Loan Sales and Bank Liquidity Risk Management: Evidence from a U.S. Credit Register*

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September 8, 2014

Abstract

We investigate the impact of commercial banks' liquidity risk management on bank loan sales. We track the dynamics of bank loan share ownership in the secondary market using data from the Shared National Credit Program, a credit register of syndicated bank loans administered by U.S. regulators. We examine the 2007-2009 financial crisis as a market-wide liquidity shock and control for loan demand using a loan fixed effects approach. We find that banks with a greater reliance on wholesale funding at the onset of the crisis were more likely to exit loan syndicates during the crisis. Our analysis identifies the importance of bank liquidity risk management as a motivation for loan sales, in addition to the credit risk transfer motive emphasized in prior literature.

JEL Classification: G01; G21; G23.

Keywords: Loan Sales; Bank Risk Management; Funding Risk; Financial Crisis.

*For invaluable comments and feedback we thank Viral Acharya, Tobias Adrian, Heitor Almeida, Darrell Duffie, Victoria Ivashina, Nellie Liang, George Pennacchi, Rodney Ramcharan, Rafael Repullo, Joao Santos, Philip Strahan, Rebecca Zarutskie, and participants at the Federal Reserve Board of Governors and the Federal Reserve Bank of Boston and the Federal Reserve Bank of New York Workshop on the Risks of Wholesale Funding. We thank Robert Cote and David Hefti for guidance on the SNC data and Lieu Hazelwood and Jeremy Oldfather for excellent research assistance. The views expressed here are those of the author and do not necessarily reflect the views of the Board of Governors or staff of the Federal Reserve. The data used here are confidential and were processed solely within the Federal Reserve.

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1 Introduction

The basic function of modern banks is to provide liquidity on demand to depositors and to supply funds as well as liquidity to their borrowers through loans and lines of credit (Kashyap et al., 2002). Accordingly, the bank risk management task involves holding capital to guard against insolvency, and maintaining a store of liquid assets as well as access to a variety of borrowing sources to guard against unexpected cash shortfalls. Recent financial innovations have changed this traditional role of banks and have had a profound impact on liquidity and credit risk management at individual banks (e.g., securitization, as in Loutskina, 2011; Loutskina and Strahan, 2009). In addition, recent changes in banks' liability structure, notably, an increased dependence on short-term wholesale funding sources, may have further complicated the risk management task at modern banks.[1]

This paper examines a recent innovation that has changed the landscape of modern financial intermediation: the secondary market for commercial bank loans. Since the early 1990s, there has been a considerable increase in the liquidity of bank loans due to the arrival of an active secondary market, as well as the development of structured finance products.[2] Gande and Saunders (2012) present data from the Loan Syndications and Trading Association (LSTA) showing that the secondary market for bank loans grew rapidly from 2000 until 2007, exceeding $100bn of trading volume in each year and peaking at $350bn

[1] Although market-based wholesale funding provides banks with greater flexibility, it may also increase susceptibility to market-wide liquidity shocks (e.g., Acharya et al., 2013a; Allen and Gale, 2000; Huang and Ratnovski, 2011). One key reason is that uninsured wholesale creditors incur greater credit risk and thus have more of incentive to promptly withdraw funds in stress scenarios (e.g., during the asset-backed commercial paper crisis of August of 2007, see Acharya et al., 2013b; Covitz et al., 2013). On the other hand, traditional deposit-based financing, which enjoys explicit government insurance, is a more reliable source of funds (Gatev and Strahan, 2006; Pennacchi, 2006).

[2] The market for bank loans can be broken down into two categories: the "primary" or "syndicated" loan market and the "seasoned" or "secondary" loan sales market. In the primary market, fractions of a loan are shared with a number of banks and other institutional investors during the loan origination process. An established literature examines various aspects of the primary market (for a survey, see Roberts and Sufi, 2009b). On the other hand, transactions in the secondary market involve a bank selling an existing participation in a loan (or the loan in its entirety) to another investor after origination (see Altman et al., 2010, for further discussion and institutional details).

in 2007.[3] This development raises the question of how the presence of a deep and liquid secondary market for bank loans may have changed the traditional risk management task of banks. Indeed, the ability of banks to easily sell loan participations in the secondary market may create an additional source of liquidity that allows banks to better manage both bank-specific and market-wide liquidity shocks.

In this paper, we examine bank liquidity risk management in the presence of a secondary loan market. We document how banks used loan sales to manage the market-wide liquidity shock that occurred during the financial crisis of 2007-2009.[4] We find that banks with a greater exposure to the liquidity shock—as measured by wholesale funding dependence—were more likely to sell shares of syndicated loans in the secondary market to conserve liquidity. In doing so, we provide evidence of how banks use the secondary market to improve risk-sharing and better achieve their liquidity risk management goals through loan sales.

Our empirical tests are based on a confidential credit register of U.S. syndicated loan commitments (including both term loans and lines of credit), the Shared National Credit Program, maintained by the Board of Governors of the Federal Reserve System, the Federal Deposit Insurance Corporation, the Office of the Comptroller of the Currency.[5] This data set allows us to track the dynamics of loan share ownership in the years following origination. We use this data to identify sales of loan shares, which correspond to ownership transfers of shares of loan commitments occurring after origination, i.e., in the secondary market. To be precise, the central object of interest in our paper is the loan share sale, which is defined to occur whenever a U.S. bank holding company reduces its ownership stake—primarily, in its

[3]These authors also argue that trading in this market was resilient during the 2007-2009 financial crisis. For example, secondary market trading volume during 2008 was only about 7% lower than in 2007, while at the same time liquidity and trading in structured finance products froze.

[4]We also separately examine the impact of the secondary loan market on bank risk management and loan sales during the period from 2003–2006, i.e., a benign macroeconomic environment.

[5]A handful of recent papers use this data. Notably, Mian and Santos (2011) focus on liquidity risk management *from the perspective of the borrower* and examine bank loan refinancing behavior over the credit cycle.

entirety—in a syndicated loan commitment in the current year relative to the previous year.

Figures 1 and 2 provide aggregated evidence on loan share sales behavior by the U.S. commercial banking sector from 1994 until 2010. These figures present a considerable countercyclical variation in sales over this time horizon including peaks during the 2001 and 2007-2009 recessions. Indeed, Figure 2 indicates that from the trough in 2004 to the peak in 2009, the fraction of all loan shares sold (in their entirety) doubled from just above 6% to around 13%. In this paper, we use this comprehensive data source to shed light on the supply-side determinants of these syndicated loan sales.

We link our data set on syndicated loan share ownership to bank-level balance sheet information to estimate the causal effect of liquidity risk management considerations, particularly wholesale funding dependence, on the loan sale decision during the financial crisis. We design our identification strategy to address a classic identification problem in the banking literature (for a discussion, see Khwaja and Mian, 2008). In particular, in order to credibly identify a bank liquidity risk management motivation for loan sales we must adequately control for changes in credit demand by borrowers (e.g., unobservable changes in borrower default risk). We address this identification problem by using a loan-year fixed effects approach that exploits the multi-bank financing aspect of the syndicated loan market, as well as the complete information on loan share holdings and panel structure of our data set. Our approach accounts for changes in borrower investment opportunities and risk at the *loan syndicate level* by comparing the loan sale decision across participant lenders as a function of wholesale funding dependence within a given loan syndicate-year pair.[6]

Our results can be summarized as follows. We find that banks that were relatively more exposed to the market-wide liquidity shock had a higher probability of selling loan shares during the crisis. This relation is pervasive across all industry groupings and is independent of

[6]A closely-related borrower fixed effects approach has been applied to data from the U.S. syndicated loan primary market (see Chodorow-Reich, 2014; Lin and Paravisini, 2011).

loan performance, providing strong evidence in favor of a bank-driven effect. We examine the timing of this effect and find that the positive relation between wholesale funding dependence and the likelihood of loan sales peaks in 2008, at the time when wholesale funding markets were most stressed (for example, see Acharya and Mora, 2013; Cornett et al., 2011). To provide additional evidence for a liquidity risk management motivation for loan sales, we examine the types of loans shares that were most likely to be sold and find that exposed banks were most likely to sell more liquid loans. For example, the estimated effect of wholesale funding dependence on loan sales for term loans is almost twice the effect for credit lines.[7] Next, we separately investigate the role of bank asset portfolio liquidity (e.g., cash holdings) on this relation and find the wholesale funding dependence effect persists. Then we examine loan share purchases and show that buyers were less reliant on wholesale funding during the crisis, especially during 2008. Finally, we conduct an analysis of credit risk management and its impact on loan sales and two notable results emerge. First, loan losses and insolvency risk (e.g., net charge offs and participation in the Troubled Asset Relief Program, respectively) have a significant impact on loan sales during the crisis. Second, there is an independent and strong effect of wholesale funding dependence on loan sales during the crisis, even after we control for several established measures of default risk. Overall, these results suggest that banks exposed to the market-wide liquidity shock used the secondary loan market to conserve liquidity to meet their liquidity risk management goals.

We also examine the supply-side determinants of loan sales in the relatively benign period from 2003 until 2006. We find robust evidence that bank capital constraints as well as the role of the bank in the lending syndicate are key factors impacting the loan sale decision. Finally, and in stark contrast to the crisis period, we find that banks with wholesale funding

[7]Kashyap et al. (2002) show that deposit-taking commercial banks have a natural advantage at managing the liquidity risk associated with credit lines. This advantage is reflected by commercial banks retaining the bulk of these commitments when they are syndicated in the primary market, as compared to term loans which are held by a variety of financial intermediaries (Bord and Santos, 2012; Gatev and Strahan, 2009).

dependence are significantly *less likely* to sell loans during the period before the financial crisis, perhaps due to greater financial flexibility. This sharp contrast indicates that banks' exposure through wholesale funding to the drying up of liquidity in the recent financial crisis was an important determinant of the increase in loan sales.

Our paper is related to several strands of the literature, which we very briefly highlight here. First, there is an established literature on bank loan sales. These papers examine the motivations for loan sales from the perspective of the bank (e.g., as a function of the cost of capital, as in Parlour and Winton, 2013; Pennacchi, 1988), as well as contracting features that must emerge to overcome informational issues and ensure that bank loans are marketable (Drucker and Puri, 2009; Gorton and Pennacchi, 1995). Gande and Saunders (2012) show that, in recent years, borrowers' shareholders have benefited from increased liquidity in the secondary loan market due to a relaxation of borrowers' financial constraints. This is in contrast to earlier studies documenting a negative reaction of equity investors to loan sales, perhaps due to a negative signaling effect or a termination of the bank-borrower relationship (e.g., Dahiya et al., 2003). Our study advances this literature on the causes and consequences loan sales by providing new empirical evidence of a bank liquidity risk management motivation for loan sales. We do so using a unique sample of loan share sales from a regulatory data source that covers a long time horizon, which, importantly, includes the post-2000 period of rapid expansion of the secondary market for commercial bank loans.

Second, our paper is related to recent work on bank liquidity risk management and wholesale funding dependence during the financial crisis. Acharya and Mora (2013) show that banks with a greater exposure to the market-wide liquidity shock increased deposit rates and curtailed loan supply during the crisis (see also Dagher and Kazimov, 2014). Cornett et al. (2011) show that U.S. commercial banks with wholesale funding dependence cut lending and increased cash holdings during the crisis to preserve liquidity. Acharya et al. (2013a) and Bord and Santos (2014) show how banks with a greater exposure to the asset-backed

commercial paper crisis during the fall of 2007 adjusted their liability structure and credit line issuance in an attempt to increase their liquidity. Similarly, Acharya and Merrouche (2013) show during the same period that UK settlement banks with a greater dependence on short term funding hoarded liquidity in the interbank market for precautionary purposes, an effect that was virtually absent in the period before the subprime crisis. Our paper provides additional insights into how banks with a reliance on wholesale funding adjust their behavior during a period of market-wide stress when these sources dry up. In particular, we show that banks with greater wholesale funding dependence were able to sell loans in the secondary loan market in order to increase their liquidity. Thus, we provide empirical evidence of an alternative liquidity risk management tool at the disposal of commercial banks, a tool that was actively used during the recent financial crisis.[8]

Third, our paper is related to the literature which examines how banks transmit balance sheet shocks to the cost and availability of corporate loans (e.g., Holmstrom and Tirole, 1997). Recent empirical work investigating the role of bank liquidity and capital shocks includes Peek and Rosengren (1997), Khwaja and Mian (2008), Paravisini (2008), Ivashina and Scharfstein (2010), Chava and Purnanandam (2011), and Santos (2011). Most micro-level analyses of U.S. data tend to focus on the flow of new lending to the market, as opposed to the stock of existing loans. Our paper differs in that we show how banks rebalance their existing loan portfolio in response to a liquidity shock, as opposed to curtailing new lending to the market. In addition, our paper makes use of a U.S.-based credit register and adapts within-firm estimators used in the international banking literature to isolate a supply-side effect (in particular, see Jimenez et al., 2012; Khwaja and Mian, 2008; Schnabl, 2012).

This rest of this paper is organized as follows. Section 2 summarizes the secondary loan

[8]Other papers that focus on how banks sought out liquidity through interbank markets and lender of last resort facilities during the recent financial crisis include, among many others, Acharya et al. (2014), Adrian et al. (2010), Afonso et al. (2011), Armantier et al. (2011), Campbell et al. (2011), Cassola et al. (2009), Drechsler et al. (2013), Duygan-Bump et al. (2013), Fleming et al. (2010), McAndrews and Wang (2008), and Wu (2011).

market data. Section 3 develops the empirical framework. Section 4 presents the results. Section 5 concludes.

2 Data and Summary Statistics

In this section we detail how we construct our sample and present summary statistics. We use two main data sets for our empirical analysis: bank level data on U.S. bank holding companies and loan share-level data on syndicated loans provided by U.S. commercial banks to firms. We obtain quarterly bank balance sheet data from Federal Financial Institutions Examination Council (FFIEC) Consolidated Financial Statements for Holding Companies (Form FR Y-9C). Every bank holding company must file these reports with the Federal Reserve.[9] We collect loan share-level data from the Shared National Credit Program (SNC), an annual survey of syndicated loans carried out by the Board of Governors of the Federal Reserve System, the Federal Deposit Insurance Corporation, the Office of the Comptroller of the Currency, and, until recently, the Office of Thrift Supervision.

The SNC is a credit register of syndicated loans covering the period 1977 to present. The program obtains confidential information from administrative agent banks on all outstanding loans or loan commitments of at least $20 million in size that are shared by three or more unaffiliated federally supervised institutions, or a portion of which is sold to two or more such institutions. This includes loan packages containing two or more facilities to the same borrower for the same origination date where the total package of loans exceeds $20 million.[10,11] New and existing loans meeting this criteria are surveyed as of the 31st of

[9]The Y9-C are almost idential to the Call Reports banks have to file with their primary regulator. The financial statement data are commonly used in the literature. For detailed information on Call Reports, among many others, see (Cornett et al., 2011). Y9-C data are available for download at the website of the FFIEC, see `http://www.ffiec.gov/nicpubweb/nicweb/nichome.aspx`.

[10]Information on the purpose of the SNC is provided at `http://www.federalreserve.gov/bankinforeg/snc.htm` and detailed information on guidelines for inclusion of a credit are provided at `http://www.newyorkfed.org/banking/reportingforms/guidelines.pdf`.

[11]Notice that a syndicated loan may disappear from the SNC data set and therefore our sample if it fails

December of each year.

For each qualifying loan, information is provided about the identity of the borrower, as well as several terms of the contract including the origination date, the maturity date, the type of loan (e.g., credit line, term loan), the total loan amount at origination, the outstanding amount on the loan, the amount of the loan available to withdraw (i.e., unused amount in the case of a credit line), and the regulatory assessment of loan quality (pass/fail/criticized). One unique aspect of the SNC—of critical importance to our study—is that the data set provides complete information about all loan syndicate members for every year following origination. In particular, each year, the program reports the identity of the administrative agent bank ("agent") and other participant lenders, as well as their respective shares of the outstanding loan commitment.

Each loan in the SNC is assigned a unique credit identifier. This identifier remains unchanged in years when the loan terms are amended or the loan is refinanced. It is important to note two distinct advantages the SNC offers over other large and commonly used data sets of syndicated loans (e.g., the Reuters' Loan Pricing Corporation Dealscan data set). First, it allows the researcher to track ownership of syndicated loan shares after they have been originated. In contrast, Dealscan, for example, provides a snapshot of loan ownership at origination, i.e., in the primary market.[12] Second, credits that are refinanced or amended do not appear as new originations in the SNC data. With Dealscan, amended or refinanced loans appear with a new credit identifier in many cases (for example, see Freudenberg et al., 2013; Roberts, 2012; Roberts and Sufi, 2009a). Unfortunately, this can lead to a double-counting problem that makes identifying the stock of outstanding loans to a given borrower difficult without further inspection of public filings.[13]

to meet these criteria. As we shall discuss later in Section 4, this potential sample selection is likely to attenuate our point estimates, if there is any impact at all. See also Mian and Santos (2011) who argue that this sample selection issue is unlikely to impact their results in any obvious direction at all.

[12]Bord and Santos (2012) provide evidence that loans are distributed after origination (also see the secondary loan market trading statistics provided by the LSTA).

[13]As a consequence, when using Dealscan, it is problematic to identify the stock of syndicated bank loans

For each year of the SNC and each loan, the data set has one observation per loan share, so that each observation can be identified as a loan share-lender-year triple. To ensure that this identifier is unique, if a lender holds several shares of the same loan in a given year we aggregate all shares to arrive at a total loan share-lender-year triple. This occurs either because the same institution owns several shares of the same loan or because different institutions belong to the same bank holding company. This loan share-lender-year is the unit of observation in our empirical analysis.

In the case of U.S. commercial banks and their subsidiaries, the data identify the current holder of a loan share by the RSSD ID number and the ultimate parent (bank or financial holding company) of the lender, commonly referred to as the "top holder." This paper focuses exclusively on these U.S. commercial banks and we conduct our regression analysis at the top holder level. Lenders belonging to the same bank holding company are assigned to a common top holder and considered as a single "bank" (for a similar approach, see also Acharya and Mora, 2013; Gatev and Strahan, 2006; Kashyap et al., 2002).

We use the SNC data set to track the dynamics of loan share ownership and identify sales of loan shares that occur after origination, i.e., ownership transfers that occur in the secondary market. We identify sales of loan shares on a loan-by-loan basis by comparing the set syndicate members between two consecutive years. In particular, if a lender is a member of a loan syndicate in year t but is not a member of the same loan syndicate in year $t+1$, then we record a loan share sale for $t+1$.[14] We require that the loan has not matured in year $t+1$ to avoid the problem of all lenders being coded as selling their participations

to a given *private* borrower that does not provide any public filings.

[14]For simplicity, our baseline tests do not include partial loan sales, where a bank reduces but retains a positive share of loan ownership from one year to the next. In the data we observe such transactions occurring infrequently, particularly among participant lenders. Nevertheless, such partial loan share sales may be important for the lead arranger who may be constrained from exiting the syndicate—perhaps due to reputation concerns—and may instead choose to reduce their exposure to a borrower. Along these lines, Bord and Santos (2012) provide evidence that, on average, lead arrangers reduce their ownership of term loans in the secondary market, particularly in the post-1994 period. In Section 4.2.5 we show that our point estimates increase in magnitude when we include these partial sales, consistent with this interpretation.

at maturity. Figures 1 and 2 plot the time-series averages of loan share sales in levels and fraction of the overall market, respectively.

In some tests, we distinguish between loan-years in which there are no changes in the terms of the contract and loan-years in which the loan is refinanced or some terms of the loan were amended. In such cases the credit identifier will not change, so we pinpoint refinanced loans and loan amendments by observed changes in maturity dates, origination dates, or total loan amounts at origination. We label a loan share sale a "pure sale" in those cases where no contract term changes (or the loan is not refinanced) and we observe a sale. In our tests, we sometimes use a restricted sample "No Amend" where we consider only these loan-years. This classification is imperfect, however, as the SNC data set does not contain sufficient information about some material contract terms including loan pricing. Figure 3 plots the time-series average of these pure sales, which closely resembles the overall trend in the market.

The SNC data structure also allows us to control for merger and acquisition activity among banks and its potential for a misclassification of loan sales. Sales are identified on the lender level, typically a commercial bank subsidiary, and assigned to a top holder, which is usually a bank holding company. If the lender RSSD ID does not change but the top holder RSSD ID does change, we record this instance as a merger and not as sale. For example, if bank holding company A acquires bank holding company B—and A consolidates their loan portfolio with B—then we do not record B's disposal of loan shares as a sale in the year when the balance sheet consolidation takes place. Similarly, sometimes a loan share is transferred from one lender to another lender, but both have the same top holder. Such within-banking organization reallocations of loan shares are not recorded as sales.[15]

We use data from the period 2002 until 2010. We define the "before crisis" period to be

[15]Transfers of loan shares within the banking organization are interesting in their own right, but beyond the scope of the present study.

the years from 2003 until 2006 and the "during crisis" period to be the years from 2007 until 2010.[16] Table I provides the basic description of the SNC sample by lender type over a longer time horizon. Table II provides a summary of the SNC data used in our empirical analysis. This sample is restricted to loan shares held by U.S. commercial banks and includes 9,627 unique syndicated loans (67,647 loan share-lender-year triples) in the before crisis period and 9,599 loans (81,011 loan share-lender-year triples) in the during crisis period. Summary statistics of the loan and bank level variables are also included in this table. Detailed definitions of these variables can be found in Appendix A. Bank level variables are from the FR Y-9C reports and are calculated at the top holder level and measured at the end of the calendar year. These bank variables are also winsorized at the 1st and 99th percentiles to mitigate the effect of outliers.

Consistent with Figure 1, Table II indicates that the unconditional probability of a loan sale increases during the crisis, as compared to the before crisis period. In the the following sections we examine the extent to which these loan sales are motivated by bank risk management considerations.

3 Identification Strategy

In this section, we describe how we use loan share-level data to estimate the impact of a market-wide liquidity shock on loan sales by U.S. commercial banks due to liquidity risk management considerations. This estimation poses a classic identification problem because it requires distinguishing between changes lending behavior due to supply-side factors (i.e., bank risk management), separately from changes in borrower investment opportunities and risk (credit demand).

This identification problem can be demonstrated with the following example. Suppose

[16] In Table VIII we repeat our analysis on a year-by-year basis during the crisis period to shed light on the precise timing of banks' adjustment in behavior.

that banks with marginal funding coming from wholesale sources ("wholesale banks") lend more to borrowers that have cyclical performance, such as those in the luxury goods industry. If the collapse in market-wide liquidity occurring at the onset of the crisis signals a coming recession then wholesale banks may be more willing to sell loan shares associated with their existing borrower pool due a lower expected performance and higher default risk. As a consequence, if we document a greater incidence of loan share sales among wholesale banks then this may reflect changes in default risk on the borrower side, as well as the outcome of bank liquidity risk management which we seek to identify. Indeed, any pattern of matching between firms and banks that correlates with credit demand during the crisis may contaminate the estimation of the supply-side impact of wholesale funding on loan share sales during the crisis.

We design an empirical approach that allows us to address this identification problem directly. We exploit the fact that firms borrow from multiple banks in the syndicated loan market. Our approach accounts for changes in credit demand at the loan level by comparing the loan sale decision across participant lenders within a given loan syndication. This level of analysis allows us to control for potentially confounding demand factors at the level of the loan, rather than across loan relationships within firms or across firms. By doing so, we avoid the potential for having our estimates biased by unobservable changes in credit demand across firms and even across different loan types for a given firm. To illustrate how our identification strategy works, suppose that a firm has a loan syndicate including bank A and bank B. Our estimation approach uses the loan share sale decision from bank A relative to the loan share sale decision from bank B for the *same loan syndicate*. By using such within-loan variation, we control for *loan-level* credit demand shocks and thus identify the supply-side impact of bank wholesale funding on loan share sales.

We carry out this identification strategy using ordinary least squares (OLS) to estimate

the following baseline regression specification:[17]

$$\text{Loan Sale}_{ijt} = \alpha_{it} + \beta \text{ Wholesale Funding}_{j,2006\text{Q4}} + \gamma \text{ X}_{j,t-1} + \epsilon_{ijt} \quad (1)$$

where Loan Sale_{ijt} is the loan sale indicator variable that is equal to one if a loan share i held by bank j in year $t-1$ is sold in year t. The coefficient α_{it} capture loan-year fixed effects. $\text{Wholesale Funding}_{j,2006\text{Q4}}$ is our variable of interest, the wholesale funding exposure of bank j, measured as of 2006:Q4. In the vector $\text{X}_{j,t-1}$, we control for other potential determinants of the bank loan sale decision.[18] The coefficient of interest is β, which captures the transmission of the market-wide liquidity shock occurring during the 2007-2009 financial crisis to bank loan sales after accounting for loan-specific changes in credit demand. The inclusion of loan-year fixed effects indicates that β is identified using within-loan syndicate variation in a given year.[19]

The main identifying assumption is that the expected reduction in borrowing by firms is evenly distributed across all lenders in the syndicate during the crisis. This assumption is plausible for two main reasons. First, the homogeneity of loan shares within a given syndicated credit: a loan share from participant lender A has identical contract terms as a loan share from participant lender B. Second, a key institutional feature of our setting is that borrowers have little influence over the composition of their loan syndicate, especially

[17] We estimate this equation using a linear probability model to fit a binary dependent variable (BDV). In our setting, when N is large but T is fixed, a linear model yields estimates that are $\sqrt{N}$ consistent whereas non-linear BDV (e.g., conditional probit) models generally produce inconsistent estimates (see Wooldridge, 2002).

[18] In some tests, we also include bank fixed effects to control for time-invariant and potentially unobservable characteristics at the bank level. Since bank fixed effects are collinear with the wholesale funding variable in Equation (1), in these tests we consider the 2003-2010 period and interact wholesale funding with a crisis indicator variable.

[19] Using loan-year fixed effects non-parametrically absorbs any year- and loan-specific effects. See Lin and Paravisini (2011) for a similar approach using primary market origination data from the U.S. syndicated loan market. Also see Khwaja and Mian (2008), Jimenez et al. (2012), and Schnabl (2012) for similar approaches using credit register data from Pakistan, Spain, and Peru, respectively.

ownership changes occurring in the secondary market.[20] While we have no reason to expect a borrower to remove a commercial bank from its loan syndicate solely for credit demand reasons, we are able to investigate this issue directly. Under the assumption that it is less easy to remove a bank when a contract is not renegotiated or refinanced, we examine the impact of bank liquidity risk management on the incidence of loan sales in years where the contract is amended and in all other years (i.e., the "No Amend" sample defined in the previous section).

We estimate the impact of bank liquidity risk management on the loan sale decision during the crisis using cross-sectional variation in banks' dependence on wholesale funding. We capture this reliance on wholesale funding sources through the ratio of non-core funding (sum of large time deposits, foreign deposits, repo sold, other borrowed money, subordinated debt, and fed funds purchased) to total assets. This is essentially the non-core liabilities to assets ratio reported by regulators (e.g., Uniform Bank Performance Report published by the Federal Deposit Insurance Corporation, Board of Governors of the Federal Reserve System, and Office of the Comptroller of the Currency) and used extensively in prior academic research (e.g., Acharya and Mora, 2013). This measure captures banks' dependence on wholesale deposits as well as non-deposit funding, such as reverse repos, federal funds (interbank borrowing), and commercial paper.[21]

We measure wholesale funding dependence as of 2006:Q4 in order to address a secondary identification (omitted variables) problem that wholesale banks may have sold loans during

[20]Inspection of U.S. syndicated credit contracts in the Dealscan data set, as well as conversations with bankers, indicates that the agreements may specify a minimum dollar amount of loan share sale, as well as a "black list" of lenders (e.g., certain investment funds) that excluded from participating in the loan syndicate. Such black lists are typically provided by the borrower to the lead arranger before the deal is structured in the primary market. In addition, sometimes loan share sales in the secondary market may require approval of the administrative agent before any transaction takes place. While there has been little theoretical or empirical research into the motivation for such contractual provisions, we do not believe that these restrictions exist to enable a borrower to remove a commercial bank from their syndicate at will or to prevent a bank selling their loan share for risk management purposes.

[21]Our results are robust to different definitions of wholesale funding.

the crisis for other reasons, such as concerns about bank insolvency.[22] The idea behind this approach is that banks entering the crisis with a greater wholesale funding dependence were more likely to affected by the liquidity squeeze during the crisis. Our second identifying assumption underlying this approach is that wholesale funding dependence just before the crisis affects the likelihood of loan sales only through liquidity management considerations, once we control for bank size and measures of insolvency and loan losses during the crisis.

We include controls for loan and bank characteristics in our regressions. These controls are incorporated to ensure that the estimates are not contaminated by differences in loan or bank characteristics as a consequence of the liquidity shock. The loan level controls are defined at the loan-lender level and include the fraction of loan held by the lender and whether the lender is an agent bank. The controls for bank characteristics are lagged balance sheet variables such as various measures of bank solvency including loan losses and bank capitalization (the equity ratio), the natural logarithm of assets, and whether the bank has engaged in merger activity in the current and previous period (see discussion in Section 2 for a description of this variable).

Controlling for losses and capitalization during the crisis is particularly important. Banks with access to wholesale funding are also likely to be money center banks that may have investment banking activities. These investment banking activities suffered relatively large losses during the crisis, so these banks suffered declines in the value of their capital. To restore their equity ratio these banks may choose to deleverage by simultaneously decreasing wholesale funding—the marginal source of funding—and selling off assets, including syndicated loans. Adrian and Shin (2010) provide evidence of such deleveraging behavior for standalone investment banks during the subprime crisis. While these authors do not find

[22]Throughout our analysis we control for measures of bank insolvency and in Section 4.4 we investigate the impact of credit risk management considerations on loan sales. However, the purpose of this paper is to separately identify a liquidity management motivation for bank loan sales. Thus, we need to control for the potentiality confounding influence of other variables, including bank insolvency.

evidence of such behavior among U.S. commercial banks (see also Berrospide and Edge, 2010), they do not separately investigate the larger banks that are most likely to participate in the syndicated loan market. Hence, as we wish to separately identify the effect of wholesale funding constraints on loan sales, we must adequately control for losses due to non-traditional banking activities and changes in capitalization in our regressions.

In the baseline regressions, the control variables are time-varying so their estimated coefficients should not be be given a causal interpretation as they may be biased due to changes in variables because of the liquidity shock (for a similar approach, see Acharya and Mora, 2013). Moreover, these variables are lagged by one year to avoid contemporaneous changes occurring due to the loan sale decision. For instance, the non performing loan ratio could improve contemporaneously with a distressed loan sale. In specification tests, we also measure the bank control variables in 2006:Q4 to avoid potential bias coming from changes in variables because of wholesale funding pressures during the financial crisis.

4 Results

This section starts by investigating the bank-level determinants of loan sales—including liquidity risk management and wholesale funding dependence—during the years immediately prior to the recent financial crisis (Section 4.1). In Section 4.2, we conduct a similar analysis for the crisis period as well as a number of cross-sectional and robustness tests. We conclude our analysis by examining the role of loan losses and insolvency on bank loan sales (Section 4.4).

4.1 Bank Liquidity Risk Management and Loan Sales During the 2003-2006 Period

We first use data from the period before the financial crisis to examine the impact of liquidity risk management considerations on loan sales outside of a period of market-wide stress. This analysis will provide us with insights on the supply-side determinants of bank loan sales, including the role of banks' liability structure and access to wholesale funding markets. In addition, this section will provide a benchmark against which bank loan sale behavior during the financial crisis can be compared.

The period from 2003 until 2006 was characterized as a period of low macroeconomic volatility, credit expansion, and few corporate defaults. In such a benign macroeconomic environment, if wholesale funding markets (e.g., interbank lending) are well-functioning then banks experiencing liquidity shortages will have no need to sell loans in order to raise cash. Indeed, banks able to tap wholesale funding markets may have greater flexibility in terms of access to funds as well as a lower cost of funds, potentially reducing the need to sell loans as compared to other banks. Accordingly, we expect the relation between wholesale funding dependence and loan sales to be nonpositive in the benign period before the financial crisis.

To investigate the supply-side determinants of bank loan sales during this period, we modify the empirical approach outlined in the previous section by shifting the timing of the event window. Wholesale funding dependence is measured at the beginning of the period, i.e., 2002:Q4, and we conduct the benchmark estimation of model (1) for the "before crisis" sample period from 2003 until 2006.

Table III presents the results. Column [1] indicates that the coefficient on the wholesale funding variable is negative and significant at the 5% level. The sign of this estimate implies that banks with greater use of wholesale funding have a lower probability of selling loan shares during this period.

Columns [2]–[6] consider several variants of this benchmark estimation to check for robustness. Column [2] restricts the sample to loans with fewer than 250 syndicate members. These very large syndicates comprise a relatively small fraction of the sample (less than 50 loans), however they may behave differently to traditional syndicates during normal times or times of stress. Column [2] indicates that dropping the large syndicates from the sample does not have any noticeable effect on any of the coefficient estimates.[23]

Column [3] restricts the sample to loan years in which the contract was not amended or refinanced and continues to provide evidence in line with our expectation. While the point estimate becomes statistically insignificant and attenuated towards zero when we remove amended contracts from the sample (about 2,500 loans), is still has a nonpositive sign.

Column [4] uses a longer time horizon and calculates the average of wholesale funding dependence across the four quarters in 2002, instead of the 2002:Q4 value. We find similar effects as the benchmark estimation using this alternative timing.

Column [5] allows wholesale funding to become time-varying throughout the crisis period by including the lagged value in the baseline specification instead of using the data from 2002:Q4. This approach complements the exposure measure used in the benchmark estimation as it incorporates within-bank variation in wholesale funding dependence. Column [5] shows that the coefficient of interest increases in magnitude and remains highly statistically significant after switching to this dynamic specification.

Column [6] uses total deposits as of 2002:Q4 as an alternative measure of wholesale funding dependence and repeats the same test. We find the point estimate on the coefficient of interest is small and statistically insignificant. Thus, using this alternative measure, we find banks with a lesser reliance on wholesale funding have a similar propensity to sell loans than other banks.

[23]The choice of 250 lenders is arbitrary and similar results emerge when we consider other cutoffs for large syndicates (200,150, etc.). The median syndicate size is eight in our sample.

Columns [1]–[6] also control for bank characteristics. Several important and robust relations emerge that are worthwhile mentioning. First, the book capital ratio has strong predictive power for loan sales. In each column, we find that the coefficient on the capital ratio is negative and statistically significant at the 1% level. This indicates that a well-capitalized bank is less likely to sell a loan share, all else equal, during normal times. This finding corroborates the theory that binding regulatory capital requirements may induce banks to push credit risk off their balance sheets through loan sales (Pennacchi, 1988). Second, larger banks are less likely to sell loan shares during the crisis on average, as indicated by the negative and highly significant coefficient on the bank size variable. This point estimate is in line with expectation as larger banks are considered more able to handle liquidity shocks by accessing alternative sources of funding (see Acharya et al., 2013a). The lagged bank merger variables indicate that loan share sales were more likely to occur following a merger between two bank holding companies, consistent with portfolio rebalancing activity. Regarding the lenders' role in the syndicate, we find that when the lender is an agent bank or retains a large portion of the loan, they are less likely to sell their share. This finding is consistent with a bank acting as lead arranger being less inclined to sell their fraction of the loan retained at origination, perhaps due relationship banking effects or reputation concerns (see Bharath et al., 2007; Lin and Paravisini, 2011; Sufi, 2007).

Taking these results together, we draw two main conclusions. First, when wholesale funding markets are well-functioning, we find that banks using wholesale funding sources having a lower propensity to sell loan shares relative to other banks. Indeed, we find robust evidence that banks accessing wholesale funding markets were less likely to sell loans in the 2003–2006 period, consistent with these banks having greater financial flexibility. Second, we find that other considerations that have been emphasized in the literature—such as regulatory capital constraints or the role of the bank in the lending syndicate—appear to play an important role during normal times.

4.2 Bank Liquidity Risk Management and Loan Sales During the 2007-2010 Period

Having documented the supply-side determinants of bank loan sales during normal times, we now examine the impact of wholesale funding dependence and bank liquidity risk management during a period characterized by financial crisis. We use the same approach as in the previous section, but here wholesale funding dependence is measured using data from 2006:Q4.

Table IV provides the main results. The first column shows the results from the benchmark estimation of Equation (1), including the full sample of loan shares held by U.S. bank holding companies during the financial crisis period from 2007 until 2010. The coefficient on the wholesale funding variable is positive and significant at the 1% level. The direction of this estimate is consistent with our expectation that banks exposed to the market-wide liquidity shock had a greater probability of selling loan shares to meet their liquidity risk management goals. Regarding economic magnitudes, the estimate implies that increasing wholesale funding by one standard deviation (this is, roughly, a 0.14 increase in wholesale funding) is associated with a 1.1% higher probability of a loan sale during the crisis, when we hold everything else constant. The magnitude of this relation is large given that the frequency of loan sales was on average around three percentage points higher during the crisis as compared to before (as shown in Table II). In what follows, when we examine the timing of loan sales as well as the types of bank loans that are sold, we shall see the magnitude of this estimate will increase substantially.

Columns [2]–[6] consider several variants of this benchmark estimation to check for robustness. We implement the identical set of tests from Section 4.1. Column [2] restricts the sample to loans with fewer than 250 syndicate members and shows that dropping these large syndicates does not impact any of the coefficient estimates in terms of magnitudes or

statistical significance.

Column [3] restricts the sample to loan years in which the contract was not amended or refinanced. As described in detail in Section 2, a loan-year and all corresponding shares are dropped from the sample if there was any refinancing or contract amendment activity during the year. Such activity is identified, for a given credit identifier, using a change in the origination date or some other contract term (maturity, loan amount, etc.). Notice, however, that the presence of renegotiated loan contracts in our benchmark sample should not compromise the internal validity of our estimates. Since, our identification strategy uses within-loan syndicate variation in bank wholesale funding dependence, we are able to control for all changes in the condition of the borrower that may motivate a loan sale. Put simply, all banks in the syndicate will observe the same change in borrower condition leading to the contract renegotiation and therefore the decision for any one bank to drop out of the syndicate (relative to the decision of other syndicate members) should be a reflection of that bank's own characteristics, including their liquidity risk management considerations. Column [3] provides strong evidence in support of this assertion: the coefficient estimates remain unchanged in both magnitude and significance when we remove renegotiated and refinanced loans from the sample (about 2,000 loans).

Column [4] uses a longer time horizon and calculates the average of wholesale funding dependence across the four quarters in 2006, instead of the 2006:Q4 value. While it is unlikely that banks adjusted their funding position in anticipation of a financial crisis,[24] we now consider this different timing for the measurement of wholesale funding. We find similar effects as the benchmark estimation using this alternative timing.

[24]There was no evidence that banks adjusted their funding position in 2006 due to concerns about an impending financial crisis. The crisis arguably began with a series of announcements of problems in the subprime mortgage market (see Acharya et al., 2013c). While media outlets and some market participants voiced concerned about banks' financial condition prior to the crisis, all standard indicators of bank risk implied a low likelihood of a financial crisis. For instance, all major U.S. and Eurozone banks had CDS spreads that were consistent with a low probability of bank failure and did not show any meaningful run up in 2006 (see Acharya et al., 2013b; Giglio, 2013).

Column [5] allows wholesale funding to become time-varying throughout the crisis period by including the lagged value in the baseline specification instead of using the data from 2006:Q4. This approach complements the exposure measure used in the benchmark estimation as it incorporates within-bank variation in wholesale funding dependence. Column [5] shows that the coefficient of interest increases slightly in magnitude and remains highly statistically significant after switching to this dynamic specification.

Column [6] uses total deposits as of 2006:Q4 as an alternative measure of funding constraints. Banks with greater reliance on deposits, core deposits in particular, are less likely to be vulnerable to market-wide liquidity shocks that impact access to funding because depositor demand is less elastic (Acharya et al., 2013a; Cornett et al., 2011; Dagher and Kazimov, 2014). We re-estimate the baseline specification and find the coefficient on deposits to be negative although statistically insignificant. This finding is consistent with our expectation that banks with more stable sources of funding were less likely to sell loan shares for liquidity risk management purposes, holding all else constant.

Columns [1]–[6] continue to control for the same set of bank characteristics as in the previous section. Many of the relations emerging in normal times remain robust during the financial crisis, notably, the lenders' role in the syndicate. We continue to find robust evidence that when the lender is an agent bank or retains a large portion of the loan, they are less likely to sell their share.[25] We also find that the loan loss variables (NPL ratio and net charge offs) are important determinants of the loan sale decision during the crisis, whereas the book capital ratio appears to be less important. In Section 4.4 we will revisit the issue of bank insolvency and credit risk management in more detail.

[25]We conduct two further tests to examine the impact of syndicate membership on the loan sale decision. First, we interact an indicator variable for agent bank status (equal to one if the bank is the lead arranger) with wholesale funding variable. We find that the effect of being an agent bank entirely offsets the greater probability of a loan sale associated with wholesale funding during the crisis. Second, we re-estimate Equation (1) separately on the sample of participant banks and find similar point estimate on wholesale funding as in Column [1] of Table IV. This confirms that our estimates are not due to wholesale banks sorting into the participant role within lending syndicates. These results are unreported and are available upon request.

When we compare this finding with the relation we estimated for the before crisis period (see Table III), we find strong evidence of an adjustment in the behavior of wholesale banks during the crisis, occurring in response to a market-wide liquidity shock. This rules out an alternative explanation that wholesale banks have a greater propensity to sell loans throughout the credit cycle.

4.2.1 Results by Industry Grouping and Credit Quality

We next examine the impact of the market-wide liquidity shock by borrower industry as well as loan credit quality. We investigate whether the estimated effect of wholesale funding dependence on loan sales is concentrated in a particular industry. To this end, we first estimate the main specification separately for each of the largest industry groupings that are provided by the SNC. We continue to include loan-year fixed effects and the same set of control variables in the regressions. If our results capture changes in investment opportunities in a particular sector, say, real estate construction, then we may expect a the effect to be concentrated in this industry.[26]

Table V presents the results. Column [1] shows the coefficient on wholesale funding dependence from the baseline estimation, for ease of comparison. Columns [2]–[6] show the propensity to sell across the four largest industry groups and the remaining groups collectively. We find the relation between wholesale funding and loan sales is positive and statistically significant at at least the 5% level across all industry groups. The coefficient is slightly smaller than the baseline effect in the agriculture and mining industry, and about 50% larger in the financial services industry. Hence, there is no evidence that the results in Table IV can be explained only by one industry group. We instead find that the effects are large and positive across all industries, which suggests other factors (such as loan liquidity)

[26]Since our estimation approach uses within loan variation in loan share shares, our estimates will still be capturing a supply-side effect. It is nevertheless interesting to check to see if this supply-side effect interacts with industry grouping in a systematic way.

may drive a differential propensity for banks to sell loans across loan or borrower types.

Next, we investigate the role of credit quality. We estimate our baseline specification separately on loan-year observations classified as "pass" and those classified as "fail" by the annual SNC Review. Loans are classified as fail if they are criticized or classified in any way by the examiner, which means they are either in default (and are soon to be charged off), non accrual, doubtful, substandard, or special mention. The latter three categories are assigned at the discretion of the examiner and are intended to reflect deficiencies in repayment prospects of the borrower or quality of pledged collateral (see SNC, 2013). We do not have a prior as to whether banks with a greater wholesale funding dependence will be more likely to sell high or low credit quality loans. On the one hand, there may be more demand for the less risky, high quality loans. On the other hand, we know that distressed loan trading increased during the crisis (Gande and Saunders, 2012), so it might be the case that banks exposed to the funding shock find it easier to sell poor credit quality loans albeit at a discount relative to par.

Columns [7] and [8] show the results by the pass or fail classification. We find similar point estimate of 0.076 and 0.078 for the pass and fail subsamples, respectively, which is essentially the same as the 0.076 baseline estimate. The results show that there is no greater propensity for banks with a greater reliance on wholesale funding to sell performing versus non performing loans, on average. One possible reason for this is that non performing loans are no less liquid than performing loans, due to specialized funds providing liquidity during the financial crisis. In the next section, we instead directly focus on loan liquidity and check to see if these loans are sold more often after the market-wide liquidity shock.

4.2.2 The Impact of Bank Loan Liquidity on Loan Sales

We now examine the role of loan liquidity on loan sales during the crisis. The key question we seek to answer in this section is: which types of loans would the banks that were more

dependent on wholesale funding choose to sell? On the one hand, hesitant to sell the more illiquid assets at fire sale prices and book significant losses, banks may prefer to sell their more liquid loan shares, i.e., loan shares with more potential trading partners in the secondary market. On the other, banks facing uncertainty may value keeping some liquidity cushion in their portfolios to insure against future liquidity needs and choose to sell less liquid loan shares first (Brown et al., 2010; Manconi et al., 2012; Scholes, 2000). Motivated by recent research on bank loan trading (particularly, Bushman and Wittenberg-Moerman, 2009), we consider four proxies for loan liquidity measured as of 2006:Q4: loan type, borrower size, whether the loan is securitized or not, and syndicate size. Table VI presents the results.

We first estimate our baseline specification separately for credit lines and term loans. The SNC identifies each loan as belonging to one of these two categories and we partition our sample accordingly. Commercial banks have a comparative advantage at managing the liquidity risk associated with credit lines (Kashyap et al., 2002), which is reflected in their holdings the majority of these commitments when they are syndicated in the primary market (Gatev and Strahan, 2006, 2009). Consequently, there is less depth in secondary market for credit lines (i.e., there are fewer potential buyers), in contrast to the market for term loans where banks and virtually every type of investment fund is an active participant (see Bord and Santos, 2012). Thus, if banks prefer to sell liquid assets after the liquidity shock then we will be more likely to observe term loan share sales as compared to credit lines sales.

Columns [1] and [2] show the results. We continue to include loan-year fixed effects and the full set of bank and loan controls in the regressions. The coefficient estimates are 0.058 and 0.097 for credit lines and term loans, respectively. Both point estimates are statistically significant at the 1% level. The results indicate that banks with a greater exposure to the market-wide liquidity shock have a greater propensity to sell term loans relative to credit lines. This finding is consistent with the hypothesis that banks with a greater reliance on wholesale funding prefer to sell more liquid term loans so as to avoid fire sales on credit lines.

Next, we estimate the regressions separately by borrower size because studies find that small firms borrowing the syndicated loan market are more informationally opaque (Sufi, 2007), and thus less likely to be actively traded in the secondary market (Bushman and Wittenberg-Moerman, 2009). Indeed, many of the smaller borrowers in the SNC data set are private firms and likely subject to an adverse selection problem if a bank tried to liquidate their holdings at short notice. If banks prefer to sell liquid assets after the liquidity shock then we expect stronger effects for large borrowers because they are more transparent, which makes them less likely to suffer from such an adverse selection problem and easier for banks to sell these loan shares. We define a firm as large if its loan size is above the upper quartile of \$300m and small if it is below the lower quartile of \$50m.

Columns [3] and [4] provide the results by borrower size. We find that the coefficient on the wholesale funding variable is positive is positive for small borrowers, however, it is not statistically significant. The coefficient on the wholesale funding variable is positive, larger in magnitude, and significant at the 1% for large borrowers.

Our final two tests consider whether a loan is securitized or not and syndicate size. Securitized loans must be of sufficient quality and transparency (e.g., they will have an external credit rating) and include contractual features that make them easier to trade, such as more financial covenants. We classify a loan share as securitized if its syndicate contains a collateralized loan obligation in the current year or not securitized otherwise. Loan shares from syndicates featuring more lenders may be easier to sell as one of the other lenders in the syndicate may be willing to take up the share. Alternatively, the share may have desirable properties that lead to more lenders holding it in the first place. The basic idea of these two tests is the same as before: we wish to test if banks with more wholesale funding were more likely to dispose of more liquid loans or not. We classify a syndicate as large if it contains greater than the median number of lenders (eight) and small otherwise.

Columns [5] and [6] report the result by securitized status. We find that the coefficient on

wholesale funding is positive and statistically significant at the 1% level in both subsamples, but the estimate for the securitized group is more than twice the size as compared to the non-securitized group.[27] Columns [7] and [8] find a similar pattern when comparing large and small loan syndicates. We find a positive and statistically significant relation between wholesale funding dependence and loan sales during the crisis and this effect is greater in magnitude for syndicates featuring a large number of lenders.

4.2.3 The Role of Asset Liquidity Risk

In this section, we examine how the composition of banks' asset portfolios—the market liquidity of banks' assets—impacts loan sales during the crisis. In traditional models of financial intermediation, banks raise equity and carry liquid assets to manage the risk of cash shortfalls stemming from unexpected demand from borrowers or creditors (e.g., Diamond and Dybvig, 1983; Gorton and Pennacchi, 1990). These liquid assets generally correspond to cash reserves and debt securities, and such holdings are a key component of liquidity risk management for banks. In general, we expect banks with more liquid asset portfolios to sell fewer loans during the crisis because it may be less costly for them to use cash reserves or liquidate debt securities instead.

Table VII presents the results. Liquid assets are defined as the ratio of cash (including repos and Federal Funds sold) and debt securities (excluding mortgage- and asset-backed securities) to total bank assets, along the lines of Acharya and Mora (2013). All columns include controls for loan-year fixed effects and the full set of loan and bank controls. Column [1] shows the baseline estimate on the full sample from Table IV, for ease of comparison. Column [2] appends the benchmark specification (1) to include the liquid assets ratio measured as of 2006:Q4. We find that liquid asset ratio has a negative and statistically significant

[27] The results are quantitatively similar if we include only term loans in this test. The rationale for doing so is that credit lines tend not to be purchased by collateralized loan obligations (for example, see Benmelech et al., 2012).

impact on loan sales during the crisis: banks with more liquid asset portfolios are less likely to sell loans. This effect does not drive out the magnitude or statistical significance of the wholesale funding dependence coefficient. Indeed, the magnitude of the coefficient on wholesale funding increases from 0.076 (in the benchmark estimation) to 0.101 when we include liquid assets in the regression.

Columns [3] and [4] further check the robustness of this result. Column [3] drops loan syndicates with greater than 250 lenders from the sample. We find that dropping the largest syndicates from the sample does not have any noticeable effect on either of the coefficient estimates of interest. Column [4] restricts the sample to loan-years in which loan contracts were not amended or refinanced and once more we find that the coefficient estimates remain stable in magnitude and precision. The wholesale funding coefficient remains significant at the 1% level across both specifications.

Next, we additionally include the interaction of wholesale funding dependence and liquid assets in the regression. Doing so allows us to test the joint effect of wholesale funding dependence and banks' asset liquidity on loan sales. If banks hold a lot of cash then we would expect this to mitigate the positive impact of wholesale funding dependence on loan sales during the crisis. This would translate into a negative coefficient on this interaction term.

Columns [5] to [7] present the results of including the interaction of wholesale funding dependence and liquid assets for the full sample, excluding large syndicates, and excluding amended loans, respectively. Column [5] indicates that the coefficient on the interaction term to be negative and statistically significant at the 5% level. Thus, for a given level of wholesale funding dependence, we find that an increase in liquid assets reduces the propensity to sell loans during the crisis consistent with a liquid asset portfolio mitigating the effects of the liquidity shock. Column [6] shows that this remains to be true when we exclude very large syndicates from the sample. Column [7] indicates that this effect is only present

for amended loan contracts and that while the estimate has the expected sign, it is not statistically significant in the pure loan sales subsample.

Overall, the results in this section indicate that liquidity management stemming from both the asset and liability side of the balance sheet had independent effects on bank loan sales during the crisis (see also Cornett et al., 2011).

4.2.4 Dynamics of Bank Liquidity Risk Management and Loan Sales

In the benchmark estimation, the crisis period was defined as the years from 2007 until 2010. The coefficient estimates in Table IV capture a time-averaged estimate across this event window. In this section, we examine the relation between wholesale funding and loan sales on a year-by-year basis during the crisis by estimating the baseline model separately on each crisis year.

Table VIII provides the results. Panel A excludes the liquid assets ratio from the regression model. Panel B includes the liquid assets ratio. Column [1] shows the coefficient estimates from the baseline regression model in Table IV, for ease of comparison. Columns [2]–[5], re-estimate this model separately for the years from 2007 until 2010, respectively. Each of these columns include controls for loan-year fixed effects and the full set of loan and bank controls.

Examining the coefficients on wholesale funding dependence across these two panels, we find a hump-shaped pattern in the point estimates. Panel A indicates that from the end of 2007 to the end of 2008 the point estimate increases by more than a factor of three, from 0.048 to 0.181. From the end of 2008 to the end of 2009, this pattern sharply reverses and the point estimate decreases 0.181 to -0.016. The statistical significance of the point estimates increases from 10% in 2007 to 1% in 2008, and then the point estimate becomes insignificant. Panel B shows that controlling for the bank liquid asset ratio does not change this pattern: the effect of wholesale funding dependence on loan sales peaks in 2008 and drop off thereafter.

Regarding the economic magnitude of this relation, in 2008 the estimate becomes as large as a one standard deviation increase in wholesale funding being associated with a 4.2% increase in the likelihood of a loan sale (up from 1.1% in the benchmark estimation).[28]

We interpret these findings in the context of the squeeze in wholesale funding markets that occurred during the financial crisis. Among others Acharya and Mora (2013) and Cornett et al. (2011) use the TED spread—the difference between the 3-month London Interbank Offered Rate (LIBOR) and the 3-month Treasury rate—to infer the depth of the market-liquidity shock during the crisis. High levels of the TED spread is commonly understood to reflect greater risks associated with short-term lending to banks, therefore indicating a worsening of conditions in banks' access to wholesale funding. Figure 4 shows the time series of the TED spread for the period from 2002 until 2010. In the summer of 2007—widely accepted as the onset of the financial crisis—the TED spread jumped up from around 0.5% to elevated levels between 1% and 2.5%. It remained at these elevated levels until shortly after the Lehman bankruptcy, when the spread peaked at around 5.8%. From this peak, the spread declined through the second half of 2008 and by the end of 2009 it had returned to 0.5%. Thus, we find a time variation in the relation between wholesale funding dependence and bank loan sales that corresponds to shifts in liquidity during the crisis.

4.2.5 Additional Robustness Tests

In this section, we conduct several specification tests. One possible concern with our baseline estimation is that it imposes a linear relationship between wholesale funding dependence and loan sales and estimation of this relationship may be sensitive to outliers. Throughout the analysis we address concerns of outliers by winsorizing our bank-level variables, including

[28]Regarding the relation between wholesale funding and loan sales in 2010, we find that the coefficient on wholesale funding is still positive. The point estimate is not statistically significant once we control for the liquid assets ratio. Thus, for the years 2009 and 2010 we find the relation is statistically insignificant in three out of four cases. We believe that measurement error in using 2006:Q4 values of wholesale funding may play a role. For robustness, we repeat the analysis defining the years 2007-2009 as the crisis period and we find the estimates are very similar in both magnitude and significance.

wholesale funding dependence, and we now consider an alternative estimation approach that does not impose linearity.

To allow for a nonlinear relation between wholesale funding dependence and loan sales, we rank banks as having high, medium, and low exposure to the liquidity shock. Banks are assigned to exposure groups depending on the tercile wholesale funding dependence distribution that the bank falls into using data from 2006:Q4. We then run the following variant of the baseline regression model (1):

$$\begin{aligned} \text{Loan Sale}_{ijt} = \alpha_{it} + \beta_1 \text{ Medium Exposure}_{j,2006Q4} + \beta_2 \text{ High Exposure}_{j,2006Q4} \\ + \gamma \text{ X}_{j,t-1} + \epsilon_{ijt} \end{aligned} \tag{2}$$

where, as before, Loan Sale_{ijt} is the loan sale indicator variable that is equal to one if a loan share i held by bank j in year $t-1$ is sold in year t, α_{it} capture loan-year fixed effects, and $\text{X}_{j,t-1}$ includes controls for other potential determinants of the bank loan sale decision. The exposure variables are indicator variables that classify the commercial banks into exposure groups. The coefficients of interest are β_1 and β_2, which captures the impact of the liquidity shock occurring during crisis to bank loan sales after accounting for loan-specific changes in credit demand. Here, β_1 measures the average propensity of banks in the medium exposure group to sell loans relative the omitted group, which is comprised of the low exposure banks. And similarly for β_2.

Panel A of Table IX presents the results. Column [1] estimates model (2) on the full sample of loan sales. We find that medium and high exposure banks increase their likelihood of selling their loan share by 0.8% and 1.5%, respectively, relative to low exposure banks. These estimates are statistically significant at the 5% and 1% level, respectively. The results of this nonlinear specification mirror that of the baseline estimation: banks with a greater reliance on wholesale funding had a greater likelihood of selling loans during the financial

crisis.

Columns [2] and [3] repeat the estimation for different samples. Using these alternative samples, we find the coefficient on the medium exposure indicator variable becomes smaller in magnitude and is no longer statistically significant. On the other hand, the high exposure indicator remains large in magnitude and highly significant. Column [4] repeats the analysis using the average value of wholesale funding dependence in 2006 to construct the exposure indicator variables and the same pattern emerges. This additional tests indicate that a robust positive relation between wholesale funding dependence at the onset of the crisis and loan sales from 2007 until 2010, primarily among the high exposure banks.

We next include partial loan sales in the analysis. The loan sale variable that we have examined so far only includes the complete sale of a loan share by a bank holding company. This choice was motivated by the fact that we observe partial sales of loan shares occurring infrequently. Nevertheless, a possible concern is that omitting such partial sales by classifying them as non-sales may introduce measurement error into the analysis and bias our estimates. For instance, a bank that was more dependent on wholesale funding may choose to reduce its exposure to a given syndicated loan by selling only 50% of their existing share, rather than 100%. This would lead us to underestimate of β in baseline regression model (1).

We check to see if this is an issue by redefining our loan sale variable to be equal to one if any reduction in the loan share is observed from year t to year $t+1$ and re-estimating the baseline model. Panel B of Table IX shows the results. Each column includes the full set of controls for loan-year fixed effects, as well as bank and loan control variables. Columns [1]–[4] present a very similar picture to the main results in Table IV. The magnitude of the coefficients appears to be slightly larger in each column, relative to the baseline results, suggesting that banks may use partial sales to alleviate funding constraints. This suggests that our baseline estimates, which focus on complete loan sales, may slightly underestimate the true effect.

We also conduct a specification test that groups the before and during crisis periods together (i.e., 2003-2010) and runs a single estimation on a full sample of loans. Here, we measure wholesale funding dependence at the bank level using data from 2002:Q4. We include an interaction term to account for the differential impact of wholesale funding dependence in normal and stress scenarios. The panel regression specification we implement is as follows:

$$\begin{aligned} \text{Loan Sale}_{ijt} = \alpha_{it} + \beta_1 \text{ Wholesale Funding}_{j,2002\text{Q4}} \\ + \beta_2 \text{ Crisis}_t \times \text{Wholesale Funding}_{j,2002\text{Q4}} + \gamma \text{ X}_{j,t-1} + \epsilon_{ijt} \end{aligned} \tag{3}$$

where Crisis_t is an indicator variable equal to one if the year is between 2007 and 2010. The estimates of β_1 and β_2 and their difference are of interest. We continue to control for bank and loan variables that are determinants of the loan sale decision, as well as the full set of loan-year fixed effects.[29] In a separate test, we also include bank fixed effects in this specification to control for unobserved time-invariant differences between banks. Inclusion of bank fixed effects sweeps out the main wholesale funding term, as this is collinear with the bank fixed effect.

Panel C of Table IX presents the results. Column [1] conducts a preliminary test that restricts the sample to the loan years from 2007 until 2010, which corresponds to the crisis period for our baseline tests. We find that wholesale funding measured in 2002:Q4 has a positive and statistically significant impact on loan sales during the crisis. This follows quite naturally from the stickiness of the wholesale funding variable at the bank level.

Columns [2] and [3] consider the longer event window from 2003 until 2010 and includes a crisis interaction term. Column [2] shows that the effect of wholesale funding dependence on loan sales is positive and statistically significant in the crisis period only. The coeffi-

[29]Note that the inclusion of loan-year fixed effects eliminates the need to include year fixed effects in (3).

cient on the main effect is negative—suggesting that wholesale funding may have improved financial flexibility in the 2003-2006 period—although this effect is small in magnitude and not statistically significant. Column [3] adds controls for bank fixed effects and finds similar results.

Next, we replace the crisis term with a continuous measure of the tightness of banks' funding liquidity conditions, the TED spread. As mentioned in the previous section, we measure the TED spread as the yearly average of the daily difference between the three month LIBOR and the three month U.S. Treasury rate. This test is based on the idea that banks with greater dependence on wholesale funds will be more likely to sell loans to conserve liquidity, as compared to banks with stable sources of funding, when the TED spread increases (for a similar approach, see Cornett et al., 2011). Figure 4 indicates that the TED spread peaked in 2008, but also shows considerable time-series variation from year-to-year. Columns [4] and [5] of Table IX show that the results remain similar when we use the TED spread as a continuous measure of wholesale funding conditions, whether we include bank fixed effects or not.

In a final specification test, we re-estimate the baseline regression model (1) during the crisis measuring the bank control using data from 2006:Q4. This test alleviates concerns that our estimates are potentially biased by changes in control variables occurring due to wholesale funding pressures in the financial crisis. Panel D of Table IX shows the results of this estimation. Columns [1]–[5] repeat the same tests as in the main analysis, but using this alternative measurement of the bank characteristics. We find that the coefficient on wholesale funding remains positive and statistically significant using this alternative approach.

In sum, the results of this section established a strong link between bank liquidity risk management and loan sales. Banks that were more exposed to liquidity shock through larger wholesale funding dependence were more likely to sell loans when wholesale funding markets came under pressure.

4.3 Wholesale Funding Dependence and Loan Purchases

So far, our main analysis has examined how bank liquidity risk management impacts loan sales. Banks with a greater dependence on wholesale funding at the onset of the crisis sold loan shares once this source of funding dried up. Until this point, we have put the question of loan buys to one side, however, one could argue that banks that were more dependent on wholesale funding were more likely to rebalance their portfolio in the crisis and were therefore not only more likely to sell but also more likely to buy loans. To address this concern, we collect and examine data on secondary market additions of loan shares to banks' loan portfolios. We continue to focus on our sample of U.S. bank holding companies and investigate the relation between wholesale funding and the decision to buy loan shares in the secondary market.

We collect all loan share buy and sell transactions for the time period from 2003 until 2010. We define loan buys analogously to loan sales: bank A buys a given loan in year t whenever this bank was absent from the corresponding syndicate in year $t-1$ and present in t. Using these transactions, we test whether banks with greater wholesale funding dependence are more or less likely to buy loans. A regression analysis of buyers is challenging since we only observe the actual buyer and not all bidders or potentially interested buyers. Hence, we explore differences between buyers and sellers. In particular, our basic empirical strategy is to contrast the average wholesale funding dependence of banks that buy loan shares with the average for banks that sell loan shares. The purpose of this mean comparison is to show that the buyers differed significantly from sellers in their dependence on wholesale funding. By doing so, we mitigate concerns that our baseline estimates are merely capturing a portfolio rebalancing effect.

We do so using two different approaches. The first approach simply incorporates the set of all of the loan transactions. The second uses the set of transactions where for a particular loan-year pair exactly one bank sells a share (i.e., exits the syndicate) and exactly one bank

buys a share (i.e., enters the syndicate and holding a share of exactly the same size). This second approach resembles a loan fixed effects model, as, holding the loan constant, we compare the wholesale funding dependence of the syndicate entrant (buyer) with the bank exiting the syndicate (seller).

Table X tests whether banks with greater wholesale funding dependence were more likely to buy or sell loan shares. We separately examine the before crisis (Panel A), during crisis (Panel B), and the 2008 height of the financial crisis (Panel C). We also separately consider pure trades which, as before, are transactions involving loans that are not amended in the year of the transaction.

Panel A examines the pre-crisis period from 2003 until 2006 and measures wholesale funding dependence as of 2002Q4. There is suggestive evidence that the banks buying loan shares had more wholesale funding in their capital structure. For instance, if we simply look at all transactions (4,363 sales and 5,556 buys) and compare the average wholesale funding of loan sellers (34.9% of assets) versus loan buyers (37.2% of assets) then we find that a difference of roughly 2.3 percentage points, significant at the 1% level. When we restrict the sample to pure trades only we see that the number of transactions reduces by a factor of four, but the same pattern emerges. When we consider the buys and sells coming from the same syndicate ("'Matched Bank-Bank Trades") this relation disappears but the number of transactions also greatly reduces. Overall, this suggests in the benign period before the crisis, banks using wholesale funding were more actively adding loan shares to their portfolios via secondary transactions. This mirrors the findings in Section 4.1 where these banks were also less likely to sell loan shares.

Panels B and C repeats the same tests for the crisis period. Here, we find consistent evidence that banks that were buying loan shares had less wholesale funding than banks selling loan shares, especially during 2008 peak of the crisis. Columns [1]-[3] of Panel B provides evidence in this regard. First, it is worth noting that the number of sales during the

crisis (7,705) exceeded the number of sales in the same length of time before the crisis (4,363, see Panel A) and the number of buys during the crisis (4,337). Thus, sales activity increased by banks during the crisis and banks switched from being net buyers to net sellers. Second, the average wholesale funding dependence of sellers exceeded the average of the buyers by 2.5 percentage points. This difference increases to 4.7 percentage points when we consider pure trades. For Matched Bank-Bank Trades, the difference has a similar magnitude although the statistical significance drops below conventional levels. When we examine the 2008 peak, the results become particularly stark. In this year, we find that the difference in wholesale funding between sellers and buyers in all transactions increases to somewhere between 8-9 percentage points, depending on the sample used, and remains highly statistically significant when we consider pure trades as well as matched bank-to-bank trades within the same loan syndicate.

Taking the results of this section together, we provide further evidence of the role of bank liquidity risk management in determining bank trading behavior in the secondary loan market. Indeed, banks that were active buyers during the crisis tended to have lower wholesale funding and vice versa for the period before the crisis.

4.4 Loan losses, Insolvency, and Loan Sales

In this section, we examine the role of bank insolvency and credit risk management on loan sales during the crisis. The crisis was characterized by many bank failures, government interventions, and several of the largest banks booking substantial losses related with their mortgage businesses.[30] Banks that experienced large losses were undoubtedly perceived as riskier prospects and, consequently, their cost of funding likely increased. Alternatively, banks incurring losses and reductions in equity capital may choose to deleverage by sell-

[30]See Santos (2011) and references therein for a detailed discussion of losses incurred by U.S. commercial banks during the subprime crisis and the impact of these losses on bank lending in the syndicated loan market.

ing loans in order to restore their equity ratio (see Adrian and Shin, 2010). We hypothesize that banks realizing larger losses during the crisis increased loan sales relative to other banks. This hypothesis follows naturally from an established theoretical and empirical literature analyzing the role of binding regulatory capital requirements on loan sales and, more generally, credit risk transfer (e.g., Allen and Carletti, 2006; Pennacchi, 1988).

Table XI presents the results. Panel A shows the impact of measures of loan losses on loan sales, as well as banks' total participation in the Troubled Asset Relief Program (TARP) during the crisis. We include TARP participation as a measure of bank insolvency.[31] These results provide a direct test of the hypothesis described above. We use two standard measures of loan losses. First, we consider the non performing loans ratio, which measures the fraction of loans that have been classified as in default or close to being in default (e.g., 90 days past due). Second, we consider the net charge off ratio, which captures the fraction of assets that have been written off the balance sheet (net of recoveries). Some studies argue that the net charge offs measure is a more accurate indicator of losses, as it is more difficult to manipulate, however, banks can be slow to write down loans which makes timing a potential issue.[32] We include these loan loss variables measured in 2006:Q4 and also lagged values in a dynamic specification. Each specification follows naturally from our baseline specification (1) and includes the full sample of loan-lender-year observations and, as before, includes controls for loan-year fixed effects and the full set of loan and bank controls.

Columns [1] and [2] regress the loan sale variable on the non performing loan ratio and the net charge offs ratio measure in 2006:Q4, respectively. Column [3] includes both ratios in the same regression model. In each case the loan loss variable is statistically insignificant. Column [4] adds TARP participation to the model. The coefficient on TARP is positive and

[31]Data from banks' participation in the TARP comes from the website of the United States Treasury Department at `http://www.treasury.gov/initiatives/financial-stability/TARP-Programs/Pages/default.aspx`.

[32]Beatty and Liao (2013) provide an extensive discussion of loan loss accounting and, more generally, financial accounting in the banking industry.

significant at the 1% level, indicating that, for a given loan syndicate, banks with greater take up of TARP funds were more likely to exit their participation during the crisis. The magnitude of this effect is large: a one standard deviation increase in TARP participation (roughly, 0.01) is associated with a 2.2% increase in the probability of a loan sale, all else equal.

Columns [5]–[8] repeat this exercise, but this time consider lagged values of non performing loans and net charge offs (for a similar specification, see Santos, 2011). In each of these specifications, we see a positive and statistically significant relation between loan losses and loan sales. The discrepancy between these two sets of specifications is likely due to a lack of variation in loan losses between banks at the onset of the crisis. Put simply, most banks in the sample have close to zero values for both loan loss measures as of 2006:Q4.

Panel B of Table XI examines whether the effect of wholesale funding dependence on loan sales survives once we control for participation in TARP. These tests are designed as an additional robustness check, as our benchmark estimation already controls for bank capital, non performing loans, and net charge offs (see Table IV). Columns [1] and [3] replicate the baseline estimation for our main and alternative measures of wholesale funding dependence, respectively. Columns [2] and [4] show the coefficients when we additionally control for TARP participation. Column [2] indicates that when we control for TARP the sign and statistical significance of wholesale funding remains unchanged. Column [4] shows that our alternative measure of wholesale funding dependence remains the correct sign, but now becomes significant at the 5% level once we control for TARP participation. Overall, and taken together with the results from Table IV, these results indicate that the effect of wholesale funding dependence on loan sales that acts independently of credit risk considerations (e.g., bank insolvency concerns).

Next, we examine how credit risk management and loan losses are associated with loan sales during the period before the crisis. Panel C of Table XI presents the results. Column

[1] examines the non performing loan ratio for the period from 2003 until 2006. Columns [2] and [3] examines non performing loans and net charge offs for the period 2004 until 2006.[33] Each specification includes the full sample of loan-lender-year observations and, as usual, includes controls for loan-year fixed effects and the full set of loan and bank controls. Of particular interest is the bank capital ratio, which is included in all specifications.

Overall, we find the loan loss variables, particularly, net charge offs, are strongly associated with loan sell offs during the period before the crisis (see also Table III). Columns [1]–[3] also show that the capital ratio has strong predictive power for loan sales. In each column, we find that the coefficient on the capital ratio is negative and statistically significant at the 1% level. This indicates that a well-capitalized bank is less likely to sell a loan share, all else equal, during the period before the crisis. This finding corroborates the theory that binding regulatory capital requirements may induce banks to push credit risk off their balance sheets through loan sales.

5 Conclusion

In this paper, we provide large-scale evidence on the supply-side determinants of syndicated bank loan sales. We take advantage of a comprehensive credit register of U.S. syndicated bank loans to track the dynamics of loan syndicates after origination. This allows us to pin down loan sales as well as control for shifts in credit demand at the loan-level using a loan-year fixed effects approach.

We provide empirical evidence of a bank liquidity risk management motivation for loan sales. We examine how banks' exposure to liquidity risk during the financial crisis (i.e., wholesale funding dependence) affected their decision to sell shares of syndicated loans. We provide direct evidence that, conditional on the market-wide liquidity shock, banks with a

[33]Data items required to calculate net charge offs only become available in 2003, which necessitates a different event windows for the present analysis.

greater reliance on wholesale funding sold more loan shares and argue that these banks did so to preserve liquidity. Moreover, these effects are not present in the period from 2003 until 2006—a time when bank funding markets were well-functioning—and persist when we account for banks' solvency position, as measured by capital constraints and loan losses.

In recent times, commercial banks have increasingly turned to wholesale funding sources. Although access to wholesale funding may be advantageous, it can also make banks more susceptible to funding shocks. Our paper provides evidence that wholesale funding reliant banks may have been able to partially smooth out funding shocks using the secondary loan market. However, the empirical evidence in the literature indicates that the drying up of liquidity in the recent crisis did ultimately cause banks to hoard liquidity—often by turning to lender of last resort facilities from the central bank and the government—and these funding shocks were transmitted to the real economy. Thus, more research is required to further our understanding of the use of wholesale funding by financial intermediaries and its implications for financial stability.

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Figure 1: Loan Shares Sold (in millions $, 1994-2010). Total number (left axis) and value in millions of dollars (right axis) of shares of U.S. syndicated loan commitments (including term loans and lines of credit) registered with the Shared National Credit Program that were sold in the secondary market by U.S. bank holding companies during the period from 1994 until 2010. A loan share is a fraction of a syndicated loan commitment. A loan share sale occurs when a U.S. bank holding company ceases to own a loan share relative to the previous year.

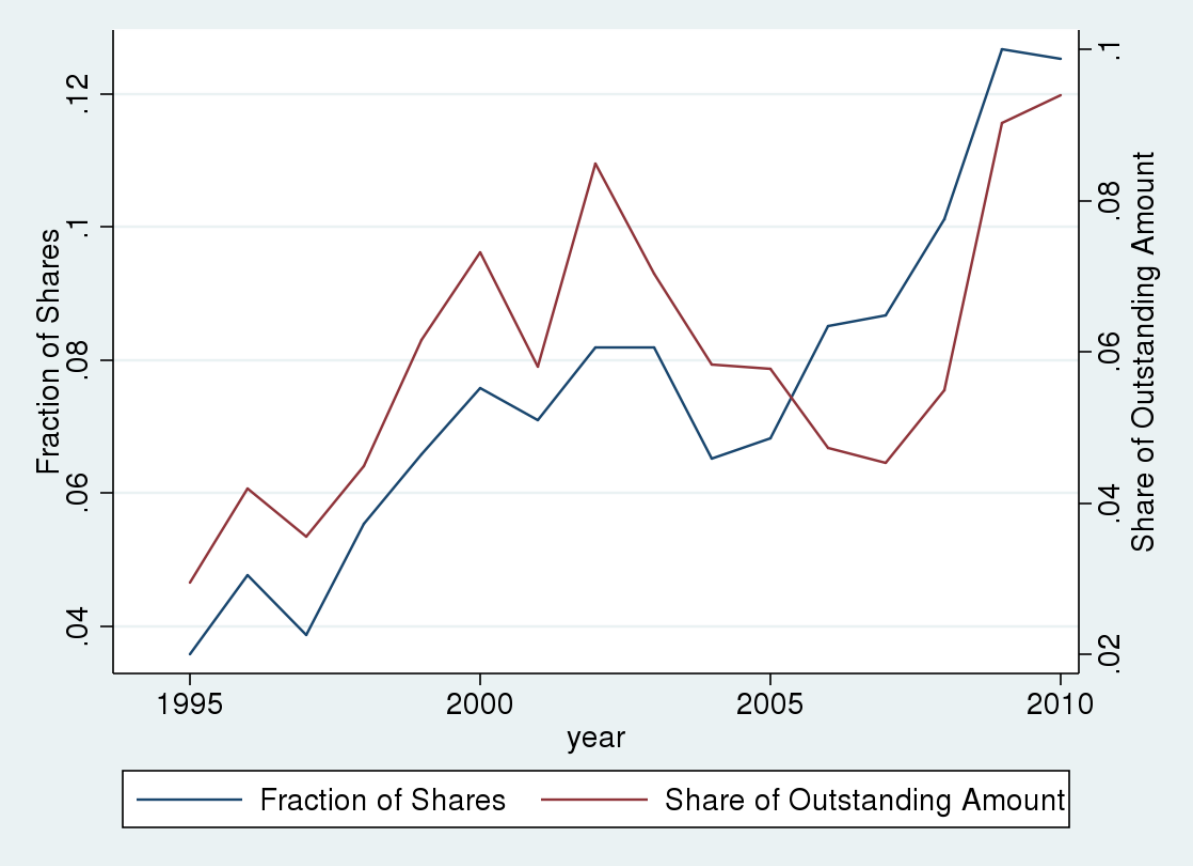

Figure 2: Loan Shares Sold (% of total loan commitments outstanding, 1995-2010). Fraction of the (lagged) total number of shares (left axis) and fraction of the (lagged) total dollar value (right axis) of shares of U.S. syndicated loan commitments (including term loans and lines of credit) registered with the Shared National Credit Program that were sold in the secondary market by U.S. bank holding companies during the period from 1995 until 2010. A loan share is a fraction of a syndicated loan commitment. A loan share sale occurs when a U.S. bank holding company ceases to own a loan share relative to the previous year.

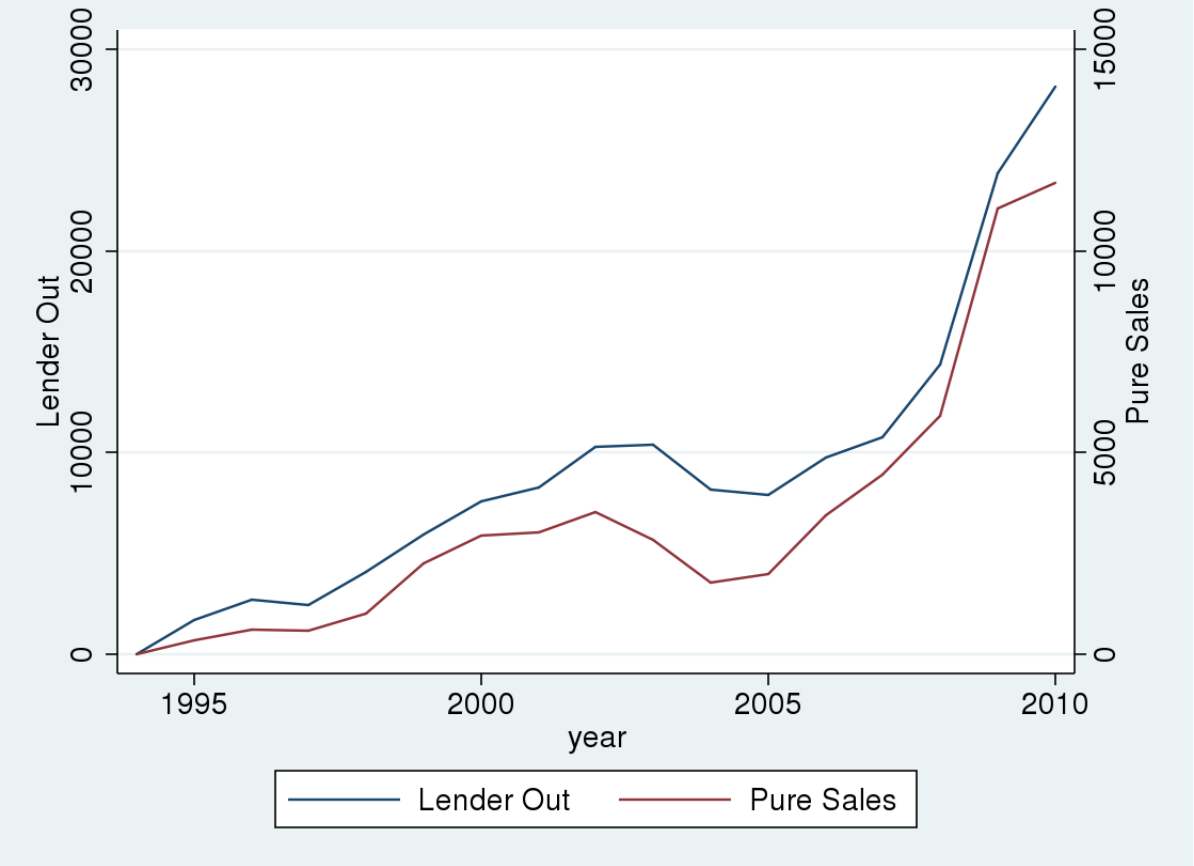

Figure 3: Loan Shares Sold ("pure sales," 1994-2010). Total number of sales (left axis) and pure sales (right axis) of shares of U.S. syndicated loan commitments (including term loans and lines of credit) registered with the Shared National Credit Program that were sold in the secondary market by U.S. bank holding companies during the period from 1994 until 2010. A pure sale is defined as a loan sale that occurs without any coincident change in a term (e.g., maturity) of the underlying contract. A loan share is a fraction of a syndicated loan commitment. A loan share sale occurs when a U.S. bank holding company ceases to own a loan share relative to the previous year.

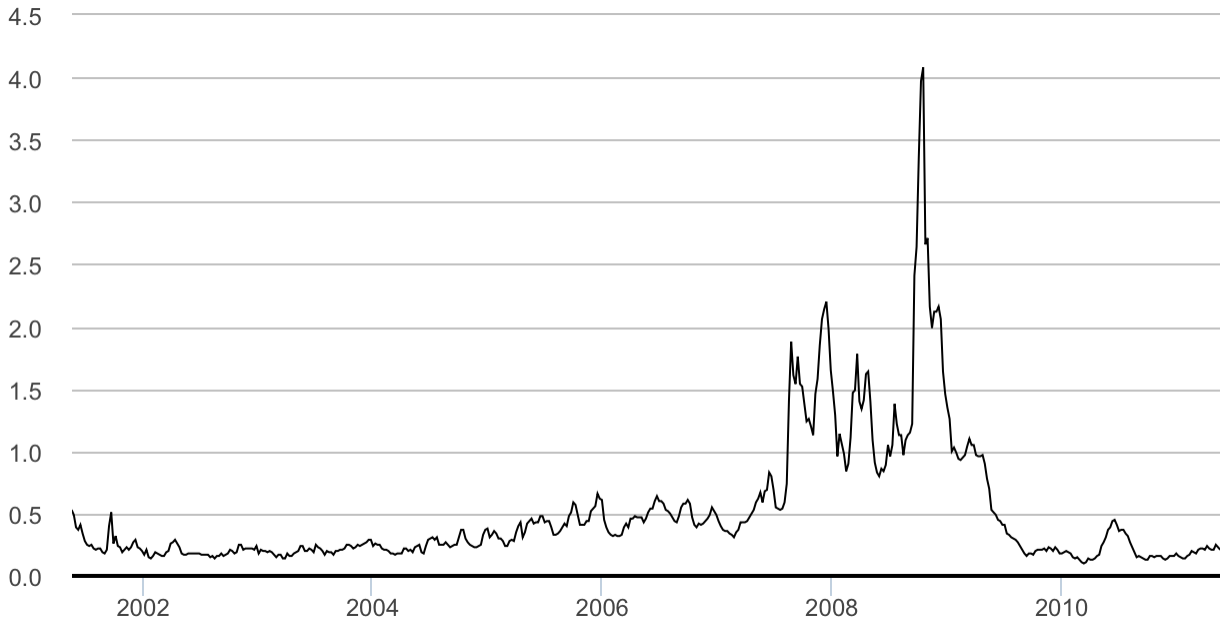

Figure 4: TED Spread (in %, 2002-2010). The difference between the three month LIBOR and the three month Treasury bill interest rate for the period from 2002 until 2010.

Table I
Shared National Credit Program Data by Lender Type

This table provides an overview of the market shares (calculated using loan commitment dollar values) across lenders in the Shared National Credit Program sample from 1994 until 2012.

	Lender Type								Location	
	Bank	Finance company	Insurance company	Pension fund	Securities broker/dealer	Structured finance	Investment management	Other	U.S.	Non-U.S.
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
1994	0.977	0.005	0.003	0.000	0.002	0.000	0.001	0.011	0.479	0.521
1995	0.981	0.005	0.002	0.000	0.002	0.000	0.002	0.007	0.482	0.518
1996	0.977	0.006	0.002	0.000	0.002	0.000	0.003	0.010	0.487	0.513
1997	0.973	0.008	0.002	0.000	0.003	0.001	0.003	0.010	0.481	0.519
1998	0.959	0.015	0.003	0.000	0.004	0.001	0.004	0.015	0.508	0.492
1999	0.916	0.028	0.003	0.000	0.005	0.003	0.006	0.041	0.531	0.469
2000	0.892	0.038	0.004	0.000	0.005	0.007	0.009	0.049	0.545	0.455
2001	0.877	0.040	0.003	0.000	0.006	0.013	0.010	0.053	0.549	0.451
2002	0.851	0.043	0.004	0.000	0.007	0.020	0.008	0.066	0.561	0.439
2003	0.839	0.044	0.005	0.000	0.008	0.025	0.012	0.071	0.576	0.424
2004	0.829	0.042	0.005	0.001	0.008	0.031	0.018	0.072	0.602	0.398
2005	0.815	0.039	0.005	0.002	0.007	0.035	0.020	0.080	0.595	0.405
2006	0.803	0.036	0.005	0.002	0.005	0.040	0.019	0.088	0.599	0.401
2007	0.790	0.032	0.005	0.002	0.005	0.053	0.025	0.095	0.596	0.404
2008	0.754	0.029	0.005	0.002	0.001	0.071	0.028	0.107	0.616	0.384
2009	0.741	0.032	0.005	0.001	0.001	0.078	0.033	0.108	0.619	0.381
2010	0.729	0.031	0.005	0.001	0.001	0.094	0.035	0.101	0.596	0.404
2011	0.742	0.028	0.004	0.001	0.001	0.092	0.042	0.092	0.582	0.418
2012	0.744	0.028	0.004	0.001	0.001	0.090	0.049	0.090	0.606	0.394
N	595,753	55,630	19,506	13,770	8,530	275,556	79,850	140,510	395,243	793,862
# Loans	57,103	14,182	4,443	2,039	4,768	5,740	6,670	20,339	54,172	47,064

Table II
Shared National Credit Program Summary Statistics

This table provides summary statistics for the Shared National Credit Program data. Columns [1]–[6] summarize the data for the 2003-2006 "Before Crisis" period and columns [7]–[12] for the 2007-2010 "During Crisis" period. The sample is restricted to loans held by at least two U.S. bank holding companies with valid covariates at the beginning of the year. Panel A provides summary statistics for the loan level variables. Panel B summarizes bank level variables, where each variable is weighted by the sampling frequency of each bank. Bank variables denoted with the "200XQ4" subscript are measured as of the fourth quarter of 2002 (2006) in the before (during) crisis periods, with the exception of Net Charge Offs which is measured as of 2003Q4 in the before crisis period. All variables are defined in Appendix A.

Variable	Before Crisis (2003-2006)						During Crisis (2007-2010)					
	N	Mean	Std.	p25	Med.	p75	N	Mean	Std.	p25	Med.	p75
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
Panel A: Loan Level Variables												
Loan Sale	67,647	0.066	0.249	0	0	0	81,011	0.095	0.294	0	0	0
Agent Dummy	67,647	0.186	0.390	0	0	0	81,011	0.169	0.375	0	0	0
Loan Fraction Held	67,647	0.131	0.108	0.005	0.100	0.182	81,011	0.114	0.108	0.034	0.083	0.160
Panel B: Bank Level Variables												
Wholesale Funding$_{200XQ4}$	66,267	0.357	0.120	0.283	0.331	0.439	76,621	0.384	0.138	0.279	0.374	0.453
Total Deposits$_{200XQ4}$	66,320	0.597	0.118	0.563	0.613	0.66	79,766	0.567	0.174	0.474	0.622	0.681
Liquid Assets$_{200XQ4}$	66,267	0.148	0.096	0.081	0.128	0.201	76,621	0.136	0.104	0.067	0.087	0.209
NPL Ratio$_{200XQ4}$	66,320	0.015	0.007	0.009	0.014	0.019	79,766	0.008	0.005	0.005	0.007	0.010
Net Charge Offs$_{200XQ4}$	47,758	0	0	0	0	0	79,766	0	0	0	0	0
NPL Ratio	67,647	0.011	0.006	0.006	0.01	0.014	81,011	0.027	0.022	0.010	0.019	0.037
Net Charge Offs	48,601	0	0.001	0	0	0	81,011	0	0.001	0	0	0
Real Estate Loan Share	67,647	0.496	0.144	0.395	0.500	0.589	81,011	0.520	0.147	0.434	0.554	0.600
Capital Ratio	67,647	0.085	0.014	0.078	0.089	0.094	81,011	0.094	0.021	0.081	0.092	0.104
Bank Size	67,647	18.90	1.674	18.17	19.60	20.42	81,011	19.42	1.909	18.42	19.41	21.17
Large Bank	67,647	0.816	0.387	1	1	1	81,011	0.858	0.349	1	1	1
Merger Dummy	67,647	0.010	0.099	0	0	0	81,011	0.018	0.134	0	0	0
TARP/Assets	-	-	-	-	-	-	81,011	0.003	0.009	0	0	0

Table III
Loan Sales and Bank Liquidity Risk Management During 2003-2006

The regressions in this table examine the impact of wholesale funding dependence and liquidity risk management on bank loan sales before the crisis period. The unit of observation in each regression is a loan share-bank-year triple. The dependent variable is an indicator variable equal to one if a lender exits a loan syndicate that it was present in during the previous year. Column [1] includes the full sample. Column [2] restricts the sample to loan syndicates with fewer that 250 participants. Column [3] restricts the sample to loan years where no contract amendment or refinancing took place during the year. Column [4] measures Wholesale Funding using the time-averaged data for 2002 data. Column [5] uses time-varying (lagged) Wholesale Funding. Column [6] uses Total Deposits measured as of 2002Q4 as an alternative measure of wholesale funding dependence. All columns include controls for loan-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the loan level. ***, **, * denotes 1%, 5%, and 10% statistical significance

Dependent Variable: Loan Sale$_t$						
	All	<250 Lenders	No Amend	2002 Avg.	Dynamic Spec.	Deposits 2002Q4
	[1]	[2]	[3]	[4]	[5]	[6]
Wholesale Funding$_{2002Q4}$	-0.037**	-0.037**	-0.011	-0.036**	-0.059***	0.024
	(0.015)	(0.015)	(0.014)	(0.017)	(0.016)	(0.019)
NPL Ratio$_{t-1}$	0.127	0.238	0.008	0.638**	0.118	0.062
	(0.274)	(0.273)	(0.253)	(0.264)	(0.272)	(0.276)
Real Estate Loan Share$_{t-1}$	-0.023*	-0.016	-0.026**	-0.014	-0.021**	-0.011
	(0.012)	(0.012)	(0.011)	(0.013)	(0.011)	(0.011)
Capital Ratio$_{t-1}$	-1.071***	-1.096***	-0.630***	-1.126***	-1.183***	-1.007***
	(0.127)	(0.126)	(0.126)	(0.136)	(0.120)	(0.118)
Bank Size$_{t-1}$	-0.012***	-0.012***	-0.007***	-0.014***	-0.010***	-0.011***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Large Bank$_{t-1}$	-0.001	-0.001	0.002	0.005	-0.002	0.002
	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
Bank Merger$_t$	-0.016*	-0.012	0.000	-0.016*	-0.019**	-0.015
	(0.009)	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)
Bank Merger$_{t-1}$	0.204***	0.207***	0.012	0.208***	0.185***	0.205***
	(0.020)	(0.020)	(0.016)	(0.020)	(0.017)	(0.020)
Agent Bank$_{t-1}$	-0.022***	-0.022***	-0.001	-0.022***	-0.022***	-0.021
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Loan Fraction Held$_{t-1}$	-0.172***	-0.168***	-0.062***	-0.169***	-0.168***	-0.169***
	(0.023)	(0.023)	(0.019)	(0.023)	(0.022)	(0.023)
Loan-Year fixed effects	Y	Y	Y	Y	Y	Y
N	66,267	65,822	38,621	66,267	67,647	66,320
# Loans	9,612	9,575	7,194	9,612	9,627	9,612
R^2	0.36	0.36	0.36	0.36	0.36	0.36

Table IV
Loan Sales and Bank Liquidity Risk Management During 2007-2010

The regressions in this table examine the impact of wholesale funding dependence at the onset of the crisis on bank loan sales during the crisis period. The unit of observation in each regression is a loan share-bank-year triple. The dependent variable is an indicator variable equal to one if a lender exits a loan syndicate that it was present in during the previous year. Wholesale Funding is measured as of 2006Q4. All columns include controls for loan-year fixed effects. Column [1] includes the full sample. Column [2] restricts the sample to loan syndicates with fewer that 250 participants. Column [3] restricts the sample to loan years where no contract amendment or refinancing took place during the year. Column [4] measures Wholesale Funding using the time-averaged data for 2006 data. Column [5] uses time-varying (lagged) Wholesale Funding. Column [6] uses Total Deposits measured as of 2006Q4 as an alternative measure of wholesale funding dependence. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the loan level. ***, **, * denotes 1%, 5%, and 10% statistical significance.

Dependent Variable: Loan Sale$_t$						
	All	<250 Lenders	No Amend	2006 Avg.	Dynamic Spec.	Deposits 2006Q4
	[1]	[2]	[3]	[4]	[5]	[6]
Wholesale Funding$_{2006Q4}$	0.076***	0.077***	0.066***	0.057***	0.103***	-0.020
	(0.014)	(0.014)	(0.015)	(0.014)	(0.014)	(0.013)
Net Charge Offs$_{t-1}$	23.64***	23.74***	5.135*	36.94***	25.18***	21.04***
	(3.121)	(3.147)	(2.817)	(6.035)	(2.941)	(2.921)
NPL Ratio$_{t-1}$	0.317**	0.205	0.362**	0.807***	0.305**	0.262*
	(0.145)	(0.145)	(0.143)	(0.188)	(0.128)	(0.139)
Real Estate Loan Share$_{t-1}$	-0.031**	-0.032**	-0.057***	-0.027**	-0.015	-0.042***
	(0.014)	(0.013)	(0.015)	(0.014)	(0.012)	(0.014)
Capital Ratio$_{t-1}$	0.172*	0.086	0.115	0.063	0.224***	0.063
	(0.091)	(0.089)	(0.097)	(0.089)	(0.075)	(0.076)
Bank Size$_{t-1}$	0.004**	0.003**	0.001	0.002	0.002*	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Large Bank$_{t-1}$	-0.065***	-0.064***	-0.042***	-0.056***	-0.064***	-0.069***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Bank Merger$_t$	-0.021**	-0.005	-0.012	-0.023***	-0.024***	-0.025***
	(0.009)	(0.008)	(0.009)	(0.009)	(0.008)	(0.008)
Bank Merger$_{t-1}$	0.145***	0.153***	0.047***	0.158***	0.134***	0.138***
	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)	(0.012)
Agent Bank$_{t-1}$	-0.017***	-0.015***	-0.006**	-0.018***	-0.017***	-0.017***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Loan Fraction Held$_{t-1}$	-0.181***	-0.173***	-0.078***	-0.180***	-0.172***	-0.185***
	(0.020)	(0.020)	(0.017)	(0.020)	(0.019)	(0.019)
Loan-Year fixed effects	Y	Y	Y	Y	Y	Y
N	76,621	73,045	46,210	76,625	81,011	79,766
# Loans	9,564	9,301	7,409	9,564	9,599	9,585
R^2	0.42	0.41	0.43	0.42	0.41	0.41

Table V
Industry Group, Loan Credit Quality, and Loan Sales During 2007-2010

The regressions in this table examine the impact of wholesale funding dependence at the onset of the crisis on bank loan sales during the crisis period by borrower industry group and loan credit quality. Industry groupings are provided by the Shared National Credit Program. A loan is classified as "Pass" by the examining agency if it has not been criticized in any way and "Fail" otherwise (i.e., the loan is rated special mention, substandard, doubtful, or loss). The unit of observation in each regression is a loan share-bank-year triple. The dependent variable is an indicator variable equal to one if a lender exits a loan syndicate that it was present in during the previous year. All columns include bank and loan controls as well as controls for loan-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the loan level. ***, **, * denotes 1%, 5%, and 10% statistical significance

Dependent Variable: Loan Sale$_t$								
		Industry Group					Credit Quality	
	All	Agriculture & Mining	Manufacturing	Wholesale & Retail	Financial Services	Other	Pass	Fail
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Wholesale Funding$_{2006Q4}$	0.076***	0.066**	0.076***	0.115***	0.121***	0.067**	0.076***	0.078**
	(0.014)	(0.029)	(0.025)	(0.041)	(0.042)	(0.026)	(0.014)	(0.037)
Bank controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
N	76,621	18,895	18,768	7,982	6,590	24,386	59,288	14,679
# Loans	9,564	2,595	2,250	953	897	2,970	7,621	2,417
R^2	0.42	0.41	0.40	0.41	0.42	0.42	0.38	0.45

Table VI
Impact of Loan Liquidity on Sales During 2007-2010

The regressions in this table examine the impact of wholesale funding dependence at the onset of the crisis on bank loan sales during the crisis period by loan liquidity. We define loans as credit lines or term loans according to how they are categorized in the Shared National Credit Program data. We define a borrowers as small (large) if they take out a loan in the bottom (top) 25th percentile of the loan size distribution. We define a loan as securitized if we identify a syndicate participant as a collateralized loan obligation and not securitized otherwise. We defined a loan as having a large syndicate if the number of syndicate members is above the median and small otherwise. The unit of observation in each regression is a loan share-bank-year triple. The dependent variable is an indicator variable equal to one if a lender exits a loan syndicate that it was present in during the previous year. Wholesale Funding is measured as of 2006Q4. All columns include controls for loan-year fixed effects, bank merger controls, and loan controls. Bank merger controls comprise contemporaneous and lagged bank merger variable. Loan controls comprise an agent bank indicator and loan fraction held. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the loan level. ***, **, * denotes 1%, 5%, and 10% statistical significance.

Dependent Variable: Loan Sale$_t$								
	Loan type		Borrower size		Securitized		Syndicate size	
	Credit line	Term loan	Small	Large	No	Yes	Small	Large
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Wholesale Funding$_{2006Q4}$	0.058***	0.097***	0.053	0.076***	0.045***	0.105**	0.056***	0.078***
	(0.015)	(0.027)	(0.041)	(0.019)	(0.013)	(0.042)	(0.022)	(0.016)
Bank controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
N	48,227	28,394	12,009	30,285	63,145	13,476	29,311	47,310
# Loans	5,795	4,564	2,635	2,522	7,986	1,578	5,320	4,462
R^2	0.36	0.43	0.50	0.36	0.36	0.36	0.49	0.39

Table VII
Bank Liquid assets and Loan Sales During 2007-2010

The regressions in this table examine the impact of wholesale funding dependence at the onset of the crisis on bank loan sales during the crisis period controlling for bank liquid assets. The unit of observation in each regression is a loan share-bank-year triple. The dependent variable is an indicator variable equal to one if a lender exits a loan syndicate that it was present in during the previous year. Wholesale Funding is measured as of 2006Q4. Liquid Assets is the ratio of cash and short-term investments to total bank assets. All columns include controls for loan-year fixed effects, bank controls, and loan controls. Bank controls comprise net charges offs, NPL ratio, real estate loan share, capital ratio, bank size, Large Bank indicator, and bank merger controls. Loan controls comprise an agent bank indicator and loan fraction held. Column [1] includes the full sample. Column [2] includes a liquid assets measure. Column [3] restricts the sample to loan syndicates with fewer that 250 participants. Column [4] restricts the sample to loan years where no contract amendment or refinancing took place during the year. Columns [5]-[7] additionally include an interaction of Wholesale Funding with Liquid Assets in the regression model and repeat the subsample analysis. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the loan level. ***, **, * denotes 1%, 5%, and 10% statistical significance.

Dependent Variable: Loan Sale$_t$							
	All	All	<250 Lenders	No Amend	All	<250 Lenders	No Amend
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
Wholesale Funding$_{2006Q4}$	0.076***	0.101***	0.099***	0.098***	0.158***	0.171***	0.101***
	(0.014)	(0.019)	(0.020)	(0.021)	(0.029)	(0.029)	(0.027)
Liquid Assets$_{2006Q4}$		-0.053***	-0.043**	-0.065***	0.042	0.086	-0.060
		(0.020)	(0.020)	(0.022)	(0.052)	(0.055)	(0.060)
Wholesale Funding$_{2006Q4}$ × Liquid Assets$_{2006Q4}$					-0.217**	-0.287***	-0.010
					(0.095)	(0.097)	(0.100)
Bank controls	Y	Y	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y	Y	Y	Y	Y
N	76,621	76,621	73,045	46,210	76,621	73,045	46,210
# Loans	9,564	9,564	9,301	7,409	9,564	9,301	7,409
R^2	0.42	0.42	0.42	0.43	0.42	0.42	0.43

Table VIII
Dynamics of Bank Liquidity Risk Management During 2007-2010

The regressions in this table examine the impact of wholesale funding dependence at the onset of the crisis on bank loan sales during the crisis period on a year by year basis. Panel A examines this relationship excluding Liquid Assets. Panel B repeats this analysis including Liquid Assets. The unit of observation in each regression is a loan share-bank-year triple. The dependent variable is an indicator variable equal to one if a lender exits a loan syndicate that it was present in during the previous year. Wholesale Funding is measured as of 2006Q4. Liquid Assets is the ratio of cash and short-term investments to total bank assets. All columns include controls for loan-year fixed effects, bank controls, and loan controls (defined in Table VII). Columns [1]-[5] use different event windows. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the loan level. ***, **, * denotes 1%, 5%, and 10% statistical significance.

Panel A: Excluding Liquid Assets

Dependent Variable: Loan Sale$_t$

	2007-2010	2007	2008	2009	2010
	[1]	[2]	[3]	[4]	[5]
Wholesale Funding$_{2006Q4}$	0.076***	0.048*	0.181***	-0.016	0.097***
	(0.014)	(0.019)	(0.020)	(0.021)	(0.019)
Bank controls	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y	Y	Y
N	76,621	19,856	16,895	23,051	16,819
# Loans	9,564	4,893	4,558	5,634	3,790
R^2	0.42	0.38	0.42	0.42	0.45

Panel B: Including Liquid Assets

Dependent Variable: Loan Sale$_t$

	2007-2010	2007	2008	2009	2010
	[1]	[2]	[3]	[4]	[5]
Wholesale Funding$_{2006Q4}$	0.101***	0.081**	0.299***	0.047	0.056
	(0.019)	(0.038)	(0.039)	(0.035)	(0.040)
Liquid Assets$_{2006Q4}$	-0.053***	-0.068*	-0.099**	-0.126***	0.0951**
	(0.020)	(0.036)	(0.045)	(0.042)	(0.045)
Bank controls	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y	Y	Y
N	76,621	19,856	16,895	23,051	16,819
# Loans	9,564	4,893	4,558	5,634	3,790
R^2	0.42	0.38	0.42	0.42	0.45

Table IX
Additional Specification Tests

The regressions in this table conduct a number of specification tests to examine the impact of wholesale funding dependence on bank loan sales. Panel A ranks banks' wholesale funding dependence as of the onset of the financial crisis, instead of using the ratio of wholesale funds to total bank assets as an independent variable. A high, medium, or low exposure bank falls into the upper, middle, or lower tercile of the wholesale funding dependence distribution as of 2006:Q4. The low exposure banks are the omitted group in the regression. Panel B redefines the loan sale variable to include partial loan sales, which are identified as any reduction in loan share size. Panel C additionally controls for bank fixed effects and also uses the TED Spread as a continuous measure of stress in wholesale funding markets. The TED Spread is defined as the yearly average of the daily difference between the three month London Interbank Offered Rate (LIBOR) and the three month U.S. Treasury rate. Wholesale funding dependence is measured as of 2002:Q4. Panel D measures all bank characteristics as of 2006:Q4. The unit of observation in each regression is a loan share-bank-year triple. The dependent variable is an indicator variable equal to one if a lender exits a loan syndicate that it was present in during the previous year. All columns include bank and loan controls as well as controls for loan-year fixed effects. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the loan level. ***, **, * denotes 1%, 5%, and 10% statistical significance

Panel A: Ranked Wholesale Funding Dependence

Dependent Variable: Loan Sale$_t$

	All	<250 Lenders	No Amend	2006 Avg.
	[1]	[2]	[3]	[4]
Medium Exposure$_{2006Q4}$	0.008**	0.003	0.005	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
High Exposure$_{2006Q4}$	0.015***	0.014***	0.013**	0.013**
	(0.005)	(0.005)	(0.005)	(0.005)
Bank controls	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y	Y
N	76,621	73,045	46,210	76,621
# Loans	9,564	9,301	7,409	9,564
R^2	0.42	0.41	0.43	0.42

Panel B: Inclusion of Partial Loan Sales

Dependent Variable: Loan Share Decrease$_t$

	All	<250 Lenders	No Amend	2006 Avg.
	[1]	[2]	[3]	[4]
Wholesale Funding$_{2006Q4}$	0.089***	0.096***	0.091***	0.063***
	(0.015)	(0.015)	(0.016)	(0.015)
Bank controls	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y	Y
N	76,621	73,045	46,210	76,625
# Loans	9,564	9,301	7,409	9,564
R^2	0.43	0.43	0.46	0.42

Panel C: Bank Fixed Effects and TED Spread

Dependent Variable: Loan Sale$_t$

	2007-2010	2003-2010			
	All	All	All	All	All
	[1]	[2]	[3]	[4]	[5]
Wholesale Funding$_{2002Q4}$	0.110***	-0.001		-0.020	
	(0.016)	(0.012)		(0.015)	
Wholesale Funding$_{2002Q4}$ × Crisis$_t$		0.097***	0.104***		
		(0.016)	(0.016)		
Wholesale Funding$_{2002Q4}$ × TED$_t$				0.099***	0.100***
				(0.018)	(0.019)
Bank controls	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y
Bank fixed effects	N	N	Y	N	Y
Loan-Year fixed effects	Y	Y	Y	Y	Y
N	71,829	138,096	138,096	138,096	138,096
# Loans	9,564	16,318	16,318	16,318	16,318
R^2	0.43	0.40	0.44	0.40	0.44

Panel D: Alternative Timing for Measurement of Bank Characteristics

Dependent Variable: Loan Sale$_t$

	All	<250 Lenders	No Amend	2006 Avg.	Deposits 2006Q4
	[1]	[2]	[3]	[4]	[5]
Wholesale Funding$_{2006Q4}$	0.065***	0.058***	0.068***	0.039***	-0.020*
	(0.015)	(0.015)	(0.016)	(0.014)	(0.011)
Net Charge Offs$_{2006Q4}$	-15.900	4.005	-2.215	-32.290	5.440
	(12.910)	(12.500)	(11.690)	(19.860)	(11.700)
NPL Ratio$_{2006Q4}$	0.310	0.516*	-0.395	0.161	0.389
	(0.291)	(0.289)	(0.297)	(0.423)	(0.276)
Real Estate Loan Share$_{2006Q4}$	-0.004	-0.010	-0.038***	-0.016	-0.026*
	(0.013)	(0.013)	(0.014)	(0.014)	(0.014)
Capital Ratio$_{2006Q4}$	0.210*	0.058	0.152	0.079	-0.076
	(0.115)	(0.111)	(0.122)	(0.104)	(0.086)
Bank Size$_{2006Q4}$	0.003**	0.003*	0.001	0.005***	0.003***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Large Bank$_{2006Q4}$	-0.045***	-0.046***	-0.034***	-0.050***	-0.045***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Bank Merger$_t$	-0.019**	-0.005	-0.011	-0.0184**	-0.021**
	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)
Bank Merger$_{t-1}$	0.178***	0.188***	0.054***	0.178***	0.171***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)
Agent Bank$_{t-1}$	-0.017***	-0.015***	-0.006**	-0.017***	-0.017***
	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Loan Fraction Held$_{t-1}$	-0.189***	-0.183***	-0.082***	-0.188***	-0.189***
	(0.020)	(0.020)	(0.017)	(0.020)	(0.019)
Loan-Year fixed effects	Y	Y	Y	Y	Y
N	76,621	73,045	46,210	76,621	79,766
# Loans	9,564	9,301	7,409	9,564	9,585
R^2	0.42	0.41	0.43	0.44	0.41

Table X
Wholesale Funding Dependence and Loan Share Trades

The table reports the average wholesale funding dependence of buyers and sellers of loan shares during the period from 2003 until 2010. Panel A examines loan transactions in the period from 2003 until 2006. Panels B examines the period from 2007 until 2010. Panel C examines the year 2008 only. Unmatched bank trades include all buy and sell transactions by banks. Matched bank-bank trades restricts the set of transactions to those where, in a given year and syndicate, one bank exits the syndicate and exactly one other bank enters and holds a loan share of the same size. A transaction is classified as a loan share sale whenever a bank that was in the syndicate last year is not present this year and similarly for a loan share buy. "Pure Trades Only" further restricts the sample to exclude transactions in years where the loan contract is amended. Each cell shows the average wholesale funding dependence of the banks engaged in a loan share transaction either as sellers or buyers. A simple average is taken across loan transactions. The number of loan transactions (N) is indicated. The difference in the mean wholesale funding dependence for each transaction type is indicated. The t-value from an independent two-sample test with equal variances are shown below in parentheses. ***, **, * Denotes 1%, 5%, and 10% statistical significance.

Panel A: 2003-2006 Before Crisis Period

	Unmatched Bank Trades			Matched Bank-Bank Trades		
	Sellers	Buyers	Diff. [t-value]	Sellers	Buyers	Diff. [t-value]
	[1]	[2]	[3]	[4]	[5]	[6]
Sample: All Trades						
Wholesale Funding$_{2002Q4}$	0.349	0.372	-0.023*** [-9.04]	0.354	0.340	0.014 [1.35]
N	4,363	5,556		255	255	
Sample: Pure Trades Only						
Wholesale Funding$_{2002Q4}$	0.359	0.399	-0.041*** [-7.33]	0.348	0.340	0.009 [0.63]
N	1,056	1,150		143	143	

Panel B: 2007-2010 Crisis Period

	Unmatched Bank Trades			Matched Bank-Bank Trades		
	Sellers	Buyers	Diff. [t-value]	Sellers	Buyers	Diff. [t-value]
	[1]	[2]	[3]	[4]	[5]	[6]
Sample: All Trades						
Wholesale Funding$_{2006Q4}$	0.395	0.369	0.025*** [8.77]	0.343	0.321	0.022 [1.44]
N	7,075	4,337		145	145	
Sample: Pure Trades Only						
Wholesale Funding$_{2006Q4}$	0.424	0.378	0.047*** [8.50]	0.348	0.327	0.021 [1.02]
N	1,056	1,150		86	86	

Panel C: 2008 Only

	Unmatched Bank Trades			Matched Bank-Bank Trades		
	Sellers	Buyers	Diff. [t-value]	Sellers	Buyers	Diff. [t-value]
	[1]	[2]	[3]	[4]	[5]	[6]
Sample: All Trades						
Wholesale Funding$_{2006Q4}$	0.432	0.352	0.079*** [15.36]	0.359	0.277	0.082*** [3.36]
N	1,664	1,272		48	48	
Sample: Pure Trades Only						
Wholesale Funding$_{2006Q4}$	0.452	0.360	0.092*** [10.18]	0.374	0.296	0.078** [2.29]
N	703	391		28	28	

Table XI
Loan losses, Insolvency, and Loan Sales During 2007-2010

The regressions in this table examine the impact of wholesale funding dependence and loan losses on bank loan sales during the crisis period. Panel A examines the impact of non performing loans, loan charge offs, and participation in the Troubled Asset Relief Program (TARP) on loan sales. Panel B examines the relationship between liquidity management, TARP, and loan sales. Panel C examines the relationship between loan losses and loan sales before the crisis. The unit of observation in each regression is a loan share-bank-year triple. The dependent variable is an indicator variable equal to one if a lender exits a loan syndicate that it was present in during the previous year. Wholesale Funding is measured as of 2006Q4. Liquid Assets is the ratio of cash and short-term investments to total bank assets. All columns include controls for loan-year fixed effects, bank controls, and loan controls (defined in Table VII). All columns use the full sample available. All variables are defined in Appendix A. Standard errors (in parentheses) are clustered at the loan level. ***, **, * denotes 1%, 5%, and 10% statistical significance

Panel A: Loan Losses and Bank Loan Sales

Dependent Variable: Loan Sale$_t$

	All	All	All	All	All	All	All	All
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
NPL Ratio$_{2006Q4}$	-0.074		-0.0749	-0.280				
	(0.290)		(0.290)	(0.291)				
Net Charge Offs$_{2006Q4}$		5.639	5.659	9.814				
		(10.55)	(10.54)	(10.56)				
NPL Ratio$_{t-1}$					0.257***		0.293**	0.228*
					(0.129)		(0.128)	(0.129)
Net Charge Offs$_{t-1}$						20.62***	20.87***	15.08***
						(2.860)	(2.857)	(2.972)
TARP/Assets$_{t-1}$				2.207***				1.800***
				(0.242)				(0.250)
Bank controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
N	79,766	79,766	79,766	79,766	81,011	81,011	81,011	81,011
# Loans	9,585	9,585	9,585	9,585	9,599	9,599	9,599	9,599
R^2	0.41	0.41	0.41	0.42	0.41	0.41	0.41	0.41

Panel B: TARP and Liquidity Risk Management

Dependent Variable: Loan Sale$_t$

	All	All	All	All
	[1]	[2]	[3]	[4]
Wholesale Funding$_{2006Q4}$	0.076***	0.073***		
	(0.013)	(0.013)		
Total Deposits$_{2006Q4}$			-0.020	-0.027**
			(0.013)	(0.013)
TARP/Assets$_{t-1}$		1.776***		1.919***
		(0.257)		(0.255)
Bank controls	Y	Y	Y	Y
Loan controls	Y	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y	Y
N	76,621	76,621	79,766	79,766
# Loans	9,564	9,564	9,585	9,585
R^2	0.42	0.42	0.41	0.42

Panel C: Losses and Loan Sales During 2003-2006

Dependent Variable: Loan Sale$_t$

	2003-2006	2004-2006	
	All	All	All
	[1]	[2]	[3]
NPL Ratio$_{2002Q4}$	1.401***		
	(0.246)		
NPL Ratio$_{2003Q4}$			-0.747**
			(0.309)
Net Charge Offs$_{2003Q4}$		154.5***	156.2***
		(54.88)	(54.63)
Real Estate Loan Share$_{t-1}$	0.018	-0.024*	-0.032**
	(0.012)	(0.012)	(0.013)
Capital Ratio$_{t-1}$	-0.877***	-1.557***	-1.587***
	(0.120)	(0.154)	(0.155)
Bank Size$_{t-1}$	-0.016***	-0.014***	-0.013***
	(0.002)	(0.002)	(0.002)
Large Bank$_{t-1}$	0.006	0.008	0.008
	(0.005)	(0.007)	(0.007)
Bank merger controls	Y	Y	Y
Loan controls	Y	Y	Y
Loan-Year fixed effects	Y	Y	Y
N	66,320	47,758	47,758
# Loans	9,612	7,286	7,286
R^2	0.36	0.35	0.35

Appendix A: Variable Definitions

This appendix presents the definitions for the variables used throughout the paper.

Panel A: Loan Level Variables

Variable	Definition	Source
Loan Sale	Indicator variable equal to one if bank exits syndicate that it participated in last year that continues to exist in the current year	SNC
Loan Share Decrease	Indicator variable equal to one if bank decreases share of syndicate that it participated in last year that continues to exist in the current year	SNC
Agent Dummy	Indicator variable equal to one if SNC identifies lender as administrative agent	SNC
Loan Fraction Held	Fraction of total outstanding loan commitment held by syndicate member	SNC

Panel B: Bank Level Variables

Variable	Definition	Source
Wholesale Funding	Sum of large time deposits, foreign deposits, repo sold, other borrowed money, subordinated debt, and fed funds purchased divided by total assets	Y-9C
Total Deposits	Total deposits divided by total assets	Y-9C
Liquid Assets	Sum of cash, fed funds sold, repo bought, and securities (excluding mortgage- and asset-backed securities) divided by total assets	Y-9C
NPL Ratio	Non performing loans divided by total loans	Y-9C
Net Charge Offs	Charge offs net of recoveries divided by total assets	Y-9C
Real Estate Loan Share	Real estate loans divided by total loans	Y-9C
Capital Ratio	Book capital divided by total assets	Y-9C
Bank Size	Natural logarithm of total assets	Y-9C
Large Bank	Indicator variable equal to one if total assets greater than $50bn	Y-9C
Merger Dummy	Indicator variable equal to one if lender top holder ID changes in current year	SNC
TARP/Assets	Funds extended under Troubled Asset Relief Program divided by total assets	Treasury