The Impact of Government Intervention in Banks on Corporate Borrowers' Stock Returns

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Abstract

Moving into and out of a financial and banking crisis is likely to be associated with spillover effects from the banking sector to the corporate sector. We investigate whether and how government interventions in the U.S. banking sector influence the stock market performance of corporate borrowers during the global financial crisis of 2007-2009. We measure firms' exposures to government interventions with an intervention score that is based on combined information on the firms' structure of bank relationships and their banks' participation in government capital support programs. We find that government capital infusions in banks have a significantly positive and economically meaningful impact on borrowing firms' stock returns. The effect is more pronounced for smaller, riskier, and bank-dependent firms. Our study highlights positive effects from government interventions during the crisis, documenting that an alleviation of financial shocks to banks has led to significantly positive valuation effects in the corporate sector.

Key words: Bank loans, Bank-firm relationships, Stock markets, Banking crisis, Government intervention.

JEL classification: G10, G21, G28, G32.

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I. Introduction

Financial and banking crises have a significantly negative impact on the corporate sector, resulting in a lower stock market valuation of borrowing firms and a subsequent decrease in aggregate economic activity. However, little is known empirically about the existence and nature of spillover effects that might arise from a removal or mitigation of shocks to the financial and banking system to the corporate sector. Do stock prices of corporate borrowers react to rescue measures for banks? If yes, what are the direction, magnitude and speed of the reaction? Which firms exhibit the strongest stock market reaction? To shed light on these questions, we investigate whether and how government interventions in the U.S. banking sector influence the stock returns of corporate borrowers during the global financial crisis of 2007-2009.

Previous crises, such as the Japanese, the Russian, the Asian, and the recent global financial crisis have not only adversely affected the financial system but also the real economy in many countries through a tightening of bank lending (e.g., Chava and Purnanandam (2011), Campello et al. (2010), Carvalho et al. (2010), Giannetti and Simonov (2010), Ivashina and Scharfstein (2010), and Lemmon and Roberts (2010)). Related studies document a sharp drop in banks' lending to the corporate sector during the peak of the financial crisis. To "restore liquidity and stability to the financial system" (U.S. Congress (2008), p. 2), the Federal Reserve System cut the target interest rate from 5.25% to close to zero from September 2007 to December 2008. When this monetary intervention proved ineffective, the U.S. government was forced to step in and use tax payers' money to bail out the troubled banking industry. Under the Emergency Economic Stabilization Act, the U.S.

government provided certain banks with additional equity to stabilize the financial industry via the Capital Purchase Program (CPP), a prominent part of the Troubled Asset Relief Program (TARP). The stated aim of the CPP was to "strengthen the capital base of the financially sound banks" by providing them with extra liquidity and equity so that banks could "increase their capability of lending to U.S. consumers and businesses to support U.S. economy" (U.S. Department of Treasury, October 14, 2008). However, evidence is mixed on whether banks have actually used this governmental support to keep on lending (Li (2010)) or to repair their own balance sheets (e.g., SIGTARP (2010), Taliaferro (2009)). Thus, the question whether such intervention in banks has implications for corporate borrowers remains largely unanswered.

In this paper, we depart from the existing literature by investigating the impact of U.S. banks' participation in CPP on corporate borrowers' stock price performances. To identify the impact, we focus on the bank lending channel and define a firm-specific time-varying intervention score that is based on the firms' pre-crisis structure of bank relationships and their banks' participation in government capital support programs. We focus on the corporate borrowers' stock price performances to capture the expectation effect of government intervention on the bank lending channel. We analyze whether and how corporate borrowers' stock returns during the financial crisis of 2007-2009 relate to the variation in their intervention scores, controlling for the general stock market performance. We also test whether different pre-crisis firm and bank relationship characteristics influence this relationship.

While related studies document the negative spillover effects from the banking to the

corporate sector in the first stage of the financial crisis, we show that bank-firm relationships serve as a transmission channel for positive spillover effects on the corporate sector in situations when shocks to banks are mitigated through government interventions. Our principal results indicate that firms significantly benefit from CPP infusions in their banks. Firms with higher intervention scores display significantly higher daily stock returns. We further show that the positive effect on borrowing firms' stock returns is not merely significant for the forced CPP interventions but also when banks voluntarily participated in the capital purchase program. Moreover, the impact of government intervention varies with pre-crisis firm characteristics. Smaller, more financially distressed and bank-dependent firms benefit more from government capital infusions in their banks during the crisis. Various empirical checks confirm these findings and their robustness. We further find some indication that financial constraints of firms have been reduced after their banks received capital infusions, which is consistent with our main results based on firms' stock price performance.

Our paper relates to three strands of the banking and finance literature. The first strand examines the impact of financial and banking crises. A large number of studies show that such crises are associated with reductions in the aggregate output level (e.g., Dell'Ariccia et al. (2008), Reinhart and Rogoff (2009)). Other studies examine the impact of the financial crises on banks and show that there are significant negative effects on banks' capital that reduces the supply of loans to the corporate sector (e.g., Panetta et al. (2009), Santos (2010)). For instance, Shin et al. (2008) document that banks, especially the under-capitalized ones, were forced to swiftly repair their capital structure by reducing loan provisions during the Korean crisis to avoid bankruptcy. Further evidence suggests that adverse consequences from increased losses

in the banking sector spill over to the corporate sector and negatively affect borrowing firms' performance (Chava and Purnanandam (2011), Lemmon and Roberts (2010)). Moreover, Campello et al. (2010) provide survey evidence that the recent financial crisis more adversely affected financially constrained firms, which were forced to cut heavily in their spending in R&D, marketing, and employment, and forego profitable investment opportunities. Our study extends this line of research by showing that corporate borrowers' stock returns positively respond to government capital infusions in their banks.

Second, our work relates to the increasing literature on government interventions in the banking sector. Previous studies have focused on the characteristics of banks that were subject to intervention and the changes in their performance after they have received capital infusions. For example, banks that received capital infusions under TARP are larger, and have lower capital ratios, lower market-to-book ratios, and better asset quality than non-TARP recipient banks (Bayazitova and Shivdasani (2009)). The finding on asset quality suggests that the U.S. government has predominantly supported those banks that were sufficiently healthy to recover from the crisis. Furthermore, evidence suggests that earlier rounds of TARP capital infusions resulted in wealth gains for the banks' shareholders (Bayazitova and Shivdasani (2009), Veronesi and Zingales (2010)). There is mixed evidence on the question whether TARP capital infusions effectively stimulated bank lending during the crisis. Li (2010) suggests that the TARP capital infusion program has indeed encouraged bank lending to the real economy. However, other studies argue that due to severe capital losses of banks during crisis, most banks use the TARP funds to repair their balance sheets rather than lending to businesses (e.g., SIGTARP (2010), Taliaferro (2009)). In addition, government intervention was accompanied

by stricter supervisory and governance rules that might have further tightened banks' lending to the corporate sector (Adams (2009), Kim (2010), Fahlenbrach and Stulz (2011)). Unlike studies that mainly investigate characteristics of TARP capital recipient banks and their performance, we analyze the impact on TARP banks' borrowers to identify spillover effects associated with capital infusion program on the corporate sector.

The third strand of literature investigates the importance of bank-firm relationships. Given that the vast majority of corporate borrowers rely on multiple bank relationships, the effectiveness of the bank lending channel essentially depends on the structure of firms' bank relationships and the banks' ability and willingness to provide credit. Previous studies suggest that firms benefit from establishing and maintaining a close relationship with banks (James (1987), Petersen and Rajan (1994), Berger and Udell (1995), Boot (2000), Bharath et al. (2011)). Closer banking ties increase firms' access to credit and facilitate loan renegotiation (e.g., Petersen and Rajan (1994), Angelini et al. (1998), Cole (1998), Elsas (2005), Shin et al. (2008)). Strong bank relationships are particularly valuable when borrowers face temporary liquidity problems or face adverse economic situations (e.g., Bolton and Scharfstein (1996), Elsas and Krahnen (1998), Detragiache et al. (2000)). On the other hand, theory argues that the information monopoly arising from close bank relationships can create a "hold up problem" for the borrowers to obtain alternative funds from other banks (e.g., Rajan (1992), Gopalan et al. (2010)). This reasoning implies that a close bank relationship exposes the firm to a higher sensitivity to potential shocks to the bank. Empirical evidence confirms that banks that experience large exogenous shocks tighten their lending and banks' financial insolvency negatively impacts their borrowers' stock market performance (Slovin et al. (1993), Kang and

Stulz (2000), Bae et al. (2002), Ongena et al. (2003)). Lemmon and Roberts (2010) highlight the important role of bank credit supply by showing that even large firms with better access to the public credit market are vulnerable to the shocks in bank credit supply. Chava and Purnanandam (2011) investigate the impact of the Russian crisis on U.S. banks and find that adverse shocks to bank capital mostly affect bank-dependent borrowers. Carvalho et al. (2010) confirm this result for the recent financial crisis by showing how negative shocks to banks spill over to the corporate sector. They find that sharp decreases in banks' market capitalization are associated with equity valuation losses of firms that have credit relationships with banks. The effect is strongest for firms with close credit relationships, higher informational asymmetry, and a higher need to roll over their debt. In a recent working paper, Gokcen (2010) looks at whether the first TARP intervention positively impacted corporate borrowers. He reports a positive short-term impact on firm's stock returns if the firm's top lead bank is one of the nine banks that were forced to participate in TARP. In this paper, we rely on a different empirical measurement approach, the intervention score, which takes into account firms' lending relationships with all lead banks and information on all capital infusions and redemptions. This method allows us to measure the longer-term impact of both TARP capital infusions and capital redemptions.

The rest of the paper is organized as follows. Section 2 describes the institutional background of the capital infusion program CPP. Section 3 presents our main hypotheses. Section 4 describes the data. Section 5 outlines the empirical method and reports the main findings. Section 6 summarizes the results from further empirical checks. Section 7 concludes.

II. Institutional Background of the Capital Purchase Program

Under the Emergency Economic Stabilization Act (EESA) of 2008, TARP was initiated by the U.S. Treasury Department to purchase up to $700 billion troubled assets from financial institutions and other companies. Secretary Paulson revised the TARP implication plan on October 14, 2008 and decided to directly inject $250 billion to the financial system through the Capital Purchase Program (CPP). CPP allows qualifying financial institutions to sell preferred stocks and warrants to the U.S. Treasury Department. The Treasury Department demanded an initial dividend rate of 5% for 5 years and 9% thereafter on the stocks purchased. The first nine banks were forced to participate in CPP whereas all the later TARP recipient banks participated in CPP voluntarily. Until the end of 2009, the total capital distributed during the first wave of capital infusion to nine banks equals to $115 billion with most of the later capital infusions being smaller (the median is $10.3 million). Table 1 provides an overview of the CPP.

[Please insert Table 1 here]

Panel A lists the top 10 banks in terms of the amount of CPP capital received and repaid. Note that the list of top CPP recipient banks does not fully coincide with the list of the first nine banks that were forced to participate (six forced TARP recipient banks are among the top 10 banks ranked in terms of total amount of CPP received). There are also a number of large voluntary capital purchases that happened at a later stage; for example, US Bankcorp was not

forced to participate in the initial CPP infusion but voluntarily opted for CPP funding and obtained $6.6 billion in total. Panel B shows that the distribution of CPP infusion is highly concentrated. We rank all CPP recipient banks in terms of the amount of capital received, and the result shows that the top 25% of CPP recipient banks in terms of the amount received have taken 97.64% of total CPP fund injected.

The CPP investments were not indiscriminately allocated to financial institutions. To apply for the CPP, a firm needed to be a Qualifying Financial Institution (QFIs) which include both public and private "bank holding companies, financial holding companies, insured depository institutions, and loan holding companies that are established and operated in the US, and not a branch of foreign bank" (Li (2010), p. 6). The demand for the TARP funds exceeded the supply, and the favorable conditions have attracted roughly one thousand applicants, out of which only 556 requests were granted until the end of 2009.

For the CPP redemption, 63 banks have paid back approximately $118 billion by the end of December 2009. The initial CPP contract makes it impossible for banks to repurchase the stock completely at par within three years after receiving the CPP, except they could issue an amount of equity privately that is equal to or larger than the amount of CPP funds received. In February 2009, the Treasury Department imposed restrictions on executive compensation for CPP recipient banks and later that month, the enactment of the American Recovery and Reinvestment Act (ARRA) introduced even stricter rules on incentive compensation but also allowed banks to repay their CPP funds earlier.

Figure 1 illustrates the number of events and amounts associated with CPP infusions and redemptions. Most TARP capital infusion happens during the fourth quarter of 2008 and the

first quarter of 2009 and all CPP redemptions happen after February 2009. There is a peak for CPP redemptions on June 16 2009, when 64.74 billion dollars were redeemed by several large banks. Those banks include JP Morgan Chase, Morgan Stanley, and Goldman Sachs that were forced to participate in the CPP initially. They choose to pay back funds at the same time in order not to leak information on their relative financial soundness to the market.

[Please insert Figure 1 here]

III. Hypotheses

The declared purpose of the U.S. government's intervention via CPP was to stabilize banks with extra liquidity and make it possible for them to keep on lending or to increase lending to the corporate sector. If investors expect that government interventions in banks could help alleviating the negative credit shocks and improving the credit availability to firms through the bank lending channel, then a positive valuation impact on corporate borrowers' stock price performances would be observed. Therefore, we propose the following hypothesis:

Hypothesis 1: CPP interventions in banks have a significantly positive impact on corporate borrowers' stock price performance.

We next investigate whether borrowers' characteristics affect the stock price impact of CPP intervention. According to several studies the borrower's credit quality is crucial for his credit availability and the terms of bank lending (e.g., Altman (1968), Santos and Winton (2009)). Other borrower characteristics, such as profitability and firm size are also important factors that affect bank's discretionary lending decisions (Boot et al. (1993)). Furthermore, it

is reasonable to consider firms' dependence on banks when analyzing the impact of the government interventions. Theory and evidence suggest that compared with non-bank dependent borrowers, bank-dependent borrowers suffer more if their banks experience large losses (Sharpe (1990), Rajan (1992), Shin et al. (2008), Ivashina and Scharfstein (2010), Santos (2010)).

Given the fact that the recent financial crisis originated from the supply side (Ciccarelli et al. (2010), Ivashina and Scharfstein (2010), Ongena et al. (2010)) the entire banking industry became cautious and reluctant to grant new loans. Other things equal, it was more difficult for smaller, bank-dependent, less profitable clients with a higher leverage ratio and bankruptcy risk to get sufficient credit or to switch to alternative financing sources due to the high risk level and information asymmetry between banks and those firms. Also, lower level of cash holdings prior to the crisis makes firms more vulnerable to the credit supply shocks during the banking crisis. It is also more difficult for higher bank-dependent firms, such as firms with low liquidity and firms that lack an investment-grade rating, to get access to external financial market. These firms are therefore more sensitive to shocks in lending banks and government capital infusion is expected to be especially helpful for those firms. We expect that the stock price performances of these firms are more positively affected when the shocks to banks are mitigated by CPP intervention. In addition, consistent with Chava and Purnanandam (2011), we expect firms that were most strongly affected during the financial crisis are also the ones that benefit most once the negative shocks are mitigated by the government interventions.

Hypothesis 2: CPP interventions in banks have a significantly stronger impact on stock returns of corporate borrowers who are smaller (H2a), more leveraged (H2b), less

profitable (H2c), closer to financial distress (H2d), short on cash (H2e), less liquid (H2f), more strongly hit during crisis (H2g) and more bank-dependent (H2h).

IV. The Data

Our data comprises information on firm stock price performance, firm characteristics, bank-firm lending relationships and banks' participation in the Capital Purchasing Program (CPP). We consider firms that are included in the CRSP, Compustat and LPC DealScan databases. We identify firm characteristics prior to the start of the crisis in the second quarter of 2007. Bank-firm relationships are measured prior to the government intervention in the banking sector. We analyze the impact of CPP on corporate borrowers' stock price performances during the crisis period, which starts from August 9, 2007 (when the Fed first increased the level of temporary open market operations; see Cecchetti (2008)) and ends on December 31, 2009. In total, we analyze 691,860 firm-day observations on 1,156 firms, of which 260 are included in the S&P 500 index. The total market value of firms in our sample accounts for more than half of the total market capitalization of the listed U.S. firms. Appendix A shows the main variables, the variable definitions, data sources, and the period of measurement. We describe each of these variables in more detail in the remainder of this section.

A. Firm Characteristics and Stock Market Data

We collect data on firms' accounting variables and bank dependence (based on S&P credit ratings) from Compustat, and data on firms' stock market performance from CRSP. We

exclude the financial services industry (which includes banks, insurance companies, broker/dealers, real estate and other financial services with SIC codes between 6000 and 6999) from our database. In order to avoid endogeneity problems in our analysis, we identify firms based on their pre-crisis accounting characteristics (2007Q2). Panel A of Table 2 reports summary statistics on firm characteristics.

[Please insert Table 2 here]

We include firms' total assets, cash holdings, and other variables that indicate the level of firms' financial distress; such as leverage ratio, ROA and Altman's Z-score. We also consider variables that reflect the ease of firms' access to the external financial resources, such as the bid-ask spread and bank dependency. In line with Kashyap et al. (1994) and Chava and Purnanandam (2011), we evaluate a firm's dependency on banks by examining their public debt rating status. We treat the non-rated or non-investment rated firms as bank-dependent firms and the investment-grade rated firms as firms as not bank-dependent. In a credit crunch of such a scale, it is very difficult for the non-investment-grade firms to obtain alternative finance from either public debt market or commercial paper market. In our sample, roughly 60% of firms are categorized as bank-dependent borrowers according to their pre-crisis credit rating status.

Panel B of Table 2 reports summary statistics on borrowing firms' daily returns and market returns. We obtain firms' daily stock returns from CRSP. We use the daily value weighted return (including dividends distributions) on all NYSE, AMEX, and Nasdaq stocks

as the market index return. We further use daily returns on the Fama-French small (market capitalization)-minus-big and high (market-to-book ratio)-minus-low portfolios from Kenneth French's website (not reported here). We merge the stock market performance data with firm accounting data using the CRSP identifier, "permno". We also double checked the merging procedure using firms' names.

B. Bank-Firm Lending Relationships

The strength of the bank-firm relationship is a key factor influencing the credit channel that transmits shocks from banks to their borrowers. Therefore, in order to examine the impact of government interventions on borrowing firms' performance we first measure the strength of each pair of bank-firm relationships. Having a stronger lending relationship with a bank allows borrowers to have better access to credit from this bank but also makes them more sensitive to the shocks to this bank at the same time.

To establish bank-firm relationships, we employ the LPC DealScan database, which has been used in related studies (e.g., Dennis et al. (2000), Bharath et al. (2011)). This database contains detailed information on bank loans, mostly syndicated loans, granted to large companies. There are various ways of measuring the strength of bank-firm relationship; some studies focus on the time dimension and measure the length of the lending relationship (e.g. Berger and Udell (1995)), while others employ the existence of repeated lending, concurrent underwriting, lines of credit, and checking accounts as proxies for a strong bank relationship (e.g., Schenone (2004), Drucker and Puri (2005), Bharath et al. (2007), Bharath et al. (2011), Norden and Weber (2010)). Since the LPC database starts in 1982, it would not be possible to

observe the exact starting point of the lending relationship and thus difficult to calculate the length of any of such a lending relationship. Thus, instead of focusing on the "time dimension" of the banking relationship, we choose to focus on the "exclusivity dimension" of bank relationships, which takes into account the number of bank lending relationships, the concentration of bank debt and the main bank status.

In line with the related studies that suggest that repeated contracting between firms and banks correlates with a strong bank-borrower relationship, we take the repeated lending of banks to firms in the past as an indication for a strong bank-firm relationship. Similar to the method used by Bharath et al. (2007), we construct a firm-specific and time varying bank-firm lending relationship variable $LR_{ij,t}$ that quantifies the relative importance of relationship with bank j among all lending relationships of firm i at time t. We construct this lending relationship measure by analyzing the loan portfolio of firm i at time t. To do so, we review the history of new business loans generated extended to firm i by bank j prior to time t over a four-year window period from 2004 to 2007. The reason is that in the LPC DealScan database, the median life of the loans is 4.8 years. Given that our analysis period is from August 2007 to December 2009, a loan granted during 2004-2007 should still be counted as part of firm's total loan portfolio in our analysis period and thus would provide information about the strength of bank-firm relationship.

The reason why we only review the loan history till 2007 and then freeze the relationship during the government intervention period is that tracking relationships through the crisis could create an endogeneity problem since certain firms might have started new relationships with banks that participated in CPP because they expected that these banks are more willing

or better able to provide credit. However, this does not seem to have happened on a large scale since significantly less new lending relationships have been formed after the beginning of the crisis in 2008 and 2009 (see Figure 2).

[Please insert Figure 2 here]

We construct the banking relationship $LR_{ij,t}$ by looking at firm i's top lead arrangers (banks) for each of firm i's historical loan in LPC database. Suppose that firm i obtained n loans during the past four years prior to time t, the lending relationship between firm i and one lending bank j at time t is calculated as:

$$LR_{ij,t} = \frac{\sum_{x=1}^{n} Lead_{ij,x}}{\sum_{x=1}^{n} numL_{i,x}} \quad (1)$$

where $Lead_{ij,x}$ is a dummy variable that equals to one if bank j (among the others) acts as a lead arranger in loan x to firm i, and zero otherwise. $numL_{i,x}$ is the number of lead arrangers involved in loan x to firm i.

The calculation of LR_{ij} is best illustrated by an example. LPC DealScan reports that Accenture has entered two new loan contracts over the four-year period from 2004 to 2007; the first loan contract was granted in June 2004 with Bank of America and JP Morgan as lead arrangers. The second loan was granted in June 2006 with Bank of America and Citigroup as lead arrangers. In this case, the strength of relationship between Accenture and Bank of America is calculated as: $LR_{Accenture,\ BankofAmerica}=2/(2+1+1)=0.5$; similarly, $LR_{Accenture,}$

$_{JPM}$=1/(2+1+1)=0.25 and $LR_{Accenture, Citi}$=1/(2+1+1)=0.25. This method does not only identify the most important banks (lead arrangers) for each firm, but also differentiate the relative importance among lead arrangers over the past years. Note that for many cases in the LPC database, information on the actual shares of the individual banks in each syndicated loan are missing or not reliable, i.e., we cannot calculate the relative importance of each lead arranger based on loan volumes. Therefore, we use an indicator variable-based measurement approach, which is the closest we can get to accurately reflect the strength of a bank-firm relationship.

For both borrowing firms and lead banks, we aggregate data to the parent-bank level. We use the parent bank in our analysis because the CPP is only conducted at the parent-firm level. We also exclude finance companies as lenders from our analysis in LPC database because they are not eligible to receive CPP capital infusions.

The large number of mergers and acquisitions in the U.S. banking industry during our sample period makes it challenging to track the dynamics of bank-firm relationships. We use the Thomson One Banker and Zephyr database to document banks mergers and acquisitions events from 2004-2009 and construct dynamic relationships between banks and firms. Similar to other studies we assume that in most of the cases, post-merger/post-acquisition bank inherited the loans of the pre-merger/pre-acquisition banks under normal economic situations. When bank A is acquired by bank B at time t_1, all clients of bank A are automatically counted as clients of bank B after time t_1, and $LR_{iB,t}$ for firm i is recalculated by taking into account the prior relationship with bank A.

Based on the information extracted from 2,449 loan contracts from January 2004 till December 2007, we are able to construct 127,748 pairs of bank-firm relationships $LR_{ij,t}$ at the

beginning of 2005 and this number is then reduced to 112,512 pairs at the end of 2009 due to mergers and acquisitions in the banking sector.

C. TARP Capital Infusions and Redemptions

The data on banks' participation in TARP's capital infusion program CPP comes from the website of U.S. Treasury Department (http://www.financialstability.gov). It includes information on capital infusions and capital redemptions. We employ an innovative measurement to assess the intensity of the positive spill-over effects stemming from intervention by defining a firm-specific and time-varying TARP intervention score which takes a firm's bank relationships and the banks' participation in the CPP program into account. We create two intervention variables for each firm to capture the presence (INT_SCO_DM) and magnitude (INT_SCO_AMT) of CPP interventions. For INT_SCO_DM, we first create a time-varying intervention variable $\text{Intervention\_DM}_{j,t}$ for each firm's bank j. $\text{Intervention\_DM}_{j,t}$ increases its value by one when a capital infusion took place and decrease value by one if there is capital redemption. Second, we transform the bank-level variable $\text{Intervention\_DM}_{j,t}$ into a firm-level intervention score, $\text{INT\_SCO\_DM}_{i,t}$, for each firm i by considering the lending relationships with its m banks. The daily firm-level intervention score is calculated as shown in equation (2).

$$INT\_SCO\_DM_{i,t} = \sum_{j=1}^{m} LR_{ij,t} \times Intervention\_DM_{j,t} \quad (2)$$

Following similar procedure, we create a second firm-level intervention measure by

considering firm i's lending relationships with m banks and the amount of CPP capital that injected into each of the m lending banks. First, for each bank, we create a time-varying intervention variable Intervention_AMT$_{j,t}$, which increases (decreases) its value by the CPP dollar amount injected to (redeemed by) bank j scaled by the total asset value of bank j prior to the start of the crisis (2007 Q2).

$$Intervention\_AMT_{j,t} = \frac{amount\ \ injected\ to\ bank\ \ j}{pre-crisis\ book\ value\ of\ bank\ \ j} \tag{3}$$

We then transform the bank-level variable Intervention_AMT$_{j,t}$ into a daily firm-level intervention score, INT_SCO_AMT$_{i,t}$ by considering the lending relationships with its m banks, as shown in equation (4):

$$INT\_SCO\_AMT_{i,t} = \sum_{j=1}^{m} LR_{ij,t} \times Intervention\_AMT_{j,t} \tag{4}$$

Since the impact of the CPP intervention on firms' stock market performance is the main focus of our analysis, we use an example from our dataset to illustrate the first intervention score INT_SCO_DM$_{i,t}$ and firms' stock price performance in Figure 3.

[Please insert Figure 3 here]

The company Archer-Daniels-Midland Co (NYSE: ADM, agriculture and food industry)

started three loan contracts from 2004 till 2007, which involved a total of 26 lead arrangers (16 unique banks). As displayed in Figure 3, $INT\_SCO\_DM_{i,t}$ (measured on the left axis) first increased during the initial CPP infusion since three banks (acted as lead arrangers eight times) received CPP funds. As more banks obtained CPP funds later on, the intervention score $INT\_SCO\_DM_{i,t}$ increased further. After the enactment of the American Recovery and Reinvestment Act (ARRA) on February of 2009, some banks started to pay back the CPP money, and thus we see a decrease in INT_SCO_DM.

V. Empirical Results

A. The General Impact of CPP Intervention on Firms' Stock Returns

In our first set of tests, we estimate multivariate panel regressions to investigate the hypothesis 1 on the general impact of CPP interventions on firms' stock price performances.

$$R_{it} = \alpha_i + \beta_{1,i} INT\_SCO\_DM_{i,t} + \beta_{2,i} R_{mt} + u_i + d_t + \varepsilon_{i,t} \quad (5)$$

$$R_{it} = \alpha_i + \beta_{1,i} INT\_SCO\_AMT_{i,t} + \beta_{2,i} R_{mt} + u_i + d_t + \varepsilon_{i,t} \quad (6)$$

We follow the model specification used by Schipper and Thompson (1983) and regress each firm's daily stock return R_{it} on its intervention score INT_SCO_DM and INT_SCO_AMT, the market factor R_{mt}, firm fixed effects u_i, and time fixed effects d_t, as shown in equation (5) and (6). Table 3 reports the estimation results for our baseline model.

[Please insert Table 3 here]

The table shows that CPP interventions in general have a significantly positive impact on firms' stock returns. The regression results using the full sample show that both INT_SCO_DM (Panel A) and INT_SCO_AMT (Panel B) are positively and significantly related with firms' stock return during the crisis. For example, a one-point increase in the intervention score INT_SCO_DM increases a firm's daily stock return by 0.06 percentage points. This number then translates into 3.82 percentage points if calculated quarterly and 16.18 percentage points at a yearly frequency. Considering that the average daily stock return over this period is 0.04 percentage points, we find that the daily stock return doubles if the INT_SCO_DM increases by one point. Hence, we find evidence in favor of our hypothesis H1.

We then categorize firms into three groups according to the types of CPP interventions in their lending banks (i.e., forced only, voluntary only, and mixed) and re-run the regression models shown equation (5) and (6) for these groups separately. Firms are categorized as forced only if they only have lending relationships with one of the nine banks that were forced into a bail out by the government on October 28, 2008, while firms are categorized as voluntary only if they only have a relationship with banks that voluntarily participated in the CPP at a later stage. "Mixed" firms are those that borrow from banks that were forced to participate and voluntarily participated in the CPP. The results show that the positive valuation effect on firms' stock price performance not only exists for forced interventions but is also present when banks voluntarily participate in the CPP (Panel A). On average,

borrowing firms daily stock returns increase by 0.16 percentage points when banks were forced to take TARP money on October 28, 2008. The effect from the amount-based intervention score is also positive and significant (Panel B), which we interpret as evidence that the positive stock market reaction is an expectation effect stemming from not only the intervention event itself but also its magnitude.

To check whether different model specifications influence our results, we employ the three-factor model suggested by Fama and French (1993) to test the impact of the intervention score. The regression results are consistent with our findings by using the basic market model. To be specific, a one-point increase in a firm's intervention score INT_SCO_DM and INT_SCO_AMT increases its daily stock return by 0.03 percentage points (t-stat.: 3.21), and 0.87 percentage points (t-stat.: 4.80), respectively.

B. The Influence of Firm Characteristics

To test our second hypothesis, we consider the influence of firm characteristics and investigate whether firms with certain characteristics are more sensitive to the impact of CPP interventions. We identify firm characteristics using data from the pre-crisis and/or pre-TARP period to avoid potential endogeneity problems. Since the information on firm characteristics is only available at a quarterly basis, we cannot directly include them as control variables in a multivariate regression setting since these variables would be constant within quarters. Moreover, since much of the CPP interventions happened between 2008Q4 and 2009Q1, a quarterly regression would fail to capture the dynamics in the CPP interventions (and thus in the intervention scores) within such a short time span. Therefore, to test hypothesis H2, we

run the panel data regression based on the equation (5)) on subsamples that we created based on firms' pre-crisis characteristics. For all firm characteristics except for bank dependency, we split the sample into five quintiles according to firm characteristics prior to the start of financial crisis. This empirical approach also makes it possible for us to examine whether the influence of firm characteristics is monotonic or not. The empirical results are reported in Table 4.

[Please insert Table 4 here]

We obtain two main findings. First, consistent with the results shown in Table 3, we note that CPP interventions in general have a positive impact on firms' stock returns in almost all portfolios. Second, the magnitude of the impact of CPP intervention on firms' stock returns varies depending on firm characteristics.

For firm size, daily stock returns of smaller firms are more sensitive to CPP infusion, which is in line with hypothesis H2a. On average, a one point increase in INT_SCO_DM is estimated to increase daily stock return by 0.07 percentage points (t-value: 4.51) for the smallest-size firms while one point increase in INT_SCO_DM corresponds to 0.04 percentage points (t-value: 2.15) increase in stock returns for biggest-size firms. However, the difference between quintile 1 and 5 is not significant.

Results on firm's financial ratios (hypotheses H2b: leverage ratio, H2c: profitability, and H2d: Altman's Z-Score) indicate that during adverse economic situations, TARP capital infusion in banks has had a more pronounced impact on stock price performance of more

financially distressed firms. Differences between the lowest and highest quintiles are all significant at the 1%-level. We find that the daily stock return of most-leveraged firms increases by 0.10 percentage points (t-value: 4.44) if INT_SCO_DM increases by one point. The impact on daily stock returns is gradually decreased for lower leveraged firms, and it in the end reduced to 0.05 percentage points (t-value: 3.54) for least-leverage firms. Similarly, stock returns of less profitable firms are significantly more sensitive to CPP infusions. A one-point increase in INT_SCO_DM is estimated to increase stock returns of the least profitable firms by 0.17 percentage points and has no significant impact on the most profitable firms. In addition, we find that CPP interventions have stronger positive valuation impacts on the stock price of firms with lower Altman's Z-score and the impact declines as the Altman's Z-score increases (although not monotonically). This set of results confirms that the borrower's level of financial distress (leverage, profitability, Z-Score) is an important factor that influences corporate borrowings.

Results on firms' pre-crisis cash holdings indicate that firms that are short on cash benefit significantly more when the government infuses capital in their lending banks, which is in line with hypothesis H2e. Moreover, conforming to hypothesis H2f, government capital infusions have more pronounced impacts on firms with lower-liquid stocks (higher bid-ask spread). In addition, we find firms that were most strongly hit by the financial crisis also benefit the most from TARP interventions in their lending banks, which is support for hypothesis H2g.

We find that bank-dependent firms benefit more from the TARP capital infusions during the financial crisis than less bank-dependent firms, which is consistent with hypothesis H2h.

Results show that a one-point increase in the INT_SCO_DM is estimated to increase bank-dependent firms' daily stock returns by 0.05 percentage points (t-value=4.55), while there is no significant impact of CPP intervention on stock returns of firms that are not bank-dependent. The difference is significant at 1%-level. This result is in line with Chava and Purnanandam (2011), who show that bank dependent borrowers would be more affected by a credit crunch. We show that bank-dependent firms also mostly benefited from CPP infusions for the same reason. As discussed earlier, the goal of TARP capital infusion program is to stimulate bank's lending to the industry by providing extra liquidity to banks and strengthen the bank lending channel. Since bank lending is the primary source of financing for bank-dependent borrowers, they are most sensitive to CPP infusions in banks. It is noteworthy that all the results outlined above remain similar when we use the INT_SCO_AMT instead of the INT_SCO_DM to measure government intervention in banks.

C. Alternative Tests for the Impact of CPP infusion on corporate borrowers' stock returns

Our previous findings from panel regressions capture both between-firm and within-firm variations in the intervention score over time. Therefore, we now employ a different method to test the impact of government intervention. We first examine the within-firm time-variation in intervention scores and test the influence of the INT_SCO_DM on each single firm's stock performance. Second, we test whether the differences in the impact of government intervention on firm's stock returns are correlated with firm and bank characteristics from the pre-crisis period.

For 1,125 out of 1,156 firms we are able to estimate time-series regressions with daily

data using our baseline model 1 (see equation (5)). Thus, the coefficient β_{1i} captures the impact of CPP interventions on each firm i's stock returns over the crisis period. We obtain positive estimates for the β_{1i} coefficients in 604 out of 1,125 regressions. The mean of the β_{1i} coefficient is 0.0010, i.e., a one-point increase in a firm's intervention score INT_SCO_DM increases its daily stock return by approximately 0.1% during the crisis period. We interpret this result as supportive evidence for our previous findings: capital infusions in banks indeed positively influence firms' performance over time.

We further explore whether the impact of government intervention in banks varies with firm characteristics. For this purpose, we regress the above estimated coefficients β_{1i} on firms' pre-crisis quarterly characteristics from the second quarter of 2007. Table 5 reports the findings.

[Please insert Table 5 here]

We find that a higher leverage is associated with a higher β_{1i} coefficient. Thus, the positive impact of INT_SCO_DM on firms' stock returns is amplified if the borrowing firm is highly leveraged. Firm profitability (ROA) is negatively related to the β_{1i} coefficient. On average, a one-percentage point decrease in firms' profitability increases the impact of CPP on stock return by 1.03 percentage points. Furthermore, we find that firm size negatively influences the impact of CPP on firm's stock return, i.e., the impact of government interventions on stock returns is more pronounced for smaller firms. Moreover, higher bankruptcy risk (lower Altman's Z-score) amplifies the positive impact of CPP intervention on firms' stock returns.

Summarizing, the results in Table 5 provide evidence that cross-sectional firm variation influences the impact of CPP on firm's stock performance. The analysis shows that smaller and more financially distressed firms are more sensitive to the positive impact of government capital infusions. These effects are not only significant from a statistical perspective but also economically meaningful. These findings are also consistent with the results from the previous section that are based on sample splits, highlighting again the benefits of government intervention in banks for smaller and riskier firms.

VI. Further Empirical Checks

We carry out a series of further empirical checks. We investigate the influence of bank characteristics on our previous results, the short-term stock market impact of CPP intervention and redemption events, and disentangle the time-series and cross-sectional effects of the government intervention on corporate stock returns. We also examine the possible changes in firms' financial constraints after government interventions in their lead banks to shed some light on potential real effects.

First, we construct weighted bank characteristics for each firm i at time t by considering the relationship between firm i and its lending bank j, as well as bank j's specific characteristics l (e.g., bank size, profitability and capital ratio) at time t.

$$(7) \qquad Weighted\ Bank\ Characteristics_{il,t} = \sum_{j=1}^{n} LR_{ij,t} \times Bank\ Characteristics_{jl,t}$$

For each bank characteristic, we run regression using equation (5) on two sub-samples

split based on the quarterly median of the weighted lending banks characteristic prior to the crisis in quarter 2 of 2007. First, we find that firms borrowing from less profitable banks benefit more from the government capital infusion. On average, a one-point increase in the intervention score corresponds to 0.06 percentage point increase in daily stock returns for clients of less-profitable banks. And this impact decreases to 0.05 percentage points for clients of more profitable banks. Second, stock returns of borrowers of banks with weaker capital ratios are more sensitive to CPP infusions. For weaker-capitalized banks' clients, a one-point increase in INT_SCO_DM increases firms' stock returns by 0.08 percentage points. The impact on stock returns decreases to 0.05 percentage points for the firms that borrow from banks with stronger capital ratio. We further find that government capital infusions matter more for corporate borrowers of bigger banks. On average, a one-point increase in intervention score is associated with 0.08 percentage points increase in daily stock price, holding the other conditions the same. The impact of intervention at small banks is positive but less significant and the coefficient size is only about two thirds of the coefficient for firms borrowing from big banks. Our finding is consistent with studies that argue that larger banks with weaker capital ratios were most strongly hit by the crisis and that these banks were the ones targeted by the CPP (e.g., Panetta et al. (2009), Santos (2010)).

Second, we examine the short-term valuation effects on firms' stock performances around CPP interventions and redemptions events. We collect information on all capital infusion events in banks and calculate the corresponding short-term valuation effects in stock markets for firms that have lending relationship with those banks. We first test the short-term stock price reaction for firms over all CPP infusion events and then separately examine the effects

from the forced CPP infusion, the voluntary CPP infusions and banks' CPP redemption events. We find that firms' short-term stock returns are positively affected by CPP infusions in their lending banks over the crisis period. CPP interventions yield on average 0.78 percent cumulative abnormal returns (CAR) over a 3-day (-1, 0, +1) event window around CPP interventions. The result is statistically significant at the 1%-level using a parametric (t-test, p-value: 0.00) and a non-parametric test (Wilcoxon sign-test, p-value: 0.00). We then check the three-day cumulative abnormal returns (CARs) for the forced- and voluntary-interventions separately. Consistent with our findings from the previous section, our results indicate that the positive short-term valuation effect on firms' stock prices is stronger during the forced interventions compared to the impacts of the voluntary interventions. On average, the 3-day CAR on borrowing firms' stock price is 2.03 percent around the forced interventions of the nine banks, whereas banks' voluntary participation in CPP is associated with an average 0.38 percent CAR on borrowing firms' stock price over a 3-day event window. Both results are significant at the 1%-level in parametric and non-parametric tests. Moreover, we analyze the short-term valuation effects around the event when the intervened banks pay back the capital they received from the government. We are not aware of any other study that has looked at this issue so far. It turns out that there are no significant short-term valuation impacts on borrowing firms' stock price performance during the CPP redemption events. This result indicates that investors and shareholders of borrowing firms perceive capital redemptions by their lending banks as performance-neutral event. Our finding is in line with previous studies that argue that banks' early repayment of TARP funding for their own benefit (e.g., Kim (2010)), and thus does not necessarily benefit banks' clients.

Third, we shed light on the question whether our intervention score fully captures the cross-sectional and time-varying dynamics of the impacts of CPP interventions on each firm. For this purpose, we create an indicator variable that equals one from the first CPP intervention to the end of the sample period to capture the macro-level time-series effects from interventions. We then orthogonalize the intervention score INT_SCO_DM with this indicator variable and include both variables in the panel regression model with daily data. This approach makes sure that we consider only that part of the intervention score that is left unexplained by the macro effect indicator variable. The results show that the indicator variable and the orthogonalized intervention score exhibit positive coefficients (0.02 and 0.03) that are statistically significant (t-stat=6.47 and 7.74). Thus, the variation in the intervention score does not only reflect the macro-level structural changes to the market as a result of the TARP interventions but also captures both the cross-sectional and time-varying dynamics of the impact of CPP interventions on corporate stock returns.

Fourth, we try to shed some light on the real impact of interventions on the corporate sector by looking at whether certain firms have become less financially constrained after CPP interventions in their lending banks. Specifically, we look at the changes in the reliance of firm's capital expenditure on its cash flow to investigate the impact on firms' financial constraints (Fazzari et al. (1988)). We do so by estimating a multivariate panel regression model using quarterly data from 2007Q3 to 2009Q4. We use firm's capital expenditure scaled by lagged total asset as the dependent variable, and regress it on the 1) firm's cash flow from operations scaled by lagged total assets, 2) firm's intervention score, and 3) the interaction term between cash flow and intervention score, controlling for time and firm fixed effects. We

find two interesting results. First, firms' investment activities have become less sensitive to cash flows when their banks experienced more CPP intervention. This finding indicates that that firms that exhibit more exposure to government interventions have become less financially constrained. Second, we split the sample according to firm characteristics (e.g. size, ROA, leverage, Altman's Z and bank dependency) and then re-run the investment-cash flow-regression on the sub-samples. We find that the magnitude of the interaction effect is larger for smaller, less profitable, highly levered, riskier and bank-dependent firms. Although it might still be too early to observe the full real impact of government intervention in banks on corporate borrowers' operating performance, our results provide some indication that the government intervention in banks helped to relax financial constraints.

VII. Conclusion

We investigate whether the U.S. government capital infusion program for banks, the Capital Purchase Program (CPP), affects corporate borrowers' stock returns during the financial crisis of 2007-2009. Based on detailed information on the firms' borrowing history, we identify credit relationships with banks as channels that transmit financial shocks from banks to their borrowers. Our principal result is that CPP interventions in banks have a significantly positive impact on the borrowing firms' stock returns. We further find that the positive impact of CPP intervention varies with firm characteristics. Smaller, riskier, and bank-dependent firms benefit more from government capital infusions in their banks. These findings extend the evidence from related studies on negative credit supply-driven spillover effects from banks to the corporate sector in the first stage of the recent financial crisis and

previous crises (Campello et al. (2010), Ivashina and Scharfstein (2010), Lemmon and Roberts (2010), Chava and Purnanandam (2011)).

Our study contributes to the existing literature by identifying significantly positive spillover effects on corporate borrowers when negative shocks to their banks are mitigated. We leave it to future research to analyze whether similar effects exist when economic shocks spill over from the corporate to the banking sector (demand-driven shocks, real economy crises). Our evidence is consistent with the broader view that bank-firm relationships serve as an important transmission channel for positive shocks to banks.

References

Adams, R. "Governance and the Financial Crisis." ECGI - Finance Working Paper, 248 (2009). Available at SSRN: http://ssrn.com/abstract=1398583.

Altman, E. "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy." *Journal of Finance*, 23(1968), 589-609.

Angelini, P.; R. Salvo; and G. Ferri. "Availability and Cost for Small Businesses: Customer Relationships and Credit Cooperatives." *Journal of Banking and Finance*, 22 (1998), 929–954.

Bae, K. H.; J. K. Kang; and C. W. Lim. "The Value of Durable Bank Relationships: Evidence from Korean Banking Shocks." *Journal of Financial Economics*, 64 (2002), 181-214.

Bayazitova, D., and A. Shivdasani. "Assessing TARP." (2002) Available at SSRN: http://ssrn.com/abstract=1461884.

Berger, A. N., and G. F. Udell. "Relationship Lending and Lines of Credit in Small Firm Finance." *Journal of Business*, 68-3 (1995), 351-381.

Bharath, S.; S. Dahiya; A. Saunders; and A. Srinivasan. "So What Do I Get? The Bank`s View of Lending Relationships." *Journal of Financial Economics*, 85 (2007), 368-419.

Bharath, S.; S. Dahiya; A. Saunders; and A. Srinivasan. "Lending Relationships and Loan Contract Terms." *Review of Financial Studies* 24 (2011), 1141-1203

Bolton, P., and D. Scharfstein. "Optimal Debt Structure and the Number of Creditors." *Journal of Political Economy*, 104 (1996), 1-25.

Boot, A. "Relationship Banking: What Do We Know?" *Journal of Financial Intermediation*, 9 (2000), 7-25.

Boot, A.; S. Greenbaum; and A. Thakor. "Reputation and Discretion in Financial Contracting." *the American Economic Review*, 83(1993), 1165-1183.

Campello, M.; J. Graham; and C. Harvey. "The real effects of financial constraints: Evidence from a financial crisis," *Journal of Financial Economics*, 97 (2010), 470-487.

Carvalho, D.; M. Ferreira; and P. Matos. "Lending Relationships and the Effect of Bank Distress: Evidence from the 2007-2008 Financial Crisis." Working Paper (2010).

Cecchetti, S. “Crisis and Responses: the Federal Reserve and the Financial Crisis of 2007-2008”, NBER Working Paper 14134 (2008), National Bureau of Economic Research.

Chava, S., and A. Purnanandam. “The Effects of Banking Crisis on Bank-Dependent Borrowers.” *Journal of Financial Economics*, 99 (2008), 116-135.

Ciccarelli, M.; A. Maddaloni; and J. Peydro. “Trusting the Bankers: A New Look at the Credit Channel of Monetary Policy.” ECB Working Paper No. 1228 (2010). Available at SSRN: http://ssrn.com/abstract=1641086.

Cole, R. “The Importance of Relationships to the Availability of Credit.” *Journal of Banking and Finance* 22 (1998), 959-977.

Dell`Ariccia, G.; E. Detragiache; and R. Rajan. “The Real Effect of Banking Crises.” *Journal of Financial Intermediation*, 17(1) (2008), 89-112.

Dennis, S.; D. Nandy; and I. Sharpe. “The Determinants of Contract Terms in Bank Revolving Credit Agreements.” *Journal of Financial and Quantitative Analysis*, 35 (2000), 87-110.

Detragiache, E.; P.G. Garella; and L. Guiso. “Multiple Versus Single Banking Relationships: Theory and Evidence.” *Journal of Finance*, 55 (2000), 1133–1161.

Drucker, S., and M. Puri. “On the Benefits of Concurrent Lending and Underwriting.” *Journal of Finance*, 60 (2005), 2763-2799.

Elsas, R. “Empirical Determinants of Relationship Lending.” *Journal of Financial Intermediation*, 14 (2005), 32-57.

Elsas, R., and J. P. Krahnen. “Is Relationship Lending Special? Evidence from Credit-File Data in Germany.” *Journal of Banking and Finance*, 22 (1998), 1283-1316.

Fahlenbrach, R., and R. Stulz. “Bank CEO Incentives and the Credit Crisis.” *Journal of Financial Economics*, 99- 1(2011), 11-26.

Fama, E., and K. French. “Common risk factors in the returns on stocks and bonds.” *Journal of Financial Economics,* 33(1993), 3–56

Giannetti, M., A. Simonov. “On the Real Effects of Bank Bailouts: Micro-Evidence from Japan.” Working Paper (2010).

Gokcen, U. “Market Value of Banking Relationships: New Evidence from the Financial Crisis of 2008.” Working Paper (2010).

Gopalan, R.; G. F. Udell; and V. Yerramilli. “Why do firms form new banking relationships?” Forthcoming *Journal of Financial and Quantitative Analysis* (2010).

Ivashina, V., and D. Scharfstein. “Bank Lending During the Financial Crisis of 2008.” *Journal of Financial Economics*, 97-3 (2010), 319-338.

James, C. “Some Evidence on the Uniqueness of Bank Loans.” *Journal of Financial Economics*, 19-2 (1987), 217-36.

Kang, J., and R. Stulz. “Do Banking Shocks Affect Borrowing Firm Performance? An Analysis of the Japanese Experience.” *Journal of Business* 73 (2000), 1-23.

Kashyap, A.; O. Lamont; and J. Stein. “Credit Conditions and the Cyclical Behavior of Inventories.” *Quarterly Journal of Economics*, 109 (1994), 565-92.

Kim, W. “Market Reaction to Limiting Executive Compensation: Evidence from TARP Firms.” SSRN Working Paper (2010), http://ssrn.com/abstract=1553394.

Lemmon, M., and M. Roberts. “The Response of Corporate Financing and Investment to Changes in the Supply of Credit.” *Journal of Financial and Quantitative Analysis*, 45 (2010), 555-587.

Li, L. “TARP Funds Distribution and Bank Loan Growth.” http://ssrn.com/abstract=1515349.

Norden, L., and M. Weber. “Credit Line Usage, Checking Account Activity, and Default Risk of Bank Borrowers.” *Review of Financial Studies*, 23 (2010), 3665-3699.

Ongena, S.; G. Jiménez; J. Peydro; and J. Saurina Salas. “Credit Supply: Identifying Balance-Sheet Channels with Loan Applications and Granted Loans”. ECB Working Paper 1179 (2010). http://ssrn.com/abstract=1588009.

Ongena, S.; D. Smith; and D. Michalsen. “Firms and their Distressed Banks: Lessons from the Norwegian Banking Crisis”, *Journal of Financial Economics*, 67 (2003), 81-112.

Panetta, F.; T. Faeh; G. Grande; C. Ho; M. King; A. Levy; F. Signoretti; M. Taboga; and A. Zaghini. “An Assessment of Financial Sector Rescue Programmes.” Bank of Italy Occasional Paper 47 (2009). http://ssrn.com/abstract=1605182.

Petersen, M., and A. Rajan. “The Benefits of Lending Relationships: Evidence from Small Business Data.” *Journal of Finance*, 49-1(1994), 3-37.

Rajan, R. “Insiders and Outsiders: The Choice Between Informed and Arms Length Debt.” *Journal of Finance* 47-4 (1992), 1367- 1400.

Reinhart, C., and K. Rogoff. “The Aftermath of Financial Crises.” *American Economic Review* 99 (2009), 466-72.

Santos, J., and A. Winton. “Bank Capital, Borrower Power, and Loan Rates,” AFA 2010 Atlanta Meetings Paper (2009). http://ssrn.com/abstract=1343897.

Santos, J. “Bank Corporate Loan Pricing Following the Subprime Crisis.” Forthcoming, *Review of Financial Studies* (2010).

Schenone, C. “The Effect of Banking Relationships on the Firm's IPO Underpricing.” *Journal of Finance* 59 (2004), 2903-2958.

Schipper, K., and R. Thompson. “Evidence on the capitalized value of merger activity for acquiring firms.” *Journal of Financial Economics* 11 (1983), 85-119.

Sharpe, S. “Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized Model of Customer Relationships.” *Journal of Finance*, 45-4 (1990), 1069-1087.

Shin, B.; S. Park; and G. Udell. “Lending Relationships, Credit Availability, Firm Value and Banking Crises.” (2008). http://ssrn.com/abstract=1102127.

SIGTARP. Quarterly Report to Congress January 30, 2010, Office of the Special Inspector General for the Troubled Asset Relief Program.

Slovin, M.; M. Sushka; and J. Polonchek. “The Value of Bank Durability: Borrowers as Bank Stakeholders.” *Journal of Finance,* 68 (1993), 247-266.

Taliaferro, R. “Where Did the Money Go? Commitments, Troubled Assets, New Lending, and the Capital Purchase Program.” Harvard Business School Working Paper (2009).

US Congress. Emergency Economic Stabilization Act. H. R. 1424, 110th Congress of the United States of America, Second Session, 3 October, 2008.

Veronesi, P., and L. Zingales. “Paulson's Gift.” *Journal of Financial Economics*, 97-3(2010), 339-368.

Appendix. Variable Categories and Definitions

Variable category	Main Variables	Definition	Data source	Measurement period
Firm characteristics	Firm size	Firm total assets	Compustat	2007Q2
	Log(Firm size)	The logarithm of firm's total assets		
	Leverage	(Long-term debt + short-term debt)/total assets		
	ROA	Income before extraordinary items/total assets		
	Altman's Z	Altman (1968)'s Z-score		
	Bank dependence	1 for bank dependent firms (public debt rated as non-investment grade or non-rated firms) 0 for non-bank dependent firms (public debt rated as investment-graded)		
	Cash holdings	Cash and marketable securities/total assets		
	Bid-ask spread	Average daily percentage bid-ask spread	CRSP	2007Q2
Bank-firm relationship	LR_{jk},	Strength of bank-firm relationship extracted from firm's past loan history	LPC DealScan	1-1-2004 – 31-12-2007
Government intervention	INT_SCO_DM	Firm-level CPP intervention score (based on the CPP dummy, see equation (2)	US Department of Treasury	28-10-2008 – 31-12-2009
	INT_SCO_AMT	Firm-level CPP intervention score (based on the amount of CPP infusion, see equation (4)		
Stock market common factors	R_{mt}	The value-weighted daily return on all NYSE, AMEX, and Nasdaq stocks	CRSP	9-8-2007 – 31-12-2009
	R_{ft}	One month U.S. Treasury bill rate	K. French's website	
	SMB	The average daily return on the three Fama and French (1993) small portfolios minus the average return on the three Fama and French big portfolios		
	HML	The average daily return on the two Fama and French (1993) value portfolios minus the average return on the two Fama and French growth portfolios		
Firm stock price performance	Firm crisis performance	Cumulative abnormal return of firm's stock returns during crisis and prior to the TARP interventions	CRSP	9-8-2007 – 30-09-2008
	RETURN	The daily firm stock return with dividends		9-8-2007 – 31-12-2009

TABLE 1

The Capital Purchase Program (CPP)

This table provides information on banks that participated in the Capital Purchase Program. Panel A contains information on banks that received CPP funds and banks that paid back CPP funds later. Panel B provides statistics on the distribution of CPP infusions. The sample period starts from 28 October 2008 and ends at 31 December 2009. Amounts of CPP are calculated as cumulative numbers in billions of dollars.

Panel A. Top 10 banks in terms of CPP capital recipient and repayment

Capital infusion		CPP redemption	
Bank name	Amount (in billion $)	Bank name	Amount (in billion $)
Wells Fargo & Company	25	Bank of America Corporation	25
JPMorgan Chase & Co.	25	JPMorgan Chase & Co.	25
Citigroup Inc.	25	Wells Fargo & Company	25
Bank of America Corporation	25	Morgan Stanley	10
The Goldman Sachs Group, Inc.	10	The Goldman Sachs Group, Inc.	10
Morgan Stanley	10	U.S. Bancorp	6.60
The PNC Financial Services Group Inc.	7.58	American Express Company	3.39
U.S. Bancorp	6.60	BB&T Corp.	3.13
SunTrust Banks, Inc.	4.85	Bank of New York Mellon Corporation	3
Capital One Financial Corporation	3.56	State Street Corporation	2
Total amount	142.58	Total amount	113.12
As a percentage of total CPP infusion	70.33%	As a percentage of total CPP repayment	95.04%

Panel B. The distribution of CPP infusion (Banks are ranked in terms of total amount of CPP received)

	Amount (in billion $)	As a percentage of total CPP infusion
First quartile of CPP recipient banks (top 25% capital recipients)	197.95	97.64%
Second quartile of CPP recipient banks (25% -50% capital recipients)	3.10	1.53%
Third quartile of CPP recipient banks (50%- 75% capital recipients)	1.23	0.61%
Fourth quartile of CPP recipient banks (75%-100% capital recipients)	0.46	0.22%

TABLE 2

Summary statistics

This table reports descriptive statistics for main variables. Detailed variable descriptions are provided in Appendix A. Panel A contains summary statistics on variables of firms' characteristics that are used in our main analysis. The data for firm crisis performance is measured from August 9, 2007 to September 30, 2008, and the data comes from the second quarter of 2007. Panel B contains summary statistics on daily firm stock price performance, daily market returns and daily returns on the on the Fama-French small (market capitalization)-minus-big and high (market-to-book ratio)-minus-low portfolios. Panel B also shows the two measures of government intervention we use in subsequent analyses. The sample period starts from August 09, 2007 and ends on December 31, 2009. The pre-TARP period refers to the period starting from August 09, 2007 to October 28, 2008, and post-TARP period refers to the period starting from October 28, 2008 to December 31, 2009.

Panel A. Firm characteristics

Variable category	Variables	Mean	Median	St. Dev.	Units
Firm Characteristics	Firm size	11040.5	1720.82	88395.5	Million $
	Log(Firm size)	7.4629	7.4570	1.6226	1
	Leverage	28.60	26.09	21.7	%
	ROA	1.31	1.17	2.61	%
	Altman's Z	1.335	1.240	1.359	1
	Bank dependence	0.6004	1	0.4898	Dummy
	Cash holdings	14.00	4.61	24.61	%
	Bid-ask spread	0.339	0.116	0.909	%
Firm crisis performance	Firm crisis performance	-0.065	-0.037	0.020	%
Number of firms		1,156			

Panel B. Firm stock price performance, general stock market performance, and government intervention

		pre-TARP			post-TARP			
Variable category	Variables	Mean	Median	St. Dev.	Mean	Median	St. Dev.	Units
Firm stock price performance	RETURN	-0.0017	-0.0012	0.0377	0.0027	0.0007	0.0553	1
Stock market factors	R_{mt}	-0.0016	-0.0005	0.0188	0.0014	0.0026	0.0222	1
Government Intervention	INT_SCO_DM	0	0	0	1.1042	1	0.6699	1
	INT_SCO_AMT	0	0	0	0.0284	0.02	0.0459	1
Number of firms	1,156				1,156			
Number of observations	350,504				341,356			

TABLE 3

Panel data regression results

This table shows the results of cross-sectional and time-series panel regressions on daily data during the crisis period starting from August 09, 2007 until December 31, 2009. Panel A reports the regression result using INT_SCO_DM and Panel B reports the regression result using INT_SCO_AMT. The dependent variable is a firm's daily stock return. We construct three sub-samples according to the types of CPP interventions in their lending banks (i.e., forced only, voluntary only, and mixed) run the regression models for these groups separately. T-statistics is reported and is calculated from Huber-White robust standard errors. *,**, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Variables are defined in Appendix A.

Panel A. The impact of interventions (dummy) on corporate borrower's stock returns

	Full sample - Market model			Mixed			Forced only			Voluntary only			Full sample - FF-3 factor model		
Dep.Var.: RETURN	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.
R_{mt}	1.1517	484.1	***	1.1674	481.75	***	1.0091	74.95	***	1.0627	84.36	***			
R_{mt} - R_{ft}													1.1389	403.90	***
R_{ft}													-2.8877	-2.33	**
SMB													0.6591	102.41	***
HML													0.1284	21.36	***
INT_SCO_DM	0.0006	8.03	***	0.0005	7.4	***	0.0016	2.55	***	0.0016	2.94	***	0.0003	3.21	***
Constant	0.0002	3.76	***	0.0002	3.49	***	-0.0001	-0.41		0.0002	0.63		0.0004	3.59	***
Number of firms	1,156			963			63			79			1,156		
Number of observations	691,860			580,334			37,534			46,494			691,860		
Adj. R-squared	0.254			0.287			0.131			0.134			0.266		

Panel B. The impact of interventions (amount) on corporate borrower's stock returns

	Full sample - Market model			Mixed			Forced only			Voluntary only			Full sample - FF-3 factor model		
Dep.Var.: RETURN	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.
R_{mt}	1.1533	484.89	***	1.1678	482.37	***	1.0103	75.14	***	1.0636	84.51	***			
R_{mt} - R_{ft}													1.1392	404.88	***
R_{ft}													-3.8860	-4.09	***
SMB													0.6590	102.39	***
HML													0.1284	21.37	***
INT_SCO_AMT	0.0131	7.86	***	0.017	7.16	***	0.013	1.86	*	0.0105	3.15	***	0.0087	4.80	***
Constant	0.0004	6.83	***	0.0003	5.47	***	0.0001	0.56		0.0005	1.7	*	0.0006	6.90	***
Number of firms	1,156			963			63			79			1,156		
Number of observations	691,860			580,334			37,534			46,494			691,860		
Adj. R-squared	0.254			0.287			0.132			0.134			0.266		

TABLE 4

Panel data regression results by firm characteristics

This table shows the results of panel data regression on daily data during crisis period starting from August 09, 2007 until December 31, 2009. The dependent variable is a firm's daily stock return (including dividend) and the independent variable is the intervention score INT_SCO_DM. Observations are grouped into one of five quintiles according to one of the eight firm characteristics using pre-crisis accounting data (gathered from 2007Q2) and pre-TARP stock performance data (gathered from 2007Q2 to 2008Q3). Coefficients of INT_SCO_DM and T-statistics are reported. *,**, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Variables are defined in Appendix A.

Panel A. Regression results firm characteristics quintiles

	Quintile 1(lowest)			Quintile 2			Quintile 3			Quintile 4			Quintile 5 (highest)			Significance Quintile 5-1
Quintiles split by	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	
Pre-Crisis firm characteristics																
Log(Firm size)	0.0007	4.51	***	0.0004	2.6	***	0.0006	3.56	***	0.0006	3.92	***	0.0004	2.15	**	Not sig.
Leverage	0.0005	3.54	***	0.0003	2.27	**	0.0005	3.23	***	0.0008	4.23	***	0.001	4.44	***	Sig.
ROA	0.0017	7.22	***	0.0006	3.26	***	0.0003	1.9	*	0.0003	2.24	**	0.0002	1.35		Sig.
Altman's Z	0.0012	5.35	***	0.0007	3.99	***	0.0004	2.7	***	0.0007	4.47	***	0.0002	1.3		Sig.
Cash holdings	0.0007	3.68	***	0.0005	3.24	***	0.0008	4.27	***	0.0006	3.56	***	0.0004	2.48	**	Sig.
Bid-ask spread	0.0003	2.66	***	0.0005	2.73	***	0.0005	3.49	***	0.0005	2.89	***	0.001	4.91	***	Sig.
Pre-TARP firm characteristics																
Firm crisis performance	0.0038	5.38	***	0.0019	4.09	***	0.0013	3.64	***	0.0015	4.44	***	0	-0.01		Sig.

Panel B. Regression results on bank dependency

	Non-bank dependent firms			Bank dependent firms			Significance high-low
	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.	
Bank-dependence	-.0001	-1.13		.0005	4.55	***	Sig.

TABLE 5

Regression results for the determinants of the intervention score coefficient

This table shows the results of a cross-sectional OLS regression of β_{1i} (from individual-firm time-series regressions $R_{it} = \alpha_i + \beta_{1i} INT\_SCO_{it} + \beta_{2i} R_{mt} + \varepsilon_{it}$) on firm characteristics during crisis period (August 09, 2007 till December 31, 2009). The data on firm characteristics is collected from 1125 firms prior to the starting date of crisis (2007Q2). Panel A contains regression results for the full sample which includes 1125 firms that have data available at 2007Q2, Panel B contains regression results for 604 firms with positive β_{1i}. T-statistics are using Huber-White robust standard errors. *,**, *** indicate coefficients that are significantly different from zero at the 10%, 5%, and 1% level. Variables are defined in Appendix A.

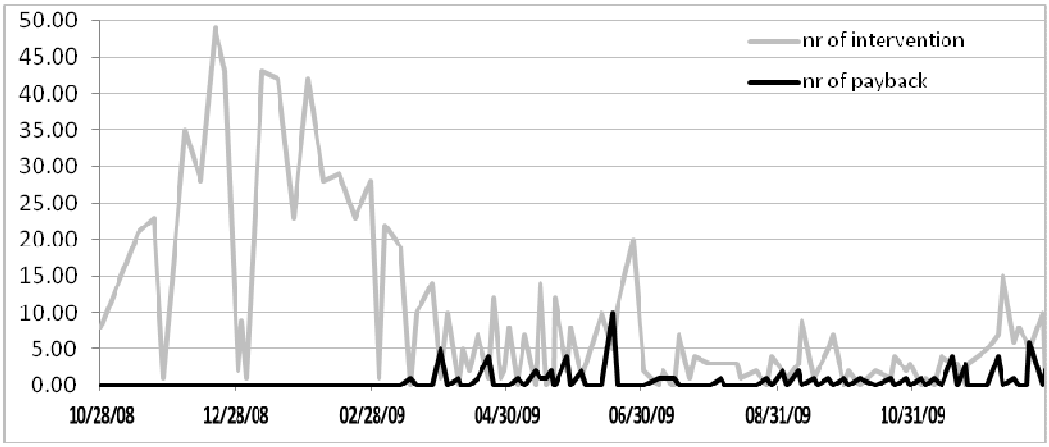
	Panel A. Full sample			*Panel B. Firms with positive coefficients of their intervention score*		
Dependent variable: β_{1i}	Coeff.	t-stat.	Sig.	Coeff.	t-stat.	Sig.
Firm Characteristics						
Log(Firm size)	-.0001	-1.73	*	-.0002	-2.00	**
Leverage	.0030	3.04	***	.0035	2.37	**
ROA	-.0103	-2.10	**	-.0136	-2.39	**
Altman's Z	-.0001	-0.85		-.0002	-2.15	**
Cash holdings	.0009	0.87		.0020	1.52	
Bid-ask spread	.0343	1.06		.0156	0.38	
Constant	.0013	1.67	*	.0040	4.06	***
Number of observations	1,125			604		
Adj. R-squared	0.024			0.046		

FIGURE 1

Number and amount of TARP capital infusions and redemptions over time

Panel A. Number of TARP capital infusions and redemptions

This figure displays the distribution of the number of capital infusions and redemptions deals from October 2008 to December 2009.



Panel B. Amount of TARP capital infusions and redemptions

This figure displays the distribution of the dollar amount of capital infusions and redemptions from October 2008 to December 2009.

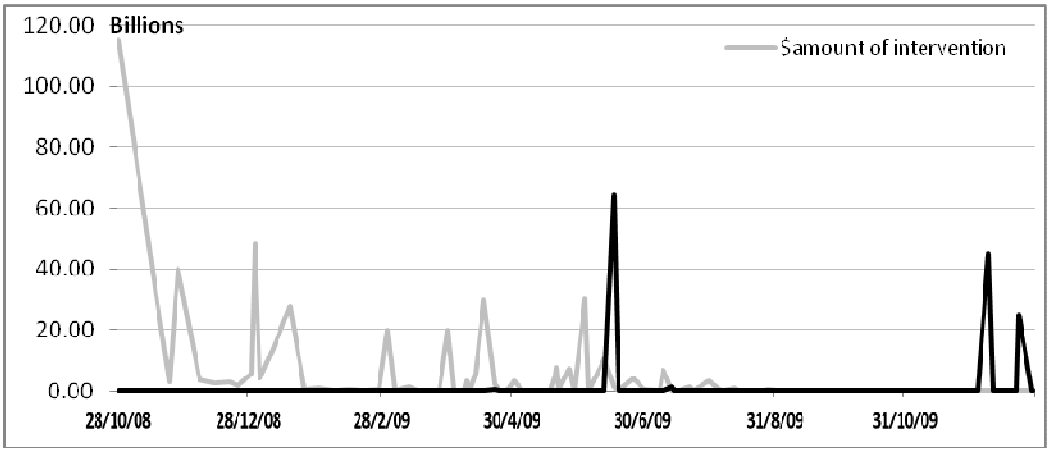


FIGURE 2

Loan origination from 2001 to 2009

This figure reports information on the total number and total volume (in billion $) of new bank loan originated from January 01, 2001 to December 31, 2009. The data comes from the LPC DealScan database.

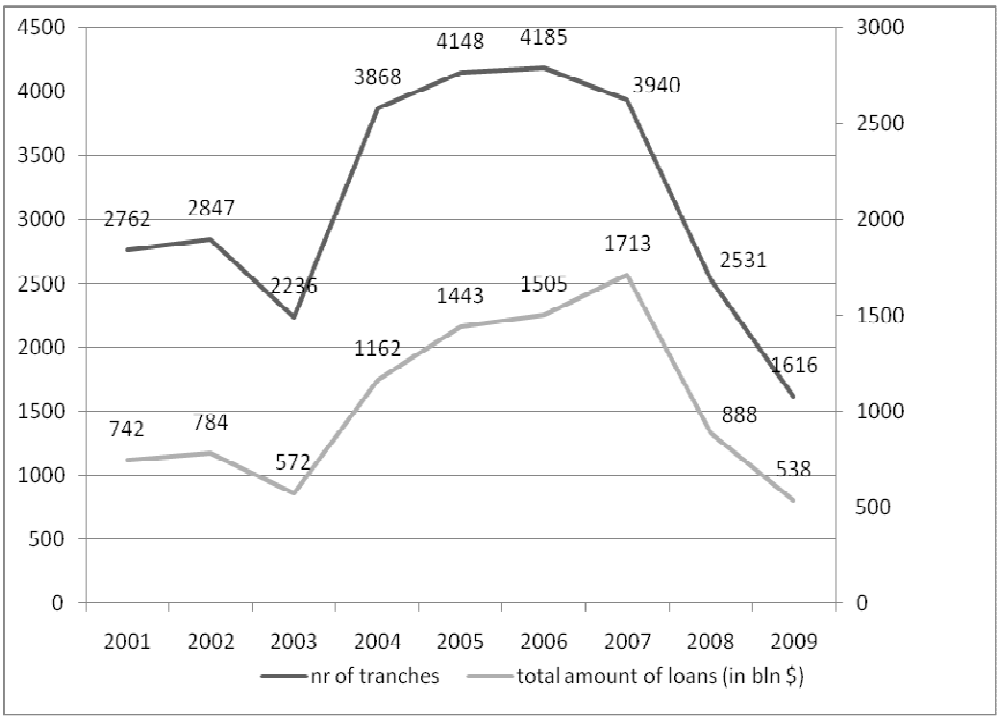


FIGURE 3

The co-movement of the intervention score and firm stock price

This figure shows the co-movement of stock price and intervention score of Archer-Daniels-Midland Co during the financial crisis period (July, 2007 to December, 2009). PRC in the figure refers to the firm's stock price.