Government Bank Lending and Corporate Investment During a Crisis: Evidence from Japan

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Abstract

This paper investigates the effect of direct lending by government owned banks (GOBs) on corporate investment for publicly traded industrial firms in Japan, during the financial crisis in the1990's. We find that increases in GOB lending during the crisis have a strong incremental impact on investment. Higher Q and higher ROA firms have a higher response to government lending. Crisis investment by such firms results in better future performance over the next 3 years. GOB lending also mitigates credit constraints for borrowers whose main bank is exposed to zombies and improves their future performance. Connections to government do not drive the results. Our results show that direct intervention by GOBs during crises can be effective in stimulating positive value creating corporate investment during a crisis.

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1. Introduction

There is a large literature showing that a credit crunch during financial crisis can have serious and long-lasting consequences on the real economy (Dell'Ariccia et al, 2008). A standard crisis policy response of governments is to recapitalize financial institutions (Laeven and Valencia, 2013). However, as an alternative, a government may also stimulate the real economy by direct lending through government banks. As many countries in the world have banking systems where government owned banks (henceforth, GOBs) have large share of the total lending, it is important to understand GOBs lending during a crisis is effective in mitigating the negative effects of such crises.

In theory, GOB lending can have beneficial social effects by correcting market failures (Stiglitz, 1993). Alternate theoretical views are that GOB lending exists to serve political interests (Shleifer and Vishny, 1994) or that poor incentives among GOB employees may cause GOB lending to be inefficient, notwithstanding a social goal (Banerjee, 1997). Prior empirical studies of GOB lending find that it is associated with poorer economic outcomes and this is usually attributed to political and/or social objectives of such lending (La Porta et al., 2002; Sapienza, 2004; Dinç, 2005; Cole, 2009; Carvalho, 2014, Fotak and Lee, 2000). At the same time, Andrianova et al. (2012) finds that the results in La Porta et al. (2002) are sensitive to empirical specification. They find that controlling for institutional quality reverses the result – countries with higher share of GOB lending have higher growth.

Focusing specifically on crisis lending, Mankiw (1986) and Bebchuk and Goldstein (2011) theoretically show that a policy where the government directly supplies credit to the real sector during a crisis can have large beneficial effects. This suggests that GOB lending due to a crisis may result in positive benefits on account of the higher cost of external finance during a crisis. On the other hand, the above-mentioned political and agency factors may be exacerbated in a crisis due to a lack of oversight as well as the immediate need to act. This may result in even

greater misallocation and inefficiency of GOB lending in a crisis period relative to a normal period.

Empirically, Chen et al. (2016) find support for the positive effects of GOB lending using country-level data – countries with higher government lending during the crisis show higher macroeconomic growth. However, this result is only obtained for countries with higher institutional quality. What could explain such increases in growth? We propose that increases in government lending can stimulate corporate investment, which can be one channel for an increase in overall economic growth. We examine this question by studying GOB lending during a financial crisis, focusing on Japan between 1990 and 1993 and its effect on firm-level investment for publicly listed firms. The crisis in Japan was caused by the burst of a bubble in real estate as well as the stock market. It led to a banking crisis as well as a stagnant economy. Private banks curtailed lending significantly. In response, government banks increased the percentage of long-term funding they supplied to the private sector from 2% in 1989 to 30% in 1993. This increase in GOB lending during the crisis had a strong impact on investment for our sample of listed firms. Our baseline result is that firms that receive an increase GOB lending during the crisis increase investment by ¥0.64 for every 1 Yen increase in lending relative to firms that do not receive any increase in GOB lending during the crisis.[2]

Although we observe a positive correlation between GOB lending and corporate investment during a crisis, GOBs might select healthy firms that are able to invest even during the crisis. Thus, this correlation might be due the selection decision of the GOBs. To address this, we compare firms that received increased GOB lending during the crisis to firms that did not. We find that firms where GOBs increased lending during the crisis had lower cash flow, higher leverage, lower Q and lower ROA relative to other firms where GOB's did not increase their

[2] Our estimation focuses on the marginal value of an increase of 1 Yen in GOB lending during the crisis. Unless otherwise stated, this is the primary parameter of interest. In our empirical estimation, we normalize increases in GOB lending as well as investment by lagged total assets.

lending. This indicates that GOBs were not cherry-picking firms with lower financial constraints or better performance. Nonetheless, to establish the causal effect of increased GOB lending on investment, we take the following approaches.

First, we add a dummy variable for increases in GOB lending (an extensive margin) along with the dollar value of increase (an intensive margin). If GOBs were selecting unobservably better-quality firms, the intensive margin effects should be close to zero after controlling for the extensive margin selection effects. The extensive margin effects, while statistically significant, are close to zero suggesting that selection effects are economically unimportant. The effect of GOB lending after controlling for extensive margin effects is ¥0.62, which is very close to the baseline effect of ¥0.64. Second, we examine this effect for the sub-sample of firms that already had a relationship with GOBs prior to the crisis. Within this sub-sample, any selection effects should not be prevalent. Using both methods, we find estimated effects between ¥0.62 to ¥0.67 of GOB lending during the crisis. Lastly, we use propensity score matching to match each firm that obtained an increased in GOB lending during the crisis with another firm was equally likely to have received in increase in GOB lending but did not. We find much higher estimates of the impact of GOB lending with this method.

Our previous results show that government lending stimulated corporate investment. However, this does not imply that the resulting investment is value-enhancing for the firm or for the macroeconomy. If the increased investment were motivated by political concerns and/or political connections of the business, this implies that firms with better performance should not display a higher response to government lending during the crisis. Second, if the increase in investment during the crisis were driven by governmental pressure, this implies that crisis investments should lower future firm performance.

To test the above two arguments, we employ two approaches. First, we stratify firms along past performance and future growth options. We find that firms with higher growth options

measured by Tobin's Q, as well as higher past performance measured by ROA, showed a higher investment response to GOB lending during the crisis. Next, we examine the future performance (measure by the future 3 year average ROA) of firm investment during the crisis. If the investment were inefficient, this should lower future ROA. We find that crisis investment increases the future ROA for high Q and high past performance firms. During the crisis, firms that are ex-ante efficient have a higher investment response to GOB lending, and the investment by such firms leads to higher future performance. Taken together, these two results provide strong evidence that the investment induced by government lending during the crisis was not inefficient.

As an additional test of efficiency, we stratify firms in terms of the exposure of their main bank to zombie firms. If the main bank of a firm is exposed to zombie firms and becomes financially distressed, the relationship firm should also become financially constrained as the bank is likely to become tighter in extending additional loans.[3] To construct the zombie measure, we use the methods developed in Hoshi and Kashyap (2010). Once this is done, we compute each bank's exposure to zombie firms and classify banks with a high exposure to zombie firms as troubled banks. Lastly, we identify the main bank of the borrower and classify it based on its zombie exposure. We classify firms as financially constrained if their main banks are troubled, and as financially unconstrained if their main banks are healthy. Thus, the financial constraint measure provides an additional exogenous exposure to the financial crisis. Constrained firms during the crisis are doubly constrained – first due to the crisis and second due to the poor health of their main bank. We find that firms with troubled relationship banks invest ¥0.93 more in response to increased GOB lending during the crisis relative to firms with healthy relationship banks. Furthermore, this investment results in a higher ROA of 0.4% on

[3] This is because banking relationships in Japan are long lasting and it is uncommon for firms to switch main banks (Uchida et al.,2008). Shikimi (2019) and Ogane (2023) also highlight the importance of relationships.

an annualized basis, which is an economically significant increase compared to the median ROA of 2.12% in our sample. Thus, the results using firm-level measures of credit constraints also suggest that the investment during the crisis is not inefficient.

Lastly, one possible explanation for our results is that government connections drive both higher investment response to government bank lending and results in higher future profitability. Firms well connected to the government may obtain better support in terms of lending by GOBs as well as obtain contracts from the government. The investment (enabled by more GOB lending) and greater contracts from the government results in better long-term profit. To examine if such might be the case, we collect additional data on firms that had retired government bureaucrats on their board as a proxy of political connection. In the Japanese context, this practice is named "Amakudari." As an additional variable control, we also employ a dummy if the firm receives government contracts. If government connections drive our results, our main result should reduce once these variables are included as additional controls. We find that our baseline results of GOBI are not impacted at all by the inclusion of either Amakudari or government business. In one specification, Amakudari has a positive effect on investment. However, neither Amakudari nor governmental business is a significant determinant of future profitability. Thus, in the Japanese context for the crisis we study, government connections do not drive our results.

To summarize, our study on crisis lending by GOBs adds to the literature that documents *positive* effects of such lending. As mentioned before, using cross-country data, Chen et al. (2016) document the beneficial effect of government lending during the GFC for the macroeconomy. At a micro level, Kong et al. (2025) and Shi and Li (2025) find positive effects in China, Susamto et al. (2024) for Indonesia, and Luong et al. (2020) find positive effects of government-guarantee schemes in Australia. However, unlike the above studies, we focus on corporate investment. Carvalho (2014) examines the effects of GOB lending on firm-level

investment in Brazil. He finds strong evidence on political incentives influencing firm-level investment. However, he does not study crisis lending by GOBs, which is the focus of our study.

Our results of a positive effect of government lending during a crisis are in stark contrast to the voluminous literature demonstrating negative effects of governmental involvement in the banking industry. The largely adverse effects of GOB lending in past literature are attributed principally to political factors. In contrast, our findings suggest that Japan was effective at stimulating value creating investment during a crisis. While an analysis of the underlying causes for this difference is not feasible using a single country setting, higher institutional quality (Keefer and Knack, 1995) and/or lower corruption (Mauro, 1995) in Japan may have allowed Japanese GOBs to be more effective in crisis lending. Higher trust during a crisis is critical, given the importance of trust in lending markets (Fotak et al., 2023). Our results on the high multiplier effect of GOB lending reflect the importance of trust by other suppliers of capital. Thus, our results are more likely to apply to other developed countries with high levels of institutional quality and low levels of corruption. At the same time, the actions we envisage may not be feasible for all countries as sovereigns themselves may be subject to credit constraints (Hasan et al., 2023).

Our results also contribute to potential crisis mitigation mechanisms for lending markets. Bank recapitalization is typically employed to avoid systemic failures and consequent real effects. Yet, this can have negative effects in terms of moral hazard (Marisetty and Shoeb, 2024). In contrast, direct lending by governments to the corporate sector avoids the moral hazard problems in the financial sector. Several studies also document the negative impact of policy and economic uncertainty on corporate investment. Chen et al. (2020) show the long-run effects of economic policy uncertainty in Australia. Jin et al. (2025) demonstrate this for a

sample of eighteen European countries. We show that direct government lending is an effective tool to mitigate such effects.

The remainder of this paper is organized as follows: Section 2 provides institutional details of 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 presents our main empirical analysis of the impact of GOB lending on corporate investment during the crisis. Section 5 examines the efficiency of crisis investment by firms. Section 6 concludes with directions for future research.

2. Institutional Details of the Japanese Banking Market

2.1 The Japanese Financial Crisis of the 1990's

From 1984 to 1989, the Japanese capital markets and the real economy expanded rapidly. The Nikkei 225 Stock Index level was around 10,000 in 1984 and reached a peak level of 38,916 on December 29, 1989. Similarly, the land price index rose rapidly during the late 1980s. Meanwhile, private investment also expanded dramatically. The business press has extensively referred to this period as a bubble period. Concerned with overheating in the asset markets, the Bank of Japan increased the official discount rate and imposed limits on the growth of commercial bank lending to real estate-related projects. These policies resulted in significantly tighter credit market conditions. As a consequence, both stock and real estate prices fell sharply during 1990-1992.

The Nikkei 225 Stock Index started to fall in early 1990, falling almost 50% from the peak and reaching 20,222 by October 1, 1990. Large declines followed this in real estate prices. This deflation in asset prices severely damaged the collateral value and caused the Japanese economy to contract significantly (Gan, 2007; Goyal and Yamada, 2004). Concerned with the potential for default risk, private banks in Japan reduced or suspended their lending, imposing

a significant negative impact on bank loan supply.[4] According to a survey by the Japanese Banking Association, private banks suspended 6,956 transactions for firms with capitalization over 1 million yen in 1989. In 1992, this number reached as high as 15,854, which was more than twice the number of suspensions in 1989.

Meanwhile, macroeconomic evidence suggests GOBs stepped in and provided funds to fill in the financing gap during the crisis period. Figure 1 compares aggregate private lending and GOB lending to the Japanese private non-financial sector, using the flow of funds data from the Bank of Japan. This figure shows a large net increase in GOB lending after 1990, as private lending decreased sharply during the crisis. This suggests that GOBs 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 the total annual long-term funds in 1989 to more than 30% in 1993.[5]

To complement the macroeconomic data, we plot a similar figure for GOB lending for our data sample. Figure 2 shows the time series pattern of the increase in GOB lending, both in terms of the number of firms and the magnitude for listed non-financial corporations. We find that there is a 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 throughout the crisis.

We define the period from 1991 to 1994 as the crisis period, since industrial production growth slowed markedly from 4.04% in 1990 to 1.80% in 1991, and further to negative growth in 1992 (-6.04%) and 1993 (-3.76%), before a weak recovery to 0.92% in 1994. (See Figure 1.) We define the period from 1995 to 1997 as the post-crisis period since the production growth in 1995 increased to 2.95% and the economy temporarily recovered until 1997, after

[4] A suspension is defined as non-renewal of an existing loan contract.
[5] Long term funds include equity, long term bonds and long-term bank debt.

which the growth turned negative again in 1998 at -6.98%.[6] The growth in production is also consistent with the recovery of capital investment that started in 1995.

We exclude the data after 1996 in our main empirical tests to avoid any confounding effects of recapitalization of Japanese banks in the late 1990's and the effects of restructuring of the GOBs, which started in 1998. Particularly, the recapitalizations of private banks by the government should have decreased funding constraints at private banks, and in turn, their borrowing firms. Giannetti and Simonov (2013) show that, if capital injections were large enough, they had positive real effects on private bank lending and firm investment, as capital injections to banks decreased financial constraints in the private banking sector.

2.2 Government-Owned Banks in Japan

Japan has various types of government banks that provide loans to different sets of borrowers.[7] These government banks, which do not take deposits from the public, have received most of their funds from the Fiscal Investment and Loan Program (FILP) during our sample period. The FILP had been mainly funded by the postal savings and insurance systems until 2000.[8] Similar to the general accounting budgets of the government, the Ministry of Finance proposed budgets for the FILP.

The GOBs supply long-term credit to firms whose projects are regarded as essential for economic development (Horiuchi and Sui, 1993). The Ministry of International Trade and

[6] The increase in the consumption tax rate from 3% to 5% and the termination of the special tax reduction program in 1997 are considered major factors that killed the nascent economic recovery, which started in 1995.
[7] 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).
[8] FILP is no longer funded by the postal savings system since 2001. It is financed by issuing bonds that are considered equivalent to government bonds.

Industry (MITI) actively recommends potential borrowers to these government-owned banks.[9] For example, Japan Development Bank and Export-Import Bank were established to provide long-term loans to large firms in industries that the Japanese 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 mainly aiming to provide credit for firms that might have difficulty receiving loans from private banks. There are also a few government banks that were established to provide credit for the development of certain regions, such as the Hokkaido and Tohoku Development Corporation and the Okinawa Development Finance Corporation (See Imai, 2009).[10]

Although the GOBs provide credit in line with the Japanese Government's policy objectives, they are also very active in searching for business, can decide credit allocations 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 period by requiring financial and operational reports from their borrowers or consulting other private banks to obtain information. Due to the dominance of the private banking sector, the proportion of financing provided by GOBs is relatively small in terms of outstanding loans. Although the average value of GOB lending is around 15% of the total corporate borrowing from banks for our sample of listed non-financial firms (see Figure 3), we shall later show that the penetration of GOB lending is quite significant even among listed firms, with more than 50% of the firms having outstanding loans from the GOBs.

3. Data and Summary Statistics

3.1 Data and Key Variables

[9] MITI has been reorganized and changed its name to Ministry of Economics, Trade and Industry in 2001.
[10] The reorganization of Japanese government owned banks resulted in three banks (Development Bank of Japan, Japan Finance Corporation and Shoko Chukin Bank) and Japan International Cooperation Agency, as of 2008.

Our main sample consists of all listed companies in Japan, excluding financial institutions and utility companies. 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 that are outstanding from individual banks for each company at the fiscal-year-end. We obtain 16,685 firm-year observations with adequate loan information and stock price information from 1978 to 1996 for our main analysis.[11]

We identify nine major government-owned banks in Japan that supply credit to the publicly traded companies in our data sample. These banks are 100% owned by the Japanese government during our sample period. Our principal independent variable of interest (GOBI) is computed as the ratio of the net annual increase of the total amount of GOB loans to the total capital of the borrowing firm in the previous year. Total capital is defined as the total amount of tangible fixed assets of the firm. Specifically, if $TL_{i,t}$ is the total amount of outstanding GOB loans of a given borrowing firm' i' in year 't', and $K_{i,t}$ is the total capital of the same borrowing firm 'i' in year t, then $GOBI_{i,t}$ is defined as follows:

$$GOBI_{i,t} = \frac{TL_{i,t} - TL_{i,t-1}}{K_{i,t-1}}$$

Following prior literature on investment in Japan (Kang and Stultz, 2000; Goyal and Yamada, 2004), we define investment as the change in tangible fixed assets plus depreciation divided by total capital in the previous year. The variables used as controls in the empirical analysis are total assets (as a proxy for size), leverage, ROA, and cash flow. We also include the market to book ratio as a proxy for Tobin's Q. A detailed definition of all variables used is presented in the Appendix.

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

3.2 Summary statistics

Table 1 presents summary statistics for the key variables for our entire data sample. Table 1 Panel A shows that the average proportion of GOB loans to total borrowing is around 7.1%, suggesting that the market share of GOBs is small compared to that of private banks. However, from Panel B, we observe that 9,300 out of 16,865 firm-years record loans outstanding from GOBs, suggesting that the penetration of GOBs is broad (around 55.14%) in public firms. In addition, Panel B shows that the fraction of firms with increases in GOB lending, i.e., positive GOBI, goes from 10.85% (523/4822) in the pre-crisis period (1987-1990) to 15.73% (825/5244) in the crisis period (1991-1994), consistent with the notion that GOBs step in to mitigate the detrimental effects of the crisis. At the same time, even at the peak of the crisis, GOBs increased lending to fewer than 20% of publicly listed firms, which suggests that they were not indiscriminately increasing lending at the cost of loan quality. The long relationships they had with their borrowers, along with their deep penetration, may have enabled them to increase lending for firms without compromising lending standards.

Panel C shows the changes in firm fundamentals in the crisis and pre-crisis period. Most variables show changes that are consistent with distress – cash flow, ROA, and Q all reduce. We further split our sample into sub-samples of firms that receive increases in GOB lending and those that do not. We find that firms with positive values of GOBI tend to have greater leverage than other firms. These firms also have a lower cash flow to capital ratio (0.146 vs. 0.241) and a return on asset (0.016 vs. 0.022) during the pre-crisis period, which continues in the crisis post-collapse period as firms receiving increases in GOB lending have lower cash flow, higher leverage, and lower ROA. Thus, GOBs appear to be selecting firms that are poorer in all these metrics in the crisis period, as well as in the pre-crisis period, which provides preliminary evidence against cherry picking of good firms by GOBs.

Figure 3 plots the increase in GOB loans to our sample of publicly traded non-financial firms during our sample period. In contrast to the large aggregate change in GOB lending to the corporate sector in Figure 1, the share of GOB loans to total bank loans for publicly traded companies increases only by around 4% from 1991 to 1994 (the crisis period), which implies that the large increase in aggregate GOB lending was concentrated on SME's and private enterprises. In addition, it also suggests that GOBs were quite selective in increasing their lending to publicly traded firms.

In Figure 4, we compute the correlation between increases in GOB lending and increases in private bank lending in our sample for each year to examine if GOB lending substitutes for private bank lending. To the extent that GOBs seek to mitigate credit constraints on account of a reduction in private lending during the crisis, we should find a negative correlation, particularly during the crisis. We find that this correlation is strongly *positive* until 1987. The correlation falls dramatically during the bubble period (1984-1989), followed by negative correlations during the crisis. Such a pattern suggests a counter-cyclical policy of GOB lending, which is less prone to over-lending in the bubble period and substitutes private bank loans during the crisis. In sum, the univariate analysis suggests that an increase in GOB lending is associated with an increase in firm investment. We examine if this association can be causal in the next section.

4. Empirical Results

4.1 Effect of GOB Lending on Capital Investment

Our principal empirical tests examine the effect of increases in GOB lending on investment. Investment is defined as the change in tangible fixed effects of the firm after subtracting the industry median value of investment for all firms in the industry in the given year. This industry adjustment is motivated in part by the Japanese government's policies to

support certain industries (Hoshi and Kashyap, 2001).[12] Such policy induced investment changes should be reflected in the industry median. Therefore, taking the difference of the firm level investment and industry level investment should isolate the impact of firm specific factors. We use a specification based on the Q-theory of investment, where investment is a function of Tobin's Q ratio, which is augmented with internal cash flow (Fazzari et al., 1988). We also include other firm specific variables as well as year and firm fixed effects to account for unobservable time and firm level heterogeneity.

$$Investment_{i,t} = \alpha\, GOBI_{i,t} + \beta CF_{i,t} + \delta Q_{i,t-1} + \gamma F_{i,t} + v_i + u_t + e_{i,t} \quad (1)$$

In the above equation, suffix *i* refers to firm *i*, *t* refers to fiscal year *t,* v_i is the firm fixed effect and u_t is the year fixed effect. These effects account for aggregate firm level and time effects. As defined earlier, $GOBI_{i,t}$ is the net increase in outstanding GOB loans from the previous year scaled by the capital at the end of the previous year, $K_{i,t-1}$. By scaling by capital, we estimate the marginal increase in investment for a unit increase in the value of a GOB loan. The vector $F_{i,t}$ consists of firm specific financial variables, including total asset, leverage, and return on asset (ROA). Larger firms may be able to invest more due to economies of scale in investment and/or capital raising. In addition, they may be less subject to credit constraints. Similarly, high ROA firms may be able to invest more due to lower constraints as well as the fact that ROA may proxy for higher managerial ability to identify positive NPV projects. Firms with high leverage may be more constrained and therefore have lower investment. High Q firms have higher growth options and therefore, ceteris paribus, should invest more. Cash flow also proxies for firm level credit constraints and therefore should have a positive effect on investment. The appendix has a detailed definition of all variables used in the empirical analysis.

[12] For example, in the early 1990s, the Japanese Government considered the animation and cartoon industries as important export industries.

Table 2 reports the results for the baseline specification in Equation (1). The reported t-statistics and p-values are based on robust standard errors clustered at the firm level. All regressions, unless otherwise mentioned, have firm and year fixed effects. In Column (1) of Table 2, the estimated coefficient of GOBI is positive and significant at the 1% level, suggesting that an increase in GOB lending is associated with increased firm investment. Model 1 suggests that a ¥1 increase in GOB lending is associated with an increase in firm investment of ¥0.934. The coefficients on cash flow and Tobin's Q are positive and significant at the 1% level. This regression suggests that GOB lending is associated with increased investment, regardless of whether the given period is a crisis period or a non-crisis period.

As our principal interest lies in evaluating GOB effects during the crisis, we augment Equation (1) by interacting *GOBI* with the crisis dummy to examine the effect of increased GOB lending on corporate investment during the crisis relative to a normal period. Coleman and Feler (2015) use a similar identification strategy to examine the impact of government bank penetration on real economic activity, comparing crisis and post-crisis periods. Column (2) shows that the coefficient on GOBI interacted with the crisis dummy is positive and significant, suggesting that an increase in GOB lending has a greater impact on investment during the crisis. More specifically, an increase of one yen in GOB lending results in an increase of investment between ¥0.828 in a normal period and an additional impact of ¥0.622 during the crisis. These values are highly significant in economic terms. In Column (3), we examine the robustness of these results by including other control variables in the regression. The crisis effect of increased GOB lending is ¥0.637 for Model (3) which is very close to the estimate in Model (2).

It is possible that the marginal effect of other control variables also differs during the crisis. To account for this, we re-estimate the empirical specifications in columns (1)-(3) for the crisis years alone. The results shown in Columns (4)-(6), which show that GOBI remains positive

and significant in all models. As such, the total effect of GOBI on investment has a multiplicative effect during the crisis with ¥1 increase in GOB lending leading to ¥1.44-1.50 of investment during the crisis. This is also consistent with the total effect estimated from Columns (1)-(3), where one would need to add the *GOBI* and *Crisis*GOBI* coefficients. For example, the total effect of GOB lending during the crisis is 0.796+0.637 which is 1.433. Thus, during the crisis, ¥1 increase in GOB lending leads to ¥1.433 increase in investment, i.e., a multiplicative effect. If one were to use Model 6, the estimate is ¥1.447 for a ¥1 increase in GOB lending. Thus, the estimate is not very sensitive to other variables used and this implies that the marginal impact of other variables does not differ very much in the crisis and non-crisis periods.

Why should GOB lending lead to a multiplicative effect during the crisis? While not the focus of our study, one conjecture is that increase in GOB lending acts a signal that enable the firm to also raise capital from other sources – suppliers, private banks etc. It may increase the trust that these suppliers have on the firm's financial positive. Such trust is very valuable in lending markets (Fotak et al, 2023).

4.2. Selection Effect in GOB Lending

One direct interpretation of the above findings is that the estimated GOB effect might reflect the ability of the GOBs to select good firms that invest more. As analysed earlier, the univariate analysis suggests the opposite – that GOBs select firms that are observably having lower performance. Nonetheless, to rule out this explanation, we employ multiple approaches as follow.

4.2.1. Effects within a sample of firms with GOB lending

We first re-estimate the baseline regression in Table 2, adding a dummy variable for firms that receive an increase in GOB lending as well as its interaction term with the crisis. We include this binary variable along with the GOBI continuous variable, where the dummy variable captures the selection effect (the extensive margin), and the GOBI continuous variable should capture the intensive margin effect of GOB lending increases.

Table 3, Panel A presents the results of this analysis. We find some evidence of unconditional selection effect – Model (1) in this panel shows that the marginal increase in investment for the dummy variable for GOBI is 0.0109. However, relative to the effects we identified earlier, this is quite small. More importantly, the interaction of the GOBI dummy variable with the crisis is not significant, which suggests that the selection effect did not change during the crisis. The incremental effect of the interaction of GOBI and the crisis is highly significant economically. The incremental effect of GOBI during the crisis is 0.623 in this model is very similar to that value of 0.637 obtained in Model (3) of Table 2.

If GOBs were selecting fundamentally better firms, we should not observe a GOB effect in the intensive margin within the sub-sample of firms that have a pre-existing GOB relationship prior to the crisis. As a further validation, we re-estimate Model (1) using only the set of firms that had a GOB loan outstanding in the previous year (Models 2 and 3, Table 3A). In both cases, *Crisis*×*GOBI* is highly significant with similar magnitude as in Model (1). The above strongly suggests that selection effects in GOB lending do not drive the empirical results.

4.2.2. Propensity score matching

Second, we match non-positive GOBI firm-years to positive GOBI firm-years, based on the nearest neighbour matching of propensity scores. The matching begins with a probit regression at the firm level of a binary variable (indicating whether a particular firm-year receives a net increase in GOB loans) on firm characteristics. We include total asset, Tobin's

Q, ROA, book leverage, industry dummy, and year dummy variables as predictors in this regression. We confirm that firm-level covariates do not differ significantly from each other after the matching (results available on request). Table 3 Panel B presents the results of the estimation using the matched sample. We find that a positive incremental effect of GOB lending on firm investment during the crisis.

It is possible to argue that GOB selection was different in the crisis years relative to non-crisis years. To alleviate this concern, we match firms with positive and non-positive GOBI in the crisis years alone, i.e., each GOBI increase firm year during the crisis is matched to another firm that was equally likely to have had an increase in lending from the government during the crisis. Even for this sub-sample (Table 3 Panel C), we find that GOBI had a strong positive effect on investment during the crisis.

5. Efficiency of GOB lending

The previous section provided evidence that increases in GOB lending increases investment, particularly during the crisis period. In this section, we examine if the positive effect of GOB lending on investment is consistent with an efficient allocation of credit. Our tests are structured around two principles. First, if the investment induced by GOB lending during the crisis is efficient, it should have a positive (or non-negative) impact on future profitability of the firms. Second, the investment should have a higher impact on firms that are ex-ante efficient users of capital or have higher growth options. Third, to the extent that constrained firms may pass up positive NPV projects, the investment effect should be larger for firms that are more constrained. We will elaborate on each of these tests below.

5.1. Impact of crisis investment on future firm performance

First, we examine the future accounting performance of companies that increase investment due to an increase in GOB lending. To do this, we regress the future Return of Assets (ROA) and Return on Equity (ROE) of the firm on an interaction term between *GOBI* and *Investment*. Specifically, our empirical model is as follows:

$$ROA/ROE_{\,i,t+1\ to\ t+3} = \alpha\ Investment_{i,t} + \beta\ \ Investment_{i,t} * Crisis + \gamma F_{i,t} + v_i + u_t + e_{i,t} \qquad (2)$$

In the above equation, $ROA/ROE_{\,i,t+1\ to\ t+3}$ is the average of the ROA/ROE for firm i between years $t+1$ and $t+3$. If the investment during the crisis is inefficient, we should expect a negative coefficient for β. If the investment during the crisis has the same return as during a normal period, we should expect an insignificant coefficient for β. If the investment during the crisis delivers higher returns to the firm, this should result in a positive value for β.

What are the channels for each of the above? A negative value of β may be implied by politically motivated lending. For example, during the crisis, government may pressure corporations to increase investment and offer government loans as a carrot. Since these projects have negative NPV, this should lower the future profitability of the firm. On the other hand, the government banks may simply step in to mitigate credit constraints created due to the crisis. This would imply that corporations would only take positive NPV projects that they would have otherwise passed up. In this case, we would expect β to be insignificant. Crisis investment may even be potentially positive if the crisis results in firm exits in the sector and therefore lower market competition. We include a sectoral ROA and sectoral ROE in the given year as additional sector specific controls in Equation (2) relative to the controls employed in Equation (1). This allows us to capture the potentially heterogenous effect of the crisis on firm performance across industries.

The result, reported Table 4, shows a positive and significant coefficient on the interaction term *Crisis* × *Investment.* This suggests that the increase in investment during the crisis increased the future profitability of firms conducting this investment. The effect is

economically large. A 1¥ increase in investment in the crisis leads to an increase in future ROA by 0.53%. This is a large gain when considering the fact that the median ROA for firms in the pre-crisis period was 2.13%. Thus, investment during the crisis resulted in an increase in the ROA by 25% relative to its pre-crisis median level. This is consistent with firms being credit constrained and that the profitability of such investments being above that during normal times. One channel for such increased profit would arise for example due to industry fire sales which may enable investing firms to earn above normal profits. This provides the first piece of evidence that the investment during the crisis is efficient. For our future tests, we use future ROA as the primary measure of future firm performance as it is not impacted by firm leverage, which can potentially change during the crisis.

5.2 Tests of efficiency based on firm performance and growth prospects

As a second test of the efficiency of GOB lending, we conduct cross-sectional analysis using past firm performance (past ROA) and future growth options (Tobin's Q) to stratify firms. To the extent that firms have a higher past ROA and are thus more efficient, we expect that the investment response of such firms to be higher during the crisis as such firms are more likely to have the managerial expertise to identify and implement positive NPV projects. Higher Q should imply higher future growth prospects for the firm.

The above arguments have two implications. Higher performance and higher growth firms should have a higher investment response during the crisis to an increased in GOB lending. Furthermore, the investments by such firms during the crisis may also have a positive (or non-negative) long run profitability effect. To test this, we estimate Equation (1) for sub-samples based on median ROA and median Q. The results are presented in Table 5 Panel A. We find that higher ROA and higher Q firms have a strong positive response to GOBI during the crisis. In contrast, low ROA and low Q firms do not have any investment response. To check if these

investments results in higher future profit, we use a specification similar to Equation (2) for sub-samples based on median ROA and Q. We find investment during the crisis by high ROA and high Q firms have a strong positive effect on 3-year future ROA (Table 5, Panel B). Investments by low ROA firms has no impact on future performance, while investments by low Q firms does have a positive effect on future performance but the magnitude is lower than high Q firms.

5.3 Tests of efficiency based on Credit Constraints

As a third test to examine the causal effect of GOB lending on investment, we study the differential effect of increases in GOB lending for firms with different financial constraints during the crisis. Since these financial constraint measures as well as the crisis (which resulted in a sudden increase in constraints) are both determined prior to the crisis, this provides an alternate approach to determining the effect of increased GOB lending.

We use the unique institutional features of lending markets in Japan to construct our measure of financial constraints. It is well known that bank finance is among most important sources of financing for firms in Japan (Allen and Gale, 2000). Firms in Japan rely heavily on their relationship bank (Shikimi, 2019; Ogane, 2023). Using the above two facts, we create a variable for firm financial constraints based on the degree to which a firm's relationship banks have credit problems. To the extent that the firm's relationship banks themselves have constraints, this should also make the borrowing firm financially constrained, as firms cannot easily switch their main banks in Japan (Uchida et al., 2008). Thus, we construct a variable called *"Troubled Relationship Banks,"* based on the exposure of a firm's relationship banks to zombie borrowers.

After the onset of the Japanese financial crisis, it is well documented that Japanese private banks allocated credit to insolvent borrowers to keep them afloat, hoping that these borrowers

might turn around in the future. Further, by keeping zombie firms alive, banks hoped to prevent their regulatory capital ratios from deteriorating (Hoshi, 2000; Caballero et al., 2008). Therefore, when these relationship banks had a large exposure to zombie firms, it would have been difficult for another borrowing firm with the same relationship bank to obtain loans for new investment, making such firms financially constrained.

There are four steps in constructing the variable *Troubled Relationship Banks*. First, we classify each firm year between 1990 and 1996 in our sample as a zombie or non-zombie observation. Second, we obtain the exposure of each bank in each year to zombie borrowers. Third, we construct a weighted average of the zombie exposures of all relationship banks of a given borrower in each year. Fourth, we construct a dummy variable for high zombie exposure for each borrowing firm for each year.

For the first step, the classification of a firm as a zombie (insolvent borrower) follows the method suggested by Caballero et al. (2008). Specifically, we create a lower bound for interest that a firm should pay during a given fiscal year:

$$R^*_{i,t} = rs_{t-1} \times BS_{i,t-1} + 1/5(\sum_{j=1}^{5} rl_{t-1}) \times BL_{i,t-1} + rcb_{min\ last\ 5\ year\ ,t} \times Bond_{i,t-1} \qquad (2)$$

where rs is the short-term loan prime rate, BS is the short term loan outstanding, rl is the long term prime rate, BL is the long-term loan outstanding, rcb is the observed minimum coupon rate for convertible bonds, and Bond is the outstanding bonds. If the interest expenditure of the firm during that fiscal year is below the lower bound, this suggests that the firm is heavily subsidized by its banks. A firm year where the firm's interest cost is below its imputed lower bound is classified as a zombie firm year observation.[13] To implement the second step, for each bank *j* in year *t*, we define its zombie exposure as follows:

[13]As documented by Fukuda and Nakamura (2011), Caballero et al. (2008)'s measure could possibly classify a good firm as zombie firm, since a healthy firm's interest rate could be lower than the prime lending rate. In unreported tables, we modify the measure by Caballero et al. (2008) with two additional criteria. In particular, firms whose earnings before interest and taxes (EBIT) exceeded the hypothetical risk-free interest payments

$$Zombie\ Exposure_{j,t} = \frac{Total\ lending\ to\ zombie\ borrowers\ by\ bank\ j\ in\ year\ t}{Total\ \ lending\ by\ bank\ j\ in\ year\ t}$$

To implement the third step, for each borrowing firm *i*, we define *Relationship Bank Constraints*$_i$ as the mean value of the weighted average of its relationship bank's zombie exposure, where the weighting is the fraction of its lending of the borrower coming from a given bank as shown below.

$$Relationship\ Bank\ Constraints_i = \frac{1}{7}\sum_{t=1990}^{t=1996}\sum_{j=1}^{J}\frac{Borrowings\ by\ firm\ i\ from\ bank\ j\ in\ year\ t}{Borrowings\ by\ firm\ i\ from\ all\ banks\ in\ year\ t} \times Zombie\ Exposure_{j,t}$$

Finally, we define a firm year observation as having *'Troubled relationships banks'* if the measured value of *Relationship Bank Constraints*$_i$ is larger than its sample median, and having *'Healthy relationship banks'* if the measured value of *Relationship Bank Constraints*$_{i,}$ is less than its sample median.

We then use the specification in Equation (1) on sub-samples of borrowers with troubled and healthy relationship banks. The results are presented in Table 6 Panel A. Firms with troubled relationships invest ¥0.93 for a ¥1 increase in GOB lending during the crisis. In contrast, firms with healthy relationship banks do not increase their investment during the crisis in response to GOB lending. This provides evidence that increases in GOB lending aided constrained firms in increasing their investments during the crisis. As before, to complete the argument, we need to establish that the investments by firms that had troubled relationship banks are value increasing (or at least not value decreasing). To examine this, we estimate Equation (2) for sub-samples based on the health of the relationship bank. We find that investments by firms that had troubled relationship banks had a positive effect on future ROA but this is not the cases for firms with healthy relationship banks (Table 6, Panel B). It should

were excluded from being classified as zombies. In addition, those that were unprofitable and highly leveraged (higher than 0.5) and had increased their external borrowings were classified as zombies. However, our results remain the same using this alternative measure.

be noted that this effect is over and above any regular effect of investments. In other words, for firms that are not constrained, they are able to undertake any positive NPV projects and thus crisis investments do not result in any higher performance. In contrast, firms that are credit constrained become even more so during the crisis. Thus, they are likely to pass up positive NPV projects even more during this period. To the extent that GOB lending can mitigate this effect, this should result in a positive future performance effect.

5.4 Impact of Government Connections

Thus far, our results show that increases in government lending increase corporate investment, these increases are found primarily for firms with greater growth options, better past performance, or greater constraints. This leads to better future firm performance. One possible confounding factor is that better performing firms may have better connections to the government, which may lead to both more lending, and more contracts, from the government. Together, this may result in better future firm performance. To alleviate this concern, we employ two additional controls – namely the presence of retired bureaucrats on the board of directors of the firm and the firms that receive governmental contracts. These data are obtained from the Kigyo-Keiretsu Soran and Toyo-Keizai magazines. In the Japanese context, "Amakudari" is a practice to employ retired bureaucrats on the board of directors of Japanese private and public corporations. Because the retired bureaucrats can provide a channel to get access to critical information within the government, "Amakudari" is viewed as a connection between the government and the private corporations. Consistent with this conjecture, prior studies document that "Amakudari directors" help to bridge transactions between government and firms (Horiuchi and Shimizu, 2001). Also, it is important to note that the appointment of directors and the terms of directors are typically for terms of several years, hence, it is unlikely for firms to be able to immediately appoint retired directors in response to the financial crisis.

As a second control, we use a dummy variable of if the firms have any government business in the given firm year.

Due to data collection constraints, these data are only obtained for the years 1990-1996. We re-estimate Equations (1) and (2) adding these two variables as additional controls. If GOBI is proxying for government connections and lucrative government contracts, these variables should reduce the impact of GOBI on investment. Table 7, Panel A presents the results for the impact of Amakudari and Gbus on firm investment. Models (1) and (2) show that both Amakudari and Gbus are individually insignificant. Neither the magnitude nor the statistical significance of GOBI is impacted by these variables. In Model 3, we include both variables together. In this case, Amakudari becomes statistically significant, but this does not impact the GOBI effect. In Panel B, we examine the impact of these two variables on the future performance of the firm. Both variables are insignificant. Thus, government connections do not impact future profitability which implies that the GOBI effect on investment that we document cannot be attributed to such connections.

5.5 Other Issues – Subsidies

Another concern may be that our GOB effects on investment are driven by the possibility that GOB loans are subsidized. An OECD study by Ford and Suyker (1990) suggests that the degree of subsidy of GOB loans relative to market rates in Japan was around 0.5% in 1987. Fukao (2003) also estimates a degree of subsidy for GOB loans to be 0.6% as of 2001. It should be noted that most of these subsidies are targeted at small and medium size enterprises.[14] Hanazaki and Hachisuga (1997) provide a summary of studies that examined the subsidy

[14] At the presentation of this work to the Ministry of Finance, Government of Japan, officials suggested that subsidies are even lower for publicly traded firms.

effects of Japan Development Bank lending, and report that the direct subsidy effects are relatively small.

To highlight this further, we collect data on cost of debt from public markets. OAn December 31, 1991, the 5 year Japanese Government Bond yield was 5.604% and the credit spread for a Baa rated firm in Japan was around 120 basis points.[15] If we assume that the GOBs lent funds to the corporate sector at the same rate as their cost of funds, the total subsidy on the loan would be the present value of the 120 basis points over the life of the loan. Since most bank loans are of durations less than 5 years, we assume that the GOB loans are also of a duration of 5 years. The present value of a subsidy of 120 basis points for this loan is approximately 4.63% of the loan value. Even if we assume that the government lent at a 200 basis point subsidy (i.e. below its cost of funds), the present value of the subsidy is approximately 7.5%. Thus, a subsidy that is far less than 1% on a 1¥ loan (empirical estimates above) or at most 7.5% based on hypothetical calculations above, is unlikely to lead to a stimulus in terms of investment of magnitude between 50%-66% of loan value that we find during the crisis.

6. Conclusion

Using Japanese firm-level data that cover the period of the Japanese financial crisis in the 1990s, we examine the impact of increases in government bank lending to mitigate private credit contraction, and their effects on corporate investment. Theory suggests the beneficial effects of direct government lending on the real economy when the state acts as "lender of last resort" during a crisis. Thus, GOB lending in Japan during the crisis had strong positive effects on the real economy via the channel of stimulating corporate investment. To the extent that publicly traded firms in our sample have access to several sources of financing, the results of

[15] Source: Bank of Japan and Japan Securities Dealers Association

this study are likely to provide a lower bound on the potential benefits of GOB loans during a crisis. This is in stark contrast to prior empirical literature during a normal period that suggests that GOB lending is largely motivated by political considerations.

As mentioned in the introduction, one conjecture for the difference in findings is on account of the better institutional structure and lower corruption in Japan relative to other countries where the negative effects of government led lending were found. Additionally, in the case of Japan, GOBs have a relatively long history and likely possess the same expertise in lending as private banks. As such, the strong positive GOB effect documented in our paper can be partially attributed to the special institutional structure in Japan. Despite this caveat, our study provides strong evidence of a positive real impact of GOB loans which achieves the general social objective of GOB lending, namely stimulating the efficiency-improving investment. Future research would examine more micro effects of GOB lending in countries with comparable levels of institutional development and low levels of corruption, which will shed light on the degree to which these results are generalizable.

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Table 1
Summary Statistics

Panel A reports the summary statistics of key variables for all observations during the entire sample period. Panel B reports the number of firm year observations with GOB loans outstanding and increase in GOB loans outstanding. Panel C reports the summary statistics of variables for firm year observations before and after the stock market collapse in 1991, those with increases in government owned bank lending, and observations without increases in government owned bank lending. *Investment* is defined as changes in tangible fixed assets plus depreciation divided by total capital in the previous year, adjusted by the industrial median investment in that year. *GOBI* is defined as the net increase in government owned bank loans outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. The sample period is from 1978 to 1996. Details of other 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	16865	0.219	0.207	0.097	0.175	0.284
GOBI	16865	-1.6E-05	0.0214	-0.00198	0	0
Cash flow	16865	0.353	0.543	0.106	0.22	0.427
Tobin's Q	16865	0.931	0.686	0.459	0.758	1.189
Total asset	16865	11.06	1.393	10.1	10.91	11.92
Book leverage	16865	0.274	0.175	0.141	0.257	0.388
ROA	16865	0.0212	0.0246	0.00893	0.0186	0.033
Cash holding	16865	0.1420	0.0827	0.0833	0.1283	0.1838
GOB loans/ Total loans	15289	0.071	0.145	0	0.0075	0.0709
Amakudari (1990-1996)	5828	0.0289	0.0549	0	0	0.0476
Gbus (1990-1996)	4938	0.1638	0.3702	0	0	0

Panel B – Sample with GOB Outstanding

	Whole sample (1978-1996)	Pre crisis (1987-1990)	During crisis (1991-1994)	Post crisis (1995-1996)
Firm years with GOB loans outstanding	9300 (55.14%)	2233 (46.31%)	2253 (42.96%)	1100 (39.63%)
Firm years with increases in GOB loans outstanding	2877 (17.06%)	523 (10.85%)	825 (15.73%)	211 (7.60%)
Total firm year observations	16865	4822	5244	2776

Table 1 (continued)

Panel C – Pre and During Crisis Sample

	Pre crisis (1987-1990)		During crisis (1991-1994)		During-Pre	
	N	Median	N	Median	Difference	Significance
Investment	3814	0.193	5244	0.179	-0.014	***
Cash flow	3814	0.229	5244	0.168	-0.061	***
Tobin's Q	3814	1.129	4086	0.944	-0.185	***
Total asset	3814	10.71	5244	10.93	0.22	***
Book leverage	3814	0.248	5244	0.257	0.009	*
ROA	3814	0.0213	5212	0.0165	-0.0048	***
Observations with increase in government owned bank loan (*GOBI* > 0)						
Investment	428	0.189	724	0.200	0.011	
Cash flow	428	0.146	724	0.103	-0.043	***
Tobin's Q	428	1.04	724	0.800	-0.24	***
Total asset	428	11.9	724	12.33	0.43	***
Book leverage	428	0.371	724	0.369	-0.002	
ROA	428	0.016	724	0.012	-0.004	***
Observations without increase in government owned bank loan (GOBI≤ 0)						
Investment	3386	0.193	3313	0.171	-0.022	***
Cash flow	3386	0.241	3313	0.183	-0.058	***
Tobin's Q	3386	1.138	2501	0.984	-0.154	***
Total asset	3386	10.87	3313	11.04	0.17	***
Book leverage	3386	0.235	3313	0.239	0.004	
ROA	3386	0.022	3296	0.017	-0.005	***

Table 2
Government Owned Bank Effect on Investment

The dependent variable is *Investment*, which is defined as changes in tangible fixed assets plus depreciation divided by total capital in the previous year, adjusted by the industrial median investment in that year. *GOBI* is defined as the net increase in government owned bank loans 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 1991 to 1994. Columns (1)-(3) use the sample of 1978-1996; Columns (4)-(6) use the sample only during crisis, i.e., in years 1991 to 1994. See Appendix for a detailed definition of all variables. Standard errors are corrected for within-firm clustering and reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10 % level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	Investment					
GOBI	0.934***	0.828***	0.796***	1.504***	1.439***	1.447***
	(0.102)	(0.115)	(0.118)	(0.211)	(0.212)	(0.215)
Crisis×GOBI		0.622***	0.637***			
		(0.219)	(0.221)			
Cash flow	0.124***	0.124***	0.121***	0.141***	0.131***	0.127***
	(0.0131)	(0.0131)	(0.0146)	(0.0381)	(0.0387)	(0.0393)
Q	0.0369***	0.0370***	0.0385***	0.0344***	0.0357***	0.0341***
	(0.00567)	(0.00565)	(0.00554)	(0.0128)	(0.0127)	(0.0124)
Total asset			0.0597***		0.175***	0.247***
			(0.0112)		(0.0584)	(0.0654)
Book leverage			-0.0586**			-0.347***
			(0.0269)			(0.120)
ROA			0.0723			-0.252
			(0.124)			(0.256)
Constant	-0.0473***	-0.0479***	-0.693***	-0.0496***	-2.031***	-2.750***
	(0.00627)	(0.00627)	(0.123)	(0.0172)	(0.659)	(0.723)
Firm Fixed Effect	Y	Y	Y	Y	Y	Y
Year Fixed Effect	Y	Y	Y	Y	Y	Y
N	17,294	17,294	16,865	4,068	4,068	4,042
adj. R-sq	0.200	0.200	0.211	0.402	0.406	0.409

Table 3
Selection Effects in GOB Lending

The dependent variable is *Investment,* which is defined as changes in tangible fixed assets plus depreciation divided by total capital in the previous year, adjusted by the industrial median investment in that year. *GOBI* is defined as the net increase in government owned bank loans outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. *GOBI Dummy* is defined as 1 if the government owned bank loans outstanding of a firm in the given year is larger relative to that in previous year, and 0 otherwise. *Crisis* is a dummy variable that takes a value of 1 for observations in years 1991 to 1994. See Appendix for a detailed definition of all variables. Standard errors are corrected for within-firm clustering and reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level, respectively.

Panel A: Subsample of Loans with GOB Outstanding

	Full sample	Conditional on having positive GOB loan outstanding	
	(1)	(2)	(3)
		Investment	
GOBI	0.706***	0.681***	0.792***
	(0.135)	(0.138)	(0.118)
Crisis×GOBI	0.623**	0.673**	0.650***
	(0.259)	(0.273)	(0.228)
GOBI Dummy	0.0109*	0.0130**	
	(0.00639)	(0.00635)	
Crisis×GOBI Dummy	-0.000797	-0.00413	
	(0.00969)	(0.0106)	
Cash flow	0.121***	0.174***	0.174***
	(0.0146)	(0.0229)	(0.0228)
Q	0.0386***	0.0248***	0.0247***
	(0.00556)	(0.00705)	(0.00705)
Total asset	0.0597***	0.0606***	0.0602***
	(0.0113)	(0.0137)	(0.0137)
Book leverage	-0.0597**	-0.0796**	-0.0776**
	(0.0269)	(0.0384)	(0.0385)
ROA	0.0731	-0.196	-0.197
	(0.123)	(0.152)	(0.151)
Constant	-0.696***	-0.703***	-0.696***
	(0.124)	(0.152)	(0.152)
Firm Fixed Effect	Y	Y	Y
Year Fixed Effect	Y	Y	Y
N	16,865	9,259	9,259
adj. R-sq	0.212	0.242	0.242

Table 3 (continued)

Panel B: Propensity Score Matching- Full Sample

	(1) GOBI	(2) Investment
GOBI		0.847***
		(0.237)
GOBI × Crisis		0.926*
		(0.499)
Cash flow	-0.000480	0.319***
	(0.000467)	(0.0480)
Q	0.000333	0.0370**
	(0.000345)	(0.0168)
Total asset	0.000869***	0.0611
	(0.000200)	(0.0399)
Book leverage	0.00484***	-0.151
	(0.00161)	(0.111)
ROA	0.00590	-1.341**
	(0.00876)	(0.526)
N	16,865	4,178
adj. R-sq	0.0167	0.650
Year Fixed Effects	NO	YES
Firm Fixed Effects	YES	YES

Panel C: Propensity Score Matching (Crisis Sub-sample)

	(1) GOBI	(2) Investment
GOBI		1.525**
		(0.686)
Cash flow	-0.00103**	0.494***
	(0.000403)	(0.184)
Q	0.000171	0.0670
	(0.000681)	(0.0867)
Total asset	0.00117***	0.482*
	(0.000342)	(0.254)
Book leverage	0.00983	-1.198**
	(0.00274)	(0.521)
ROA	0.0317	-1.621
	(0.0121)	(1.393)
N	4,055	706
adj. R-sq	0.0196	0.730
Year Fixed Effects	NO	YES
Firm Fixed Effects	YES	YES

Table 4
Efficiency of GOB Lending: Future Firm Performance

The dependent variable is the average ROA and average ROE between year t+1 and year t+3. *Investment* is defined as changes in tangible fixed asset plus depreciation divided by total capital in the previous year, adjusted by the industrial median investment in that year. *Crisis* is a dummy variable that takes a value of 1 for observations in years 1991 to 1994. Detailed variable definitions are provided in the appendix. Standard errors are corrected for within-firm clustering and reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level, respectively.

	(1) ROA (3 years forward)	(2) ROE (3 years forward)
Investment × Crisis	0.533***	0.577**
	(0.192)	(0.277)
Investment	-0.360***	-0.426***
	(0.0856)	(0.127)
Cash flow	0.982***	1.21***
	(0.121)	(0.161)
Q	0.0693	0.116
	(0.0501)	(0.0772)
Total asset	-1.34***	-1.76***
	(0.130)	(0.199)
Book leverage	-0.345	1.18**
	(0.342)	(0.516)
Sector-level ROA	0.241***	0.217*
	(0.0741)	(0.113)
Sector-level ROE	-0.0555	-4.83e-05
	(0.0472)	(0.0711)
Firm Fixed Effect	Y	Y
Year Fixed Effect	Y	Y
N	13,615	13,615
adj. R-sq	0.665	0.575

Table 5: Impact of Firm Quality and Growth Options

Investment is defined as changes in tangible fixed assets plus depreciation divided by total capital in the previous year. *ROA (3 years forward)* is the average ROA between year t+1 and year t+3. *GOBI* is defined as the net increase in government owned bank loans 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 1991 to 1994. A firm year observation is respectively categorized as large ROA and large Q if it has above median level of ROA and Q in the given year. Control variables include *Cash Flow*, *Q*, *Total Asset*, *Book Leverage*, and *ROA*, which are the same as those included in Table 2. The sample period is from 1978 to 1996. See Appendix for a detailed definition of all variables. Standard errors are corrected for within-firm clustering and reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10 %level respectively.

Panel A: Investment Effect of GOBI

	Small ROA	Large ROA	Small Q	Large Q
	(1)	(2)	(3)	(4)
		Investment		
Crisis × GOBI	0.395	0.934**	0.466	0.644*
	(0.273)	(0.364)	(0.306)	(0.338)
GOBI	0.893***	0.589***	0.804***	0.867***
	(0.149)	(0.199)	(0.152)	(0.186)
Other Controls	Y	Y	Y	Y
Firm Fixed Effect	Y	Y	Y	Y
Year Fixed Effect	Y	Y	Y	Y
N	8,557	8,166	8,268	8,432
adj. R-sq	0.221	0.316	0.224	0.303

Panel B: Future ROA Effect of Crisis Investment

	Small ROA	Large ROA	Small Q	Large Q
	(1)	(2)	(3)	(4)
		ROA (3 years forward)		
Crisis × Investment	0.239	0.816***	0.467*	0.690**
	(0.247)	(0.305)	(0.255)	(0.300)
Investment	-0.120	-0.706***	-0.134	-0.706***
	(9.54)	(0.136)	(0.102)	(0.138)
Other Controls	Y	Y	Y	Y
Firm Fixed Effect	Y	Y	Y	Y
Year Fixed Effect	Y	Y	Y	Y
N	6,691	6,609	6,617	6,834
adj. R-sq	0.534	0.675	0.589	0.702

Table 6: Impact of Credit Constraints

Investment is defined as changes in tangible fixed assets plus depreciation divided by total capital in the previous year. *ROA (3 years forward)* is the ROA between year t+1 and year t+3. *GOBI* is defined as the net increase in government owned bank loans 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 1991 to 1994. *Troubled relationship banks* takes a value of 1 if the weighted average of the exposure of a firm's relationship banks to zombie borrowers is above median. Control variables include *Cash Flow*, *Q*, *Total Asset*, *Book Leverage*, and *ROA*, which are the same as those included in Table 2. The sample period is from 1978 to 1996. See Appendix for a detailed definition of all variables. Standard errors are corrected for within-firm clustering and reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10 %level respectively.

Panel A: Effect of GOBI in Investment

	Troubled relationship banks	Healthy relationship banks
	(1)	(2)
	Investment	
Crisis × GOBI	0.932**	0.416
	(0.462)	(0.261)
GOBI	0.282	1.063***
	(0.189)	(0.14)
Other Controls	Y	Y
Firm Fixed Effect	Y	Y
Year Fixed Effect	Y	Y
N	8,037	8,704
adj. R-sq	0.241	0.305

Panel B: Effect of Investment on future ROA

	Troubled relationship banks	Healthy relationship banks
	(1)	(2)
	ROA (3 years forward)	
Investment × Crisis	0.418*	0.441
	(0.227)	(0.315)
Investment	-0.408***	-0.414***
	(0.114)	(0.131)
Other Controls	Y	Y
Firm Fixed Effect	Y	Y
Year Fixed Effect	Y	Y
N	6,571	6,888
adj. R-sq	0.674	0.740

Table 7
Government Connections

Investment is defined as changes in tangible fixed assets plus depreciation divided by total capital in the previous year, adjusted by the industrial median investment in that year. *GOBI* is defined as the net increase in government owned bank loans outstanding to a firm in the given year relative to the previous year divided by the total capital in previous year. *Amakudari* is defined the number of Amakudari director scaled by the total number of directors in the board. *GBus* is a dummy that equals 1 if the firm has business relationship with the government. Panel A replicates Table 2 with the only exception of adding *Amakudari* and *GBus* as controls. The dependent variable in Panel B is *ROAI* between year *t*+1 and year *t*+3. Control variables include *Cash Flow*, *Q*, *Total asset*, *Book Leverage*, and *ROA*, which are the same as those included in Table 2. See Appendix for a detailed definition of all variables. Standard errors are corrected for within-firm clustering and reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level, respectively.

Panel A: Effect of Government Connections on Investment

	(1)	(2)	(3)
		Investment	
GOBI	1.268***	1.134***	1.123***
	(0.211)	(0.246)	(0.250)
Amakudari	0.206		0.309*
	(0.128)		(0.165)
GBus		0.0292	0.0320
		(0.0229)	(0.0220)
Constant	-0.0601***	-0.0644***	-2.314***
	(0.0203)	(0.0232)	(0.745)
Other Controls	Y	Y	Y
Firm Fixed Effect	Y	Y	Y
Year Fixed Effect	Y	Y	Y
N	3,304	2,654	2,626
adj. R-sq	0.422	0.423	0.427

Panel B: Effect of Government connections on Future ROA

	(1)	(2)	(3)
		ROA (3 years forward)	
Amakudari	0.369		0.195
	(0.751)		(0.904)
GBus		0.182	0.174
		(0.144)	(0.146)
Constant	-1.03**	-1.50***	-1.50***
	(0.448)	(0.526)	(0.526)
N	3,408	2,768	2,760
adj. R-sq	0.496	0.497	0.496
Other Controls	Y	Y	Y
Industry Fixed Effect	Y	Y	Y

Figure 1
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: Bank lending, Flow of Funds, The Bank of Japan. Industrial production growth, METI.

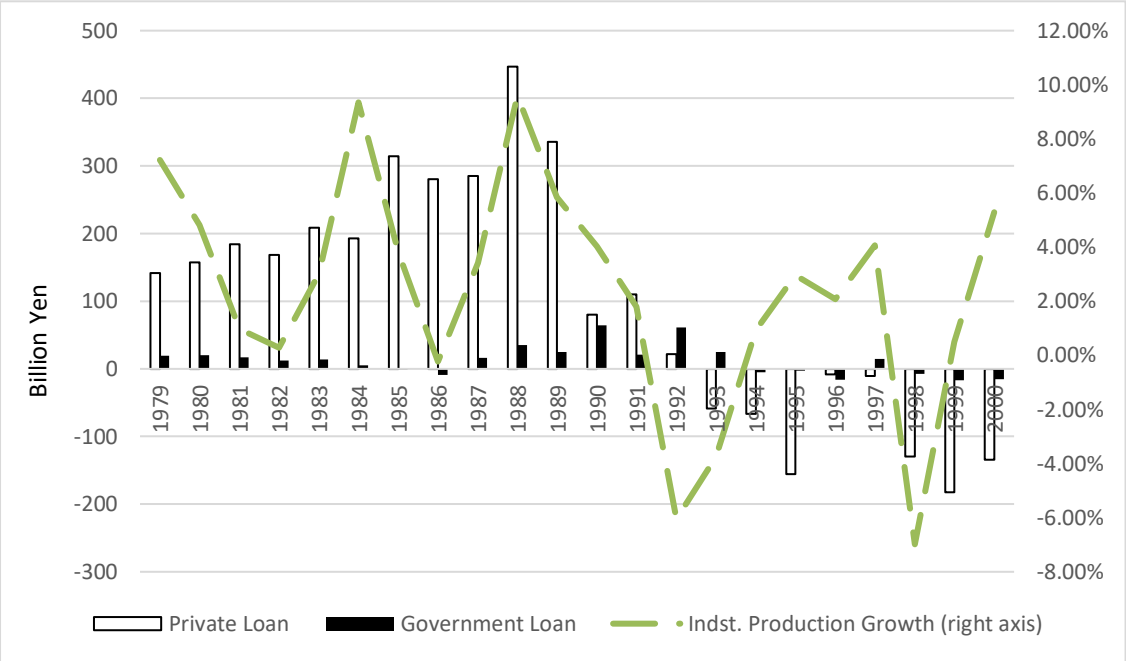


Figure 2
Time Series Pattern of Increases in Government Owned Bank Lending

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 increase in GOB lending based on our data sample of publicly traded firms.

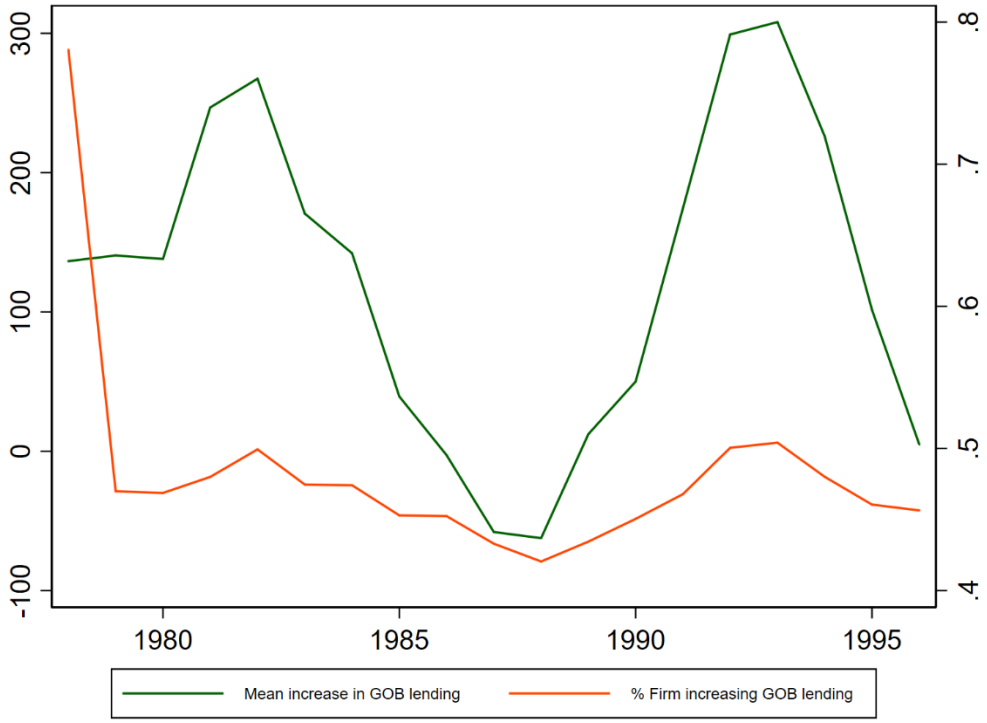


Figure 3
Loan Market Share of Government Owned Banks

This figure illustrates the proportion of total bank loans granted to listed firms that come from government-owned banks. Market share is calculated as the total loans extended by government-owned banks divided by the total loans extended by all banks, expressed as a percentage.

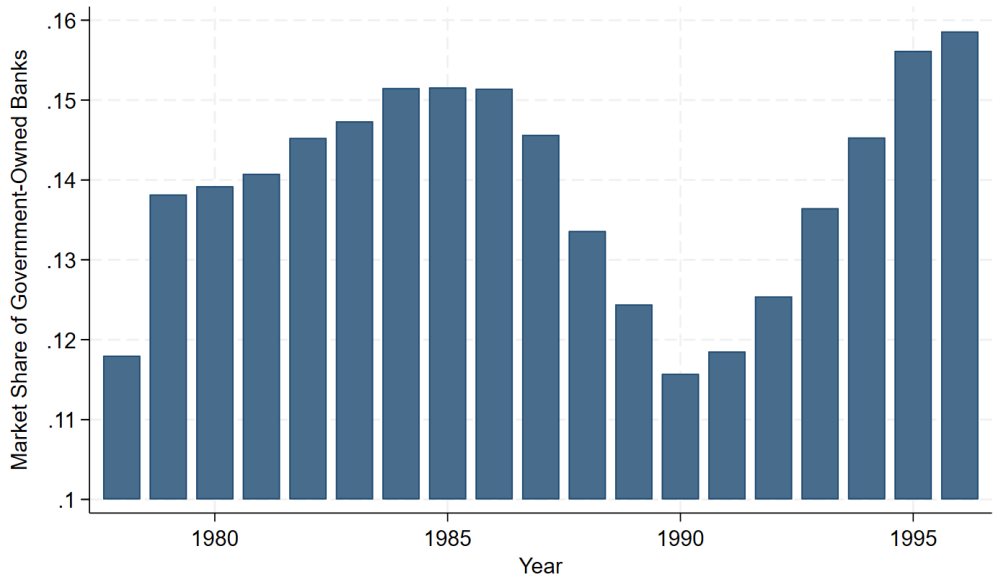
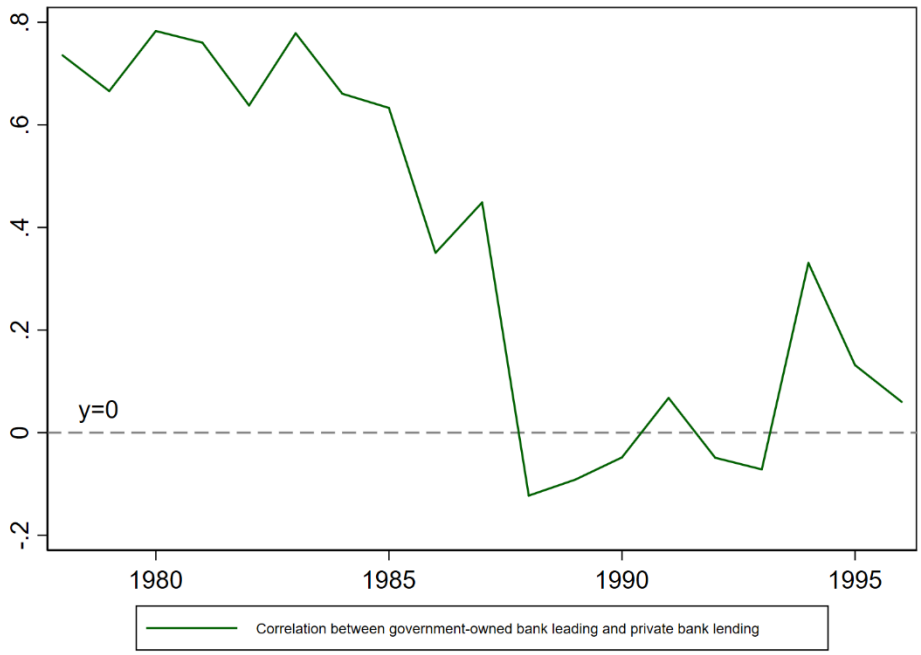


Figure 4

Correlation between GOB 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.



Appendix: Definition of variables

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

Amakudari: The number of retired government official directors scaled by the total number of directors in the board.

Book Leverage: Total Debt divided by Total Asset (FB067). Total Debt is defined as the sum of short term debt and long term debt. 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).

Cash Flow: The Net Income before Extraordinary Items and Depreciation (FC029), scaled by Capital (FB032) in the previous year.

Capital: Tangible Fixed Asset (FB032).

Crisis: A dummy variable that takes a value of 1 for observations in years 1991-1994.

GBus: A dummy that equals 1 if the firm has business relationship with the government.

GOBI: The net increase in government owned bank loans outstanding to a firm in the given year relative to the previous year divided by the total capital (FB032) in the 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.

Investment: Changes in Tangible Fixed Asset (FB032) plus Depreciation (FE011) divided by total capital in the previous year minus the median value of investment for all firms in the same industry in that year.

Q (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.

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

Total Asset: Total Asset (FB067) in 100 billion Yen.

Troubled (Healthy) Relationship banks: We define a firm as having 'Troubled relationships banks' if the measured value of *Relationship Bank Constraints*$_i$ is larger than its sample median, and having 'Healthy Relationship banks' if the measured value of *Relationship Bank Constraints*$_i$ is less than its sample median. The definition of relationship bank constraints is given below. First, for each bank j in year t, we define its zombie exposure as follows (See definition of zombie below):

$$Zombie\ Exposure_{j,t} = \frac{The\ lending\ to\ zombie\ borrowers\ by\ bank\ j\ in\ year\ t}{Total\ \ lending\ by\ bank\ j\ in\ year\ t}$$

For each borrowing firm *i*, we define *Relationship Bank constraints*$_i$ as the average value of the weighted average of its relationship bank's zombie exposure during year 1990 to 1996, where the weighting is the fraction of lending of the borrower coming from a given bank.

$$Relationship\ Bank\ Constraints_i = \frac{1}{7}\sum_{t=1990}^{t=1996}\sum_{j=1}^{J}\frac{Borrowings\ \ by\ firm\ i\ from\ bank\ j\ in\ year\ t}{Borrowings\ by\ firm\ i\ from\ all\ banks\ in\ year\ t} \times Zombie\ Exposure_{j,t}$$

Zombie (Non-zombie): A firm-year classified as a zombie as per the definition of Caballero et al. (2008). Specifically, we create a lower bound for interest that a firm could pay during the fiscal year:

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

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 bonds, and *Bond* is outstanding bonds. If the interest expenditure of the firm during that fiscal year is lower than the lower bound, which implies that the firm is heavily subsidized, we define the firm to be a zombie firm.

A firm year not classified as zombie year is a **non-zombie** year.