The Real Effects of Government Intervention: Firm-level Evidence from TARP*

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June 2016

Abstract

This paper investigates the real and financial effects of the largest government intervention in US history, the Troubled Asset Relief Program (TARP), on individual firms. Firms borrowing from banks that participate in TARP increase long-term debt and have more cash holdings and working capital after the Program compared to firms borrowing from banks that do not participate in TARP. But, there is no significant impact of TARP on corporate investment, employment, or R&D. We conclude that TARP exerts significant influence on firms' liquidity and financial decisions, yet its impact on firms' real activities is limited.

Keywords: TARP, bank lending, the real economy, firm activities, cash holdings, debt structure

JEL Code: E44, G21, G28, G32

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* First draft: September, 2013. This paper was previously circulated under the title "The Effects of Government Intervention in Financial Market on the Real Economy." I am grateful to Adlai Fisher, Murray Carlson, Kai Li, Jan Bena, and Carolin Pflueger for insightful comments. I also thank Paul Beaudry, Allen Berger, Ran Duchin, Murray Frank, George Georgopoulos (Discussant), Lorenzo Garlappi, Ron Giammarino, Will Gornall, Guangli Lu, Alejandra Medina, Hernan Ortiz-Molina, Elena Pikulina, Elena Simintzi, Francesco Trebbi, Ting Xu, and participants at UBC (Finance, Economics), 2014 North American Summer Meeting of the Econometric Society at University of Minnesota, 2014 Northern Finance Association Conference and 2014 Canadian Economics Association Conference for helpful comments. I thank Dinara Bayazitova and Anil Shivdasani for sharing their data. All errors are my own.

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This paper investigates the real and financial effects of the largest government intervention in US history, the Troubled Asset Relief Program (TARP), on individual firms. Firms borrowing from banks that participate in TARP increase long-term debt and have more cash holdings and working capital after the Program compared to firms borrowing from banks that do not participate in TARP. But, there is no significant impact of TARP on corporate investment, employment, or R&D. We conclude that TARP exerts significant influence on firms' liquidity and financial decisions, yet its impact on firms' real activities is limited.

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1 Introduction

Seven years after the 2008-09 financial crisis, there are still extensive debates among politicians and pundits about the effects of the US government's first and largest intervention during that period of turmoil, the Troubled Asset Relief Program (TARP).[1] One central concern of these debates is whether the intervention had a positive impact on the real economy, one of the key intentions of the program. Although many economists and regulators have examined the impacts of TARP on the financial sector, there is little academic research about its ultimate effects on the real economy.[2]

The central question of this paper is whether, beyond the banking system, the over $200 billion dollars of capital provided by TARP impacts activities of non-financial firms through the bank lending channel. Existing theoretical and empirical evidence does not provide clear guidance as to what we should expect. On the one hand, TARP may have helped restore the real economy because it provided positive credit supply shocks to financial institutions and enabled banks to be less restrictive in granting loans to firms. As a result, firms that borrowed from TARP banks were less likely to cut real activities (i.e., investment, employment, and R&D) than firms that borrowed from non-TARP banks since they had access to more lending and were less financially constrained.[3] One the other hand, since firms were experiencing the worst recession since the 1929-1933 Great Depression and facing unprecedented uncertainty, it is not clear that firms which

[1] Critics of TARP claim that it helped large banks but not firms or households, and it failed to achieve the goal of ensuring that banks lend money (see SIGTARP report 2012; Duchin and Sosyura, 2014). However, advocates of TARP take an opposite stance and argue that TARP actually prevented the immediate collapse of the financial system, improved stability since 2008, and enabled banks to lend money (Li, 2013; Paulson, 2013). Veronesi and Zingales (2010) find that the big winners of the first round TARP capital injection were the bondholders of three former investment banks and Citigroup, while the losers were JP Morgan shareholders and the US taxpayers.

[2] Several studies examine the effects of TARP on banks (see, e.g., Black and Hazelwood, 2013; Li, 2013; Duchin and Sosyura, 2014).

[3] Campello, Graham, and Harvey (2010) find that financially-constrained firms planned deeper cuts in technology spending, employment, and capital expenditures during the 2008 financial crisis.

received more loans would have engaged in more real activities. Several studies show that uncertainty deters firms' real activities (e.g., Bloom, Bond and van Reenen, 2007; Bloom, 2009; Bloom et al, 2014; Bhattacharya, U., Hsu, P.H., Tian, X. and Xu, Y., 2014). Thus, firms may have used their new bank loans to strengthen their balance sheets after the 2008-09 financial crisis. Alternatively, they may have kept more cash for precautionary reasons because they faced extremely high default risk during that period (Acharya et al., 2015).

Using difference-in-differences (DiD) analysis, we first show that banks that received TARP funds lent more in the syndicated loans market than non-TARP banks did after TARP capital injection. This is consistent with prior research supporting that TARP increases bank loans (Li, 2013).

We next investigate the impact of TARP on firms' activities from three perspectives. First, we test how TARP can affect firms' debt structure. If TARP enables banks to extend more credit to firms, then the most direct impact should be on firms' debt. Indeed, we find that firms that borrowed from TARP banks obtained more long-term debt including bank loans by about 2%, which corresponds to about 7% of the mean long-term debt in our sample. By contrast, firms linked to TARP banks had less short-term debt than firms that borrowed from non-TARP banks after TARP launched. The reduction in short-term debt may be due to the unusual cost of short-term funding during the 2008 financial crisis (Kacperczyk and Schnabl, 2010; Gorton and Metrick, 2012). Despite its impact on firms' debt structure, TARP's effect on firms' leverage is insignificant. These findings suggest that firms borrowing from TARP banks were able to replace short-term debt with long-term debt without having substantially different leverage, which gave them significant advantage during the crisis. Prior research finds that firms faced significant rollover risk during the 2008-09 financial crisis and the level of rollover risk had broad influence

on firms' decisions (Acharya et al., 2011; Almeida et al., 2011; He and Xiong, 2012). The program allowed firms borrowing from TARP banks to suffer less from the rollover risk, suggesting an important positive impact on firms.

Second, we test whether TARP impacts firms' short-term activities on their balance sheets, such as cash and working capital. We find that firms borrowing from TARP banks held more cash and working capital. In particular, firms that borrowed from TARP banks held about 1% more cash than other firms, which is 14% of the mean of cash holdings in our sample. Similarly, firms that borrowed from TARP banks held about 4% more working capital than other firms, which is 27% of the mean of working capital in our sample. Thus, the economic magnitudes of such an impact are significant. The finding on cash holdings suggests that firms tend to hold more cash during a period of high uncertainty. This is consistent with prior studies emphasizing the roles of the financial frictions and precautionary saving motives in understanding firms' cash reverses (Keynes, 1936; Harford, 1999; Opler, Pinkowitz, Stulz, and Williamson, 1999; Gao, Harford, and Li, 2013; Gao and Grinstein, 2014).

Third, we examine whether firms linked to TARP banks were able to expand on real activities. We find that firms that borrowed from TARP banks did not have different real activities than other firms that borrowed from non-TARP banks. This finding is consistent with existing theoretical and empirical evidence that firms tend to deter investment when the state of the economy is bad or the future of the economy is uncertain (Leahy and Whited, 1996; Bloom, 2009; Acharya et al., 2015).

One concern is that the insignificant impact of TARP on real activities may be due to the fact that firms that borrowed from TARP banks were not financially constrained. Theories suggest

that credit supply shock will have more pronounced effects on firms that were financially constrained ex ante. To address this concern, we conduct a host of subsample analyses. Specifically, we examine how the effects of TARP vary in firm-level measures of financial constraints, industry-level measures of dependence on external finance, and firm-level measures of dependence on bank loans. Under the financial constraint hypothesis, firms that are financially constrained are more likely to increase their real activities if they have access to more funds. Thus, although we find that TARP has no significant impact on firms' real activities in the full sample, we may expect that it can have significant impact on more financially constrained firms. However, we find that TARP's impact is not economically and statistically significant for firms with low or high degrees of financial constraint. We also test cash and working capital and find that the increase in post-TARP cash and working capital is significantly greater for firms that were financially constrained, firms in industries that are historically more dependent on external finance or external equity finance, or firms with higher dependence on bank loans. This finding again suggests firms' precautionary saving motives.

Finally, we conduct a number of robustness tests. First, one may be concerned that the selection of TARP recipients is correlated with the bank's financial health and local economic conditions that drive the demand for loans. To identify the causal stimulus effect of TARP on credit supply, we conduct an instrumental variable (IV) analysis using measures of banks' political connections. Banks' political connections could affect the selection of TARP recipients, but they were unlikely to be correlated with loan demand. The conclusions of IV analysis confirm that TARP impacts banks' credit supply and firms' debt structure and cash reserving, but its influence on real activity is not economically and statistically significant. Second, we use alternative samples to overcome possible selection bias in the sample construction process. Again, we reach the same

conclusion as our main finding. Third, one concern with the DiD analysis is that our results could be driven by other unobservable shocks, which are not related to TARP but affect the selection process of TARP recipients. To address this concern, we perform a placebo test by using 2005Q3 as a "pseudo-event" quarter. The results verify the validity of DiD analysis, suggesting our main findings are unlikely to be driven by other unobservable factors.

This paper contributes to a growing body of literature that evaluates the impact of TARP. Veronesi and Zingales (2010) estimate the cost and benefit of initial TARP infusions for ten banks. They argue that this intervention increased the value of the financial sector's financial claims at taxpayers' cost with a net benefit around $100bn. Bayazitova and Shivdasani (2012) study banks' incentives to participate in TARP and the U.S. Treasury's approval decision for TARP application. Duchin and Sosyura (2012) document that politically connected banks were more likely to receive TARP capital injection. Berger and Roman (2015) find no evidence that TARP had significant impact on local economic conditions such as job creation, business failures, and personal bankruptcies at the state level. Prior research also finds that TARP allows banks to obtain competitive advantages (Berger and Roman, 2013), to increase lending (Li, 2013), and to increase risk-taking at the same time (Black and Hazelwood, 2013; Duchin and Sosyura, 2014). More generally, this paper is related to studies on the impact of bank bailout or related government intervention in the emerging market, Japan, and Europe (Khwaja and Mian, 2008; Kasahara et al, 2011; Giannetti and Simonov, 2013; Krishnamurthy, Nagel, and Vissing-Jorgensen, 2014; Acharya et al, 2015). Unlike prior studies, this paper focuses on a comprehensive examination of the microeconomic effects of TARP. The firm-level analysis is crucial to understand the long-lasting debate on the real effects of TARP. This paper shows that the positive impact of TARP on firms is on debt structure and liquidity, but not on the real side.

This paper also contributes to studies on the real effects of credit supply shocks. In a seminal work, Lemmon and Roberts (2010) find that credit supply shocks significantly influence firms' financing and investment decisions. In particular, this is closely related to research on the effects of post-Lehman credit disruptions on real economic activities. Greenstone and Mas (2012) document the significant negative impact of a sharp reduction in credit supply following the 2008-09 financial crisis on lending to small business at the county level. Chodorow-Reich (2014) shows that a substantial negative credit supply shock following the Lehman bankruptcy led to reduction in bank lending, resulting in reduction of firm-level employment. Campello, Graham and Harvey (2010) provide survey evidence that the 2008-09 financial crisis adversely affected financially constrained firms which were forced to heavily cut their spending on R&D, marketing, and employment, and forego profitable investment opportunities. These studies focus on the negative supply shock generated by the 2008-09 financial crisis, especially the Lehman Bankruptcy. However, little is known about whether government interventions such as TARP mitigate the negative shocks generated by the 2008-09 crisis. Although government interventions played an important role in fighting the recent financial crisis and stabilizing the financial system, it remains unclear whether the positive credit supply shocks generated by TARP had a significant impact on the real economy.[4] This paper extends this line of research by testing government intervention's potential positive effect on firms' activities through bank lending channel.

[4] This paper focuses on bank lending to firms. The bank-household channel is outside the scope of this paper. Several studies have highlighted the importance of the bank-household channel. For example, Mian and Sufi (2010; 2011), and Mian, Rao, and Sufi (2013) examine how reduction in consumption explains the slow economic recovery in employment.

2 Background on TARP

The 2008-09 financial crisis began with housing market distress and then quickly spread to the financial market. The financial crisis reached its peak when Lehman Brothers filed for bankruptcy on September 15, 2008. The Lehman bankruptcy had a huge negative impact on the financial sector. Commercial banks' new loans to large borrowers fell by 47% during the fourth quarter of 2008 relative to the prior quarter (Ivashina and Scharfstein, 2010).

To save the financial market and the US economy, the US government and Federal Reserve launched a series of rescue programs after the Lehman bankruptcy. One of the most important rescue programs was the Emergency Economic Stabilization Act of 2008 (EESA), which established the $700 billion Troubled Asset Relief Program (TARP) by the U.S. Treasury.[5] As one of the largest government interventions in U.S. history, TARP was mainly intended to stabilize the financial sector through the increased capitalization of banks, which would encourage them to resume lending and increase the flow of financing to U.S. businesses and consumers, and stimulate the real economy. TARP included five areas with the Capital Purchase Program (CPP) being the first and the largest component. The U.S. Treasury committed more than a third of total TARP funding, $250 billion, to the CPP and 709 financial institutions in 50 states received funding from this program.[6] Although this paper focuses on the CPP, we use the name TARP henceforth to refer to CPP since TARP is the most widely used name in the media.

[5] Other rescue programs include the U.S. Treasury Department's temporary guarantee program for money market mutual funds and Capital Assessment Plan (CAP), the Fed's Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF), and the Commercial Paper Funding Facility (CPFF). For studies on these programs, please see Kacperczyk and Schnabl (2010), and Glasserman and Wang (2011).
[6] More details can be found on the U.S. Department of Treasury's website:
http://www.treasury.gov/initiatives/financial-stability/TARP-Programs/Pages/default.aspx

The first round of TARP bank bailouts of nine U.S. banks was made in October 2008 and the final TARP capital injections were made in December 2009.[7] The largest investment was $25 billion and the smallest was $301,000. Although the program lasted for 15 months, it delivered the vast majority (89.71%) of funds by January 2009.[8] Thus TARP capital injection is an event that mainly occurred in one quarter.

The U.S. Treasury received preferred stock or debt securities in exchange for these investments. Most financial institutions participating in TARP bailouts paid the US Treasury a 5% dividend on preferred shares for the first 5 years and a 9% rate thereafter. In addition, the U.S. Treasury received warrants to purchase common shares or other securities from the banks at the time of TARP capital injection. The first group of banks paid back TARP funds on March 31, 2009. As of September 6, 2013, most (80.49%) of the TARP banks had redeemed all of the preferred shares, while 144 banks with 3.5 billion outstanding had not repaid the funding.[9]

There has been intensive debate concerning the economic impact of TARP among academics and regulators since TARP launched in 2008. Critics of TARP claim that it helped large banks but not firms or households, and it failed to achieve the goal of ensuring that banks lend money. Academic evidence supports the view that TARP did not increase bank loans in the home mortgage market (see Duchin and Sosyura, 2014). Moreover, the Special Inspector General for TARP (SIGTARP) stated, "A significant legacy of TARP is increased moral hazard…Finally,

[7] The nine banks were Bank of America Corporation, Bank of New York Mellon Corporation, Citigroup Inc., Goldman Sachs Inc., J.P. Morgan Chase &Co., Morgan Stanley, State Street Corporation, Wells Fargo and Company, and Merrill Lynch.

[8] Detailed timeline about the development of TARP can be found here: "The Financial Crisis: A Timeline of Events and Policy Actions", Federal Reserve Bank of St. Louis (Link: https://www.stlouisfed.org/financial-crisis/full-timeline).

[9] See the TARP Transaction Report from http://www.treasury.gov/initiatives/financial-stability/reports/Pages/TARP-Investment-Program-Transaction-Reports.aspx

TARP's legacy includes white-collar crime that SIGTARP is uncovering and stopping."[10] However, advocates of TARP take an opposite stand and argue that TARP actually prevented the immediate collapse of the financial system, improved stability since 2008, and that it enabled banks to lend money. There are studies which support this view. Li (2013) finds that TARP has indeed encouraged bank lending to corporations and consumers from Call report data. The tension between these two views has still not been resolved, even seven years after TARP launched; it is perfectly summarized by the following quote of Henry Paulson, the founder of TARP and former Secretary of the Treasury: "I was never able to convince the American people that what we did with TARP was not for the banks. It was for them. It was to save Main Street. It was to save our economy from a catastrophe."[11] A central issue in this debate is that as of yet, there has been no microeconomic study of whether or not TARP helped the real economy. This paper sheds some light on this debate.

3 Data

TARP capital injection involves 709 banks in over 50 states. To apply for TARP, a bank needs to be a Qualifying Financial Institution (QFIs) which includes 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, not a branch of foreign bank.

The sample control group of banks starts with a list of 1,289 commercial banks, bank holding companies, and thrift holding companies (banks in short) with CRSP data. Banks without ticker are then removed since we can only find and use information for public firms. We only

[10] See the SIGTARP report from http://www.sigtarp.gov/Quarterly%20Reports/April_25_2012_Report_to_Congress.pdf

[11] Bloomberg BusinessWeek, September 2013, http://www.moneynews.com/FinanceNews/Paulson-crisis-financial-Fed/2013/09/13/id/525579

include banks that are active as of September 30, 2008, the quarter end before TARP, yielding 548 publicly-traded TARP-eligible banks. Among the 548 banks left, 263 banks are TARP banks, and 285 are non-TARP banks. These 263 TARP banks account for the majority (87.3%) of the CPP capital. From the 548 banks, we exclude the 18 large QFIs in the sample that were subject to stress tests under the Capital Assessment Plan (CAP) because these banks were excessively affected by factors other than TARP.[12]

It is challenging to find banks that were rejected by the US government in TARP applications. The US Department of Treasury has not publicly disclosed applicants to TARP that were rejected because of concerns that investors may have interpreted non-award of TARP capital as a negative signal which could have triggered a bank run. Following Bayazitova and Shivdasani (2012) and Duchin and Sosyura (2014), we identify the status of a bank's TARP application from its filed financial statements, press releases, news wires, and company website. Of the 530 banks in the final sample, 349 banks applied for TARP, and the remaining 181 banks disclosed that they did not apply for TARP. Among the 349 banks which submitted applications, 276 were approved for funding, and the remaining 73 banks were rejected (see Figure B1 in Appendix B).

To identify the impacts of TARP on banks from banks' other characteristics requires the construction of a control group of banks (non-TARP banks) that are statistically similar to a treatment group (TARP banks). Ideally, these two groups of banks were very similar ex ante except that one group of banks received TARP funds, while the other did not.

[12] The excluded financial institutions are Citigroup, JP Morgan, Bank of America (including Merrill Lynch), Goldman Sachs, Morgan Stanley, State Street, Bank of New York Mellon, Wells Fargo (including Wachovia), KeyCorp, Fifth Third Bancorp, Regions Corp., BB&T, Capital One, SunTrust, U.S. Bancorp, American Express, PNC Financial Services, and MetLife.

To address this concern, we employ Propensity Score Match (PSM). We match each of the 73 non-TARP banks to a TARP bank by PSM based on proxies of CAMELS.[13] CAMELS is the regulators' rating system for TARP applicants and evaluates six bank characteristics: **C**apital adequacy, **A**sset quality, **M**anagement, **E**arnings, **L**iquidity, and **S**ensitivity to market risk. The proxies for these assessment categories are based on Li (2013) and Duchin and Sosyura (2014). Specifically, we use the Tier 1 ratio to proxy for a bank's capital adequacy, since it is widely used by regulators to measure a bank's ability to absorb potential losses on assets. We use the troubled asset ratio to proxy for asset quality. Management quality can be measured several ways; we use the age of the bank as the proxy.[14] Earnings is measured by return on equity (ROE). We use cash-to-deposits ratio to proxy for liquidity. Finally, the sensitivity to market risk is measured by loans-to-deposits ratio (see Appendix A for details).

Among the 73 banks, only one bank cannot be matched. This procedure results in a matched sample of 144 banks (72 TARP banks and 72 non-TARP banks).[15] This approach enables us to identify the impacts of TARP on banks with similar characteristics ex ante. Therefore, we can attribute the dynamics of banks' lending behaviors to TARP, rather than other factors. Table 1 Panel A reports the summary statistics of this matched bank sample. We can see that TARP and non-TARP banks are statistically indifferent ex ante according to CAMELS proxies and bank fundamentals.

[13] I also match the banks based on additional variables such as size, equity capital ratio, etc. The match results are similar and do not change our regression results in section 5.

[14] Duchin and Sosyura (2014) use the number of corrective actions taken by regulators to proxy for management quality. However, Li (2013) finds that their two measures yield similar results. Thus, I choose the simple measure.

[15] As a robustness check, I also conduct propensity score match using all banks that did not get TARP funds as non-TARP banks, and the results are similar.

To examine the effects of TARP on firms, we need to establish the linkages between banks and firms. The bank-firm linkages data is from DealScan, which collects loan-level information on syndicated loans from SEC filings, company statements, and media reports. This dataset covers large corporate loans, the vast majority of which are syndicated (originated by several banks). DealScan reports loans at origination, allowing us to study new corporate credit and avoid contamination from the drawdowns of prior loan commitments. Each observation is a newly issued credit facility that lists the originating bank(s), date of origination, loan amount, interest rate, and the corporate borrower. The average corporate loan amount in the DealScan sample is $539 million. The syndicated loans comprise a significant part of the total loan market in the U.S. For example, Ivashina and Scharfstein (2010) document that the loan portfolio for Bank of America, constructed using DealScan, is approximately 75% of the bank's total domestic commercial loan volume (50% of its total loan portfolio) as stated in its annual reports. Colla, Ippolito, and Li (2013) document that syndicated loans constitute a large fraction of firms' debts.

Finally, we construct the sample of treatment and control groups of firms. Using Michael Roberts' DealScan-Compustat link, we obtain 1049 firms linked to the bank sample. Table 1 Panel B reports the summary statistics of firms. It shows that firms that borrowed from TARP banks tended to have less long-term debt and lower leverage before the 2008-09 crisis. These firms had more real activities such as investment and R&D. They also had more cash and working capital than other firms. Finally, comparing other firms' characteristics, I find that firms that borrowed from TARP banks were smaller and had more tangibility. Importantly, these firms had high Z scores, which indicate low probability of bankruptcy. This suggests that healthy firms (high Z score) tended to lend with TARP before the crisis.

4 Empirical Results

4.1 The effects of TARP on bank loans

We first test how TARP affects bank lending. Several researchers have studied this issue, but there is no consensus in the literature as to whether or not TARP promoted bank lending (Li, 2013; Duchin and Sosyura, 2014). Thus, it is important to check and establish the fact that firms which borrowed from TARP banks did receive more funding than other firms.

It is an empirical question whether TARP banks extended more credit to firms than non-TARP banks. It is possible that banks which received TARP funds were less financially constrained and were willing to lend more than non-TARP banks. This assumption is a reverse of the mechanism of Ivashina and Scharfstein (2010) and Chodorow-Reich (2014). However, since banks were in the middle of the financial crisis when they received TARP funds, they may or may not have used TARP funds to extend loans. Instead, they may have used TARP funds to repair their balance sheet (Li, 2013). There is evidence that banks are reluctant to lend when uncertainty is high (see, e.g. Jo, 2012; Valencia and Verrier, 2013).

Specifically, we test whether TARP banks lent more to firms than non-TARP banks after TARP launched. We employ a difference-in-difference model of corporate loan, where the first difference is before and after TARP and the second difference is between TARP banks and the control group of non-TARP banks. This model, estimated over the sample period of 2005-2012, is specified as follows:

$$\begin{aligned} loan_{i,t} = {} & \alpha_0 + \alpha_1 TARP_i + \alpha_2 Post\_TARP_t + \alpha_3 Post\_TARP_t \times TARP_i \\ & + \alpha_4 TARP\_AMT_{i,t} + \eta X_{it} + \varepsilon_{i,t} \end{aligned} \tag{1}$$

where $loan_{i,t}$ is change in loan amount scaled by assets for bank i at time t to each firm, $TARP_i = 1$ if bank i received TARP funds and 0 otherwise, $Post\_TARP_t = 1$ if the loan happened after 2008Q3 and 0 otherwise.[16] $TARP\_AMT_{i,t}$ equals TARP capital injection amount that bank i received at the time it got the funds and 0 otherwise. For non-TARP banks, it is always equal to 0. $X_{i,t}$ includes three sets of control variables for syndicated loans and bank characteristics.

The first set of control variables includes loan facility characteristics to control for differences in loan type and loan maturity. Controlling these variables can absorb possible variations of loans which might affect a bank's syndicated loan amount before and after TARP and address the concern that banks might have changed the loan amount along with the loan type and maturity after the 2008-09 financial crisis. The second set of control variables includes CAMELS proxies for TARP selection to account for differences in fundamentals between approved and denied firms. It is worth noting that our CAMELS proxies are imperfect measures of the true CAMELS scores because the former do not capture the content of onsite examinations. It is also possible that the regulators used other intangible or undeclared criteria in the selection process. To help control for this heterogeneity between approved and denied firms, we also include bank fixed effects, which capture all differences between the two groups that remain invariant during the seven-year sample period. The third set of control variables includes other time-variant bank characteristics such as bank size, charge-off, and exposure to real estate loan market. By including these variables, we control for the possibility that they vary systematically in time

[16] We use the start date of the second round of TARP capital injection as event date because participants in the first round of TARP were forced by the government. Thus, it is not clear whether these banks needed these funds or not.

between TARP and non-TARP banks in a way that is correlated with loan amount but unrelated to TARP.

Table 2 reports the estimation results. Columns (1) and (2) of Panel A use a matched sample of banks. Column (1) presents a parsimonious model without including any control variables. The coefficient on *Post_TARP*×*TARP* is 0.058, which is economically meaningful and statistically significant. That is, compared to non-TARP banks, TARP banks were associated with 19% less reduction in supply of credit after TARP launched. In column (2) the coefficient on the interaction term stays positive and significant after controlling loan facility type, maturity, banks' observable characteristics (bank level controls), unobservable characteristics (bank fixed effects), and concomitant national macroeconomic trends (quarter fixed effects). The estimated coefficient on *Post_TARP* is negative and significant at 1% level (-0.309), suggesting that banks reduced their loans to firms after the 2008-09 financial crisis. This is consistent with Ivashina and Scharfstein (2010) who find that banks' new loans decreased dramatically after the failure of Lehman Brothers. The estimated value of coefficient of *TARP Amount* is not significant, indicating that the amount of funding does not matter much for banks' lending in the syndicated loan market. Columns (3) and (4) use a full sample of banks and show similar results.

A bank's ability to extend credit during the 2008-09 financial crisis highly depended on its ex ante healthiness (Chodorow-Reich, 2014). Financially healthier banks should experience less reduction in supply of credit. Financial health could be captured through ex ante tier one capital ratio and return on equity. To test this, we partition the sample into two subsamples based on whether banks' average tie 1 ratio or ROE in the four quarters prior to the TARP event is above the sample median.

Table 2 Panel B confirms that more healthy TARP banks (with higher Tie 1 ratio and ROE) have further decreased reduction in loans. Column (1) shows that the coefficient on *Post_TARP*×*TARP* is 0.096, much greater than the coefficient 0.040 in Column (2) of Panel A with the sample specification. The results with full sample have relatively weak evidence. Again, the coefficient on TARP amount is not significant across different specifications. This is not surprising, since the TARP amount that a bank received is proportionate to its risk-weighted assets.

Overall, the findings in this section suggest that TARP had a positive effect on bank loans to firms: banks which received TARP funds lent more (or reduced less) in the syndicated loan market than non-TARP banks did after TARP capital injection. The effect is stronger among banks with higher Tie 1 ratio and ROE.

4.2 The effects of TARP on firms' activities: main results

In this section, we examine whether firms that borrowed from TARP banks behaved differently since they had relatively larger loans and less financial constraint. Did these firms make more investments, hiring, and R&D, or just keep more cash or working capital relative to other firms? We use a difference-in-differences (DiD) analysis, where the first difference is from before to after TARP, and the second difference is between treatment and control firm groups. This model, estimated over the sample period of 2005-2012 using quarterly data, is specified as follows:

$$y_{i,t} = \beta_0 + \beta_1 Post\_TARP_t + \beta_2 Post\_TARP_t \times TARP_i + \gamma Z_{it} + firm\_FE + time\_FE + \varepsilon_{i,t} \quad (2)$$

where $y_{i,t}$ is firm i's activities (e.g., investment, employment, R&D, long-term debt, short-term debt, leverage, cash, and working capital) at time t. $TARP_i = 1$ if firm i borrowed from a TARP bank in the syndicated loan market and 0 otherwise. $Post\_TARP_t = 1$ if the firm's activities

happened after 2008Q4 and 0 otherwise. $Z_{i,t}$ includes various control variables: Book-to-Market, Return to Asset (ROA), Profitability (Operating Income Before Depreciation/Total assets), Tangibility (Property Plant and Equipment/Total assets), asset growth rate, size, and Tobin's Q. Firm fixed effects are included to control unobservable firm characteristics and time-fixed effects are included to control trends.

Table 3 reports the results of the effects of TARP on firm activities over the period of 2005 to 2012. The dependent variables in Panel A are long-term debt, short-term debt, and leverage. Column (1) shows that firms increased long-term debt on their balance sheet after 2008. In Columns (2) and (3) the estimated value of coefficient on *Post_TARP*×*TARP* is positive and significant, suggesting that firms borrowing from TARP banks increased their long-term debt more than other firms. This is not surprising because they received more syndicated loans from TARP banks as shown in Section 4.1. The average maturity of a syndicated loan in DealScan is about 5 years, thus many of these loans should show up on a firm's balance sheet as long-term debt. By contrast, Columns (4)-(6) suggest that firms linked to TARP banks had less short-term debt than firms which borrowed from non-TARP banks after TARP launched. One possible explanation for this phenomenon is that they received more long-term loans from their TARP lenders, and therefore they reduced their short-term debts. Furthermore, short-term debt was unusually costly during the 2008-09 crisis period. Columns (7)-(9) show that leverage, which is measured by the sum of long-term debt and short-term debt divided by total assets, increased after 2008 to all the firms. However, the insignificant coefficient on interaction term indicates that there is no significant difference among treatment and control groups of firms. Overall, these findings suggest that firms borrowing from TARP banks were able to restructure debt components without having substantially different leverage. This gave them significant advantage during the 2008-09 crisis

because the program allowed firms that borrowed from TARP banks to suffer less from the well-documented rollover risk in prior research (Acharya et al., 2011; He and Xiong, 2012). This suggests an important positive impact on firms, which has not been documented before.

Panel B shows results on cash and working capital, which are short-term items on firms' balance sheets. Column (1) shows that firms held more cash after 2008. Columns (2) and (3) show this increase is substantially greater for firms which borrowed from TARP banks. The coefficient estimates in Column (3) imply an approximately additional 1 % increase in cash for a firm linked to TARP banks, which is 14% of the mean of cash among treatment firms. Thus, the economic magnitude is significant. This result suggests that firms tend to hold more cash during periods of high uncertainty, which is consistent with prior studies on firms' precautionary saving motives for cash holdings (Keynes, 1936; Harford, 1999; Opler, Pinkowitz, Stulz, and Williamson, 1999; Gao, Harford, and Li, 2013; Gao and Grinstein, 2014). Similarly, Columns (4) to (6) show that although the average firm tended to reduce its working capital, firms that borrowed from TARP banks increased their working capital, which is both statistically and economically significant.

Panel C reports firms' real activities. Across Columns (1) to (9), the estimated values of coefficient on *Post_TARP* are all negative and significant, which indicates that firms decreased their investment, employment, and R&D after 2008. However, the coefficients on *Post_ TARP×TARP* are not significant regardless of the specification, suggesting that compared to the pre-TARP period, firms which borrowed from TARP banks did not engage in more investment, employment, or R&D than other firms. This finding is consistent with exiting theoretical and empirical evidence that firms tend to deter investment when the state of economy is bad or the future of the economy is uncertain (Leahy and Whited, 1996; Bloom, 2009; Bhattacharya, U., Hsu, P.H., Tian, X. and Xu, Y., 2014).

Overall, the credit supply shock from TARP allows firms that borrowed from TARP banks to obtain more long-term debt and reduce short-term debt. Firms linked TARP banks build up more cash holdings and working capital. There is no impact on real activity like investment, employment, and R&D. These findings are consistent with prior evidence from Europe (Acharya et al, 2015).

4.3 Financial constraints and the effects of TARP

In this section, we consider how the effects of TARP vary in the cross-section of firms by financial constraints. Theories suggest that credit supply shock will have a more pronounced effect on firms that are ex ante financially constrained. Two measures of financial constraints, the Whited-Wu (Whited and Wu, 2006) index and firm size are used.[17] For each measure, we classify firms as constrained or unconstrained based on whether firms' average Whited-Wu index or size in the four quarters before the TARP event was above the sample median and partition the sample into two subsamples. We then employ the same specification as equation (2) using two subsamples defined above.

Table 4 Panel A reports the results for this subsample analysis. Columns (1) and (2) show that the difference in cash between firms which borrowed from TARP banks and other firms is significantly greater for the financially constrained subsample. Notice that the coefficient estimate on the interaction term in Column (1) is not even significant, suggesting that among the financially unconstrained subsample, there is no significant difference between treatment and control firms. Columns (3) and (4) present similar results for working capital. However, Columns (5)-(10) in Panel A show that changes in investment, employment, and R&D for both constrained and

[17] We also use other measures of financial constraint, such as Kaplan-Zingales index (Kaplan and Zingales, 1997), and the results are similar.

unconstrained firms after 2008 are not statistically significant. The differences between the two groups of firms are not significant either. Panel B of Table 4 finds a similar result using firm size as a measure of financial constraint.

These results suggest that even for the relatively more financially constrained firms, the positive credit supply shock from TARP did not significantly impact firms' tendency in real activities. This again indicates firms' strong precautionary saving motives after the 2008-09 financial crisis.

4.4 External finance dependence and the effects of TARP

The effects of TARP on firms can also vary in the cross-section of firms by industry-level measures of variation in dependence of external capital. The industry-level measures are more plausibly exogenous to an individual firm, and can further help us identify the credit supply shock generated by TARP. We expect TARP's effect to be stronger in industries in which firms rely more on external financing. Following the literature, we use two measures of external finance needs: external finance dependence and external equity dependence (see Appendix A for definition). These two measures and their medians are computed using annual data at the three-digit SIC code level over 2005-2007. Firms are classified as high or low external finance (equity) dependence by dividing the sample at the industry median.

Panel A of Table 5 reports the results for external finance dependence. Columns (1)-(2) show that the difference in cash between firms that borrowed from TARP banks and other firms is significantly greater for firms in industries historically dependent on external finance. Notice that the coefficient estimate on the interaction term in column (1) is negative and significant, suggesting that among firms in low external finance dependence industries, treatment firms had

even less cash than control firms. Columns (3) and (4) show that a similar conclusion holds for working capital. However, columns (5)-(10) show that there is no significant difference in investment, employment, and R&D between treatment and control firms for both low and high external finance dependence subsamples.

Panel B of Table 5 presents results for external equity dependence. Again, the impact of TARP on firms' cash and working capital is stronger for firms in industries with high external equity needs. There is no significant evidence on the effects of TARP on real activities, even among firms in industries with high external finance dependence.

4.5 Bank loans dependence and the effects of TARP

The effects of TARP on firms may depend on the importance of bank loans in firms' balance sheets. For firms that relied more on bank loans, the credit supply shock from TARP banks may have had stronger effects. To test this conjecture, we partition the sample into two subsamples based on bank loan dependence which is defined as the ratio of bank loans to total debt from Capital IQ.

Table 6 reports regression results. Columns (1)-(2) show that the difference in cash between firms that borrowed from TARP banks and other firms is significantly greater for firms with high dependence on bank loans. The F-test of the difference of the coefficient on *Post_TARP*×*TARP* across the two partitions is significantly different (p-value=0.003). Columns (3)-(4) show that a similar conclusion holds for working capital. Contrary to previous findings in this paper, we find that TARP enabled firms to increase more investment (or reduce less) when firms had a high degree of bank-loan dependence. However, the effects of TARP on other real activities like employment and R&D are not significant.

Overall, the findings in this section provide evidence that precautionary saving motive may explain the significant increase in cash holdings and working capital of firms that borrowed from TARP banks. The impact of TARP on firms' real activities is insignificant even for firms that are less financially constrained or have lower dependence of external finance/external equity.

5 Robustness tests

5.1 Instrumental variables analysis

One potential concern regarding the selection of TARP recipients is that the TARP decision is correlated with the bank's health and local loan demand. In order to identify the stimulus effect of TARP on credit supply, we follow Bayazitova and Shivdasani (2012), Duchin and Sosyura (2012), and Li (2013) and conduct an instrumental variable analysis using measures of political connections. Banks' political connections could affect the selection of TARP recipients, but they were unlikely to be correlated with loan demand. Specifically, we use two instruments: *Congress committee*, a dummy for the local Representative sitting on the Subcommittee on Financial Institutions or Capital Markets, and *Democrat*, a dummy for the local Representative being a Democrat. As suggested in Wooldridge (2010), we employ a dummy endogenous variable model. For the first stage, we use a probit model in which we regress the TARP (a dummy variable, equals to one if a bank received TARP funds) on the political instruments and control variables. For the second stage, we use the predicted probability obtained from the first stage as an instrument for TARP. Table 7 presents the results of IV regression. The first stage results (Panel A) indicate that the instrumental variables are positively related to TARP selection. Panel B reports the second stage results, where columns (1)-(2) are based on regression results using *Congress committee* and *Democrat* as instruments respectively. Both coefficients on *Post_ TARP*×*TARP* are positive and

statistically significant, suggesting that TARP banks extended more (or reduced fewer) loans to firms than other banks. This result confirms the conclusion in Table 2.

The main results of Table 3 are also subject to the same endogeneity concern since the credit supply shock to firms is transmitted from banks. Notice that the definition of TARP in Table 3 is a dummy for firms that borrowed from TARP banks. Therefore, we also conduct instrumental analysis at firm level. Specifically, instead of using the realized TARP value, we use the predicted probability of TARP receipt obtained from the first stage. Table 8 presents the results of IV regression at firm level. Consistent with Table 3, the coefficients on *Post_TARP*×*TARP* are significant where dependent variables are long-term debt, short-term debt, cash and working capital, though not statistically significant for real activity like investment, employment, and R&D. These results again confirm that TARP impacted firms' debt structure and cash reserving, but its influence on real activity is not significant.

5.2 Alternative samples

One potential concern is that the borrower-lender relationships are formed endogenously. Healthy banks tend to pair with strong firms. Therefore, it is possible that firms that borrowed from TARP banks are totally different from firms that borrowed from non-TARP banks. If this is the case, then the regression results might be misleading. The differences in firm activities between firms borrowing from TARP banks and firms borrowing from non-TARP banks are driven by firms' characteristics rather than the credit shock from TARP. For instance, the size and industry of firms might affect whether a firm borrows from TARP or non-TARP banks. To address this concern, we construct a double matched sample. The first match is the PSM between 144 banks as documented in Section 3. For the second match, we perform a one-to-one match between treatment firms and control firms based on industry and size. Among 1049 firms that have

syndicated loans with a sample of 144 banks, 828 firms borrowed from TARP banks in the syndicated loan market and the rest of the 221 firms borrowed from non-TARP banks. To construct a matched sample, for each firm in the control group we find a firm in the treatment group based on industry and size.[18] This procedure results in a matched sample of 440 firms that are in the same industry and have similar size before the TARP event.

Table 9 Panel A presents the effects of TARP on firms' activities using a double matched sample. Columns (1) and (2) show that compared to the pre-TARP period, firms which borrowed from TARP banks had more long-term debt and less short-term debt than other firms after TARP launched. Column (3) shows that there is no significant difference in leverage between the two groups of firms, while in general, firms increased leverage after 2008. For real activities, Columns (4)-(5) show that these firms held more cash and working capital on their balance sheets. Finally, Columns (5)-(8) show that firms which borrowed from TARP banks did not make more (reduce less) investment, employment, or R&D than other firms.

There may be concern regarding the match procedure used to create the sample of 144 banks. It is possible that the control group of banks selected from PSM is too narrow. To address this concern, we examine whether the results will change if expanded to a broader sample. We use a full sample of firms that borrowed from 548 banks and use the same specification as in section 4.2. Table 9 Panel B reports the regression results. The results largely echo those seen in Table 3.

[18] Specifically, we match the sample in two steps: first, for each firm which borrowed from non-TARP banks (control group firm), we match it to a firm which borrowed from TARP banks (treatment group firm) based on the same 4-digit SIC code. If there is no matched firm within the same 4-digit SIC code, then I extend to a 3-digit SIC code. If there is no matched firm within the same 3-digit SIC code, then that firm is dropped. Among 221 firms, only 1 firm cannot be matched within a 3-digit SIC code. Second, for the matched treatment and control group firms in the same industry, we find a treatment group firm that has the closest absolute difference in total assets in 2008Q2 to the control group firm.

That is, firms that borrowed from TARP banks have different debt structure, cash holdings and working capital, but no difference in real activity.

5.3 Placebo test

One concern with the DiD analysis is that our results could be driven by other unobservable shocks, which are not related to TARP but affect the selection process of TARP banks. To address this concern, we perform a placebo test. In particular, we choose 2005Q3 rather than 2008Q4 as the "pseudo-event" quarter that the TARP launched. [19] We choose 2005Q3 because it is before the 2008-09 crisis.

Table 10 reports the DiD estimation using 2005Q3 as the event quarter over the period of 2002Q1 to 2008Q3, so the sample period here is before the actual TARP date. The coefficient estimates on *Post_TARP*×*TARP* for long-term debt, short-term debt, cash and working capital are statistically insignificant, and the magnitudes are much smaller than the main DiD estimator in Table 3. Thus, the placebo test confirms that the main findings in Table 3 are driven by TARP rather than other events.

Overall, the results of IV test, alternative samples, and the placebo test provide further confirmation of the main findings on the effects of TARP on firms' behaviors.

6 Conclusion

This paper has demonstrated that the TARP capital injection enabled TARP banks to extend more credit to firms than other banks. More importantly, this paper provides evidence of the ultimate effects of TARP on firms. Compared to the pre-TARP period, firms which borrowed

[19] We also use other date as "pseudo-event" and the results are similar.

from TARP banks sustained more long-term debt and held more liquidity like cash and working capital. However, there is no impact on real activity like investment, employment, or R&D.

These results have policy implications for explaining the slow recovery of the U.S. economy. Although the U.S. government aggressively conducted a series of interventions right after the 2008-09 financial crisis, the U.S. economy recovered slowly. There are intensive debates on why the U.S. economy has been so slow to recover (see e.g., Hall, 2010). This paper contributes to these debates by providing new evidence that the real economy might react slowly and in a precautionary manner. The findings of this paper indicate that it takes time for the real economy to recover even when the financial sector has stabilized.

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Appendix A. Variable Definition

Variable	Definition
CAMLES proxies	
Capital adequacy	tier-1 risk-based capital ratio, measured by the ratio of tier-1 capital to risk-weighted assets.
Asset quality	negative of non-current loans and leases scaled by total loans and leases.
Management quality	age of bank
Earnings	return on equity (ROE), measured by the ratio of quarterly net income to total equity capital
Liquidity	cash divided by deposits
Sensitivity to market risk	loans divided by deposit
Bank variables from Call Report	
Age	the number of years a bank is in existence as of facility start date
Size($000)	log (Asset)
Total risk-based capital ratio	Total risk-based capital ratio (rbcrwaj)
Equity capital ratio	Equity capital to assets (eqv)
Non-perferming loans (%)	noncurrent loans/total loans
Real estate loans (%)	the percentage of real estate loans in a bank's loan portfolio
Charge-off (%)	the charge-off against loan loss allowance net of loan recoveries scaled by total loans
Bank variables from DealScan	
Leader	indicator that equals one if a bank is lead bank in a syndicated loan
Participant	indicator that equals one if a bank is participant bank in a syndicated loan
Loan	change in loan amount for each bank-firm pair at each quarter scaled by banks' assets in previous quarter
TARP regulation related variables	
Post TARP	indicator that equals one in after November 14, 2008, and zero otherwise
TARP	indicator that equals one if a bank's TARP application was approved, equals zero if a bank's application was rejected

TARP Amount	capital injection amount scaled by bank's total assets
Firm variables from Compustat	
Long-term debt	Long-term debt(dlttq)/total assets (atq)
Short-term debt	Debt in current liabilities(dlcq)/total assets (atq)
Leverage	Total debts (dlttq+dlcq)/total assets (atq)
Investment	quarterly capital expenditure(capxy)/total assets(atq). Because capital expenditure is reported on a year-to-date basis in quarterly financial statements, I subtract the previous quarter's capital expenditure from the current quarter's capital expenditure (capxy) for fiscal quarters 2, 3, and 4.
Emp	change in Number of Employees(emp) in each quarter
R&D	R&D expense (xrdq)/total assets(atq)
Cash	Cash and short-term investments (cheq)/total assets (atq)
Working capital	Working capital(wcapq)/total assets(atq)
Tangibility	Property Plant and Equipment (ppent)/Total assets (atq)
Profitability	Operating Income Before Depreciation(oibdpq)/total assets(atq)
Book-to-Market	Total Common Equity(ceq)/Price Close(prcc)*Common Shares Outstanding(csho)
Return on Assets (ROA)	Net Income(niq) /total assets(atq)
Asset growth	Total assets(atq)[t]-total assets [t-1]/total assets[t-1]
Tobin's Q	Market value of assets(total assets (atq)+ market value of common equity(cshoq* prccq)-common equity (ceqq)-deferred taxes(txdbq))/(0.9 *book value of assets (atq)+0.1 *market value of assets)
Whited-Wu index	-0.091*Cash flow+0.062* Dividend dummy+0.021*Long-termdebt-0.044*Size +0.102*Industry salesgrowth-0.035*Sales growth
External finance dependence	(Capitalexpenditures (capx)-funds from operations (fopt)) /capital expenditures (capx). When fopt is missing, funds from operations is defined as the sum of the following variables: Income before extraordinary items (ibc), depreciation and amor tization (dpc), deferred taxes (txdc), equity in net loss/ earnings (esubc), sale of property, plant, and equipment and investments-gain/loss (sppiv), and funds from operations -other (fopo).

External equity dependence	Ratio of the net amount of equity issued (sale of common and preferred stock (sstk)-purchase of common and pref. stock (prstkc)) to capital expenditures (capx).
Z score	1.2* working capital (actq-lctq)/total assets (atq) +1.4*retained earnings (req)/total assets+3.3 earnings before interest and taxes (oibdpq)/total assets+0.6*market value equity (prccq*cshoq)/book value of total liabilities (ltq)+0.99*sales (saleq)/total assets

Appendix B. Sample

Figure B1: The Sample of Banks

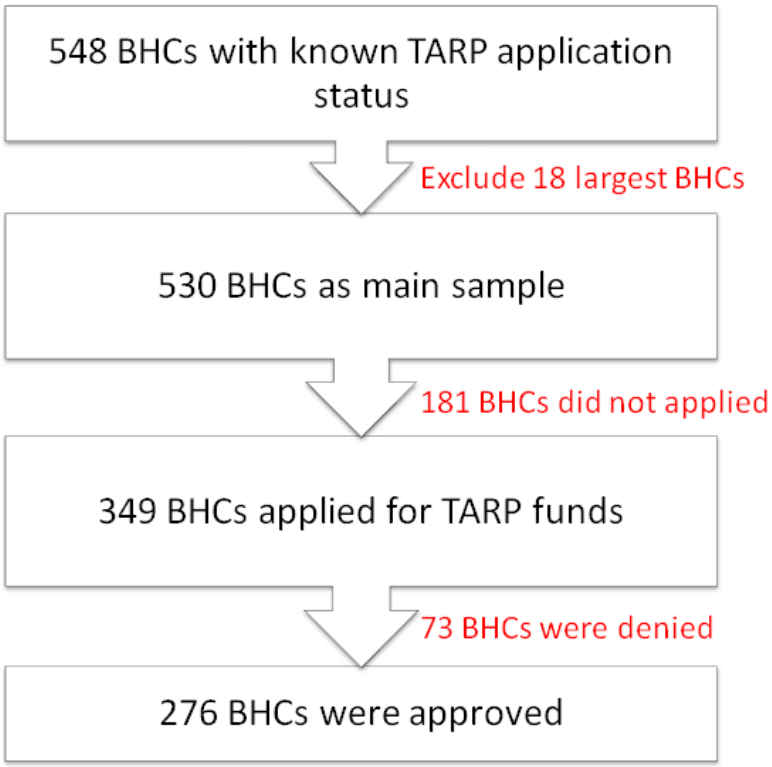

Table 1: Summary Statistics

This table presents summary statistics for banks (Panel A) and firms (Panel B). In panel A, Columns (1)-(2) reports the mean of several of bank characteristics for TARP banks, and non-TARP banks respectively, for the period of 2005Q3-2008Q3. In panel B, Columns (1)-(2) reports the mean of several of firm's characteristics for firms that borrowed from TARP banks and non-TARP banks, respectively, for the period of 2005Q3-2008Q3. P-values are reported for the test of the difference of means. See Appendix A for the definitions of variables. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Banks

Variables	**TARP**	**Non-TARP**	**Difference**	**p-value**
	(1)	(2)	(3)	(4)
Camels				
Capital adequacy (%)	13.78	15.40	-1.59	0.24
Asset quality (%)	-0.93	-1.10	0.17	0.09
Management quality	43.81	42.58	1.45	0.59
Earning (%)	4.88	4.27	0.61	0.09
Liquidity (%)	3.87	4.64	-0.77	0.45
Sensitivity to market risk	0.97	0.95	0.02	0.27
Bank fundamentals				
Total risk-based capital ratio	14.97	16.46	-1.26	0.38
Equity capital ratio	10.83	11.36	-0.67	0.20
Size(log assets)	14.22	13.83	0.17	0.16
Charge-off(%)	0.15	0.15	-0.01	0.77

Table 1 (continued)

Panel B: Firms

Variables	TARP	Non-TARP	Difference	p-value
	(1)	(2)	(3)	(4)
debt and leverage				
Long-term debt/asset (%)	29.38	37.86	-8.47***	0.00
Short-term debt/asset (%)	3.80	3.92	-0.12	0.74
Leverage (%)	32.75	36.57	-3.82***	0.00
real activities				
Investment/asset (%)	1.45	1.24	0.21**	0.05
Log (employment)	0.15	0.02	0.13	0.72
R&D/asset (%)	0.80	0.39	0.41***	0.00
cash and working capital				
Cash/asset (%)	6.90	5.78	1.13***	0.00
Working capital/asset (%)	13.63	6.57	7.06***	0.00
firm fundamentals				
Log(asset)	7.92	8.54	-0.62***	0.00
Profitability (%)	3.30	3.25	0.05	0.76
Tangibility (%)	29.12	26.51	2.61**	0.02
ROA	0.72	0.86	-0.14	0.40
Q	1.22	1.22	0.00	0.99
Z score	2.28	1.94	0.33**	0.02

Table 2: The Effects of TARP on Bank Lending

This table reports results of regression (1) over 2005-2012. Dependent variable is change in bank's loan amount to each firm in each quarter scaled by bank's asset in last quarter. TARP equals to 1 if a bank received TARP funds and zero otherwise, and Post TARP equals to one if the loan happened after 2008Q3. TARP Amount equals TARP capital injection amount that a bank received at the time it got the funds and zero otherwise. For non-TARP banks, it is always equal to zero. Bank level control variables include CAMELS proxies, size, exposure to real estate loan market, and charge-off. The Tie 1 ratio is the ratio of tier-1 capital to risk-weighted assets. ROE is net income divided by total equity capital. Please see Appendix A for detailed definitions of variables. Standard errors are clustered at bank level and are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: full sample with all observations

	PSM sample		Full sample	
	(1)	(2)	(3)	(4)
VARIABLES	Loan change/Asset (%)			
Post TARP	-0.309***		-0.150***	
	(0.033)		(0.034)	
TARP	0.055***		0.068***	
	(0.002)		(0.003)	
Post TARP*TARP	0.058***	0.040***	0.029***	0.025***
	(0.004)	(0.002)	(0.003)	(0.002)
TARP Amount	0.004	-0.005	0.013***	0.001
	(0.007)	(0.004)	(0.001)	(0.001)
Controls	No	Yes	No	Yes
Bank FE	No	Yes	No	Yes
Time FE	No	Yes	No	Yes
Observations	24,176	23,879	384,490	384,330
Adjusted R-squared	0.064	0.143	0.011	0.093

Table 2 (continued)

Panel B: partition sample based on bank characteristics

	Partition variable: Tie1 ratio				Partition variable: ROE			
	PSM sample		Full sample		PSM sample		Full sample	
	(1)	(2)	(3)	(4)	(5)	(6)	(9)	(10)
VARIABLES	High Tie1	Low Tie1	High Tie1 Ratio	Low Tie1	High ROE	Low ROE	High ROE	Low ROE
Post TARP*TARP	0.096***	0.027***	0.026***	0.010***	0.050***	0.027***	0.029***	0.023***
	(0.013)	(0.005)	(0.002)	(0.002)	(0.006)	(0.001)	(0.002)	(0.002)
TARP Amount	0.000	0.003*	-0.001	-0.000	-0.006	-0.005	-0.001	0.002**
	(0.003)	(0.001)	(0.001)	(0.002)	(0.005)	(0.004)	(0.002)	(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	12,106	11,773	165,180	219,150	15,578	8,301	190,774	193,556
Adjusted R-squared	0.120	0.046	0.111	0.072	0.098	0.156	0.095	0.091
F-test p-value		0.000		0.000		0.000		0.016

Table 3: The Effects of TARP on Firms' Activities: Main Results

This table reports the main results of firms' activities over 2005-2012. Dependent variables for Panel A are long-term debt, short-term debt and leverage, respectively. Dependent variables for Panel B are cash & short-term investment, and working capital, respectively. Dependent variables for Panel C are investment, employment, and R&D, respectively. All of them, except employment, are ratios in percentage and divided by total asset. Post TARP equals to 1 if the observation is after 2008Q3. TARP equals to 1 if a firm borrowed from a bank that received capital injection from the TARP. Firm level control variables include size, Book-to-Market, Return to Asset (ROA), Profitability (Operating Income Before Depreciation/Total assets), Tangibility (Property Plant and Equipment/Total assets), asset growth rate and Tobin's Q. See Appendix A for detailed definitions of variables. Firm fixed effects and year fixed effects are included. Standard errors are clustered at firm level and are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Debt structure and leverage

	Long-term debt			Short-term debt			Leverage		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post TARP	1.532***	0.381		-0.163	0.353		1.525***	1.753***	
	(0.550)	(0.595)		(0.189)	(0.293)		(0.561)	(0.500)	
Post TARP×TARP		1.303**	1.964***		-1.066***	-0.957***		-0.257	-0.557
		(0.641)	(0.637)		(0.287)	(0.323)		(0.516)	(0.591)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	No	No	Yes	No	No	Yes
Time FE	No	No	Yes	No	No	Yes	No	No	Yes
Observations	13,126	13,126	11,776	12,222	12,222	10,323	12,219	12,219	10,320
Adj. R-squared	0.814	0.814	0.810	0.431	0.432	0.463	0.827	0.827	0.823

Table 3 (continued)

Panel B: cash and working capital

	Cash			Working Capital		
	(1)	(2)	(3)	(4)	(5)	(6)
Post TARP	1.630***	0.542*		1.007***	3.591**	
	(0.271)	(0.281)		(0.337)	(1.745)	
Post TARP×TARP		1.493***	0.989***		5.341***	3.698***
		(0.283)	(0.343)		(1.826)	(0.682)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	No	No	Yes
Time FE	No	No	Yes	No	No	Yes
Observations	13,170	13,170	10,609	11,526	11,526	10,038
Adj. R-squared	0.736	0.711	0.767	0.806	0.821	0.815

Table 3 (continued)

Panel C: real activities

	Investment			Employment			R&D		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Post TARP	-0.428***	-0.446***		-0.012***	-0.018*		-0.095***	-0.074**	
	(0.051)	(0.124)		(0.004)	(0.010)		(0.026)	(0.037)	
Post TARP×TARP		0.021	0.058		0.007	0.010		-0.036	-0.041
		(0.122)	(0.149)		(0.010)	(0.011)		(0.038)	(0.042)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	No	Yes	No	No	Yes	No	No	Yes
Time FE	No	No	Yes	No	No	Yes	No	No	Yes
Observations	13,170	13,170	10,785	11,620	11,620	10,753	4,426	3,897	3,491
Adj. R-squared	0.491	0.491	0.509	0.019	0.019	0.031	0.799	0.876	0.889

Table 4: Financial Constraints, Firm Size, and the Effects of TARP on Firms' Activities

This table reports subsample analysis of the effects of TARP on firms' activities. The partition variable for Panel A is financial constraint, which is Whited-Wu index. The partition variable for Panel B is firms' total assets. Post TARP equals to 1 if the observation is after 2008Q3. TARP equals to 1 if a firm borrowed from a bank that received capital injection from the TARP. Firm level control variables include size, Book-to-Market, Return to Asset (ROA), Profitability (Operating Income Before Depreciation/Total assets), Tangibility (Property Plant and Equipment/Total assets), asset growth rate, and Tobin's Q. See Appendix A for detailed definitions of variables. Firm fixed effects and year fixed effect are included. Standard errors are clustered at firm level and are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Financial constraints (FC)

	Cash		Working capital		Investment		Employment		R&D	
	Low FC	High FC	Low FC	High FC	Low FC	High FC	Low FC	High FC	Low FC	High FC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post TARP×TARP	0.271	1.489***	2.989***	4.846***	0.235	0.040	0.005	0.001	0.082	0.032
	(0.515)	(0.447)	(0.843)	(0.966)	(0.248)	(0.091)	(0.020)	(0.009)	(0.246)	(0.077)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5,282	5,320	4,932	5,099	5,435	5,343	5,363	5,383	1,823	1,668
Adj. R-squared	0.67	0.75	0.56	0.75	0.541	0.484	0.041	0.029	0.689	0.799
F-test p-value		0.044		0.147		0.525		0.579		0.815

Table 4 (continued)

Panel B: Firm assets

	Cash		Working capital		Investment		Employment		R&D	
	Big	Small	Big	Small	Big	Small	Big	Small	Big	Small
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post TARP×TARP	0.943**	1.795***	2.896***	7.609***	0.038	0.192	-0.028	-0.001	-0.049	-0.051
	(0.398)	(0.674)	(0.594)	(1.863)	(0.372)	(0.149)	(0.027)	(0.018)	(0.045)	(0.054)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,935	5,674	4,502	5,536	5,798	4,987	5,668	4775	1,759	1,732
Adj. R-squared	0.71	0.65	0.82	0.79	0.457	0.666	0.007	0.129	0.999	0.809
F-test p-value		0.057		0.001		0.971		0.128		0.787

Table 5: External Finance Dependence, External Equity Dependence, and the Effects of TARP on Firms' Activities

This table reports subsample analysis of the effects of TARP on firms' activities. The partition variable for Panel A is external finance dependence. The partition variable for Panel B is external equity dependence. Post TARP equals to 1 if the observation is after 2008Q3. TARP equals to 1 if a firm borrowed from a bank that received capital injection from the TARP. Firm level control variables include size, Book-to-Market, Return to Asset (ROA), Profitability (Operating Income Before Depreciation/Total assets), Tangibility (Property Plant and Equipment/Total assets), asset growth rate, and Tobin's Q. See Appendix A for detailed definitions of variables. Firm fixed effects and year fixed effects are included. Standard errors are clustered at firm level and are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: External finance dependence

	Cash		Working capital		Investment		Employment		R&D	
	Low	High	Low	High	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post TARP×TARP	-2.199***	3.040***	3.826***	12.848***	0.048	0.764	-0.005	0.023	0.428	-0.095
	(0.817)	(0.642)	(0.899)	(1.494)	(0.076)	(0.606)	(0.010)	(0.036)	(0.397)	(0.067)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,022	3,739	2,996	3,407	3,767	3,081	3,832	3,020	1,091	1,002
Adj. R-squared	0.712	0.649	0.843	0.814	0.639	0.388	0.041	0.075	0.806	0.869
F-test p-value		0.000		0.000		0.225		0.646		0.173

Table 5 (continued)

Panel B: External equity dependence

	Cash		Working capital		Investment		Employment		R&D	
	Low	High	Low	High	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post TARP×TARP	0.063	2.290***	3.217***	10.045***	0.104	0.266	-0.001	0.011	0.197	-0.077
	(0.619)	(0.579)	(0.807)	(1.130)	(0.132)	(0.438)	(0.016)	(0.022)	(0.282)	(0.049)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,669	4,908	3,515	4,626	4,913	3,759	4,986	3,682	1,700	1,053
Adj. R-squared	0.691	0.795	0.741	0.879	0.512	0.420	0.030	0.056	0.668	0.880
F-test p-value		0.000		0.000		0.7134		0.7944		0.316

Table 6: Bank Loan Dependence and the Effects of TARP on Firms' Activities

This table reports subsample analysis of the effects of TARP on firms' activities over 2005-2015. The partition variable for is bank loan dependence, which is defined as the ratio of bank loans to total debt from Capital IQ. Post TARP equals to 1 if the observation is after 2008Q3. TARP equals to 1 if a firm borrowed from a bank that received capital injection from the TARP. Firm level control variables include size, Book-to-Market, Return to Asset (ROA), Profitability (Operating Income Before Depreciation/Total assets), Tangibility (Property Plant and Equipment/Total assets), asset growth rate, and Tobin's Q. See Appendix A for detailed definitions of variables. Firm fixed effects and year fixed effects are included. Standard errors are clustered at firm level and are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

	Cash		Working capital		Investment		Employment		R&D	
	Low	High	Low	High	Low	High	Low	High	Low	High
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post TARP×TARP	0.760***	2.615***	3.551***	6.051***	-0.230	0.309**	1.049	0.016	-0.108*	-0.037
	(0.145)	(0.599)	(0.622)	(1.433)	(1.014)	(0.120)	(3.137)	(0.076)	(0.057)	(0.086)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,018	3,834	2,760	2,720	3,018	2,836	3,685	3,527	1,090	1,082
Adj. R-squared	0.788	0.088	0.171	0.830	0.585	0.480	0.068	0.811	0.837	0.856
F-test p-value		0.003		0.094		0.000		0.266		0.470

Table 7: The Effects of TARP on Bank Lending-Instrumental Variable Analysis

This table reports results of regression (1) over 2005-2012 using instrumental variable method. For the first stage (Panel A), I use a probit model in which I regress the TARP (a dummy variable, equals to one if a bank received TARP funds) on the political instruments and control variables. For the second stage (panel B), I then use the predicted probability obtained from first stage as an instrument for TARP. Dependent variable is change in a bank's loan amount to each firm in each quarter scaled by the bank's asset in last quarter. Post TARP equals to one if the loan happened after 2008Q3 and zero otherwise. TARP Amount equals TARP capital injection amount that a bank received at the time it got the funds and zero otherwise. For non-TARP banks, it is always equal to zero. Bank level control variables include CAMELS proxies, size, exposure to real estate loan market, and charge-off. Please see Appendix A for detailed definitions of variables. Standard errors are clustered at bank level and are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: IV first stage

	TARP (dummy)	
Variables	(1)	(2)
Congress committee	.230***	
	(0.060)	
Democrat		.130***
		(0.028)
Controls	Yes	Yes
Bank FE	Yes	Yes
Time FE	Yes	Yes
Observations	23,879	23,879
Pseudo R-squared	0.113	0.149

Panel B: IV second stage

	Loan change/Asset (%)	
Variables	(1)	(2)
Post TARP ×TARP	0.012**	0.036***
	(0.006)	(0.011)
TARP Amount	-0.010	-0.007
	(0.007)	(0.007)
Controls	Yes	Yes
Bank FE	Yes	Yes
Time FE	Yes	Yes
Observations	23,879	23,879
Adjusted R-squared	0.124	0.131

Table 8: The Effects of TARP on Firms' Activities: Instrumental Variable Analysis

This table reports the main results of firms' activities over 2005-2012 using instrumental variable method. The first stage regression is the same as in Table 3. This table presents the second stage regression results where the predicted probability is used as an instrument for TARP. Panel A and Panel B present results using *Congress committee*, *Democrat* as IV, respectively. Dependent variables for columns (1)-(8) are long-term debt, short-term debt, leverage, cash & short-term investment, working capital, investment, employment, and R&D, respectively. All of them, except employment, are ratios and divided by total asset. Post TARP equals to one if the observation is after 2008Q3. Firm level control variables include size, Book-to-Market, Return to Asset (ROA), Profitability (Operating Income Before Depreciation/Total assets), Tangibility (Property Plant and Equipment/Total assets), asset growth rate, and Tobin's Q. See Appendix A for detailed definitions of variables. Firm fixed effects and year fixed effects are included. Standard errors are clustered at firm level and are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: IV- Congress committee

	Debts and leverage			***Cash and working capital***		***Real activities***		
	Long-term Debt	Short-term Debt	Leverage	Cash	Working capital	Investment	Employment	R&D
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post TARP×TARP	2.617***	-2.771**	-0.320	2.359***	2.442***	0.731	0.022	-0.080
	(0.359)	(1.246)	(.460)	(0.443)	(0.599)	(1.353)	(0.027)	(0.066)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,776	10,323	10,320	10,609	10,038	10,785	10,753	3,491
Adj. R-squared	0.637	0.248	0.796	0.634	0.602	0.768	0.108	0.101

Table 8 (continued)

Panel B: IV- Democrat

	Debts and leverage			*Cash*		*Real activities*		
	Long-term Debt	Short-term Debt	Leverage	Cash	Working capital	Investment	Employment	R&D
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post TARP×TARP	2.383***	-1.676***	-1.609	1.991***	1.872***	0.180	0.006	-0.099
	(0.238)	(0.289)	(1.060)	(0.328)	(0.205)	(0.341)	(0.010)	(0.086)
Observations	11,776	10,323	10,320	10,609	10,038	10,785	10,753	3,491
Adj. R-squared	0.40	0.223	0.691	0.320	0.519	0.572	0.306	0.360
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: The Effects of TARP on Firm's Real Activities: Alternative Samples

This table reports the results of the effects of TARP on firm level activities using two alternative samples over 2005-2012. Panel A uses the double matched sample. The first match is the PSM between 144 banks as documented in Section 3. The second match is the match between firms. Specifically, for each of 123 firms that borrowed from non-TARP banks, it is matched by a firm borrowed from TARP banks within the same industry and with closest size. Panel B uses a broader sample where all banks and related firms are included. The dependent variables for columns (1) to (8) are long-term debt, short-term debt, leverage, cash, working capital, investment, employment, and R&D, respectively. Post TARP equals to 1 if the observation is after 2008Q3. TARP equals to 1 if a firm borrowed from a bank that received capital injection from the TARP. Firm level control variables include Book-to-Market, Return to Asset (ROA), Profitability (Operating Income before Depreciation/Total assets), Tangibility (Property Plant and Equipment/Total assets), asset growth rate, and Tobin's Q. See Appendix A for detailed definitions of variables. Firm fixed effects and year fixed effects are included. Standard errors are clustered at firm level and are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Double matched sample

	Long-term debt	Short-term debt	Leverage	Cash	Working capital	Investment	Employment	R&D
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post TARP×TARP	4.71***	-1.49***	0.18	2.42***	3.64***	0.08	-0.01	-0.12
	(1.71)	(0.46)	(1.26)	(0.55)	(0.88)	(0.18)	(0.04)	(0.08)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,892	2,114	2,114	2,634	2,276	2,270	1321	725
Adj. R-squared	0.74	0.62	0.89	0.87	0.89	0.61	0.10	0.88

Table 9 (continued)

Panel B: A broader sample

	Long-term debt	Short-term debt	Leverage	Cash	Working capital	Investment	Employment	R&D
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post TARP×TARP	9.97***	-0.88*	-1.69	1.06***	2.48***	0.13	0.02	-0.06
	(2.46)	(0.52)	(1.39)	(0.12)	(0.18)	(0.21)	(14.90)	(0.12)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52,399	45,678	45,621	52,498	48,378	47,563	40,704	16,912
Adj. R-squared	0.52	0.71	0.79	0.60	0.86	0.52	0.06	0.77

Table 10: Placebo test

This table presents the results for placebo test. Instead of using 2008Q4, I use 2005Q3 as the "pseudo-event" quarter. The dependent variables for columns (1)-(8) are long-term debt, short-term debt, leverage, cash, working capital, investment, employment, and R&D, respectively. Post TARP equals to 1 if the observation is after 2008Q3. TARP equals to 1 if a firm borrowed from a bank that received capital injection from the TARP. Firm level control variables include Book-to-Market, Return to Asset (ROA), Profitability (Operating Income before Depreciation/Total assets), Tangibility (Property Plant and Equipment/Total assets), asset growth rate and Tobin's Q. See Appendix A for detailed definitions of variables. Firm fixed effects and year fixed effect are included. Standard errors are clustered at firm level and are reported in brackets. Superscripts ***, **, * correspond to statistical significance at the 1, 5, and 10 percent levels, respectively.

	Long-term debt	Short-term debt	Leverage	Cash	Working capital	Investment	Employment	R&D
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post TARP×TARP	-0.19	0.03	-0.02	-0.32	0.01	-0.10	0.01	0.04
	(0.51)	(0.28)	(1.30)	(0.50)	(0.82)	(0.15)	(0.03)	(0.11)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,338	7,994	7,990	9,413	8,639	8,373	4346	2,566
Adj. R-squared	0.85	0.65	0.86	0.79	0.87	0.56	0.08	0.75