A Tale of Two Items Sent Off Balance Sheet: Securitization and Loan Commitment

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Abstract

Two competing explanations have been offered for the liquidity problem experienced by U.S. banks during the 2007-09 financial crisis: the malfunction of the securitization market and the drawdown of loan commitments. The explanations are inseparable, however. Based on the bank-level panel data, we find that when U.S. banks see greater potential for loan securitization they issue more Commercial and Industrial (C&I) loan commitments and less real estate loan commitments. By taking into account the effects of both securitization and loan commitment, this paper demonstrates that the freeze on securitization and the risk exposure of real estate loan commitments were the main factors behind U.S. banks' liquidity shortage during the crisis. We also show that the importance of liquidity risks from C&I loan commitments is overstated in the previous literature.

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1 Introduction

Both the extensive drawdowns of unused loan commitments and the freeze of the securitization market are cited in the literature as contributing to the widespread liquidity shortage of U.S. banks during the 2007-09 financial crisis. However, the potential linkage of banks' loan commitment business and the securitization market has not been investigated. The existence of such a connection is not just interesting from a theoretical perspective but also implies that any research into the liquidity problems of U.S. banks during the crisis could be biased if it neglects either of two factors: the liquidity risks of loan commitments and the difficulty of securitizing loans during crisis. This paper aims to fill this gap.

Via securitization, banks move their outstanding loans off their balance sheets and raise liquidity by selling claims to those loans in capital markets. Hence, securitization effectively increases the liquidity pool that banks can access. The development of the securitization market in the past two decades has substantially altered the way in which banks manage their liquidity. For instance, Loutskina (2011) highlights that because of the growth of the securitization market, U.S. banks tend to lower their holdings of liquid assets on their balance sheets.

In this paper, we move forward and show that as the securitization market develops U.S. banks tend to expose themselves more to the liquidity risks of commercial and industrial (C&I) loan commitments. The intuition is the following. The development of the securitization market lowers the stockpile of liquid assets that a bank must maintain to accommodate the uncertain liquidity needs of its depositors (Loutskina and Strahan, 2009). Similarly, if a bank expects to easily securitize its outstanding loans, it can benefit from extending a line of credit to a firm customer. At the aggregate level, we observe that as the fraction of securitized bank loans in the U.S. economy increases, banks also gradually expand their C&I loan commitment business (Figure 1). The magnitude of this effect is substantial: as the fraction of securitized bank loans rose from 20 percent in 1990 to above 40 percent in 2009, the ratio of C&I loan commitments to C&I loans rose from 1 in 1990 to around 1.25 in 2009.

First we use bank-level data to show that a bank that finds it easier to convert its existing loans into marketable securities tends to sell more liquidity insurance via C&I loan commitments.

In addition to C&I loan commitments, banks also issue commitments that are backed by real properties such as home equity lines of credit. However, unlike C&I loan commitments, the development of the securitization may deter banks from extending real estate

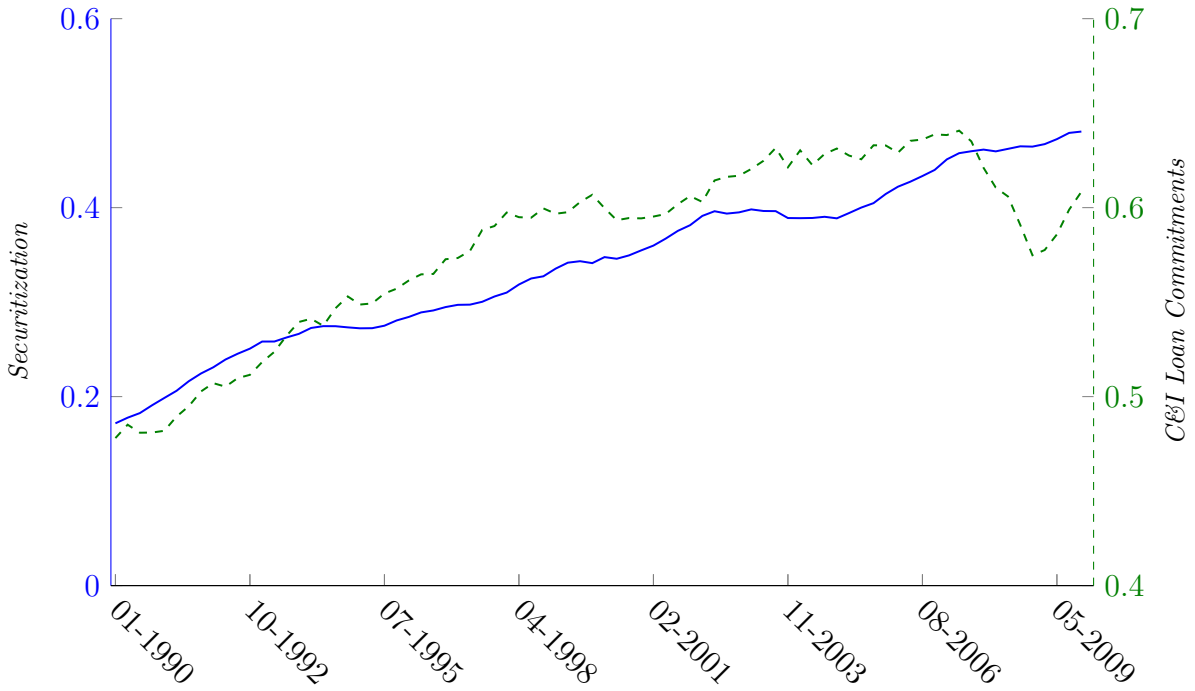

Figure 1: Securitization and C&I Loan Commitments. This figure shows the relation between the fraction of outstanding loans in the U.S. economy that has been securitized (solid line, left-hand-side scale) and the U.S. banks' exposure to C&I loan commitments (total C&I loan commitments divided by the sum of C&I loan commitments and C&I loan, dashed line, the right-hand-side scale). Loan data are from the "Flow of Funds Accounts of the United States" and the bank-level loan data are from "Call Reports"

loan commitments. This is because it is easier to securitize mortgages than C&I loans. Therefore, if banks choose real estate loans rather than real estate loan commitments, they could enjoy more liquidity from the securitization market instead of assuming the liquidity risk of commitment takedowns. Indeed, our analyses of bank-level data show that banks lower their exposure to real estate loan commitments as the securitization market grows. Additionally, extending commitments related to real properties also increases banks' exposure to the downside risk of the housing market. For example, when a housing boom busts and customers draw down through their real estate loan commitments, banks would have to assume low-quality loans that they would definitely avoid if there were no such prior commitment.

The second set of results in the paper highlight the distinction between C&I and real estate loan commitments, particularly their relationship to the securitization market.

Given the close connection between banks' decisions with respect to loan commitments and the securitization market, it is easy to see the importance of including banks' exposure to both the securitization market and loan commitment takedowns when explaining

the liquidity problem of U.S. banks during the financial crisis. We then show that 1) the meltdown of the securitization market contributed to the liquidity shortage of U.S. banks, and 2) the role of massive takedowns of C&I loan commitments is overestimated in the previous literature (Cornett et al., 2011; Acharya and Mora, 2015). The reasoning behind this is that the banks that assume more risks to C&I loan commitments are the same ones relying more heavily on the securitization market. If studies do not take into account the effects of the securitization market breakdown, they will likely overestimate the significance of banks' exposure to C&I loan commitments.

As a complement to Cornett et al. (2011) and Acharya and Mora (2015), our results also highlight that it is primarily banks' exposure to real estate loan commitments rather than to C&I commitments that causes their lending cutback and liquidity shortage. Nevertheless, the fundamental cause of the liquidity crisis cannot be stated decisively for two reasons. First, the housing market was deteriorating during the crisis, and because of pre-existing real estate loan commitments banks had to assume more lower quality real estate loans than expected. Therefore, banks with relatively more loan commitments ought to have been more cautious about the status of their liquidity and solvency. Second, when banks extended loan commitments related to real properties before the crisis they anticipated a high probability of securitizing real estate loans if these commitments materialized. However, when the securitization market froze they lost the possibility of that expected liquidity.

We next discuss the identification strategies of our major results. First we explain two indexes that measure a bank's potential to securitize its existing loans. The first index, proposed by Loutskina (2011), is the weighted average of the potential to securitize loans of a particular type, where the weight is the portfolio weight of loans of that type, and the securitization potential is the fraction of outstanding loans of that type being securitized in the U.S. economy. The second index is a modification of the first. Notice that the likelihood of securitizing a given type of loan within a given period, say a quarter, should depend more on the proportion of loans being securitized within that period than in previous periods. Therefore, the second index uses flow variables instead of stock variables to measure securitization potential.

Identification strategies of our first and second results follow Loutskina (2011). The most representative identification that we use is the difference-in-difference analysis around the outbreak of the Enron scandal. Right after the Enron collapse, Enron's use of off-balance-sheet financing was widely criticized and the securitization market expected that regulatory agencies would take more stringent rules against off-balance-sheet financing that securitization also heavily uses. Naturally, the securitization market slows down due

to the scandal and we find that banks with higher securitization indexes extended less C&I and more real estate loan commitments than they did before the scandal.

The identification strategy of our third set of results is straightforward. We use lagged independent variables to explain the U.S. banks' liquidity problem in the 2007-09 financial crisis. For comparison, we run regressions that include and do not include banks' exposure to the securitization market. Results indicate that if banks' exposure to the securitization market is missing, the impact of small banks' exposure to C&I loan commitments on their liquidity would be overestimated.

This paper draws a bridge between two lines of current research that emphasize two separate off-balance-sheet items. One line of research concerns loan commitments or lines of credit (Shockley and Thakor, 1997; Kashyap et al., 2002; Gatev and Strahan, 2006; Gatev et al., 2009). The other line of research focuses on securitization (Gorton and Souleles, 2007; Loutskina and Strahan, 2009; Loutskina, 2011). We demonstrate that banks can generate more liquidity via extending more lines of credit by taking advantage of the superior loan liquidity offered by the securitization market. In addition, our paper highlights a potential "missing variable" problem in the two strands of literature that attempt to explain U.S. banks' liquidity problem during the 2007-09 financial crisis. The first strand of literature emphasizes the liquidity risk of loan commitment takedowns (Ivashina and Scharfstein, 2010; Cornett et al., 2011; Acharya and Mora, 2015). The second strand of literature concerns the freeze of the securitization market (Acharya et al., 2012, 2016).

2 Data and Variable Description

2.1 Data and Sample Construction

Our bank-level panel data come from the Federal Reserve's Report of Condition and Income that banks file with regulators quarterly ("Call Reports"). Following Kashyap et al. (2002), we aggregate the bank-level data for banks belonging to the same top holders. Therefore, "banks" in the remainder of the paper means the top holding companies, and standard errors are clustered at the top holding company level. We compile our data set for all reporting banks over the period from the first quarter of 1990 to the fourth quarter of 2009. Bank reports of their unused loan commitment off-balance-sheet items begin in the first quarter of 1990.

Our data cleaning procedure is the same as that in Loutskina (2011). In particular, we eliminate bank quarters in which banks experienced mergers, primarily using the

database provided by the Federal Reserve Bank of Chicago. We also exclude observations of acquiring banks before and after mergers. To minimize the contamination of outliers, we drop observations for quarters with asset growth over the previous quarter of more than 50 percent, those with total loan growth more than 100 percent, those with total loan-to-asset ratios less than 10 percent, and those with credit card loan shares more than 50 percent. Our ultimate data set has 617,361 bank-quarter observations. In addition, all items from Call Reports are winsorized at the 1st and 99th percentiles.

2.2 Measuring Securitization-Based Loan Liquidity

Measures of a bank's securitization-based loan liquidity indicate the likelihood that it can securitize the loans on its balance sheet. As explained in Loutskina (2011), banks' loan liquidity is increasing in the proportion of loans that can be securitized easily.

The first measure of loan liquidity that we use is constructed by Loutskina (2011). The construction involves two steps for a bank-quarter observation. The first step is to calculate the potential to securitize loans of a given category for the quarter based on the aggregate-level data that come from "Financial Accounts of the United States." The second step is to derive the weighted average of the securitization potential of all loan categories, where weights are the bank's portfolio weights of corresponding loan categories. The categories of loans are *i*) home mortgages, *ii*) multi-family residential mortgages, *iii*) commercial mortgages, *iv*) consumer credit, *v*) commercial and industrial loans, and *vi*) farm mortgages.

$$\begin{aligned}\text{Loan liquidity}_{i,t} &= \sum_{j=1}^{6}\left(\frac{\text{Economy-wide Securitized Loans of Type } j \text{ at Time } t}{\text{Economy-wide Total Loans Outstanding of Type } j \text{ at Time } t}\right)\\ &\times\big(\text{Share of Type } j \text{ Loans in Bank } i\text{'s Portfolio at Time } t\big) \qquad (1)\end{aligned}$$

Since the above measure uses stock variables to estimate the securitization potential of each type of loan, it may not capture the contemporaneous movement of the securitization market in a given quarter. To address this issue, we propose an alternative measure.

$$\begin{aligned}\text{Loan liquidity}^{\Delta}_{i,t} &= \sum_{j=1}^{6}\left(\frac{\Delta\text{Economy-wide Securitized Loans of Type } j \text{ at Time } t}{\text{Economy-wide Total Loans Outstanding of Type } j \text{ at Time } t-1}\right)\\ &\times\big(\text{Share of Type } j \text{ Loans in Bank } i\text{'s Portfolio at Time } t\big), \qquad (2)\end{aligned}$$

where ΔEconomy-wide Securitized Loans of Type j at time t = Economy-wide Securitized Loans of Type j at time t − Economy-wide Securitized Loans of Type j at time $t-1$.

This measure modifies the first step used to construct the original one. In particular, the potential to securitize loans of type j within a quarter t is the net growth in the securitized loans of type j in quarter t over the previous period divided by the outstanding total loans of type j in quart $t-1$. Intuitively, the new measure captures to what extent the securitization market for a certain type of loan is viable in a given quarter.[1]

2.3 Measuring Exposure to Loan Commitments

We focus primarily on C&I loan commitments because the massive drawdowns by firms through lines of credit is claimed to be the major cause of the liquidity shortage that U.S. banks experienced during the 2007-09 financial crisis (Ivashina and Scharfstein, 2010; Cornett et al., 2011; Acharya and Mora, 2015). Since Call Reports do not contain a specific item for C&I loan commitments, we follow Kashyap et al. (2002) and use "other commitments" as the measure of a bank's outstanding C&I loan commitments since it predominantly consists of commitments to issue C&I loans.

In this paper, we are interested in banks' liquidity management with respect to their optimal exposure to the liquidity risk of C&I loan commitments. However, the absolute level of C&I loan commitments that a bank has is directly associated with the amount of C&I loan lending that the bank intends to maintain on average over the time, which, in turn, is the outcome of its loan portfolio choice. As in Kashyap et al. (2002), to purge the effects of banks' portfolio decisions, we use the ratio of "other commitments" over the sum of "other commitments" plus C&I loans as the measure of a bank's exposure to the liquidity risk coming from takedowns of C&I loan commitments, which is denoted by "C&I comrat", that is,

$$\text{C\&I comrat}_{it} = \frac{\text{C\&I loan commitments}}{\text{C\&I loan commitments} + \text{C\&I Loans}}.$$

Besides C&I loan commitments, banks also extend other types of commitments. Most of these loan commitments have a commonality that if they are realized, they will be loans secured by residential or commercial properties. One example is home equity lines. We also construct the variable "Real estate comrat" to control for banks' exposure to the liquidity risk along this dimension

$$\text{Real estate comrat}_{it} = \frac{\text{Real estate loan commitments}}{\text{Real estate loan commitments} + \text{Real estate loans}}. \tag{3}$$

[1]It is not a perfect measure because we observe only the net change in the outstanding securitized loans. It would be better if we could observe the gross amount of loans securitized within a period.

To measure a bank's effective exposure to risks from C&I loan commitments, we need to take into account the weight of C&I loans in the bank's overall loan portfolio. Thus, we calculate the share of C&I loans and C&I loan commitments in the total credit extended by a bank; i.e., we define "C&I share" as

$$\text{C\&I share}_{it} = \frac{\text{C\&I loans} + \text{C\&I loan commitments}}{\text{Total loans} + \text{Total loan commitments}}.$$

Similarly, we define "Real estate share" as

$$\text{Real estate share}_{it} = \frac{\text{Real estate loans} + \text{Real estate loan commitments}}{\text{Total loans} + \text{Total loan commitments}}.$$

2.4 Proxies for the Bank Liquidity Shortage

Banks suffering from the liquidity problem reacted by cutting new lending and/or promising higher returns to attract more deposits. To measure the total credit that a bank i has originated by quarter t, we sum its loans and unused loan commitments considering that the drawdowns of preexisting commitments do not constitute new lending. Therefore, the net new credit that a bank i originates in quarter t is the difference between the total credit the bank has originated by quarter t and by quarter $t-1$ (Cornett et al., 2011). Furthermore, we normalize the difference by the sum of the bank's total assets and outstanding commitments.

Other than new lending, banks also scrambled for deposits to assuage the liquidity shortage experienced during the financial crisis (Acharya and Mora, 2015). Therefore, we also investigate how the liquidity problem of the banks influenced the interest rates promised to depositors during the crisis.

2.5 Bank Characteristics

A number of bank characteristics that affect banks' optimal exposure to loan commitment takedowns. For instance, banks with ample liquid assets, such as treasury securities, should easily collect loan commitment fees by choosing large exposures to the liquidity risk of commitment drawdowns. We therefore control banks' liquid asset holdings, which include U.S. treasury securities, U.S. government agency obligations, federal funds repurchase agreements, securities held to maturity, and securities available for sale. We also need to control the total amount of deposits on banks' liability side because of the synergy between banks' lending via their commitments and their deposit-taking that Kashyap et al. (2002) ememphasize. Other controls of bank liquidity and solvency that we incorpo-

Table 1: Summary Statistics

This table reports summary statistics for all bank-level variables used in regressions, as well as the number of bank quarters in the full sample and two subsamples. The small bank subsample includes the bottom 75 percent in total asset size for each quarter; the large bank sample includes the top 5 percent. The data are from the Federal Reserves Report of Condition and Income for the period between 1990Q1 and 2009Q4. We drop observations with asset growth over the previous quarter of more than 50 percent, those with total loan growth of more than 100 percent, those with total loan-to-asset ratios less than 10 percent, and those with credit card loan shares of more than 50 percent. In addition, all items from Call Reports are winsorized at the 1st and 99th percentiles.

	Full Sample (N = 617,361)				Small Banks (N = 462,992)				Large Banks (N = 30,832)			
	Mean	Q1	Median	Q3	Mean	Q1	Median	Q3	Mean	Q1	Median	Q3
Total assets	815.1	36.9	78.8	185.5	715.9	29.6	54.5	95.0	13689	1293	2401	6316
Loan liquidity	0.237	0.156	0.233	0.308	0.230	0.148	0.224	0.300	0.253	0.187	0.260	0.314
Loan liquidity$^{\Delta}$ (in percentage)	0.642	0.334	0.616	0.941	0.618	0.312	0.589	0.911	0.674	0.402	0.683	0.976
C&I share (in percentage)	28.6	14.3	25.3	40.0	30.7	15.7	27.5	43.3	21.7	7.8	22.8	33.5
C&I comrat (in percentage)	25.3	11.3	22.6	34.8	22.1	9.1	19.7	30.5	43.2	31.7	44.1	55.5
Real estate share (in percentage)	55.7	41.2	57.1	71.8	54.4	39.4	55.3	69.9	47.3	37.5	47.7	63.5
Real estate comrat (in percentage)	7.57	0.15	4.54	11.2	6.32	0	2.96	9.01	15.7	8.7	15.1	22.2
Δcredit/ (commit + asset) (in percentage)	1.58	-0.51	1.00	2.91	1.47	-0.57	0.98	2.92	2.58	-0.48	0.37	2.36
Interst rate, large time deposits	2.88	1.44	2.59	3.99	2.87	1.44	2.58	3.98	2.91	1.43	2.59	4.03
Interst rate, core deposits	2.27	1.09	1.99	3.24	2.29	1.10	2.01	3.25	2.14	0.97	1.80	3.08
Bank liquidity (percentage of total assets)	31.1	19.9	29.3	40.9	32.3	20.6	30.8	42.5	24.1	18.0	22.1	29.7
Total deposits (percentage of total assets)	82.8	81.9	86.7	89.7	84.8	83.2	87.3	89.9	63.8	63.4	72.7	83.7
Equity capital (percentage of total assets)	10.1	7.89	9.33	11.5	10.7	8.13	9.67	12.0	7.04	6.74	7.44	8.83
Net income (percentage of total assets)	0.567	0.264	0.545	0.908	0.558	0.264	0.544	0.918	0.494	0.180	0.522	0.712
Nonperforming loan (percentage of total loans)	1.38	0.23	0.76	1.76	1.40	0.20	0.75	1.79	1.36	0.39	0.97	2.07
Wholesale funding (percentage of total assets)	14.7	7.11	12.8	20.3	13.8	6.8	12.1	19.0	17.9	8.3	19.4	23.8

rate into our regressions are the log of banks' total assets, banks' equity capital, wholesale funds, net incomes, and the ratio of non-performing loans. Appendix A contains details about how to construct these variables.

2.6 Summary Statistics

The summary statistics of major bank-level variables are reported in Table 1. Besides the full sample, we also present the summary statistics for both the small bank subsample and the large bank subsample. A bank in quarter t is classified as a small bank if its total assets are within the bottom 75 percent of the bank size distribution in quarter t. Large banks in a quarter are those whose total assets are in the top 5 percent of the distribution in the quarter.

Table 1 shows that the average C&I comrat and Real estate comrat are 43.2 percent and 15.7 percent for large banks, respectively. These figures are much higher than their counterparts for small banks, which are 22.1 percent for C&I comrat and 11.2 percent for Real estate comrat. Moreover, the difference between large and small banks is especially large for the liquidity risk of C&I loan commitments.

Even though large banks have larger exposures to drawdowns of loan commitments than small banks, they hold less liquid assets and rely more on unstable funds than small banks. In particular, almost one-third of the total assets held by small banks are

liquid assets on average, while large banks keep only one-quarter of their total assets as liquid ones. On the liability side, capital to total assets is, on average, 10.7 percent at small banks and 7.04 percent at large banks, and wholesale funds to total assets is 13.8 percent at small banks and 17.9 percent at large banks. Based on these results, a well-educated conjecture is that large banks definitely find a good substitute for traditional liquid assets as the source of liquidity, which is likely to be loans that have a high potential of being securitized. As a matter of fact, the securitization-based loan liquidity of small banks is generally lower than that of large banks, as both measures of loan liquidity show (0.23 versus 0.253 for Loan liquidity, and 0.618 percent versus 0.674 percent for Loan liquidity$^{\Delta}$).

3 Empirical Results

In this section, we highlight two sets of empirical results. First, we uncover the intrinsic connection between two liquidity variables that are off banks' balance sheets. By using various identification strategies, we show that when banks find it easier to securitize loans on their balance sheets, they expand their C&I loan commitment business and shrink loan commitments related to real properties. Our second set of results concerns the massive liquidity problem that U.S. banks suffered during the 2007-09 financial crisis. Our first set of results demonstrates the importance of incorporating both of two liquidity variables as explanatory variables. In particular, our results highlight the substantial influence of the breakdown in the securitization market on bank liquidity during the crisis. They also show that the role of liquidity risks caused by unused loan commitments is overestimated in the previous literature.

3.1 More Loan Liquidity, More C&I Loan Commitments

By securitizing their outstanding loans, banks can enjoy large pools of liquidity, which in turn allows them to make more profits from the fees of extending C&I loan commitments. This section presents a highly consistent result that if banks find a larger potential to securitize their loans, they tend to issue more C&I loan commitments. The test of this result involves the endogeneity problem that banks choose their loan portfolio and their exposure to liquidity risk simultaneously. To avoid this problem, we apply three identification methods used in Loutskina (2011). The first approach is to use lagged explanatory variables, the second approach is to run instrumental variable regressions, and the third approach is to exploit the regulatory discontinuity.

3.1.1 Multivariate Analyses

To implement the first two approaches, we regress C&I comrat$_{it}$ on one period lagged variables of Loan liquidity$_{it-1}$ and other bank characteristics

$$\text{C\&I comrat}_{it} = \alpha + \beta \text{Loan liquidity}_{it-1} + \text{Bank characteristics}_{it-1} + \delta_i + \gamma_t + \varepsilon_{it}, \qquad (4)$$

where δ_i is the bank fixed effect and γ_t the time fixed effect. We expect β, the coefficient of Loan liquidity$_{it-1}$ to be positive, because if banks can easily securitize their loans, they effectively have more liquid assets, and thus they become more capable of providing liquidity services for their C&I loan commitment customers.

The instrument for Loan liquidity$_{it}$ is

$$\sum_{j=1}^{6} \left(\frac{\text{Economy-wide Securitized Loans of Type } j \text{ at Time } t}{\text{Economy-wide Total Loans Outstanding of Type } j \text{ at Time } t} \right)$$
$$\times \big(\text{Average Share of Type } j \text{ Loans in Bank } i \text{ Portfolio over } t-1 \text{ to } t-4 \big).$$

In constructing the instrument, we use a bank's average portfolio shares to capture the persistent, instead of contemporaneous, components of the bank's loan liquidity. The instrument for Loan liquidity$^{\Delta}_{it}$ is constructed in the same fashion.

Table 2 reports the results of both ordinary regressions (columns (1) - (4)) and instrumental variable regressions (columns (5) - (8)). We observe a statistically significant pattern that banks that enjoy more securitization-based loan liquidity tend to expand their C&I loan commitment business. This pattern holds consistently across eight different econometric specifications. In particular, as the securitization-based loan liquidity increases by 1 percent, the composition of C&I loan commitments (i.e., C&I comrat) rises by about 50 basis points.

In addition to our main results, Table 2 also confirms other stylized phenomena of banks' liquidity risk management. Banks that are larger or that hold more liquid assets are inclined to extend more C&I loan commitment business. The stability of equity capital also helps banks to make C&I loan commitments. In contrast, the instability of wholesale funding restrains banks from exposing themselves to the liquidity risk of loan commitment takedowns. For example, as a bank's equity capital increases by 1 percent, the composition of its C&I loan commitments increases by at least 6 basis points; if a bank's wholesale financing increases by 1 percent, it will lower the composition of its C&I loan commitments by more than 6 basis points. With respect to solvency measures, we find that banks suffering from more bad loans tend to have less C&I loan commitments

Table 2: C&I loan commitment exposure and securitization-based loan liquidity

This table reports the fixed effects regressions of exposure to C&I loan commitment, C&I loan commitment$_{it}$/ (C&I loan$_{it}$ + C&I loan commitment$_{it}$) on securitization-based loan liquidity (Loan liquidity$_{it}$ or Loan liquidity$^{\Delta}_{it}$), quarterly time dummies and other bank characteristics, including the log of total assets, bank liquidity (ratio of liquid assets to total assets), deposit financing (ratio of total deposits to total assets), equity financing (ratio of equity capital to total assets), ratio of net income to total assets, share of non-performing loans, and wholesale financing (ratios of wholesale funds to total assets). Specifications (1) - (4) show the results of ordinary regressions and (5) - (8) show those of instrumental variable regressions. The instruments for Loan liquidity$_{it}$ and Loan liquidity$^{\Delta}$ are constructed based on equations 1 and 2, with loan level in quarter t replaced by the average loan level of the previous four quarters. Standard errors are clustered at the bank level. Robust t statistics are reported in parentheses. Coefficients denoted *, **, and *** are statistically significantly different from zero at the 10 percent, 5 percent, and 1 percent level, respectively.

	C&I Loan Commitment$_{it}$/ $\left(\text{C\&I Loan}_{it} + \text{C\&I Loan Commitment}_{it}\right)$							
	Ordinary regression				Instrumental variable regression			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Loan liqudity$_{it-1}$	0.610***	0.457***			0.610***	0.458***		
	(24.15)	(4.01)			(24.14)	(4.02)		
Loan liquidity$_{it-1}$ × size$_{it-1}$		0.0135				0.0134		
		(1.42)				(1.41)		
Loan liqudity$^{\Delta}_{it-1}$			4.884***	5.003***			4.884***	5.002***
			(20.50)	(6.21)			(20.50)	(6.20)
Loan liquidity$^{\Delta}_{it-1}$ × size$_{it-1}$				-0.0102				-0.010
				(-0.16)				(-0.15)
Size$_{it}$(log of total asset$_{it-1}$)	0.00983***	0.00630*	0.00930***	0.00936***	0.00993***	0.00642*	0.00939***	0.00945***
	(4.09)	(1.89)	(3.80)	(3.82)	(4.12)	(1.93)	(3.84)	(3.86)
Bank liquidity$_{it-1}$	0.0587***	0.0580***	0.0531***	0.0531***	0.0586***	0.0579***	0.0529***	0.0529***
	(7.86)	(7.81)	(7.05)	(7.06)	(7.83)	(7.78)	(7.03)	(7.03)
Deposit financing$_{it-1}$	0.00116	0.00634	-0.00853	-0.00850	0.00103	-0.00617	-0.00863	-0.00860
	(0.06)	(0.33)	(-0.45)	(-0.45)	(0.05)	(0.32)	(-0.45)	(-0.45)
Equity capital$_{it-1}$	0.0876***	0.0885***	0.0634*	0.0634*	0.0870***	0.0878***	0.0626*	0.0626*
	(2.65)	(2.67)	(1.92)	(1.92)	(2.62)	(2.64)	(1.89)	(1.89)
Net income$_{it-1}$	0.116*	0.118*	0.111	0.111	0.116*	0.118*	0.111	0.111
	(1.72)	(1.75)	(1.62)	(1.62)	(1.71)	(1.74)	(1.62)	(1.62)
Nonperforming loan$_{it-1}$	-0.265***	-0.265***	-0.267***	-0.268***	-0.265***	-0.265***	-0.267***	-0.267***
	(-9.33)	(-9.33)	(-9.34)	(-9.35)	(-9.31)	(-9.32)	(-9.32)	(-9.34)
Wholesale financing$_{it-1}$	-0.0629***	-0.0626***	-0.0686***	-0.0685***	-0.0630***	-0.0637***	-0.0687***	-0.0686***
	(-5.06)	(-5.01)	(-5.57)	(-5.59)	(-5.06)	(-5.02)	(-5.57)	(-5.59)
Quarter dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	576467	576467	576467	576467	575904	575904	575904	575904
Adjusted R^2	0.146	0.146	0.129	0.129	0.146	0.146	0.129	0.129

in the subsequent quarter. In particular, as the fraction of a bank's non-performing loans increases by 1 percent, it lowers the composition of its C&I loan commitments (i.e., C&I comrat) by 26 basis points. Lastly, there is no evidence showing that the increase in deposit financing or in banks' net income helps them issue relatively more C&I loan commitments.[2]

3.1.2 Regulatory Discontinuity

We next apply the third difference-in-difference identification strategy by exploiting the exogenous regulatory shocks that substantially changed the functioning of the securitization market. The econometric specification is

$$\begin{aligned} \text{C\&I comrat}_{it} &= \alpha + \beta \text{Loan liquidity}_{it-1} + \beta_{\text{post-shock}} \text{Loan liquidity}_{it-1} \times \mathbb{1}_{\text{post-shock}} \\ &\quad + \text{Bank characteristics}_{it-1} + \delta_i + \gamma_t + \varepsilon_{it}. \end{aligned} \tag{5}$$

We expect that banks' decisions about their exposure to liquidity risk will become less sensitive to the change in their Loan liquidity$_{it}$ ($\beta_{\text{post-shock}} < 0$) if a regulatory shock adversely affects the securitization market.

We borrow two unexpected regulatory changes that Loutskina (2011) applies in her difference-in-difference analysis. The first regulatory shock is the Enron Scandal. Before Enron collapsed, it had used hundreds of special purpose entities to hide its debt so that it overstated its equity and understated its liability. The collapse of Enron led the banking sector to expect regulatory agencies to impose additional capital requirements for assets sold to special purpose entities (i.e., securitization). It was also anticipated that such a regulatory change might halt the normal operation of the securitization market. Given such an prospect, banks would be expected to lower their exposure to the liquidity risk of C&I loan commitments ($\beta_{\text{post-shock}} < 0$), since their liquidity pool becomes smaller for the same level of securitization-based loan liquidity.

Two years later, in July 2004, bank regulators made it clear that there would be no dramatic change to the capital requirement for securitized loans. For example, the official release states that "[t]he final rule will permanently permit sponsoring banks, bank holding companies, and thrifts (collectively, sponsoring banking organizations) to exclude from their risk-weighted asset base those assets in ABCP programs that are consolidated onto sponsoring banking organizations' balance sheets as a result of Financial Accounting

[2] Kashyap et al. (2002) find a positive correlation between "C&I comrat" and the ratio of transaction deposits to total deposits. In our paper, however, deposit financing is defined as the ratio of total deposits to total assets.

Table 3: C&I loan commitment exposure and securitization-based loan liquidity: regulatory discontinuity

This table reports the fixed effects regressions of C&I loan commitment exposure, C&I loan commitment$_{it}$/(C&I loan$_{it}$ + C&I loan commitment$_{it}$) on securitization-based loan liquidity (Loan liquidity$_{it}$ or Loan liquidity$^{\Delta}_{it}$), bank characteristics and their interactions with exogenous event dummies ($\mathbb{1}_{\text{2002:I-II}}$ or $\mathbb{1}_{\text{2004:III-IV}}$). $\mathbb{1}_{\text{2002:I-II}}$ equals one for quarters 2002:I and 2002:II when the Enron scandal was fully revealed and zero otherwise. $\mathbb{1}_{\text{2004:III-IV}}$ equals one for quarters 2004:III and 2004:IV when bank regulators issued securitization-friendly new rules and zero otherwise. Quarterly fixed effect is also controlled in these regressions. Standard errors are clustered at the bank level. Robust t statistics are reported in parentheses. Coefficients denoted *, **, and *** are statistically significantly different from zero at the 10 percent, 5 percent, and 1 percent level, respectively.

	$\frac{\text{C\&I Loan Commitment}_{it}}{\text{C\&I Loan}_{it}+\text{C\&I Loan Commitment}_{it}}$			
	(1)	(2)	(3)	(4)
Loan liqudity$_{it-1}$	0.402***		0.444***	
	(6.36)		(4.86)	
Loan liquidity$_{it-1}$ × $\mathbb{1}_{\text{2002:I-II}}$	-0.0518***			
	(-4.53)			
Loan liquidity$_{it-1}$ × $\mathbb{1}_{\text{2004:III-IV}}$			0.0408***	
			(2.98)	
Loan liqudity$^{\Delta}_{it-1}$		1.919***		0.520
		(5.08)		(1.26)
Loan liquidity$^{\Delta}_{it-1}$ × $\mathbb{1}_{\text{2002:I-II}}$		-1.223***		
		(-4.37)		
Loan liquidity$^{\Delta}_{it-1}$ × $\mathbb{1}_{\text{2004:III-IV}}$				1.105***
				(2.76)
Sample period	2001:III - 2002:II		2004:I - 2004:IV	
Other controls	Yes	Yes	Yes	Yes
Other controls × $\mathbb{1}_{\text{2002:I-II}}$	Yes	Yes		
Other controls × $\mathbb{1}_{\text{2004:III-IV}}$			Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes
Bank dummies	Yes	Yes	Yes	Yes
Observations	27000	27000	26486	26486
Adjusted R^2	0.021	0.019	0.018	0.015

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

Standards Board Interpretation No.46, Consolidation of Variable Interest Entities, as revised (FIN46-R)." Thus, the securitization market prospered again (Acharya et al., 2012).

We analyzed regulatory discontinuity for two subsample periods: one 2001Q3 to 2002Q2, around the Enron Scandal period, and the other 2004Q1 to 2004Q4, around the regulatory relief period. The indicator variables are $\mathbb{1}_{\text{2002:I-II}}$ for the first and second quarters of 2002, and $\mathbb{1}_{\text{2004:III-IV}}$ for the third and fourth quarters of 2004.

Table 3 reports the results of the difference-in-difference analyses. The Enron scandal significantly reduced the responsiveness of C&I loan commitment decisions to the securitization-based loan liquidity irrespective of what measure of loan liquidity we use. The regression using stock variables to measure securitization-based loan liquidity indicates that the coefficient of Loan liquidity$_{it}$ declines by 12.5 percent because of the scandal. If we use flow variables, the coefficient of Loan liquidity$^{\Delta}_{it}$ drops by more than 50 percent

because of the Enron collapse. On the other hand, the issuance of the securitization-friendly rule not only revived this market but also reunited the complementary roles of C&I loan commitment exposure and securitization-based loan liquidity: the issuance of C&I loan commitments became more sensitive to the securitization-based loan liquidity after the 2004 regulation (columns (2) and (4) in Table 3).

3.2 More Loan Liquidity, Less Real Estate Loan Commitments

It is somewhat easier to securitize real estate loans, such as home mortgages, than C&I loans. Therefore, as the securitization market develops, banks would prefer real estate loans rather than their loan commitment counterparts since the former increases banks' liquidity and the latter consumes it. In addition to this straightforward mechanism, the prospects for the housing market also affect a bank's choice to extend commitments backed by real estate. The logic is that in the middle of a housing boom banks are inclined to expect that they would assume high-quality loans if real estate loan commitments are realized. Thus, their incentive to issue real estate loan commitments becomes stronger when the housing market is booming.

Our identification strategies are exactly the same as those in Section 3.1. Econometric specifications are also the same except that dependent variables are replaced by "Real estate comrat$_{it}$".

Table 4 reports the results of multivariate analyses. As expected, coefficients on"Loan liquidity" and "Loan liquidity$^{\Delta}$" are negative across all specifications, which implies that the higher potential of securitizing loans leads banks to shrink their real estate loan commitment business and to hold more real estate loans that can be readily securitized. Furthermore, we observe that this effect becomes less pronounced for larger banks, which is intuitive because loan liquidity is more important for small banks. In addition, we find that banks with more equity financing and less non-performing loans still choose higher exposure to the liquidity risks of real estate loan commitments, which is in line with results for C&I loan commitments.

Table 5 reports the results of difference-in-difference regressions that exploit the two regulatory shocks. Columns (1) and (2) support our hypothesis with respect to real estate loan commitments. Banks extended more real estate loan commitments than they would have if there were no Enron scandal. Recall that the impact of this natural experiment is in the opposite direction for C&I loan commitments. However, the results around the regulatory shock in 2004 that is friendly to the securitization market go against our

Table 4: Real estate loan commitment exposure and securitization-based loan liquidity

This table reports the fixed effects regressions of exposure to real estate loan commitments, Real estate loan commitments$_{it}$/ (Real estate loans$_{it}$ + Real estate loan commitments$_{it}$) on securitization-based loan liquidity (Loan liquidity$_{it}$ or Loan liquidity$^{\Delta}_{it}$), quarterly time dummies and other bank characteristics including the log of total asset, bank liquidity (ratio of liquid assets to total assets), deposit financing (ratio of total deposits to total assets), equity financing (ratio of equity capital to total assets), ratio of net income to total assets, share of non-performing loans, and wholesale financing (ratios of wholesale funds to total assets). Specification (1) - (4) show the results of ordinary regressions and (5) - (8) show those of instrumental variable regressions. The instruments for Loan liquidity$_{it}$ and Loan liquidity$^{\Delta}$ are constructed based on equations 1 and 2 with loan level in quarter t replaced by the average loan level of the previous four quarters. Standard errors are clustered at the bank level. Robust t statistics are reported in parentheses. Coefficients denoted *, **, and *** are statistically significantly different from zero at the 10 percent, 5 percent, and 1 percent level, respectively.

	Real Estate Loan Commitment$_{it}$/ (Real Estate Loan$_{it}$ + Real Estate Loan Commitment$_{it}$)							
	Ordinary regression				Instrumental variable regression			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Loan liqudity$_{it-1}$	-0.162***	-0.500***			-0.162***	-0.497***		
	(-15.26)	(-10.23)			(-15.25)	(-10.22)		
Loan liquidity$_{it-1}$ × size$_{it-1}$		0.0297***				0.0295***		
		(7.04)				(7.01)		
Loan liqudity$^{\Delta}_{it-1}$			-0.602***	-3.338***			-0.596***	-3.319***
			(-5.36)	(-8.74)			(-5.32)	(-8.73)
Loan liquidity$^{\Delta}_{it-1}$ × size$_{it-1}$				0.233***				0.232***
				(7.34)				(7.32)
Size$_{it}$(log of total asset$_{it-1}$)	0.0150***	0.00718***	0.0149***	0.0135***	0.0151***	0.00733***	0.0150***	0.0136***
	(12.98)	(4.27)	(12.90)	(11.55)	(13.07)	(4.36)	(12.99)	(11.65)
Bank liquidity$_{it-1}$	0.00434	0.00268	0.00583*	0.00561	0.00414	0.00250	0.00562	0.00540
	(1.25)	(0.78)	(1.68)	(1.61)	(1.20)	(0.72)	(1.62)	(1.56)
Deposit financing$_{it-1}$	-0.0218*	-0.0105	-0.0193*	-0.0201*	-0.0215*	-0.0103	-0.0190	-0.0198*
	(-1.86)	(-0.89)	(-1.65)	(-1.72)	(-1.84)	(-0.87)	(-1.63)	(-1.69)
Equity capital$_{it-1}$	0.195***	0.197***	0.202***	0.202***	0.194***	0.196***	0.201***	0.201***
	(8.35)	(8.56)	(8.85)	(8.87)	(8.27)	(8.48)	(8.77)	(8.79)
Net income$_{it-1}$	-0.0531	-0.0482	-0.0528	-0.0594	-0.0474	-0.0424	-0.0472	-0.0537
	(-1.21)	(-1.10)	(-1.19)	(-1.34)	(-1.08)	(-0.97)	(-1.06)	(-1.21)
Nonperforming loan$_{it-1}$	-0.334***	-0.334***	-0.331***	-0.329***	-0.333***	-0.333***	-0.330***	-0.328***
	(-20.47)	(-20.57)	(-20.10)	(-20.03)	(-20.44)	(-20.54)	(-20.07)	(-20.01)
Wholesale financing$_{it-1}$	0.00824	0.00887	0.00950	0.00833	0.00814	0.00878	0.00940	0.00825
	(1.02)	(1.11)	(1.18)	(1.04)	(1.01)	(1.10)	(1.17)	(1.02)
Quarter dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	579552	579552	579552	579552	578991	578991	578991	578991
Adjusted R^2	0.120	0.121	0.113	0.114	0.096	0.098	0.089	0.090

Table 5: Real estate loan commitment exposure and securitization-based loan liquidity: regulatory discontinuity

This table reports the fixed effects regressions of loan exposure to loan commitments backed by real estate, Real estate loan commitments$_{it}$/(Real estate loans$_{it}$ + Real estate loan commitments$_{it}$) on securitization-based loan liquidity (Loan liquidity$_{it}$ or Loan liquidity$^{\Delta}_{it}$), bank characteristics and their interactions with exogenous event dummies ($\mathbb{1}_{\text{2002:I-II}}$ or $\mathbb{1}_{\text{2004:III-IV}}$). $\mathbb{1}_{\text{2002:I-II}}$ equals one for quarters 2002:I and 2002:II when the Enron scandal was fully revealed and zero otherwise. $\mathbb{1}_{\text{2004:III-IV}}$ equals one for quarter s2004:III and 2004:IV when bank regulators issued securitization-friendly new rules and zero otherwise. Quarterly fixed effect is also controlled in these regressions. Standard errors are clustered at the bank level. Robust t statistics are reported in parentheses. Coefficients denoted *, **, and *** are statistically significantly different from zero at the 10 percent, 5 percent, and 1 percent level, respectively.

	$\frac{\text{Real Estate Loan Commitment}_{it}}{\text{Real Estate Loan}_{it}+\text{Real Estate Loan Commitment}_{it}}$			
	(1)	(2)	(3)	(4)
Loan liqudity$_{it-1}$	-0.0643*		-0.0554	
	(-1.76)		(-1.31)	
Loan liquidity$_{it-1}$ × $\mathbb{1}_{\text{2002:I-II}}$	0.0222***			
	(4.60)			
Loan liquidity$_{it-1}$ × $\mathbb{1}_{\text{2004:III-IV}}$			-0.00233	
			(-1.31)	
Loan liqudity$^{\Delta}_{it-1}$		-0.416***		-0.766***
		(-2.58)		(-4.69)
Loan liquidity$^{\Delta}_{it-1}$ × $\mathbb{1}_{\text{2002:I-II}}$		0.505***		
		(4.41)		
Loan liquidity$^{\Delta}_{it-1}$ × $\mathbb{1}_{\text{2004:III-IV}}$				0.485***
				(2.82)
Sample period	2001:III - 2002:II		2004:I - 2004:IV	
Other controls	Yes	Yes	Yes	Yes
Other controls × $\mathbb{1}_{\text{2002:I-II}}$	Yes	Yes		
Other controls × $\mathbb{1}_{\text{2004:III-IV}}$			Yes	Yes
Quarter dummies	Yes	Yes	Yes	Yes
Bank dummies	Yes	Yes	Yes	Yes
Observations	27108	27108	26577	26577
Adjusted R^2	0.013	0.013	0.012	0.014

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

hypothesis. We suspect the major reason is that banks were more willing to take the upside risk of the housing market in the middle of the housing boom and that they expected the development of the securitization market to enhance their liquidity in the future as lots of their real estate loan commitments materialized.

3.3 Securitization and Loan Commitments in the 2007-09 Financial Crisis

In the literature, the liquidity risk of unused loan commitments is claimed to be one major cause of the liquidity problem that U.S. banks experienced during the financial crisis (Ivashina and Scharfstein, 2010; Cornett et al., 2011; Acharya and Mora, 2015). However, these papers do not take into account the effect of the breakdown in the securitization

market on banks' liquidity. In light of this causal relationship, established in Sections 3.1 and 3.2 establish, we next run a number of "horse-race" regressions between securitization-based loan liquidity and liquidity risk exposure to loan commitments. We find that the freeze of the securitization market significantly lowers banks' liquidity and that the liquidity risk of unused loan commitments is overestimated in the previous literature.

3.3.1 Lending Cut

Banks' natural reaction to a liquidity shortage is to cut their new lending. The representative econometric specification is

$$\begin{aligned}
\frac{\Delta\text{Loan Commitment}_{it} + \Delta\text{Loan}_{it}}{(\text{Commitment} + \text{Asset})_{it}} &= \alpha + \left(\beta + \beta_{\text{comrat}} \times \text{C\&I comrat}_{it-1}\right) \times \text{C\&I share}_{it-1} \\
&+ \left(\beta_{\text{crisis}} + \beta_{\text{comrat,crisis}} \times \text{C\&I comrat}_{it-1}\right) \times \text{C\&I share}_{it-1} \times \text{Crisis}_t \\
&+ \left(\zeta + \zeta_{\text{comrat}} \times \text{Real estate comrat}_{it-1}\right) \times \text{Real estate share}_{it-1} \\
&+ \left(\zeta_{\text{crisis}} + \zeta_{\text{comrat,crisis}} \times \text{Real estate comrat}_{it-1}\right) \times \text{Real estate share}_{it-1} \times \text{Crisis}_t \\
&+ \eta\text{Loan liquidity}_{it-1} + \eta_{\text{crisis}}\text{Loan liquidity}_{it-1} \times \text{Crisis}_t + \text{Bank characteristics}_{it-1} + \delta_i + \gamma_t + \varepsilon_{it},
\end{aligned}$$

where Crisis_t represents two time dummies: $\mathbb{1}_{\text{crisis1}}$ refers to periods 2007Q3 to 2008Q2 and $\mathbb{1}_{\text{crisis2}}$ periods 2008Q3 to 2009Q2. This time dummy specification follows Acharya and Mora (2015). The two-year window of the financial crisis is divided into two periods in order to capture the dramatic change in the financial market caused by the failure of Lehman Brothers and the subsequent massive government intervention.

The sample period of our regression analyses is 2005Q1 to 2009Q4. In addition, we run separate regressions for the large bank and small bank subsamples. Large banks are those with beginning of quarter total assets above $1 billion; small banks are those with beginning of quarter total assets below $800 million.[3] To highlight the importance of including the effects of securitization-based loan liquidity, we run the representative regression dropping "Loan liquidity$_{it}$" and also with "Loan liquidity$_{it}$" replaced by "Loan liquidity$^{\Delta}_{it}$". Table 6 reports the results of these regressions. Columns (1) - (3) in Table 6 contain results for the large bank sample, and columns (4) - (6) report results for the small banks.

In addition to including the effect of securitization-based loan liquidity, our econometric specification differs from the previous literature (Cornett et al., 2011; Acharya and Mora, 2015) in two respects.

First, we distinguish the effects of C&I loan commitments from those of real estate

[3] Our results are still consistent if we use different thresholds.

loan commitments. This is because the impact of the securitization market on the two types of loan commitments is in the opposite direction as observed in Section 3.1 and 3.2. In addition, the previous literature typically uses the drawdown of firms' lines of credit to motivate the liquidity risk of unused loan commitments during the crisis.[4] We are interested in examining this channel in particular.

The second difference is that our specification takes into account the effect of loan portfolio choices (β and ζ) in addition to the effect of liquidity risk exposure (β_{comrat} and ζ_{comrat}). In this specification, the key coefficient of interest, β_{comrat}, is interpreted to measure to what degree the increase in a bank's exposure to liquidity risk from its C&I loan commitments ("C&I comrat") affects its new lending, given the loan portfolio weight with respect to C&I loans ("C&I share").

The results presented in Table 6 contain three key messages. First, the new lending of large banks is barely affected by the liquidity drain of loan commitments and the collapse of the securitization market. Second, the regression results tend to overestimate the influence of the liquidity risk of C&I loan commitments on the cut in small banks' lending during the 2007-09 financial crisis if the effect of the securitization market on bank liquidity is overlooked. Third, as columns (5) and (6) in Table 6 show, the malfunction of the securitization market contributes to the cut in small banks' lending during the crisis.

The results of all six regressions in Table 6 confirm the hypothesis that if banks are more exposed to the liquidity risk of C&I loan commitment drawdowns, then they tend to originate less new credit (the coefficient of "C&I share$_{it-1}$ $\times$ C&I comrat$_{it-1}$"). However, the financial crisis did not significantly change the impact of this channel for large banks. With respect to small banks, column (4) in Table 6 shows that the significance of this channel seems to become stronger during the crisis if we exclude the effects of the securitization market on loan liquidity. However, if we include loan liquidity measures in our regressions, the coefficient of "C&I share$_{it-1}$ $\times$ C&I comrat$_{it-1}$ $\times$ $\mathbb{1}_{\text{crisis2}}$" becomes statistically less or not significant at all (columns (5) and (6) of Table 6). The underlying intuition follows. Banks that expect to enjoy securitization-based loan liquidity, tend to extend more C&I loan commitments. However, when the securitization market suddenly stalled, those banks responded by cutting their new lending because they could not easily securitize their existing loans as they did pre-crisis. If we overlook this channel, we might interpret the result of column (4) in Table 6 as implying that banks reduced their new lending because of the concern over the liquidity risk of C& loan commitments during the crisis.

[4]For example, Ivashina and Scharfstein (2010) ,Cornett et al. (2011), and Acharya and Mora (2015)

Table 6: New lending, C&I loan commitment takedowns, and securitization

This table reports the fixed effects regressions of new lending, ΔLoan Commitments$_{it}$ + ΔLoans$_{it}$/ (Loan Commitments + Total Assets)$_{it}$ on exposure to C&I loan commitment drawdowns (C&I loan commitments$_{it}$/ (C&I loan commitments$_{it}$ + C&I loans$_{it}$)), exposure to real estate related loan commitment drawdowns (real estate loan commitments$_{it}$/ (real estate loans$_{it}$ + real estate loan commitments$_{it}$)), securitization-based loan liquidity (Loan liquidity$_{it}$ or Loan liquidity$^{\Delta}_{it}$), bank characteristics and their interactions with event dummies, $\mathbb{1}_{\text{crisis1}}$ and $\mathbb{1}_{\text{crisis2}}$. $\mathbb{1}_{\text{crisis1}}$ equals one for quarters 2007Q3 to 2008Q2 and zero otherwise. $\mathbb{1}_{\text{crisis2}}$ equals one for quarters 2008Q3 to 2009Q2 and zero otherwise. Sample period is 2005Q1 to 2009Q2. Large banks are those with beginning of quarter total assets more than $1 billion, and small banks are those with beginning of quarter total assets less than $800 million. Quarterly fixed effect is also controlled in these regressions. Standard errors are clustered at the bank level. Robust t statistics are reported in parentheses. Coefficients denoted *, **, and *** are statistically significantly different from zero at the 10 percent, 5 percent, and 1 percent level, respectively.

	$\frac{\Delta\text{Loan commitments}_{it}+\Delta\text{Total loans}_{it}}{(\text{Loan commitments+Total assets})_{it}}$, large banks			$\frac{\Delta\text{Loan commitments}_{it}+\Delta\text{Total loans}_{it}}{(\text{Total commitments+Total assets})_{it}}$, small banks		
	(1)	(2)	(3)	(4)	(5)	(6)
C&I share$_{it-1}$	-0.2155**	-0.1175	-0.2247**	0.0090	0.0108	0.0149
	(-2.39)	(-1.26)	(-2.45)	(0.52)	(0.63)	(0.87)
C&I share$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$	-0.0030	-0.0085	.0050	0.0173**	0.0057	0.0091
	(-0.08)	(-0.20)	(0.13)	(2.36)	(0.74)	(1.19)
C&I share$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$	0.0340	0.0165	0.0514	0.0157**	0.0137	0.0069
	(0.92)	(0.36)	(1.29)	(1.97)	(1.63)	(0.86)
C&I share$_{it-1}$ × C&I comrat$_{it-1}$	-0.2860***	-0.3662***	-0.2764***	-0.1484***	-0.1486***	-0.1551***
	(-2.77)	(-3.36)	(-2.65)	(-11.38)	(-11.27)	(-11.84)
C&I share$_{it-1}$ × C&I comrat$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$	0.0876	0.0845	0.0789	-0.0313**	-0.0273*	-0.0248
	(1.20)	(1.12)	(1.10)	(-2.05)	(-1.81)	(-1.62)
C&I share$_{it-1}$ × C&I comrat$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$	-.0409	-0.0290	-0.0615	-0.0399***	-0.0392**	-0.0327*
	(-0.66)	(-0.41)	(-0.95)	(-2.30)	(-2.28)	(-1.91)
Real estate share$_{it-1}$	-0.1562***	-0.1691***	-0.1517***	0.0230	0.0229	0.0172
	(-3.11)	(-3.37)	(-2.98)	(1.48)	(1.45)	(1.10)
Real estate share$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$	0.0189	0.0150	0.0145	0.0015	0.0043	0.0081
	(0.73)	(0.53)	(0.51)	(0.25)	(0.70)	(1.30)
Real estate share$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$	0.0473*	.0467*	0.0377	-0.0011	-0.0006	0.0076
	(1.81)	(1.66)	(1.35)	(-0.17)	(-0.10)	(1.18)
Real estate share$_{it-1}$ × Real estate comrat$_{it-1}$	-0.0647	-0.0374	-0.0681	-0.0455***	-0.0446***	-0.0421***
	(-1.10)	(-0.63)	(-1.15)	(-4.21)	(-3.98)	(-3.90)
Real estate share$_{it-1}$ × Real estate comrat$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$	0.0164	0.0093	0.0209	-0.0147	-0.0217**	-0.0200**
	(0.32)	(0.17)	(0.40)	(-1.57)	(-2.26)	(-2.17)
Real estate share$_{it-1}$ × Real estate comrat$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$	-0.0111	-0.0178	-0.0005	-0.0429***	-0.0443***	-0.0514***
	(-0.22)	(-0.37)	(-0.01)	(-3.90)	(-3.99)	(-4.60)
Loan liqudity$_{it-1}$		0.2504**			0.0030	
		(2.15)			(0.11)	
Loan liquidity$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$		-0.0088			-0.0299***	
		(-0.16)			(-3.56)	
Loan liquidity$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$		-0.0401			-0.0051	
		(-0.74)			(-0.69)	
Loan liqudity$^{\Delta}_{it-1}$			-0.4971			0.6080***
			(-0.78)			(5.10)
Loan liquidity$^{\Delta}_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$			-0.0284			-0.6582***
			(-0.03)			(-2.96)
Loan liquidity$^{\Delta}_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$			1.6278			-1.1709**
			(0.99)			(-3.82)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Other controls × event dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9444	9444	9444	115577	115577	115577
Adjusted R^2	0.364	0.365	0.364	0.196	0.196	0.197

Third, columns (4) - (6) in Table 6 show that small banks that are more exposed to commitments backed by real estates tend to originate less new credit, and the financial crisis enhanced this effect. This result complements that found in Cornett et al. (2011) and Acharya and Mora (2015) that commitments-exposed banks tend to cut back new lending more heavily. Our results show that this effect is driven mainly by the exposure to loan commitments related to real properties rather than by the liquidity risk associated with C&I loan commitments. Nevertheless, it is still difficult to have a decisive conclusion because of two alternative explanations other than liquidity risk. First, the turbulence of the housing market during the crisis meant that increased exposure to loan commitments related to housing implied greater exposure to the downside risk of the housing market. Therefore, banks with large exposure to real estate loan commitments were naturally cautious about new lending. The second explanation concerns the breakdown of the securitization market. Prior to the crisis, when small banks originated loan commitments backed by real properties they expected that if those commitments were converted to mortgages they would still enjoy relatively high loan liquidity due to the ease of securitizing mortgages. However, the freeze of this market during the crisis made the exposure to real estate loan commitments more costly.

3.3.2 Scrambling for Deposits

During the financial crisis, banks were inclined to raised deposit rates to attract more deposits and ease their liquidity shortage (Acharya and Mora, 2015). To test the relative importance of the securitization market breakdown and the drawdown of loan commitments in explaining this phenomenon, we also run a number of "horse race" regressions with dependent variables replaced by the deposit rates for large time deposits and core deposits. The econometric specification is

$$
\begin{aligned}
\text{Deposit rate}_{it} = {} & \alpha + \left(\beta + \beta_{\text{comrat}} \times \text{C\&I comrat}_{it-1}\right) \times \text{C\&I share}_{it-1} \\
& + \left(\beta_{\text{crisis}} + \beta_{\text{comrat,crisis}} \times \text{C\&I comrat}_{it-1}\right) \times \text{C\&I share}_{it-1} \times \text{Crisis}_t \\
& + \left(\zeta + \zeta_{\text{comrat}} \times \text{Real estate comrat}_{it-1}\right) \times \text{Real estate share}_{it-1} \\
& + \left(\zeta_{\text{crisis}} + \zeta_{\text{comrat,crisis}} \times \text{Real estate comrat}_{it-1}\right) \times \text{Real estate share}_{it-1} \times \text{Crisis}_t \\
& + \eta \text{Loan liquidity}_{it-1} + \eta_{\text{crisis}} \text{Loan liquidity}_{it-1} \times \text{Crisis}_t + \text{Bank characteristics}_{it-1} + \delta_i + \gamma_t + \varepsilon_{it},
\end{aligned}
$$

which is similar to that used to analyze the banks' lending cut. We run regressions for both large bank and small bank subsamples. The sample period is also 2005Q1 to 2009Q4. Table 7 reports the results of regressions with the rate of large time deposits

as the dependent variables, and Table 8 the results of regressions with the rate of core deposits as the dependent variables.

Results in Tables 7 and 8 indicate the critical role of the securitization market in bank liquidity. During the pre-crisis period, small banks that enjoy better loan liquidity do not have a strong incentive to attract large time deposits and thus offered their depositors relatively low returns (the coefficient on "Loan liquidity$^{\Delta}_{it-1}$" in column (6) of Table 7). With respect to core deposits, a bank with better securitization-based loan liquidity also offers lower rates regardless of whether the bank is "big" or "small" (coefficients on "Loan liquidity$^{\Delta}_{it-1}$" in columns (3) and (6) of Table 8). During the crisis period, banks that had enjoyed high loan liquidity thanks to securitization had to offer higher rates to attract more core deposits (columns (3) and (6) of Table 8). This is true for the entire two-year period of the crisis, which means that the government intervention during the second phase of the crisis did not effectively revive the securitization market.

Some coefficients on "Loan liquidity$_{it-1}$" have counter-intuitive signs. This is because this measure uses the stock variable to quantify the potential of securitizing assets, which does not thoroughly capture contemporaneous changes in the securitization market.

Table 7 also shows that banks with more unused loan commitments offered lower rates for large time deposits prior to the 2007-09 financial crisis, which is consistent with the result in Acharya and Mora (2015). The most plausible explanation, which is in line with the literature (Kashyap et al., 2002; Gatev and Strahan, 2006), is that banks with better access to deposits during periods of typical market distresses extend more loan commitments.[5] Since these banks can access deposits more easily, they typically offer lower deposit rates.

With respect to the liquidity shortage during the crisis, no results in Table 7 or 8 indicates that banks with larger exposure to C&I loan commitments offered high deposit rates during the first one-year period of the crisis. Thus, there is no strong cross-sectional evidence showing that firms' credit line drawdowns constituted the driving force behind the banks' liquidity shortage. On the contrary, exposure to real estate loan commitments led banks to raise deposit rates to attract more core deposits, especially during the first phase of the crisis. Nevertheless, this effect might be driven by three alternative channels: risks of massive drawdowns, risks of assuming low-quality loans in a the deteriorating housing market, and illiquidity of loans due to the malfunction of the securitization market, as we have discussed in Section 3.3.1.

Similar to the lending cut regressions in Section 3.3.1, results in this section also

[5]The 2007-09 financial crisis is not a typical market distress.

Table 7: Large time deposits, exposure to C&I loan commitment takedowns, and securitization

This table reports the fixed effects regressions of interest rates paid on large time deposits on the exposure to C&I loan commitment drawdowns (C&I loan commitments$_{it}$/ (C&I loans$_{it}$ + C&I loan commitments$_{it}$)), exposure to real estate related loan commitment drawdowns (real estate loan commitments$_{it}$/ (real estate loans$_{it}$ +real estate loan commitments$_{it}$)), securitization-based loan liquidity (Loan liquidity$_{it}$ or Loan liquidity$^{\Delta}_{it}$), bank characteristics and their interactions with event dummies, $\mathbb{1}_{\text{crisis1}}$ and $\mathbb{1}_{\text{crisis2}}$. $\mathbb{1}_{\text{crisis1}}$ equals one for quarters 2007Q3 to 2008Q2 and zero otherwise. $\mathbb{1}_{\text{crisis2}}$ equals one for quarters 2008Q3 to 2009Q2 and zero otherwise. Sample period is 2005Q1 to 2009Q2. Large banks are those with beginning of quarter total assets more than $1 billion, and small banks are those with beginning of quarter total assets less than $800 million. Quarterly fixed effect is also controlled in these regressions. Standard errors are clustered at the bank level. Robust t statistics are reported in parentheses. Coefficients denoted *, **, and *** are statistically significantly different from zero at the 10 percent, 5 percent, and 1 percent level, respectively.

	Interest rate, large time deposit					
	Large banks			Small banks		
	(1)	(2)	(3)	(4)	(5)	(6)
C&I share$_{it-1}$	0.3359	0.6039	0.3910	0.2108	0.2780**	0.1697
	(0.68)	(1.14)	(0.82)	(1.64)	(2.07)	(1.32)
C&I share$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$	0.6801**	0.3095	0.8317**	0.1741**	0.0306	0.2736***
	(2.17)	(0.79)	(2.13)	(2.15)	(0.33)	(3.16)
C&I share$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$	0.2348	-0.2188	.0280	-0.0385	-0.1497	0.0110
	(0.53)	(-0.38)	(0.06)	(-0.44)	(-1.51)	(0.12)
C&I share$_{it-1}$ × C&I comrat$_{it-1}$	-1.4792**	-1.7171***	-1.5342**	-0.3174***	-0.3469***	-0.2764***
	(-2.31)	(-2.90)	(-2.44)	(-3.19)	(-3.32)	(-2.75)
C&I share$_{it-1}$ × C&I comrat$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$	-0.3175	0.0433	-0.4974	0.1978	0.2470*	0.1049
	(-0.67)	(0.09)	(-0.94)	(1.42)	(1.76)	(0.74)
C&I share$_{it-1}$ × C&I comrat$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$	-0.4502	0.0307	-0.2119	-0.2295	-0.1918	-0.2643*
	(-0.69)	(0.04)	(-0.32)	(-1.64)	(-1.36)	(-1.88)
Real estate share$_{it-1}$	-0.2884	-0.3448	-0.3171	0.2042	0.1929	0.2403*
	(-1.31)	(-1.59)	(-1.43)	(1.63)	(1.53)	(1.89)
Real estate share$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$	0.1083	0.2262	0.0214	0.0404	0.0692	-0.0518
	(0.50)	(1.02)	(0.09)	(0.62)	(1.06)	(-0.77)
Real estate share$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$	-0.0124	0.1249	0.0925	-0.0043	0.0165	-0.0311
	(-0.04)	(0.41)	(0.30)	(-0.06)	(0.23)	(-0.41)
Real estate share$_{it-1}$ × Real estate comrat$_{it-1}$	-1.3476***	-1.2511***	-1.3192***	-0.2436***	-0.2102***	-0.2628***
	(-3.45)	(-2.95)	(-3.36)	(-3.27)	(-2.75)	(-3.53)
Real estate share$_{it-1}$ × Real estate comrat$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$	0.4767	0.2265	0.5224	0.2291***	0.1483*	0.2892
	(1.50)	(0.66)	(1.50)	(2.72)	(1.70)	(3.41)
Real estate share$_{it-1}$ × Real estate comrat$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$	1.6255***	1.3764***	1.4832***	-0.0220	-0.0831	-0.0024
	(3.22)	(2.70)	(2.91)	(-0.18)	(-0.69)	(-0.02)
Loan liqudity$_{it-1}$		0.6384			0.2173	
		(0.57)			(1.09)	
Loan liquidity$_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$		-0.7299			-0.3598***	
		(-1.50)			(-3.81)	
Loan liquidity$_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$		-0.8485*			-0.2740***	
		(-1.68)			(-2.83)	
Loan liqudity$^{\Delta}_{it-1}$			3.3604			-4.1252***
			(0.37)			(-3.24)
Loan liquidity$^{\Delta}_{it-1}$ × $\mathbb{1}_{\text{crisis1}}$			12.385			10.092***
			(0.87)			(3.57)
Loan liquidity$^{\Delta}_{it-1}$ × $\mathbb{1}_{\text{crisis2}}$			-23.847			1.3096
			(-1.15)			(0.29)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Other controls × event dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9390	9390	9390	115114	115114	115114
Adjusted R^2	0.881	0.881	0.881	0.871	0.871	0.871

t statistics in parentheses

* $p < .1$, ** $p < .05$, *** $p < .01$

complement to the previous literature on the liquidity risks of unused loan commitments (Acharya and Mora, 2015) since we distinguish between the different roles of C&I loan commitments and real estate commitments. We highlight that it is primarily the risk exposure to commitments backed by real estates that caused the liquidity shortage for U.S. banks during the crisis.

4 Conclusion

This paper shows that when banks can securitize the loans on their balance sheet with relative ease, they tend to extend more C&I loan commitments and less real estate loan commitments. Given this connection, it is critical to include the effects of both securitization and loan commitments when explaining the liquidity shortage of U.S. banks during the 2007-09 financial crisis. By doing so, our paper highlights the significance of both the securitization market malfunction and the risk exposure to real estate loan commitments during the crisis. Overall, the paper provides a detailed picture of what the U.S. banking sector experienced during the crisis and how it reacted. We also underscore the importance of the quick restoration of the securitization market in improving the liquidity of the banking sector.

Appendix

A Bank Characteristics

All bank characteristic variables are constructed based on Call Report items.

Bank identifier: RSSD9001, the unique identifying number (RSSDID) assigned by the Federal Reserve for all banks.

The highest holding company id: RSSD9348, the RSSDID of the highest holding company. We aggregate balance sheet variables of all banks that have the same highest holding company.

Total assets: RCFD2170, the sum of all asset items.

Total loans: RCFD1400, the gross book value of total loans and leases.

Home mortgages: RCON1430, real estate loans backed by 1-4 family residential properties.

Table 8: Core deposits, exposure to C&I loan commitment takedowns, and securitization

This table reports the fixed effects regressions of interest rates paid on core deposits on the exposure to C&I loan commitment drawdowns (C&I loan commitments$_{it}$/ (C&I loans$_{it}$ + C&I loan commitments$_{it}$)), exposure to real estate related loan commitment drawdowns (real estate loan commitments$_{it}$/ (real estate loans$_{it}$ +real estate loan commitments$_{it}$)), securitization-based loan liquidity (Loan liquidity$_{it}$ or Loan liquidity$^{\Delta}_{it}$), bank characteristics and their interactions with event dummies, $\mathbb{1}_{\text{crisis1}}$ and $\mathbb{1}_{\text{crisis2}}$. $\mathbb{1}_{\text{crisis1}}$ equals one for quarters 2007Q3 to 2008Q2 and zero otherwise. $\mathbb{1}_{\text{crisis2}}$ equals one for quarters 2008Q3 to 2009Q2 and zero otherwise. Sample period is 2005Q1 to 2009Q2. Large banks are those with beginning of quarter total assets more than $1 billion, and small banks are those with beginning of quarter total assets less than $800 million. Quarterly fixed effect is also controlled in these regressions. Standard errors are clustered at the bank level. Robust t statistics are reported in parentheses. Coefficients denoted *, **, and *** are statistically significantly different from zero at the 10 percent, 5 percent, and 1 percent level, respectively.

	Interest rate, core deposit					
	Large banks			Small banks		
	(1)	(2)	(3)	(4)	(5)	(6)
C&I share$_{it-1}$	0.1950	-0.4496	-0.1979	0.1112	0.0753	0.0913
	(0.53)	(-1.00)	(-0.53)	(1.24)	(0.80)	(1.02)
C&I share$_{it-1} \times \mathbb{1}_{\text{crisis1}}$	-0.4704*	-0.1253	0.1924	0.1105**	0.0345	0.2705***
	(-1.83)	(-0.45)	(0.64)	(2.33)	(0.63)	(5.22)
C&I share$_{it-1} \times \mathbb{1}_{\text{crisis2}}$	-.5511***	0.0951	-0.0829	-.1211**	-0.0377	-0.0916
	(-2.59)	(0.39)	(-0.36)	(-2.07)	(-0.56)	(-1.50)
C&I share$_{it-1} \times$ C&I comrat$_{it-1}$	-0.3475	0.2060	0.0596	-0.0106	0.0158	-0.0041
	(-0.80)	(0.43)	(0.13)	(-0.17)	(0.24)	(-0.06)
C&I share$_{it-1} \times$ C&I comrat$_{it-1} \times \mathbb{1}_{\text{crisis1}}$	0.6436	0.3339	-0.1033	-0.0566	-0.0289	-0.2267***
	(1.36)	(0.70)	(-0.20)	(-0.80)	(-0.40)	(-3.07)
C&I share$_{it-1} \times$ C&I comrat$_{it-1} \times \mathbb{1}_{\text{crisis2}}$	0.1281	-0.5608	-0.4056	-0.3769***	-0.4041***	-0.4079***
	(0.32)	(-1.36)	(-1.01)	(-4.98)	(-5.25)	(-5.33)
Real estate share$_{it-1}$	0.0887	0.2058	0.2698	0.1245	0.1356	0.1415
	(0.41)	(0.96)	(1.19)	(1.44)	(1.58)	(1.63)
Real estate share$_{it-1} \times \mathbb{1}_{\text{crisis1}}$	-0.1702	-0.2635	-0.5384***	0.0448	0.0682	-0.1271***
	(-1.08)	(-1.61)	(-2.88)	(1.05)	(1.60)	(-2.71)
Real estate share$_{it-1} \times \mathbb{1}_{\text{crisis2}}$	-0.2102	-0.4082***	-0.4513***	0.0095	-0.0063	-0.0361
	(-1.33)	(-2.70)	(-2.66)	(0.18)	(-0.12)	(-0.69)
Real estate share$_{it-1} \times$ Real estate comrat$_{it-1}$	-.2560	-0.4711	-.3710	0.1121**	0.0924*	0.0958**
	(-0.89)	(-1.53)	(-1.28)	(2.31)	(1.86)	(1.97)
Real estate share$_{it-1} \times$ Real estate comrat$_{it-1} \times \mathbb{1}_{\text{crisis1}}$	0.4663*	0.7028**	0.7775***	0.1916***	0.1411**	0.2816***
	(1.95)	(2.47)	(2.95)	(3.48)	(2.52)	(5.00)
Real estate share$_{it-1} \times$ Real estate comrat$_{it-1} \times \mathbb{1}_{\text{crisis2}}$	0.2574	0.5933**	0.4822*	-0.2098***	-0.1680	-0.1672**
	(0.95)	(2.16)	(1.76)	(-3.10)	(-2.48)	(-2.47)
Loan liqudity$_{it-1}$		-1.597**			-0.1742	
		(-2.02)			(-1.40)	
Loan liquidity$_{it-1} \times \mathbb{1}_{\text{crisis1}}$		0.6748*			-0.2021***	
		(1.92)			(-3.84)	
Loan liquidity$_{it-1} \times \mathbb{1}_{\text{crisis2}}$		1.2498***			0.2074***	
		(4.29)			(3.72)	
Loan liqudity$^{\Delta}_{it-1}$			-20.928***			-1.5745*
			(-3.87)			(-1.92)
Loan liquidity$^{\Delta}_{it-1} \times \mathbb{1}_{\text{crisis1}}$			38.601***			20.014***
			(4.21)			(9.79)
Loan liquidity$^{\Delta}_{it-1} \times \mathbb{1}_{\text{crisis2}}$			27.803**			7.4318***
			(2.53)			(2.98)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Other controls $\times$ event dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9429	9429	9429	115443	118054	118054
Adjusted R^2	0.876	0.877	0.877	0.901	0.901	0.900

Multi-family residential mortgages: RCON1460, real estate loans backed by residential properties with more than 4 families.

Commercial mortgages: RCON1480, real estate loans backed by non-farm and non-residential properties, such as business and industrial properties, hotels, hospitals and dormitories.

Consumer credit: RCFD1975, loans, not secured by real estate, issued to individuals for family or personal expenditure such as purchasing automobiles and paying medical expenses.

Commercial and industrial loans: The sum of RCFD1600, loans for commercial and industrial purpose to firms and RCFD1590, loans for financing agriculture production before 2000Q4; the sum of RCFD1766, commercial and industrial loans, RCFD1755, acceptances of other banks, and RCFD1590 between 2001Q1 and 2001Q4; the sum of RCFD1766 and RCFD1590.

Farm mortgages: RCON1420, real estate loans backed by farmlands.

Loans secured by real estate: The sum of Home mortgages, Multi-family residential mortgages, and commercial mortgages.

Commercial and industrial (C&I) loan commitments: RCFD3818, commitments used to extend commercial and industrial loans and loans to financial institutions.

Commitments backed by real estate: The sum of RCFD3814, home equity lines, RCFD3816, commitments of loans secured by multifamily residential properties, and RCFD6550, commitments to extend credit for the purpose of financing real estate ventures.

Total unused loan commitment: The sum of C&I loan commitment, commitments backed by real estate, RCFD3817, commitments related to securities underwriting, and RCFD3411, commercial and similar letters of credit.

Interest rate, large time deposits (implicit) : To follow Acharya and Mora (2015), RIADA517/ RCONA514 after 1997Q1; RIAD4174/ RCON3345 before 1997Q1, where RIADA517 and RIAD4174 are interest expense on large time deposits and RCONA514 and RCON3345 are quarterly average of large time deposits.

Interest rate, core deposits (implicit): To follow Acharya and Mora (2015),

$$\frac{\text{RIAD4508} + \text{RIAD0093(replaced by RIAD4509 + RIAD4511 before 1997Q1)} + \text{RIADA518(replaced by RIAD4512 before 1997Q1)}}{\text{RCON3485} + \text{RCONB563(RCON3486 + RCON3487 before 2001Q1)} + \text{RCONA529(RCON3469 before 1997Q1)}},$$

where the numerator is the interest expense on core deposits and the denominator is the quarterly average core deposits.

Bank liquidity: Liquid assets divided by total assets. The calculation of liquid assets follows Loutskina (2011). Liquid assets include RCFD0390(total investment securities), RCFD1350(Federal funds and securities purchased under agreement to sell), and RCFD2146(all assets held in trading accounts) before 1993Q4. Between 1994Q1 and 2001Q4, liquid assets are RCFD1350, RCFD1754(held-to-maturity securities) and rcfd1773(total available-for-sale securities). From 2002Q1 to 2009Q4, liquid assets are RCFDB987(Federal funds sold), RCFDB989(securities sold under agreement to resell), RCFD1754, and RCFD1773.

Total deposits: RCFD2200, the sum of total transaction accounts, nontransaction savings deposits, and total time deposits.

Equity capital: RCFD3210, the sum of perpetual preferred stock, common stock, undivided profits and capital reserves, and others minus net unrealized loss on marketable equity securities.

Net income: RIAD4340.

Nonperforming loans: the sum of RCFD1407 and RCFD1403. RCFD1407 includes loans and lease financing receivables on which payment is due and unpaid for more than 90 days; RCFD1403 covers loans and lease financing receivables that the bank has placed in nonaccrual status.

Wholesale funding: The sum of RCON2604(time deposits of $100,000 or more), RCFD3200(outstanding subordinated notes and debentures), and RCFD2800(Federal Funds repo) before 1994Q1; the sum of RCON2604, RCFD3200, RCFD2800, RCFD3190(money owed to nonrelated commercial banks) between 1994Q2 and 2001Q4; the sum of RCON2604, RCFD3200, RCONB993(federal funds purchased), RCONB995(securities repo), and RCFD3190 since 2002Q1.

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