

# **The Effect of Bank Shocks on Corporate Financing and Investment: Evidence from 2007-2009 Financial Crisis**

This version: April 5, 2013

## **Abstract**

We examine how shocks to banks' financial conditions impact corporate financing and investment decisions using the 2007-2009 financial crisis as an experimental setting. We find that average firms relied more heavily on bank credit during the crisis. However, firms whose banks incurred a larger amount of nonperforming loans used less bank credit when comparing their bank debt before and during the crisis. Their reduction on bank debt weren't replaced by alternative credit such as public debt or trade credit. There is some evidence that shocks on banks eventually affected corporate real activities; firms with more adversely affected banks invest less and hoard more cash during the crisis compared to their pre-crisis level. Overall, our results suggest that adverse shocks on the banking system can curtail bank lending and negatively affect the real sector.

**JEL classification: G01, G21, G31**

## I. Introduction

Banks play an important role in providing financing to corporations. Bank lending is important not only to small firms with limited access to the public debt market, but also to large and medium-sized companies. Using the Kauffman Firm Survey, Robb and Robinson (2009) find that bank loans and business credit cards are the primary sources of financing for first-year start-up firms. Sufi (2009) show that around 85% of large publicly listed corporations obtain a bank line of credit. Theories motivate the importance of banks as they can provide delegated monitoring service (Diamond (1984)), screen out poor quality borrowers (Leland and Pyle (1977), Ramakrishnan and Thakor (1984)), provide flexible loan renegotiation (Berlin and Lloyes (1988), Gertner and Scharfstein (1991)), and serve as an important liquidity cushion for systematic liquidity shocks (Kashyap et al. (2002) and Gatev and Stranhan (2006)).

Although bank credit is viewed as an important source of funding to corporations in the literature, when examining corporate financing and investment decisions, most of the empirical work analyzes these corporate decisions as a function of firm fundamentals (demand side). Few papers investigate how banks' wellbeing can impact corporate financing and investment decisions. Though some papers investigate how banks' lending affects real output at the aggregate level (for example Bernanke (1983)), their method suffers from the critique that a reduction on bank lending may be driven by aggregate production or technology shocks from the demand side. Recently, several studies (Peek and Rosengren (1997, 2000), Khwaja and Mian (2008), Schnabl (2011)) address these critiques by identifying exogenous shocks on banks and examining the heterogeneous response of corporate borrowers to banks with different level of shocks.

This paper advances the literature by examining how banks' financial conditions impact corporate financing and investment decisions using the 2007-2009 financial crisis as an experimental setting. We are interested in the recent financial crisis for the following reasons. First, it is the largest shock to the banking system since the great depression and merits a systematic examination of whether and how shocks on banks impacted the real sector.<sup>1</sup> Second, the recent financial crisis offers a nice setting to mitigate the confounded demand side effect. During the crisis banks' real estate loan portfolios in general took a big hit because of the lax lending standard during the boom period and a bust of real estate value during the crisis. Yet the deterioration of these real estate loans was not expected by banks and created substantial variation across banks and over time. Moreover, the losses on the residential or commercial real estate loans made by banks *before* the crisis should not be related to firms' change of credit demand before and during the crisis. The arguably exogenous shocks from banks' exposure to the real estate

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<sup>1</sup> During the financial crisis, US banks wrote down \$680 billion dollars on their balance sheets between the second quarter of 2007 and the fourth quarter of 2009<sup>1</sup> and reduced their *new loan* issuance by 79% at the same time (Ivashina and Scharfstein (2010)).

market allow us examine how banks' financial conditions impact corporate financing and investment decisions.

To our best knowledge, our paper is the most comprehensive study that investigates the impact of bank shocks on corporate financing and investment decisions during the 2007-2009 financial crisis. Although some evidences indicate that during the crisis more affected banks lent less or charged higher loan price (Ivashina and Scharfstein (2009), Cornett et al. (2010), Santos (2010)), few papers provide direct evidence of how banks' financial conditions impacted corporate financing and investment decisions. Our paper intends to shed light on these issues.

We break down our investigation into three steps. The first part of the paper examines whether firms were given less bank credit when their relationship banks were more adversely affected during the crisis. We hypothesize that firms whose banks experienced more negative shocks obtained less bank credit through the bank lending channel (Bernanke and Blinder (1988)). We further break down bank debt into credit line drawdown and term loans and investigate how these two types of bank debt reacted differently to shocks on banks. Credit lines and term loans have different contractual features. Term loans have a fixed amortization schedule at the issuance, whereas credit lines can be drawn down more flexibly at the borrowers' discretion. Ivashina and Scharfstein (2010) report that during the recent crisis, banks with worse financial conditions experienced "bank run", by precautionary corporate borrowers who drew down their credit lines at the concern of their banks' health. The "bank run" from the demand side can cause firms with a more troubled bank to take *more* bank credit and therefore confounds with our prediction from the supply side. The "bank run", however, is less likely to happen to term loans because of their fixed amortization schedule. Therefore, we expect to observe that firms' use of term loans responses more negatively to shocks on banks compared to credit lines.

The second part of the paper investigates whether and how firms adjust their financing decisions in response to the negative shock from their relationship banks. In the previous literature, trade credit and public debt are often viewed as alternative sources of credit to bank credit. Petersen and Rajan (1997) report that trade credit is an importance source of short-term finance and a substitute of bank credit. The choice between bank debt and public bond is also extensively studied in the previous theoretical and empirical studies (for example Diamond (1991), James and Houston (1997)). Therefore, we examine whether trade credit or public debt was used to replace reduced bank debt. We also investigate how firm leverage responded to shocks on banks to provide indirect evidence on whether bank debt was replaced by other types of debt.

In the third part of the paper, we examine whether shocks to the banking sector ultimately impact corporate real activities. We first examine whether firms with more troubled banks reduced their investment more than firms with healthier banks. We further investigate whether firms with more troubled banks increased their cash holdings for precautionary motive so that firms can use cash to

finance valuable feature investment opportunities when bank credit is not available or is excessively costly.

To test our hypotheses, we face an empirical challenge of disentangling the credit supply from the demand side. We tackle this issue by identifying an exogenous source of shock on banks that affects banks heterogeneously but arguably has little to do with corporate demand for bank credit. Specifically, we measure a shock variable as a bank's level of non-performing loans excluding commercial and industrial loans. Bank non-performing loan ratio reflects banks asset quality and is more difficult to manipulate than other accounting indicators because of the objective definitions (i.e. loans overdue for more than 90 days). Excluding the commercial and industrial loans from the non-performing loan measure further assures the exogeneity of the shock measurement. During the crisis period the share of commercial and industry loans in nonperforming loans portfolio was never above 12 percent.<sup>2</sup> This mitigates the reverse causality concern that deterioration of corporate credit quality caused banks' asset deterioration and impacted corporate financing and investment decisions. To further partial out the demand effect, we exclude construction related firms from our sample, because their investment opportunities can change with the boom and the bust of real estate market. We also control for a comprehensive set of firm characteristics measuring firms' demand for financing and investment and include firm fixed effects to exploit within-firm variation.

Overall, we find the following main results. First, we show that firms increased their overall level of bank debt during the crisis. Both term loans and credit line drawdowns increased during the crisis. However, firms with more adversely affected banks did not use as much bank debt as firms with less affected banks. This effect manifested mainly for term loans. This provides supportive evidence that banks' financial conditions affected the supply of bank credit to corporate borrowers during the crisis. Second, we find that firms with adversely affected banks did not replace the reduced bank credit with other source of credit during the crisis. Public debt and trade credit did not increase for firms with more distressed banks with respect to other firms. The leverage of firms with more troubled banks decreased more than that of firms with healthier banks. Third, we find some evidence of real effects associated with bank shocks. Firms with more troubled lenders invest less during the crisis compared to those with healthier banks. There is weak evidence that they tended to hoard more cash on their balance sheet during the crisis for precautionary reasons.

We contribute to the literature by providing direct evidence on how banks' financial conditions affect corporate financing and investment decisions at the firm level. Ivashina and Scharfstein (2009) and Cornett et al. (2010) find that banks with severe liquidity shortage reduce their commercial and industrial

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<sup>2</sup> This number can be compared with the 20% of commercial industrial loans out of total bank loan portfolio during our sample period. The data source comes from the Federal Reserve Board's H.8 report on the assets and liabilities of US commercial banks. <http://www.federalreserve.gov/releases/h8/>

lending during the 2007-2009 financial crisis. Nevertheless, these two studies remain silent on how such loan contractions affect corporate decisions. While Duchin et al (2009) and Campello et al. (2010) investigate how financial constraints affect corporate investment during the recent financial crisis, neither studies banks' role in generating such financial constraint. Carvalho et al. (2011) investigate how bank stock performance is related to the borrower stock performance but provide limited evidence on firm financial decisions. Santos (2011) and Kwan (2011) examine the effect of bank financial conditions on loan pricing but remain silent on the overall effect of bank financial condition on corporate decisions.

The remainder of the paper is organized as follows. Section II describes banks' financial conditions during the 2007-2009 financial crisis. Section III introduces the data, sample description, and the empirical methodology. Section IV presents the results of our analysis. Section V concludes.

## **II. 2007-2009 Financial Crisis**

At the heart of the 2007-2009 crisis is the meltdown of the residential and commercial real estate market. US house prices on average declined 30% from the 2006 peak to early 2010 (Furlong and Knight (2009)). This broad-based decline in house prices had been widely considered unlikely given the behavior of house prices over the post-World War II period, despite of signs of overvalued real estate properties before the bust (Krainer (2004)).

Banks took a big hit during the crisis from bad loans and collateralized debt obligation. According to the Global Financial Stability Report, U.S. banks wrote down \$680 billion dollars on their balance sheets between the second quarter of 2007 to the fourth quarter of 2009.<sup>3</sup> Banks also experienced liquidity shortages as it got hard to finance themselves from the commercial paper and interbank borrowing market during the crisis.

During the financial crisis, banks' *new* commercial and industrial loans fell dramatically. At the same time, the total amount of outstanding bank loans increased. Ivashina and Scharfstein (2010) document a decrease of new loans to large borrowers by 79 percent from the second quarter of 2007 relative to the fourth quarter of 2009. They point out that the increase in bank loans during the financial crisis is mainly due to increased drawdown of credit lines.

We examine how banks' financial condition impacts corporate financing and investment decisions using the 2007-2009 financial crisis as an experimental setting for the following reasons. First it is the largest shock to the banking system since the great depression. The exceptional magnitude of shock on banks and contraction of bank lending merits a systematic examination of whether and how bank shocks impacted the real sector. The shock on the banking sector was particular problematic given that some

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<sup>3</sup> Compared to the average of \$6.9 trillion loan portfolio on banks' balance sheet during that time, this accounts for 9.8 percent of bank's average loan portfolio.

alternative financing sources were also limited. The commercial paper market collapsed after the bankruptcy of Lehman Brothers in September 2008 and junk bond issuance dropped 66 percent due to flight to quality.

Moreover, the recent financial crisis serves as a convenient experiment setting in the sense that the crisis was not expected by banks ex-ante, and had a detrimental but heterogeneous impact on banks ex-post. While the bust of the housing bubble left banks sitting on mounting bad loans, banks were affected differently depending on their exposure to the housing bubble. Yet, when facing losses on their real estate loan portfolio, more affected banks may have become more risk averse and reduced their overall lending. This reduction can include some commercial and industry loans, which presumably banks would be willing to lend, had they not being as risk averse from their capital losses. In this way, banks passed the shock from the residential or commercial market to the relatively healthier corporate sector.

The fact that industrial firms' overall condition did not worsen sharply until the second quarter of 2008 supports the above statement. Neither corporate bond spreads nor bankruptcy filings rose dramatically until September of 2008 (Huang (2010)). The level of bank non-performing loans (NPLs) was 0.5 percent of total bank assets at the beginning of 2007 and jumped to 2.95 percent at the end of 2009, a five-fold increase. In contrast, the component of bank commercial and industrial NPLs only increased from 0.11 percent of total bank assets at the beginning of 2007 to 0.36 percent at the end of 2009.

In this paper, we explore the cross-sectional difference in shocks across banks and over time caused by banks' exposure to the real estate market. We utilize this variation to measure how banks' financial conditions impacted corporate financing and investment decisions, when the nonfinancial sector was less directly affected by the financial crisis.

### **III. Data, Sample Description and Methodology**

#### **A. Data and Sample Description**

Our main sample consists of yearly data on non-financial and non-utility firms drawn from Compustat. Specifically, we exclude firms with SIC codes between 6000-6999 (financial firms), and between 4900-4949 (utility firms). To mitigate the concern that changes in credit demand may drive our results, we exclude firms in the construction industry (SIC code 1500-1700) which were hit dramatically during the subprime crisis. Our sample period starts from 2003 and ends at 2009.<sup>4</sup>

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<sup>4</sup> We use this sample period to alleviate the concern that during the 2000-2002 mild recession firms might have fewer investment opportunities and reduce their demand for bank credit, which may reflect in our measurement of non-performing loan. If we include year 2002 in our sample, our results are even stronger.

We take the following steps to construct our sample. First, we use the Loan Pricing Corporation’s (LPC) Dealscan database to identify firm-bank lending relationship. According to Ivashina (2009) and Standard and Poor (2006), lead banks are the primary banks responsible for ex-ante due diligence and for ex-post monitoring of the borrower, the types of services motivated in theory. Therefore, we identify a lending relationship only if a bank serves as a lead lender for a firm. We define lead lenders following Bharath et al. (2011)<sup>5</sup>. We examine the Dealscan database to identify lead lenders in a five-year rolling window for each firm-year observation lagged by half a year.<sup>6</sup> For example, if we examine the lending relationships of company X on December 31, 2005, we investigate all lead banks of company X from whom it took loans. We then assign weights to different lead banks according to the loan amount lead lent by the banks. Assume bank A lead lent a loan of 100 million dollars on Jun. 1, 2001. Bank A keep 40% of the loan and the remaining 60% is shared by other participant banks. Bank B and C lead lent a loan \$200million on Sept. 2 2004. Bank B and C retain 20% and 30% of the loan. We assign 33.3% to bank A, 0.267 to bank B, and 0.4 to bank C.<sup>7</sup> Our measurements of bank characteristics, including the bank shock variable, is calculated as a weighted average of all lead banks.

We then link borrowing firms with Compustat to retrieve their accounting information and with CRSP to obtain stock information.<sup>8</sup> Our bank debt and public debt data comes from Capital IQ<sup>9</sup>, which reports detailed breakdown of corporate debt at a yearly basis. Houston and James (1997) find evidence that bank holding companies can form an internal capital market and allocate their capital among various subsidiary banks. Therefore, we link the relationship lenders’ information with their ultimate bank holding company parent (BHC)<sup>10</sup>. Our sample of lenders only includes US BHC<sup>11</sup>. Our final sample includes 4,442 firm-year observations.

## B. Empirical Strategy

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<sup>5</sup> They define the lead lenders as those who are the sole lender on a loan, or are credited as “agent”, “administrative agent”, “arranger”, “lead bank”. They find that on average banks with these roles retain more than 25% share of the loan.

<sup>6</sup> We have the half year lag to allow for the new lending relationship to have some effect on corporate decisions.

<sup>7</sup> The weights are calculated as  $100/300$  for bank A;  $\frac{200 * (\frac{0.2}{0.2+0.3})}{(100+200)} = 0.267$  to bank B, and  $\frac{200 * (\frac{0.3}{0.2+0.3})}{(100+200)} = 0.4$  to bank C.

<sup>8</sup> The link table is kindly provided by Michael Roberts.

<sup>9</sup> To ensure our data quality, we exclude those firm-year observations in our bank debt and public debt sample, whose total debt reported on CIQ differs from the record in Compustat by 10%.

<sup>10</sup> We use National Information Center’s web site information to trace the BHC parent of lenders over time.

<sup>11</sup> To ensure that the measurements of BHC financial conditions are representative of the financial conditions of overall lenders, we constrain our sample to those firm-year observations whose majority lenders are subsidiary of US BHCs.

Identifying a linkage between bank financial condition and corporate decisions is challenging, as the results could be confounded with the credit demand. That is, shocks to the banking sector during the 2007-2009 financial crisis were accompanied by changes in investment opportunities and therefore may just proxy for changes in credit demand. To disentangle the supply and demand effects on corporate decisions, we adopt the following identification strategies.

First of all, we identify a source of shock on banks that is believed to be exogenous to firms' credit demand. Specifically, we use the level of bank non-performing loan as the measurement of supply shock. On the one hand, the majority of banks' loans that turned out to be problematic (i.e. non-performing) were extended during the credit boom and were largely unexpected by banks (Furlong and Knight (2010)). Such unexpected bank asset deterioration varied across lenders and over time. Additionally, the majority of nonperforming loan portfolios is comprised of real estate loans, and the proportion of real estate non-performing loans increased from around 80 percent of the total non-performing loans before crisis to 90 percent after crisis. Figure 1 illustrates these statements. This mitigates the endogeneity issue that the increase in nonperforming loan comes from the deterioration of borrowers' conditions.

Second, we control for a comprehensive set of firm controls to partial out firms' demand for financing and investment.

Third, our empirical models include firm fixed effects that exploit within-firm variation. With this specification, the effect of bank non-performing loans on associated firms' financing and investment is estimated by comparing the response of the same firm over time. This fixed effect specification removes all firm-specific time-invariant omitted variables that can simultaneously relate to banks' financial conditions and corporate financing and investment decisions. For example, firms with good private projects may finance with banks of strong financials and these firms may also obtain more credit from banks for their positive prospect. Our results can be driven by the unobserved firm characteristics. By adding firm fixed effects in the model, we can mitigate the omitted time-invariant firm characteristics and explore changes in the financing and investment decisions within the same firm.

### **C. Model**

This section describes the empirical model. Our identification strategy is based on the premise that the financial crisis was an unexpected negative shock to banks' financial positions, which induces banks to reduce credit supply to corporations and affect corporate financing and investment decisions. We test our hypotheses by interacting the crisis dummy with bank non-performing loans. Specifically, we estimate the following regression model. Appendix A specifies definitions of variables in the model. Variables measuring bank financial positions are lagged by one quarter to allow enough time for banks to respond to shocks.

$$Y_{i,t} = b_0 + b_1 \text{crisis} + b_2 \text{crisis} * \text{bank NPL}_{i,t-1} + b_3 \text{bank NPL}_{i,t-1} + b_4 \text{firm controls}_{i,t-1} + b_5 \text{bank controls}_{i,t-1} + \text{Firm FE}_i + e_{it} \quad (1)$$

$Y_{i,t}$ : Firm's financing and investment variables. Specifically, they are bank debt, public debt, book and market leverage, trade credit, capital expenditures, and cash holding.

*Crisis*: A dummy variable that equals 1 if the firm-year observation is at or after 2008 and 0 otherwise.

*Bank NPL*: Bank NPL excluding commercial and industrial loans. NPL level reflects bank's asset quality and is more difficult to manipulate than other accounting variables due to its objective definition (i.e. loans overdue for more than 90 days). This variable is the weighted average across all lead lenders. The weights are described in the Data and Sample Description section.

*Firm controls*: Firm fundamental variables that are determinants of firms' financing and investment decisions.

Specifically, we identify the bank debt, trade credit, and public debt equation by adding log of inflation-adjusted total assets, market-to-book asset, EBITDA over total assets, fixed assets over total assets, z-score, asset volatility, and log of firm age following Petersen and Rajan (1997), and Denis and Mihov (2003). These variables are used to proxy firms' demand for credit, access to capital sources, information asymmetry, and credit worthiness.

In the leverage equation, we include the log of inflation-adjusted total assets, market-to-book asset, EBITDA over total assets, fixed assets over total assets, asset volatility, industry median leverage ratio, and dividend payout dummy given their strong theoretical and empirical prediction power on firms' leverage ratio (Lemmon et al. (2008), Frank and Goyal (2009)).<sup>12</sup>

As in the investment literature, we control for cash flow, and Tobin's Q. To capture industry-wide investment demand shifts over time, we also control for industry median capital expenditure.

In the cash equation, we include the log of inflation-adjusted total assets, market-to-book asset, EBITDA over total assets, net working capital to total assets, industry cash flow risk, dividend payout dummy, and R&D to sales in the cash holding equation following Opler et al. (1999).

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<sup>12</sup> We include additional firm controls such as z-score, investment tax credit, tax loss carry forward. Our main results still hold.

*Bank controls:* Bank financial conditions are the variables that affect banks' supply of credit.<sup>13</sup> They include the Tier 1 capital ratio, core deposit ratio, liquid asset ratio, off-balance sheet loan unused loan commitments and return on assets.

#### **D. Descriptive Statistics**

Table I presents descriptive statistics of our sample. Panel A provides summary statistics for corporate borrowers. Bank debt is an important source of financing for firms. In our sample, bank debt counts for 9.7 percent of total assets or around 38 percent of total debt. Term loans and credit line drawdowns each constitute 50 percent of total bank debt. Public debt and trade credit are two other important sources of funding, accounting for 13.9 percent and 8 percent of total assets respectively. The level of book leverage and market leverage is similar as documented in the previous literature (for example Lemmon, Roberts, and Zender (2008), Sufi (2007)). In an unreported analysis, we find that our sampled firms are bigger and older, more profitable, and have fewer investment opportunities than the Compustat universe. This suggests that our sample includes more mature firms. This partly comes from the fact that our sample requires a previous lending relationship with a bank recorded according to the issuance history from the Dealscan. Younger firms may rely more on equity than bank debt for financing (Bolton and Freixas (2000)). Given that our sample of firms is older and more mature, they can access other sources of funding relatively easily (for instance, to the public bond market). This can bias against rejecting the null. Panel B reports the summary statistics for BHCs. Our sampled BHCs in general are larger banks who play a major role in the syndication market.

Panel C compares borrower financing and investment before crisis (year 2003 to year 2007) with those during the crisis (year 2008 and 2009). It shows that overall firms' financial and investment decisions altered during the crisis compared to their before crisis level. During the crisis, firms relied more on bank debt. Asset scaled bank debt increased by 3.9 percentage points during the financial crisis compared to the pre-crisis level period, a 46 percent increase. 64 percent of the increase came from term loans, whereas drawdown on credit lines accounts for the other 36 percent. Public debt remained the same before and during the crisis whereas trade credit decreased marginally. During the crisis period, firm book (market) leverage increased by 4.5 (11.3) percentage points, suggesting that firms used more debt on their balance sheet. Firms reduced their capital expenditure and hold less cash during the financial crisis.

Panel D provides summary statistics for the BHCs in our sample, and it shows that the financial condition of banks deteriorated during the subprime crisis. Our key variable bank noncommercial and

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<sup>13</sup> We include these control variables to ensure that our results are not driven by banks' endogenous choice of enhancing their capital and liquidity positions or capital (or liquidity) injection by the federal government.

industrial NPL increased by average of 143 percent, suggesting that this increase is widespread among banks. Bank liquid assets and core deposits also reduced and profitability dropped dramatically during the crisis period.

## IV. Empirical Results

### A. Bank Debt

We first present the sets of empirical results on bank debt. If shocks on the banks can affect the corporate sector, we should observe a first-order linkage between bank's financial condition and its borrowers' reliance on bank loan financing.

Table II presents the results on bank debt. We begin by comparing firms' bank debt level before the crisis to the bank debt level during the crisis, controlling for firm characteristics and fixed effects. Column (1) shows that the *Crisis* dummy is positive and highly statistically significant, indicating that firms relied on more bank debt during the crisis. On average, bank debt increased by 2.7 percentage points during the crisis. This indicates that other types of financing may be even harder to obtain than bank debt during the crisis. Larger firms with more investment opportunities and less asset risk use more bank debt, suggesting that compared to other non-bank sources of funding including equity, bank debt is used more often by mature firms. The coefficient on z-score indicates that more distressed firms use more bank debt. This is consistent with the argument of Berlin and Lloyes (1988) that bank debt can provide valuable financing flexibility to more distressed firms.

Next, we investigate whether firms whose relationship banks incurred more NPLs obtained less bank debt during the crisis compared to firms with healthier banks. Column (2) investigates this hypothesis, controlling for firm-specific controls and firm fixed effects. The coefficient on the interaction variable *Crisis*  $\times$  *NPL\_noC&I* is negative and statistically significant, indicating that firms with more troubled banks obtained less bank credit during the crisis compared firms with healthier banks. The coefficient on *NPL\_noC&I* is positive and statistically significant, suggesting that banks with a higher level of NPLs extended more credit before the financial crisis, an indicator of aggressive lending. However, during the crisis, banks with a higher level of NPLs lent less compared to healthier banks.<sup>14</sup> This suggests that banks lent less to corporate borrowers during the crisis after they experienced more asset deterioration in their non-C&I loan portfolio.

Column (3) shows that our main results continue to hold when we expand our controls to account for other bank characteristics that might affect their willingness to lend. Among the bank control

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<sup>14</sup> The point estimate is  $-3.052 + 2.272 = -0.78$ , and is statistically significant at the 1% level.

variables, we notice that *Bank Tier 1 Ratio* is negative and statistically significant; indicating that bank with higher regulatory capital reduced its supply of credit more than other banks. We will defer the discussion of this effect to the section where we break down the total debt into credit line drawdown and term loans (see Table III and Table IV).

Column (4) demonstrates that our main findings still hold when we further control for year dummies to account for any macroeconomic shocks.<sup>15</sup> The economic impact of bank shocks on firm bank debt usage is economically significant. According to column (4), one standard deviation increase in the level of NPLs leads to a decrease of 1.82 percentage points of bank debt during the crisis by corporate borrowers.<sup>16</sup> Compared to the 9.7 percent unconditional mean of bank debt during the sample period, this is an increase of 18.8 percent.<sup>17</sup> These tests support our hypothesis that banks with greater asset quality deterioration lent less to their corporate borrowers during the crisis, compared to those healthier banks.

We further break down bank debt into credit line drawdown and term loans and investigate how these two types of bank debt reacted differently to shocks on banks. Term loans have a fixed amortization schedule at the issuance and banks can cut off the supply of new terms loans quickly if they wish to do so. In contrast, credit lines can be drawn down at the borrowers' discretion. Ivashina and Scharfstein (2010) report that during the recent crisis, banks with worse financial conditions experienced "bank runs" by precautionary corporate borrowers who drew down their credit lines at the concern of their banks' health. The "bank runs" from the demand (firm) side can cause firms with more troubled banks to take *more* bank credit and therefore confounds with our prediction from the supply (bank) side. The "bank run", however, is less likely to happen to term loans because of term loans' fixed amortization schedule. Therefore, we expect to observe that firms' usage of term loans responded more negatively to shocks on banks compared to credit line drawdowns during the crisis.

Tables III and IV present the results on credit line drawdowns and term loans, respectively. The *Crisis* dummy in column (1) of both tables is positive and highly statistically significant. Economically, the credit line drawdown (term loan) of an average firm increased by 1.3 (1.4) percentage points during the crisis.

Our empirical results confirm our hypothesis that term loans responded more negatively to bank shocks compared to credit line drawdowns during the crisis. In the regression of credit line drawdown, the coefficient on the interaction term  $Crisis \times NPL\_noC&I$  is negative but statistically insignificant across

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<sup>15</sup> Specifically, we include year dummy for 2004, 2005, 2006, and 2007. We didn't include dummy for year 2008 and year 2009 to avoid perfect multicollinearity and to be able to estimate the crisis dummy.

<sup>16</sup> This number is calculated as  $-2.282 \times 0.008 = 1.83\%$ . The standard deviation of the NPL comes from Appendix B, which presents the weighted average of relationship banks for each firm.

<sup>17</sup> Compared to the standard deviation of bank debt, this leads to a  $0.137$  standard deviation change of bank debt. This is calculated as  $0.0182 / 0.127 = 0.143$ .

all specifications, providing no evidence that firms whose banks experienced more NPLs increased their drawdowns on credit lines during the crisis compared to firms with healthier banks. Given that the “bank run” effect predicts a positive sign on the  $Crisis \times NPL\_noC&I$  interaction term and bank supply shock effect predicts a negative sign, the insignificant sign can be driven by both effects. In comparison, Table IV shows that the coefficient on the interaction variable  $Crisis \times NPL\_noC&I$  is negative and statistically significant across all specifications, suggesting that firms whose banks had more NPLs obtained less term loans during the crisis compared to firms with healthier banks. According to column (4) in Table IV, an increase of one standard deviation in NPLs leads to a decrease of 1.52 percentage point of term loans comparing the before and after crisis level. Compared to the 4.7 percent unconditional mean of term loan during the sample period, this is an increase of 32.3 percent, which is economically significant.<sup>18</sup> However, a Wald test of coefficient equality shows that the interaction term  $Crisis \times NPL\_noC&I$  in the term loan regression and that in the credit line drawdown regression is not significantly different (p-value is around 25 percent).

As we pointed out earlier, *Bank Tier 1 Ratio* has a negative and statistically significant coefficient in the bank debt regression in Table II. Our results in Tables III and IV show that this negative sign on *Bank Tier 1 Ratio* is driven by credit line drawdowns rather than term loans. Firms whose banks have a higher regulatory capital drew down less on their credit lines than other firms. This is consistent with Ivashina and Scharfstein (2010)’s argument that banks with stronger financial conditions are less likely to subject to run on credit lines by corporate borrowers.

To sum up, our results support the hypothesis that shocks on banks reduced bank credit supply. Although firms increased their reliance on bank debt during the recent financial crisis, firms with more troubled banks did not use as much bank debt as firms with healthier banks during the crisis. This effect manifested mainly on term loans rather than credit line drawdowns.

## **B. Trade Credit, Public Debt, and Leverage**

As the investigation on bank debt suggests that firms with more adversely affected banks obtained less bank credit during the crisis, we then investigate whether and how these firms adjusted their financing decisions in response to accommodate the negative shock from their relationship banks. Trade credit and public debt are often viewed as alternative sources of credit for bank debt. Therefore, we investigate whether firms with more troubled banks use relatively more of these two types of credit during the crisis.

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<sup>18</sup> Compared to the standard deviation of term loans, this leads to a 0.137 standard deviation decrease of term loan. This is calculated as  $0.0152/0.1=0.152$ .

Our results for trade credit are reported in Table V. Column (1) shows that the *Crisis* dummy is negative and statistically significant. During the crisis, average asset-scaled trade credit decreased by 0.3 percentage points, a moderate decrease of 3.75 percent compared to its unconditional mean 8 percent. Across specifications in column (2)-(4), the coefficient on the interaction term  $Crisis \times NPL\_noC&I$  is negative but is not statistically different from zero. This suggests that firms whose banks experienced more NPLs didn't increase their usage of trade credit during the crisis. The NPLs variable is statistically insignificant during both the pre-crisis period and crisis period, indicating no impact of bank NPLs on firm trade credit. The signs on firm-specific controls are generally consistent with the previous literature (for example Peterson and Rajan (1994)); small firms with more growth opportunities, fewer fixed assets, and higher degrees of financial distress use more trade credit.

With respect to the public debt, column (1) in Table VI shows that the *Crisis* dummy is not statistically significant, indicating that firms' usage of public debt did not change during the crisis. The coefficient on the interaction variable  $Crisis \times NPL\_noC&I$  is negative but is not statistically different from zero across all specifications in column (2)-(4). This indicates that firms whose banks experienced larger NPLs did not use more public debt during the crisis. The NPLs variable is statistically insignificant during both the pre-crisis period and crisis period, indicating no impact of bank NPLs on firm public debt.

We next investigate whether firms with more troubled banks reduced their leverage ratio, in order to provide indirect evidence on whether reduced bank credit was replaced by other types of debt for firms with more affected banks. Tables VII and VIII present results on book leverage and market leverage, respectively. Column (1) of both tables shows that firm leverage increased during the recent financial crisis. However, such increase is less pronounced among firms with a higher level of NPL as the coefficient on the interaction variable  $Crisis \times NPL\_noC&I$  is negative and statistically different from zero in column (2). These results hold even after we control for other bank characteristics and year dummies in column (3) and (4). According to column (4), an increase of one standard deviation in the level of NPLs leads to a decrease of 2.45 (2.92) percentage point of book (market) leverage by corporate borrowers compared to their pre-crisis level. Compared to the unconditional mean of 25.2 (24) percent, this is an increase of 9.7 (12.2) percent, indicating that the effect is economically significant.

Together, these results are consistent with the view that firms with adversely affected banks didn't replace the reduced bank credit with other sources of credit during the crisis. Public debt and trade credit did not change for firms with more distressed banks compared to firms with healthier banks.

### **C. Investment and Cash Holdings**

Given that firms associated with more troubled banks used less bank debt during the crisis and seemed not to substitute the bank credit with other sources of credit, we proceed to investigate whether adverse shocks on the banking system ultimately impact corporate real activities. We first examine whether firms with more troubled banks reduced their investment than firms with healthier banks. We further investigate whether firms with more troubled banks increased their cash holdings for precautionary motive so that firms can use cash to finance valuable feature investment opportunities when bank credit are not available or are excessively costly.

The results of investment, measured as capital expenditure, are reported in Table IX. We begin by comparing the firm's investments before the crisis with the investments during the crisis, controlling for a set of firm-specific characteristics commonly used in the literature and firm fixed effects. Column (1) shows that the average capital expenditure scaled by total assets decreased by 0.2 percentage points during the crisis. With regards to firm controls, they are generally consistent with the previous literature. Firms with more investment opportunities and higher cash flows invest more on average.

Next, we investigate whether firms whose banks experienced more NPLs during the crisis invested less. Column (2)-(4) investigates this hypothesis, with different specifications. Column (2) only controls for firm characteristics and fixed effects. Column (3) further controls for bank characteristics. Column (4) adds year fixed effect and time-varying industry median investment level to account for some unknown macroeconomic or industrial changes in firm investment. The coefficient on the interaction variable  $Crisis \times NPL\_noC&I$  is negative and weakly significant, indicating a possible real effect associated with bank shocks during the crisis. The coefficient on NPLs is insignificantly different from zero during the pre-crisis period, but is weakly significantly negative during the crisis indicating that bank NPL did not have a major effect on firm investment before the financial crisis but decreased firm investment during the financial crisis.

As data in the investment regression can be obtained at the quarterly frequency, which allows us to estimate the model with more statistical power and capture timely changes of both firms and banks, we rerun the above analyses using quarterly data and presents our results in Table IX Panel B. Results from the quarterly data suggest that bank shocks brought in real effects in the corporate sector. According to column (4) in Panel B, a change of one standard deviation in the level of NPLs leads to a decrease of 0.16 per cent of investments by corporate borrowers. Compared to the unconditional mean of 1.6 percent, our results indicate a decrease by 8.75 percent. The results are therefore economically significant.

Table X presents the results on cash. Column (1) shows that our *Crisis* dummy is positive and highly statistically significant, indicating that firms tend to hold more cash during crisis. Firm controls are generally consistent with the previous literature (for example Opler et al (1999)). Specifically, smaller firms with more investment opportunities and lower net working capital hold more cash. In column (2)-(4) the interaction term  $Crisis \times NPL\_noC&I$  is positive and but statistically insignificant. As with the

investment regression, we rerun the analyses using quarterly data. Results are presented in Table X Panel B. The interaction term  $Crisis \times NPL_{noC\&I}$  is positive and weakly significant, providing some evidence that firms with more affected banks increased cash holdings more during the crisis compared to the pre-crisis cash holding level. The NPLs variable is negative but statistically insignificant during the pre-crisis period, but is weakly significantly positive during the crisis indicating that bank NPL did not have a major effect on firm cash holding before the financial crisis but increased firm cash holdings during the financial crisis.

Together, our results provide some evidence that shock on banks eventually transmitted to corporate real activities; firms with more adversely affected banks invest less and hoard more cash during the crisis compared to firms with healthier banks. Overall, our results suggest that adverse shocks on the banking system can curtail bank lending and negatively affect the real sector.

#### **D. Robustness and Extension**

Our results may be driven by a sample selection issue, i.e. riskier firms were matched with riskier banks, both of which were hit hard during the crisis. If this matching story holds, the reduction of firm bank debt usage and investment may be driven by reduction of investment opportunities of the riskier borrowers rather than banks' reluctance of lending. To alleviate this concern, we compare borrower characteristics of banks with higher NPLs (above the mean) to those of banks with lower NPLs (below the mean) during the pre-crisis period. Appendix C reports the comparison results. Our results show that firms with higher NPLs have slightly better credit quality than the firms with lower NPLs according to their pre-crisis characteristics. Specifically, firms with riskier banks on average are older, bigger, have a higher cash flow and less asset volatility though they are slightly more distressed. These results are inconsistent with the firm-bank matching story.

Another concern is that there can be some measurement error in the borrower-bank lending relationship. The lending relationship in our study is identified by the Dealscan loan issuance data and is assumed to hold within a five year period. However, a firm can endogenously switch to a healthier bank to refinance its loan if it is concerned about its bank's financial condition. Without observing the switching, a ceased lending relationship may exist in our sample adding noise to our measurement of lending relationship and bank shock. However, such noise should make our estimation less precise and bias us toward not finding any results. The fact that we still find significant results alleviates such measurement error concern.

As in section A and B, we find that firms with more troubled banks used less bank credit and didn't increase other credits such as public debt, trade credit, or other types of debt during the crisis. We then investigate whether these firms used other financing sources, such as equity, when their relationship

banks were adversely impacted during the crisis. To answer this question, we break down firms' total financing sources into five categories: bank debt, public debt, trade credit, other liabilities, and equity. We run seemingly unrelated regressions to allow for correlated error terms across regressions due to the balance sheet constraint. Results are presented in Table XI. The results indicate that firms with more troubled banks reduced their reliance on bank debt, but increased their relative reliance on equity. We further investigate the change of absolute level of equity from the end of 2007 to the end of 2009 across bank NPL quintiles. Table XII displays the results. Firms with bank NPL in higher quintiles (quintile 4 and 5) increased more equity holdings compared to firms with bank NPL in lower quintiles (quintile 1 to 3). The last column in Table XII reports the t-statistics when comparing the mean of change in equity in quintile 5 vs. quintile 1-4. The results show some evidence that firms with more troubled banks used more equity during the crisis compared to those with healthier banks.

## **V. Summary and Conclusion**

This study examines how banks' financial conditions impact corporate financing and investment decisions using the 2007-2009 financial crisis as an experimental setting. We are interested in the recent financial crisis because the exceptional magnitude of shock on banks merits a systematic examination. This crisis was originated from the melt-down of a housing bubble and banks were heterogeneously affected depending on their exposure to the real estate market. The nonfinancial sector was less directly affected until the later phase of the crisis. We utilize this cross-sectional variation of shock on banks from the real estate market to explore the different response of corporate financing and investment before vs. after the crisis. Specifically, we use banks' noncommercial and industrial nonperforming loans to measure shock on banks, given its relative exogeneity from corporate credit demand.

Our results suggest that the financial condition of banks is important to corporate financing and investment decisions. Overall, we find the following main results. First, we show that firms increased their overall level of bank debt during the crisis, the increase is not only due to the higher level of drawdown from their line of credit but also on term loans. This suggests that relative to alternative financing sources, bank debt is a relatively accessible source of funding. Second, we show that though firms in general relied more on bank debt during the crisis, those with more adversely affected banks did not use as much bank debt as firms with less affected banks during the crisis. This effect manifested mainly on term loans. Third, we find that for those firms with adversely affected banks, they did not replace the reduced bank credit with other source of credit during the crisis. Public debt and trade credit did not change for firms with more negatively affected banks in comparison to firms with healthier banks during the crisis. Indeed, firms with more adversely affected banks use less leverage during the crisis than those firms whose lenders were less affected. Moreover, we provide some evidence that shock on banks

eventually transmitted to corporate real activities; firms with more adversely affected banks invest less and hoard more cash during the crisis compared to firms with healthier banks. Overall, our results suggest that adverse shocks on the banking system can impact corporate financing and investment decisions.

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**Table I**  
**Descriptive Statistics**

This table reports descriptive statistics of variables in our empirical analysis. Panel A describes firm characteristics. Panel B presents bank characteristics. Panel C compares firm financing and investment levels before and during the crisis. Panel D reports the comparison of bank characteristics before and during the crisis. Variable definitions are provided in Appendix A. Variables are winsorized at 1 and 99 percentile to alleviate the concern of outliers.

**Panel A. Firm Characteristics**

Variable	Obs	Mean	Median	Std. Dev.	Min	Max
Dependent Variables						
Bank Debt	4,442	0.097	0.041	0.127	0.000	0.569
Drawdowns	4,442	0.048	0.002	0.082	0.000	0.391
Term Loans	4,442	0.047	0.000	0.100	0.000	0.519
Public Debt	4,442	0.139	0.117	0.145	0.000	0.657
Trade Credit	4,442	0.080	0.063	0.067	0.004	0.367
Book Leverage	4,442	0.252	0.229	0.182	0.001	0.916
Market Leverage	4,442	0.240	0.189	0.206	0.000	0.891
Capital Expenditure	4,442	0.016	0.011	0.018	0.000	0.104
Cash	4,442	0.105	0.058	0.126	0.000	0.646
Independent Variables						
Size (Billion)	4442	5.102	0.988	13.454	0.019	101.308
Log(Size)	4,442	6.239	6.191	1.799	2.272	10.866
Market-to-book	4,442	1.412	1.146	0.910	0.361	5.650
Cash Flow	4,442	0.035	0.034	0.026	-0.069	0.108
Z-score	4,442	2.461	1.982	2.428	-3.879	14.044
Fixed Assets	4,442	0.301	0.232	0.233	0.019	0.900
Firm Age (Year)	4,442	22.147	16.748	16.729	0.748	58.748
Log(Firm Age)	4,442	2.827	2.876	0.863	0.558	4.056
Assets Volatility	4,442	0.326	0.287	0.175	0.078	0.940
Industry Median Book Leverage	4,442	0.241	0.224	0.085	0.063	0.581
Industry Median Market Leverage	4,442	0.209	0.183	0.105	0.055	0.626
Industry Median Investment	4,442	0.012	0.008	0.011	-0.013	0.070
Dividend Payer Dummy	4,442	0.436	0.000	0.496	0.000	1.000
R&D	1,596	0.013	0.007	0.019	0.000	0.109
Industry Sigma	4,442	0.064	0.063	0.026	0.013	0.116
Net Working Capital-Exclude Cash	4,442	0.086	0.075	0.154	-0.303	0.524

**Panel B. Bank Characteristics**

<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Median</b>	<b>St. Dev</b>	<b>Min</b>	<b>Max</b>
Size	569	120.414	8.531	357.886	0.171	2268.347
NPL	569	0.012	0.006	0.018	0.000	0.172
NPL_noCI	569	0.010	0.004	0.016	0.000	0.164
Liq Assets	569	0.105	0.076	0.094	0.007	0.519
Core Dep.	569	0.546	0.573	0.160	0.001	0.823
ROA	569	0.007	0.009	0.014	-0.105	0.048
Tier1 ratio	569	0.112	0.105	0.039	0.000	0.368
Tier1/Total Assets	569	0.084	0.080	0.030	0.000	0.327
Unused Commit	569	0.138	0.115	0.105	0.000	0.865

**Panel C. Firm Financing and Investment Before vs. During Crisis**

<b>Variable</b>	<b>Before the Crisis</b>	<b>During the Crisis</b>	<b>Difference</b>	<b>T-stats</b>
	<b>(1/1/2003-12/31/2007)</b>	<b>(1/1/2008-12/31/2009)</b>		
	<b>Mean</b>	<b>Mean</b>		
Bank Debt	0.084	0.123	0.039	8.905
Drawdowns	0.044	0.058	0.014	5.024
Term Loans	0.039	0.064	0.025	6.904
Public Debt	0.139	0.138	-0.001	-0.210
Trade Credit	0.082	0.076	-0.005	-2.531
Book Leverage	0.237	0.282	0.045	7.379
Market Leverage	0.203	0.316	0.113	15.929
Capital Expenditure	0.017	0.014	-0.003	-5.395
Cash	0.109	0.098	-0.011	-2.879

**Panel D. Bank Characteristics Before vs. During the Crisis**

<b>Variable</b>	<b>Before the Crisis</b>	<b>During the Crisis</b>	<b>Difference</b>	<b>T-stats</b>
	<b>(1/1/2003-12/31/2007)</b>	<b>(1/1/2008-12/31/2009)</b>		
	<b>Mean</b>	<b>Mean</b>		
Size	108.199	160.457	52.258	1.252
NPL	0.008	0.025	0.017	7.742
NPL_noCI	0.007	0.022	0.015	7.472
Liq Assets	0.103	0.111	0.008	0.821
Core Dep.	0.555	0.518	-0.037	-2.305
ROA	0.011	-0.006	-0.016	-8.684
Tier1	0.111	0.116	0.005	1.315
Tier1/Total Assets	0.083	0.086	0.003	0.897
Unused Commit	0.142	0.125	-0.017	-1.842

**Table II**

**Regression Results of Bank Debt on Firm and Bank Conditioning Variables**

This table presents the results on bank debt and bank financial conditions. Dependent variable is firm bank debt, measured as bank debt scaled by book value of total asset. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Sample includes 4,442 firm-year observations from year 2003 to year 2009. Variables are defined in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1% level, 5% level, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Crisis	0.027*** (0.005)	0.047*** (0.008)	0.038*** (0.008)	0.033*** (0.009)
Crisis x NPL_noC&I		-3.052*** (1.130)	-2.564** (1.162)	-2.282* (1.182)
NPL_noC&I		2.272** (1.128)	2.850** (1.184)	2.657** (1.238)
Size	0.023*** (0.008)	0.022*** (0.008)	0.020** (0.008)	0.018** (0.008)
Market-to-book	0.022*** (0.007)	0.021*** (0.007)	0.021*** (0.007)	0.020*** (0.007)
Cash Flow	0.004 (0.128)	-0.025 (0.128)	-0.028 (0.129)	-0.019 (0.130)
Z-score	-0.018*** (0.003)	-0.018*** (0.003)	-0.018*** (0.003)	-0.018*** (0.003)
Fixed Assets	0.017 (0.047)	0.023 (0.047)	0.026 (0.046)	0.036 (0.047)
Log Firm Age	-0.007 (0.017)	-0.003 (0.017)	-0.005 (0.018)	-0.024 (0.020)
Asset Volatility	-0.093*** (0.014)	-0.094*** (0.014)	-0.096*** (0.014)	-0.097*** (0.014)
Bank Controls:				
Bank Size			-0.003 (0.005)	-0.004 (0.005)
Bank ROA			-0.276 (0.497)	-0.270 (0.498)
Bank Tier1 ratio			-0.522** (0.252)	-0.699*** (0.269)
Bank CoreDep			-0.050 (0.042)	-0.014 (0.042)
Bank Liq Assets			-0.021 (0.122)	0.161 (0.134)
Bank Unused Comm.			0.032 (0.044)	0.017 (0.046)
Constant	0.002 (0.059)	-0.011 (0.059)	0.125 (0.133)	0.212 (0.147)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Number of Observations	4,442	4,442	4,442	4,442
Adj-R <sup>2</sup>	0.697	0.698	0.700	0.701

**Table III****Regression Results of Credit Line Drawdown on Firm and Bank Conditioning Variables**

This table presents the results on credit line drawdowns and bank financial conditions. Dependent variable is firm credit line drawdown, measured as credit line drawdown scaled by book value of total asset. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Sample includes 4,442 firm-year observations from year 2003 to year 2009. Variables are defined in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1% level, 5% level, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Crisis	0.013*** (0.003)	0.025*** (0.005)	0.022*** (0.006)	0.019*** (0.006)
Crisis x NPL_noC&I		-0.999 (0.902)	-0.692 (0.918)	-0.545 (0.943)
NPL_noC&I		0.220 (0.937)	0.621 (0.966)	0.528 (1.010)
Size	0.012* (0.007)	0.011* (0.007)	0.009 (0.007)	0.008 (0.007)
Market-to-book	0.011*** (0.004)	0.010** (0.004)	0.011*** (0.004)	0.010** (0.004)
Cash Flow	-0.140 (0.094)	-0.169* (0.093)	-0.175* (0.093)	-0.171* (0.094)
Z-score	-0.009*** (0.002)	-0.008*** (0.002)	-0.008*** (0.002)	-0.008*** (0.002)
Fixed Assets	0.038 (0.033)	0.044 (0.033)	0.038 (0.033)	0.043 (0.033)
Log Firm Age	-0.015 (0.010)	-0.010 (0.010)	-0.012 (0.011)	-0.022* (0.012)
Asset Volatility	-0.042*** (0.009)	-0.042*** (0.009)	-0.044*** (0.009)	-0.045*** (0.009)
Bank Controls:				
Bank Size			0.002 (0.004)	0.001 (0.004)
Bank ROA			0.215 (0.316)	0.216 (0.314)
Bank Tier1 ratio			-0.399** (0.180)	-0.503*** (0.189)
Bank Core Dep.			-0.037 (0.029)	-0.017 (0.030)
Bank Liq. Assets			0.099 (0.088)	0.201** (0.098)
Bank Unused Comm.			0.050 (0.035)	0.042 (0.037)
Constant	0.024 (0.044)	0.016 (0.044)	0.029 (0.104)	0.076 (0.110)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Number of Observations	4,442	4,442	4,442	4,442
Adj-R <sup>2</sup>	0.629	0.631	0.632	0.633

**Table IV**

**Regression Results of Term loans on Firm and Bank Conditioning Variables**

This table presents on term loans and bank financial conditions. Dependent variable is firm term loan, measured as total term loan scaled by book value of total asset. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Sample includes 4,442 firm-year observations from year 2003 to year 2009. Variables are defined in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1% level, 5% level, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Crisis	0.014*** (0.004)	0.022*** (0.006)	0.017** (0.007)	0.015** (0.007)
Crisis x NPL_noC&I		-2.171*** (0.840)	-2.024** (0.859)	-1.900** (0.863)
NPL_noC&I		2.222** (0.893)	2.369** (0.934)	2.278** (0.969)
Size	0.011 (0.008)	0.011 (0.008)	0.011 (0.008)	0.010 (0.008)
Market-to-book	0.010* (0.006)	0.010 (0.006)	0.010 (0.006)	0.009 (0.006)
Cash Flow	0.157 (0.102)	0.160 (0.103)	0.163 (0.104)	0.167 (0.105)
Z-score	-0.009*** (0.003)	-0.009*** (0.003)	-0.009*** (0.003)	-0.009*** (0.003)
Fixed Assets	-0.019 (0.037)	-0.021 (0.038)	-0.011 (0.038)	-0.007 (0.039)
Log Firm Age	0.007 (0.014)	0.007 (0.014)	0.006 (0.015)	-0.002 (0.017)
Asset Volatility	-0.050*** (0.012)	-0.051*** (0.012)	-0.050*** (0.012)	-0.051*** (0.012)
Bank Controls:				
Bank Size			-0.004 (0.005)	-0.005 (0.005)
Bank ROA			-0.452 (0.415)	-0.450 (0.418)
Bank Tier1 ratio			-0.086 (0.201)	-0.158 (0.218)
Bank Core Dep.			-0.011 (0.034)	0.004 (0.035)
Bank Liq. Assets			-0.126 (0.099)	-0.050 (0.106)
Bank Unused Comm.			-0.021 (0.039)	-0.027 (0.042)
Constant	-0.022 (0.052)	-0.027 (0.052)	0.087 (0.116)	0.123 (0.130)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Number of Observations	4,442	4,442	4,442	4,442
Adj-R <sup>2</sup>	0.677	0.678	0.678	0.678

**Table V**

**Regression Results of Trade Credit on Firm and Bank Conditioning Variables**

This table presents the results on trade credit and bank financial conditions. Dependent variable is firm trade credit, measured as trade credit scaled by book value of total asset. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Sample includes 4,442 firm-year observations from year 2003 to year 2009. Variables are defined in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1% level, 5% level, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Crisis	-0.003** (0.001)	0.002 (0.002)	0.001 (0.003)	0.000 (0.003)
Crisis x NPL_noC&I		-0.217 (0.389)	-0.205 (0.399)	-0.238 (0.413)
NPL_noC&I		-0.146 (0.390)	-0.022 (0.378)	0.075 (0.403)
Size	-0.014*** (0.003)	-0.015*** (0.003)	-0.016*** (0.003)	-0.017*** (0.003)
Market-to-book	0.008*** (0.002)	0.008*** (0.002)	0.007*** (0.002)	0.007*** (0.002)
Cash Flow	0.009 (0.045)	-0.005 (0.045)	-0.008 (0.045)	-0.007 (0.045)
Z-score	-0.003*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)	-0.003*** (0.001)
Fixed Assets	-0.028** (0.014)	-0.025* (0.013)	-0.024* (0.014)	-0.020 (0.014)
Log Firm Age	0.007 (0.004)	0.009** (0.004)	0.006 (0.005)	-0.000 (0.005)
Asset Volatility	-0.004 (0.004)	-0.004 (0.004)	-0.005 (0.004)	-0.004 (0.005)
Bank Controls:				
Bank Size			0.002 (0.001)	0.001 (0.001)
Bank ROA			0.019 (0.101)	0.041 (0.101)
Bank Tier1 ratio			-0.054 (0.071)	-0.098 (0.076)
Bank Core Dep.			-0.007 (0.011)	-0.004 (0.012)
Bank Liq. Assets			-0.054 (0.034)	-0.011 (0.038)
Bank Unused Comm.			-0.001 (0.015)	0.004 (0.016)
Constant	0.157*** (0.022)	0.154*** (0.021)	0.145*** (0.039)	0.183*** (0.043)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Number of Observations	4,442	4,442	4,442	4,442
Adj-R <sup>2</sup>	0.917	0.918	0.919	0.919

**Table VI**  
**Regression Results of Public Debt on Firm and Bank Conditioning Variables**

This table presents the results on public debt and bank financial conditions. Dependent variable is firm public debt, measured as total public debt scaled by book value of total asset. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Sample includes 4,442 firm-year observations from year 2003 to year 2009. Variables are defined in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1% level, 5% level, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Crisis	0.006 (0.005)	0.009 (0.008)	0.017* (0.009)	0.021** (0.009)
Crisis x NPL_noC&I		-0.599 (1.141)	-0.910 (1.189)	-0.927 (1.203)
NPL_noC&I		0.501 (1.143)	-0.048 (1.207)	-0.220 (1.261)
Size	0.013 (0.011)	0.013 (0.011)	0.017 (0.011)	0.020* (0.011)
Market-to-book	0.024*** (0.007)	0.023*** (0.007)	0.023*** (0.007)	0.025*** (0.007)
Cash Flow	-0.370** (0.154)	-0.374** (0.154)	-0.364** (0.154)	-0.373** (0.153)
Z-score	-0.016*** (0.003)	-0.016*** (0.003)	-0.016*** (0.003)	-0.016*** (0.003)
Fixed Assets	0.060 (0.052)	0.061 (0.052)	0.056 (0.052)	0.041 (0.052)
Log Firm Age	-0.025 (0.016)	-0.025 (0.017)	-0.019 (0.017)	0.005 (0.020)
Asset Volatility	-0.060*** (0.015)	-0.060*** (0.015)	-0.058*** (0.015)	-0.059*** (0.015)
Bank Controls:				
Bank Size			-0.004 (0.006)	-0.002 (0.006)
Bank ROA			0.506 (0.395)	0.464 (0.399)
Bank Tier1 ratio			0.400 (0.259)	0.591** (0.275)
Bank Core Dep.			0.022 (0.054)	-0.004 (0.056)
Bank Liq. Assets			0.148 (0.138)	-0.055 (0.155)
Bank Unused Comm.			-0.053 (0.053)	-0.057 (0.056)
Constant	0.150** (0.072)	0.148** (0.072)	0.154 (0.170)	0.023 (0.181)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Number of Observations	4,442	4,442	4,442	4,442
Adj-R <sup>2</sup>	0.782	0.782	0.784	0.786

**Table VII**

**Regression Results of Book Leverage on Firm and Bank Conditioning Variables**

This table presents the results on book leverage and bank financial conditions. Dependent variable is firm book leverage, measured as total book debt scaled by book value of total asset. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Sample includes 4,442 firm-year observations from year 2003 to year 2009. Variables are defined in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1% level, 5% level, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Crisis	0.028*** (0.005)	0.059*** (0.008)	0.055*** (0.009)	0.052*** (0.009)
Crisis x NPL_noC&I		-3.765*** (1.149)	-3.433*** (1.178)	-3.067** (1.226)
NPL_noC&I		2.154* (1.157)	2.436** (1.194)	1.940 (1.290)
Size	0.029*** (0.010)	0.027*** (0.010)	0.028*** (0.011)	0.029*** (0.011)
Market-to-book	0.050*** (0.008)	0.048*** (0.008)	0.049*** (0.008)	0.049*** (0.008)
Cash Flow	-0.214 (0.169)	-0.274 (0.168)	-0.270 (0.170)	-0.267 (0.170)
Z-score	-0.038*** (0.004)	-0.038*** (0.004)	-0.038*** (0.004)	-0.038*** (0.004)
Fixed Assets	0.058 (0.047)	0.070 (0.047)	0.072 (0.047)	0.068 (0.047)
Log Firm Age	-0.027 (0.017)	-0.018 (0.018)	-0.017 (0.018)	-0.014 (0.020)
Asset Volatility	-0.161*** (0.016)	-0.163*** (0.016)	-0.162*** (0.016)	-0.165*** (0.016)
Ind.Median	0.241*** (0.044)	0.251*** (0.044)	0.248*** (0.044)	0.238*** (0.046)
Divpay	0.008 (0.011)	0.006 (0.011)	0.006 (0.011)	0.007 (0.011)
Bank Controls:				
Bank Size			-0.007 (0.006)	-0.006 (0.006)
Bank ROA			-0.056 (0.446)	-0.078 (0.447)
Bank Tier1 ratio			-0.294 (0.270)	-0.249 (0.286)
Bank Core Dep.			-0.041 (0.048)	-0.031 (0.051)
Bank Liq. Assets			0.045 (0.131)	0.022 (0.143)
Bank Unused Comm.			-0.002 (0.046)	-0.016 (0.049)
Constant	0.141** (0.070)	0.118* (0.070)	0.287* (0.149)	0.260 (0.161)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Bank Controls	N	N	Y	Y
Number of Observations	4,442	4,442	4,442	4,442
Adj-R <sup>2</sup>	0.852	0.854	0.854	0.854

**Table VIII**

**Regression Results of Market Leverage on Firm and Bank Conditioning Variables**

This table presents the results on market leverage and bank financial conditions. Dependent variable is firm market leverage, measured as total book debt scaled by market value of total asset. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Sample includes 4,442 firm-year observations from year 2003 to year 2009. Detailed variable definitions are presented in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1% level, 5% level, and 10% level, respectively.

	(1)	(2)	(3)	(4)
Crisis	0.087*** (0.008)	0.149*** (0.012)	0.114*** (0.013)	0.107*** (0.013)
Crisis x NPL_noC&I		-5.794*** (1.517)	-4.413*** (1.545)	-3.647** (1.583)
NPL_noC&I		1.499 (1.517)	3.009** (1.510)	2.007 (1.614)
Size	0.027** (0.012)	0.024** (0.012)	0.021* (0.012)	0.021* (0.012)
Market-to-book	-0.010 (0.007)	-0.013* (0.008)	-0.012 (0.008)	-0.011 (0.008)
Cash Flow	-0.848*** (0.224)	-0.999*** (0.218)	-1.003*** (0.219)	-0.991*** (0.218)
Z-score	-0.021*** (0.003)	-0.020*** (0.003)	-0.020*** (0.003)	-0.020*** (0.003)
Fixed Assets	0.177*** (0.063)	0.207*** (0.063)	0.218*** (0.063)	0.215*** (0.064)
Log Firm Age	-0.022 (0.020)	0.004 (0.020)	0.003 (0.021)	0.000 (0.024)
Asset Volatility	-0.265*** (0.023)	-0.269*** (0.022)	-0.272*** (0.022)	-0.275*** (0.023)
Ind.Median	0.276*** (0.045)	0.336*** (0.045)	0.340*** (0.045)	0.333*** (0.049)
Divpay	-0.001 (0.015)	-0.006 (0.015)	-0.004 (0.015)	-0.005 (0.015)
Bank Controls:				
Bank Size			-0.011 (0.009)	-0.010 (0.009)
Bank ROA			-2.141*** (0.704)	-2.185*** (0.706)
Bank Tier1 ratio			-1.437*** (0.343)	-1.394*** (0.366)
Bank Core Dep.			-0.132** (0.059)	-0.101 (0.062)
Bank Liq. Assets			0.025 (0.159)	0.053 (0.176)
Bank Unused Comm.			0.047 (0.057)	0.019 (0.061)
Constant	0.176** (0.079)	0.108 (0.078)	0.527** (0.210)	0.514** (0.227)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Bank Controls	N	N	Y	Y
Number of Observations	4,442	4,442	4,442	4,442
Adj-R <sup>2</sup>	0.797	0.807	0.813	0.814

**Table IX**

**Regression Results of Investments on Firm and Bank Conditioning Variables**

This table presents the results on investment and bank financial conditions. Dependent variable is firm investment, measured as capital expenditure scaled by book value of total asset. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Panel A reports the results obtained from yearly data (total 4,442 firm-year observations) and Panel B reports results obtained from quarterly data (total 37,603 firm-quarter observations). Sample starts from year 2003 and ends at year 2009. Variables are defined in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1% level, 5% level, and 10% level, respectively.

**Panel A. Investment Results from Yearly Data**

	(1)	(2)	(3)	(4)
Crisis	-0.002*** (0.001)	0.002 (0.001)	0.001 (0.001)	0.002 (0.001)
Crisis x NPL_noC&I		-0.329* (0.199)	-0.343 (0.212)	-0.350* (0.203)
NPL_noC&I		0.122 (0.193)	0.131 (0.191)	0.261 (0.192)
Market-to-book	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.003*** (0.001)
Cash Flow	0.091*** (0.022)	0.083*** (0.021)	0.084*** (0.021)	0.057*** (0.019)
Industry Median Inv.				0.627*** (0.097)
Bank Controls:				
Bank Size			-0.000 (0.001)	-0.001 (0.001)
Bank ROA			-0.072 (0.062)	-0.036 (0.057)
Bank Tier1 ratio			0.030 (0.039)	0.039 (0.039)
Bank Core Dep.			-0.002 (0.006)	-0.005 (0.006)
Bank Liq. Assets			-0.041*** (0.014)	-0.021 (0.016)
Bank Unused Comm.			-0.002 (0.008)	-0.002 (0.008)
Constant	0.008*** (0.001)	0.008*** (0.001)	0.020 (0.025)	0.013 (0.025)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Bank Controls	N	N	Y	Y
Number of Observations	4,442	4,442	4,442	4,442
Adj-R <sup>2</sup>	0.636	0.640	0.640	0.661

**Panel B. Investment Results from Quarterly Data**

	(1)	(2)	(3)	(4)
Crisis	-0.001*** (0.000)	0.002*** (0.000)	0.001*** (0.000)	0.002*** (0.001)
Crisis x NPL_noC&I		-0.163* (0.090)	-0.189** (0.095)	-0.175** (0.087)
NPL_noC&I		-0.034 (0.088)	-0.033 (0.089)	0.036 (0.085)
Market-to-book	0.003*** (0.000)	0.003*** (0.000)	0.003*** (0.000)	0.002*** (0.000)
Cash Flow	0.023*** (0.004)	0.022*** (0.004)	0.022*** (0.004)	0.020*** (0.004)
Industry Median Inv.				0.642*** (0.064)
Bank Controls:				
Bank Size			0.001* (0.001)	0.000 (0.000)
Bank ROA			-0.071*** (0.014)	-0.065*** (0.014)
Bank Tier1 ratio			0.015 (0.011)	0.008 (0.011)
Bank Core Dep.			0.005* (0.003)	0.006** (0.003)
Bank Liq. Assets			-0.021*** (0.005)	-0.005 (0.005)
Bank Unused Comm.			0.004 (0.003)	0.004 (0.003)
Constant	0.009*** (0.000)	0.010*** (0.000)	-0.010 (0.012)	-0.009 (0.011)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Bank Controls	N	N	Y	Y
Number of Observations	37,603	37,603	37,603	37,603
Adj-R <sup>2</sup>	0.641	0.645	0.646	0.658

**Table X**

**Regression Results of Cash Holding on Firm and Bank Conditioning Variables**

This table presents the results on cash holding and bank financial conditions. Dependent variable is firm cash holding, measured as cash scaled by book value of total asset. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Panel A reports the results obtained from yearly data (total 4,442 firm-year observations) and Panel B reports results obtained from quarterly data (total 37,603 firm-quarter observations). Sample starts from year 2003 and ends at year 2009. Variables are defined in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1%, 5%, and 10% level, respectively.

**Panel A. Cash Holding Results from Yearly Data**

	(1)	(2)	(3)	(4)
Crisis	0.011*** (0.004)	-0.008 (0.006)	-0.008 (0.007)	-0.008 (0.007)
Crisis x NPL_noC&I		0.982 (0.984)	0.634 (1.010)	0.594 (1.082)
NPL_noC&I		0.426 (1.017)	0.113 (1.036)	0.165 (1.151)
Size	-0.015** (0.007)	-0.015** (0.007)	-0.013* (0.008)	-0.013* (0.008)
Market-to-book	0.022*** (0.005)	0.022*** (0.005)	0.022*** (0.005)	0.022*** (0.005)
Cash Flow	0.138 (0.143)	0.196 (0.140)	0.202 (0.140)	0.202 (0.140)
R&D	-1.490 (1.057)	-1.517 (1.037)	-1.547 (1.037)	-1.546 (1.040)
R&D Missed	0.008 (0.009)	0.007 (0.009)	0.005 (0.009)	0.005 (0.009)
Industry Sigma	0.045 (0.300)	0.224 (0.301)	0.256 (0.289)	0.253 (0.298)
Net Working Capital-excash	-0.086*** (0.031)	-0.082*** (0.031)	-0.080*** (0.031)	-0.080*** (0.031)
Dividend Payer dummies	-0.009 (0.010)	-0.008 (0.010)	-0.009 (0.010)	-0.009 (0.010)
Bank Controls:				
Bank Size			-0.001 (0.006)	-0.001 (0.006)
Bank ROA			-0.751* (0.406)	-0.753* (0.409)
Bank Tier1 ratio			0.448** (0.211)	0.449** (0.225)
Bank Core Dep.			0.019 (0.044)	0.016 (0.048)
Bank Liq. Assets			-0.097 (0.114)	-0.103 (0.129)
Bank Unused Comm.			-0.039 (0.045)	-0.038 (0.048)
Constant	0.172*** (0.053)	0.152*** (0.054)	0.148 (0.160)	0.145 (0.164)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Bank Controls	N	N	Y	Y

Number of Observations	4,442	4,442	4,442	4,442
Adj-R <sup>2</sup>	0.862	0.864	0.865	0.865

**Panel B. Cash Holding Results from Quarterly Data**

	(1)	(2)	(3)	(4)
Crisis	0.007*** (0.002)	-0.008** (0.003)	-0.004 (0.004)	0.009 (0.007)
Crisis x NPL_noC&I		1.605** (0.654)	1.534** (0.680)	1.068 (0.704)
NPL_noC&I		-0.355 (0.647)	-0.711 (0.663)	-0.243 (0.696)
Size	-0.016*** (0.005)	-0.016*** (0.005)	-0.014*** (0.005)	-0.015*** (0.005)
Market-to-book	0.018*** (0.002)	0.020*** (0.002)	0.020*** (0.002)	0.019*** (0.002)
Cash Flow	0.130*** (0.044)	0.139*** (0.043)	0.141*** (0.043)	0.141*** (0.043)
R&D	-0.322 (0.210)	-0.319 (0.209)	-0.323 (0.210)	-0.326 (0.209)
R&D Missed	0.001 (0.004)	0.002 (0.004)	0.002 (0.004)	0.002 (0.004)
Industry Sigma	0.051 (0.178)	0.362** (0.185)	0.394** (0.184)	0.380** (0.185)
Net Working Capital-excash	-0.045*** (0.015)	-0.043*** (0.015)	-0.042*** (0.015)	-0.042*** (0.015)
Dividend Payer dummies	-0.007 (0.005)	-0.006 (0.005)	-0.006 (0.005)	-0.007 (0.005)
Bank Controls:				
Bank Size			-0.004 (0.003)	-0.005* (0.003)
Bank ROA			0.052 (0.112)	0.101 (0.118)
Bank Tier1 ratio			0.333*** (0.097)	0.268*** (0.096)
Bank Core Dep.			0.006 (0.021)	0.001 (0.022)
Bank Liq. Assets			0.014 (0.053)	0.041 (0.059)
Bank Unused Comm.			-0.033 (0.027)	-0.020 (0.029)
Constant	0.191*** (0.032)	0.166*** (0.034)	0.210*** (0.077)	0.235*** (0.079)
Firm FE	Y	Y	Y	Y
Year FE	N	N	N	Y
Bank Controls	N	N	Y	Y
Number of Observations	37,603	37,603	37,603	37,603
Adj-R <sup>2</sup>	0.853	0.854	0.855	0.855

**Table XI****Seemingly Unrelated Regressions on Firm Financing**

This table presents results on firms' financing sources and bank financial conditions using seemingly unrelated regressions. We break down firms' financing sources into five categories. They are bank debt, public debt, trade credit, other liabilities, and equity scaled by book value of total assets. Crisis is an indicator variable equal to 1 for observations in year 2008 and 2009 and 0 otherwise. Bank shock variable is NPL\_noC&I, measured as bank non-performing loans excluding commercial and industrial loans scaled by total bank asset. Sample includes 4,442 firm-year observations from year 2003 to year 2009. Variables are defined in Appendix A. Standard errors clustered by firm are reported in parentheses below the parameter estimates. We use \*\*\*, \*\*, and \* to denote significance at the 1% level, 5% level, and 10% level, respectively.

	<b>Bank Debt</b>	<b>Public Debt</b>	<b>Trade Credit</b>	<b>Other Liab.</b>	<b>Equity</b>
Crisis	0.033*** (0.007)	0.021*** (0.008)	0.000 (0.002)	0.006 (0.005)	-0.060*** (0.007)
Crisis x NPL_noC&I	-2.282** (0.997)	-0.927 (1.015)	-0.238 (0.348)	1.056 (0.734)	2.383* (0.917)
NPL_noC&I	2.657** (1.044)	-0.220 (1.064)	0.075 (0.340)	-1.155 (0.747)	-1.250 (0.932)
Market-to-book	0.020*** (0.006)	0.025*** (0.006)	0.007*** (0.002)	0.018** (0.003)	-0.062*** (0.004)
Size	0.018** (0.110)	0.020** (0.01)	-0.017*** (0.002)	-0.050*** (0.004)	0.025** (0.005)
Cash Flow	-0.019 (0.002)	-0.373*** (0.129)	-0.007 (0.038)	0.206 (0.072)	0.289* (0.090)
Z-score	-0.018*** (0.002)	-0.016*** (0.003)	-0.003*** (0.001)	-0.016*** (0.001)	0.049*** (0.001)
Fixed Assets	0.036 (0.040)	0.041 (0.044)	-0.020* (0.011)	0.006 (0.023)	-0.064 (0.028)
Log Firm Age	-0.024 (0.017)	0.005 (0.017)	-0.000 (0.004)	0.034** (0.008)	-0.016 (0.010)
Asset Volatility	-0.097*** (0.012)	-0.059*** (0.013)	-0.004 (0.004)	-0.001 (0.008)	0.156*** (0.010)
Bank Controls:					
Bank Size	-0.004 (0.0046)	-0.002 (0.005)	0.001 (0.001)	0.003 (0.003)	0.004 (0.004)
Bank ROA	-0.270 (0.420)	0.464 (0.336)	0.041 (0.085)	-0.131 (0.270)	-0.107 (0.337)
Bank Liq Assets	0.161 (0.113)	-0.055 (0.131)	-0.011 (0.032)	-0.044 (0.074)	-0.050 (0.093)
Bank CoreDep	-0.014 (0.036)	-0.004 (0.047)	-0.004 (0.011)	0.021 (0.024)	0.002 (0.029)
Bank Tier1 ratio	-0.699*** (0.227)	0.591** (0.232)	-0.098 (0.064)	-0.421** (0.150)	0.609** (0.187)
Bank Unused Comm.	0.017 (0.039)	-0.057 (0.048)	0.004 (0.014)	-0.035 (0.026)	0.082 (0.033)
Constant	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.001)	0.000 (0.001)
Firm FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Bank Controls	Y	Y	Y	Y	Y
Number of Observations	4,442	4,442	4,442	4,442	4,442

**Table XII**

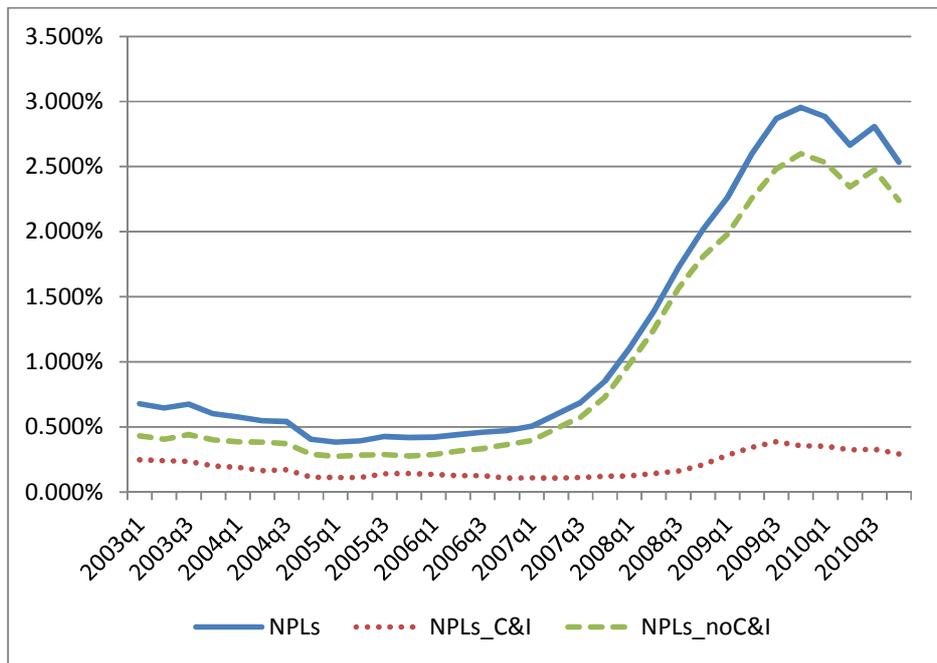
**Change in Equity by Bank Financial Condition Quintiles**

This table presents results on the change of firm equity from the end of 2007 to the end of 2009 across bank NPL quintiles. Change in equity is scaled by total assets at the end of 2007. Bank NPL is measured as the average level of bank NPL from 2007 to 2009 for each firm. T-stat is calculated as comparing quintile 1-4 to quintile 5.

NPL_noC&I Quintile (Low to High)	Change in Equity from 12/31/2007 to 12/31/2009		
	Mean	Std. Dev.	T-stat
1	-0.0156	0.2010	-1.59
2	0.0143	0.1781	-0.61
3	-0.0230	0.2057	-1.82
4	0.0272	0.2167	-0.13
5	0.0310	0.1916	

### Figure I. Bank Non-Performing Loans

Figure I plots the average bank non-performing loans (NPLs) over total assets ratio over our sample period. The sample includes U.S. BHCs from the first quarter of 2003 to the fourth quarter of 2009. NPLs is the ratio of NPLs over total bank assets, NPLs\_C&I is the ratio of commercial and industrial loans (C&I loans) that are non-performing over total bank assets, and NPLs\_noC&I is the difference between NPLs and NPLs\_C&I. The figure shows the level of non-C&I NPLs spiked during the financial crisis and level of NPL C&I loans were comparably more stable.



## Appendix A: Variable Definitions

### Firm Variables

Asset volatility= stock return volatility<sub>t</sub> \*(1-market leverage<sub>t</sub>)

Bank Debt= CIQ bank debt/ book assets (6)

Book Leverage= (short-term debt<sub>t+1</sub> (34))+long-term debt<sub>t+1</sub> (9))/book assets<sub>t+1</sub> (6)

Capital Exp= (capital expenditure<sub>t+1</sub>)/book assets<sub>t</sub> (6)

Cash= cash and cash equivalent (1)/book assets (6)

Cash flows = EBITDA<sub>t</sub>(13)/ book assets<sub>t</sub>(6)

Dividend payer = 1 if dividends per share-ex-date<sub>t</sub> (26)>0 and 0 otherwise

Drawdown= CIQ credit line drawdown/ book assets (6)

Firm Age=log (1+number of years in Compustat)

Firm Size= log of book assets<sub>t</sub> (6)

Fixed Assets= net PPE<sub>t</sub> (8)/book assets<sub>t</sub> (6)

Ind.Median Book (Market) Leverage = industry median book (market) leverage by 2-digit SIC code<sub>t</sub>

Ind.Median Capital Expenditure = industry median capital expenditure by 2-digit SIC code<sub>t</sub>

Industry Sigma= industry mean of cash flow standard deviation over 10 years by 2-digit SIC code<sub>t</sub>

Market Leverage= (short-term debt<sub>t+1</sub>(34))+long-term debt<sub>t+1</sub>(9))/ (book assets<sub>t+1</sub> (6)-book common equity<sub>t+1</sub> (60)+ stock price<sub>t+1</sub> (199)\*shares outstanding<sub>t+1</sub> (54))

Market-to-book= (book assets<sub>t</sub> (6)-book common equity<sub>t</sub> (60)+ stock price<sub>t</sub> (199)\*shares outstanding<sub>t</sub> (54))/book assets<sub>t</sub> (6)

Net Working Capital = (current asset<sub>t</sub> (4)- current liability<sub>t</sub> (5) -cash and cash equivalent<sub>t</sub> (1))/ book assets<sub>t</sub> (6)

R&D Expenditure=R&D expenditure<sub>t</sub> (46)/ book assets<sub>t</sub> (6)

Term Loan= CIQ term loan/ book assets (6)

Trade Credit = account payable (70)/book assets (6)

Z-score=(3.3\*pre-tax income<sub>t</sub> (170)+sales<sub>t</sub> (12)+1.4\*retained earnings<sub>t</sub> (36)+1.2\*working capital<sub>t</sub> (179))/book assets<sub>t</sub> (6)

Note: Numbers in parentheses are Compustat field codes.

### **Bank Variables**

Core Deposit = Noninterest-bearing deposit (bhdm6631) + Interest-bearing deposit (bhdm6636), minus

Liquid Assets = sum of Cash and balances due from depository institutions over total assets (bhck2170) (bhck0081+bhck0395+bhck0397), Federal funds sold and securities purchased under agreements to resell (bhdm987+ bhckb989), Trading assets (bhck3545) over total assets (bhck2170).

Non-performing loans (NPLs) = loans pastdue90 (bhck5525) plus non-accrual loans (bhck5526) over total assets over total assets (bhck2170).

Non-performing loans-net of C&I (NPLs\_noC&I) = C&I loans pastdue90 (bhck1607) plus C&I non-accrual loans (bhck1608) over total assets (bhck2170).

Non-performing loans- C&I (NPLs\_C&I) = NPLs minus NPLs\_noC&I.

Time deposits of \$100,000 or more (bhcb2604) over total assets (bhck2170).

ROA = Income (loss) before extraordinary items and other adjustments (bhck4300) over total assets (bhck2170).

Size= Log of bank total assets (bhck2170).

Unused Commitments = Unused Commitments (bhck3818) over total assets (bhck2170).

Note: Numbers in parentheses are FR-Y9 codes.

## Appendix B: Descriptive Statistics for Weighted Average Bank Control Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Avg_NPL_noC&I	4,442	0.008	0.008	0.000	0.041
Avg_Size	4,442	20.261	1.358	15.316	21.535
Avg_ROA	4,442	0.006	0.005	-0.020	0.016
Avg_Tier1 (%)	4,442	0.089	0.014	0.071	0.132
Avg_Core Dep.	4,442	0.373	0.145	0.079	0.730
Avg_Liq.Assets	4,442	0.064	0.026	0.027	0.150
Avg_Unused comm.	4,442	0.226	0.101	0.108	0.783

## Appendix C: Robustness Test of Firm-Bank Matching (Pre-Crisis period 1/1/2005-12/31/2007)

Variable	Mean	NPLs_noCI > Mean	NPLs_noCI < Mean	Difference	T-stats
Log(Size)	6.153	6.201	6.104	0.097	1.443
Market-to-book	1.523	1.579	1.468	0.110	3.151
Cash Flow	0.035	0.037	0.034	0.003	3.139
Z-score	2.697	2.761	2.634	0.126	1.327
Fixed Assets	0.304	0.296	0.311	-0.014	-1.681
Log(Age)	2.788	2.846	2.730	0.117	3.676
Assets volatility	0.302	0.297	0.307	-0.010	-1.703