on the Banks Lending Under Funding Shocks

If securitization in fact acts as a substitute for liquidity on banks' balance sheets, the increasing liquidity of bank loans ought to change the link from bank funding availability (e.g., deposits) to their willingness to supply credit. In this section I empirically evaluate this issue exploiting the Federal Reserve's ability to affect bank costs of funds via open market operations known in the literature as "the bank lending channel".

6.1. Testable Predictions

The main argument behind the lending channel of monetary policy is that by selling bonds in the open market the Federal Reserve drains the reserves of the depositary institutions thus causing a reduction in the availability of insured deposits – the cheapest source of the loanable funds for banks. It is not optimal for banks to completely offset this decline in deposits by borrowing directly from economic agents using the uninsured financing instruments.[22] Consequently, in the past, a bank facing tightened monetary policy would reduce lending in response to an increase in the marginal costs of raising deposits. Today, however, securitization offers an additional mechanism to finance loans in the face of restricted availability of external financing. Apart from cutting back on lending and draining down liquid funds, a bank can securitize existing loans, thus obtaining funds for new lending opportunities; it can also finance new loans by tapping into the securities market (securitizing issued loans immediately).

[22] The uninsured financing instruments are not free from the traditional principal-agent problem and, hence, require the additional risk premium. CDs in excess of $100 000, for example, are not protected by the deposit insurance and, therefore, carry more risk as well as the necessity for monitoring by lenders. For detailed discussions of the sufficient conditions for the existence of the bank lending channel of the monetary policy see Bernanke and Blinder (1992), Bernanke and Gertler (1995), and Kashyap and Stein (1994).

Following this intuition, a bank with higher securitizability of its loan portfolio will experience a smaller contraction in its lending activity under a restricted availability of external sources of funds than a bank with lower securitizability of its loan portfolio.[23] Furthermore, since large banks have a competitive advantage in their ability to access the securitization market (see discussion in Section 5.1), the effect of securitization on bank lending activity should be more pronounced for large banks than for small banks.

The substitutability between liquid funds and securitizable loans on banks' balance sheets has another implication. A bank with more liquid loans can drain its liquid funds more aggressively in maintaining its loan portfolio under a funding shock than a bank with less liquid loans because a manager of former bank knows he can easily replenish lost liquid funds through securitization.

My strategy of analyzing the relationship between the amount of liquid funds maintained by banks, their lending behavior, and loan portfolio securitizability in the framework of bank lending responses to the external funding shock have number of advantages. First, it allows to adjust for potential endogeneity. Since the Federal Reserve induced funding shocks are exogenous to financial intermediaries decisions, it is possible to isolate the cross-sectional differences in the relationship between financial institutions' investments (loans) and their ability to securitize them (sell them) using the monetary policy as a state variable.[24] Second, it allows to test whether securitization offers an additional mechanism to finance loans in the face of central bank tightening, thereby potentially weakening the link from monetary policy to loan supply.

6.2. Econometric Specifications

In choosing the regression specification I start from so called "univariate" one-step regression specification similar to Kashyap and Stein (2000) and Ehrmann et.al. (2001). I regress the log real loan

[23] The existing literature documents that the availability of additional internal and external sources of funds partially alleviates the effect of funding shocks on the supply of loans. Kashyap and Stein (2000) document that more liquid banks are less susceptible to monetary authority moves than less liquid ones. Campello (2002) shows that internal capital markets also help shield banks from the impact of increase in the costs of funds. Since securitization provides banks with an additional source of financing and liquidity, my argument is in tune with this literature.

[24] This approach also gives me an additional identification strategy for the simultaneity between the securitizability of bank loan portfolios and on-balance-sheet liquidity that might have not been completely accounted for in the regression analysis presented in Section 5.3.

growth ($\Delta \log(L_{it})$) against: (i) four lags of itself; (ii) five lags of changes in a monetary policy indicator (ΔM_t); (iii) linear time trend; (iv) quarter dummies; (v) bank-specific fixed effects; (vi) liquidity of a bank's balance sheet (B_{it-1}) as well as cross effect of liquidity and changes in the monetary policy indicator.[25]

$$\Delta \log(L_{it}) = \lambda_i + \sum_{j=1}^{4} \alpha_j \Delta \log(L_{it-j}) + \sum_{j=0}^{4} \mu_j \Delta M_{t-j} + \Theta_0 Time_t + \Theta_1 Quarter_t + B_{it-1}(b + \sum_{j=0}^{4} \beta_j \Delta M_{t-j}) + \varepsilon_{it} \qquad \textbf{(2)}$$

Where M_t is a monetary policy indicator and an increase in the level of M_t corresponds to a monetary tightening. Following Ehrmann et.al. (2001) I adopt the bank-specific fixed effects because the variation in the level of liquidity, as well as the composition of a banks' balance sheet, growth of the loan portfolio, etc. might be affected by the bank internal characteristics such as clientele base, management team, and mainstream and availability of the lending opportunities (e.g., individual home mortgages versus business loans).[26]

The traditional theory of the lending channel of monetary policy transmission argues that a contractionary monetary impulse drains banks insured deposits and, hence, causes decrease in a bank's lending volumes. Thus, the sum of μ's should be negative. Following Kashyap and Stein (2000), the availability of liquid funds reduces bank's loan growth sensitivity towards a positive cost of funds shock. Thus, the sum of β's should be positive.

To capture the securitization market influence on a bank's loan growth I augment the set of the independent variables in the basic univariate regression specification (2) with the bank-specific index of

[25] In the dynamic models for panel data which contain the individual specific fixed effects lagged dependent variables become non-exogeneous if the sample has small time dimension (T). Arellano and Bond (1991) and Andersen and Hsiao (1982) propose the solution for this problem by using GMM estimation procedures. However, the literature considers this problem to be present only in samples with time-series number of periods below 15. Since my sample contains bank-quarters from 112 periods and I restrict each deposit institution to have at least 20 quarters of data present (84% of the deposit institutions in my sample are present for more than 40 quarters) I do not use the GMM procedures proposed by Arellano and Bond (1991) and Andersen and Hsiao (1982).

[26] Consider an example, let us think about two banks: one with average level of on-balance-sheet liquidity of 15% over the years (less conservative), another one with average level of on-balance-sheet liquidity of 25% (more conservative). If the on-balance-sheet liquidity of both banks spikes up to 30% in year 1, then one should treat this 30% differently for two banks. For the less conservative bank 30% implies significant increase in on-balance-sheet liquidity above preferable (or sustainable) level of 15%, whereas for the more conservative bank this increase in liquid funds is less dramatic (only 5%). Consequently, the first bank is more likely to drain its liquid funds back to 15% of total assets in year 2 by converting the liquid funds into loans, whereas the second bank might consider 15% level of on-balance-sheet liquidity below sustainable and thus issue fewer loans than the first one. The bank-specific fixed effects accommodate these differences.

securitizability of a loan portfolio S_{it} proposed in this paper, cross-effects $B_{it}S_{it}$, five lags of $S_{it-1}\Delta M_{t-j}$, and five lags of $B_{it-1}S_{it-1}\Delta M_{t-j}$ ($j=\overline{0,4}$).

$$\Delta\log(L_{it}) = \lambda_i + \sum_{j=1}^{4}\alpha_j\Delta\log(L_{it-j}) + \sum_{j=0}^{4}\mu_j\Delta M_{t-j} + \Theta_0 Time_t + \Theta_1 Quarter_t + \\ + B_{it-1}(b + \sum_{j=0}^{4}\beta_j\Delta M_{t-j}) + S_{it-1}(c + \sum_{j=0}^{4}\xi_j\Delta M_{t-j}) + B_{it-1}S_{it-1}(d + \sum_{j=0}^{4}\rho_j\Delta M_{t-j}) + \varepsilon_{it} \quad \textbf{(3)}$$

A bank with higher securitizability of its loan portfolio should have smaller contraction in lending activity under a positive cost of funds shock than a bank with lower securitizability of its loan portfolio. Hence, I expect the sum of ξ's to be positive. If securitization acts as a substitute for liquidity on banks' balance sheets, then an increase in the securitizability of a bank loan portfolio would allow a bank to dig deeper into its liquid funds to protect its loan portfolio under a contractionary monetary impulse, and the sum of ρ's should be positive.

While I focus on the question of how a bank's decisions on the asset side of the balance sheet affect its loan growth, there are other mechanisms that can generate a similar effect on bank lending. Specifically, a similar effect might be generated by a bank's inability to fulfill capital adequacy requirements.[27] To disentangle this "inadequate capitalization" alternative, I implement so called "bivariate" regression analysis where I add the log real GDP growth to the set of the independent variables.[28] Adjusting for the GDP growth also allows me to control for loan demand differences across quarters.

$$\Delta\log(L_{it}) = \lambda_i + \sum_{j=1}^{4}\alpha_j\Delta\log(L_{it-j}) + \sum_{j=0}^{4}\mu_j\Delta M_{t-j} + \Theta_0 Time_t + \Theta_1 Quarter_t + \\ + B_{it-1}(b + \sum_{j=0}^{4}\beta_j\Delta M_{t-j}) + S_{it-1}(c + \sum_{j=0}^{4}\xi_j\Delta M_{t-j}) + B_{it-1}S_{it-1}(d + \sum_{j=0}^{4}\rho_j\Delta M_{t-j}) + \\ + \sum_{j=0}^{4}\Delta\log GDP_{t-j}(\theta_j^1 + \theta_j^2 B_{it-1} + \theta_j^3 S_{it-1} + \theta_j^4 B_{it-1}S_{it-1}) + \varepsilon_{it} \quad \textbf{(4)}$$

[27] A number of papers (see e.g., Diamond and Rajan (2000), Hubbard, Kuttner and Palia (2002), and Sharpe (1995)) argue that insufficient bank's equity capital can be one of the restricting forces behind bank's lending activity. According to this story, monetary tightening simply raises rates and suppresses economic activity thus causing banks to experience loan losses and, hence, reduction in capital. This, in turn, forces weaker, more capital constraint banks to cut back on new lending.

[28] See Kashyap and Stein (2000) for the discussion of the "bivariate" regression approach.

Finally, to analyze whether the groups of large and small banks exhibit different loan - liquidity and loan – securitizability sensitivity under a monetary policy shock, I estimate specifications (3) and (4) for large and small bank sub-samples of my sample of bank-quarters. The standard errors for each set of the "difference coefficients" are estimated via SUR system using either univariate (equation (3)) or bivariate (equation (4)) specifications.

6.3. On-Balance-Sheet Loans Versus Bank Lending Activity

The empirical predictions formulated in Section 6.1 relate the securitizability of bank loan portfolios and on-balance-sheet liquidity to banks lending activity or, in other words, banks loan origination. I cannot observe the loan origination and therefore I proxy the banks' lending activity by the on-balance-sheet loan growth. This approach possesses a problem. When a bank securitizes its loans, they are eliminated from its balance sheets. Hence, it is possible that the balance sheet loan volumes are significantly smaller than the actual loan volumes extended to the economic agents by a bank. To alleviate this problem in my analysis, I consider the balance sheet loan growth not only for total loans but also for C&I loans. The balance sheet data for C&I loans better reflects the actual bank lending activity because these loans are still difficult to securitize and, hence, are last-to-be-sold by a depositary institution when it faces a funding constraint. I anticipate that the ability of securitization to alleviate the sensitivity of the loan portfolios to the availability of the traditional sources of financing should be more pronounced for least liquid C&I balance sheet loan volumes (that have smaller measurement error) and less pronounced for balance sheet volumes of total loans that contain first-to-be-sold mortgages. The magnitudes of the securitization effect on C&I loans are likely to reveal the actual effect securitization has on bank ability to supply credit.

6.4. Empirical Tests and Results

6.4.1. Total Loans Growth and Securitization

Table 5 presents regression analysis of the total loan growth. The table gives a compact overview of the various regression estimations. Panel A presents the estimates of the univariate specification (3),

whereas Panel B presents the results for the bivariate specification (4). Since both specifications contain bank-specific fixed effects, I require that each bank has at least 20 observations in my sample to ensure correct estimation of these parameters.[29] For each regression only a few numbers are shown. Specifically, the sums of the coefficients β_j, ξ_j, and ρ_j on the interaction term of a monetary indicator and B_{it-1}, S_{it-1}, and $S_{it-1} B_{it-1}$ correspondingly. Along with the different regression specifications, I consider three monetary policy indicators: (i) fed funds rate, (ii) paper-bill, and (iii) Strongin measure. In addition I test whether the considered sets of coefficients are different across the sub-samples of small and large banks.

Both Panel A and Panel B show that the total loan growth is positively affected by the securitizability of a bank loan portfolio and the availability of liquid assets. All specifications (univariate and bivariate) combined with various monetary indicators unanimously agree on the directions of the effects of the considered independent variables: $\Delta M_t B_{it-1}$, $\Delta M_{t-j} S_{it-1}$, and the cross-effect $\Delta M_t S_{it-1} B_{it-1}$. First, the sum of coefficients of $\Delta M_t S_{it-1}$ is positive in almost all specification, which indicates that securitization provides an additional source of funding for banks upon a funding constraint thus allowing lending to expand.[30] Second, the positive sum of coefficients of $\Delta M_t S_{it-1} B_{it-1}$ indicates that as securitizability of bank loan portfolios increases, banks are likely to dig deeper into their liquid funds to protect the loan volumes under a monetary tightening. This evidence supports the idea that securitization act as a substitute for the liquidity on banks' balance sheets. Finally, consistent with Kashyap and Stein (2000), I find that a thicker liquidity buffer allows banks to maintain more loans on their balance sheet upon a monetary contraction: the sum of coefficients of $\Delta M_t B_{it-1}$ is positive. These results are statistically significant at below 1% level in most regression specifications.

My next step is to look at the groups of large and small banks. Table 5 shows that the full sample results are mostly driven by the group of small banks. Consistent with large banks being more efficient in

[29] For robustness, I implemented similar regression analysis (i) without imposing 20-quarter restriction on my sample, (ii) without including the bank-specific fixed effects in the regression specifications, and (iii) using time fixed effects instead of the bank-specific fixed effects. I find the results to be qualitatively similar.

[30] In addition to the statistical tests presented in Table 5 and Table 5, I also implemented two additional tests of joint hypotheses. First, I tested if the coefficient of all lagged $\Delta M_{t-j} B_{it-1}$, ($\Delta M_{t-j} S_{it-1}$ and $\Delta M_{t-j} S_{it-1} B_{it-1}$) are jointly equal to zero. Second, I tested if all ξ and ρ coefficients are jointly equal to zero. Since, the obtained results showed rejection of these hypotheses at least 2% level for all regression specifications, I do not present these tests in the Table 5 and Tables 6.

managing their on-balance-sheet liquidity, the sum of coefficients of $\Delta M_t B_{it-1}$ is insignificant for the sub-sample of large banks in most regression specifications. Securitization, on the other hand, has significant positive effect on the lending activity for both small and large banks. There is, however, no agreement between the monetary policy indicators on the question of whether securitization affects large banks to a greater extent than it affects small banks. This might be attributed to the inability of the balance sheet total loan volumes to capture the actual banks' lending activity. To resolve this issue in the next sub-section, I consider how securitization affects C&I loans. Finally, small banks are likely to behave more aggressively in draining their liquid funds under a monetary contraction when the securitizability of a bank loan portfolio increases. Large banks, on the other hand, exhibit no influence of securitization on the protective ability of the on-balance-sheet liquid securities. This, once again, might be due to large banks' numerous advantages in liquidity management over small banks.

In summary, I find statistically significant evidence that the bank loan liquidity shields bank lending under a restricted availability of external financing. Furthermore, a bank with more securitizable loans tends to drain its liquid funds to a higher extent in protecting its total loan portfolio than a bank with less securitizable loans which ones again confirms the substitutability of the securitized loans and liquid funds on banks' balance sheets.

6.4.2. C&I Loans Growth and Securitization

Table 6 presents regression analysis where the dependant variable is the real C&I loan growth. The structure of the table is similar to the structure of Table 5. Panel A presents the estimates of the univariate specification (3), whereas Panel B presents the results for the bivariate specification (4). For each regression only the sums of the coefficients for $\Delta M_t B_{it-1}$, $\Delta M_t S_{it-1}$, and the cross-effect $\Delta M_t S_{it-1} B_{it-1}$ are presented. In the regression analysis of the real C&I loan growth I impose an additional sample restriction. Specifically, I omit all banks that have less than 5% of their loan portfolio in C&I loans to

avoid any distortion due to banks that only do negligible amount of C&I lending.[31] This restriction eliminates around 6.3 percent of my sample.

The regression result for the C&I loans are statistically significant and similar across univariate and bivariate specifications. First, the securitizability of a bank loan portfolio plays a positive role in maintaining the C&I loan growth under a monetary tightening when the cost of fund goes up (the sum of the coefficients of $\Delta M_t S_{it-1}$ is positive and statistically significant at 1% level). As anticipated, the magnitude of these regression coefficients for C&I loans is 4 to 10 times larger than that for total loans. Second, similar to the total loans case, I observe a positive and statistically significant at 1% level sum of the coefficients of $\Delta M_t S_{it-1} B_{it-1}$. In maintaining C&I loans banks with more liquid loan portfolios are willing to dig deeper into their liquid funds than banks with illiquid loans on balance sheet. Finally, the hypotheses that the liquidity buffer helps protect bank loan growth under a monetary contraction is strongly supported for C&I loans (the sum of coefficients of $\Delta M_t B_{it-1}$ is positive and statistically significant at 1% level).

Small banks behave similarly to the full sample case. The coefficients of $\Delta M_t B_{it-1}$, $\Delta M_t S_{it-1}$, and the cross-effect $\Delta M_t S_{it-1} B_{it-1}$ are positive and have magnitudes similar to the full sample estimates. The case of large banks, on the other hand, is much more interesting. First, large banks show considerable ability to exploit the securitization market in protecting their business loans. The sum of the coefficients of $\Delta M_t S_{it-1}$ for the sub-sample of large banks is not only positive but it is also significantly larger than that for the sub-sample of small banks. Second, similar to the case of the total loans, large banks do not consistently exhibit any dependency on the liquid funds in maintaining their lending activity under a monetary tightening.

To summarize, the analysis of C&I loans shows that a bank with higher securitizability of its loan portfolio tend to have larger C&I loan volumes under a constrained availability of external sources of funds than a bank with lower securitizability of its loan portfolio. I observe a positive effect of the securitization market on the ability of the liquid funds to act like a protective buffer for the portfolio of

[31] Similar sample restrictions are imposed in other studies (see e.g., Kashyap and Stein (2000)).

C&I loans which supports the substitutability hypothesis. As expected for difficult to securitize loans, the magnitude of the positive securitization effect on bank lending under a funding shock is significantly larger for balance sheet volumes of C&I loans than for balance sheet total loans. In addition, I find that securitization has a significantly greater impact on C&I loans for large banks when compared to small ones. This supports the argument that large banks are able to exploit the benefits of the securitization for loan origination to a greater extent.

6.5. Economic Significance of the Results

In the previous sub-sections I discussed the effect of securitization on bank lending, concentrating on the sign and the statistical significance of the obtained estimates. There is, however, another question to be addressed. Specifically, it is important to evaluate whether the estimated coefficients imply economically significant magnitudes.

I address this issue by quantifying how two equal-sized banks with different levels of on-balance-sheet liquidity (B_{it}) and different degrees of loan securitizability (S_{it}) would respond to a cost of funds shock. In Table 7 I present the estimates of the combined liquidity - securitization effect on loan growth under a 100 basis points hike in the federal funds rate implied by the estimates of the coefficients of $\Delta M_t B_{it-1}$, $\Delta M_t S_{it-1}$, and $\Delta M_t S_{it-1} B_{it-1}$ presented earlier in Tables 5 and Table 6 for various combinations of B_{it} and S_{it}.[32] Panel A shows the results for total loans and Panel B shows the results for C&I loans. In an attempt to disentangle the magnitudes of liquidity and securitization effects without crowding the table any further I compute the percentage of the total effect attributed to the presence of securitization and report it in parenthesis. In constructing the table, I consider liquid and illiquid banks as having B_{it} of 53.4% and 15.4% respectively, which corresponds to 90th and 10th percentiles of the B_{it} distributions in my sample. I also consider high loan securitizability (liquidity) banks and low loan securitizability banks as having S_{it} of 27.1% and 0.7% respectively which corresponds to 90th and 10th percentile of the S_{it} distribution. The magnitudes presented in Table 7 are positive since they *do not* contain the direct

[32] Table 7 is drawn on the parameter estimates from the univariate and bivariate regression for the full sample (since they are most conservative) where B_{it-1}, S_{it-1}, and the cross effect $B_{it-1}S_{it-1}$ are included in the set of the independent variables.

negative effect of a monetary tightening on bank lending. Consequently in this table only the magnitudes of the differences in the lending activity between liquid and illiquid banks as well as between banks with high and low loan securitizability (where this direct effect cancels out) are correctly identified.

Panel A of Table 7 shows that four quarters after a 100 basis points increase in the federal funds rate, a high loan securitizability bank would on average exhibit 0.7% to 1.14% higher growth in total loans than a bank with a low loan securitizability (depending on the amount of the traditional on-balance-sheet liquidity).[33] This indicates that if both banks start with $1000 in their total loan portfolios, then after the tightening the high loan securitizability bank will have roughly $7 to $11.4 more total loans than a low loan securitizability bank - purely based on the differences in the securitizability of their loan portfolios. Similarly, four quarters after 100 basis points hike in the federal funds rate, a liquid bank would on average exhibit 0.51% to 0.92% higher growth in total loans than an illiquid bank.[34] The share of securitization related total loan growth in the combined positive liquidity-securitization effect starts from 4.5% for a liquid bank with low loan securitizability and reaches around 78.8% for an illiquid bank with high loan securitizability.

The liquidity effect for C&I loans is similar in magnitude to the total loans case. A liquid bank would have on average 0.5% to 0.92% higher C&I loan growth relative to an illiquid bank four quarters after a 100 basis points increase in the federal funds rate solely due to the on-balance-sheet liquidity differential. In contrast, the magnitude of the securitization effect for C&I loans is roughly six times larger than that for total loans. Under a monetary contraction of a 100 basis points in the federal funds rate, a high loan securitizability bank would on average exhibit 5.15% to 5.25% more C&I loan growth than a low loan securitizability bank purely based on the difference in the loan liquidity. The securitizability of a bank loan portfolio accounts for 12% to 94% of the combined liquidity-securitization effect and clearly dominates. Since the analysis of C&I loans is likely to reveal the actual effect securitization has on banks ability to supply credit, I argue that the magnitude of the securitization effect introduced in this study is 7

[33] Note that the magnitudes of the effects are similar whether the coefficient estimates from univariate or bivariate specifications are used.

[34] This magnitude is consistent with one documented by Kashyap and Stein (2000).

to 10 times larger than the magnitude of the pure liquidity effect documented by Kashyap and Stein (2000). It is hard to deny that securitization has not only statistically but also economically significant effect on C&I lending under a restricted availability of external financing.

7. Conclusion

This paper analyzes the importance of securitization in affecting the nature of banking. I propose a new bank-level index of bank loan portfolio liquidity and use it to evaluate the impact of securitization on bank liquidity and lending management. First, I find that securitization acts as a substitute for banks' on-balance-sheet liquidity as it provides deposit institutions with an effective channel to convert illiquid loans into liquid securities. It alleviates the advantages of large banks in terms of liquidity management allowing the liquidity levels of small and large banks to converge. Banks' ability to securitize has become an integral part of their liquidity-risk management. Overlooked earlier loan liquidity should now be considered along the traditional liquidity measures.

Second, securitization increases credit availability across sectors as it reduces the sensitivity of bank loan portfolios towards availability of the traditional sources of financing (e.g., deposits). The credit supply of banks with more liquid (securitizable) loan portfolios is less susceptible toward shocks in the costs of external financing than the credit supply of banks with less liquid loan portfolio. As a result banks now seem to hold more of their assets in loans than in the past. In addition, large banks are able to exploit the benefits of securitization for loan origination to a greater extent relative to small banks.

Finally, the evidence indicates that access to the securitization market can potentially offset the impact of Fed policies on banks loan supply. With securitization, it might be necessary to make a larger policy moves to achieve a significant contraction in banks' lending.

My results point to the need to better understand the role of securitization as well as other credit market financial innovations which trading volume has dramatically expanded over last few years (e.g., credit derivatives, interest rate swaps, loan sale and syndication). These instruments affect not only banking but also corporate sector. Today more and more corporations securitize their receivables and use

credit derivatives to hedge their debt. How these activities affect the investment and financing decisions of these companies is a topic for the future research.

Appendixes

I. Bank-Level Variables

Whenever possible, in defining the bank-level variable I follow the series definitions in the Federal Reserve notes on forming consistent time series.

Federal Reserve Physical District Code. The district code is taken from item RSSD9170.

Total Loans. Total loans are reported in the Call Report item RCFD1400. Starting in 1984:I, this item also includes lease-financing receivables. To ensure continuity, total loans must be computed as the sum of RCFD1400 and RCFD2165 (lease-financing receivables) for the period prior to 1984:I.

Total Mortgages. Total mortgages are taken from item RCFD1410.

Home Mortgages. Home mortgages are computed as RCON1430.

Multifamily Residential Mortgages. Multifamily residential mortgages are computed as RCON1460.

Commercial mortgages. Commercial mortgages are taken from item RCON1480.

Farm Mortgages. Farm mortgages are taken from item RCON1420.

Assets. Total assets are taken from item RCFD2170.

C&I Loans. Commercial and industrial loans are computed as sum of RCFD1600 and RCFD1590.

Consumer Loans. Consumer loans (include car loans and student loans) are computed as RCFD1975.

Liquidity. The measure of a bank liquidity is computed as sum of RCFD0400 (U.S. treasury securities), RCFD0600 (U.S. government agency and corporate obligations), RCFD0900 (obligations of states and political subdivisions), RCFD0380 (all other bonds, stocks and securities), and RCFD1350 (Fed funds sold and securities purchased under agreements to resell) for the period up to 1983:IV. For the 1984:I-1993:II period, liquidity is the sum of RCFD0390 (total investment securities), RCFD1350, and RCFD2146 (assets held in trading account). Finally, for the 1993:II-1997:II period, it equals the sum of RCFD1350, RCFD1754 (securities held to maturity), and RCFD3545 (total trading assets). I eliminate cash in vaults since a greater portion of banks' cash is stored for purposes of reserve requirements.

Following Kashyap and Stein (2000), I compute the measure of bank's on-balance-sheet liquidity B_{it} as a percentage of the liquid funds in the total assets.

Deposits. Total deposits are computed as RCFD2200.

Total Equity. Total equity is computed as RCFD3210.

Income. Net income comes from item RIAD4340.

Non-Performing Loans. Following Campello (2002) I use the measure of loan performance that avoids managerial discretion in reporting losses. It equals the sum of loans over 90 days late (RCFD1407), plus loans not accruing (RCFD1403).

Credit Card Loans. The amount of credit card loans comes from item RCFD2008.

Standby Letters of Credit. The standby letters of credit are computed as either item RCFD3375 or as sum of items RCFD3376 and RCFD3377 where the data on item RCFD3375 is missing.

II. Measures of Monetary Policy

Fed Funds. I use the monthly series of the effective annualized federal funds rates provided by the Board of Governors' Release H.15. This proxy is advocated by Bernanke and Blinder (1992) who show that the federal funds rate captures the stance of monetary policy well because it is sensitive to shocks to the supply of bank reserves. The fed funds rate is the prevalent measure of monetary policy in empirical work. However, the adequacy of this proxy has been questioned for periods when the Fed's operating procedures were modified (e.g., the Volcker period). For robustness, I employ alternative measures of the monetary policy.

Paper-bill. This proxy is computed as the difference between the rates paid on six-month prime rated commercial papers and 180-day Treasury bills. These series are available from the Board of Governors'. Bernanke (1990) argues that increases in paper-bill index capture Fed tightenings since banks will cut loans and corporations are forced to substitute commercial paper for bank loans.

Strongin. Strongin (1995) argues that previous studies that attempted to identify the stance of monetary policy fail to properly address the Fed's strategy of accommodating reserve demand shocks.

Strongin measures the portion of non-borrowed reserves growth that is orthogonal to total reserve growth. It equals the residual of the linear regression of total reserves on non-borrowed reserves, here both series are normalized by a 24-month moving average of total reserves prior to the estimation. Furthermore, as suggested by Bernanke and Mihov (1998) I estimate the regression parameters based on the monthly data separately for the sub-period 01/01/1964 to 10/01/1979 and for sub-period 11/01/1979 to 01/01/2004. I perform this computation using data from the Federal Reserve's FRED data bank.

All indicators of the monetary policy are converted so that an increase in the indicator represents a monetary tightening.

III. Securitizability of a Bank Loan Portfolio

I compute the degree of securitizability for six loan categories as the ratio of loans securitized to total loans outstanding. All the data are taken from the Flow of Funds Accounts of the US.

Home Mortgages. Home mortgages outstanding are taken from Table L.2 item FL193165105; home mortgages securitized are computed as sum of item FL413065105 from Table L.126 and item FL673065105 from Table L.127.

Multifamily Residential Mortgages. Multifamily residential mortgages outstanding are taken from Table L.2 item FL123165405; multifamily residential mortgages securitized are computed as sum of item FL413065405 from Table L.126 and item FL673065405 from Table L.127.

Commercial Mortgages. Commercial mortgages outstanding are taken from Table L.2 item FL193165505; commercial mortgages securitized are computed as sum of item FL413065505 from Table L.126 and item FL673065505 from Table L.127.

Farm Mortgages. Farm mortgages outstanding are taken from Table L.2 item FL893065605; farm mortgages securitized are taken from Table L.126 item FL413065605.

C&I Loans. Loans to business outstanding are computed as sum of item FL253169255, item FL193168005, item FL263168005, item FL263169255 from Table L.2; loans to business securitized are taken from Table L.127 item FL673069505.

Consumer Credit. Consumer credit outstanding is taken from Table L.2 item FL153166000; consumer credit securitized is computed as sum of items FL673066000 and item FL673069153 from Table L.127.

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Figure 1
Securitization of Loans in the US Economy

The figure presents the percentage of loans securitized relative to total loans outstanding for six categories of loans: (i) home mortgages, (ii) multifamily residential mortgages, (iii) commercial mortgages, (iv) consumer credit, (v) business loans, and (vi) farm mortgages. The data are from Flow of Funds Accounts of the United States. For the exact description of the methodology see Appendix III.

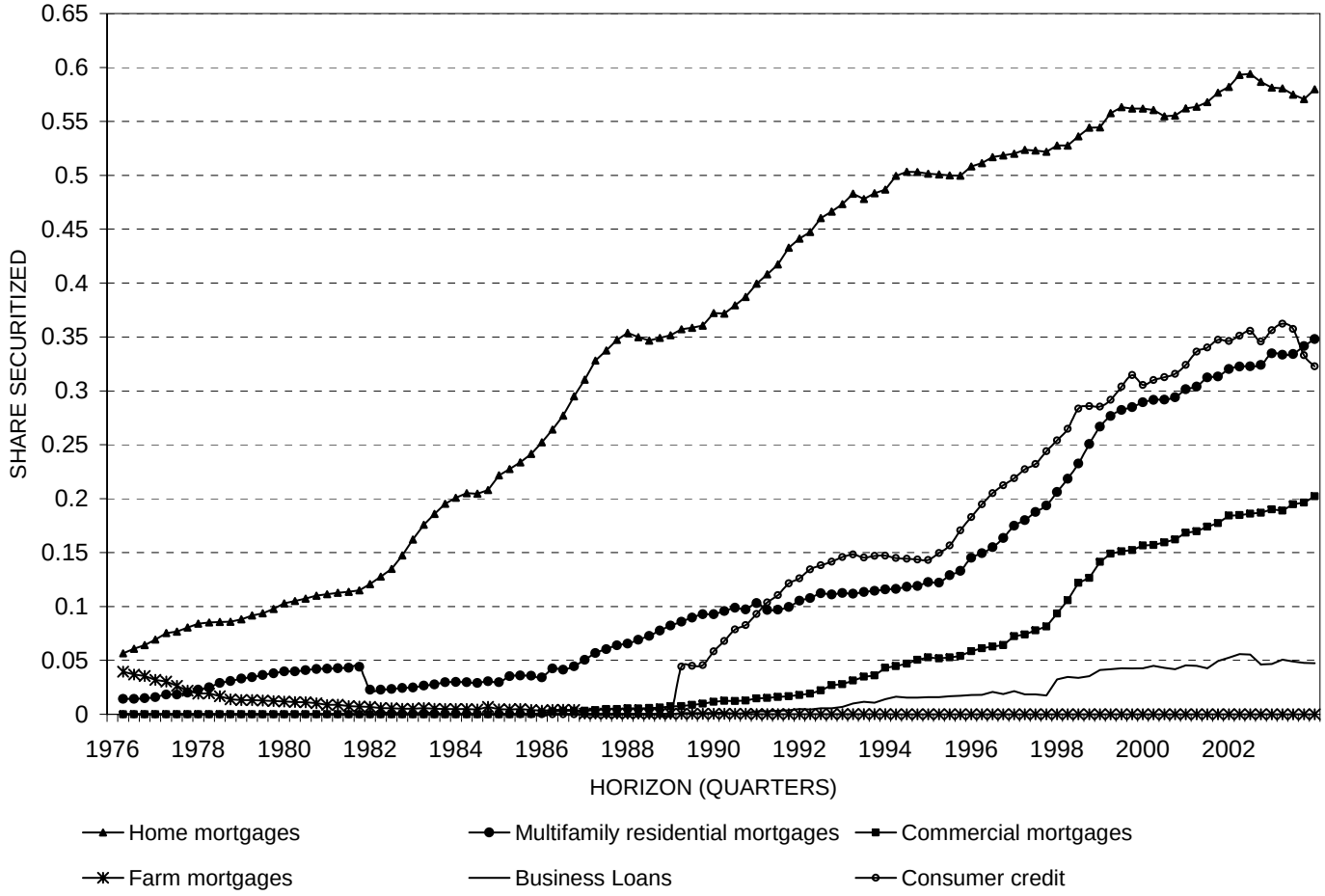
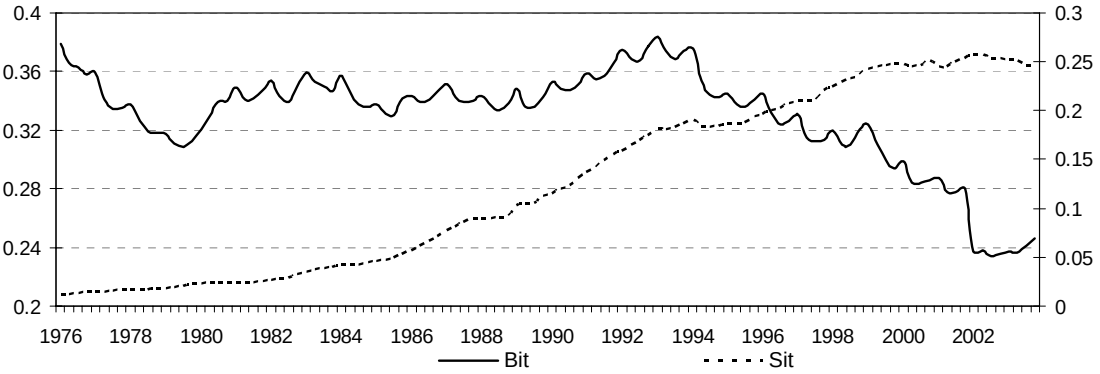


Figure 2
Securitizability of a Bank Loan Portfolio, Liquidity, and Size Relationship

Panel A presents the relationship over time between average level of liquidity (B_{it}) maintained by banks (solid line, left hand side scale) and the average securitizability of a bank loan portfolio (S_{it}) (dashed line, right hand side scale). Panel B presents the evolution of the average level of liquidity (B_{it}) for the full sample of bank-quarters, as well as for the lowers and highest size quartiles of the sample. See Appendixes I and II for exact methodology for calculating B_{it}, S_{it}, and size of the banks. The sample contains bank-quarters from 1976:I through 2003:IV.

Panel A: Securitizability of Bank Loan Portfolio and Liquidity



Panel B: Average Amount of Liquid Funds in Banks Assets

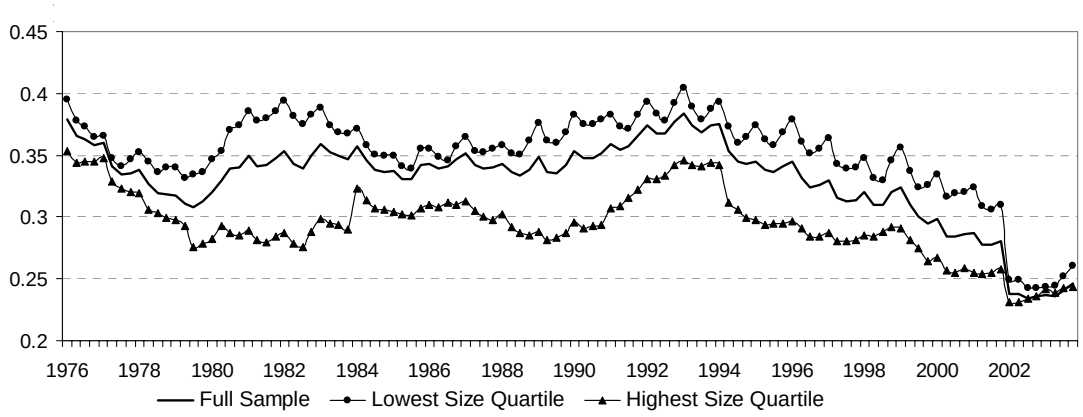


Figure 3
Securitizability of a Bank Loan Portfolio and Commercial and Industrial Loan Growth

This figure presents the value weighted C&I loan growth for two types of banks under the monetary tightening of 1993-1995 and monetary loosening of 2001-2003. I consider banks with the securitizability of the bank loan portfolio in the top 10% of S_{it} distribution to have liquid loan portfolios, and banks with the securitizability of the bank loan portfolio in the bottom 10% of S_{it} distribution to have illiquid loan portfolios.

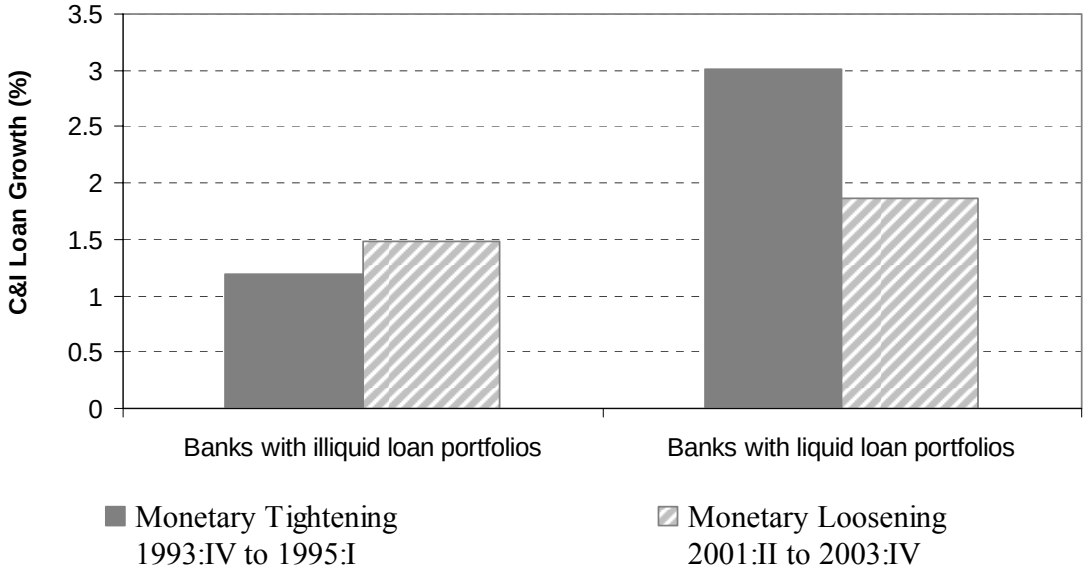


Table 1
Economy-wide Loans Outstanding and Securitized

The table presents the aggregate, economy-wide amounts of the loans outstanding and loans securitized for six loan categories over time period 1976:I to 2003:IV. The loan categories considered are: (i) home mortgages; (ii) multifamily residential mortgages; (iii) commercial mortgages; (iv) consumer credit; (v) business loans (C&I loans); and (vi) farm mortgages. "Total Mortgages" represent the aggregate of home mortgages, multifamily residential mortgages, commercial mortgages, and farm mortgages. "Total loans" represent the aggregate of all six loan categories. The data are from the Flow of Funds Accounts of the United States. For the exact description of the methodology see Appendix III.

	1976:I		**1981:I**		**1986:I**		**1991:I**		**1996:I**		**2001:I**		**2003:IV**	
	Outstanding (mill. $)	Securitized (mill. $)	Outstanding (mill. $)	Securitized (mill. $)	Outstanding (mill. $)	Securitized (mill. $)	Outstanding (mill. $)	Securitized (mill. $)	Outstanding (mill. $)	Securitized (mill. $)	Outstanding (mill. $)	Securitized (mill. $)	Outstanding (mill. $)	Securitized (mill. $)
Home Mortgages	489 063	27 700	977 592	110 264	1 554 381	410 641	2 654 591	1 083 561	3 532 530	1 806 239	5 301 129	2 988 224	7 282 611	4 222 938
Multifamily Residential Mortgages	100 600	1 446	142 798	6 111	212 033	8 991	288 341	27 900	267 921	40 027	386 091	117 347	503 803	175 362
Commercial Mortgages	162 168	0	266 231	0	553 272	1 377	825 087	12 509	729 011	44 628	1 135 225	192 714	1 452 382	293 547
Farm Mortgages	50 797	2 006	100 097	885	103 994	427	78 880	24	84 861	4	109 983	0	132 199	0
Loans to Business (C&I Loans)	409 006	0	766 107	0	1 191 754	0	1 464 743	4 267	1 673 709	30 218	2 387 841	107 572	2 194 240	103 991
Consumer Credit	204 908	0	353 902	0	606 799	0	802 207	83 251	1 162 807	226 420	1 724 595	580 209	2 039 663	658 212
Total Mortgages	802 628	31 152	1 486 718	117 260	2 423 680	421 436	3 846 899	1 123 994	4 614 323	1 890 898	6 932 428	3 298 285	9 370 995	4 691 847
Total Loans	1 416 542	31 152	2 606 727	117 260	4 222 233	421 436	6 113 849	1 211 512	7 450 839	2 147 536	11 044 864	3 986 066	13 604 898	5 454 050

Table 2
Summary Statistics

The table presents the means and medians for with-in category distribution of various balance sheet items (see definition in Appendix I) and the total number of bank-quarters in the full sample and in the sub-samples of large and small banks (as defined in the text). The data are collected from the Federal Reserve's Report of Condition and Income for the period from 1976:I to 2003:IV. I eliminate all bank-quarters with asset growth over the last quarter in excess of 50 percent, those with total loan growth exceeding 100 percent, those with total loans-to-asset ratio below 10 percent, and those with the share of credit card loans in the loan portfolio above 50 percent.

	1976Q1 - 2003Q4						**1976Q1 - 1979Q4**				**2001Q1-2003Q4**			
	Full Sample		**Small Banks**		**Large Banks**		**Small Banks**		**Large Banks**		**Small Banks**		**Large Banks**	
	mean	**median**	**mean**	**median**	**mean**	**median**	**mean**	**median**	**mean**	**median**	**mean**	**median**	**mean**	**median**
Total Assets (1983 $ millions)	113.93	35.12	28.11	24.84	1111.77	449.35	26.14	22.43	1857.06	518.15	32.09	29.99	967.80	421.28
Liquid Assets (% of Total Assets, B_{it})	33.82	32.42	35.01	33.73	27.49	26.41	34.37	33.00	28.34	28.07	26.73	25.01	25.44	23.52
Total Loans (% of Total Assets)	56.04	57.35	54.80	56.09	60.86	61.53	56.00	57.54	55.57	56.58	60.71	62.23	64.24	66.05
C&I Loans (% of Total Loans)	31.67	27.49	34.34	30.74	25.09	23.90	36.88	32.61	31.66	30.96	27.67	24.55	18.64	16.17
Home Mortgages (% of Total Loans)	24.88	21.77	23.45	20.55	28.06	22.97	18.89	15.59	19.08	16.00	28.15	25.47	31.43	27.72
Multifamily Mortgages (% of Total Loans)	1.00	0.00	0.72	0.00	2.60	0.90	0.46	0.00	1.63	0.51	1.19	0.08	3.20	1.55
Farm Mortgages (% of Total Loans)	4.67	1.60	5.71	2.75	0.65	0.08	5.03	2.54	0.44	0.09	8.28	4.93	1.17	0.14
Commercial Mortgages (% of Total Loans)	11.33	8.69	9.63	7.02	15.68	13.70	6.50	5.12	10.38	9.49	15.78	12.37	25.07	24.01
Consumer Loans (% of Total Loans)	20.59	17.86	21.22	18.21	18.12	16.59	27.91	25.66	25.02	24.79	12.76	10.15	10.52	5.96
Total Deposits (% of Total Assets)	87.52	88.99	88.12	89.28	82.15	84.57	89.35	90.21	83.87	85.62	84.73	86.08	77.08	79.72
Net Income (% of Total Assets)	0.60	0.60	0.58	0.60	0.60	0.56	0.79	0.79	0.53	0.49	0.57	0.53	0.76	0.67
Total Equity (% of Total Assets)	9.26	8.52	9.60	8.79	7.76	7.30	8.97	8.31	6.81	6.62	11.17	10.12	9.55	8.72
Securitizability of Loan Portfolio (%, S_{it})	11.09	7.03	9.95	5.94	13.83	10.19	1.77	1.48	1.78	1.38	25.40	24.78	27.74	26.67
Number of Observations	1 332 582		999 436		66 629		244 177		7 412		58 484		14 621	

Table 3
Liquidity, Securitizability of a Loan Portfolio, and Bank's Size: Univariate Analysis

The table presents the univariate analysis of the relationships between banks' size (measured by log real total assets), level of on-balance-sheet liquidity (B_{it}), and the bank-specific securitizability of a loan portfolio (S_{it}). Panel A presents the average securitizability of a loan portfolio for four liquidity quartiles and the securitizability index differential between more liquid and less liquid banks. Panel B presents the average on-balance-sheet liquidity for four size quartiles as well as the liquidity differential between banks in the largest and smallest size quartiles. The averages are computed for the full sample 1976:I to 2003:IV, as well as for various sub-periods of the sample. The standard deviations for each group are reported in the round parentheses. The t-statistics for differences in means are reported in square parentheses. *, **, and *** correspond to below 10%, 5%, and 1% significance of t-statistics respectively.

		1976:I – 2003:IV	**1980:IV**	**1985:IV**	**1990:IV**	**1995:IV**	**2000:IV**	**2003:IV**
Observations		1344696	287333	282808	263784	224195	186715	99861
Panel A: Average Securitizability of a Loan Portfolio S_{it} Across Liquidity Quartiles								
Liquidity quartiles	Illiquid Q1	0.127	0.025	0.059	0.143	0.194	0.264	0.269
		(0.121)	(0.024)	(0.040)	(0.079)	(0.122)	(0.123)	(0.109)
	Q2	0.107	0.024	0.056	0.136	0.199	0.255	0.265
		(0.109)	(0.016)	(0.036)	(0.067)	(0.094)	(0.103)	(0.097)
	Q3	0.101	0.024	0.055	0.129	0.195	0.251	0.254
		(0.105)	(0.017)	(0.036)	(0.065)	(0.094)	(0.102)	(0.106)
	Liquid Q4	0.100	0.024	0.055	0.116	0.189	0.252	0.265
		(0.100)	(0.017)	(0.039)	(0.065)	(0.096)	(0.106)	(0.117)
Illiquid (Q1) - Liquid (Q4)		0.027	0.001	0.004	0.027	0.005	0.012	0.004
		[101.16]***	[2.14]**	[5.46]***	[15.14]***	[1.89]*	[2.38]**	[10.78]***
Panel B: Average Liquidity Measure B_{it} Across Size Quartiles								
Size Quartiles	Small Q1	0.358	0.374	0.355	0.379	0.369	0.320	0.260
		(0.157)	(0.136)	(0.167)	(0.160)	(0.154)	(0.150)	(0.165)
	Q2	0.346	0.355	0.352	0.370	0.357	0.291	0.246
		(0.145)	(0.119)	(0.157)	(0.149)	(0.143)	(0.140)	(0.153)
	Q3	0.338	0.346	0.354	0.362	0.342	0.275	0.235
		(0.143)	(0.110)	(0.147)	(0.154)	(0.142)	(0.133)	(0.147)
	Large Q4	0.292	0.285	0.307	0.294	0.295	0.259	0.244
		(0.142)	(0.136)	(0.133)	(0.141)	(0.154)	(0.140)	(0.153)
Small (Q1) - Large (Q4)		0.066	0.088	0.048	0.085	0.074	0.061	0.017
		[184.28]***	[30.26]***	[13.32]***	[21.84]***	[18.00]***	[14.16]***	[3.40]***

Table 4
Liquidity, Securitizability of a Loan Portfolio, and Bank's Size: Multivariate Analysis

The table reports the results of the regression analysis where the dependant variable is the level of on-balance-sheet liquidity (B_{it}). The independent variables are (i) securitizability of a bank loan portfolio S_{it-1}, (ii) bank size measured by the log of real total assets, (iii) net income as percentage of total assets, (iv) equity capital as percentage of total assets, (v) letters of credit as percentage of total assets, and (vi) percentage of non-performing loans in total loans. The time-specific fixed effects accommodate the effects of changes in the regulation and other economic conditions. Panel A contains specification (1)-(6) and presents the results of ordinary regressions whereas Panel B contains specifications (7)-(12) and presents the results of the instrumental variable analysis. The instrumental variable for S_{it-1} is constructed using formula (1a) where instead of variable over time bank loan portfolio structure I use the average loan portfolio structure of an individual bank over the first four quarters available in my sample. The fixed portfolio structure captures an individual bank loan specialization and provides variability across banks, whereas the market trends generate time variation in the instrumental variable. S_{it-1}*$Size_{it-1}$ and S_{it-1}*Letters of $Credit_{it-1}$ in Panel B are also instrumented. Robust t-statistics are reported in parentheses. *, **, and *** correspond to below 10%, 5%, and 1% significance of t-statistics respectively.

	Panel A: Ordinary Regression						**Panel B: Instrumental Variable Regressions**					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Securitizability of Loan Portfolio: S_{it-1}	-0.072 (5.33)***	-0.052 (3.48)***	-0.743 (8.35)***	-0.101 (8.10)***	-0.121 (8.05)***	-0.094 (6.83)***	-0.260 (15.30)***	-0.211 (12.31)***	-1.077 (9.85)***	-0.284 (16.81)***	-0.289 (16.71)***	-0.262 (15.22)***
$Size_{it-1}$ (log of real total assets)		-0.014 (18.44)***	-0.020 (19.06)***			-0.007 (8.74)***		-0.012 (16.62)***	-0.023 (15.37)***			-0.005 (6.41)***
$Size_{it-1}$ *S_{it-1}			0.046 (7.91)***						0.078 (8.10)***			
Letters of $Credit_{it-1}$				-2.824 (25.80)***	-2.898 (19.36)***	-2.540 (22.62)***				-2.972 (27.39)***	-3.182 (18.97)***	-2.752 (24.13)***
Letters of $Credit_{it-1}$*S_{it-1}					0.900 (0.85)						2.587 (2.19)**	
Non-Performing $Loans_{it-1}$ (% in Total Loans)	0.101 (3.61)***	0.087 (3.18)***	0.081 (2.98)***	0.089 (3.27)***	0.089 (3.27)***	0.083 (3.07)***	0.045 (1.64)	0.040 (1.49)	0.027 (1.01)	0.035 (1.33)	0.036 (1.34)	0.034 (1.29)
Equity $Capital_{it-1}$ (% in Total Assets)	0.896 (26.74)***	0.775 (22.98)***	0.763 (22.72)***	0.832 (25.65)***	0.833 (25.66)***	0.776 (23.33)***	0.877 (26.49)***	0.768 (22.95)***	0.749 (22.39)***	0.810 (25.31)***	0.812 (25.37)***	0.770 (23.35)***
Net $Income_{it-1}$ (% in Total Assets)	1.961 (21.72)***	2.163 (22.85)***	2.166 (22.95)***	1.864 (21.59)***	1.861 (21.50)***	1.978 (22.20)***	1.939 (21.95)***	2.127 (23.01)***	2.128 (23.13)***	1.839 (21.77)***	1.830 (21.60)***	1.924 (22.22)***
Time Dummies	+	+	+	+	+	+	+	+	+	+	+	+
Number of Observations	926,120	926,120	926,120	926,120	926,120	926,120	926,114	926,114	926,114	926,114	926,114	926,114
R-squared	0.11	0.12	0.12	0.14	0.14	0.14	0.12	0.13	0.13	0.15	0.15	0.15

Table 5
Analysis of Securitization Effect on Total Loans

The table presents the results of the regression analysis of real total loans growth for individual banks. Panel A presents the results of the "univariate" regression. Panel B presents the results of "bivariate" regressions where five lags of the log of real GDP growth are added, as specified in regression equation (4). The dependent variable is the log of real loan growth. The independent variables are (i) bank specific fixed effects, (ii) four lags of real loan growth, (iii) five lags of change in a measure of monetary policy (ΔM_{t-j}, $j \in \{0,..,4\}$), (iv) lagged measure of liquidity B_{it-1}, (v) lagged measure of securitizability of a loan portfolio S_{it-1}, and (vi) the cross effects for these variables as specified in regression equations (3) and (4). The monetary policy indicators are federal funds rate, Paper-Bill, and Strongin measure. All policy indicators are transformed so that increases in their levels represent Fed tightening, they are also normalized to have the same standard deviation. Only the sum of the coefficients for $\Delta M_t B_{it-1}$, $\Delta M_t S_{it-1}$, and the cross-effect $\Delta M_t S_{it-1} B_{it-1}$ are shown such that $\Delta M_t B_{it-1}$ represent sum of β's, $\Delta M_t S_{it-1}$ – sum of ξ's, and $\Delta M_t S_{it-1} B_{it-1}$ – sum of ρ's . "Full Sample" stands for all banks-quarters available in the sample period 1976: I-2003: IV. "Small Banks" represents only bank-quarters in the bottom 75th percentile of the size distribution, where size is measured as the log of real total assets. "Large Banks" represents only bank-quarters in the top 5th percentile of the size distribution. "Large – Small" statistics are estimated via SUR system. The robust standard errors are reported in parenthesis. *, **, and *** correspond to below 10%, 5%, and 1% significance of t-statistics respectively.

		Federal Funds Rate				*Paper-Bill*				*Strongin Measure*			
Panel A: Univariate Analysis													
Full Sample	$\Delta M_t B_{it-1}$	0.0160		0.0177	0.0130	0.0082		0.0087	0.0082	0.0126		0.0126	0.0056
		(0.0008)***		(0.0008)***	(0.0010)***	(0.0005)***		(0.0005)***	(0.0007)***	(0.0010)***		(0.0010)***	(0.0014)***
	$\Delta M_t S_{it-1}$		0.0501	0.0331	0.0209		0.0486	0.0390	0.0385		0.1200	0.1002	-0.0290
			(0.0013)***	(0.0013)***	(0.0032)***		(0.0011)***	(0.0011)***	(0.0028)***		(0.0058)***	(0.0058)***	(0.0153)*
	$\Delta M_t B_{it-1} S_{it-1}$				0.0420				0.0013				0.4110
					(0.0090)***				(0.0078)				(0.0431)***
Small Banks	$\Delta M_t B_{it-1}$	0.0189		0.0203	0.0150	0.0093		0.0094	0.0082	0.0115		0.0113	0.0054
		(0.0010)***		(0.0010)***	(0.0012)***	(0.0006)***		(0.0006)***	(0.0009)***	(0.0012)***		(0.0012)***	(0.0016)***
	$\Delta M_t S_{it-1}$		0.0575	0.0376	0.0237		0.0462	0.0370	0.0340		0.1148	0.0977	-0.0409
			(0.0017)***	(0.0017)***	(0.0041)***		(0.0014)***	(0.0014)***	(0.0036)***		(0.0070)***	(0.0070)***	(0.0192)**
	$\Delta M_t B_{it-1} S_{it-1}$				0.0460				0.0078				0.4231
					(0.0113)***				(0.0097)				(0.0529)***
Large Banks	$\Delta M_t B_{it-1}$	-0.0036		-0.0075	-0.0072	-0.0035		-0.0044	-0.0060	0.0158		0.0168	0.0172
		(0.0038)		(0.0038)**	(0.0049)	(0.0027)		(0.0027)	(0.0036)*	(0.0056)***		(0.0056)***	(0.0069)**
	$\Delta M_t S_{it-1}$		0.0239	0.0207	0.0187		0.0587	0.0508	0.0424		0.1316	0.1146	0.1242
			(0.0050)***	(0.0049)***	(0.0108)*		(0.0044)***	(0.0044)***	(0.0097)***		(0.0260)***	(0.0260)***	(0.0579)**
	$\Delta M_t B_{it-1} S_{it-1}$				0.0065				0.0287				-0.0397
					(0.0341)				(0.0313)				(0.1855)
Large - Small	$\Delta M_t B_{it-1}$	-0.0225		-0.0278	-0.0221	-0.0128		-0.0138	-0.0142	0.0043		0.0055	0.0118
		(0.0039)***		(0.0039)***	(0.0050)***	(0.0028)***		(0.0028)***	(0.0037)***	(0.0057)		(0.0057)	(0.0071)*
	$\Delta M_t S_{it-1}$		-0.0336	-0.0169	-0.0049		0.0125	0.0138	0.0084		0.0168	0.0169	0.1652
			(0.0053)***	(0.0052)***	(0.0115)		(0.0047)***	(0.0046)***	(0.0103)		(0.0269)	(0.0269)	(0.0610)***
	$\Delta M_t B_{it-1} S_{it-1}$				-0.0395				0.0209				-0.4628
					(0.0359)				(0.0328)				(0.1929)**

		Federal Funds Rate				*Paper-Bill*				*Strongin Measure*			
Panel B: Bivariate Analysis													
Full Sample	$\Delta M_t B_{it-1}$	0.0120		0.0126	0.0059	0.0064		0.0068	0.0054	0.0114		0.0105	0.0057
		(0.0009)***		(0.0009)***	(0.0012)***	(0.0006)***		(0.0006)***	(0.0009)***	(0.0013)***		(0.0013)***	(0.0018)***
	$\Delta M_t S_{it-1}$		0.0260	0.0093	-0.0122		0.0245	0.0143	0.0097		0.0655	0.0583	-0.0743
			(0.0016)***	(0.0016)***	(0.0039)***		(0.0013)***	(0.0012)***	(0.0030)***		(0.0064)***	(0.0063)***	(0.0171)***
	$\Delta M_t B_{it-1}S_{it-1}$				0.0703				0.0144				0.4171
					(0.0109)***				(0.0084)*				(0.0478)***
Small Banks	$\Delta M_t B_{it-1}$	0.0143		0.0149	0.0075	0.0074		0.0074	0.0049	0.0085		0.0077	0.0065
		(0.0011)***		(0.0011)***	(0.0014)***	(0.0007)***		(0.0007)***	(0.0010)***	(0.0015)***		(0.0015)***	(0.0021)***
	$\Delta M_t S_{it-1}$		0.0361	0.0151	-0.0067		0.0218	0.0106	0.0027		0.0621	0.0557	-0.0667
			(0.0021)***	(0.0020)***	(0.0050)		(0.0016)***	(0.0016)***	(0.0039)		(0.0076)***	(0.0075)***	(0.0210)***
	$\Delta M_t B_{it-1}S_{it-1}$				0.0695				0.0228				0.3721
					(0.0137)***				(0.0105)**				(0.0576)***
Large Banks	$\Delta M_t B_{it-1}$	-0.0096		-0.0131	-0.0113	-0.0036		-0.0055	-0.0047	0.0015		0.0051	-0.0105
		(0.0043)**		(0.0043)***	(0.0056)**	(0.0030)		(0.0030)*	(0.0041)	(0.0067)		(0.0067)	(0.0086)
	$\Delta M_t S_{it-1}$		0.0082	0.0069	-0.0104		0.0325	0.0271	0.0213		0.0534	0.0531	-0.0480
			(0.0061)	(0.0061)	(0.0133)		(0.0048)***	(0.0048)***	(0.0102)**		(0.0295)*	(0.0294)*	(0.0684)
	$\Delta M_t B_{it-1}S_{it-1}$				0.0115				0.0247				0.3642
					(0.0422)				(0.0336)				(0.2190)*
Large - Small	$\Delta M_t B_{it-1}$	-0.0239		-0.0279	-0.0188	-0.0110		-0.0129	-0.0096	-0.0069		-0.0026	-0.0170
		(0.0044)***		(0.0044)***	(0.0058)***	(0.0031)***		(0.0031)***	(0.0043)**	(0.0068)		(0.0069)	(0.0089)*
	$\Delta M_t S_{it-1}$		-0.0279	-0.0082	-0.0037		0.0108	0.0164	0.0186		-0.0086	-0.0026	0.0186
			(0.0064)***	(0.0064)***	(0.0142)		(0.0050)**	(0.0050)***	(0.0110)*		(0.0304)	(0.0304)	(0.0716)
	$\Delta M_t B_{it-1}S_{it-1}$				-0.0580				0.0020				-0.0078
					(0.0443)				(0.0352)				(0.2265)

Table 6
Analysis of Securitization Effect on Commercial and Industrial Loans

The table presents the results of the regression analysis of real C&I loans growth. Panel A presents the results of the "univariate" regression. Panel B presents the results of "bivariate" regressions where five lags of the log of real GDP growth are added, as specified in regression equation (4). The dependent variable is the log of real C&I loans growth. The independent variables are (i) bank specific fixed effects, (ii) four lags of real loan growth, (iii) five lags of change in a measure of monetary policy (ΔM_{t-j}, $j \in \{0,..,4\}$), (iv) lagged measure of liquidity B_{it-1}, (v) lagged measure of securitizability of a loan portfolio S_{it-1}, and (vi) the cross effects for these variables as specified in regression equations (3) and (4). The monetary policy indicators are federal funds rate, Paper-Bill, and Strongin measure. All policy indicators are transformed so that increases in their levels represent Fed tightening, they are also normalized to have the same standard deviation. Only the sum of the coefficients for $\Delta M_t B_{it-1}$, $\Delta M_t S_{it-1}$, and the cross-effect $\Delta M_t S_{it-1} B_{it-1}$ are shown such that $\Delta M_t B_{it-1}$ represent sum of β's, $\Delta M_t S_{it-1}$ – sum of ξ's, and $\Delta M_t S_{it-1} B_{it-1}$ – sum of ρ's . "Full Sample" stands for all banks-quarters available in the sample period 1976: I-2003: IV. "Small Banks" represents only bank-quarters in the bottom 75th percentile of the size distribution, where size is measured as the log of real total assets. "Large Banks" represents only bank-quarters in the top 5th percentile of the size distribution. "Large – Small" statistics are estimated via SUR system. The robust standard errors are reported in parenthesis. *, **, and *** correspond to below 10%, 5%, and 1% significance of t-statistics respectively.

		Federal Funds Rate				*Paper-Bill*				*Strongin Measure*			
Panel A: Univariate Analysis													
Full Sample	$\Delta M_t B_{it-1}$	0.0216		0.0209	0.0203	0.0126		0.0124	0.0098	0.0260		0.0231	0.0064
		(0.0023)***		(0.0023)***	(0.0030)***	(0.0014)***		(0.0014)***	(0.0019)***	(0.0029)***		(0.0029)***	(0.0042)
	$\Delta M_t S_{it-1}$		0.2124	0.1967	0.2006		0.0840	0.0756	0.0601		0.6524	0.6462	0.3605
			(0.0047)***	(0.0047)***	(0.0126)***		(0.0033)***	(0.0033)***	(0.0088)***		(0.0180)***	(0.0180)***	(0.0535)***
	$\Delta M_t B_{it-1} S_{it-1}$				-0.0101				0.0456				0.8412
					(0.0340)				(0.0240)*				(0.1476)***
Small Banks	$\Delta M_t B_{it-1}$	0.0226		0.0221	0.0195	0.0128		0.0125	0.0103	0.0238		0.0226	0.0043
		(0.0026)***		(0.0026)***	(0.0034)***	(0.0016)***		(0.0016)***	(0.0022)***	(0.0032)***		(0.0032)***	(0.0046)
	$\Delta M_t S_{it-1}$		0.2094	0.1900	0.1853		0.0780	0.0698	0.0571		0.6337	0.6257	0.2941
			(0.0055)***	(0.0055)***	(0.0149)***		(0.0039)***	(0.0039)***	(0.0107)***		(0.0206)***	(0.0206)***	(0.0611)***
	$\Delta M_t B_{it-1} S_{it-1}$				0.0146				0.0361				0.9628
					(0.0391)				(0.0282)				(0.1664)***
Large Banks	$\Delta M_t B_{it-1}$	-0.0087		-0.0187	-0.0175	-0.0079		-0.0094	-0.0204	0.0322		0.0114	0.0011
		(0.0129)		(0.0128)	(0.0168)	(0.0076)		(0.0076)	(0.0102)**	(0.0159)**		(0.0160)	(0.0225)
	$\Delta M_t S_{it-1}$		0.2735	0.2757	0.2718		0.1152	0.1106	0.0533		0.7889	0.7791	0.6371
			(0.0247)***	(0.0247)***	(0.0632)***		(0.0156)***	(0.0156)***	(0.0386)		(0.0998)***	(0.1006)***	(0.2909)**
	$\Delta M_t B_{it-1} S_{it-1}$				0.0151				0.2029				0.4905
					(0.2010)				(0.1246)				(0.9009)
Large - Small	$\Delta M_t B_{it-1}$	-0.0313		-0.0407	-0.0370	-0.0206		-0.0219	-0.0307	0.0084		-0.0113	-0.0032
		(0.0131)**		(0.0131)***	(0.0171)**	(0.0078)***		(0.0078)***	(0.0104)***	(0.0162)		(0.0163)	(0.0230)
	$\Delta M_t S_{it-1}$		0.0641	0.0857	0.0865		0.0372	0.0408	-0.0038		0.1552	0.1534	0.3430
			(0.0252)**	(0.0253)***	(0.0649)		(0.0161)**	(0.0161)**	(0.0400)		(0.1018)	(0.1026)	(0.2972)
	$\Delta M_t B_{it-1} S_{it-1}$				0.0005				0.1668				1.4533
					(0.2048)				(0.1277)				(0.9162)

		Federal Funds Rate				*Paper-Bill*				*Strongin Measure*			
Panel B: Bivariate Analysis													
Full Sample	$\Delta M_t B_{it-1}$	0.0136		0.0159	0.0135	0.0103		0.0108	0.0056	0.0429		0.0403	0.0007
		(0.0026)***		(0.0026)***	(0.0035)***	(0.0016)***		(0.0016)***	(0.0023)**	(0.0035)***		(0.0035)***	(0.0052)
	$\Delta M_t S_{it-1}$		0.2052	0.1862	0.1650		0.0517	0.0417	0.0070		0.3794	0.3808	-0.0039
			(0.0055)***	(0.0055)***	(0.0148)***		(0.0036)***	(0.0036)***	(0.0097)		(0.0190)***	(0.0190)***	(0.0564)
	$\Delta M_t B_{it-1} S_{it-1}$				0.0657				0.1011				1.1396
					(0.0396)*				(0.0261)***				(0.1558)***
Small Banks	$\Delta M_t B_{it-1}$	0.0142		0.0167	0.0120	0.0099		0.0103	0.0061	0.0375		0.0363	-0.0030
		(0.0029)***		(0.0029)***	(0.0039)***	(0.0018)***		(0.0018)***	(0.0026)**	(0.0040)***		(0.0039)***	(0.0058)
	$\Delta M_t S_{it-1}$		0.2110	0.1871	0.1544		0.0498	0.0389	0.0108		0.3483	0.3474	-0.0783
			(0.0064)***	(0.0064)***	(0.0175)***		(0.0043)***	(0.0043)***	(0.0117)		(0.0218)***	(0.0217)***	(0.0646)
	$\Delta M_t B_{it-1} S_{it-1}$				0.0963				0.0795				1.2408
					(0.0458)**				(0.0307)**				(0.1761)***
Large Banks	$\Delta M_t B_{it-1}$	-0.0119		-0.0202	-0.0121	-0.0085		-0.0103	-0.0187	0.0185		0.0068	-0.0167
		(0.0142)		(0.0142)	(0.0190)	(0.0083)		(0.0083)	(0.0118)	(0.0197)		(0.0197)	(0.0277)
	$\Delta M_t S_{it-1}$		0.2422	0.2466	0.2624		0.0616	0.0605	0.0052		0.4931	0.4947	0.2590
			(0.0280)***	(0.0280)***	(0.0714)***		(0.0171)***	(0.0171)***	(0.0417)		(0.1037)***	(0.1046)***	(0.3024)
	$\Delta M_t B_{it-1} S_{it-1}$				-0.0539				0.1975				0.8056
					(0.2250)				(0.1355)				(0.9363)
Large - Small	$\Delta M_t B_{it-1}$	-0.0261		-0.0369	-0.0241	-0.0184		-0.0206	-0.0248	-0.0190		-0.0294	-0.0136
		(0.0145)*		(0.0145)**	(0.0194)	(0.0085)**		(0.0085)**	(0.0121)**	(0.0201)		(0.0201)	(0.0283)
	$\Delta M_t S_{it-1}$		0.0311	0.0595	0.1080		0.0118	0.0216	-0.0055		0.1448	0.1473	0.3372
			(0.0287)	(0.0287)**	(0.0735)		(0.0176)	(0.0176)	(0.0433)		(0.1059)	(0.1068)	(0.3092)
	$\Delta M_t B_{it-1} S_{it-1}$				-0.1502				0.1180				-0.4352
					(0.2296)				(0.1389)				(0.9527)

Table 7
Implied Effect of the Liquidity and Securitization on the Aggregate Lending Four Quarters After a Federal Funds Rate Shock of 100 Basis Points

The table shows how two equal-sized banks with different levels of liquidity B_{it} and securitizability of a loan portfolio S_{it} would respond to a monetary tightening. I present the estimates of the combined liquidity - securitization effect on loan growth under a 100 basis points hike in the federal funds rate implied by the estimates of β, ξ, and ρ presented earlier in Tables 5 and Table 6 for various combinations of B_{it} and S_{it}. Panel A shows the results for total loans and Panel B for C&I loans. The computed magnitudes are drawn on the parameter estimates from the univariate and bivariate regression for the full sample where B_{it-1}, S_{it-1}, and the cross effect $B_{it-1}S_{it-1}$ are included in the set of the independent variables. The percentage of the total effect attributed to the presence of securitization is reported in parenthesis.

		Univariate Regression					**Bivariate Regression**				
		Percentiles of Bit					Percentiles of Bit				
		10th	35th	65th	90th	90th-10th	10th	35th	65th	90th	90th-10th
		15.37%	26.86%	37.93%	53.44%		15.37%	26.86%	37.93%	53.44%	
Panel A: Total Loans Growth (%)											
Percentiles of S_{it}	10th	0.2207	0.3738	0.5212	0.7278	0.5072	0.1082	0.1822	0.2535	0.3533	0.2451
	0.76%	(9.46)	(6.57)	(5.39)	(4.54)		(16.22)	(13.02)	(11.70)	(10.75)	
	35th	0.2935	0.4595	0.6193	0.8433	0.5498	0.1695	0.2650	0.3570	0.4859	0.3164
	3.43%	(31.94)	(24.00)	(20.38)	(17.61)		(46.51)	(40.19)	(37.31)	(35.10)	
	65th	0.5384	0.7476	0.9490	1.2313	0.6929	0.3754	0.5432	0.7049	0.9313	0.5559
	12.38%	(62.89)	(53.28)	(48.04)	(43.57)		(75.85)	(70.82)	(68.25)	(66.14)	
	90th	0.9422	1.2227	1.4927	1.8712	0.9290	0.7150	1.0021	1.2786	1.6661	0.9511
	27.14%	(78.79)	(71.44)	(66.96)	(62.87)		(87.32)	(84.18)	(82.50)	(81.07)	
	90th-10th	0.7215	0.8489	0.9715	1.1433	0.4218	0.6068	0.8199	1.0252	1.3128	0.7060
Panel B: C&I Loans Growth (%)											
Percentiles of S_{it}	10th	0.4638	0.6963	0.9202	1.2339	0.7700	0.3411	0.5020	0.6570	0.8742	0.5331
	0.76%	(32.74)	(21.68)	(16.32)	(12.07)		(39.17)	(27.76)	(22.06)	(17.47)	
	35th	0.9941	1.2235	1.4443	1.7538	0.7598	0.8075	0.9886	1.1629	1.4072	0.5997
	3.43%	(68.62)	(55.43)	(46.68)	(38.14)		(74.31)	(63.31)	(55.96)	(48.73)	
	65th	2.7756	2.9946	3.2054	3.5009	0.7253	2.3746	2.6233	2.8628	3.1983	0.8236
	12.38%	(88.76)	(81.79)	(75.98)	(69.01)		(91.26)	(86.18)	(82.11)	(77.44)	
	90th	5.7140	5.9158	6.1102	6.3825	0.6686	4.9595	5.3196	5.6664	6.1524	1.1929
	27.14%	(94.54)	(90.78)	(87.40)	(83.00)		(95.82)	(93.18)	(90.96)	(88.27)	
	90th-10th	5.25	5.22	5.19	5.15	(0.10)	4.62	4.82	5.01	5.28	0.66