The bright side of lending by government owned banks: Evidence from the financial crisis in Japan

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Abstract

This paper investigates the effect of lending by government owned banks on real investment and employment for publicly traded industrial firms in Japan, focusing on a period that covers the financial crisis in the 1990s caused by the burst of the real estate bubble. We find that increases in government owned bank lending has strong impact on investment during the crisis. In contrast, increases in government owned bank lending has little effect on employment growth. The positive effects of increases in government owned bank lending are focused on non-zombie firms. Firms that are more credit constrained show larger increases in investment with increases in government owned bank lending. Thus, our results show that government owned bank interventions can be effective in mitigating credit constraints and stimulating investment even for publicly traded companies.

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Abstract

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1. **Introduction**

During the financial crisis of 2008-2009, most governments around the world have aggressively moved to mitigate the real effects of the crisis by providing guarantees of bank debt and/or recapitalization of banks. Nevertheless, questions remain about the effectiveness of such policies since banks tend to hoard liquidity during a crisis, thereby, effectively blunting the impact of governmental actions (Acharya, Shin and Yorulmazer, 2011, Diamond and Rajan, 2011). Besides supporting the banks by infusing capital or providing credit guarantees, the government can directly lend to the operating firms. For example, during the financial crisis of 2008-2009, the US government provided direct loans to General Motors as part of the government's Troubled Asset Relief Program (TARP). Theoretically, Mankiew (1986) and Bebchuk and Goldstein (2011) show that, when private credit supply is reduced and government acts as 'lender of last resort' during crisis, such a policy can have beneficial real effects on the economy. Despite its importance as a potential policy tool, the empirical effectiveness of such direct lending during a crisis has not been studied to the best of our knowledge.

Specifically, we investigate the lending decision of government owned banks and the impact of government bank lending on firm level investment. We focus on differential impact of such lending during the crisis caused by the bursting of the real estate bubble in early 1990's in Japan. In addition, we examine differences in the effect of such lending across firms with different sets of credit constraints. We also examine the effect of such lending on firm level employment.

Two contrasting views exist on the role of government in credit markets – the political view that suggests that involvement of government results in inefficient credit allocation and inefficient investment (Shleifer and Vishny, 1994), and the market failure view (Stiglitz, 1989a, 1989b) that envisages a positive role for government in minimizing the impact of credit market failures. The setting of our study lends itself naturally to studying the impact of government lending on mitigating the effects of market failure. Nevertheless, we do consider the possibility that GOB lending, even during a crisis, may continue to be driven by reasons other than mitigation of credit constraints.

To test the effects of GOB lending, we use the Nikkei Needs database, which has been used extensively in studies of Japanese public companies. This database provides a comprehensive sample of the identity of the lenders for publicly traded firms in Japan, which allows us to identify the degree of lending from GOBs and private banks. Supplementing the above data set with the PACAP database, we construct a firm-year panel data set that spans the period from 1977 to 1996 for all publicly traded companies in Japan.[1] This data set is used to identify the impact of lending by GOBs on these companies.

We first examine the determinants of increases in GOB lending. We find that GOBs significantly increase lending during the crisis, and increase lending to firms that have lower cash flows and rely more on external financing. This provides preliminary evidence that suggests GOB lending is directed towards firms having more credit constraints.

However, a potentially complicating factor is the presence of zombie lending (evergreen lending to poorly performing companies) that was identified by Peek and Rosengren (2005) and Caballero, Hoshi and Kashyap (2008) as existing in Japan. Are increases in GOB lending focused on zombie firms? Unconditionally, there is no relationship between being a zombie firm and increases in GOB lending. During the crisis, zombie firms are less likely to be the recipient of GOB lending.

Next, we examine the differential effect of increases in GOB lending on real investment by corporations during crisis and non-crisis periods. We find a strong incremental effect on investment during the crisis period, over and above the effect during normal times. In particular, in a baseline specification, an increase of one yen in GOB lending results in a ¥0.84 increase of investment during normal times and a further increase of ¥0.51 during the crisis. Since the crisis was a sudden exogenous event, leading to a sharp increase in financial constraints for all firms, this result provides strong evidence that increases in GOB lending does mitigate financial constraints.

We conduct several further tests to examine this question. First, we sort firms by several credit constraint measures and examine differential effects of increases in GOB lending across these different measures. The measures we use are - the Rajan-Zingales measure of external financial

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[1] All results are robust to inclusion of a longer time period till 2007. The reason limiting the data sample to 1996 is to avoid the effects of GOB reform as well as bank recapitalizations in Japan after this period.

dependence, dummy variables that classify firms into Keiretsu versus non-Keiretsu firms, leverage, firm size, and Altman's Z score. We find that the overall impact of GOB lending on investment is almost always larger on firms that are more constrained relative to those that are less constrained.

Second, we examine the interactive effect of increases in GOB lending and Tobin's Q, and of increases in GOB lending and cash flow, - on firm investment. If a firm uses the increases in GOB loans inefficiently, i.e., the loan was made for political reasons, the firm should increase investment regardless of the market signal (i.e., Tobin's Q). On the other hand, if a firm uses GOB loans efficiently, we expect the sensitivity of investment to Tobin's Q to increase. If increases in GOB lending mitigate financial constraints, we should find that increases in GOB lending reduce investment sensitivity to cash flow. Our study finds both effects, suggesting firms use increases in GOB loans efficiently.

Third, we find that increases in investment due to increases in GOB lending are concentrated on non-zombie firms, which provides further evidence that GOBs do not favor supporting inefficient firms. For the zombie firms, the effect of an increase in GOB lending on investment is statistically zero, both in normal and crisis times, in contrast to the strong effects documented earlier. Any quid pro quo of increase in GOB lending to zombie firms should have resulted in large effects for zombie firms and smaller effects for non-zombie firms.

As a last test for testing the potential inefficiency of the increases in investment associated with increases in GOB lending, we examine long run stock price performance of firms with increases in GOB lending. Using equally weighted calendar-time event portfolio returns, we do not find any abnormal performance using Fama-French 3 factor model over a three year horizon. However, using value weighted returns, we find small positive abnormal returns - around 0.7% per year for non-crisis periods, and around 0.3% per year for the crisis periods. If the increases in investments induced by GOB lending were inefficient from a shareholders perspective, we would observe negative abnormal returns.

Taken together, our results suggest that GOB lending during the 1990's crisis helped healthy companies mitigate credit constraints, consistent with government lending mitigating market failures.

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We conduct similar tests for employment growth. Consistent with earlier studies, we find a positive effect of increases in GOB lending on employment growth. However, the economic magnitudes are small. For example, an increase in the GOB lending that equals 1% of firm's capital (i.e., an increase of 0.01 in the GOB lending to capital ratio) results in an increase of approximately 0.13% employment growth. In contrast to our results for real investments, we find no incremental effect of GOB lending on employment growth during the crisis.

A major concern in our results stems from the endogeneity of GOB lending. For example, governments may choose to extend loans to firms that hire more people or invest more. In addition to using time invariant factors, such as firm fixed effects, in the regressions, we employ several alternative measures to control for endogeneity – propensity score matching and Arellano and Bond GMM estimation.

An important instrument we use to identify the likelihood of increases in GOB lending is the percentage of directors that are former government bureaucrats that serve on the board of the firm. We posit that having former government bureaucrats on the board might increase the likelihood of receiving more GOB lending, but do not directly affect firm's investment or employment. The results using these different methods of endogeneity corrections for investment are largely consistent with our base panel data results.

The strong economic impact of GOB lending that we find on investment is consistent with the stated policy objectives of GOB lending. Although our study provides evidence of the benefits (i.e., the bright side) of GOB lending, it should be acknowledged that we do not have access to individual loan contract terms. Thus, we are unable to directly examine if government owned banks provided firms with subsidized loan rates. Therefore, we are unable to comment on the net benefit of such direct lending - which would be the benefit of increased investment and employment minus the cost of the government subsidy. However, we can conclude that government owned bank system is effective in impacting real activities, especially for firms with constraints, and for firms during the Japanese crisis of the 1990s.

Our paper primarily contributes to the literature on the role of government during a crisis. The crises of Japan in the 1990's provides a good laboratory for understanding the effect of direct government lending vis-à-vis the crisis of 2008 in the US, particularly because of the similarity of the two crises (Hoshi and Kashyap, 2010). Further, it has been argued that government owned banks in Japan were an effective instrument by which the Japanese government stimulated the economic growth (Horiuchi and Sui, 1993). We show that direct lending can be an effective tool for impacting corporate activity during an economic crisis and this finding may be applicable to other advanced economies as well.

Our results complement those in Giannetti and Simonov (2013) who show that state funded recapitalizations of Japanese banks in the late 1990's resulted in more zombie lending by the recapitalized banks, if the size of the capital injection was too small. This further suggests that direct lending should be seriously considered as an alternative tool to stimulate corporate investment.

Our paper also contributes to the debate on the efficiency of lending by government owned banks. Several papers document the negative effects of such lending - both at the level of the macroeconomy (Barth et al, 1999, La Porta et al, 2002, Dinç, 2005) as well as at the firm level (Sapienza, 2004, Carvalho, 2012). In conjunction with the results documented by Imai (2009) on politically motivated lending by GOBs in Japan, our results suggest that both the political and market failure views could co-exist as rationales for GOB lending. None of the above papers focus specifically on a crisis, hence, the difference in results suggests that there are positive effects of such lending that have not been highlighted in the literature.

The remainder of this paper is organized as follows. Section 2 provides institutional details on the 1990's crisis in Japan as well as an overview of government owned banks in Japan. We describe our data set and variables in Section 3. Section 4 performs the empirical analysis and Section 5 concludes with directions for future research.

2. Institutional Details of the Japanese banking market

2.1 The Japanese Financial Crisis of the 1990's

During the 1984-1989 period, the Japanese capital markets and the real economy expanded rapidly. The Nikkei 225 Stock Index was around 10,000 levels in 1984 and reached a peak of 38,916 on December 29, 1989. Similarly, the land price index rose rapidly during the late 1980s. Meanwhile, the private investment also expanded dramatically (see Figure 1). The business press has extensively referred to this period as a bubble period.

Concerned with the overheating in the asset markets, the Bank of Japan increased the official discount rate and imposed limits on commercial bank lending to real estate related projects. These policies resulted in much tighter credit market conditions. Both stock and real estate prices fell sharply during 1990-1992. The Nikkei 225 Stock Index started to fall in early 1990, reaching 20,222 by October 1, 1990, which was followed by declines in real estate prices. This deflation in asset prices caused the Japanese economy to contract significantly. Concerned with default risk, private banks in Japan reduced or suspended their lending, imposing negative impacts on bank loan supply. According to a survey by the Japanese Banking Association, private banks suspended 6,956 transactions for firms with capitalization of more than 1 million yen in 1989.[2] In 1992, this number reached as high as 15,854, which was more than twice of the number of suspensions in 1989.

In the meanwhile, GOBs stepped in and provided funds to fill in the financing gap during the crisis period. Figure 2 compares aggregate private lending and GOB lending to the Japanese private non-financial sector, using flow of funds data from the Bank of Japan. The figure shows net increases in GOB lending after 1990 as private lending decreased sharply during the crisis. Even when private lending was shrinking (i.e., net increases in private lending being negative) after 1993, GOB lending did not contract, which suggests that GOB intervened to mitigate the effect of shrinking private lending. Also, according to a statistic compiled by the Bank of Japan, the fraction of aggregate long term loans extended by GOBs increased from 2% of total annual long term funds in 1989 to more than 30% in 1993.[3]

Figure 3 shows the time series pattern of the increase in GOB lending, both in terms of number of firms and magnitude for listed non-financial corporations in our data sample. We find that there is a

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[2] Suspension is defined as non-renewal of existing loan contracts.
[3] Long term funds include equity funds, long term bonds and long term bank debts.

sharp increase in the number of firms that experienced an increase in GOB lending after the onset of the crisis in 1990. We also observe that the magnitude of GOB lending increased through the crisis.

Based on the above facts, we define the period starting from 1990 to 1994 as the crisis period and we define 1995 onwards as the post crisis period. The GDP growth in the second quarter of 1995 increased to 2.9% and economic growth recovered until 1997, which is consistent with Figure 1 where the capital investment started to recover from 1995. Since there were bank defaults and banking system restructuring from 1997, we exclude data after the end of 1996 in our main empirical tests.

2.2 Government Owned Banks in Japan

Japan has various types of government banks to provide loans to a different set of borrowers.[4] These government banks have received most of their funds from the Fiscal Investment and Loan Program (FILP) which is mainly funded by the postal saving and insurance system.[5] Similar to the general accounting budgets of the government, the FILP budgets are proposed by the Ministry of Finance.

The GOBs supply long term credit to firms whose projects are regarded as important for the economic development (Horiuchi and Sui, 1993). Meanwhile, Ministry of International Trade and Industry (MITI) also actively recommends potential borrowers to these government owned banks.[6] For example, Japan Development Bank and Export-Import Bank have been established to provide long-term loans to large firms in industries that government considers important for its policy objectives. Government banks that provide loans to smaller firms, such as Japan Finance Corporation for Small Business and People's Finance Corporation, have been established for the aim of mainly providing credit for firms that might have difficulty receiving loans from private banks. There are also a few government banks that have been established to provide government credit for the development

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[4] They are Japan Development Bank, People's Finance Corporation, Agricultural Forestry and Fisheries Finance Corporation, Hokkaido and Tohoku Development Corporation, Local Public Enterprise Finance Corporation, Environmental Sanitation Business Finance Corporation, Export Import Bank of Japan, Housing Loan Corporation, Small Business Finance Corporation, Small Business Credit Insurance Corporation, Commerce and Industry Finance Corporation and Okinawa Development Finance Corporation. Local Public Enterprise Finance Corp and Housing Loan Corporation are most likely not included in our sample as they are less likely to lend to private corporations. For details, see Imai (2009).
[5] FILP is no longer funded by the postal savings system since 2001, and is financed by issuing bonds that are considered equivalent to government bonds.
[6] MITI has been reorganized and changed its name to ministry of Economic, Trade and Industry in 2001.

of certain regions such as the Hokkaido and Tohoku Development Corporation and the Okinawa Development Finance Corporation (See Imai, 2009). Although the government owned banks exist to provide credit in line with the government's policy objectives, they are also very active in searching business, can decide credit allocation independently from the government, and can also act like private commercial banks to supply loans in the form of syndicated loans. They also regularly monitor the performance of borrowers during the loan commitment by requiring operation reports from their borrowers or consulting other private banks to obtain information.[7] Due to the dominance of the private banking sector, the proportion of corporate financing provided by GOBs is relatively small in terms of loans outstanding. For our sample of listed non-financial firms, the average value of GOB lending is around 15% of the total corporate borrowing from banks (see Figure 4).

3. Data and Summary Statistics

3.1 Data and key variables

Our main sample consists of all listed companies in Japan, excluding financial institutions and utility companies, from 1977 to 1996. We deliberately choose to end the main sample in 1996 to avoid any effects of economic downturn which started in 1997, any confounding effects of recapitalization of Japanese banks in the late 1990's, and the effects of restructuring of GOB which started from 1999. Particularly, the recapitalizations of private banks by the government may have had the effect of providing a guarantee effect for private banks, which would reduce the difference between government and private loans. In unreported tables, we include all data till 2007, using the economic downturn from 1997 as a second crisis, and find all our results are robust to the inclusion of the period after 1997.[8]

Accounting information, bank loan information and historical stock prices are obtained from the Nikkei Corporate Financial Database (Nikkei), Nikkei Bank Loan Database and Pacific-Basin Capital Markets Research Center (PACAP), respectively. The Nikkei Bank Loan database includes loans

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[7] The reorganization of Japanese government owned banks resulted in three banks (i.e., Development Bank of Japan, Japan Finance Corporation and Shoko Chukin Bank) and Japan International Cooperation Agency, as of 2008.
[8] The increase in the consumption tax rate from 3% to 5% and the termination of special tax reduction program in 1997 are considered major factors that killed the nascent economic recovery which started in 1995.

outstanding of individual banks for each company at the fiscal-year-end. We obtain 22,009 firm-year

observations with adequate loan information and 19,076 firm-year observations with both loan and

stock price information from 1977 to 1996.[9]

We identify nine major government owned banks in Japan that supply credit to companies. These

banks are 100% owned by the Japanese government during our entire sample period. We construct a

continuous variable 'Government Owned Bank,' that is computed as the ratio of the net annual

increase in all government owned bank loans outstanding to total capital in the current year. Total

capital is defined as the total amount of tangible fixed assets of the firm. Thus,

$$\text{Government Owned Bank}_{i,t}$$

$$= \frac{\text{Total Loans outstanding from GOBs to firm i in year t} - \text{Total loans outstanding from GOBs to firm i in year t} - 1}{\text{Total Capital of firm i in year t} - 1}$$

This is the principal measure that we use in the empirical analysis. Following prior literature on

investments in Japan (Kang and Stultz, 2000, Goyal and Yamada, 2004), we define investment as the

change in tangible fixed asset plus depreciation. We define employment as the total number of

employees at the end of the year. This number includes full-time employees, employees on term

contracts, temporary employees (loaned employees from other companies), and employees on leave

of absence. It does not include directors. The following is some of the important variables used in the

empirical analysis, which includes sales growth, cash by asset, size, wage, book leverage, ROA, cash

flow and Tobin's Q. Tobin's Q is proxied by the ratio of the market value of assets to total book assets

(Chung and Pruitt, 1994). A detailed definition of all variables is presented in the Appendix.

3.2 Summary statistics

Table 1 presents summary statistics from 1977 to 1996 for the key variables. Table 1 Panel A

shows that the proportion of government owned bank loan to total borrowing is around 6.7% on

average, suggesting that the market share of government owned bank is small compared with that of

private banks. However, in our sample, over 12,176 out of 22,009 firm years, which is over 55% of

our sample, record loan outstanding from GOBs, suggesting that the penetration of GOB influence is

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[9] We delete firms that do not have any information on the borrowing from banks.

deep despite their low market share.[10] Panels B and C of Table 1 stratify the sample for borrowers with an increase in government owned bank lending in a given year (Government Owned Bank$_{i,t}$ >0), and those without such an increase (Government Owned Bank$_{i,t}$ ≤0). We find that firms that experience an increase in GOB loans have higher employment growth and investment. In particular, such firms have 0.2% higher employment growth and 0.029 higher investment to capital ratio compared with other firms. Given that the overall average of employment growth is 0.3%, and the overall average of the investment to capital ratio is 0.085, the difference in firms that receive an increase in GOB lending is not only statistically significant but also economically significant. For example, an increase in GOB lending is associated with an increase of 34% for the investment to capital ratio, and an increase of around 66% for the employment growth relative to their respective mean values.

We also find that firms with increases in GOB lending tend to have greater leverage than other firm years. Also, these firms have lower Tobin's Q (0.930 vs. 1.024), lower cash flow to capital ratio (0.212 vs. 0.353) and lower cash by asset ratio (0.115 vs. 0.149), which implies that these firms not only have lower market valuations but also are more cash constrained. Our findings are consistent with those by Sapienza (2004) who documents that GOBs generally favor providing loans to depressed firms.

Figure 4 shows increase in GOB loans to our sample of publicly traded non-financial firms during our sample period. In contrast to the aggregate change in GOB lending to the corporate sector in Figure 2, the share of lending by GOBs to publicly traded companies in Japan increases only around 4% from 1990 to 1994 (the crisis period), which is a relatively small amount.[11] In Figure 5 we compute the correlation between GOB lending and private lending in our sample for each year to examine if GOB lending substitutes for private bank lending. To the extent that GOBs intend to mitigate credit constraints, we expect to find a negative correlation, particularly during the crisis, which indeed is the case. We find that the correlation is also negative prior to the crisis, suggesting that GOB lending substitute private bank lending after the late 1980s. The above figures provide

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[10] This number is computed independently and is not available in Table 1.
[11] Our finding suggests that large increase in aggregate GOB lending have been concentrated on SMEs and private enterprises.

preliminary evidence that GOBs in Japan stepped in to mitigate the reduction in private bank lending during the crisis, which provides our foundation for the remainder of the empirical tests.

4. Empirical Results

4.1 Increase in GOB lending and firm characteristics

The results in Section 2 provide evidence that on the aggregate level, GOB lending is negatively correlated with private bank lending. Further, univariate results in section 3 also provide similar evidence at the firm level. In this section, we reexamine the firm level results, using a multivariate regression to control for other potential determinants of increases in GOB lending.

Specifically, we are interested in investigating two issues – (1) Do GOB's target more credit constrained firms during the crisis, and (2) How likely are zombie firms to be the recipients of GOB lending. Our measures of financial constraints are quite standard – the Rajan-Zingales (RZ) measure being the main measure. Other measures used include leverage and cash flow. Likewise, classifying a firm as a zombie follows the method suggested by Caballero, Hoshi and Kashyap (2008). Specifically, we create a lower bound for interest that a firm could pay during the fiscal year:

$$R_{i,t}^* = rs_{t-1} \times BS_{i,t-1} + 1/5(\sum_{j=1}^{5} rl_{t-1}) \times BL_{i,t-1} + rcb_{\text{min over last 5 year},t} \times Bond_{i,t-1}$$

where rs is short term loan prime rate, BS is the short term loan outstanding, rl is long term prime rate, BL is the long term loan outstanding , rcb is the observed minimum coupon rate for convertible bond and Bond is the outstanding of bonds. If the interest expenditure of the firm during that fiscal year is lower than this lower bound, which implies that the firm is heavily subsidized, we define the firm to be a zombie firm.[12]

As a first step, in panel A, we examine the relation between firm characteristics and increases in GOB lending, both using a dummy variable to capture increases in GOB lending, as well as the

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[12] As documented by Fukuda and Nakamura (2011), Caballero, Hoshi and Kashyap (2008)'s measure could possible classify a good firm as zombie as healthy firms' interest rate could lower than the prime lending rate. In unreported tables, we modify Caballero, Hoshi and Kashyap (2008)'s measure with two additional criterions. In particular, firms whose earnings before interest and taxes (EBIT) exceeded the hypothetical risk-free interest payments were excluded from being classified as zombies and firms that were unprofitable and highly leveraged (higher than 0.5) and had increased their external borrowings were classified as zombies. Our results remain the same using this alternative measure.

continuous measure defined in Section 3.1. Unconditionally, we find that there is a large likelihood of an increase in GOB lending during the crisis. Further, using some of the financial constraint measures (leverage, cash flow, the RZ measure), increases in GOB lending are more likely for more constrained firms. Interesting, there is no relationship between increases in GOB lending and the zombie measure.

In Panel B, we reexamine the interactions of the financial constraint measures with the crisis dummy. We find some evidence for increases to high leverage firms. Interestingly, we find the increases in GOB lending for zombie firms during the crisis reduces significantly. This provides further evidence that GOB lending is not in any way concentrated on zombie firms, either in normal times, or during the crisis. We will revisit the zombie issue later again to ensure that the results obtained are not driven by differential reactions of zombie firms.

4.2   Effect of GOB lending on capital investment

Next, we examine the effect of government owned bank lending on real investment. The empirical specification is based on the q-theory of investment, where investment is a function of Tobin's Q ratio. We also augment the model with firm specific financial variables such as internal cash flow (Fazzari, Hubbard, and Petersen 1988) as well as year and firm fixed effects to account for unobservable time and firm heterogeneity.

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha \; Government \; Owned \; Bank_{i,t} + \beta \frac{CF_{i,t}}{K_{i,t-1}} + \delta Q_{i,t-1} + \gamma F_{i,t} + v_i + u_t + e_{i,t} \quad (1)$$

In the above equation, suffix i refers to firm i and t refers to fiscal year t. We compute the industry adjusted investment to capital ratio by taking the difference of this variable from its industry median value. This industry adjustment is motivated in part by the Japanese government policy that has targeted and supported certain industries as part of the government's industrial policy (Hoshi and Kashyap, 2001).[13,14] Such policy induced investment changes should be reflected in the industry median, and therefore taking the difference of the firm level to industry should isolate the impact of firm specific factors.

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[13] For example, in the early 1990s, the Japanese government considered the animation and cartoon industry as an important export industry.
[14] All results are robust to using unadjusted values and using industry dummies. An earlier version of the paper had both sets of results. Due to length considerations, these are omitted from the present version. The advantage of using industry adjusted values is that this method would account for time variation in industry level investment.

Government Owned Bank$_{i,t}$, as defined earlier, is the net increase in government owned bank loans outstanding at the end of the current year, relative to the previous year, scaled by the capital at the end of the previous year. By using this variable, we estimate the marginal increase in investment for a unit increase in GOB lending from its coefficient.

We define cash flow, $CF_{i,t}$, as net income before extraordinary items and depreciation, $K_{i,t-1}$ is tangible fixed asset, and Q is Tobin's Q. Vector F consists of firm specific financial variables, v_i is the firm fixed effect, u_t is the year fixed effect, and $e_{i,t}$ is the idiosyncratic error. In several tests, we augment equation (1) by interacting Government Owned Bank with crisis dummy, as well as proxies for financial constraints faced by the borrowing firm. (See appendix for details of the variables.)

Table 3 reports the results for our baseline specification in equation 1. Reported t-statistics and p-values are based on robust standard errors clustered at the firm level. In Model (1), the estimated coefficient on 'government owned bank' is positive and significant at the 1% level, suggesting that increases in GOB lending stimulate firm investment. In particular, the coefficient on "government owned bank" is 0.973, suggesting that a ¥1 increase in government owned bank lending will result in ¥0.973 increase in firm investment. The coefficients on Tobin's Q are positive and significant at the 1% level. This is consistent with the q theory that firms with more growth opportunities will invest more. The positive and significant coefficient on cash flow reflects that firms are sensitive to cash flow fluctuations suggesting that financial frictions do play a role in determining firm investment. This regression suggests that government owned bank lending can help to boost investment, regardless of whether the given period is a crisis period or a non-crisis period.

In Model (2), we further investigate the incremental effects of government owned bank lending on firm level investment during the crisis. The results show that the coefficient on the interacted term is positive and significant, suggesting that government owned bank lending have greater impacts on investment during crisis. More specifically, an increase of one yen in GOB lending results in an increase of investment between ¥0.86 in normal times, and a further increase of ¥0.54 during crisis times. Thus, there is a multiplier effect of GOB lending since one yen of GOB lending stimulates total investment of more than one yen during crisis periods.

In Model (3), we examine the robustness of these results by including other control variables in the regression. The role of additional control variables in Model (3) is to account for time varying firm characteristics that might not be captured by the above adjustments. These additional control variables are motivated by prior literature – for example, firms with high leverage are more likely to be financially constrained or distressed, or both, relative to firms with lower leverage. We posit that firm size is inversely related to financial constraints, and ROA is an alternative proxy for future growth opportunities, although high ROA could also mean that firm has more cash at its disposal and is less financially constrained. Under both interpretations of ROA, one would still expect a positive impact on investment. Although we find that all additional control variables have the expected effects on investment, the magnitude and statistical significance of the effect of GOB lending on investment is not affected by the inclusion of these additional control variables.

Although the net effect of increase in GOB lending on investment in Model (3) reduces to 0.839 compared with that of Model (1), the coefficient is both statistically and economically significant. To estimate the economic significance of this effect, we use the mean value of 'government owned bank,' which is 0.026 from Table 1 Panel B. When we multiply this number with the coefficient estimate of 0.839, we obtain the mean increase in the investment to capital ratio to be 0.021. Thus, compared with the average level of investment to capital ratio of 0.085, the ratio increases almost 25%, which is close to the estimate from our univariate analysis in Section 4.2.

In Models (4) and (5), we stratify the sample into firms that experience a decrease in private bank (henceforth, PB) lending in the given year relative to the previous year, and those that do not. We posit that firms that experience a decrease in lending from PBs are more likely to be credit constrained, relative to firms that did not experience such a decrease. To the extent that decreases in PB lending could be caused by changing economic conditions, such as lower growth prospects, these should be captured by other control variables such Q, ROA and year fixed effects. Although we find strong positive effects of GOB lending on investment in both samples, the sub-sample of firms that experience decrease in PB lending shows a stronger incremental effect during the crisis. Thus, our result suggests that GOB lending mitigates credit constraints caused by reduction in PB lending

during crisis periods. In non-crisis times, we find that the effect of GOB lending on investment is much smaller for firms that experience a decrease in PB lending than for those that do not experience a decrease, suggesting that the former might use the proceeds from GOB loans for other purposes than investments. As Japanese GOBs also provide loans for working capital, these firms might use GOB loans to substitute the decrease in PB loans for this purpose.

4.3 Alternative tests for efficiency of investment

One may argue that GOB lending might lead firms to take inefficient investments if firms that experience reductions in PB lending have lower (unobservable) growth opportunities that are not captured by our model. We address the issue in this section by using different model specifications, using different subsamples, and examining the impact on shareholder wealth of GOB lending.

4.3.1 Impact of GOB lending on high growth and high cash flow sensitivity firms

To the extent that GOB lending mitigates credit constraints, this may enable firms to better capture growth opportunities. Thus, we might expect that investment sensitivity to Q be higher for firm with increases in GOB lending. In addition, investment sensitivity to cash flow should be lower if credit constraints are mitigated by GOB lending. On the other hand, if GOB lending is directed to politically motivated investment projects, there might be no incremental effect of GOB lending on high growth firms, nor should the cash flow sensitivity of financially constrained firms be mitigated by GOB lending. To examine these effects we interact GOB lending with Tobin's Q and cash flow in our investment regressions.

The results of this estimation are presented in Table 4 (all control variables used in Table 3 are also used, but not presented to conserve space). In Model (1), we interact the Q ratio of the firm at the end of the previous year with 'government owned bank.' We find a strong incremental effect of GOB lending on high growth firms. A GOB loan made to a firm that has a 0.01 higher Q ratio results in an increased investment of ¥.0067 relative to the lower Q firm. We also find that GOB lending decreases firm's investment sensitivity to cash flows (Model 2) which is consistent with reduction of financial

constraints. Thus, our results show that GOB loans are used efficiently by firms to capture growth opportunities and to reduce cash flow constraints, although we find no differential impact during crisis period (Models 3 and 4).

4.3.2 Impact of GOB lending on zombie firms and non-zombie firms

One of the concerns in interpreting the positive GOB effect on investment is that it could simply reflect the government subsidization (Shleifer and Vishny, 1994). Unfortunately, the data set we have does not have any contract terms of the loan. In this section, we use alternative approach to release the concern by investigating the relationship between GOB lending and their ever-greening behavior (Hoshi, 2000; Hoshi and Kashyap, 2004).

During the 1990s, banks continued to roll over loans to insolvent borrowers, or zombie firms, gambling that firms will recover or that government might eventually bailout the firm. However, it has widely been documented that such lending to zombie firms reflect the banks' inefficient subsidization and hampered the economy recovery (Hoshi, 2000; Caballero, Hoshi and Kashyap, 2008; Giannetti and Simonov, 2013). Caballero, Hoshi and Kashyap (2008) also point out that the government encouraged private banks to direct their lending particularly to small and medium enterprises (SMEs), claiming that increase in lending to these SMEs should "ease the credit crunch". However, keeping zombie firms afloat could save unemployment rate from deteriorating, which could potentially benefit the politicians (Shleifer and Vishny, 1994). If the above argument is correct, the effects that we observe should be focused on zombie firms and lower for non-zombie firms.

To test this, we stratify firms based on measures of zombies and investigate whether the GOB effects are mainly concentrated in zombie firms. We first employ Caballero, Hoshi and Kashyap (2008)'s measure. In addition, we further create industry level zombie measure to alleviate any measurement error in the firm level measure. In particular, we classify the construction, wholesale, retail sale, real estate and service industry as zombie dominated industries as previous literature documents that these companies in these industries more likely to have evergreened loans (Hoshi, 2000; Hoshi and Kashyap, 2004; Caballero, Hoshi and Kashyap, 2008).

18

The result in Table 5 shows that the GOB effect in investment is mainly concentrated in non-zombie firms and non-zombie industry. The effects of increases in GOB lending on investment is insignificant for zombie firms or high zombie industry. This result is consistent with our argument that GOBs stimulate investment mainly through the channel of easing credit crunch. It also mitigates our concern that GOBs might be ever-greening zombie firms.

4.3.3 Impact of GOB lending on firms with higher financial constraints and distress risk

In this sub-section, we further examine the results by stratifying firms based on various measures of financial constraints and distress risk that have been used in the literature. We use the following measures – a dummy variable for whether or not the firm belongs to a keiretsu group,[15] a measure of the firm's external financial dependence by Rajan and Zingales (1998) or the RZ measure, leverage, Altman's Z score, and size based on a firm's ranking in a given year.[16] Note that the last three firm specific measures could proxy for financial constraints as well as for financial distress. Also, many keiretsu firms not only have internal capital market among group firms or a main bank that mitigates their financial constraints but also have lower distress risk due to potential cross-subsidization among group firms. In this regard, the RZ measure is our only measure that proxies external financial constraints and not financial distress. As the RZ measure is computed at the industry level, it is most exogenous with respect to GOB lending at the firm level. In contrast, other measures of credit constraints may be positively correlated with increases in GOB lending.

To the extent that GOBs have the incentive to minimize the likelihood of distressed firms becoming bankrupt or laying off employees, this correlation works against finding incremental effects of GOB lending. For example, if constrained firms need to use the proceeds of the GOB loan to repay other creditors, or pay employees, this would reduce the measured effect of GOB lending on

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[15] Keiretsu is a group of large Japanese financial and industrial corporations whose member firms cross-hold shares. In a keiretsu, each firm maintains its operational independence while retaining very close commercial relationships with other firms and main bank in the group. Thus, these firms are less likely to be financial constrained.
[16] We computed the Rajan and Zingales (RZ) measure using Japanese data. Our measure differs markedly from the original estimates using US data published in Rajan and Zingales (1998). In particular, two things are striking – the Japanese RZ measure has zero correlation with the RZ measure for the US. Second, there are several industries where the sign of external financial dependence differs – that is, an industry classified as being dependent on external financing in the US having a positive RZ score, is classified as not being dependent on external financing in Japan having a negative RZ score.

investment. In this case, our measured effect would understate the true effects of GOB lending on investment.

However, if GOBs behave in a manner similar to private banks, the measured effect might reflect the selection ability of GOBs being able to screen good firms with unobservable quality, rather than mitigating credit constraints.[17] However, this type of endogeneity might be less relevant for GOB lending as previous research showed that GOBs lend to distressed and constrained firms (Sapienza, 2004). Nevertheless, to address these concerns, we adjust for endogeneity using a variety of methods in Section 5.5.

In this section, we follow a simple approach by stratifying our sample into firm years that are classified as being constrained or distressed using each of the five measures discussed above, and estimate Equation (1) for each sub-sample. In Table 6 Panel A, we present our base results, and in Panel B we add an additional interaction term for GOB lending with the crisis. Generally, we would expect the effect of GOB lending on investment to be more for constrained or distressed firms. However, if constrained firms receive more GOB lending during the crisis, GOB lending may be correlated with distress and/or financial constraints, which could bias our results. In subsequent sections we provide auxiliary analysis to mitigate this issue.

The results in Panel A show that there is a significant difference between the effects of GOB lending on constrained and/or distressed firms versus unconstrained or non/distressed firms. In all cases, the marginal impact of GOB lending on constrained or distressed firms is larger relative to unconstrained firms. For example, for firms with a high RZ measure, the net effect an increase of ¥1 in GOB lending leads to an increase of ¥1.2 in investment, similar to a multiplier effect found in Table 3. Likewise, the marginal effect of GOB lending for non-Keiretsu firms is ¥1.21, whereas for Keiretsu firms, it ¥0.69. Other firm specific variables show similar differences, which are quite large economically. However, these firm specific variables may be correlated with the likelihood of increases in GOB lending which makes interpretation of these magnitudes difficult. As mentioned earlier, the RZ measure, which is more likely to be exogenous to increases in GOB lending, provides

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[17] In addition, there is a possibility that private market participants might perceive an increase in GOB loans to a firm as evidence of an implicit government guarantee, which is turn might result in a lowering of credit constraints for the firm.

the strongest evidence that GOB lending leads to increases in investment among financially constrained firms.

In Panel B, we examine the incremental effect during crisis for the same subsamples of firms. The results show several interesting patterns. First, for virtually all the measures, the impact of GOB lending on constrained firms is much larger than unconstrained firms during normal times. Second, constrained firms do not show any incremental effect of GOB lending during the crisis; In contrast, unconstrained firms have a strong positive incremental effect of GOB lending during the crisis. Thus, the marginal value of GOB lending on investment increases for unconstrained firms during the crisis relative to normal times, which is quite likely because the crisis makes such firms more constrained. However, for the firms that are already constrained, such firms may have little room to further increase investment, showing no additional effects during the crisis. [18]

In Panel C, we examine the incremental effect of GOB lending on high Q firms. Recall from Table 4 that GOB lending had a stronger effect on high growth firms, consistent with efficiency arguments. Here, we further investigate if this effect varies by credit constraints that a firm faces. First, the incremental effect of GOB and Q is positive and significant for all sub-samples except for the low leverage sub-sample, which provides a robustness test for our earlier results. Second, the incremental effect of GOB is greater on high growth firms for several cases, – for firms with high RZ index, the incremental effect is 0.67 versus 0.55 for low RZ firms. Similarly, we find larger incremental effects for high leverage and low Z score firms.

In contrast, for non-keiretsu and small firms, we observe opposite effects where the incremental effect is lower for large and keiretsu firms. However, the total effect of GOB lending is still larger for non-Keiretsu firms and small firms, while the incremental effect for high growth firms is lower. For example, for the non-Keirestu firms, the unconditional effect of GOB lending is 0.71 and the incremental effect is 0.51, leading to a total incremental effect to be close to 1.2 that is much higher than that for Keiretsu firms.

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[18] Virtually all the results in Panels A and B in Table 4 have been replicated using a single regression using interaction variables for combined sub-samples As we find consistent results, we choose a sub-sample presentation for the ease of interpretation. We apply Hausman test to investigate the statistical differences between the coefficients for different subsamples.

4.3.4 Impact of GOB lending on stock price performance

To further examine whether the increases in investments are efficient from a shareholder's perspective, we examine abnormal stock returns for firms that experience increases in GOB lending in a given year. We use the calendar time-based regression approach to estimate abnormal return of firms that receive increases in GOB lending. Because we cannot observe the announcement date of the loan, we assume end of June of each year as the event date since most Japanese firms have fiscal-year-end at end-March and accounting information from the previous fiscal year should be available by end-June. For each month, we form a portfolio consisting of all firms that participated in the event within the previous 1 year (3 years). We calculate the one month value-weighted (VW) and equally weighted (EW) returns for the portfolio and repeat this for each month. Finally, we regress each vector of one-month returns on the monthly Fama-French factors and examine the intercept.[19]

The results are reported in Panel A and B in Table 7. We find that none of the intercepts (alpha) is significantly negative, suggesting that the shareholders are not negatively impacted by increases in GOB lending. For the value weighted portfolio, we find positive abnormal returns from 0.3% to 0.7% in three of the four regressions, whereas for the equally weighted portfolio, the abnormal returns are generally zero. This suggests that larger firms derive greater benefits of increases in GOB lending.

4.4   Employment

In this subsection, we examine the effect of GOB lending on employment growth, using the following empirical model.

Employment Growth$_{i,t}$=α Government Owned Bank$_{i.t}$ + βX$_{i,t}$ + γF$_{i,t}$ + v$_i$ + u$_t$ + e$_{i,t}$ (2)

Suffix *i* refers to firm *i* and *t* refers to fiscal year *t*. The dependent variable is the growth of total employees from previous year. Vector X consists of non-financial factors including size, sales growth,

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[19] For June of each year from 1977 to 1997, we sorted all the stocks listed on the Tokyo Stock Exchange, excluding those of financial companies, into two groups according to the market value of their equity (small [S] and big [B]); we also classified them into three groups (low [L], medium [M], and high [H]) on the basis of their book-to-market ratios. We formed six portfolios (S/L, S/M, S/H, B/L, B/M, and B/H) from the intersections of the two size groups and the three book-to-market groups. We calculated monthly value-weighted returns on the six portfolios from July of year t to June of year t + 1 and rebalanced the portfolios in June of year t + 1. Our SMB portfolio equaled the monthly difference between the simple average returns on the S/L, S/M, and S/H portfolios and the simple average returns on the B/L, B/M, and B/H portfolios.

cash flow, ROA, and wage. Vector F consists of financial factors that include book leverage, "Government Owned Bank", and the interaction term between crisis dummy and "Government Owned Bank". The control variables are motivated by prior literature on firm-specific determinants of employment (see Nickell and Nicolitsas, 1999, Sharpe, 1994). Similar to the investment equation (Equation 1), v_i is the firm fixed effect that controls for firm level heterogeneity, u_t is the year fixed effect, and $e_{i,t}$ is the idiosyncratic error.

Table 8 reports estimates from regressing employment on government owned bank loan dummy and various control variables. Model (1) in Table 8 shows that the coefficient on the "government owned bank" is positive and significant, suggesting that firms that receive increase in GOB lending hire more people than non-supported firms. The coefficient estimate in Model (1) suggests that an increase in the GOB lending of 1% of the firm's capital results in an increase of approximately 0.13% for employment growth. In contrast to the investment results (Table 3), the estimated coefficients on interaction term between "government owned bank" and crisis dummy is insignificant, suggesting that there is no incremental effect for government owned bank lending during crisis period.

Other control variables have signs consistent with prior literature. For example, Sharpe (1994) showed that leverage is an important determinant of employment, as firms with high risk of financial distress are likely to reduce employment growth. Consistent with this argument, we find higher leverage is associated with lower employment growth. In Model (1) we also find that size and sales growth have positive and significant effects on employment. Following Nickell and Nicolitsas (1999), we also control for cash flow, ROA, and wage. We find firms that have higher cash flow and ROA have higher employment growth. We also find a negative coefficient on the wage variable, which implies higher staff costs reduce a firm's incentive to hire.

Similar to the investment equation, we examine the impact of an increase in government owned bank lending on employment growth by stratifying firms that experience a decrease in PB lending (Model 3) and those that do not (Model 4). In contrast to the investment results, the firms that experience a decrease in PB lending do not have any incremental employment effects during the crisis.

In fact, the marginal effect of GOB lending on employment is greater for firms do not experience a decrease in PB lending.

Next, we examine the incremental impact of GOB lending by stratifying firms into constrained and unconstrained firms. We present the results in Table 9. We find that the unconditional impact of GOB lending for constrained and unconstrained firms is similar in magnitude, in contrast to the large differences observed for investment (see Panel A). Also, consistent with the results in Table 6, the marginal impact of GOB lending during the crisis is insignificant for almost all the measures with the exception of leverage and Z-score size.

The above suggests that employment growth is not significantly enhanced by GOB lending, in contrast to other literature that shows significant effects (Carvalho, 2010). One conjecture on the cause of these results is that the Japanese firms (at least in this period) practiced lifetime employment policies, due to which the incremental impact of GOB lending during the crisis is insignificant. However, we leave investigation of this question to future research.

4.5 Endogeneity of increases in GOB lending

One concern about the empirical results documented so far is that the increases in GOB lending may be endogenous to firms' capital investment or employment growth. In particular, GOBs may target firms that are perceived to have higher employment growth, or have higher investment to capital ratio. Evidence based on countries other than Japan showed that GOBs tend to lend to distressed and constrained borrowers. However, if GOBs in Japan have screening and monitoring ability similar to private banks, our results might reflect better selection ability of GOBs. However, some of our findings do not necessarily support this hypothesis. For example, the univariate statistics in Table 1 suggest that GOBs in Japan increase lending to lower Q, higher leverage, lower cash flow firms, lower cash, lower Z score firms, which are observably more credit constrained. Further, the multivariate evidence generally supports the role of GOB lending in mitigation of credit constraints. To examine the endogeneity problem, and to rule out the effects of selection ability, we use two

approaches – namely propensity score matching and GMM estimation using the Arellano-Bond estimator to address selection problem and reverse causality concern.

4.5.1 Propensity score matching to account for endogeneity

We account for endogeneity in the increase in GOB lending by means of propensity score matching, a methodology proposed by Heckman (1990) and Heckman, Ichimura and Todd (1997). In this approach, each firm that receives an increase in GOB lending (treatment group) is matched with another firm that was equally likely to have received an increase in GOB lending, but in fact did not (the control group). The differences for the key variables (i.e., investment and employment growth) in the two samples would reflect the treatment effect of an increase in GOB lending.

In the first stage, a logistic regression is conducted to compute the underlying probability of being in the treatment group. Next, each observation in the treatment group is matched to another set of observations that are in the control group that have an approximately equal likelihood of being in the treatment group as the given observation itself, where the probabilities are based on covariation with observable variables in this regression. In our model, for the first stage regression, we use firm size, leverage, sales, ROA, size of GOB loans in the previous year, industry and year dummy variables as predictors of a given firm's likelihood of receiving an increase in GOB lending. Some of these variables are also used in the investment and employment growth equations (Equations 1 and 2).

We include the Amakudari as an additional determinant in the first stage regression. "Amakudari" is a practice to employ retired bureaucrats on the board of directors of Japanese private and public corporations. Because retired bureaucrats can provide a channel to access critical information within the government, "Amakudari" is viewed as a subtle area of contact between the government and the private corporations. Consistent with this conjecture, prior studies document that "Amakudari directors" help the firms to predict the government actions and facilitate transaction with government (see Raj and Yamada, 2009; Horiuchi and Shimizu, 2001), which provide foundation for the argument that "Amakudari" can proxy for the strength of the connection between government and firms. As politically connected firms are more likely to be funded, we might expect that firms with more

"Amakudari directors" are able to get increases in lending from government owned banks. Meanwhile, we can reasonably expect that there should be no direct relation between "Amakudari" and firm investment (employment). Thus, we argue that "Amakudari" can be viewed as good instrument for government owned bank lending that should be positive related to increases in GOB lending, but not directly impacting firm investment or employment. We use the fraction of directors relative to the total number of directors to account for the fact that larger boards may have larger number of ex-bureaucrats.

Note that the propensity score matching does not require the presence of additional variable that is uncorrelated with the investment, as the method assumes that the selection of treatment group is based on observable characteristics. Using propensity scores to construct a matched sample of treatment and control group observations, we calculate average differences between these two set of observations for employment growth and investment to capital ratio. The results are reported in Table 10, which shows separate results for the entire period and for the crisis period. For the entire sample, we find that firms that receive an increase in GOB lending have both greater investment to capital ratio and employment growth compared to the control sample by 0.017 and 0.9%, respectively. A similar result holds during the crisis, where the magnitude of the effect for investment is significantly larger than the overall sample.

4.5.2 Arellano Bond estimation

Lastly, we further apply the Arrellano-Bond estimation method (1991) to rule out the potential biases caused by the endogenous variables. The Arrellano-Bond (1991) GMM estimator allows for more flexibility in specifying which variables are to be taken as endogenous or truly exogenous and to assign appropriate instruments to endogenous variables. Moreover, the qualities of all the designations can be tested by different standard tests and we can evaluate whether the variables of interest are independent of the error term. The Arrellano-Bond (1991) method also enables us to take into account the possible auto correlation in the dependent variables.

We designate firm size as truly exogenous and Tobin's Q in previous year as predetermined. As most of other independent variables can be potentially jointly determined with investment or employment structure, we use a conservative approach and designate all other independent variables as being endogenous. We use these variables, lagged 3 to lagged 6 periods, as instruments. We also include "Amakudari" as an additional IV in the estimation.

The stability of our regression is evaluated in four tests. First, we test whether the idiosyncratic disturbance is auto correlated at the second lag following Arrellano and Bond (1991). This test enables us to justify the number of order in auto correlations. If the second order autocorrelation is significant, the second lagged value of endogenous variables cannot be viewed as instruments because the error terms will be correlated with the instruments. In such a case, we have to use the third lagged value of the endogenous variables as instruments. Second, we examine the Hansen J-statistic of over identification restrictions for all instruments. A significant J-statistic indicates improper instrumentation for endogeneity. Third, we conduct test for the exogeneity of firm size, Tobin's Q and 'Amakudari.' Lastly, we test for the exogeneity of difference of the additional instrumental variables. We report the results of the four tests discussed here in a row titled "regression diagnostics" and indicate each test is passed using "a," "b," "c," and "d" in Table 10. Consistent with earlier multivariate results, we find that an increase in GOB lending effectively stimulates firm investment and employment. For the investment regression, we find that the effect of GOB lending is significant only during crisis period. For employment, we find an insignificant result during the crisis, but a significant result in normal times, similar to the panel regression results. The regression diagnostics suggests that the instruments are valid as J-statistic for all instruments and additional instruments are all insignificant.

4.5.3 Summary of results from endogeneity corrections

The results of this section broadly support the notion that GOB lending has positive effects on investment. The results using the Arellano-Bond method suggest that the incremental effect for investment exists only during the crisis, whereas the propensity score matching suggests that the GOB

lending effects exist both during crisis and normal periods. Taken together with our earlier panel regression results, the above results confirm that investment is positively impacted by GOB lending both during crisis and non-crisis periods, with strong evidence for incremental effects during crisis periods.

For employment, our results using the propensity score matching method imply that there is GOB effect on employment during the crisis, whereas the Arellano-Bond method does not indicate an incremental effect. However, the results using the propensity score matching method imply there are effects both in crisis and non-crisis periods. Therefore, the two different methods of endogeneity correction show no clear differences in the effect of GOB lending on employment between crisis and normal times

5 Conclusion

Using Japanese firm-level data that cover the period of the Japanese financial crisis in the 1990s, we examine the determinants of GOB lending and their effects on corporate investment and employment. Compared with previous studies that examined the impact of GOBs in emerging markets, where GOBs often dominate the banking sector, our study examines a market where GOBs co-exist with a developed private banking sector. During financial crisis, private banks are often plagued by adverse incentives, such as hoarding liquidity, that cause the contraction of corporate lending and increase credit rationing. It is well documented that Japanese commercial banks extended loans to otherwise financially insolvent firms (i.e., zombie firms) to avoid realizing losses on their balance sheets during the financial crisis. As Japanese GOBs (during our observation period) are statutory institutions that are not subject to the same capital requirements and accounting standards as private banks, they are free from such adverse incentives. Therefore, we might expect GOBs to play a complementary role as "lender of last resort," during financial crisis. Yet, GOBs can be still influenced by political incentives.

Our findings shows that GOBs increase lending during crisis periods, particularly for firms that are more likely to face financial constraints, rather than support otherwise financially insolvent firms.

Our tests further show that GOB lending has a positive and significant effect on investment during the crisis, for more credit constrained firms, and for firms with higher growth prospects. Further, such firms appear to have positive stock market performance. This shows that lending by GOBs can enhance efficiency of the firm's investment by mitigating credit constraints. In contrast, we find relatively small incremental effects of GOB lending on employment growth, both during crisis and non-crisis periods.

There are a few caveats in understanding our results. To the extent that publicly traded firms have access to several sources of financing, the results of this study are likely to provide a lower bound on the potential benefits of GOB loans. On the other hand, Japanese GOBs are likely to possess lending technologies that are similar to private banks. Therefore, our results might differ from direct government loans such as those provided using TARP by the US government to operating companies during the financial crisis. Further, to the extent that many companies in Japan have an implicit lifetime employment guarantee for their employees, the findings here are likely to understate the benefits of lending by GOBs in other economies such as the US where employers do not typically have such implicit guarantees for employment. Lastly, since we do not have the terms of the loans provided by government owned banks, we are unable to examine whether the strong economic effects that we document are due to subsidized rates of these loans. Despite such caveats, our study provides strong evidence of positive real impacts of GOB loans on firm activity, which appears that government, at least in the context of Japan, achieves the general social objective of GOB lending, namely increases investment and employment.

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Appendix - Definitions of variables

All variables are obtained from the Nikkei Needs database, except for the market value of equity, the stock return, and the Amakudari variable. The source of the data items is provided in their respective definitions.

Book Leverage: Total Debt divided by Total Asset (FB067). Total Debt is defined as the sum of the following data items: We classify total debt into short term and long term. We define short term debt as the sum of the following: Short Term loans, bank overdraft and due loan within a year (FB074), Commercial Paper (FB075), Long term debt that matures within one year (FB076), Corporate Bonds and Convertible Bonds redeemable within one year (FB077), and Derivative Debt (FB0159). We define long term debt as the sum of the following data items: Corporate Bonds and Convertible Bonds with maturity more than one year (FB098), Long Term Loan (FB101) and Unconsolidated affiliate long term debt (FB102).

Book to Market: The ratio of Book Value of Common Equity (FB126) in the previous fiscal year to Market Value of Common Equity (6 Month after filing date). Book Value of Common Equity is the sum of Book Common Equity and Deferred Taxes (FE019).

Cash Flow: Net Income before extraordinary items and depreciation (FC029), scaled by capital (FB032) in the previous year.

Cash by Asset: Amount of Cash available (FB003) scaled by Total Assets (FB067).

Capital: Tangible Fixed Asset (FB032).

Crisis: A dummy variable that takes a value of 1 for observations in years 1990-1994.

Employment: Total Number Employees including part time employees of the firm at the end of the year (FE056).

Investment: Changes in Tangible Fixed asset (FB032) plus depreciation (FE011).

No. Amakudari/ No. Directors : The ratio of the number of Amakudari Directors to the total number of directors in the firm at the end of the given year. An Amakudari director is one who is a retired government bureaucrat appointed to the board of the company. The source of this data is Kigyo Keiretsu Soran published by Toyo Keizai.

Quick Ratio: Ratio of current asset (FB068) to current liabilities (FB121).

Rajan and Zingales (RZ) ratio: Investment minus cash flow from operations divided by capital expenditures. We first estimate the sum of the difference between investment and cash flow for each firm during the whole sample period (Investment – Cash flow). Then, we divide this total difference by the total investment by the given firm over the entire period. We compute the median of this ratio for all firms in the industry as the RZ ratio for the given firm. As computed above, positive values represent industries with high external finance requirements and negative value show industries that do not depend on external finance.

ROA: Net Income (FC051) divided by Total Asset (FB067).

Sales Growth: Sales in current year – Sales in previous year, scaled by the sales in the previous year. Data item for Sales is FC001.

Government owned bank: The net increase in government owned bank loan outstanding to a firm in the given year relative to the previous year divided by the total capital (FB032) in previous year. The total loans outstanding for government owned bank in each year is given by total lending by all institutions with financial institution code 299999, which corresponds to total lending by all government financial institutions.

Stock Return: Annual return over the fiscal year, computed using PACAP data for the common equity of the firm.

Tobin's Q: the Market Value of Assets scaled by their replacement values. It is computed by taking the sum of Market Value of Common Equity, Value of preferred Stock (FB123), Long term debt, Short Term debt minus Current Assets, divided by Total Assets. See

Total Asset: Total Asset (FB067)

Wage: Labor Expenses (FE087) divided by total number of employees (FE056).

Z Score: 3.3* Earnings before Interest and Taxes (FC051)/Total Assets (FB067) +1.2*(Current Asset (FB001) - Current Liability (FB121)) / Total Assets (FB067) +0.6* Market Value of Equity / Book Value of Total Liabilities (FB121) +1.4* Retain Earnings (FC059)/ Total Asset (FB067)+0.999* Sales (FC001)/ Total Assets (FB067).

Table 1

Summary Statistics

Panel A reports the summary statistics of key variables for all observations during whole sample period. Panel B reports the summary statistics of variables for firm year observations with increases in government owned bank lending. Panel C reports the summary statistics of variables for firm year observations without increases in government owned bank lending. Investment is defined as changes in tangible fixed asset plus depreciation divided by total capital in the previous year. Government Owned Bank is defined as the net increase in government owned bank loan outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. Employment growth is the change in the total number of employees divided by number of total employees in the previous year. The sample period is from 1977 to 1996. Details of variable definitions are stated in the appendix. ***, ** and * indicate statistically significant at 1%, 5% and 10% level respectively.

Panel A – Overall Sample

	N	Mean	Std	25%	50%	75%
Investment	20441	0.085	0.182	-0.017	0.044	0.135
Employment growth (%)	20110	0.3	6.8	-0.24	0.15	2.89
Government Owned Bank	20110	-0.0003	0.0218	-0.002	0	0
Total asset($\times 10^2$ Billion)	22009	1.805	4.489	0.207	0.467	1.270
Cash flow	20441	0.330	0.634	0.075	0.188	0.404
Book leverage	22009	0.280	0.182	0.139	0.261	0.402
Cash by asset	22009	0.144	0.085	0.085	0.130	0.186
Sales growth	20441	0.057	0.164	-0.017	0.045	0.109
Tobin's Q	19076	1.009	0.788	0.559	0.834	1.229
Wage(million)	22009	2.785	2.224	1.187	2.056	3.779
Government Owned Bank Loans /Total loans	19992	0.0674	0.1420	0.0000	0.0072	0.0661
Z score	21890	2.6989	1.8149	1.6868	2.3116	3.1488
ROA	22009	0.021	0.027	0.009	0.019	0.034
Quick Ratio	22009	1.571	0.974	1.054	1.280	1.738

Table 1(continued)

Panel B – Observations with increase in government owned bank loan

	N	Mean	Std	25%	50%	75%
Investment	3350	0.110	0.181	0.012	0.070	0.150
Employment growth (%)	3350	0.5	6.5	-2	0.17	2.3
Government Owned Bank	3350	0.026	0.031	0.005	0.013	0.034
Total asset($\times 10^2$ Billion)	3350	4.117	7.402	0.367	1.082	4.037
Cash flow	3350	0.212	0.319	0.038	0.117	0.286
Book leverage	3350	0.381	0.185	0.238	0.373	0.520
Cash by asset	3350	0.115	0.066	0.067	0.109	0.155
Sales growth	3350	0.068	0.157	-0.004	0.047	0.107
Tobin's Q	3032	0.930	0.630	0.562	0.820	1.138
Wage(million)	3350	2.982	2.452	1.193	2.103	4.085
Government Owned Bank Loans /Total loans	3350	0.155	0.173	0.038	0.093	0.215
Z score	3341	2.069	1.189	1.318	1.880	2.556
ROA	3350	0.016	0.021	0.007	0.014	0.025
Quick Ratio	3350	1.243	0.508	0.961	1.144	1.408

Panel C – Observations without increase in government owned bank loan

	N	Mean	Std	25%	50%	75%
Investment	17091	0.081	0.182	-0.022	0.037	0.131
Employment growth (%)	16760	0.3	6.9	-2.4	0.1	3.0
Government Owned Bank	16760	-0.006	0.015	-0.003	0.000	0.000
Total asset($\times 10^2$ Billion)	18659	1.38	3.58	1.93	4.22	10.41
Cash flow	17091	0.353	0.676	0.086	0.204	0.425
Book leverage	18659	0.262	0.175	0.123	0.244	0.378
Cash by asset	18659	0.149	0.087	0.088	0.134	0.191
Sales growth	17091	0.055	0.165	-0.019	0.044	0.109
Tobin's Q	16044	1.024	0.813	0.558	0.838	1.248
Wage(million)	18659	2.750	2.179	1.184	2.050	3.724
Government Owned Bank Loans /Total loans	16642	0.050	0.128	0.000	0.001	0.036
Z score	18549	2.812	1.884	1.761	2.391	3.262
ROA	18659	0.022	0.028	0.009	0.020	0.035
Quick Ratio	18659	1.629	1.024	1.072	1.314	1.810

Table 1 (continued)

Panel D – Differences between firms with increases in Government Owned Bank lending and other firms

	Difference in Mean	Difference in Median
Investment	0.030***	0.033***
Employment growth (%)	0.2***	0.07***
Government Owned Bank	0.032***	0.013***
Total asset(×10² Billion)	2.72***	0.66***
Cash flow	-0.141***	-0.087***
Book leverage	0.119***	0.129***
Cash by asset	-0.033***	-0.026***
Sales growth	0.013***	0.003***
Tobin's Q	-0.094***	-0.017***
Wage(million)	0.232***	0.052***
Government Owned Bank Loans /Total loans	0.105***	0.092***
Z score	-0.75***	-0.510***
ROA	-0.006**	-0.006**
Quick Ratio	-0.387***	-0.169**

Table 2

The determinants of increases in Government Owned Bank Lending

The dependent variable in column (1) in Panel A equals 1 if there is an increase in government owned bank loan outstanding to a firm in the given year relative to the previous year. The dependent variables in column (2), Panel A, and all specifications in panel B, is Government Owned Bank which is defined as the net increase in government owned bank loan outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. All panel B regressions include control variables from specification (2) of panel A which are not reported. Crisis is a dummy variable that takes a value of 1 for observations in years 1990 to 1994. The sample period for this table is from 1988 to 1996 due to the availability of zombie measure. See Appendix for a detailed definition of all variables. Standard errors are corrected for within-firm clustering and T statistics are reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10 %level respectively.

Panel A

	(1) PROBIT	(2) OLS
Crisis	0.277***	0.004***
	(8.504)	(11.313)
Cash flow $_{t-1}$	-0.458***	-0.001**
	(-4.656)	(-2.410)
Sale growth $_{t-1}$	0.108	0.001
	(1.356)	(1.092)
Size $_{t-1}$	0.252***	0.000
	(13.232)	(1.405)
Book leverage $_{t-1}$	1.599***	-0.003
	(10.186)	(-1.625)
ROA $_{t-1}$	4.850***	0.018**
	(5.163)	(2.109)
Keiretsu	0.058	-0.002***
	(0.963)	(-3.731)
Zombie	-0.084	0.001
	(-0.724)	(0.465)
High RZ ratio	0.172***	0.001***
	(3.182)	(2.977)
N	12264	12264

Panel B

	(1)	(2)	(3)	(4)
Crisis× Cash flow $_{t-1}$	-0.0004			
	(-0.119)			
Crisis× Book leverage $_{t-1}$		0.009***		
		(3.885)		
Crisis× High RZ ratio			0.001	
			(1.006)	
Crisis× Zombie				-0.004**
				(-2.405)
N	12264	12264	12264	12264

Table 3

Government Owned Bank Effect on Investment

The dependent variable is the investment for firm i at year t, adjusted by the industry's median investment in that year. All regressions include year, firm dummies and constant term. Investment is defined as changes in tangible fixed asset plus depreciation divided by total capital in the previous year. Government Owned Bank is defined as the net increase in government owned bank loan outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. Crisis is a dummy variable that takes a value of 1 for observations in years 1990 to 1994. The sample period is from 1977 to 1996. See Appendix for a detailed definition of all variables. Standard errors are corrected for within-firm clustering and T statistics are reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10 %level respectively.

	(1)	(2)	(3)	(4) Private bank lending decreases	(5) Private bank lending does not decrease
Government owned bank	0.973***	0.862***	0.839***	0.548***	0.942***
	(8.840)	(6.938)	(6.835)	(3.984)	(5.454)
Government owned bank ×Crisis dummy		0.536**	0.510**	0.591**	0.356
		(2.575)	(2.427)	(2.021)	(1.240)
Tobin's Q_{t-1}	0.031***	0.031***	0.031***	0.025***	0.032***
	(6.169)	(6.220)	(6.531)	(3.735)	(4.253)
Cash flow	0.081***	0.081***	0.074***	0.092***	0.065***
	(5.609)	(5.615)	(4.975)	(3.347)	(4.808)
Book leverage			-0.064**	-0.147***	-0.005
			(-2.550)	(-4.674)	(-0.144)
Size			0.059***	0.045***	0.067***
			(6.584)	(3.806)	(4.539)
ROA			0.270**	0.184	0.583***
			(2.445)	(1.063)	(3.503)
N	17629	17629	17629	8246	9383
adj. R-sq	0.090	0.091	0.099	0.161	0.098
Firm and Year fixed effect	YES	YES	YES	YES	YES

Table 4

Government Owned Bank Effect on Investment Sensitivity to Q and Cash flow

The dependent variable is the investment for firm i at year t, adjusted by the industrial median investment in that year. Investment is defined as changes in tangible fixed asset plus depreciation divided by total capital in the previous year. Government Owned Bank is defined as the net increase in government owned bank loan outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. Crisis is a dummy variable that takes a value of 1 for observations in years 1990 to 1994. Other Controls that are not reported in these regressions, but included in the estimation are :"Government owned bank", Tobin's Q, Cash flow, Book leverage, ROA and Size. In model 3, we also include "Government owned bank× Crisis dummy" and "Tobin's Q× Crisis dummy" respectively as controls. In model 4, we include "Government owned bank× Crisis dummy" and "Cash flow× Crisis dummy". All regressions include year dummies, firm dummy and a constant term. The sample period is from 1977 to 1996. Detailed variable definitions are provided in the appendix. Standard errors are corrected for within-firm clustering and. T statistics are reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level respectively.

	(1)	(2)	(3)	(4)
Government owned bank × Tobin's Q_{t-1}	0.670***		0.760***	
	(8.318)		(7.231)	
Government owned bank × Tobin's Q_{t-1} × Crisis dummy			-0.278	
			(-1.643)	
Government owned bank × Cash flow		-0.585***		-0.520***
		(-5.364)		(-4.584)
Government owned bank × Cash flow× Crisis dummy				-0.366
				(-0.891)
Other Controls	YES	YES	YES	YES
N	17629	17629	17629	17629
adj. R-sq	0.102	0.100	0.103	0.101
Firm and Year fixed effect	YES	YES	YES	YES

Table 5

Government Owned Bank Effect on Investment: Zombies versus Non-Zombies

The dependent variable is the investment for firm i at year t, adjusted by the industrial median investment in that year. Investment is defined as changes in tangible fixed asset plus depreciation divided by total capital in the previous year. Government Owned Bank is defined as the net increase in government owned bank loan outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. Crisis is a dummy variable that takes a value of 1 for observations in years 1990 to 1994. The definition of zombies in column (1) and (2) follows Caballero et.al (2008). In columns (3) and (4), we define construction, wholesale, retail sale, real estate and service industry as zombie industries. All regressions include year dummies, firm dummy and a constant term. The sample period is from 1990 to 1996. Detailed variable definitions are provided in the appendix. Standard errors are corrected for within-firm clustering and. T statistics are reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level respectively.

	(1)	(2)	(3)	(4)
	Non- Zombies	**Zombies**	**Non- Zombie Industry**	**Zombie Industry**
Government owned bank	0.607**	5.215	0.802***	0.280
	(2.292)	(0.693)	(2.844)	(0.590)
Government owned bank ×Crisis dummy	0.743**	-4.777	0.645*	0.811
	(2.390)	(-0.702)	(1.940)	(1.411)
Cash flow	0.082***	0.035***	0.158***	0.044**
	(3.167)	(3.132)	(4.006)	(2.124)
Q	0.027***	-0.057	0.013	0.039**
	(2.679)	(-0.917)	(1.471)	(1.990)
N	7176	517	5748	1945
adj. R-sq	0.134	-0.017	0.129	0.092
Firm and Year fixed effect	YES	YES	YES	YES

Table 6

Government Owned Bank Effect on Investment for financially constrained firms

The dependent variable is the investment for firm i at year t, adjusted by the industrial median investment in that year. Investment is defined as changes in tangible fixed asset plus depreciation divided by total capital in the previous year. Government Owned Bank is defined as the net increase in government owned bank loan outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. Crisis is a dummy variable that takes a value of 1 for observations in years 1990 to 1994. Other Controls in Table 2 are used in all estimations but not reported to conserve space. The sample period is from 1977 to 1996. Detailed variable definitions are provided in the appendix. We apply Hausman test to investigate the differences between coefficients for sub-samples. Standard errors are corrected for within-firm clustering and .T statistics are reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level respectively.

Panel A –Overall effect

	Keiretsu	Non-Keiretsu	Low RZ	High RZ	Low Leverage	High Leverage	Low Z score	High	Small firm	Large Firm
Government owned bank	0.691***	1.209***	0.726***	1.197***	0.518***	1.076***	1.045***	0.742***	1.474***	0.631***
	(8.440)	(15.151)	(8.315)	(15.543)	(4.161)	(16.342)	(13.344)	(8.087)	(13.571)	(9.758)
Other Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	4356	13100	8756	8873	8502	9127	8177	9452	8064	9565
adj. R-sq	0.098	0.104	0.089	0.111	0.129	0.113	0.093	0.141	0.109	0.119
Firm and Year fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constraint-Unconstraint	0.518***		0.471***		0.558***		0.303***		0.843***	

Panel B – Effect of GOB during crisis

	Keiretsu	Non-Keiretsu	Low RZ	High RZ	Low Leverage	High Leverage	Low	High	Small firm	Large Firm
Government owned bank	0.571***	1.129***	0.582***	1.143***	0.285	1.047***	1.070***	0.490***	1.450***	0.493***
	(3.322)	(7.124)	(3.699)	(6.266)	(1.594)	(6.857)	(6.008)	(3.016)	(11.766)	(6.853)
Government owned bank ×Crisis dummy	0.611**	0.370	0.686**	0.259	1.333***	0.134	-0.129	1.139***	0.109	0.690***
	(2.178)	(1.264)	(2.148)	(0.950)	(3.574)	(0.561)	(-0.467)	(3.355)	(0.421)	(4.316)
Other Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	4356	13100	8756	8873	8502	9127	8177	9452	8064	9565
adj. R-sq	0.100	0.105	0.090	0.111	0.131	0.113	0.093	0.143	0.109	0.121
Firm and Year fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constraint-Unconstraint	0.558***		0.561***		0.762***		0.58***		0.957***	
Constraint-Unconstraint (Interact terms)	-0.241***		-0.427**		-0.427***		-1.268***		-0.581***	

Panel C – Effect of GOB on high growth firms

	Keiretsu	Non-Keiretsu	Low RZ	High RZ	Low Leverage	High Leverage	Low	High	Small firm	Large Firm
Government owned bank	0.090	0.710***	0.362***	0.476***	0.295	0.509***	0.365***	0.273**	1.192***	0.085
	(0.728)	(5.499)	(2.841)	(3.608)	(1.504)	(5.027)	(2.719)	(2.045)	(6.386)	(0.877)
Government owned bank × Q	0.869***	0.512***	0.554***	0.674***	0.266	0.662***	0.881***	0.517***	0.249*	0.797***
	(6.487)	(4.924)	(3.933)	(6.728)	(1.473)	(7.360)	(6.226)	(4.840)	(1.861)	(7.554)
Other Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	4356	13100	8756	8873	8502	9127	8177	9452	8064	9565
adj. R-sq	0.107	0.106	0.091	0.116	0.129	0.119	0.097	0.143	0.110	0.125
Firm and Year fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constraint-Unconstraint	0.620***		0.114***		0.214		0.092***		1.107***	
Constraint-Unconstraint (Interact terms)	-0.357***		0.120		0.396***		0.364***		-0.548***	

Table 7

Impact of Government Owned Bank Lending on Firm Performance

Panels A(B) report the Calendar time-based regressions of one (three) year long-run stock return performance of firms that experience increases in government owned bank lending. Detailed variable definitions are provided in the appendix. ***, ** and * indicate statistically significant at 1%, 5% and 10%level respectively. T statistics are reported in parentheses.

Panel A: Abnormal returns (1 Year)

	Non-crisis period EW	Crisis period EW	Non-crisis period VW	Crisis period VW
Intercept	-0.0001	0.002	0.006***	0.003
	(-0.09)	(1.44)	(3.07)	(1.57)
RMRF	0.973***	1.04***	0.973***	1.008***
	(27.12)	(33.97)	(22.51)	(27.03)
SMB	0.549***	0.347***	-0.174***	-0.196***
	(13.36)	(6.61)	(-3.35)	(-3.07)
HML	0.076	-0.146	-0.002	-0.181
	(1.414)	(1.16)	(-0.03)	(-0.12)
N	168	60	168	60
adj. R-sq	0.839	0.96	0.77	0.92

Panel B: Abnormal returns (3 Year)

	Non-crisis period EW	Crisis period EW	Non-crisis period VW	Crisis period VW
Intercept	0.0001	0.002	0.007***	0.003*
	0.09	(1.35)	(3.89)	(1.67)
RMRF	0.992***	1.039***	0.987***	1.006***
	(29.29)	(36.43)	(25.81)	(28.06)
SMB	0.568***	0.363***	-0.198***	-0.185***
	(14.15)	(7.43)	(-4.27)	(3.02)
HML	0.086*	-0.134	0.0205	-0.005
	(1.60)	(1.15)	(0.33)	(-0.04)
N	168	60	168	60
adj. R-sq	0.85	0.97	0.82	0.94

Table 8

Government Owned Bank Effect on Employment Growth

The dependent variable is the employment growth for firm i at year t, adjusted by industrial median employment growth. The definition of employment includes temporary employee and full time employees. Government Owned Bank is defined as the net increase in government owned bank loan outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. Crisis is a dummy variable that takes a value of 1 for observations in years 1990 to 1994. The sample period is from 1977 to 1996. Detailed variable definitions are provided in the appendix. Standard errors are corrected for within-firm clustering and .T statistics are reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level respectively.

	(1)	(2)	(3) Private bank lending decreases	(4) Private bank lending does not decrease
Government owned bank	0.133***	0.151***	0.101**	0.154***
	(5.261)	(5.009)	(2.206)	(3.471)
Government owned bank ×Crisis dummy		-0.090	-0.002	-0.152
		(-1.464)	(-0.020)	(-1.526)
Book leverage	-0.055***	-0.055***	-0.072***	-0.043***
	(-6.093)	(-6.071)	(-5.642)	(-3.405)
Size	0.012***	0.012***	0.011**	0.011***
	(4.032)	(4.065)	(2.568)	(2.755)
Sales growth	0.058***	0.058***	0.050***	0.058***
	(9.374)	(9.361)	(5.868)	(7.135)
Cash flow	0.012***	0.012***	0.016***	0.010***
	(4.380)	(4.379)	(4.079)	(2.851)
ROA	0.284***	0.285***	0.233***	0.401***
	(7.778)	(7.792)	(4.180)	(6.827)
Wage	-0.009***	-0.009***	-0.009***	-0.009***
	(-7.086)	(-7.060)	(-4.924)	(-5.027)
N	20110	20110	9443	10667
adj. R-sq	0.189	0.189	0.221	0.189
Firm and Year fixed effect	YES	YES	YES	YES

Table 9

Government Owned Bank Effect on Employment Growth by firm characteristics

The dependent variable is the employment growth for firm i at year t, adjusted by industrial median employment growth. The definition of employment includes temporary employee and full time employees. Government Owned Bank is defined as the net increase in government owned bank loan outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. Crisis is a dummy variable that takes a value of 1 for observations in years 1990 to 1994. Detailed variable definitions are provided in the appendix. Other control variables used in Table 6 are used in the estimation but not reported to conserve space. The sample period is from 1977 to 1996. We apply Hausman test to investigate the differences between coefficients for sub-samples. Standard errors are corrected for within-firm clustering and .T statistics are reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level respectively.

Panel A

	Keiretsu	Non-Keiretsu	Low RZ	High RZ	Low Leverage	High Leverage	Low	High	Small firm	Large Firm
Government owned bank	0.137***	0.125***	0.136***	0.127***	0.053	0.151***	0.127***	0.129***	0.144***	0.115***
	(4.409)	(4.813)	(4.973)	(4.400)	(1.444)	(6.081)	(4.759)	(4.118)	(4.330)	(4.735)
Other Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	4578	15342	10438	9672	9985	10125	9814	10296	9892	10218
adj. R-sq	0.141	0.204	0.213	0.166	0.226	0.184	0.189	0.215	0.197	0.197
Firm and Year fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constraint-Unconstraint	-0.012		-0.009		0.098***		-0.002		0.029	

Panel B

	Keiretsu	Non-Keiretsu	Low RZ	High RZ	Low Leverage	High Leverage	Low	High	Small firm	Large Firm
Government owned bank	0.137***	0.150***	0.168***	0.133***	0.059	0.175***	0.150***	0.128***	0.160***	0.133***
	(2.855)	(3.895)	(4.089)	(3.000)	(1.210)	(4.489)	(3.583)	(2.938)	(4.280)	(4.940)
Government owned bank ×Crisis dummy	-0.003	-0.120	-0.166*	-0.029	-0.036	-0.115	-0.120	0.004	-0.076	-0.095
	(-0.035)	(-1.576)	(-1.804)	(-0.355)	(-0.393)	(-1.537)	(-1.336)	(0.041)	(-0.944)	(-1.556)
Other Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N	4578	15342	8769	8860	9985	10125	9814	10296	9892	10218
adj. R-sq	0.141	0.205	0.117	0.097	0.226	0.184	0.189	0.215	0.197	0.197
Firm and Year fixed effect	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Constraint-Unconstraint	0.013		-0.035**		0.116***		0.022*		0.027	
Constraint-Unconstraint (Interaction term)	-0.117		0.137		-0.079		-0.124		0.019	

Table 10

Propensity score matching

These tables provide estimates of the mean difference for the employment growth and investment to capital ratio. We compute propensity scores by matching firms that receive more loans from government owned banks with firms that do not. We use a probit model to calculate the scores. The dependent variable is "government owned bank dummy", which take 1 if a firm records increases in government owned bank loan outstanding. The independent variables are as follows: logarithm of total asset, Book Leverage, ROA, Tobin's Q, industry dummy variables based on 2-digit primary TSE code, and year dummy variables. We also include "Amakudari" as an additional variable in first step. "Amakudari" is defined the number of Amakudari director scaled by the total number of directors in the board. Details of variable definitions are stated in the appendix. Estimators are nearest neighbor matching using n non-support firms (NEAR NEIGHBOR) for all estimations; we present the sample averages of yield spread differences. We report t-ratios in parentheses, which are calculated using standard errors that are computed by bootstrapping with 50 replications. ***, ** and * indicates significantly different than zero at 1%, 5% and 10% level, respectively.

Panel A

A (treatment group)	Firms that received an increase in government owned bank lending	
B (control group)	other firms	
Investment to Capital ratio		
Estimator(A-B)	Whole period	Crisis period
NEAR NEIGHBOR(n =5)	0.017**	0.016***
	(2.50)	(2.60)
NEAR NEIGHBOR(n =10)	0.013***	0.042**
	(3.14)	(2.45)
Employment growth		
Estimator(A-B)	Whole period	Crisis period
NEAR NEIGHBOR(n =5)	0.009***	0.004*
	(3.04)	(1.88)
NEAR NEIGHBOR(n =10)	0.010***	0.007**
	(3.66)	(2.22)

Table 11

Arellano – Bond GMM Estimators

This table reports the results of Arrellano and Bond (1991) estimation for the effect of government owned bank lending on investment as well as employment growth. A specification includes the letter "a" if the idiosyncratic disturbance is not autocorrelated at the second lag at the 1% level, following Arrellano and Bond (1991). A specification includes the letter "b" if the Hansen J statistic of overidentifying restrictions is not significant at the 1% level. A specification includes the letter "c" if the additional instruments have a Hansen statistic that is not significant at the 1% level, A specification includes the letter "d" if the difference of additional instruments has a Hansen statistic that is not significant at the 1% level. consistent with a failure to reject their being exogenous. The sample period is from 1977 to 1996. Detailed variable definitions are provided in the Appendix. ***, ** and * indicates significantly different than zero at 1%, 5% and 10% level, respectively.

	Investment	Employment
Government owned bank	0.359	0.492*
	(0.578)	(1.791)
Government owned bank × crisis	1.746**	-0.236
	(2.112)	(-0.718)
Lagged.1 Dep. Var.	-0.046	0.186**
	(-0.925)	(2.123)
Tobin's q(t-1)	0.098***	
	(4.737)	
Cash flow	0.063***	0.005
	(6.853)	(0.960)
Book leverage	-0.312	0.022*
	(-1.490)	0.091
Size	0.016***	(1.073)
	(2.645)	(0.759)
ROA	-0.041	0.711***
	(-0.102)	(3.657)
Sales growth		0.074**
		(2.036)
Wage		-0.015**
		(-2.319)
N	9479	9206
Regression Diagnostics	a,b,c,d	a,b,c,d
Instruments	Lag 3-6 and Amakudari	Lag 3-6 and Amakudari
Year Fixed Effects	YES	YES

Figure 1
Capital Investment and Employment Growth.

Investment is defined as changes in tangible fixed asset plus depreciation divided by total capital in the previous year. The definition of employment includes temporary employee and full time employees. The following graph plots the median value of investment and of employment growth for each year for publicly traded firms in our sample.
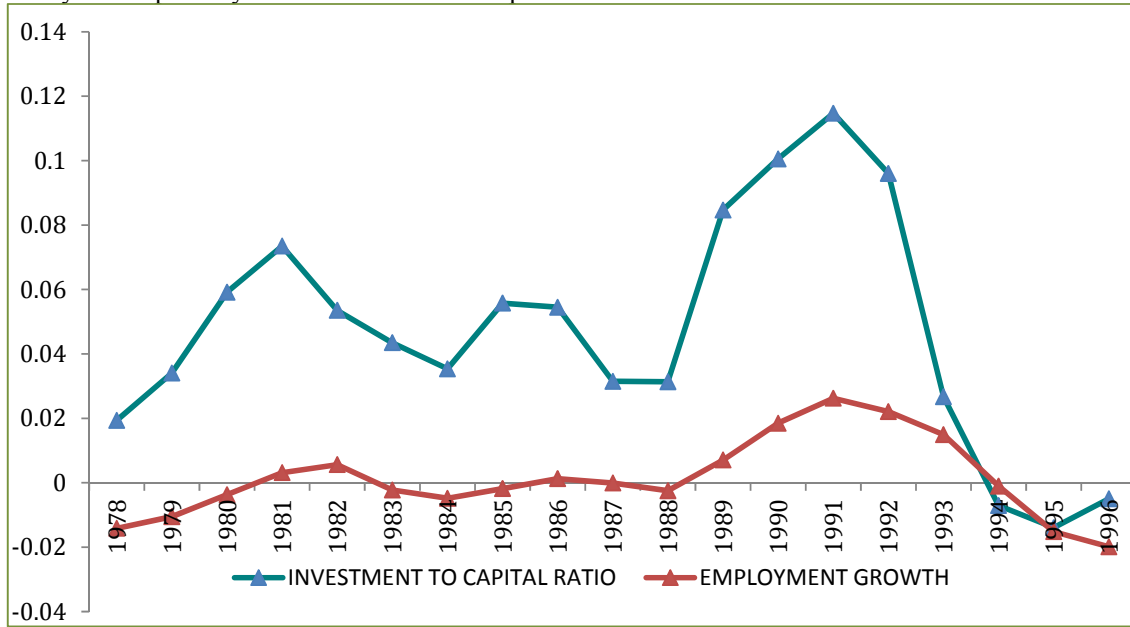

Figure 2
Government Owned Bank Lending and Private Bank Lending

Aggregate corporate loan outstanding from private banks and government owned banks during 1979 to 1996 in for Japan. Source: Flow of Funds, The Bank of Japan.
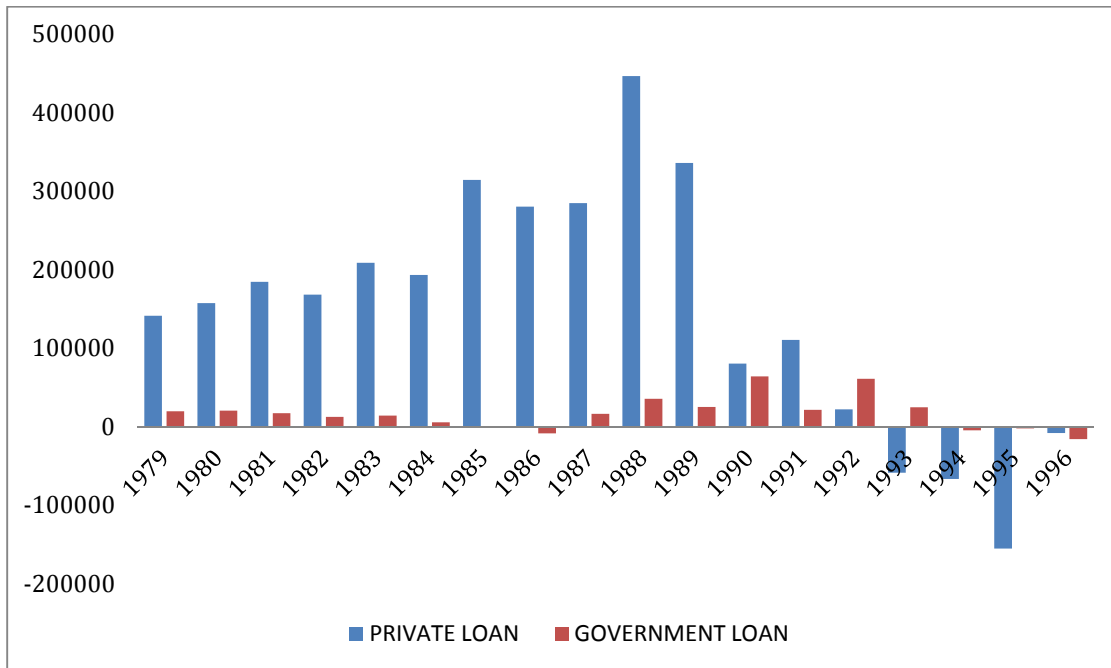
49

Figure 3
Time series patter of Government Owned Bank lending
This figure plots the time series pattern of increases in government owned bank lending (mean value million Yen) of the firm (right axis) and the total number of firms in a given year that receive an increases in GOB lending based on our data sample of publicly traded firms. .
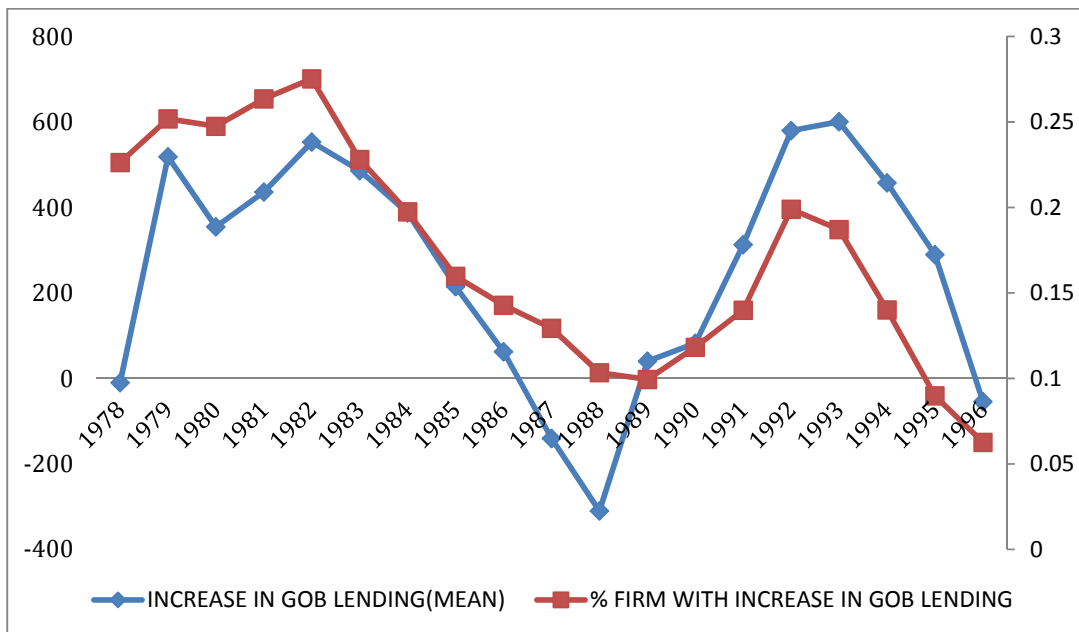
Figure 4
Government Owned Bank loan and Private Bank loan

Corporate loan outstanding from private banks and government owned banks for listed firms in our sample.
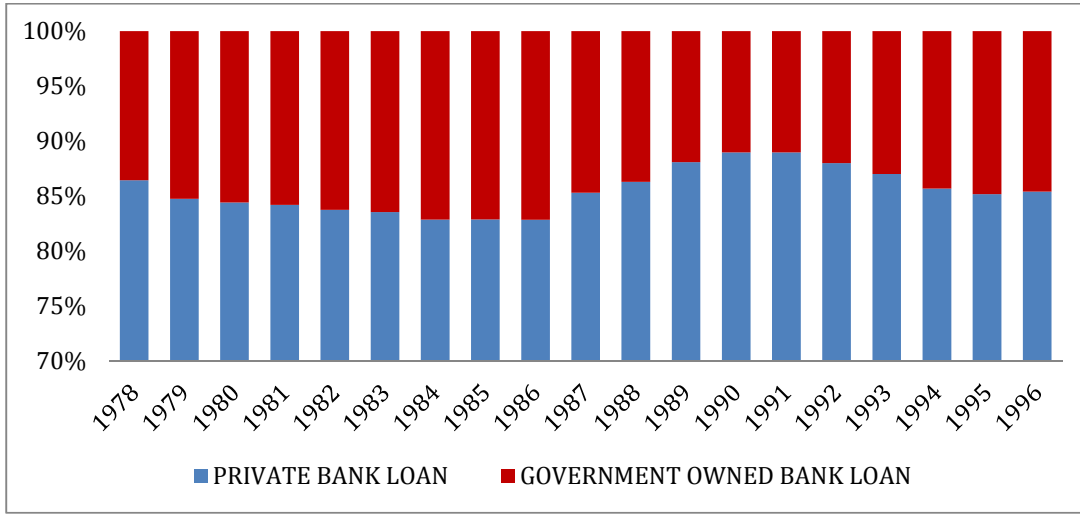

Figure 5
Correlation between Government Owned Bank lending and Private Bank Lending

The following graph depicts the cross-sectional correlation between increases in lending from government owned banks loans and increases in lending by private banks for publicly traded firms in our sample.