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ABSTRACT

This paper shows that new loans to large borrowers fell by 47% during the peak period of the financial crisis (fourth quarter of 2008) relative to the prior quarter and by 79% relative to the peak of the credit boom (second quarter of 2007). New lending for real investment (such as working capital and capital expenditures) fell by only 14% in the last quarter of 2008, but contracted nearly as much as new lending for restructuring (LBOs, M&As, share repurchases) relative to the peak of the credit boom. After the failure of Lehman Brothers in September 2008, there was a run by short-term bank creditors, making it difficult for banks to roll over their short term debt. We find that there was a simultaneous run by borrowers who drew down their credit lines, leading to a spike in commercial and industrial loans reported on bank balance sheets. We examine whether these two stresses on bank liquidity led them to cut lending. In particular, we show that banks cut their lending less if they had better access to deposit financing and thus, they were not as reliant on short-term debt. We also show that banks that were more vulnerable to credit-line drawdowns because they co-syndicated more of their credit lines with Lehman Brothers reduced their lending to a greater extent.

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1. Introduction

The banking panic in the fall of 2008 threw economies around the world into severe recession. The seeds of this panic were sown in the credit boom that peaked in mid-2007, followed by the meltdown of subprime mortgages and all types of securitized products. This meltdown, in turn, raised concerns about the solvency and liquidity of

financial institutions, becoming a full-blown banking panic following the failures of Lehman Brothers and Washington Mutual, and government takeovers of Fannie Mae, Freddie Mac, and AIG. Although the panic subsided in the first half of October after a variety of government actions to promote the liquidity and solvency of the financial sector, the prices of most asset classes and commodities fell drastically, the cost of corporate and bank borrowing rose substantially, and financial market volatility rose to levels that have rarely, if ever, been seen.

The goal of this paper is to understand the effect of the banking panic on the supply of credit to the corporate sector. Towards this end, we examine data on syndicated loans—bank loans in which a lead bank “originates” a loan and lines up other financial institutions to share a portion of the loan. This market has evolved over the last 30 years as the main vehicle through which banks lend to large corporations. Importantly, it also includes other non-bank financial institutions—investment banks such

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as Goldman Sachs and finance companies such as GE Capital—as well as institutional investors such as collateralized loan obligations (CLOs), hedge funds, mutual funds, insurance companies, and pension funds. Thus, the syndicated loan market is part of the “shadow banking” system that has developed over the last three decades (Gorton, 2009).

We begin by showing that syndicated lending started to fall in mid-2007, with the fall accelerating during the banking panic that began in September 2008. Lending volume in the fourth quarter of 2008 (2008:Q4) was 47% lower than it was in the prior quarter and 79% lower than at the peak of the credit boom (2007:Q2). Lending fell across all types of loans: investment grade and non-investment grade; term loans and credit lines; and those used for corporate restructuring as well as those used for general corporate purposes and working capital.

While syndicated lending fell, commercial and industrial (C&I) loans reported on the aggregate balance sheet of the U.S. banking sector actually rose by about \$100 billion from September to mid-October 2008, from a base of about \$1.5 trillion (Chari, Christiano, and Kehoe, 2008). However, we show that this increase was not driven by an increase in new loans, but rather by an increase in drawdowns by corporate borrowers on *existing* credit lines (prior commitments by banks to lend to corporations at prespecified rates and up to prespecified limits). From news accounts alone, we are able to record \$26.8 billion of credit-line drawdowns, which accounts for approximately 25% of the increase in C&I loans reported on bank balance sheets. In almost all instances, firms state that they drew on their credit lines to ensure that they had access to funds at a time when there was widespread concern about the solvency and liquidity of the banking sector. For example, Dana Corporation, a large vehicle parts manufacturer, describes its decision to draw on its credit line as “Ensuring access to our liquidity to the fullest extent possible at a time of ambiguity in the capital markets.”¹

These credit-line drawdowns were part of the “run” on banks that occurred at the height of the crisis. Unlike old-style bank runs, instigated by uninsured depositors when there was no deposit insurance, this bank run was instigated by short-term creditors, counterparties, and borrowers who were concerned about the liquidity and solvency of the banking sector.² Unsecured commercial paper holders refused to roll over their debt, while repo lenders and trading counterparties required more collateral to back their loans and trades, all of which drained liquidity from the system (Brunnermeier, 2009; Gorton, 2009). Borrowers who drew on their credit lines were also part of this run and also reduced the liquidity of the banking sector.

This paper examines the effect of this bank run on lending. Towards this end, we exploit variation in the structure of banks’ liabilities to identify banks that were more vulnerable to the run. We focus on two factors: the

extent to which a bank is financed by short-term debt rather than insured deposits, and its exposure to credit-line drawdowns.

We first establish that banks with more deposit financing cut their syndicated lending by less than did banks without as much access to this, more stable, source of funding. A bank with the median deposits-to-assets ratio reduced its monthly number of loan originations by 36% in the period between August and December of 2008, relative to the prior year. However, a bank with a deposits-to-assets ratio one standard deviation below the mean reduced its loan originations by 49%, while a bank with deposits ratio one standard deviation above the mean reduced its loan originations lending by only 21%. Given the history of bank runs driven by panicked withdrawals of demand deposits, it is ironic that banks with *more* deposits (though most of them now insured) were less adversely affected by the banking crisis.

Our second focus is on the effect of credit-line drawdowns or the threat of such drawdowns on new syndicated lending. Unfortunately, we do not directly observe credit-line drawdowns. The analysis is further complicated by the fact that banks that extend more credit lines are more prone to fund themselves with deposits. This has been shown in the theoretical and empirical work of Kashyap, Rajan, and Stein (2002) and Gatev and Strahan (2006). Thus, banks at greater risk of credit-line drawdowns are at less risk of a run by short-term creditors. This makes it difficult to identify an independent effect of credit-line drawdowns. Our approach is to examine the effect of *unexpected* credit-line drawdowns. In particular, we argue that banks that co-syndicated credit lines with Lehman Brothers were more likely to experience larger credit-line drawdowns after the Lehman failure. Commitments that would have been met by Lehman would then have to be met by other members of the syndicate, and credit lines with Lehman in the syndicate would be more likely to be drawn down. Indeed, we show that banks that co-syndicated a larger fraction of their credit lines with Lehman reduced their lending more. Interestingly, we do not find a bigger reduction in lending if a bank co-syndicated more term loans with Lehman, suggesting that it is the drawdowns or the threat of such drawdowns that drives the effect, not the relationship with Lehman, *per se*.

These findings are consistent with a decline in the supply of funding as a result of the bank run. At the same time, however, the recession—which the National Bureau of Economic Research dates to December 2007—as well as the prospect of an even deeper recession as the crisis erupted, also likely reduced the *demand* for credit. While such a decline in demand could explain the overall drop in lending during the crisis, it must also explain why more vulnerable banks cut lending more than others. One possibility is that these banks tend to lend to firms whose loan demand fell more during the crisis. For example, investment banks, which do not fund with deposits, may do more lending for acquisitions. If the demand for such financing fell more during the crisis, then our finding would be the result of a shock to demand rather than supply. However, we find that the result continues to hold

¹ Dana Holding Corp. 8-K report, 2 October 2008.

² Short-term debt includes repos. See Gorton and Metrick (2009) for their description of a “run on repos” during the crisis.

for commercial banks and for loans not used for acquisitions. This is one of a number of possible alternative explanations that we explore. And while we present evidence that is inconsistent with these alternative explanations, we cannot prove that the supply shock is uncorrelated with loan demand.

This paper is organized as follows. Section 2 briefly describes the data. Section 3 presents the basic facts about aggregate bank lending for a variety of loan types, and it shows the importance of credit-line drawdowns. Section 4 presents the cross-sectional regressions and Section 5 concludes.

2. Data

The data for our analysis come from Reuters' DealScan database of large bank loans.³ Almost all these loans are syndicated, i.e., originated by one or more banks (both commercial and investment banks) and sold to a syndicate of banks and other investors, notably collateralized debt obligations (CDOs), as well as hedge funds, insurance companies, mutual funds, and pension funds. The mean size of the loans between 2000 and 2006 was \$467 million, the median was \$185 million, and 90% were larger than \$20 million. Borrowers had mean sales of \$3.2 billion and median sales of \$0.5 billion.

The coverage of DealScan data differs from coverage of C&I loans reported by the Federal Reserve Board of Governors (FRB) in two main ways. First, DealScan primarily covers syndicated loans, while the FRB data also include non-syndicated loans. Second, DealScan reports total loan issuance regardless of the ultimate holder of the loan (including investment banks, foreign banks, and non-banks), while the FRB data only report C&I loans on the balance sheet of regulated banks.⁴ Thus, there is an overlap between the FRB and DealScan data, but each data set captures only a subset of U.S. corporate loans. While we do not have data on small non-syndicated loans, the loans in our sample account for a large share of outstanding bank loans. In fact, if we aggregate the loans in our sample, the estimated value of the outstanding loans in our sample exceeds the value of C&I loans on commercial bank balance sheets.⁵

³ An earlier version of this paper included an adjustment for the reporting delay in the DealScan data. However, we overstated the reporting delay. We were able to confirm claims by DealScan that the reporting lag is insignificant by downloading data at different points and verifying that there was no appreciable difference in the data included in the database. Thus, we no longer adjust for the insignificant reporting delay.

⁴ According to data from the Shared National Credit (SNC) Program (www.federalreserve.gov/newsevents/press/bcreg/20081008a.htm), in 2007, nearly 58% of the overall commitments were backed by non-bank financial institutions. However, with the exception of finance companies, non-bank financial institutions do not originate loans.

⁵ Data from the SNC Program of the Federal Reserve Board are useful in reconciling FRB and DealScan data. The SNC Program provides annual data for syndicated loans of \$20 million or more that are held by three or more federally supervised institutions (approximately 95% of our DealScan sample). These data give us information about the stock of syndicated loans and their distribution among financial institutions. According to the SNC Program, in 2007, the total amount of C&I

In addition to these coverage differences, the two data sets differ in that the FRB C&I loans data are a balance sheet (stock) measure, while DealScan data are a flow measure of new loan issuance. We will see that a major deficiency of the FRB balance sheet measure is that it makes it difficult to distinguish new lending from drawdowns on existing loan commitments. At the same time, DealScan's new loan issuance data can be misleading. For example, there could be a drop in loan issuance simply because of a fall in refinancing activity, which had risen to high levels as interest rates fell during the credit boom as firms locked in low rates on longer maturity loans. We address these concerns after presenting the basic facts.

3. Basic facts

Panel A of Fig. 1 graphs the quarterly dollar volume of loan issues from 2000 through 2008. Because there appears to be a seasonal component to syndicated lending—with a marked increase in lending in the second quarter of each year—we also graph a seasonally adjusted series.⁶ Panel B of Fig. 1 graphs the quarterly dollar amount and number of loan issues for 2007 and 2008, where we index both series to the first quarter of 2007. Not surprisingly, both series track each other quite closely.

Fact 1. New lending in 2008 was significantly below new lending in 2007, even before the banking panic in the fourth quarter of 2008.

As can be seen easily from both panels of Fig. 1, new lending to large corporate borrowers peaked in the second quarter of 2007. In the summer of 2007, concerns about the credit risk of all types of CDOs led to a drop in demand for syndicated loans, many of which were securitized and placed in CLOs. By the first quarter of 2008, the dollar volume of lending was 64% lower than it was in the peak quarter of the credit boom, and the number of loans was 42% lower. Over the same period, the dollar volume of lending to financial services firms contracted by 32%, indicating that the contraction in credit was not just because of concerns about the credit quality of financial institutions.

Fact 2. The decline in new loans accelerated during the banking panic. In the fourth quarter of 2008, the dollar volume of lending was 47% lower than it was in the prior quarter and the number of issues was 33% lower than it was in the prior quarter.

(footnote continued)

syndicated loans on the balance sheets of commercial banks operating in the U.S. was \$378.3 billion, which implies that syndicated loans account for at least 26% of the total C&I loans as reported by the FRB (\$1437.2 billion). Note that syndicated loans are primarily originated and held by large banks (the minimum fraction of the loan for sale is typically \$5 million). Thus, syndicated loans account for approximately 36% of the C&I loans on the balance sheets of large and foreign banks (\$1041.9 billion).

⁶ We follow the basic procedure for seasonal adjustment outlined by Robert Nau (www.duke.edu/~rnau/411outbd.htm).

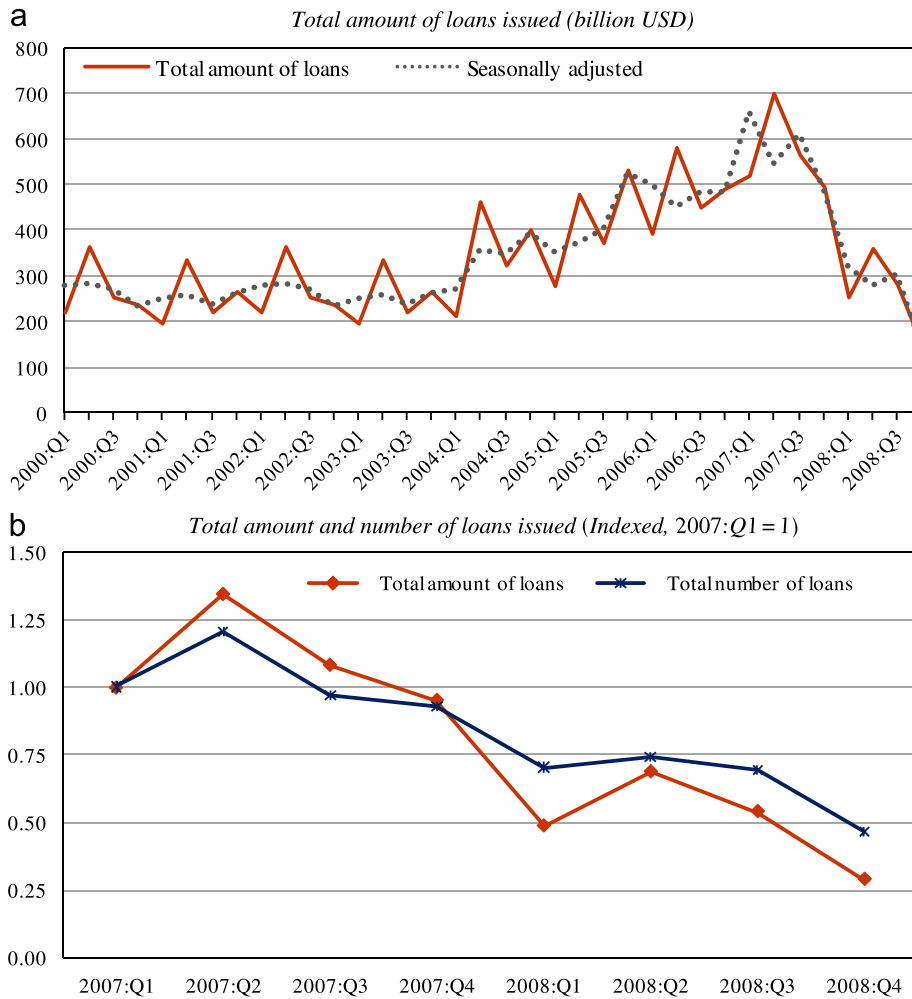


Fig. 1. Total loan issuance, U.S. corporate loans. The graph is compiled from the DealScan database of loan originations. Panel A: Total amount of loans issued (billion USD); Panel B: Total amount and number of loans issued (Indexed, 2007:Q1=1).

The dollar volume of bank loans fell from \$701.5 billion in 2007:Q2, the peak of the credit boom, to \$281.4 billion in 2008:Q3, and then to \$150.2 billion three months later in 2008:Q4. The drop in October 2008 was particularly steep. The dollar volume of lending during the peak financial crisis period was less than one-fourth of its level 18 months earlier. The number of issues was less than one-third its peak level. In real terms, lending in 2008:Q4 was less than half the rate of lending during the recession of 2001.

While this decrease in lending could result from the contraction in loan supply or demand, it is also possible that it stems from increase in loan maturity, the rate of refinancing (Roberts and Sufi, 2009), or both. In particular, if firms extended the maturity of their loans at the peak of the credit boom, there would be a decrease in the loans that mature during the crisis and, as a result, we would see less lending activity. In addition, if firms were more prone to refinance their loans during the credit boom, say, because interest rates were low and covenants were weak, there would also be a decrease in new loan issuance

during the following quarters. We investigate both of these possibilities and find that while both of these factors contributed to the contraction in credit, they do not explain our findings. First, we find that the amount of loans that expire in any given quarter stays relatively constant from the second half of 2005 through the period of our analysis. Thus, the decrease in new lending during the crisis is unlikely to be driven by a decrease in loans that become due during that time.⁷ Second, if we simply exclude refinancing of existing loans, we still observe the same basic pattern in the contraction of new loan issuance.

Table 1 breaks out the data by the use of loan proceeds. A large portion of the loans were used for corporate restructuring—leveraged buyouts (LBOs), mergers and

⁷ It is possible that a loan was modified by extending its maturity through a loan amendment and not through a new loan contract. However, such extensions are typically short-term and most of the maturity extensions are done through new loan contracts and are reported in DealScan as such.

Table 1

Total loan issuance by loan purpose, U.S. corporate loans (billion USD).
Compiled from the DealScan database of loan originations.

| | Corp. purposes | Work. capital | CP backup | LBO/M&A | Recap. | Debtor-in-poss. | Exit financing | Project finance | Real estate | Other | Total |
|---------|----------------|---------------|-----------|---------|--------|-----------------|----------------|-----------------|-------------|-------|--------|
| 2005:Q1 | 137.57 | 36.88 | 19.57 | 41.03 | 21.49 | 5.61 | 7.08 | 0.22 | 8.75 | 0.55 | 278.73 |
| 2005:Q2 | 246.84 | 55.47 | 46.54 | 63.44 | 40.50 | 1.36 | 9.35 | 1.48 | 13.13 | 2.83 | 480.94 |
| 2005:Q3 | 177.23 | 49.78 | 26.88 | 56.28 | 36.14 | 2.03 | 5.05 | 1.19 | 14.90 | 2.58 | 372.07 |
| 2005:Q4 | 228.76 | 73.21 | 23.64 | 140.83 | 25.20 | 1.68 | 19.73 | 0.21 | 15.17 | 4.45 | 532.87 |
| 2006:Q1 | 76.71 | 56.29 | 11.09 | 209.94 | 17.52 | 4.21 | 5.68 | 0.83 | 12.33 | 0.37 | 394.98 |
| 2006:Q2 | 149.82 | 59.05 | 25.23 | 288.40 | 39.98 | 0.29 | 4.89 | 1.10 | 13.92 | 1.20 | 583.86 |
| 2006:Q3 | 89.29 | 46.91 | 16.90 | 238.97 | 17.08 | 1.46 | 11.47 | 12.79 | 13.06 | 0.74 | 448.67 |
| 2006:Q4 | 135.34 | 38.70 | 23.80 | 233.90 | 29.20 | 1.19 | 10.72 | 1.54 | 15.53 | 0.96 | 490.88 |
| 2007:Q1 | 106.46 | 39.08 | 3.24 | 329.34 | 17.73 | 1.73 | 3.83 | 4.14 | 14.68 | 0.00 | 520.22 |
| 2007:Q2 | 177.73 | 53.64 | 10.75 | 357.14 | 47.25 | 0.00 | 19.78 | 15.27 | 19.96 | 0.00 | 701.53 |
| 2007:Q3 | 163.25 | 38.71 | 17.38 | 300.91 | 28.09 | 0.58 | 0.81 | 2.04 | 12.69 | 0.00 | 564.47 |
| 2007:Q4 | 110.36 | 34.35 | 17.96 | 295.90 | 10.50 | 0.84 | 10.79 | 2.04 | 11.29 | 2.36 | 496.37 |
| 2008:Q1 | 65.66 | 39.62 | 2.24 | 109.38 | 2.34 | 1.57 | 16.46 | 6.51 | 9.31 | 0.47 | 253.57 |
| 2008:Q2 | 105.82 | 26.33 | 3.00 | 184.84 | 2.93 | 1.23 | 5.65 | 14.41 | 12.57 | 1.73 | 358.49 |
| 2008:Q3 | 59.89 | 16.49 | 4.08 | 160.43 | 4.01 | 3.70 | 12.04 | 10.26 | 9.50 | 1.03 | 281.44 |
| 2008:Q4 | 51.45 | 14.06 | 0.92 | 64.35 | 1.45 | 2.14 | 3.20 | 6.49 | 4.53 | 1.66 | 150.24 |

acquisitions (M&A), and stock repurchases. In 2007, these types of “restructuring loans” accounted for roughly 61% of all syndicated loans.⁸ Another 31% of loans were used for general corporate purposes or working capital, which we will refer to as “real investment loans.” We make this distinction to examine whether the decline in lending was restricted to restructuring activity, which saw a very large increase in the earlier part of the decade.

Fact 3. In the fourth quarter of 2008, the dollar volume of restructuring loans was 84% below its level at the peak of the credit boom, and the dollar volume of real investment loans was 72% below its level at the peak. Restructuring loans fell by 60% in the fourth quarter of 2008 relative to the prior quarter, while real investment loans fell by only 14%.

Fig. 2 graphs restructuring and real investment loans through time. It is apparent that restructuring loans and real investment loans both experienced significant declines. Although the fall in restructuring loans from the peak of the credit boom was somewhat larger than the fall in real investment loans (84% vs. 72%), it is clear that lending declined not just because LBO and M&A activity had dried up.

Note that while real investment lending exhibits a steady decline, there are quarters in which restructuring loans increase. This is because there are some very large LBOs and mergers that could shift the total amount in any given quarter, and there can be a long lag between an LBO and merger financing commitment and the closing date of the transaction. For example, in October 2006 lenders committed to a \$16 billion loan for the LBO of Harrah’s

Entertainment, one of the largest buyout transactions ever; however, the loan did not close until January 2008 when all the necessary regulatory approvals were finalized. In fact, the number of restructuring deals rather than their dollar value shows a steady decline from 584 deals in 2007:Q2 to 125 in 2008:Q4.

The drastic decline in lending from the peak of the credit boom coincides with a significant decline in the participation of institutional investors in the syndicated loan market. Indeed, the growth of the syndicated loan market earlier in the decade is largely explained by the influx of institutional investors—collateralized loan obligations (CLOs), hedge funds, mutual funds, insurance companies, and pension funds. It is thus worth considering whether the decline in lending during the crisis is more than just a drop in institutional participation. In other words, did banks play some role in the decline in loan activity? One way to address this question is to break out the data into investment-grade and non-investment grade loans as institutional investors put most of their funds in non-investment grade loans (Loan Syndications and Trading Association, 2007; Ivashina and Sun, 2008).

Fact 4. In the fourth quarter of 2008, investment-grade lending was 77% less than its level at the peak of the credit boom, and non-investment grade lending was 91% below the peak. Investment-grade lending fell by 22% in the fourth quarter of 2008 relative to the prior quarter, while non-investment grade lending fell by 75%.

Fig. 3 graphs dollar volume of new issues of investment-grade and non-investment grade loans. This figure is based on the sample where ratings are available. Both types of lending fell dramatically from the peak of the credit boom. The decline in investment-grade lending cannot be explained by the contraction in institutional funding because institutional investors were not a large part of this market. Moreover, the steep decline in non-investment grade lending in 2008:Q4 is also unlikely to be

⁸ DealScan reports the purpose of the loan; however, these descriptions can be inaccurate. By reading through deal purpose remarks reported in DealScan and combining it with SDC data on mergers and acquisitions, we were able to reclassify over 20 of the loans from general corporate purpose to restructuring loans.

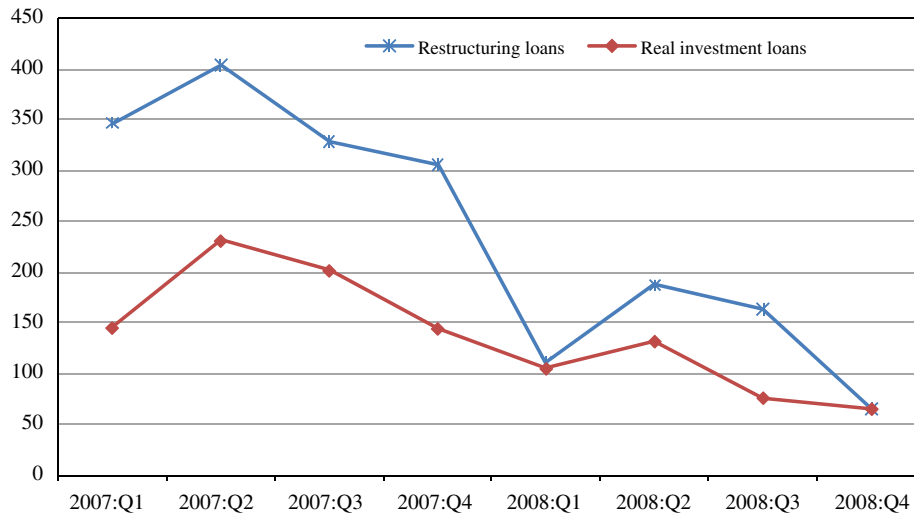


Fig. 2. Real investment loans vs. restructuring loans (billion USD). The graph is compiled from the DealScan database of loan originations. Real investment loans are defined as those that are intended for general corporate purposes, capital expenditure, or working capital. Restructuring loans are defined as those that are intended for leveraged buyouts, mergers and acquisitions, or share repurchases.

associated with the contraction in institutional funding since these investors—mainly CLOs which at the peak accounted for roughly two-thirds of the market—had already substantially retrenched by the end of 2007.⁹ Instead, the near disappearance of non-investment grade issues was part of an overall flight to quality, an extreme version of what is typically observed in recessions (Bernanke, Gertler, and Gilchrist, 1996).

Fact 5. In the fourth quarter of 2008, new issues of credit-lines facilities and term loans both declined, but the decline in term loans (67%) was larger than the decline in credit lines (27%).

Fig. 4 breaks out the sample into term loans and credit lines. These credit-line facilities allow firms to borrow up to a certain amount at a pre-set interest rate (usually a spread over the LIBOR). For this right, the firm pays an additional annual fee on all unused portions of the loan. Credit lines are traditionally funded by banks.

Here, too, term loans and revolving credit facilities track each other. One can see a big drop in 2008 relative to 2007, leading to the low point in the last quarter of 2008. The decline in credit lines with a maturity greater than one year was even larger. These facilities, which comprise a large portion of originations, require banks to hold more regulatory capital than do facilities with a maturity of less than one year. Thus, it is not surprising that there has been a bigger drop in the longer term facilities.

The decline in credit lines also suggests that the decline in lending was not just attributable to a decline in institutional participation in syndicated loans since banks are the main lenders for unfunded credit lines.

As noted in the introduction, despite the apparent decline in syndicated lending during the crisis, there was a sharp increase in C&I loans on the aggregate balance sheet of U.S. banks in the four weeks after the failure of Lehman Brothers (Chari, Christiano, and Kehoe, 2008). Fig. 5 shows this graphically.

To reconcile the decline in syndicated lending with the increase in loans on banks' balance sheets, we note the following identity:

$$\text{Outstanding Loans}_t = \text{Outstanding Loans}_{t-1} + \text{New Loans}_t + \text{Drawdowns}_t - \text{Loan Retirements}_t.$$

Thus, outstanding loans increase if the sum of new loans and credit-line drawdowns exceeds loan retirements. Since our data suggest that new loans decreased, this means that there was either an increase in drawdowns or a decrease in loan retirements.¹⁰

Loan retirements: Firms may choose to retire debt early with excess cash flow or a stock issue. In fact, in many LBOs, there are explicit plans to pay down debt early with excess cash flow. Though we have no direct evidence of a reduction in loan retirements, it would not be surprising if firms increasingly chose not to repay debt early. This would be the case for LBOs that are running into trouble, firms that want the security of having more cash on their balance sheets, or those that are reluctant to repay debt by issuing equity in a down market. The flip side of a reduction in loan retirements is an increase in loan rollovers. Some bank debt used to finance LBOs had "PIK toggles," which allowed firms to increase principal outstanding on the loan in lieu of paying cash interest (i.e., to

⁹ According to IFR Markets, there were \$1.5 billion of new CLOs originated in the last quarter of 2007 in the U.S. as compared to \$8.6 billion of new CLOs originated just in the month of June of the same year.

¹⁰ Increase in C&I loans cannot be explained by the entry of Washington Mutual (WaMu) assets and liabilities into the FRB statistics. WaMu was a thrift before it was acquired by Chase, and therefore, was not part of the statistics reported by FRB. However, the effect of this merger on C&I loans series was minimal because WaMu had only \$1.9 billion of C&I loans as of 2008:Q2.

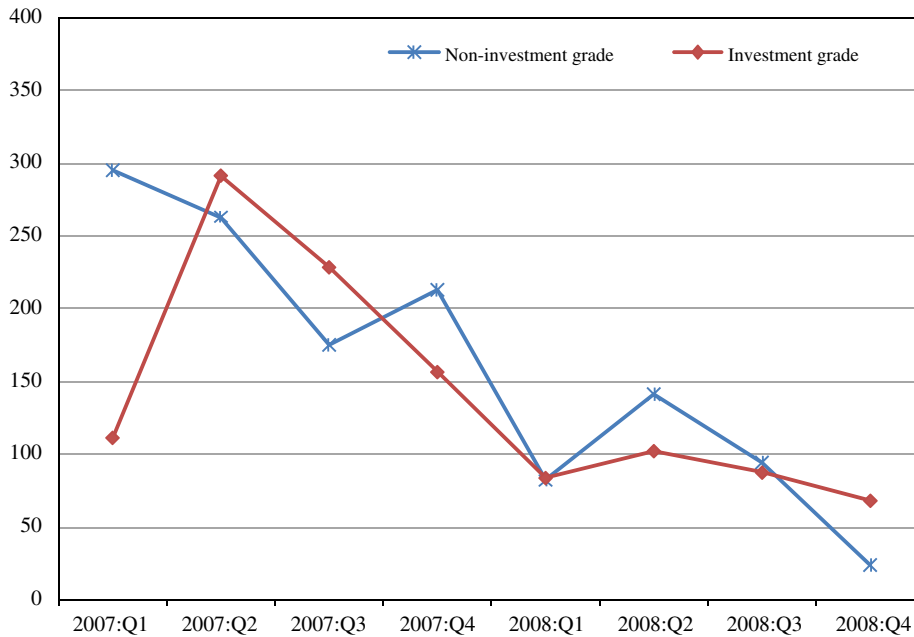


Fig. 3. Total loan issuance, by corporate rating (billion USD). The graph is compiled from the DealScan database of loan originations. This figure is based on a subsample of loans for which credit ratings are available.

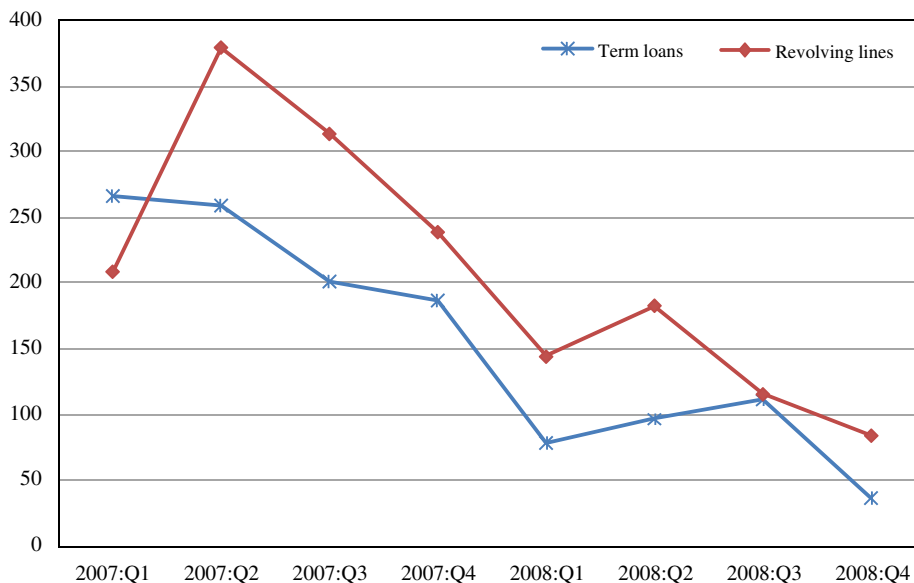


Fig. 4. Total issuance of revolving credit facilities vs. term loans (billion USD). The graph is compiled from the DealScan database of loan originations.

choose “payment-in-kind” interest). In July 2008, Harrah’s Entertainment opted for the toggle on its \$1.4 billion bank loan, as have a number of other firms. This would show up as an increase in loans outstanding.

Credit-lines drawdowns: Drawdowns of existing credit lines would not count as new loans in our data, but would count as additional C&I loans on the balance sheets of U.S. banks.

While we do not have comprehensive data on credit-line drawdowns, there is clear indication from the FRB’s Shared National Credit (SNC) Program data, from the FRB’s Survey of Terms of Business Lending, and from news reports that firms increased their drawdowns in response to growing concerns about their access to credit.

According to data from the FRB’s SNC Program, in 2008, the fraction of unused credit lines as a percentage of

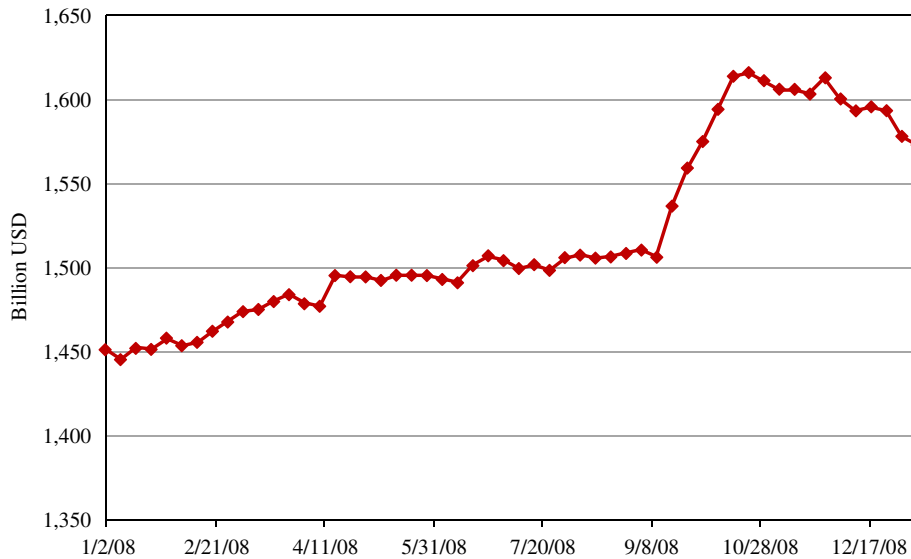


Fig. 5. Commercial and industrial bank credit (billion USD). The graph is compiled from the Federal Reserve Statistical Release of Assets and Liabilities of Commercial Banks in the United States. The numbers correspond to all commercial banks in United States, not seasonally adjusted.

total loans committed by banks dropped by 9 percentage points as compared to the historic average. Given the outstanding amount of credit lines, this implies that an additional \$119 billion could have been drawn from unused credit lines, an amount which is close to the \$100 billion increase in C&I loans after the failure of Lehman Brothers.

A similar story emerges from the Survey of Terms of Business Lending, which reports flow lending data for the first week of the second month of each calendar quarter. The amount drawn on credit lines in the first week of November 2008 was \$13.6 billion larger than it was three months earlier. Prorating this number across the quarter implies drawdowns well in excess of the increase in C&I loans on bank balance sheets.

Finally, Table 2 lists 34 credit-line drawdowns reported between mid-August and December 2008. These announcements were found in Factiva or Reuters using search words (“draw” or “tap”) and (“revolver” or “RC” or “commitment” or “credit” or “loan”). There were no equivalent announcements in the prior three-month period, which suggests that there was an increase in drawdowns. The drawdowns identified in this search totaled \$26.8 billion, 24% of the increase in the C&I loans on the aggregate bank balance sheet. Note that, unlike data from SNC Program or Survey of Terms of Business Lending, drawdowns collected from news reports are not directly comparable to C&I loans reported by the FRB both because we do not observe all drawdowns and because some of these credit lines are funded by non-banks.

Interestingly, 20 of the 30 rated companies in the sample were below investment grade at the end of 2008. At the time of the drawdowns, the mean credit default swap (CDS) spread for 29 of the companies for which data were available was 1,509 basis points and the median was 1,007 basis points, indicating high default probabilities. Despite these high CDS spreads, 13 of the 20 firms with

below investment-grade rating were able to draw down and pay interest rates that were below prevailing rates for non-investment grade debt (LIBOR+270 basis points for BB credit rating). Although violation of covenants in the loan agreement could prevent a firm from drawing down its credit line (Sufi, 2009), many of the loans originated in the prior two years were “covenant-lite”; they had loose covenants, which would not prevent them from drawing down their credit lines as their financial condition worsened.¹¹

It is instructive to note the reasons firms give for why they draw on their credit lines. In 20 cases, firms state that they drew on the credit line to enhance their liquidity and financial flexibility during the credit crisis. For example, in an 8-K filing with the SEC, the Tribune Company notes that it “is borrowing under the revolving credit facility to increase its cash position to preserve its financial flexibility in light of the current uncertainty in the credit markets.” While Tribune’s bankruptcy filing in December of 2008 and the credit problems of the other firms listed in Table 2 make clear that financial market turmoil was not the only reason for an increase in drawdowns, it is likely that a combination of firm-specific credit problems and market-wide financial instability led to an acceleration of drawdowns.

¹¹ A typical loan contract also includes a Material Adverse Change (MAC) provision that allows the lender to terminate the loan agreement if the borrower has *material* changes in its financial condition. These provisions explicitly exclude adverse changes in general economic conditions, financial markets, or industry-wide performance. Since a material adverse change is subject to interpretation, invoking it often leads to litigation. Thus, although the financial condition of many of the firms deteriorated, apparently the deterioration was not enough for banks to invoke the MAC provision and risk litigation. Note that banks cannot invoke a MAC provision because their own financial condition makes it difficult for them to fund the loan; the MAC clause relates to the health of the borrower, not the lender.

Table 2

Revolving lines drawdowns, U.S. corporate loans (billion USD).

Compiled from SEC filings and Reuters.

| Date drawn | Company | Credit rating (12/31/08) | Amount drawn (\$MM) | Credit line (\$MM) | Maturity | Spread (Undrawn/Drawn) | Lead bank | Comment (SEC filings) |
|------------|---|--------------------------|---------------------|--------------------|----------|------------------------|--------------|---|
| 8/25/2008 | Delta Air Lines | BB- /Ba2 | 1,000 | 1,000 | 2012 | 50/L+200 | JPM | Simply put, we have taken this action to increase our cash balance as we approach the closing of the merger. We believe this will provide us with the utmost in flexibility—at minimal cost—as we prepare for this critical transition. |
| Sep-2008 | Marriott | BBB+ /Baa2 | 908 | 2,500 | 2012 | 8/L+35 | Citi | Shrinking liquidity in the commercial paper market. |
| 9/15/2008 | FairPoint Communications | BB+ /Ba3 | 200 | 200 | 2014 | 37.5/L+275 | Lehman | The Company believes that these actions were necessary to preserve its access to capital due to Lehman Brothers' level of participation in the Company's debt facilities and the uncertainty surrounding both that firm and the financial markets in general. |
| 9/16/2008 | International Lease Finance Corporation | AA- /A1 | 6,500 | 6,500 | 2009-11 | 10/L+25 | Citi | ILFC drew on its unsecured revolving credit facilities to provide it with liquidity to repay its commercial paper and other general obligations as they become due. |
| 9/19/2008 | Michaels Stores | B | 120 | 1,000 | 2011 | 25/L+150 | BofA | The Company took this proactive step to ensure that it had adequate liquidity to meet its cash needs while there are disruptions in the debt markets. |
| 9/22/2008 | General Motors | B- /Caa3 | 3,400 | 4,100 | 2011 | 30/L+205 | Citi, JPM | The company said it was drawing down the credit in order to maintain a high level of financial flexibility in the face of uncertain credit markets. |
| 9/26/2008 | Goodyear Rubber & Tire Co. | BB+ /Baa3 | 600 | 1,500 | 2013 | 37.5/L+125 | JPM | Temporary delay in the company's ability to access \$360 million currently invested with The Reserve Primary Fund, Goodyear said in a statement. The funds also will be used to support seasonal working capital needs and to enhance the company's liquidity position. |
| 9/26/2008 | AMR Corp | B- | 255 | 225 | 2013 | 50/L+425 | GE Capital | Cash balance |
| 9/30/2008 | Duke Energy | A- /Baa2 | 1,000 | 3,200 | 2012 | 9/L+40 | Wachovia JPM | In light of the uncertain market environment, we made this proactive financial decision to increase our liquidity and cash position and to bridge our access to the debt capital markets. Duke spokesman: "We had about \$1 billion in cash or cash equivalent, so we decided as a conservative measure to go for the other billion. The financial companies are having a very tough time right now." |
| 9/30/2008 | Gannett Co. | BBB- /Ba2 | 1,200 | 3,400 | 2012 | 7/L+25 | BofA | (A)s a prudent liquidity measure in light of the ongoing credit market dislocations. |
| Oct-2008 | Six Flags | B/B2 | 244 | 275 | 2013 | 50/L+250 | JPM | (W)e borrowed \$244.2 million under the revolving facility portion of the Credit Facility to ensure we would have sufficient liquidity to fund our |

Table 2 (continued)

| Date drawn | Company | Credit rating (12/31/08) | Amount drawn (\$MM) | Credit line (\$MM) | Maturity | Spread (Undrawn/Drawn) | Lead bank | Comment (SEC filings) |
|------------|-------------------------|--------------------------|---------------------|--------------------|----------|------------------------|---------------|--|
| Oct-2008 | Saks | B+/B2 | 80.6 | 500 | 2011 | 25/L+100 | BofA | off-season expenditures given difficulties in the global credit markets. |
| Oct-2008 | Monster Worldwide | | 247 | 250 | 2012 | 8/L+30 | BofA | Cash balance |
| 10/1/2008 | GameStop | BB+/Ba1 | 150 | 400 | 2012 | 25/L+100 | BofA | “We have always viewed our revolving credit as an insurance policy, and given the events in the market, we felt that it was appropriate to access that insurance,” CFO Timothy Yates said in an Oct. 30 earnings call. |
| 10/2/2008 | Dana Corp | BB+/Ba3 | 200 | 650 | 2013 | 37.5/L+200 | Citi | Acquisition |
| 10/2/2008 | Calpine | B+/B2 | 725 | 1,000 | 2014 | 50/L+287.5 | Goldman | Drawing down these funds is a prudent liquidity measure. Ensuring access to our liquidity to the fullest extent possible at a time of ambiguity in the capital markets is in the best interest of our customers, suppliers, shareholders, and employees. |
| 10/2/2008 | YRC Worldwide | – | 325 | 950 | 2012 | – | – | N/A |
| 10/9/2008 | CMS Energy | BB+/Baa3 | 420 | 550 | 2012 | 20/L+100 | Citi | YRC chairman, president and CEO said, “Given the unrest in the credit markets, we believe it is in the best interest of YRC to satisfy these maturities early ... (Firm's) current financial condition is solid; and with no further note maturities until 2010, we are well-positioned to weather this economic environment.” |
| 10/10/2008 | American Electric Power | BBB/Baa2 | 2,000 | 3,000 | 2012 | 9/L+45 | JPM, Barclays | Cash balance |
| 10/15/2008 | Lear Corp | BB/B1 | 400 | 1,000 | 2012 | 50/L+200 | BofA | AEP took this proactive step to increase its cash position while there are disruptions in the debt markets. The borrowings provide AEP flexibility and will act as a bridge until the capital markets improve. |
| 10/16/2008 | Southwest Airlines | BBB+/Baa1 | 400 | 1,200 | 2010 | 15/L+75 | JPM | Given the recent volatility in the financial markets, we believe it is also prudent to temporarily increase our cash on hand by borrowing under our revolving credit facility. |
| 10/16/2008 | Chesapeake Energy | BB/Ba2 | 460 | 3,000 | 2012 | 20/L+100 | Union Bank | Although our liquidity is healthy, we have made the prudent decision in today's unstable financial markets to access \$400 million in additional cash through our bank revolving credit facility. |
| 10/16/2008 | Ebay | – | 1,000 | 1,840 | 2012 | 4/L+24 | BofA | Cash balance |
| 10/16/2008 | Parker Drilling | B+/B2 | 48 | 60 | 2012 | 50/L+250 | BofA | Acquisition |
| 10/20/2008 | Tribune Co. | B/Caa1 | 250 | 750 | 2013 | 75/L+300 | JPM | N/A |
| 10/23/2008 | FreeScale Semiconductor | BB/B– | 460 | 750 | 2012 | 50/L+200 | Citi | Tribune is borrowing under the revolving credit facility to increase its cash position to preserve its financial flexibility in light of the current uncertainty in the credit markets. |
| | | | | | | | | We made this proactive financial decision to further enhance our liquidity and cash position. This improves the company's financial flexibility as we continue to execute our business plans. |

| | | | | | | | | |
|------------|---------------------------------------|------------|-------|-------|------|------------|----------------|--|
| 10/24/2008 | Idearc | BBB – /Ba3 | 249 | 250 | 2011 | 37.5/L+150 | JPM | The company made this borrowing under the revolver to increase its cash position to preserve its financial flexibility in light of the current uncertainty in the credit markets. |
| 10/24/2008 | Energy Future Holdings Corp. (ex-TXU) | B+ /B1 | 570 | 2,700 | 2013 | 50/L+350 | Citi | We drew down on the revolver now in light of current financial market conditions and as a precautionary measure. (The company) expects to maintain the cash proceeds from the borrowings in highly liquid short term investments |
| 10/30/2008 | Accuride Corp. | B+ /B2 | 78.4 | 125 | 2010 | 50/L+350 | Citi, Lehman | Although the Company does not have any immediate needs for this additional liquidity, in light of the current financial market conditions and as a precautionary measure, we made the borrowings under our revolver to enhance the quality of the Company's liquidity. Furthermore, we continue to expect that the Company will remain in compliance with its financial covenants through the end of 2008. |
| 11/13/2008 | Genworth Financial | A/A2 | 930 | 1,700 | 2012 | 5/L+20 | BofA, JPM | The Company intends to use the borrowings along with other sources of liquidity for the repayment of outstanding holding company debt (including the Company's senior notes maturing in 2009) at maturity and/or the purchase and retirement of outstanding debt prior to maturity or for other general corporate purposes. |
| 11/20/2008 | Allied World Assurance | – | 250 | 400 | 2012 | 8/L+35 | Wachovia | Our current strong leverage position, solid balance sheet and \$400 million credit facility position us well to take advantage of current insurance market opportunities. Drawing down these funds under favorable terms through our credit facility simply ensures access to contingent liquidity during the current turbulence in the financial markets |
| 11/23/2008 | Computer Sciences | A – /Baa1 | 1,500 | 1,500 | 2012 | 7/L+25 | Citi | The Company took the action due to the current instability of the commercial paper market and to ensure the Company's liquidity position in light of the ongoing credit market dislocation. |
| 11/25/2008 | NXP Semiconductors | B | 400 | 600 | 2012 | 50/L+275 | Morgan Stanley | In view of the current global financial turmoil we are drawing USD 400 million under our revolving credit facility. This is a proactive financial decision in order to secure availability of this facility in a turbulent financial market environment. |
| 11/28/2008 | CNA Financial Corp. | BBB/Baa3 | 250 | 250 | 2012 | 11/L+55 | Citi | The majority of the proceeds of the draw will be used to retire Senior Notes due December 15, 2008 in the principal amount of \$200 million. |

Another reason that has been offered to explain the spike in C&I loans on bank balance sheets is that during the crisis, banks had to bring assets previously in off-balance sheet vehicles back onto their own books. For example, a bank sponsoring an asset-backed commercial paper (ABCP) vehicle would typically provide, back-up liquidity line, which if used, could end up bringing the underlying assets back on the bank's balance sheet. Although formal back-up liquidity lines are less common in structured investment vehicles (SIVs), banks may also provide support to these funds, which would have the same effect on their balance sheet. There are three reasons to believe that this does not explain the spike in C&I loans on bank balance sheets after Lehman's failure. First, the assets typically used in these vehicles are not C&I loans. Second, the main problems in this market were already evident almost a year before Lehman's failure. Indeed, Citibank made news in December 2007 for bringing back \$49 billion of residential mortgage backed securities onto its balance sheet.¹² Finally, the C&I loan exposure of banks to these vehicles is much smaller than their exposure to credit-line drawdowns. According to Fitch Ratings, at the end of 2007:Q3, the total amount of liquidity facilities issued by U.S. banks to back ABCP issuance was \$357 billion, and liquidity lines backing SIVs were at most \$191 billion (52% of the total outstanding).¹³ By contrast, the SNC Program estimates that at the end of 2007, approximately \$1.4 trillion of revolving lines funded by banks were undrawn, making it by far the largest off-balance sheet exposure faced by banks.

Although C&I loans on bank balance sheets rose from September to mid-October, Fig. 5 shows that they leveled off just after October 14, 2008 when the U.S. Treasury bought equity and warrants in nine large banks as part of the Troubled Asset Relief Program (TARP) and the Federal Deposit Insurance Corporation (FDIC) introduced the Temporary Liquidity Guarantee Program to guarantee new issues of bank debt. Veronesi and Zingales (2008) show that this led to a large drop in the perceived probability of default as measured by bank credit default swap spreads. Thus, as concerns about bank solvency and liquidity diminished, firms slowed their drawdowns of credit lines. This lends some further support to the view that credit-line drawdowns constituted a "run" on banks.

4. Determinants of bank lending during the banking panic

In this section, we examine the cross-sectional determinants of bank lending during the banking panic. Our main interest is in whether banks that were more vulnerable to the bank run that followed the failure of Lehman Brothers reduced their lending by more than others. We focus on two factors that, in theory, would make some banks more vulnerable than others: (i) the

extent to which they were financed by short-term debt rather than insured deposits, and (ii) their exposure to credit-line drawdowns. As noted in the introduction, banks had a difficult time rolling over their short-term debt (including repos) because of concerns about the solvency and liquidity of the banking system (Brunnermeier, 2009; Gorton, 2009). They were also faced with unexpectedly large drawdowns on their revolving credit lines. Both factors increased banks' need for liquidity. We examine whether this, in turn, led banks to cut back on making illiquid corporate loans.

To investigate this issue we identify banks that are less vulnerable to short-term funding problems as those who are better able to fund themselves with deposits. We argue that deposits, particularly insured deposits, are a more stable source of capital than short-term debt. Indeed, Gatev and Strahan (2006) find that deposits grow as conditions in the short-term debt market deteriorate, while other types of bank funding do not exhibit this pattern. Thus, we predict that firms with a larger amount of deposits relative to assets will cut lending by less during the banking panic.

To examine this prediction, we calculate total deposits as a fraction of assets measured as of December 2007. Ideally, we would use insured deposits; however, we were not able to get these data for the several foreign banks in our sample (e.g., Royal Bank of Scotland, Societe Generale). As Table 3 indicates, the median bank funds 56% of its assets with deposits. The bank at the 25th percentile of our sample has 26% deposits. Indeed, 12 of the 38 firms in our sample are investment banks (such as Goldman Sachs) or finance companies (CIT Group and GE Capital) which have very low levels of deposits. We drop the investment bank, Bear Stearns, which failed in March 2008. We do keep Lehman Brothers, which failed in September 2008, and Merrill Lynch and Wachovia, both of which were acquired in October 2008. None of the results depend on these inclusion and exclusion decisions.

We calculate each bank's average monthly lending in three periods: *Pre-crisis* (August 2006–July 2007); *Crisis I* (August 2007–July 2008); and *Crisis II* (August 2008–December 2008). The *Pre-crisis* period is the year leading up to the collapse of the credit boom. *Crisis I* starts with the collapse of the subprime market in the summer of 2007. *Crisis II* begins in August 2008 when CDS spreads of financial institutions start rising and it covers the period of greatest concerns about the liquidity and solvency of the financial system (the banking panic).

We measure bank lending in three different ways: (i) the number of loan syndications in which a bank participates; (ii) the number of loan syndications in which a bank is the lead originator; and (iii) the total dollar amount of loan syndications in which a bank is the lead originator.¹⁴ Note that we do not observe the actual amount lent by a bank, only the amount lent by the syndicate and whether a bank is a lead lender or other

¹² "Citigroup Says It Will Absorb SIV Assets," MarketWatch.com, December 13, 2007.

¹³ "Asset-Backed Commercial Paper & Global Banks Exposure," Fitch Ratings, September 12, 2007; "SIVs—Assessing Potential Exposure of Sponsor Banks," Fitch Ratings, November 14, 2007.

¹⁴ If a loan has more than one lead bank, we allocate an equal share of the loan amount to each of the lead banks.

Table 3

Summary statistics.

Deposits and assets correspond to the Call Reports figures as of the end of 2007. %Revolving lines with Lehman is percentage of all credit lines originated before the end of 2007 that had Lehman Brothers as part of the lending syndicate. Pre-crisis, Crisis I, and Crisis II are respectively defined as periods August 2006 through July 2007, August 2007 through July 2008, and August 2008 through November 2008. The dependent variable is in percentage changes; e.g., % Δ Total number of loans (Crisis II vs. Crisis I)=[Mean (Monthly number of loans issued between Aug'08 and Nov'08)]/Mean (Monthly number of loans issued between Aug'07 and Jul'08)–1]. (Lead bank) indicates variables calculated using only loans where the bank is the lead arranger; based on pro-rata credit and estimated retained share of the loans. All the other variables just count the total number of loans with the bank participation. Real investment loans are defined as those that are intended for general corporate purposes, capital expenditure, or working capital.

| | | Obs. | P25 | P50 | P75 | Mean | SD |
|--|--------------------------|------|-------|-------|-------|-------|------|
| Deposits/Assets | | 38 | 0.26 | 0.56 | 0.65 | 0.45 | 0.25 |
| % Revolving lines with Lehman | | 37 | 0.03 | 0.04 | 0.06 | 0.06 | 0.06 |
| All loans: | | | | | | | |
| % Δ Total number of loans | Crisis II vs. Crisis I | 38 | –0.56 | –0.49 | –0.36 | –0.47 | 0.16 |
| % Δ Total number of loans | Crisis II vs. Pre-crisis | 38 | –0.75 | –0.65 | –0.49 | –0.59 | 0.22 |
| % Δ Total number of loans (lead bank) | Crisis II vs. Crisis I | 38 | –0.55 | –0.36 | –0.23 | –0.34 | 0.33 |
| % Δ Total number of loans (lead bank) | Crisis II vs. Pre-crisis | 38 | –0.70 | –0.50 | –0.33 | –0.42 | 0.49 |
| % Δ Total amount of loans (lead bank) | Crisis II vs. Crisis I | 38 | –0.67 | –0.54 | –0.36 | –0.50 | 0.31 |
| % Δ Total amount of loans (lead bank) | Crisis II vs. Pre-crisis | 38 | –0.80 | –0.62 | –0.37 | –0.50 | 0.53 |
| Real investment loans: | | | | | | | |
| % Δ Total number of loans | Crisis II vs. Crisis I | 38 | –0.51 | –0.38 | –0.21 | –0.36 | 0.24 |
| % Δ Total number of loans | Crisis II vs. Pre-crisis | 38 | –0.64 | –0.55 | –0.38 | –0.49 | 0.28 |
| % Δ Total number of loans (lead bank) | Crisis II vs. Crisis I | 38 | –0.60 | –0.17 | 0.26 | –0.13 | 0.62 |
| % Δ Total number of loans (lead bank) | Crisis II vs. Pre-crisis | 38 | –0.77 | –0.54 | –0.02 | –0.15 | 0.97 |
| % Δ Total amount of loans (lead bank) | Crisis II vs. Crisis I | 38 | –0.71 | –0.49 | –0.25 | –0.44 | 0.39 |
| % Δ Total amount of loans (lead bank) | Crisis II vs. Pre-crisis | 38 | –0.82 | –0.60 | –0.20 | –0.31 | 0.97 |

type of syndicate member. To examine the change in bank lending during *Crisis II* we calculate the percentage change in each of these variables with respect to a base period, which is either *Crisis I* or *Pre-crisis*.

As can be seen from [Table 3](#), in *Crisis II* the median bank cut lending drastically. For example, in *Crisis II*, the median bank reduced its number of monthly lead originations by 36% relative to *Crisis I* and 50% relative to *Pre-crisis*. There is a 54% drop in the dollar volume of lead originations relative to *Crisis I* and a 62% drop relative to *Pre-crisis*.

The question we take up now is whether these reductions are related to deposits. [Table 4](#) reports the results of regressing loan growth on deposits (normalized by assets). In odd columns our dependent variable is loan growth relative to *Crisis I* as the base period, and in even columns the dependent variable is loan growth relative to *Pre-crisis* as the base period. Note that this is a cross-sectional regression with 38 observations. Regardless of how we define the change in loans, the coefficient on deposits is positive, and statistically significant in most of the specifications. For example, in column 3 of [Table 4](#), Panel A, the dependent variable is the percentage change from *Crisis I* to *Crisis II* in the number of loans in which the bank plays the lead role. The average bank experiences a 34% drop in the number of lead syndications; however, the estimated coefficients imply that banks with deposits one standard deviation above the mean experience a 14% drop, while banks one standard deviation below the mean experience a 51% drop in dollar lending volume.

Banks with low deposits experience the biggest declines in lending. It is possible, however, that these banks, many of which were investment banks or finance

companies, specialized in loan types that experienced an especially sharp drop in demand. In particular, there was a big drop in LBO and M&A activity during *Crisis I* and *Crisis II*. If investment banks made more of these loans before the crisis (perhaps to support their private equity and M&A advisory businesses), it could generate the pattern we observe. Panel B addresses this concern by focusing on real investment loans—those intended to be used for corporate purposes or working capital. Here, too, we observe the same basic pattern of results, with positive and often statistically significant coefficients on the deposit variable.

The analysis uses total deposits as our main explanatory variable. Because insured deposits are an even more stable supply of capital than uninsured deposits, it would be useful to verify that the same relationship holds with this variable. Unfortunately, we do not have reliable information on the insured deposits of many of the foreign banks in the sample. Nevertheless, for those we do have (18 banks), we found that there is a positive correlation between loan growth and insured deposits. The correlation between the change in number of lead syndications from *Pre-crisis* to *Crisis II* and percent of insured deposits measured as of December 2007 is 0.58.

Note that while we use deposits measured in December 2007, the crisis begins in the second half of 2007. Our finding would be misleading if, during the crisis, deposits were reallocated to banks that were less likely to be in trouble. To deal with this possibility, [Table 4](#), Panel C reports our analysis using deposits as of year-end 2006. The findings remain qualitatively unchanged.

We now move to our analysis of the effect of potential drawdowns of outstanding revolving credit facilities on

Table 4

Change in lending and deposits.

Deposits and assets correspond to the Call Reports figures as of the end of 2007. Pre-crisis, Crisis I, and Crisis II are respectively defined as periods August 2006 through July 2007, August 2007 through July 2008, and August 2008 through November 2008. The dependent variable is in percentage changes; e.g., %Δ Total number of loans (Aug'08–Nov'08 vs. Aug'07–Jul'08)=[Mean (Monthly number of loans issued between Aug'08 and Nov'08)/Mean (Monthly number of loans issued between Aug'07 and Jul'08)–1]. (Lead bank) indicates variables calculated using only loans where the bank is the lead arranger; based on pro-rata credit and estimated retained share of the loans. All the other variables just count the total number of loans with the bank participation. Real investment loans are defined as those that are intended for general corporate purposes, capital expenditure, or working capital. Robust standard errors are reported in brackets. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

| | (1) %Δ Total number of loans Crisis II vs. Crisis I | (2) %Δ Total number of loans Crisis II vs. Pre- crisis | (3) %Δ Total number of loans (lead bank) Crisis II vs. Crisis I | (4) %Δ Total number of loans (lead bank) Crisis II vs. Pre-crisis | (5) %Δ Total amount of loans (lead bank) Crisis II vs. Crisis I | (6) %Δ Total amount of loans (lead bank) Crisis II vs. Pre-crisis |
|--|--|---|--|--|--|--|
| <i>Panel A: All loans</i> | | | | | | |
| Deposits/ Assets | 0.22* | 0.42*** | 0.56** | 0.91*** | 0.27 | 0.81** |
| | [0.11] | [0.11] | [0.22] | [0.26] | [0.21] | [0.30] |
| Constant | –0.57*** | –0.79*** | –0.60*** | –0.83*** | –0.62*** | –0.86*** |
| | [0.06] | [0.04] | [0.10] | [0.08] | [0.12] | [0.08] |
| Observations | 38 | 38 | 38 | 38 | 38 | 38 |
| R-squared | 0.11 | 0.24 | 0.18 | 0.22 | 0.05 | 0.14 |
| <i>Panel B: Real investment loans</i> | | | | | | |
| Deposits/ Assets | 0.32* | 0.50*** | 0.79* | 1.44*** | 0.17 | 0.98*** |
| | [0.19] | [0.16] | [0.41] | [0.41] | [0.28] | [0.32] |
| Constant | –0.51*** | –0.72*** | –0.49** | –0.81*** | –0.52*** | –0.75*** |
| | [0.10] | [0.07] | [0.20] | [0.13] | [0.15] | [0.14] |
| Observations | 38 | 38 | 38 | 38 | 38 | 38 |
| R-squared | 0.11 | 0.21 | 0.10 | 0.14 | 0.01 | 0.06 |
| <i>Panel C: Deposits measured as of the year-end 2006.</i> | | | | | | |
| Deposits/ Assets | 0.23* | 0.43*** | 0.54** | 0.89*** | 0.31 | 0.87*** |
| | [0.12] | [0.11] | [0.21] | [0.24] | [0.21] | [0.31] |
| Constant | –0.58*** | –0.80*** | –0.60*** | –0.83*** | –0.65*** | –0.91*** |
| | [0.06] | [0.04] | [0.11] | [0.08] | [0.12] | [0.09] |
| Observations | 38 | 38 | 38 | 38 | 38 | 38 |
| R-squared | 0.13 | 0.26 | 0.17 | 0.21 | 0.07 | 0.17 |

lending behavior of banks. As noted in the introduction and as shown in Table 2, firms drew on their credit lines primarily because of concerns about the ability of banks to fund these commitments. One way to examine the effect of credit-line drawdowns on lending would be to estimate the relationship between loan growth and the existing stock of outstanding revolving lines. The problem with this approach is that credit lines and deposits are highly positively correlated. Fig. 6 plots the relationship between deposits scaled by total assets and revolving lines as a fraction of total lending. Their correlation is 0.69. Kashyap, Rajan, and Stein (2002) argue that we should observe such a relationship because it is efficient for financial institutions to hold liquid assets to meet the uncertain liquidity needs of depositors and borrowers, as long as those liquidity needs are imperfectly correlated. Gatev and Strahan (2006) argue that when the commercial paper market dries up, firms draw on their credit lines, while funds are withdrawn from the money market and

deposited at banks. Thus, banks with a strong deposit base are in the best position to fund credit lines.

Given that banks that fund with deposits choose to have more credit-line exposure, we need to identify an unanticipated shock to drawdowns on credit lines. Our measure is the extent to which banks co-syndicate credit lines with Lehman Brothers. We argue that, for at least two reasons, banks that co-syndicated more of their credit lines with Lehman Brothers would be more vulnerable to drawdowns on these credit lines after the failure of Lehman. First, if a firm draws down less than the maximum amount of its credit line, then other banks in the syndicate had to fund a larger piece after the Lehman failure. To see why, suppose Lehman and JP Morgan have equal \$150 million commitments in a \$300 million revolving credit facility. Prior to Lehman's failure, if a firm drew \$100 million on the facility, each bank would only pay out \$50 million. After Lehman's failure, JP Morgan would have to pay out \$100 million. Thus,

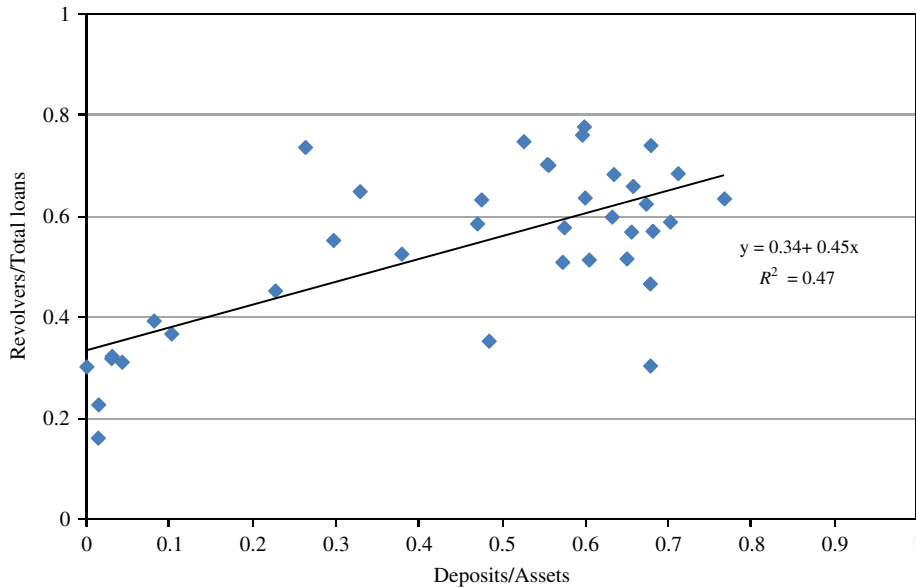


Fig. 6. Relation between Deposits/Assets and Revolvers/Total loans.

Lehman's failure put more of the funding burden on other members of the syndicate.¹⁵ Five of the firms in Table 2 explicitly mention that this was the case.¹⁶

A second reason why the failure of Lehman exposed lending syndicate members to additional drawdowns is that it increased the likelihood that firms funded by Lehman would draw on their credit lines. A firm always faces the risk that its bank will be unable or unwilling to fund its credit line. Getting commitments from multiple lenders (as in a loan syndication), is one way to reduce this risk, but it does not eliminate it. In the above example, after Lehman fails, the firm now only has a \$150 million commitment from JP Morgan. Thus, the risk that the firm would not be able to draw on its credit line has gone up. Rather than bear this extra risk, the firm may rationally choose to draw on its credit line, even if it does not have an immediate need for the funding. In fact, FairPoint Communications explained its drawdown on the revolver as actions "necessary to preserve its access to capital due to Lehman Brothers' level of participation in the Company's debt facilities and the uncertainty surrounding both that firm and the financial markets in general." The incentive to draw on the credit line is increased further, if firms conjecture that others will also be drawing on their credit lines, as it increases the chance that banks will not be able or willing to fund their credit lines. This is the same logic that leads depositors to run on

a bank as in Diamond and Dybvig (1983). Overall, it is estimated that at the moment of the bankruptcy filing, Lehman had \$30 billion of undrawn revolving commitments.¹⁷

For these reasons, we predict that banks that co-syndicate more with Lehman will be subject to more credit-line drawdowns and will be under more pressure to cut corporate lending. To test this prediction, we measure the outstanding amount of credit lines co-syndicated with Lehman as a percentage of all revolving lines originated before the end of 2007 and outstanding through the fourth quarter of 2008. We only count those loans where Lehman was one of the key lenders because Lehman would likely not have sold these commitments in the secondary market.¹⁸ However, it is important to keep in mind that our proxy is a crude measure both because we rarely know the actual allocations in loan syndications and we do not know whether there were prior drawdowns on existing credit lines.

As reported in Table 3, on average, 6% of the revolving lines are co-syndicated with Lehman. Table 5 provides evidence to support our claim that banks that co-syndicated more of their credit lines with Lehman experienced greater drawdowns. The analysis relies on data we collected from SEC filings for a subsample of publicly traded manufacturing firms (one-digit SIC

¹⁵ Note, however, that if the firm requests \$300 million and Lehman does not honor its commitment, JP Morgan would still only be responsible for funding \$150 million.

¹⁶ Marriott 10-Q statement, October 3, 2008; "Chesapeake Energy enters into \$460M credit, draws down on existing RC," *Reuters*, October 16, 2008; Parker Drilling 8-K Report, October 22, 2008; "FreeScale draws down \$460M under covenant-lite \$750M RC," *Reuters*, October 24, 2008; Accuride Corporation 8-K, October 30, 2008.

¹⁷ Loan Syndications and Trading Association's presentation "Examining the Legal and Business Reality of Syndicated Leveraged Loans," WilmerHale, Boston, July 15, 2009.

¹⁸ We use lenders' syndicate titles to identify loans with substantial Lehman funding. Generally, lenders with small commitments are called "participants," a default title. Titles other than "participant," e.g., "documentation agent," "co-arranger," "co-manager," etc., identify large commitments and are used by Reuters to calculate the leading players in the loan syndication market, which are reported in "league tables."

Table 5

Relationship between drawdowns and banks' exposure to Lehman on revolvers co-syndications.

The table is constructed using drawdowns on revolving lines reported in SEC filings by a subsample of publicly traded manufacturing firms (one-digit SIC codes 2 and 3). We map each borrower to the lead lenders; we then compute an average for each bank (37 observations). The reported numbers correspond to the averages across banks. Firms' and banks' assets are computed as of the end of 2007 (calendar year). % Revolving lines with Lehman is percentage of all credit lines originated before the end of 2007 that had Lehman Brothers as part of the lending syndicate. We only count those loans where Lehman was one of the key lenders. In Panel B the analysis is at the firm level (443 firms). In specifications (1) and (2), for each borrower we only count the lender with the highest exposure to Lehman (one lender per borrower). Specifications (3) and (4) allow for multiple (bank x firm) matches. Standard errors are clustered at the bank level and are reported in brackets. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

Panel A: Used revolving lines by bank

| % Revolving lines with Lehman | | | (1) Used Balance (2008:Q4) | | (2) Used Change (2008:Q4 vs.2007:Q4) | | (3) Used Change (2008:Q4 vs.2007:Q4) | | (4) Unused Balance (2007:Q4) | | (5) Used Change (2008:Q4 vs.2007:Q4) | |
|-------------------------------|----------|------|-------------------------------------|--------|--|--------|--|------|---------------------------------------|------|--|------|
| | | | Million USD | | Million USD | | % of RL limit | | % of RL limit | | % Bank's assets | |
| | Quartile | Obs. | Mean | Mean | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Low | 1 | 9 | 147.60 | 130.51 | 56.41 | 115.00 | 1.16 | 7.71 | 85.46 | 6.91 | 0.00 | 0.17 |
| | 2 | 9 | 113.53 | 2.00 | 37.16 | 33.60 | 3.80 | 3.91 | 83.47 | 8.20 | 0.09 | 0.11 |
| | 3 | 10 | 150.34 | 83.20 | 61.93 | 75.77 | 5.99 | 5.36 | 84.80 | 5.70 | 0.11 | 0.23 |
| High | 4 | 9 | 254.61 | 234.65 | 174.04 | 237.46 | 6.83 | 7.33 | 86.92 | 4.66 | 0.22 | 0.27 |
| (High-Low) | | | 107.00* | | 117.63* | | 5.67** | | 1.47 | | 0.22*** | |
| Correlation with: | | | | | | | | | | | | |
| % Revolving lines with Lehman | | | 0.65*** | | 0.64*** | | 0.29* | | 0.04 | | 0.44*** | |
| % Term loans with Lehman | | | 0.37** | | 0.39** | | 0.11 | | 0.06 | | 0.21 | |

Panel B: Change in firm's cash holdings

| Dependent variable: | One lead per lending syndicate | | | | Multiple leads per lending syndicate | | | |
|--|--------------------------------|--------|----------|--------|--------------------------------------|--------|----------|--------|
| | (1) | (2) | (3) | (4) | (3) | (4) | (3) | (4) |
| Δ Cash (2008:Q4 vs.2007:Q4)/Total assets (2007:Q4) | | | | | | | | |
| Δ Revolvers drawn (2008:Q4 vs.2007:Q4)/Total assets (2007:Q4) | 0.02 | [0.03] | 0.02 | [0.03] | 0.03** | [0.01] | 0.03** | [0.01] |
| % Revolving lines with Lehman (lead bank) | | | 3.69** | [1.76] | | | 2.56* | [1.35] |
| Constant | -0.92*** | [0.23] | -1.26*** | [0.31] | -0.86*** | [0.07] | -0.98*** | [0.09] |
| Observations | 443 | | 443 | | 2,125 | | 2,125 | |
| R-squared | 0.001 | | 0.004 | | 0.002 | | 0.003 | |

codes 2 and 3) with revolving lines originally set up before August 2007 and outstanding through December of 2008. The resulting sample has 443 unique borrowers with valid accounting information available in Compustat and, after matching borrowers to lead lenders, a total of 2,125 bank-firm matches. We want to establish two facts: (i) drawdowns were higher for Lehman co-syndicators, and (ii) these drawdowns were held largely in cash.

Table 5, Panel A establishes the first fact. We start by sorting banks into quartiles based on the fraction of revolvers they co-syndicated with Lehman. For each bank we compute an average revolver drawdown by December 2008. As can be seen from the first column, borrowers of the banks with the largest fraction of revolving lines with Lehman on average draw \$254.6 million on their lines, \$107.0 million more than borrowers of the banks with the lowest fraction of revolving lines with Lehman. It is possible, however, that these drawdowns took place much earlier and were unrelated to Lehman's failure. To address this issue, we look at the change in drawdowns between the last quarter of 2007 and the last quarter of 2008. The result is even more striking, as borrowers of banks in the top quartile of Lehman co-syndication draw

down over three times more than borrowers of the least affected quartile. A similar pattern emerges if we scale draw-downs by the revolving line limit. Note that we only observe the contractual revolver limit, not the actual limit, which was reduced because of the Lehman failure. Thus, we are likely underestimating the difference between top and bottom quartiles. The strong, positive relationship between revolving lines drawdowns and lenders' exposure to co-syndication with Lehman can also be observed in correlations reported in the tables.

It is possible that larger drawdowns were associated with larger undrawn revolving capacity. For example, if firms and banks are paired based on some unobservable characteristic, it could be that firms that have lines with banks least exposed to Lehman usually draw down their lines, while firms that have lines with the banks most exposed to Lehman usually keep their lines undrawn (e.g., firms with less working capital needs). Therefore, if drawdowns are a consequence of an aggregate shock, not a shock to the banks with large revolving line exposure to Lehman, then all firms might want to get more cash, but we would still observe cross-sectional differences in drawdowns simply because firms that have larger undrawn lines are the only firms that have access to

Table 6

Change in lending and revolvers overhang.

Deposits and assets correspond to the Call Reports figures as of the end of 2007. %Revolving lines with Lehman is percentage of all credit lines originated before the end of 2007 that had Lehman Brothers as part of the lending syndicate. We only count those loans where Lehman was one of the key lenders. Pre-crisis, Crisis I, and Crisis II are respectively defined as periods August 2006 through July 2007, August 2007 through July 2008, and August 2008 through November 2008. The dependent variable is in percentage changes; e.g., % Δ Total number of loans (Aug'08–Nov'08 vs. Aug'07–Jul'08) = [Mean (Monthly number of loans issued between Aug'08 and Nov'08)]/Mean (Monthly number of loans issued between Aug'07 and Jul'08) – 1]. (Lead bank) indicates variables calculated using only loans where the bank is the lead arranger; based on pro-rata credit and estimated retained share of the loans. All the other variables just count the total number of loans with the bank participation. Real investment loans are defined as those that are intended for general corporate purposes, capital expenditure, or working capital. Robust standard errors are reported in brackets. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

| | (1) % Δ Total number of loans Crisis II vs. Crisis I | (2) % Δ Total number of loans Crisis II vs. Pre- crisis | (3) % Δ Total number of loans (lead bank) Crisis II vs. Crisis I | (4) % Δ Total number of loans (lead bank) Crisis II vs. Pre-crisis | (5) % Δ Total amount of loans (lead bank) Crisis II vs. Crisis I | (6) % Δ Total amount of loans (lead bank) Crisis II vs. Pre-crisis |
|--|--|---|--|--|--|--|
| <i>Panel A: All loans</i> | | | | | | |
| Deposits/Assets | 0.01 [0.10] | 0.28** [0.11] | 0.42* [0.24] | 0.77*** [0.28] | –0.08 [0.23] | 0.74* [0.41] |
| % Revolving lines with Lehman | –1.31** [0.50] | –0.93*** [0.30] | –1.58** [0.60] | –1.28** [0.53] | –2.21*** [0.67] | –0.38 [1.11] |
| Constant | –0.39*** [0.06] | –0.66*** [0.05] | –0.44*** [0.13] | –0.69*** [0.11] | –0.32** [0.16] | –0.81*** [0.19] |
| Observations | 37 | 37 | 37 | 37 | 37 | 37 |
| R-squared | 0.26 | 0.26 | 0.27 | 0.23 | 0.17 | 0.13 |
| <i>Panel B: Real investment loans</i> | | | | | | |
| Deposits/Assets | 0.01 [0.18] | 0.29 [0.19] | 0.49 [0.46] | 1.30** [0.48] | –0.06 [0.33] | 0.86** [0.38] |
| % Revolving lines with Lehman | –1.61** [0.66] | –1.17** [0.50] | –1.44 [1.25] | –0.73 [1.09] | –0.99 [1.28] | –0.46 [1.08] |
| Constant | –0.25** [0.11] | –0.54*** [0.10] | –0.25 [0.25] | –0.68*** [0.20] | –0.34* [0.20] | –0.66*** [0.19] |
| Observations | 37 | 37 | 37 | 37 | 37 | 37 |
| R-squared | 0.21 | 0.22 | 0.09 | 0.12 | 0.02 | 0.05 |
| <i>Panel C: All loans, term loans originated with Lehman</i> | | | | | | |
| Deposits/Assets | 0.16 [0.12] | 0.38*** [0.11] | 0.60** [0.23] | 0.89*** [0.22] | 0.20 [0.24] | 0.86** [0.40] |
| % Term loans with Lehman | –0.28 [0.23] | –0.29 [0.37] | –0.29 [0.47] | –0.58 [0.67] | –0.25 [0.66] | 0.81 [1.59] |
| Constant | –0.50*** [0.07] | –0.73*** [0.07] | –0.59*** [0.14] | –0.75*** [0.11] | –0.55*** [0.17] | –1.00*** [0.32] |
| Observations | 37 | 37 | 37 | 37 | 37 | 37 |
| R-squared | 0.10 | 0.23 | 0.21 | 0.23 | 0.04 | 0.15 |

cash. However, the facts are inconsistent with this explanation. Column 4 of Table 5, Panel A shows that, as of December 2007, there were no significant differences in the unused balance of the revolving lines among the clients of banks in our sample. Hence, differences in undrawn balances cannot explain our findings.

Finally, the last column in Panel A shows that drawdowns at banks with high exposure to Lehman were larger relative to the size of those banks. This confirms that the shock was unanticipated by the banks.

One concern with this analysis is that co-syndication of revolving lines with Lehman could proxy for other exposures the bank has with Lehman. To the extent that the bank had greater losses because of these exposures,

our finding may simply reflect the fact that banks that do business with Lehman are in worse shape and thus, have to cut lending. While this interpretation is interesting in itself, we suspect that it is not the explanation. Indeed, the correlation between drawdowns and lenders' exposure to Lehman revolving lines is larger and statistically stronger than the correlation between drawdowns and lenders' exposure to Lehman term loans. This suggests that it is the drawdowns—or the threat of drawdowns—that is driving the effect, not the relationship with Lehman per se.

Table 5, Panel B presents data on the relationship between the change in revolving line drawdowns and the change in the firms' cash position. We include only firms with positive change in drawdowns between December of

2007 and December 2008. If the drawdowns indeed happened for precautionary reasons, then we would expect that firms drawing from banks that are most exposed to Lehman would hold more of the drawdowns in cash. This is indeed what we find. There is a positive and statistically significant relationship between the percent change in firms' cash holdings over the crisis period and the firms' lead bank's exposure to revolving line co-syndication with Lehman. As of December 2007, the average level of cash as a percent of assets was 8.5% and it dropped to 7.6% by December 2008. Clients of the banks that had one standard deviation higher exposure to Lehman experienced an 8% drop in cash, while clients of the banks with one standard deviation lower exposure to Lehman experienced a 13% drop in cash.

With these facts as background, we are now in a position to examine the effect of a bank's exposure to Lehman credit lines on their lending. The results in Table 6 show that banks that co-syndicated a larger fraction of their credit lines with Lehman cut their lending more than those banks that syndicated less with Lehman. Column 3 of Table 6, Panel A reports the results in which the dependent variable is the percentage change in the number of loans originated by the bank in *Crisis II* relative to *Crisis I*. The point estimate indicates that banks that have one standard deviation higher exposure to Lehman through the revolving lines experience a 44% drop, while banks with one standard deviation lower exposure to Lehman experience a 25% drop in lending. A comparison of columns 3 and 4 shows that this effect is lower for the *Pre-crisis* period, which is consistent with the timing of the Lehman failure. Consistent with results in Table 5, Panel C of Table 6 indicates that banks that co-syndicate more term loans with Lehman do not cut lending more.

A more general concern with our findings may be that they are driven by borrower characteristics rather than bank financing structure and credit-line exposure. For example, it is conceivable that firms that borrow from deposit-reliant banks were less vulnerable to the recession, and thus, experienced a less negative shock to loan demand. To address this issue, Table 7 provides summary statistics on borrowers in the *Pre-crisis* period. Sales data

come from DealScan, while the rest of the data come from Compustat. Matching to Compustat reduces the number of borrowers on which these statistics are based. We calculate the median for each bank and then average across banks. The first column provides averages for all 38 banks. Column 2 limits the sample to the ten banks with the highest ratio of deposits-to-assets in December 2007, while column 3 presents data on the ten banks with the lowest ratio of deposits-to-assets. There are no appreciable differences across the two sets of banks in terms of borrowers' sales, assets, leverage, Q, or return on assets (ROA). It would appear that if borrowers of deposit-reliant banks are less vulnerable to the recession, it does not stem from any of these characteristics.

Columns 4 and 5 present borrower characteristics for the ten banks with the most credit-line exposure to Lehman and the ten banks with the least credit-line exposure to Lehman. It appears that the average sales of borrowers funded by banks with large revolving lines exposure to Lehman is considerably greater than those funded by banks with a small Lehman exposure. The reverse is true with respect to assets. (Note that the asset data come from the subsample matched to Compustat.) None of the other characteristics are substantially different across subsamples.

To see whether this size difference might affect lending behavior during the crisis, say, because larger borrowers had a more negative shock to loan demand, we included the median sales of a banks' borrowers in the *Pre-crisis* period. The results are reported in Panel A of Table 8. The sales variable is statistically insignificant, and its inclusion does not have much of an effect on the deposit variable and the Lehman exposure variable. Measuring size by assets (unreported) also had no effect on the coefficients of interest.

Finally, we note that the low-deposit banks in the sample are mainly investment banks. These banks likely experienced a greater increase in lending during the credit boom, in part because of their strong presence in the financing of LBO and M&A activity. Therefore, it would not be surprising if their lending fell more during the crisis as LBO and M&A activity dried up. To control for the possibility, we included an investment bank dummy in

Table 7
Borrowers' characteristics.

This table provides summary statistics on borrowers in the *Pre-crisis* period (August 2006 through July 2007). We calculate the median for each bank and then average across banks. Sales at close come from DealScan. The rest of the financial data are from Compustat and corresponds to the fiscal year prior to loan origination. *Leverage* is Total long-term debt plus Debt in current liabilities divided by Total assets. *Q* is calculated as [Assets + Market value of equity – Book value of equity – Deferred taxes]/Assets. *ROA* is Income before extraordinary items divided by Total assets. All dollar figures are measured in USD millions.

| | (1) All banks | | (2) Ten banks with highest Deposits/Assets | | (3) Ten banks with lowest Deposits/Assets | | (4) Ten banks with highest % Revolving lines with Lehman | | (5) Ten banks with highest % Revolving lines with Lehman | |
|----------------|------------------|----------|--|----------|---|----------|--|----------|--|----------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Sales at close | 1,182.09 | 1,805.24 | 719.24 | 909.56 | 823.50 | 578.16 | 937.36 | 948.42 | 1,639.63 | 3,205.46 |
| Total assets | 2,773.41 | 2,788.54 | 2,897.74 | 3,018.49 | 2,353.36 | 1,920.53 | 3,287.81 | 2,439.64 | 2,442.50 | 4,004.97 |
| Leverage | 0.533 | 0.107 | 0.504 | 0.188 | 0.565 | 0.089 | 0.487 | 0.162 | 0.506 | 0.062 |
| Q | 1.570 | 0.292 | 1.610 | 0.356 | 1.605 | 0.227 | 1.755 | 0.340 | 1.538 | 0.363 |
| ROA | 0.045 | 0.018 | 0.048 | 0.029 | 0.039 | 0.015 | 0.049 | 0.024 | 0.051 | 0.021 |

Table 8

Robustness tests.

This table examines robustness of the results to additional controls for banks' characteristics. Deposits and assets correspond to the Call Reports figures as of the end of 2007. We only count those loans where Lehman was one of the key lenders. Sales figure comes from DealScan. *Investment bank* is a dummy equal to one if the bank is an investment bank and zero otherwise. Pre-crisis, Crisis I, and Crisis II are respectively defined as periods August 2006 through July 2007, August 2007 through July 2008, and August 2008 through November 2008. The dependent variable is in percentage changes; e.g., %Δ Total number of loans (Aug'08–Nov'08 vs. Aug'07–Jul'08)=[Mean (Monthly number of loans issued between Aug'08 and Nov'08)/Mean (Monthly number of loans issued between Aug'07 and Jul'08)–1]. (Lead bank) indicates variables calculated using only loans where the bank is the lead arranger; based on pro-rata credit and estimated retained share of the loans. All the other variables just count the total number of loans with the bank participation. Robust standard errors are reported in brackets. ***, **, * indicate statistical significance at 1%, 5%, and 10%, respectively.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|--|--------------------------|--------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| | %Δ Total number of loans | %Δ Total number of loans | %Δ Total number of loans (lead bank) | %Δ Total number of loans (lead bank) | %Δ Total amount of loans (lead bank) | %Δ Total amount of loans (lead bank) |
| | Crisis II vs. Crisis I | Crisis II vs. Pre-crisis | Crisis II vs. Crisis I | Crisis II vs. Pre-crisis | Crisis II vs. Crisis I | Crisis II vs. Pre-crisis |
| <i>Panel A: All loans, controlling for median borrowers' sales</i> | | | | | | |
| Deposits/Assets | 0.10 [0.13] | 0.33*** [0.12] | 0.37* [0.22] | 0.80*** [0.29] | 0.05 [0.26] | 0.74** [0.36] |
| % Revolving lines with Lehman | -1.02 [0.65] | -0.80** [0.38] | -1.74*** [0.55] | -1.16** [0.55] | -1.79** [0.77] | -0.41 [0.96] |
| Median borrower's sales (billion USD) | -0.01 [0.01] | -0.01 [0.01] | 0.00 [0.02] | 0.03 [0.04] | -0.03 [0.02] | -0.03 [0.03] |
| Constant | -0.44*** [0.09] | -0.68*** [0.06] | -0.41*** [0.13] | -0.74*** [0.15] | -0.39* [0.19] | -0.77*** [0.15] |
| Observations | 37 | 37 | 37 | 37 | 37 | 37 |
| R-squared | 0.23 | 0.28 | 0.26 | 0.25 | 0.16 | 0.16 |
| <i>Panel B: All loans, controlling for investment banks</i> | | | | | | |
| Deposits/Assets | 0.01 [0.12] | 0.30** [0.11] | 0.47 [0.29] | 0.96** [0.47] | 0.11 [0.24] | 1.06* [0.60] |
| % Revolving lines with Lehman | -1.31** [0.50] | -0.95*** [0.30] | -1.65** [0.65] | -1.59*** [0.58] | -2.50*** [0.72] | -0.88 [0.78] |
| Investment bank | -0.00 [0.05] | 0.02 [0.05] | 0.06 [0.15] | 0.24 [0.31] | 0.23 [0.16] | 0.39 [0.33] |
| Constant | -0.39*** [0.07] | -0.67*** [0.05] | -0.48*** [0.16] | -0.83*** [0.25] | -0.46*** [0.15] | -1.04*** [0.34] |
| Observations | 37 | 37 | 37 | 37 | 37 | 37 |
| R-squared | 0.26 | 0.26 | 0.27 | 0.27 | 0.26 | 0.21 |

our basic regressions. These regressions are reported in Panel B of Table 8. The coefficient of the investment bank dummy is statistically insignificant, with no appreciable change in the other coefficients. We conclude that while it is possible that borrower characteristics could drive loan demand, and that these characteristics might be correlated with deposit-reliance and credit-line exposure, they would seem to be unobservable. We know of no particular theory of borrower-bank matching that would be consistent with our findings.

5. Final remarks

New lending declined substantially during the financial crisis across all types of loans. Some of this decline could have reflected a drop in demand as firms scaled back expansion plans during a recession. However, we show that there may also have been a supply effect: banks with less access to deposit financing and at greater risk of credit-line drawdowns reduced their lending more than other banks.

A drop in the supply of credit has important implications. Without a drop in supply, there would likely have been some attenuation of the drop in loan demand due to downward pressure on interest rate spreads. However, the drop in supply puts upward pressure on interest rate spreads, and leads to a greater fall in lending than one might see in a typical recession. The combination of a recession and a banking crisis is particularly problematic.

The fact that some banks were more adversely impacted than others could affect the distribution of credit in the economy. If bank-borrower relationships matter for the lending process, then borrowers of a liquidity-constrained bank may not be able to easily switch to a less constrained one. Thus, some banks may have enough capital to make loans, but are unwilling to extend credit to firms with which they have no prior relationship. The ability to switch lenders may be critical to mitigating the effects of a reduction in the supply of credit. The experience of Continental Illinois National Bank failure in 1984 suggests that such switching is not easy (Slovin, Sushka, and Polonchek, 1993). Whether this

has been a problem in the current financial crisis is an open question and deserves further inquiry.

References

- Bernanke, B., Gertler, M., Gilchrist, S., 1996. The financial accelerator and the flight to quality. *Review of Economics and Statistics* 78, 1–15.
- Brunnermeier, M., 2009. Deciphering the liquidity and credit crunch 2007–2008. *Journal of Economic Perspectives* 23, 77–100.
- Chari, V.V., Christiano, L.J., Kehoe, P.J., 2008. Facts and myths about the financial crisis of 2008. Federal Reserve Bank of Minneapolis, Unpublished working paper.
- Diamond, D.W., Dybvig, P.H., 1983. Bank runs, deposit insurance, and liquidity. *Journal of Political Economy* 91, 401–419.
- Gatev, E., Strahan, P.E., 2006. Banks' advantage in hedging liquidity risk: theory and evidence from the commercial paper market. *Journal of Finance* 61, 867–892.
- Gorton, G., 2009. Slapped in the face by the invisible hand: banking and the panic of 2007. Yale School of Management, Unpublished working paper.
- Gorton, G., Metrick, A., 2009. Securitized banking and the run on repo. Yale School of Management, Unpublished working paper.
- Ivashina, V., Sun, Z., 2008. Institutional demand pressure and the cost of leveraged loans. Harvard Business School, Unpublished working paper.
- Kashyap, A.K., Rajan, R.G., Stein, J.C., 2002. Banks as liquidity providers: an explanation for the co-existence of lending and deposit-taking. *Journal of Finance* 57, 33–73.
- Loan Syndications and Trading Association, 2007. *The Handbook of Loan Syndication and Trading*. McGraw-Hill, New York, NY.
- Roberts, M., Sufi, A., 2009. Renegotiation of financial contracts: evidence from private credit agreements. *Journal of Financial Economics* 93, 159–184.
- Slovin, M., Sushka, M., Polonchek, J., 1993. The value of bank durability: borrowers as bank stakeholders. *Journal of Finance* 48, 247–266.
- Sufi, A., 2009. The real effects of debt certification: evidence from the introduction of bank loan rating. *Review of Financial Studies* 22, 1659–1691.
- Veronesi, P., Zingales, L., 2008. Paulson's gift. University of Chicago, Unpublished working paper.