The bright side of lending by state owned banks: Evidence from Japan

Yupeng Lin[a]
Anand Srinivasan[b]
Takeshi Yamada[c]

May 31, 2012

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This paper investigates the effect of lending by state owned banks on real investment and employment for publicly traded industrial firms in Japan, focusing on a period that covers the Japanese financial crisis in the 1990s. The paper finds that increases in lending by state owned banks lead to both higher levels of real investment and employment growth, in non-crisis periods. Further, increases in state owned bank lending has strong incremental effects on investment during the crisis. Firms that are most credit constrained also benefit from increases in state owned bank lending. In contrast, little evidence is found for incremental employment effects of state owned bank lending during the crisis, or for more credit constrained firms. Our results demonstrate the lending by state owned banks can be consistent with the social view of such lending.

The authors thank comments from Michael Brennan, Bruce Grundy, Derek Neal, David Yermack, seminar participants at Deakin University, Federal Reserve Bank of Chicago, National University of Singapore, Queensland University of Technology, University of Adelaide, University of Melbourne, and conference participants at the Econometric Society Australasian Meeting. This paper was earlier titled 'The effect of state owned bank lending on investment and employment: evidence from Japan.'

[a]Dept. of Finance, NUS Business School, Mochtar Riady Building, 15 Kent Ridge Drive, Singapore 117592. E-mail: linyupeng@nus.edu.sg

[b]Dept. of Finance and Risk Management Institute, National University of Singapore, Mochtar Riady Building, 15 Kent Ridge Drive, Singapore 117592. E-mail: bizas@nus.edu.sg

[c] The University of Adelaide Business School, South Australia, Australia 5005. E-mail: takeshi.yamada@adelaide.edu.au

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Abstract

This paper investigates the effect of lending by state owned banks on real investment and employment for publicly traded industrial firms in Japan, focusing on a period that covers the Japanese financial crisis in the 1990s. The paper finds that increases in lending by state owned banks lead to both higher levels of real investment and employment growth, in non-crisis periods. Further, increases in state owned bank lending has strong incremental effects on investment during the crisis. Firms that are most credit constrained also benefit from increases in state owned bank lending. In contrast, little evidence is found for incremental employment effects of state owned bank lending during the crisis, or for more credit constrained firms. Our results demonstrate the lending by state owned banks can be consistent with the social view of such lending.

1. Introduction

A growing body of literature demonstrates the real effects of financial crisis (Dell'Aricia et al, 2008, Campello et al, 2010). Due to the perceived large costs of these crises, most governments around the world have aggressively moved to mitigate such effects by providing guarantees of bank debt and/or recapitalization of banks. Nevertheless, questions remain about the effectiveness of such guarantees and recapitalizations as 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).

However, there are alternate measures that are suggested by the literature to mitigate the effects for credit crisis – in particular, direct government lending is an important tool that is available at the government's disposal to mitigate crisis. However, the effectiveness of such a policy response has not been studied in great detail. Theoretically, Bebchuk and Goldstein (2011) show that such direct lending can have beneficial effects on investment during crisis. However, in their model, when the government does not have the lending technology that private banks have, this leads to inefficient lending that could waste resources by channeling capital to some firms with bad projects. So, what happens when the government, by means of state owned banks (SOB henceforth), has the ability to discriminate among borrowers and monitor loans like private lenders?

We study this question using lending by SOBs in Japan as it is plausible to expect that Japanese SOB's have the ability to screen and monitor borrowers due to their experience in the corporate lending market. The crises of Japan in the 1990's provides a good laboratory for studying the effect of SOB lending during a crisis, particularly because of the similarity of the Japanese crisis to the US crisis in 2008 (Hoshi and Kashyap, 2010). Further, it has been argued that state owned banks in Japan were an effective instrument by which Japanese government stimulated the economic growth (Horiuchi and Sui, 1993). They also might have

played an important role during crisis when government is expected to step in and correct market failures. Therefore, using this setting, we study the impact of SOB lending on investment as well as on employment during the Japanese financial crisis in the 1990s and compare it with the impact of SOB lending in non-crisis periods.

The traditional neoclassical rationale for state involvement in commercial activities, including government lending, is the 'market failure' view that posits state should intervene to correct for any market failures (Stiglitz, 1989a, 1989b). However, an alternate view suggested by Shleifer and Vishny (1994) posits that SOB lending could be a quid pro quo between politicians and firms for employment in return for lending. Previous literature that examined SOB lending has mostly focused on its political aspects and has found evidence of political impact (i.e., the dark side) of SOB lending.[1] More generally, as Krueger (1990) puts it, state intervention, ostensibly to correct market failure, often leads to 'government failures.'

Our study contributes to this literature as we examine if SOB lending is motivated to correct for market failures. To this end, we examine the impact of SOB lending during non-crisis and crisis periods, as market failures are more likely during a crisis, and the government is also more likely to intervene during crisis periods. Similarly, we compare the impact of SOB lending for firms that face different financial constraints - as SOB lending might mitigate constraints for firms that face, for example, credit rationing from private banks. Therefore, we are able to identify the impact of SOB lending that might correct market failures, which has not been studied previously. Importantly, our study focuses on the efficiency of SOB lending at the firm level and from the shareholders' perspective, not from a social planner's point of view.

[1] See for example, Sapienza (2004) using Italian data, Dinç(2005) using global data, Khwaja and Mian (2005, 2008) using Pakistani data, Imai (2009) using Japanese data and Carvalho (2010) using Brazilian data. In addition, there is an extensive literature on the detrimental effects of state owned banks on the macro-economy such as on financial development (e.g., Barth et al, 1999) and economic growth (e.g., La Porta et al, 2002).

To investigate the real effects of state owned bank lending, this paper uses a comprehensive data set of SOB lending to publicly traded industrial firms in Japan. We obtain the principal data set from 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 to a given firm, which allows us to identify the degree of lending from SOBs 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 on the Tokyo Stock Exchange.[2] This data set is used to identify the impact of lending by SOB's on these companies.

Our main dependent variables are investment (measured by the investment to capital ratio) and employment growth. We use *net increases in lending by state owned banks (divided by capital)* to a firm as the principal empirical variable for measuring the effects of SOB lending on investment and employment growth. All the main empirical tests are conducted with standard panel data estimation with year and firm fixed effects to account for potential self-selection of increases in SOB lending.

Our main findings are summarized here. We find a positive and significant effect of SOBs lending on firm level investment, both during crisis and non-crisis periods. For the entire sample period, we find that an increase of one yen of SOB lending leads to an increase of ¥0.97 for firm investment. This result, in itself, could be consistent both with the political and market failure views - as the increase in investment may or may not be efficient from a shareholder's perspective. To distinguish between the political and market failure views, we conduct several further tests on interaction effects of SOB lending with other variables.

First, we examine the differential effect of SOB lending during the Japanese financial crisis of the 1990's. We find a strong incremental effect of SOB lending on investment during

[2] All results are robust to inclusion of a longer time period till 2007. The reason for conducting empirical analysis till 1996 is to avoid the effects of SOB reform and privatization after this period.

the crisis period, over and above the effect during normal times. In particular, in a baseline specification, an increase of one yen in SOB 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 in the Japanese economy, this result provides strong evidence that SOB lending indeed mitigates financial constraints.

Second, to distinguish the political and market failure views of SOB lending, we sort firms according to their financial constraints and examine the differential effects of SOB lending on different firms. We use a variety of alternative measures of financial constraints such as the Rajan-Zingales measure of external financial 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 SOB lending on investment is almost always larger on firms that are more constrained relative to firms that are less constrained. This result is also consistent with the market failure view of SOB lending.

Third, we examine if firms use SOB loans efficiently for investment by estimating (1) the interactive effect between SOB lending and Tobin's Q, and (2) between SOB lending and cash flow. If a firm uses SOB loans inefficiently, i.e., the loan was made solely 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 SOB loans efficiently, consistent with the market failure, view, we expect the sensitivity of investment to Tobin's Q to increase. If SOB lending mitigates financial constraints, we should find that SOB lending reduces investment sensitivity to cash flow. Our study finds both effects, suggesting firms use SOB loans efficiently.

As a last test to distinguish the market failure versus political views, we examine long run stock price performance of firms with increases in SOB 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 SOB lending were inefficient from a shareholders perspective, we would observe negative abnormal returns. However, we either observe positive or zero returns, which is consistent with the increases being driven by efficiency rather than political motives.

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

A major concern in all our results stems from the endogeneity of the state owned bank lending. For example, governments may choose to extend loans to firms that hire more people or invest more. As mentioned earlier, we use time invariant factors, such as firm fixed effects, to alleviate the endogeneity issue. Further, we apply an instrument variables approach to correct for this potential endogeneity bias. An important instrument we use to identify the likelihood of increases in SOB lending is a variable that measures fraction of directors that are retired government bureaucrats that serve on the board of the firm as a percentage of the total number of board members. We posit that this variable will be related to the likelihood of increases in government lending, but is unlikely to directly impact firm specific, industry adjusted investment or employment growth. Using the instrumental variables approach, we find that increases in SOB lending have a strong incremental effect on investment during the crisis.

In addition to the above, we employ a series of alternative measures to control for endogeneity – propensity score matching, sequential matching and Arellano and Bond GMM estimation. The results using these different methods of endogeneity corrections for investment are largely consistent with the panel data estimation. However, for employment, some specifications only show an effect of SOB lending on employment during the crisis, while others show an effect both in crisis and non-crisis periods. Considering the overall picture of these results, along with the insignificant incremental effect of SOB lending on financially constrained firms, we interpret these results to support the notion that SOB lending has significant employment effects during normal times, but no robust effect during the crisis.

In summary, our results are consistent with Duygan-Bump et al (2010), which showed that state guarantees to small businesses generated significant employment benefits, although they do not study the effects of state guarantees on investments. However, we find a relatively small magnitude of employment benefits compared with what they document. This may be due to the fact that many Japanese companies had lifetime employment model for employees during this time. Also, their study uses a sample that consists of small private firms, whereas our study uses a sample of publicly listed firms that are mostly larger than private ones. Likewise, our results regarding abnormal returns are somewhat similar to those reported by Giannetti and Simonov (2009) who showed that bank restructuring by the Japanese government resulted in a positive CAR for the borrowing firms of the restructured banks.

In conjunction with the earlier documented results by Imai (2009) on politically motivated lending by SOB's in Japan, our results are consistent with the conjecture that both political motives and motives to correct market failure could co-exist as rationales for SOB

lending. The strong economic impact of SOB lending that we find on investment is consistent with the stated policy objectives of SOB lending.

Although our study provides evidence of important benefit of lending by state owned banks, it should be acknowledged that we do not have access to individual loan contract terms. As a result, we are unable to directly examine if state owned banks subsidized firms with discounted loan rates. However, we can conclude that state owned bank system is effective in impacting real activities, especially for firms with constraints, and for firms during the Japanese crisis of the 1990s.

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 state owned banks in Japan. We develop the hypothesis and provide a literature review in Section 3. Section 4 describes our data set and construction of variables. Section 5 performs the empirical analysis and 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

During the 1984-1989 period, the Japanese capital markets as well as 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. As shown in Figure 1, capital investment was growing rapidly during this period. 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 dramatically at the end of 1990. The Nikkei 225 Stock Index fell sharply starting from the first part of the year, reaching 20,222 by October 1, 1990. Real estate prices followed a similar pattern. 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.[3] According 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. 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, SOB's stepped in and provided funds to fill in the financing gap during the crisis period. Figure 2 compares aggregate private lending and SOB lending to the Japanese private non-financial sector, using flow of funds data from the Bank of Japan. The figure shows net increases in SOB lending after 1990 as private lending decreased dramatically during the crisis. Even when private lending was shrinking (i.e., net increases in private lending being negative) after 1993, SOB lending was not reduced, which suggests that SOB 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 SOB's increased from 2% of total annual long term funds in 1989 to more than 30% in 1993.[4]

Figure 3 shows the time series pattern of the increase in SOB 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 sharp increase in the number of firms that experienced an increase in SOB lending after the onset of the crisis in 1990. We also observe that the magnitude of SOB lending increased through the crisis.

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[3] Suspension is defined as non-renewal of existing loan contracts.

[4] Long term funds include equity funds, long term bonds and long term bank debts.

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 went up 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.[5]

2.2 State Owned Banks in Japan

Japan has various types of government banks to provide loans to a different set of borrowers.[6] These government banks receive most of their funds from the Fiscal Investment and Loan Program (FILP) which is mainly funded by the postal saving and insurance system.[7] Similar to the general accounting budgets, the FILP budgets are proposed by the Ministry of Finance.

These SOB's supply long term credit to those 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

[5] Our results are robust to the inclusion of all data till 2006, and inclusion of the recession that was triggered by the increase in the consumption tax rate in 1997 as a second crisis. The increase in consumption tax rate from 3% to 5% and the termination of special tax reduction program are considered major factors that killed the nascent economic recovery which started in 1995.

[6] 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, 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).

[7] 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.

these state owned banks.[8] 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, among others, have been established for the aim of mainly providing credit for firms that might have difficulty receiving loans from private financial institutions. There are also a few government banks that have been established to provide government credit for the development of certain regions such as the Hokkaido and Tohoku Development Corporation and the Okinawa Development Finance Corporation (See Imai, 2009) Although the state 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 the operation reports or consulting other private banks to obtain information.

Compared with private bank lending, the proportion of corporate financing provided by SOB's is relatively small. For our sample of listed non-financial firms, the average value of SOB lending is around 6.7% of the total corporate borrowing from banks (see Table 1).

3. Literature review and hypotheses

The two main empirical variables of interest in this study are investment and employment. Our main hypothesis compares the differences in effects of SOB lending across the crisis and non-crisis times, as well as the cross-sectional differences of the effect between

[8] MITI has been reorganized and changed its name to ministry of Economic, Trade and Industry in 2001.

firms that are more or less financially constrained. These comparisons aim at identifying the effect of SOB lending on mitigating credit constraints versus political objectives.

There is a long literature in banking based on information asymmetry starting with Diamond (1984) and Boot and Thakor (1991) that postulates a role for banks in resolving informational problems between borrowers and suppliers of capital, and consequently resulting in efficient investment by the firm. However, there is relatively little theoretical modeling of specific differences between state owned banks and private banks vis-à-vis resolving such informational asymmetries and encouraging optimal investment. When private banks themselves are facing funding difficulties during a crisis, this might justify the role of state in mitigating such market failures in the credit market (Stigltiz, 1989a, 1989b).

Bebchuk and Goldstein (2011) is among the first papers to formally model various government responses to a crisis situation in detail with a role for direct government lending to the corporate sector. They find that direct government lending can have a significant impact on mitigating credit freezes, which in turn helps investment. However, the main inefficiency in their model for government lending is that governments may not have access to the same lending technology that private banks have. In our empirical setting, given the lending technology of Japanese SOBs, this condition might not be satisfied. Therefore, the beneficial effects of SOB lending on investment could be more pronounced than those postulated by the above model.

Similarly, for employment, Greenwald and Stiglitz (1987) develop a model where credit market frictions result in excess unemployment at the firm level.[9] In a general equilibrium model, Wasmer and Weil (2004) demonstrate that credit and labor market frictions interact with each other to create credit rationing for borrowers, as well as excess unemployment.

[9] Excess Unemployment is defined as unemployment in excess of what would prevail with perfect credit markets.

To the extent that the state can mitigate such market failures in the credit and labor markets, SOB lending should be associated with reduction of such credit rationing, and consequently, lower excess unemployment and higher (optimal) investment. However, none of the above models (with the exception of the model by Bebchuk and Goldstein, 2011) examine the role of state owned bank lending during a crisis.

In contrast to the above, the political view of government ownership in general, propounded by Shleifer and Vishny (1994) views government subsidies (of which subsidized lending is one) as a quid pro quo in exchange for political objectives of employment. Further, as mentioned in Shleifer and Vishny (2004), there are numerous examples of governments encouraging investment inefficient projects.

This view has found empirical support in banking research both at the cross-country level (Barth et al, 1999, La Porta et al, 2002, Dinç, 2005) as well as at the micro level (Sapienza, 2004, Carvalho, 2010). Even for the case of Japan, Imai (2009) documents that electoral vulnerability and seniority of the person competing in the election had an effect on SOB lending at the district level. However, these papers have not specifically modeled or tested the role of government or state owned banks during a crisis, which is a focal point of this study.

With the exception of Carvalho (2010), no study examines in detail the impact SOB lending on investment. While Carvalho (2010) provides convincing evidence for political motivated lending, and consequent increases in investment and employment by a sample of Brazilian firms, he does not examine the differential responses across crisis and non-crisis periods, or by firm credit constraints.

Based on the above discussion, SOB lending may be associated with higher investment and higher employment, due to state correcting market failures and/or acting to increase political benefits. However, by examining incremental lending effects during the crisis, as well as examining cross-sectional differences among firms, we can potentially shed some

light on the benefits or the lack thereof, of SOB lending. In particular, differences between firm's reactions in employment and investment during the crisis and normal times, as well as differences from firms that are more versus less constrained for credit can help isolate the benefit of SOB lending. Any such differences are likely to be driven by differing financial constraints, and therefore, more likely to be efficiency driven rather than driven by political objectives**.**

Thus, the main identification strategy for our empirical work is that SOB lending should have a larger effect on firm level investment and employment during the crisis, and that SOB lending should have a larger effect on firm level investment and employment for firms that are more financially constrained.

4. Data and Summary Statistics

4.1 Data and key variables

Our main sample consists of all listed companies on the Tokyo Stock Exchange, excluding financial institutions and utility companies, from 1977 to 1996. We deliberately choose to end the main sample in 1996 to avoid any effects the economic downturn which started in 1997, any confounding effects of recapitalization of the Japanese banks in the late 1990's, and the effects of SOB reform which started from 2001. 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.

Accounting information, bank loan information and historical stock prices of the companies 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 outstanding of individual banks for each company at the fiscal-year-end. We obtain 22,009 observations with adequate loan information and 19,076 observations with both loan and stock price information from 1977 to 1996 on a yearly firm basis.[10]

We identify nine major state 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 'State owned bank,' that is computed as the ratio of the net increase in all state owned bank loans outstanding in the given year relative to the previous year to total capital in the current year. Total capital is defined as the total amount of tangible fixed assets of the firm. Thus,

$$\text{State Owned Bank}_{i,t} = \frac{\text{Total Loans outstanding from SOB's to firm i in year t} - \text{Total loans outstanding from SOB's to firm i in year t} - 1}{\text{Total Capital of firm i in year t} - 1}$$

Our measure captures the effect of increases in state owned bank lending on corporate behavior. This is the principal measure that we use in the empirical analysis. Following prior literature on studying 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 of the firm 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 the description of some of the important variables used in the empirical analysis. (1) Sales growth, defined as increase in sales divided by sales revenue in previous year; (2) Cash by asset, defined as the amount of cash available to finance new projects, scaled by assets; (3) Size, defined as logarithm of total assets; (4) Wage, defined as logarithm

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

of ratio of labor expenses to number of employees; (5) Book Leverage, defined as total debt divided by total asset; (6) ROA, defined as net income divided by total asset; (7) Tobin's Q, proxied by the ratio of the market value of assets to total book assets (see Chung and Pruitt 1994); (8) Cash Flow, defined as net income before extraordinary items and depreciation, scaled by total capital in previous year. A detailed definition of all variables used is presented in the Appendix.

4.2 Summary statistics

Table 1 presents summary statistics from 1977 to 1996 for the key variables that we use in this study. Table 1 Panel A shows that the mean value of the proportion of state owned bank loan to total borrowing is around 6.7%, suggesting that the market share of state owned bank is small compared with to 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 positive loan outstanding in state owned bank lending, suggesting that even though the market share of state owned bank is low, the penetration of state owned bank's influence is deep.[11] Table 1 Panels B and C stratify the sample for borrowers with an increase in state owned bank lending in the given year (State Owned $Bank_{i,t}=1$), and those without such an increase (State Owned $Bank_{i,t}=0$). We find that firms that experience an increase in loans outstanding from state owned banks 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 SOB lending is not only statistically significant, but also economically significant. For example, an increase in SOB lending is associated with an increase of 34% for the investment to capital

[11] This number is computed independently and is not available in Table 1.

ratio, and an increase of around 66% for the employment growth relative to their respective mean values.

When comparing other firm specific characteristics of firms that experience an increase in SOB lending, and those without, those with increases in SOB 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 have higher default risk as well are likely more cash constrained. Our findings are consistent with those by Sapienza (2004) who documents that SOBs generally favor providing loans to depressed firms.

Figure 4 shows increase in SOB loans to our sample of publicly traded non-financial firms during our sample period. In contrast to the dramatic change in SOB lending to the aggregate corporate sector in Figure 2, the share of lending by SOB's to publicly traded companies in Japan increases only around 4% from 1990 to 1994 (the crisis period), which is a relatively small amount. Thus, this finding suggests that most of the increase in SOB lending appears to have been concentrated on the SME and private enterprises.

In Figure 5 we examine the correlation between the SOB lending in our sample to private lending in each year of the sample to examine if SOB lending substitutes for private bank lending. To the extent that SOB's intend to mitigate credit constraints, we should find a negative correlation during the crisis. We find that this is indeed the case with SOB lending although the correlation becomes negative even prior to the crisis. The above figures provide preliminary evidence that SOB's in Japan stepped in to mitigate reduction in private bank lending during the crisis, which provides the foundation for the remainder of the empirical tests on their impact on investment and employment where we examine this credit constraint mitigation effect in more detail.

5. Empirical Results

5.1 Effect of SOB lending on capital investment

In this section, we examine the effect of state owned bank lending on 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.

$$\frac{I_{i,t}}{K_{i,t-1}} = \alpha \text{ State Owned Bank}_{i,t} + \beta \frac{CF_{i,t}}{K_{i,t-1}} + \delta Q_{i,t-1} + \gamma F_{i,t} + v_i + u_t + e_{i,t} \qquad (1)$$

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).[12,13] Any 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.

State owned $bank_{i,t}$, as defined earlier, is the net increase in state 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. This has the additional advantage (when estimating investment effects) that the coefficient estimate is the marginal increase in investment for a unit increase in SOB lending.

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

[13] All results are robust to using the 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 using industry adjusted values is that this method would account for time variation of the industry investment.

We define $CF_{i,t}$ is cash flow defined as net income before extraordinary items and depreciation, and Q is Tobin's Q. Vector F consists of firm specific financial variables, ν_i is the firm fixed effect, u_t is the year fixed effect, and $e_{i,t}$ is the idiosyncratic error. Section 4.1 as well as the appendix defines all variables in detail. In several tests, we augment equation (1) by interacting State Owned Bank with the crisis dummy, as well as proxies for financial constraints faced by the borrowing firm.

Table 2 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 'state owned bank' is positive and significant at the 1% level, suggesting that increases in SOB lending stimulate firm investment. In particular, the coefficient on "state owned bank" is 0.973, suggesting that a ¥1 increase in state 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 state 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 state 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 state owned bank lending have greater impacts on investment during crisis. More specifically, an increase of one yen in SOB 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 appears to be a multiplier effect of SOB lending in that one yen of SOB lending stimulates a greater amount of investment.

In model (3), we examine the robustness of these results to inclusion of other control variables. Note that all models have time and firm fixed effects, thus, unobservable firm heterogeneity as well as time heterogeneity are already taken into account. In addition, the use of industry adjusted values implies that any aggregate industry level time varying patterns of variation in investment are also controlled for. Thus, the role of these additional variables is to account for time varying firm characteristics that are not controlled for by the above adjustments. These additional control variables are motivated by prior literature – for example, cash flow is motivated by the large literature showing an association of cash flow with investment, usually interpreted as evidence in favor of financial constraints having an impact on firm investment. Firms with high leverage are also likely more financially constrained or distressed, or both, relative to firms with lower leverage. Firm size is posited to be inversely related to financial constraints, and ROA is an alternative proxy for future growth opportunities, although a high ROA could also mean that the firm has more cash at its disposal and therefore less financially constrained. Under both interpretations of ROA, one would still expect a positive impact on investment. All these additional control variables have the expected effects on investment, however, the magnitude or the statistical significance of the effect of increases in SOB lending are not materially impacted by the inclusion of these additional controls.

The net effect of increases in SOB lending with these additional control variables in model (3) reduces to 0.839, which is somewhat lower than model (1), nevertheless highly significant both statistically and economically. To estimate the economic significance of this, we use the mean value of ‘state owned bank,’ which is 0.026 from Table 1, Panel B. Multiplying this by the coefficient estimate, we obtain that the mean increase in the investment to capital ratio to be 0.021. Thus, in terms of the average investment to capital ratio of 0.085, this represents an increase of almost 25% in this ratio, which is highly

significant in economic terms as well. This estimate is also fairly close to the estimate of SOB lending from the univariate analysis in Section 4.2.

Next, in models (4) and (5), we stratify the sample into firms that experienced a decrease in private bank (henceforth, PB) lending in the given year relative to the previous year, and those that did not. We posit that firms that experience a decrease in lending from private banks are more likely to be credit constrained, relative to firms that did not experience such a decrease. To the extent that decreases in private bank lending could be caused by changing economic conditions, such as lower growth prospects, these should be captured by other control variables such as Q as well as contemporaneous return on assets and year fixed effects. We find in both samples a strong positive effect of increases in SOB lending on investment, however, only the sub-sample that experienced a decrease in PB lending shows a strong incremental effect during the crisis. This result is consistent with the increases in investment associated with increases in SOB lending mitigating credit constraints caused by reduction in lending by private banks. Note that the effects of SOB lending on firms that do not experience any decrease in PB lending is much larger than those firms that do, in non-crisis times, suggesting that firms that obtain credit from both state and private sources are able to use the proceeds mainly towards investment, whereas firms that have a decrease in PB lending may have to use a part of the SOB loan to repay private loans that have not been renewed.

5.2 Alternative tests for efficiency of investment

In the previous sub-section, we documented that firms that are credit constrained, as measured by decreases in PB Lending are associated with a stronger effect of SOB lending on investment during crisis period. However, it is difficult to rule out that such decreases in PB lending and consequent reductions in investment are inefficient. For example, one may

argue that firms that experience reductions in private bank lending have lower (unobservable) growth opportunities that are not captured by the firm or year fixed effect or other controls, and thus the increases in investment caused by increases in SOB lending are actually inefficient. We use three approaches to test if these increases are efficient from a shareholders perspective.

5.2.1 Impact of SOB lending on high growth and high cash flow sensitivity firms

First, we interact SOB lending with Tobin's Q and cash flow. To the extent that SOB lending mitigates credit constraints, this may enable firms to better capture growth opportunities. Thus, we might expect that investment sensitivity to Q should be higher for firm with increases in SOB lending. In addition, investment sensitivity to cash flow should be lower if credit constraints are mitigated by SOB lending. On the other hand, with the political view of SOB lending, there should be no incremental effect of SOB lending on high growth firms, nor should the sensitivity of more constrained firms to their cash flow be impacted by SOB lending.

The results of this estimation are presented in Table 3 (all control variables used in Table 2 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 'state owned bank.' We find a strong incremental effect of SOB lending on high growth firms. A SOB 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. However, there is no incremental effect of lending by SOB's to high growth firms during the crisis (model 3). Similarly, SOB lending decreases a firm's sensitivity to cash flow (model 2) which is consistent with reduction of financial constraints. Again, there is no incremental effect of SOB lending during the crisis (model 4).

5.2.2 Impact of SOB lending on firms with higher financial constraints and distress risk

In this sub-section, we re-examine the above results by stratifying firms based 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[14], a measure of the firm's external financial dependence, computed based on 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.[15] Note that the last three firm specific measures could proxy for financial constraints as well as financial distress. For example, many Keiretsu firms not only have an internal capital market among group firms or a main bank that mitigates their financial constraints but also may 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 only for external financial constraints and not distress. As the RZ measure is computed at the industry level, it is most exogenous with respect to the likelihood of SOB lending increases at the firm level. In contrast, other measures of credit constraints may be positively correlated with increases in SOB lending.

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

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[14] A keiretsu is a grouping of large Japanese financial and industrial corporations and cross-shareholdings. In a keiretsu each firm maintains its operational independence while retaining very close commercial relationships with other firms and the main bank in the group. Thus, these firms are less likely to be financial constrained.

[15] We recomputed the Rajan and Zingales (RZ) measure using Japanese data, as the computed measures of external financial dependence using Japanese data, differ markedly from estimates using US data, published in Rajan and Zingales (1998). In particular, two things are striking – the RZ measure computed using Japanese data has a zero correlation with that computed using US data. 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 with a positive RZ score, is classified as not being dependent on external financing in Japan with a negative RZ score.

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

However, if SOBs behave in a manner similar to private banks, the measured effect might reflect a selection effect of SOBs screening good firms and not necessarily mitigating credit constraints.[16] However, this second type of endogeneity, namely SOB's selecting unobservably good quality firms, is less likely to be associated with SOB lending evidence based on other countries shows that SOBs lend to distressed and constrained firms (Sapienza, 2004). Nevertheless, to account for such selection and screening effects, we adjust for endogeneity using a variety of methods in Section 5.4.

Here, we follow a much simpler approach of stratifying our firm year sample into firms that are classified as being constrained or distressed using each of the five measures discussed earlier and estimate Equation (1) for each sub-sample. We use a sub-sample specification, and not a single regression with interaction effects, for three reasons – first, with three variables that we are interested in finding marginal effects for - SOB lending, crisis, and the given constraint, we have a total of 7 variables in the regression which sometimes may cause multicollinearity problems, as well as problems with the interpretation of the marginal effects. Second, due to firm fixed effects as well as year fixed effects, it is difficult to compute the marginal effects even in the absence of multicollinearity. For example, the Keiretsu dummy will be subsumed by the firm fixed effects. Likewise, the crisis dummy will be subsumed by the year fixed effects. Third, using sub-sample regressions allows other control variables to have different marginal effects in the different sub-samples – for example, a Keiretsu firm may react differently to an increase in cash flow or ROA relative to a non-Keiretsu firm.

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

In Panel A, we first present the results for interactions of SOB lending with the relevant financial constraint measure, and in Panel B, we add an additional interaction term for SOB lending with the crisis. Generally, we expect to see a larger effect of SOB lending on constrained firms. Thus, we would expect the effect of SOB lending on investment to be more for constrained or distressed firms. However, during the crisis, these firms may also be disproportionately the recipients of SOB lending. To the extent that SOB's target distressed firms, SOB lending may be correlated with distress and/or financial constraints, as a result of which the incremental effects are difficult to interpret.

The results in Panel A show that there is a significant difference between the effects of SOB lending on constrained and/or distressed firms versus unconstrained or non/distressed firms. In all cases, the marginal impact of SOB lending on constrained or distressed firms is larger relative to unconstrained firms. For example, for firms with a high Rajan –Zingales measure, the net effect an increase of ¥1 in SOB lending leads to an increase of ¥1.2 in investment, something similar to a multiplier effect earlier found for the crisis. Likewise, the marginal effect of SOB 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 SOB lending which makes interpretation of these magnitudes difficult. As mentioned earlier, the Rajan-Zingales measures, which is likely exogenous to increases in SOB lending provides the strongest evidence that SOB lending leads to increases evidence among financially constrained firms.

In Panel B, we examine the incremental effect of the crisis on these two sub-samples of constrained versus unconstrained firms. The results show several interesting patterns. First, for virtually all the measures, the impact of SOB lending on constrained firms is much larger than unconstrained firms during normal times. Second, constrained firms do not show any

incremental effect of SOB lending during the crisis; In contrast, unconstrained firms have a strong positive incremental effect of SOB lending during the crisis. Thus, the marginal value of SOB lending on investment increases for unconstrained firms during the crisis relative to normal times, 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, therefore, they do not show any additional effects during the crisis.

Note that virtually all the results in Panels A and B of this table have been replicated using a single combined regression of the two sub-samples with interaction variables, and the differences in the coefficient estimates observed in the results is statistically significant using the combined regression. As mentioned earlier, we choose this method of presentation for each sub-sample primarily for ease of interpretation.

Next, in panel C, we examine the incremental effect of SOB lending on high Q firms. Recall from Table 3 that SOB 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 SOB and Q is positive and significant for all sub-samples except for the low leverage sub-sample, which is an important robustness test for the earlier results. Second, in several cases, the incremental effect of SOB is positive on high growth firms – for example, for firms with high RZ index, the incremental effect is 0.67 versus 0.55 for low RZ firms. Similar larger incremental effects are observed for high leverage and low Z score firms.

In contrast, for non-Keiretsu and small firms, we observe the opposite effect that the incremental effect is lower for large and Keiretsu firms. However, note that these firms have a large SOB effect in the first place, thus the total effect of SOB lending is still larger for non-Keiretsu firms and small firms, only the incremental effect is lower. For example, for the non-Keirestu firms, the unconditional effect of SOB lending is 0.71, and the incremental

effect is 0.51 leading to a total incremental effect of SOB lending on high Q firms to be close to 1.2, still much higher than that for Keiretsu firms.

5.2.3 Impact of SOB lending on stock price performance

As a third test of whether the increases in investment are efficient or inefficient from a shareholder's perspective, we examine abnormal stock returns for firms that experience increases in SOB lending in a given year. To the extent that the increases in investment in response to increases in SOB lending are inefficient for the shareholders, for example, due to political pressure, we should observe negative performance of the stock prices of such firms. In contrast, with the efficiency view, we should obtain non-negative or positive stock returns.

We apply calendar time-based regression to estimate the one year abnormal return of firms that receive increases in SOB lending. Because we cannot observe the announcement date of the loan, we assume that the announcement day is at the end of June in the event year. For each month, we form a portfolio consisting of all firms that participated in the event within the previous 1 year (3 year). We calculate the one month value-weighted (VW) and equally weighted (EW) returns for that portfolio and repeat this each month. Finally, we regress each vector of one-month returns on the monthly Fama-French factors and examine the intercept.[17]

The results are reported in Panel A and B in table 5. We find that none of the intercepts (alpha) is significantly negative, suggesting that the shareholders are not impacted by

[17] 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.

increases in SOB lending. For the value weighted portfolio, we find positive abnormal returns of between 0.3% to 0.7% in 3 of the 4 specifications, whereas for the equally weighted portfolio, the abnormal returns are generally zero. This suggests that larger firms derive greater benefits of increases in SOB lending.

Overall, the results of the previous subsections (5.2.1, 5.2.2, and 5.2.3) suggest that increases in SOB lending lead to increases in investment, especially during the crisis, and for constrained firms, where constraints are measured in five different ways. Further, these increases are greater for high Q firms, and reduce the cash flow sensitivity for all firms. Lastly, they have a non-negative effect or positive effect on shareholder returns. Taken together, all these results are consistent with lending by SOB's leading to efficient increases of investment, where efficiency is measured from a shareholder's perspective. In the next sub-section, we do a similar analysis on the effect of SOB lending on employment.

5.3 Employment

In this subsection, we examine the effect of state owned bank loans on employment growth. We examine employment growth (and not the level of employment) to mitigate possible differences across firms and industries in their employment intensity that may not be fully captured by the cross-sectional variables that we employ. We use the following empirical model.

$$\text{Employment Growth}_{i,t} = \alpha\, \text{State Owned Bank}_{i,t} + \beta X_{i,t} + \gamma F_{i,t} + v_i + u_t + e_{i,t} \qquad (2)$$

where 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, cash flow, ROA, and wage. Vector F consists of financial factors that include book leverage, "state owned bank", and the interaction term between crisis dummy and "state 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, u_t is the year fixed effect, and $e_{i,t}$ is the idiosyncratic error. We also include firm fixed effects and year fixed effect to control for firm level heterogeneity and year effects.

Table 6 reports estimates from regressing employment on state owned bank loan dummy and various control variables. Model (1) in Table 6 shows that the coefficient on the "state owned bank" is positive and significant, suggesting that firms that receive increase in loans from state owned banks hire more people than non-supported firms. The coefficient estimate in model 1 suggests that an increase in the state owned bank lending of a magnitude equal to 1% of the firm's capital results in an increase of approximately 0.13% for employment growth. In contrast to the investment results (Table 2), the estimated coefficients on interaction term between "state owned bank" and crisis dummy is insignificant, suggesting that there is no incremental effect for state 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 his 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 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 state owned bank lending on employment growth by stratifying firms that experience a decrease in PB lending and those that do not. Again, 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 SOB lending on employment is greater for firms do not experience a decrease in PB lending.

To investigate if this continues to hold in other specifications, we examine the incremental impact of SOB lending, stratifying firms into constrained and unconstrained firms. Again, consistent with the results in Table 6, the marginal impact of SOB lending during the crisis is insignificant for almost all the measures with the exception of leverage and size. Further, even the unconditional impact of SOB lending for constrained and unconstrained firms is similar in magnitude, in contrast to the large differences observed for investment.

The above suggests that employment growth is not significantly enhanced by SOB 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, as a result of which the incremental impact of SOB lending during the crisis is insignificant. We leave investigation of this question to future research.

5.4 Endogeneity of increases in SOB lending

One concern about the empirical results documented so far is that the increases in SOB lending may be endogenous to the investment to capital ratio or employment growth. In particular, SOB's may target firms that are perceived to have higher employment growth, or have higher investment to capital ratio. As mentioned earlier, while evidence (based on countries other than Japan) is generally that SOB's tend to lend to distressed and constrained borrowers, this may not necessarily be applicable to Japan. In particular, given the long history of SOB's in Japan, it is likely that they have screening and monitoring ability similar

to private banks. Thus, the earlier effects that we measured may reflect better selection ability of SOB's.

Note that some of the earlier evidence does work against this selection hypothesis. For example, the univariate statistics in Table 1 suggest that SOB's 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 mitigation of credit constraints. For example, the incremental larger impact of SOB lending on high Q firms, as well as the incrementally larger effect of SOB's during the crisis which was largely unanticipated is also more consistent with mitigation of credit constraints.

To further support the above evidence on the credit constraint mitigation role of SOB lending, and to rule out selection effects, we use four approaches – namely instrumental variables, sequential matching and propensity score matching and a GMM estimation using the Arellano-Bond estimator. We elaborate on the methodology for each of these now.

5.4.1 Instrumental Variables

In the standard IV approach, we use the "Amakudari" as the instrument for state owned bank lending. "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 subtle area of contact 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.

For example, Raj and Yamada (2009) show that retired bureaucrats as directors help the firms to predict the government actions and facilitate transaction with government, through their personnel relationships. By studying "Amakudari" in banking industry, Horiuchi and

Shimizu (2001) show that “Amakudari” is a form of collusion between the regulators and the regional banks and it helps in the liberalization of prudential norms for the troubled banks. These studies provide solid foundation for the argument that “Amakudari” can effectively 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 state owned banks. Meanwhile, there should be no direct relation between the “Amakudari” and firm investment (employment). Recall that our dependent variables are industry adjusted on an annual basis, thus any effects on the aggregate level due to state support for a given industry in a given year should already be accounted for. Thus, we argue that “Amakudari” can be viewed as good instrument for state owned bank lending that should be positive related to increases in SOB lending, but not directly impact firm investment of employment. We use the fraction of directors relative to the total number of directors in the board as the instrument, to account for the fact that larger boards may mechanically have larger number of ex-bureaucrats.

Table 8 reports the results of the 2SLS estimation. The first stage regression, with the dependent variable as state owned bank, shows that the coefficient of “Amakudari directors” is positive and significant. This is consistent with the predicted impact of this variable on increases in SOB lending. In the second stage regression, the coefficient of the “state owned bank” is positive and significant at the 1% level, however, only for the crisis period, for investment and employment growth. Thus, the result on the crisis is consistent with the earlier panel regression, with the additional result that employment effects are also significant. We study the robustness of these results to alternate methods of endogeneity adjustments.

5.4.2 Sequential matching to account for endogeneity

The next approach we use to account for endogeneity is sequential matching, where we construct a list of control firms that share the same 2 digit industrial codes, same sample year and same size quantile[18] in previous year as the firms that receive an increase in SOB lending, but do not receive the increase in SOB lending. Table 9 reports the difference between control group and the treatment group where two sets of matching are done, one for the overall sample, and one for the subsample of firms during the crisis period.

We find that firms that receive increased state owned bank loans have 0.04 higher investments to capital ratio and 0.8% higher employment growth than firms that did not. These differences are highly significant statistically. While the significance of these results are similar to that obtained from the regression analysis, the economic magnitudes of the effect of SOB lending are much larger using the matched sample analysis relative to the regression analysis. For example, from Table 2, the effect of an increase in SOB lending on the investment to capital ratio lies between 0.021 to 0.025, and the effect on employment growth (Table 7) lies between 0.13% and 0.15%. This is not surprising as the matching method does not control for several other firm characteristics that may potentially impact investment or employment. However, it does provide another alternative simple method of assessing the differences that does not rely very much on the statistical assumptions inherent in the IV estimation.

5.4.3 Propensity score matching to account for endogeneity

Next, we account for endogeneity in the increase in SOB 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 SOB lending (treatment group) is matched with another firm that was equally likely to have received an increase in

[18] We rank all observations into 10 quintiles by their size.

SOB lending, but in fact did not (the control group). The differences in these two samples for key variables of interest (employment growth and investment) would reflect the treatment effect of an increase in SOB lending if the underlying statistical assumptions are met, an important one being that any sample selection bias into the treatment and control groups is based on observables.

In the first stage, a logistic regression is conducted to get 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, the size of SOB loans to the firm in the previous year to the given firm, industry of a firm and year dummy variables as predictors of a given firm's likelihood of obtaining an increase in SOB lending. Several of the above variables were also used in the investment and employment growth equations (equations 1 and 2). Similar to the IV estimation, we include the Amakudari as an additional determinant in the first stage regression. Note that the Propensity Score matching does not require presence of this additional variable that is uncorrelated with the investment, as the underlying assumption is that selection into the 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. This table shows results of this estimation for the whole period as well as the subsample using only the crisis period observations. On an overall basis, firms that have an increase in SOB lending have an employment growth at 0.9% and investment to capital ratio at 0.017

compared to other firms that were equally likely to have received an increase in SOB lending, but in fact did not. A similar result holds during the crisis where the magnitude of the effect of being in the treatment group is similar to the overall sample in one specification, but significantly larger in another.[19]

5.4.4 Arellano Bond estimation

Lastly, we apply the Arrellano-Bond estimation method (1991) to further 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 identify these endogenous variables using lagged 3 to lagged 6 values. 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

[19] We are not aware of any formal test that can test if these two treatment effects are significantly different from each other.

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.' Last, 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".

Table 11 reports the results using Arrellano and Bond (1991) model. Consistent with earlier multivariate results, an increase in SOB lending effectively stimulates firm investment and employment. For the investment regression, we find that the effect of state owned bank 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.

5.4.5 Summary of results from endogeneity corrections

The results of this section broadly support the notion that SOB lending has positive effects on investment. Both the IV and Arellano-Bond methods suggest that this incremental effect for investment exists only during the crisis, whereas the propensity score and sequential matching suggests that the SOB lending effects exist both during crisis and normal periods.

For employment, three of the four endogeneity corrections used (IV, PSM, Sequential Matching) imply that there is SOB effect on employment during the crisis, whereas the Arellano-Bond method does not indicate an incremental effect. In addition, IV estimation

indicates a SOB lending effect on employment only during the crisis whereas PSM and sequential matching imply there is an effect both in crisis and non-crisis periods.

Given the earlier panel regression results, the above suggests that investment is positively impacted by SOB lending both during crisis and non-crisis periods, with strong evidence for incremental effects during crisis periods. In contrast, for the employment, the panel regression and the endogeneity corrections, as well as the different methods of correcting for endogeneity, show differences on whether SOB lending has an effect during the crisis or during normal times. Taken in conjunction with the panel results on the insignificance of employment for firms with different credit constrained firms, we interpret the results as one where SOB lending has an effect on employment, but no robustly demonstrated incremental effect during the crisis.

5.5 Impact of SOB lending on private lending

The overall results of the above analysis suggest that SOB lending has positive and significant effect on investment and also on employment. One last question that we examine is whether the SOB lending can effectively induce private bank lending as SOB lending might reflect an implicit government guarantee of the firm, which may be more valuable during a crisis (Horiuchi and Sui, 1993). In particular, if a SOB decides to increase credit to a firm, private banks might interpret this increase as an indicator of government support for the firm. This implicit guarantee may induce additional lending to the firm by private banks. This may also result in a multiplier effect of SOB lending, with marginal effects of one yen of SOB lending being greater than one for investment, as was seen in several tables earlier.

The difficulties in examining this relationship lie in that private bank lending might also affect state owned bank lending because one of the important mandates for state owned banks was to mitigate credit market failures. In particular, when the balance sheet of private banks

are damaged and they are forced to reduce credit, state owned bank should step in and extend credit to the firms which used to be financed by private bank. The evidence for this on an aggregate level was provided in Figure 2 and Figure 5.

On one hand, SOB lending might mitigate the credit rationing by PB lending during crisis and resulting in a negative correlation between these two variables. On the other hand, the guarantee effect of state owned bank lending might induce more private bank lending. In order to overcome this problem, we employ both 2SLS and 3SLS to estimate a system of equations which take into account the mitigation effect on credit rationing and inducement effect on private bank lending. In particular, the interrelation between state owned bank lending and private bank lending is captured by the following equations:

Mitigation Effect:

$$\text{State Owned Bank}_{i,t} = \theta\ \text{Private Bank}_{i,t} + \mu X_{i,t} + \gamma U_{i,t} + v_i + u_t + e_{i,t} \qquad (3)$$

Inducement Effect:

$$\text{Private Bank}_{i,t} = \alpha\ \text{State Owned Bank}_{i,t} + \beta X_{i,t} + \delta Z_{i,t} + v_i + u_t + e_{i,t} \qquad (4)$$

where "state owned bank" is the increase in state owned bank lending, scaled by firm capital; "private bank" is the increase in private bank lending, scaled by firm capital; X is a vector of firm characteristics that are common to both equation, i.e., they are related to both the state owned bank lending and to private bank lending; U is a vector of exogenous firm characteristics that are uniquely related to the amount of state owned bank lending but not to private bank lending; Z is a vector of exogenous firm characteristics that are uniquely related to the amount of private bank lending but not to state owned bank lending.

There are number of control variable that are common to both equations. For example, the size of firm reflects the borrowing capacity of firm and will impact both the supply of

bank loan and demand of bank loan. We also control for firm profitability, growth opportunity and industry fixed effects. The exogenous variable that uniquely affect state owned bank lending include the "Amakudari", which defined as the fraction of Amakudari director in board, "Density of state owned bank support", which defined as the fraction of firms which experience increases in state owned bank lending within the industry, and state owned bank lending to the given firm in previous year. The exogenous variable that uniquely affect private bank lending include "Density of private bank support", which defined as the fraction of firms which experience increases in private bank lending within the industry, and private bank lending to the given firm in previous year.

Before we conduct 3SLS estimation, we first employ 2SLS to estimate each equation separately. The first and second columns in Panel A table 12 report the results of test for the mitigation effect. The first column shows the result of the first step estimation. It is shown that PB lending is positively related to the exogenous variable- "Density of private bank support". The signs of all coefficients are generally consistent with our prediction. The second column reports the result of the second step test for mitigation effect. The coefficient on PB lending is negative and significant, suggesting the decrease in private credit provides an incentive for SOB's to extend credit during crisis period. This result is also consistent with the evidence shown in Figure 5 in which the correlation between SOB lending and private bank lending is negative during the crisis period.

The last two columns in Panel A report the results of test for inducement effect. In the first step, we regress the "state owned bank" on "Amakudari", "Density of state owned bank support" and "state owned bank" in previous year and other control variables. Consistent with our prediction, state owned bank lending is positively related to "Amakudari" and "Density of state owned bank support". In the second step, the coefficient on "state owned bank" on PB lending is positive and significant. More specifically, the result shows that 1 yen increase in

state owned bank lending will induce around 4 yen increase in private bank lending during the crisis. In other words, the state owned bank can quadruple their effect by inducing private bank lending. We also conduct Hansen test for the validity of instrumental variables (IVs). The results suggest that the tests fail to reject the hypothesis that our IVs are valid.

In order to take into account the possible correlation between the residual of these two equation, we employ 3SLS to estimate these two equations simultaneously. The results are reported in Panel B, Table 12. The first column in this panel reports the result for the test of mitigation effect. The coefficient on the private bank lending is negative. However, the value is not statistically significant. In the second column, we test the inducement effect of state owned bank lending on private bank lending. The coefficient on state owned bank lending is positive and significant, suggesting that state owned bank can effectively induce private bank lending. Thus, one potential channel through which SOB lending has the large positive effects on investment is by means of this inducement effect.

6 Conclusion

Using Japanese firm-level data that cover the period of the Japanese financial crisis in the 1990s, we examine the real effects of state owned bank loans on corporate investment and employment. Compared with previous studies that examined the impact of state owned banks in emerging markets, where state owned banks often dominate the banking sector, our study examines a market where state owned banks co-exist with a developed private banking sector. Therefore, our study has implications on developed economies that have similar institutional developments.

Our tests show that state owned bank 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 state owned banks can enhance efficiency of the firm's investment by mitigating credit constraints. In contrast, we find relatively small incremental effects of SOB lending on employment growth, both during the crisis and for more credit constrained firms.

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 state owned banks loans. 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 state owned banks in other economies such as the US where employers do not typically have such employment guarantees. Lastly, since we do not have the terms of the loans provided by state 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 state bank loans on firm activity, which appears that government, at least in the context of Japan, achieves the general social objective of SOB 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.

State owned bank: The net increase in state 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 state 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 state owned bank lending. Panel C reports the summary statistics of variables for firm year observations without increases in state owned bank lending. Investment is defined as changes in tangible fixed asset plus depreciation divided by total capital in the previous year. State Owned Bank is defined as the net increase in state 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. 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
State Owned Bank	20110	-0.0003	0.0218	-0.002	0	0
Total asset(×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
State 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 state 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
State Owned Bank	3350	0.026	0.031	0.005	0.013	0.034
Total asset(×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
State 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 state 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
State Owned Bank	16760	-0.006	0.015	-0.003	0.000	0.000
Total asset(×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
State 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 State Owned Bank lending and other firms

	Difference in Mean	Difference in Median
Investment	0.030***	0.033***
Employment growth (%)	0.2***	0.07***
State Owned Bank	0.032***	0.013***
Total asset($\times 10^2$ 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***
State 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

State 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. State Owned Bank is defined as the net increase in state 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. 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)	(5)
				Private bank lending decreases	**Private bank lending does not decrease**
State owned bank	0.973***	0.862***	0.839***	0.548***	0.942***
	(8.840)	(6.938)	(6.835)	(3.984)	(5.454)
State 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 3

State 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. State Owned Bank is defined as the net increase in state 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 :"State owned bank", Tobin's Q, Cash flow, Book leverage, ROA and Size. In model 3, we also include "State owned bank× Crisis dummy" and "Tobin's Q× Crisis dummy" respectively as controls. In model 4, we include "State owned bank× Crisis dummy" and "Cash flow× Crisis dummy". All regressions include year dummies, firm dummy and a constant term. 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)
State owned bank × Tobin's Q_{t-1}	0.670***		0.760***	
	(8.318)		(7.231)	
State owned bank × Tobin's Q_{t-1} × Crisis dummy			-0.278	
			(-1.643)	
State owned bank × Cash flow		-0.585***		-0.520***
		(-5.364)		(-4.584)
State 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 4

State 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. State Owned Bank is defined as the net increase in state 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. 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.

Panel A –Overall effect

	Keiretsu	Non-Keiretsu	Low RZ	High RZ	Low Leverage	High Leverage	Low Zscore	High Zscore	Small firm	Large Firm
State 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

Panel B – Effect of SOB during crisis

	Keiretsu	Non-Keiretsu	Low RZ	High RZ	Low Leverage	High Leverage	Low Zscore	High Zscore	Small firm	Large Firm
State 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)
State 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

Table 4 (continued)

Panel C – Effect of SOB on high growth firms

	Keiretsu	Non-Keiretsu	Low RZ	High RZ	Low Leverage	High Leverage	Low Zscore	High Zscore	Small firm	Large Firm
State 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)
State 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

Table 5
Impact of State 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 state 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	**crisis period**	**Non-crisis period**	**Crisis period**
	EW	**EW**	**VW**	**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	**crisis period**	**Non-crisis period**	**Crisis period**
	EW	**EW**	**VW**	**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 6

State 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. State Owned Bank is defined as the net increase in state 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. 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	**Private bank lending does not decrease**
State owned bank	0.133***	0.151***	0.101**	0.154***
	(5.261)	(5.009)	(2.206)	(3.471)
State 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 7

State 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. State Owned Bank is defined as the net increase in state 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. 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 Zscore	High Zscore	Small firm	Large Firm
State 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

Panel B

	Keiretsu	Non-Keiretsu	Low RZ	High RZ	Low Leverage	High Leverage	Low Zscore	High Zscore	Small firm	Large Firm
State 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)
State 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

Table 8

Instrumental variable estimation

This table reports the results of 2SLS estimations for the effects of state owned bank lending on employment and investment respectively. Investment for firm i at year t, is 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. 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. State Owned Bank is defined as the net increase in state 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 dependent variable in the first step is State Owned Bank as defined above. Detailed variable definitions are provided in the appendix. t statistics are reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level respectively.

	First step	Second step	First step	Second step
		Investment		Employment
State owned bank		0.093		0.136
		(0.021)		(0.087)
State owned bank × crisis		0.506*		0.513***
		(1.649)		(5.123)
No. Amakudari/No. Directors	0.013**		0.012**	
	(2.355)		(2.272)	
Tobin's q(t-1)	-0.000	0.022***		
	(-0.015)	(4.430)		
Cash flow	-0.001	0.069***	-0.001	0.008***
	(-0.788)	(13.224)	(-1.017)	(4.029)
Book leverage	-0.007**	-0.212***	-0.006**	-0.092***
	(-2.157)	(-4.931)	(-1.984)	(-6.038)
Size	0.009***	0.177***	0.008***	0.047***
	(6.114)	(4.488)	(5.947)	(3.351)
ROA	-0.001	-0.199**	-0.003	0.274***
	(-0.144)	(-1.968)	(-0.293)	(7.887)
Sales growth			0.001	0.037***
			(1.222)	(8.241)
Wage			0.001***	-0.029***
			(3.026)	(-11.913)
N	9653	9653	9653	9653
adj. R-sq	0.114	0.111	0.115	0.224
Year Fixed Effects	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES

Table 9

Sequential Matching

This table presents descriptive statistics that compare treatment firms and control firms. The sample comprises 2861 treatment firms observation that state owned bank lending increased between1977 and 1996 and the same number of control firms matched by industry, year, and size in previous year for Japanese operating firms. Investment for firm i at year t, is 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. 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. State Owned Bank is defined as the net increase in state 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 dependent variable in the first step is State Owned Bank as defined above. Detailed variable definitions are provided in the appendix. t statistics are reported in parentheses. ***, ** and * indicate statistically significant at 1%, 5% and 10% level respectively.

	Treatment firms				**Control firms**					
Whole sample period	25th percentile	Median	Mean	75th percentile	25th percentile	Median	Mean	75th percentile	**Treatment group-Control group(mean)**	**Treatment group-Control group(median)**
Total asset(m)	33462	86462	256395	268827	31341	75421	279511	225409	-23115	11041
Investment	0.01	0.07	0.12	0.15	-0.01	0.04	0.08	0.12	0.04***	0.03**
Employment Growth (%)	-2.21	0.11	0.97	2.4	-2.21	0.09	0.18	2.67	0.81***	0.02
Crisis sample Period										
Total asset(m)	56284	147399	353179	363287	54537	126489.5	357559.1	357346	-4379	20909
Investment	0.02	0.09	0.13	0.18	0	0.06	0.1	0.15	0.03***	0.03***
Employment Growth (%)	-0.5	1.45	2	3.98	-0.74	1.41	1.43	3.93	0.57***	0.04

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 state owned banks with firms that do not. We use a probit model to calculate the scores. The dependent variable is "state owned bank dummy", which take 1 if the a firm records increases in state 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 varaible 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 state 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 state 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 have a Hansen statistic that is not significant at the 1% level. consistent with a failure to reject their being exogenous. Detailed variable definitions are provided in the Appendix. ***, ** and * indicates significantly different than zero at 1%, 5% and 10% level, respectively.

	Investment	Employment
State owned bank	0.359	0.492*
	(0.578)	(1.791)
State 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

Table 12

Effect of State Owned bank lending on Private Bank lending

This table reports the results of 2SLS and 3SLS estimations for the relationship between state owned bank lending and private bank lending during the crisis period (1990-1994). The dependent variable in the first equation is the increase in state owned bank lending for given firm year observation, scaled by firm capital. The dependent variable in the second equation is the increase in private bank lending for given firm year observation, scaled by firm capital. Detailed variable definitions are provided in the Appendix. ***, ** and * indicate statistically significant at 1%, 5% and 10%level respectively.

Panel A - 2SLS

	Mitigating effect		**Inducement effect**	
	First step	Second step	First step	Second step
	Private Bank	State owned bank	State owned bank	Private Bank
Private bank		-0.002***		
		(-3.105)		4.132**
State owned bank				(2.571)
No. Amakudari/No. Directors			0.010**	
			(2.415)	
Density of state owned bank support(t)			0.033***	
			(7.645)	
State owned bank lending/capital (t-1)			-0.015***	
			(-4.160)	
Density of Private bank support(t)	0.201***			
	(4.965)			
Private bank lending/ capital (t-1)	0.000			
	(0.020)			
Size	0.002	0.001	0.001***	-0.001
	(0.693)	(1.347)	(5.074)	(-0.474)
Sales growth	0.039**	-0.007*	0.001	0.034
	(1.981)	(-1.852)	(0.669)	(1.645)
Cash flow	0.022***	0.009***	-0.001	0.024***
	(4.906)	(2.871)	(-0.434)	(5.084)
Book leverage	0.225***	0.008*	0.005***	0.210***
	(9.816)	(1.748)	(3.447)	(9.054)
N	6019	6019	6019	6019
Hansen J test for IVs (p-value)		0.29		0.07
Year and Industry Fixed Effects	Yes	Yes	YES	YES

Table 12 (continued)

Panel B - 3SLS

	Mitigating effect	Inducement effect
	State owned bank	Private bank
Private bank	-0.016	
	(-1.462)	
State owned bank		2.770*
		(1.770)
No. Amakudari/No. Directors	0.010**	
	(2.407)	
Density of state owned bank support(t)	0.034***	
	(7.655)	
State owned bank lending/capital (t-1)	-0.018***	
	(-4.210)	
Density of Private bank support(t)		0.197***
		(4.822)
Private bank lending/ capital (t-1)		0.000
		(0.083)
Size	0.001***	0.001
	(5.132)	(0.361)
Salesgrowth	0.002	0.049**
	(1.031)	(2.404)
Cash flow	0.000	0.027***
	(0.554)	(5.763)
Book leverage	0.009***	0.165***
	(2.985)	(6.216)
N	6019	
Year and industry Fixed Effects	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.

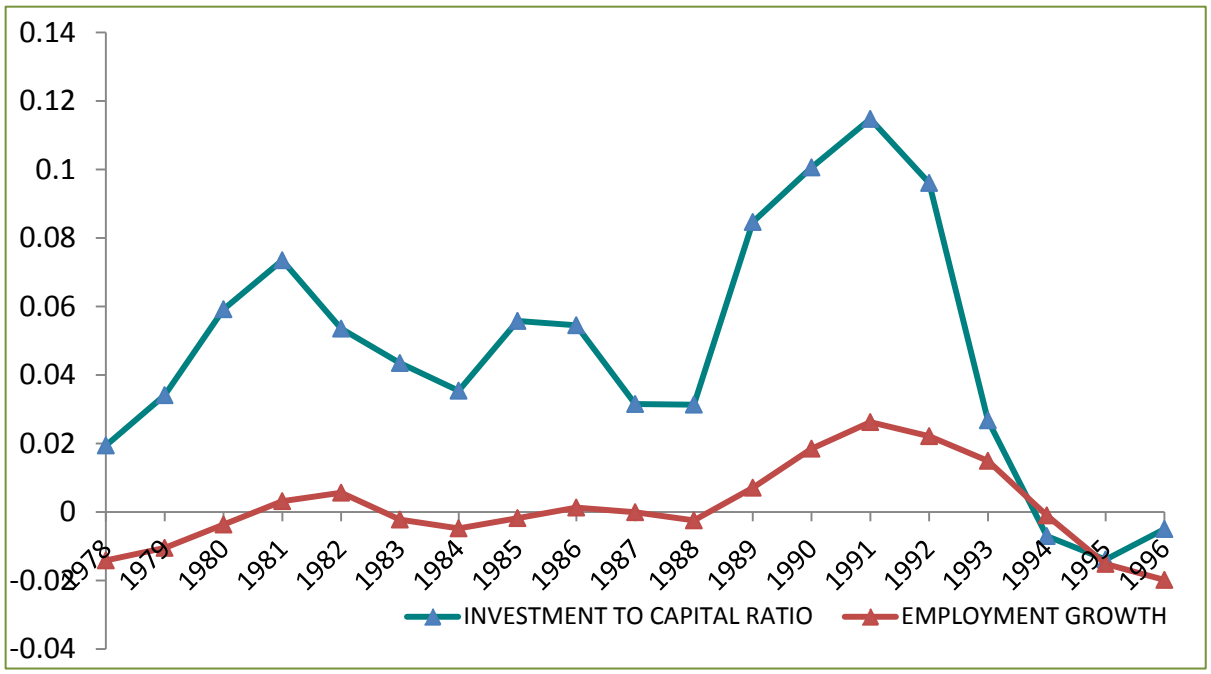

Figure 2
State Owned Bank Lending and Private Bank Lending

Aggregate corporate loans from private banks and state owned banks during 1979 to 1996 in for Japan. Source: Flow of Funds, The Bank of Japan.

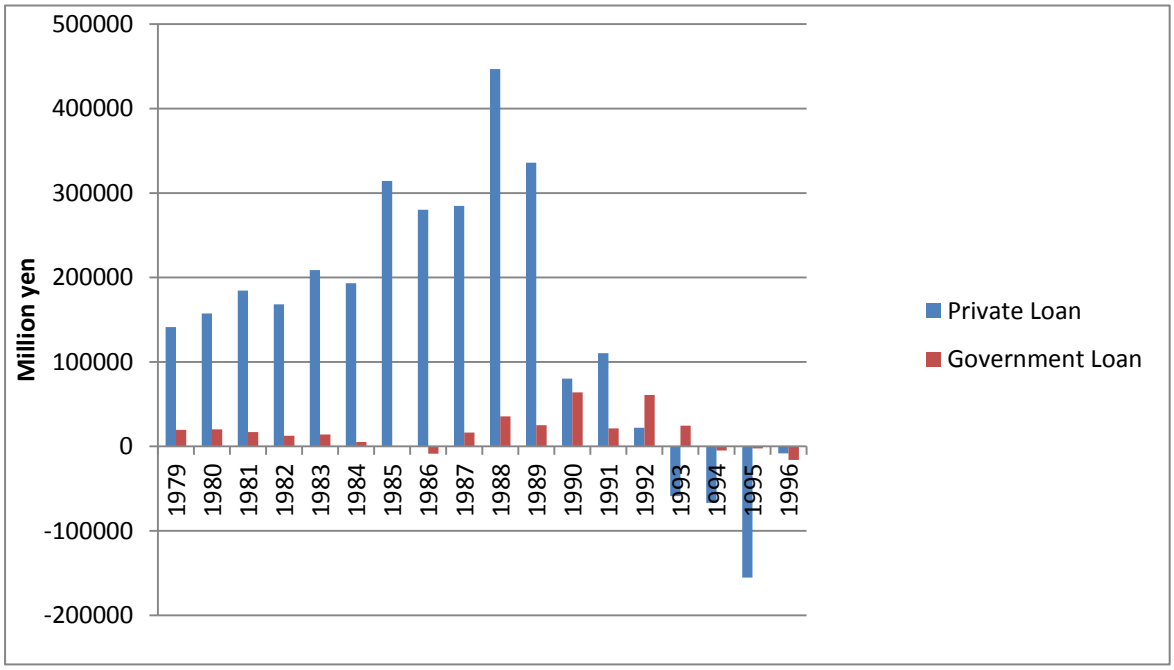

Figure 3
Time series patter of State Owned Bank lending

This figure plots the time series pattern of increases in state owned bank lending scaled by the total borrowings of the firm (right axis) and the total number of firms in a given year that receive an increases in SOB lending based on our data sample of publicly traded firms. .

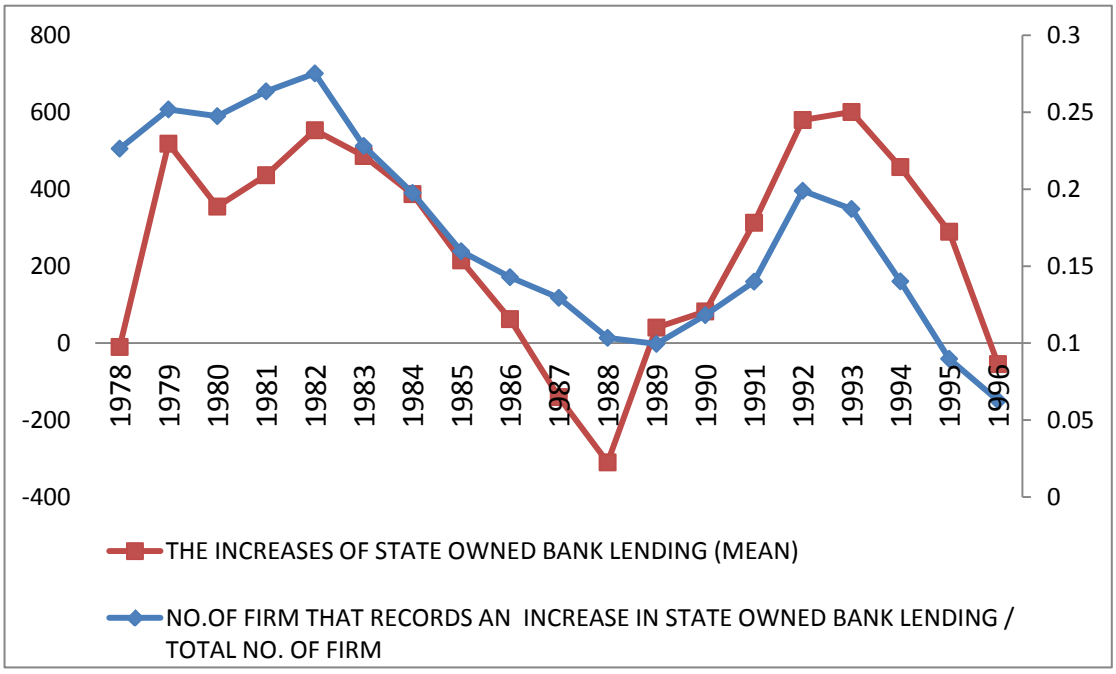

Figure 4
State Owned Bank loan and Private Bank loan

Corporate loans from private banks and state owned banks for listed firms in our sample.

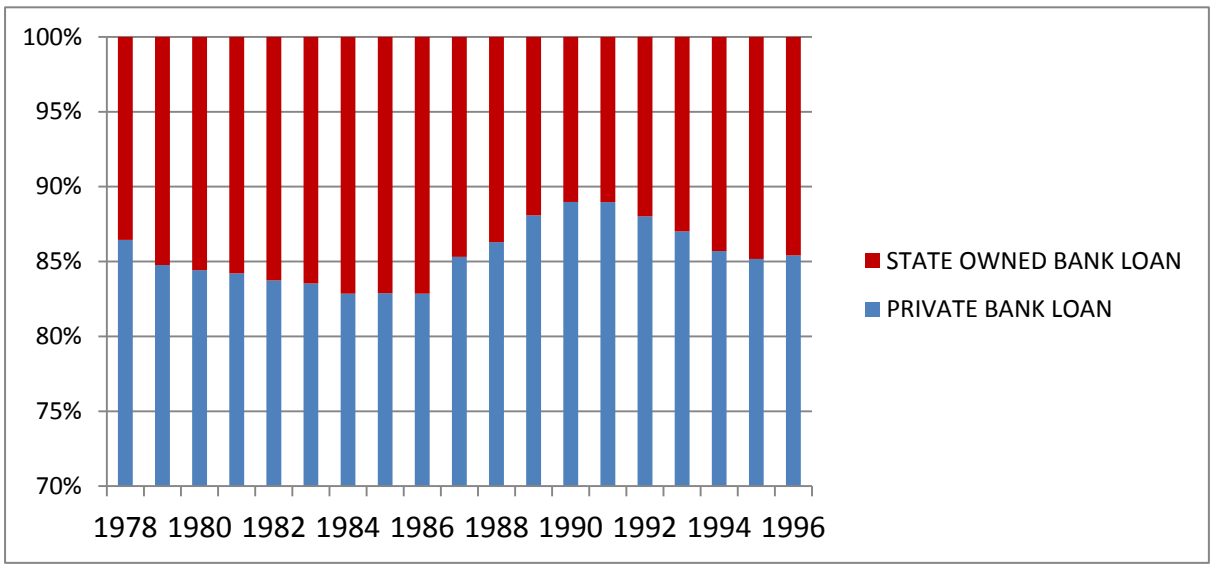

Figure 5
Correlation between State Owned Bank lending and Private Bank Lending

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