**Bank of Japan Working Paper Series**

# Efficiency of Credit Allocation and Effectiveness of Government Credit Guarantees: Evidence from Japanese Small Businesses

Iichiro Uesugi *
iuesugi@ier.hit-u.ac.jp

No.08-E-2
February 2008

Bank of Japan
2-1-1 Nihonbashi Hongoku-cho, Chuo-ku, Tokyo 103-8660

* Institute of Economic Research, Hitotsubashi University

# Efficiency of Credit Allocation and Effectiveness of Government Credit Guarantees: Evidence from Japanese Small Businesses

Iichiro Uesugi[1]

Institute of Economic Research,
Hitotsubashi University
2-1 Kunitachi Tokyo 186-8603
JAPAN
iuesugi@ier.hit-u.ac.jp

January 31, 2008

Abstract

This paper empirically examines the development of credit allocation amongst Japanese small- and medium-sized enterprises (SMEs), and the relationship between credit allocation and economic efficiency. We first investigate whether the credit market is inefficient, in that the survival of underperforming firms force better-performing firms to exit the market. Secondly, we test whether government credit guarantee programs are beneficial. In other words, do these programs increase the funds available to SMEs, and, more importantly, do they significantly impact the profitability of program users? Using a pair of unique firm-level datasets, we come to two major conclusions. (1) The selection mechanism in the Japanese credit market is efficiency-improving in that lower quality firms with higher borrowing costs are more likely to default. (2) The massive credit guarantee program implemented by the Japanese government in the late 1990s did result in the increased availability of funds to SMEs, and to the greater profitability of creditworthy firms. Moreover, interest rates do not decrease among program users indicating that government interest payment subsidies are not attributed fully to borrowers.

[1] The paper is mainly based on Sakai, Uesugi, and Watanabe (2005) and Uesugi, Sakai, and Yamashiro (2006). The author wishes to thank Wako Watanabe (discussant) and participants at the conference on the "Economic Costs during the Deflationary Period," cohosted by the Bank of Japan and University of Tokyo for valuable comments. Also, the author is grateful to the members of the Corporate Finance Study Group in RIETI and the members of the Research Office of the Small and Medium Enterprises Agency for useful comments and discussions.

## 1. Introduction

This paper empirically examines the development of credit allocation among Japanese small and medium enterprises (hereafter SMEs), and the relationship between credit allocation and economic efficiency. How to improve the efficiency of credit markets, either by facilitating the flow of funds, or by reducing interest payments, has been of major interest, not only to borrowers and lenders, but also to policy makers and academics. In Japan, during the late 1990s and early 2000s, public scrutiny fell heavily on credit markets and the possible *inefficient* allocation of funds. The belief was that these markets were distorted by the dramatic increase in non-performing loans. Banks continued to lend to "doomed-to-fail" firms in an effort to postpone the realization of losses incurred by the mounting non-performing loans. The government response was to attempt to facilitate the flow of funds to SMEs, but this only led to criticisms of adding yet another source of inefficiency to the market. The fact of the matter was that the federal credit programs were too lenient. They attracted low quality firms and/or discouraged firms' managerial efforts.

The focus of this paper is twofold. First, we investigate if the credit market for SMEs is inefficient in that the survival of underperforming firms prevent innovative better-performing firms from staying in the market. A number of economists claim that this inefficient selection, most frequently observed among large-sized firms, contributed significantly to Japan's stagnant decade of the 1990s. Furthermore, many researchers believe that this inefficiency was much more severe among small businesses. We look into these claims, and investigate whether a rational selection mechanism for SMEs exists. Secondly, we examine whether government interventions in credit markets can be effective. Many fear that these interventions worsen the information problems between lenders and borrowers and exacerbate moral hazard and adverse selection problems. We test these predictions by focusing on a massive credit guarantee program, with exceptionally lenient lending conditions, that was temporarily implemented by the Japanese government.

It should be noted that empirical studies of this type have only recently become possible as a variety of new firm-level data sets of SMEs have become available in Japan. Establishment of the Credit Risk Database (hereafter CRD), with more than 5 million SMEs' balance sheets, and annual surveys by the Small and Medium Enterprise Agency of Japan (hereafter SMEA) since 2001 are the two notable examples. The remainder of the paper proceeds as follows. Section 2 examines if the credit market for SMEs has an appropriate selection mechanism. Effectiveness of government interventions is discussed in section 3. Section 4 concludes.

## 2. Examining the Selection Mechanism of the Credit Market[2]

### 2.1 Natural versus Unnatural Selection[3]

To test for market efficiency, we specifically focus on the process of "selection," in which surviving firms and defaulting firms are separated from one another. We define natural selection as lower quality firms being separated out from good performers, charged higher interest rates, and eventually being forced out of the market. If selection is natural, overall efficiency improves since low-quality inefficient firms are expunged from the market. In addition, the pricing of loans by financial institutions improves the efficiency of the market since high quality firms benefit from the lower borrowing costs, and thus, have greater chances of survival.

The working of the selection process in the late 1990s has been one of the most important empirical issues to Japanese economists. Sekine et al. (2003) and Peek and Rosengren (2005) use

[2] This section is based on Sakai, Uesugi, and Watanabe (2005) and Small and Medium Enterprises Agency (hereafter SMEA) (2007).

[3] Needless to say, "natural selection" is borrowed from evolutionary biology. Even with non-trivial differences between industrial and biological evolution, the authors believe that this analogy is useful for readers to clearly understand their exercises.

firm-level data to investigate whether the selection process worked properly for large, publicly traded firms. Using various performance indicators, including productivity, profitability, and debt ratios, to distinguish bad from good firms, they find that troubled banks tend to increase (rather than decrease) loans to bad firms in order to avoid the realization of losses on their own balance sheets. They interpret this as evidence against natural selection. Peek and Rosengren (2005) dub this "unnatural selection."[4] Also, Nishimura et al. (2005) find that, in the latter half of the 1990s, some Japanese industries were characterized by the survival of low productivity firms and with the exit of high productivity firms. Furthermore, Caballero et al. (2006) and Ahearne and Shinada (2004) argue that Japanese banks have kept unprofitable ("zombie") firms alive by extending loans at extremely low interest rates, and that these zombies crowd out firms with profitable projects, thereby distorting the allocation of financial resources.

One common feature of this line of research is the focus on large firms.[5] This is partly because the misallocation of bank loans is believed to occur only for these firms. There is no a priori reason, however, to believe that small firms are free from unnatural selection. In fact, a number of practitioners and researchers argue that the misallocation and the mispricing of bank loans to small firms is a much more serious issue. Also, given that large parent firms and their subsidiaries are closely related in terms of their activities, it is possible that the unnatural selection of large firms has an adverse impact on small firms. Based on this understanding, we examine whether small and medium sized firms have also been vulnerable to unnatural selection.

### 2.2 Data

The data in this study are obtained from the Credit Risk Database (CRD),[6] which covers about 60 percent of all small corporations in Japan.[7] One of the advantages of the CRD is that it contains detailed information on firm defaults. In fact, defaults are characterized in four ways: (1) delinquent payment for three months or more, (2) de facto failure, (3) failure, and (4) repayment of debts by a loan guarantee corporation. This information allows us to identify defaulters and non-defaulters in each year of our sample.

Using more than 5 million firm-years contained in the CRD, we construct a panel data set. Our sample period runs from 1997 through 2002. We limit the sample to those firms satisfying either of the following two conditions: (1) surviving firms from 1997 to 2002 that reported information to the CRD in each year, or (2) defaulting firms during this period that reported information to the CRD until the year of default. Put differently, a firm is not included in our sample if it does not report to the CRD in 1997, or if it disappears without a record of default. Thus, firms born in and after 1998 are not included in our data set. Finally, we remove outliers for each variable based on the following rules. For interest rates, we first remove outliers in the lower tail by omitting observations with exactly zero interest rates (0.91 percent of the total observations), and we then remove the same percentage of observations in the upper tail. For the other variables (operating profits and net worth), we remove the top and bottom 1 percent of all the observations. After making the above adjustments, we obtain a panel data set whose structure is described in table 2-1. Our sample starts with about 240,000 firms in 1997, and ends with about 200,000 firms, or a loss of approximately 8,000 firms per year.[8] Below we explain the major variables employed in our analyses.

[Insert table 2-1]

---

[4] Note that, in Peek and Rosengren (2005), selection, whether it is natural or unnatural, does not imply exit from markets: unnaturally selected firms (with poor performance) increase debts but continue in the market. This is presumably because their sample is limited to publicly traded firms, which seldom default.

[5] An exception is Nishimura et al. (2005) who use a data set containing small firms.

[6] The CRD was established in 2001 at the initiative of the Small and Medium Enterprises Agency of Japan (SMEA) in order to provide financial institutions with detailed and reliable P/L and B/S information about small businesses, thereby enabling financial institutions to accurately estimate default probabilities.

[7] There were about 1.6 million small- and medium-size corporations in Japan as of 2001, of which the CRD covers 0.9 million.

[8] The default rates are two to four percent per year.

- **Borrowing Cost** The CRD does not provide borrowing cost information for each individual loan contract. To calculate borrowing cost, we divide annual interest payments by the average of total borrowing outstanding (including discounted notes receivable) at the end of the current and previous years.

- **Birth Year and Firm Age** We define the year when a firm is registered at the Legal Affairs Bureau as its birth (cohort) year. The difference between the current year and the cohort year is the age of the firm. The number of firms that are very old or very young is quite limited, and thus, we mainly focus on the samples with cohort years between 1950 and 1995.

- **Operating Profit** We define operating profit as business profits divided by the value of total assets outstanding. This performance variable serves as a proxy for firm quality.

[Insert table 2-2]

Table 2-2 displays summary statistics for these variables. The mean borrowing cost for all firms is 2.83 percent, and there is a substantial difference in performance between the surviving and defaulting firms. The performance of defaulting firms, in terms of default probability and operating profit, is markedly worse than that of surviving firms.

### 2.3 Hypothesis Tests

Natural selection implies that lower quality firms are required to pay higher borrowing costs, and are eventually forced to exit the market. Therefore, whether selection is natural or unnatural depends on how different surviving firms are from defaulters in terms of performance and borrowing costs. Specifically, we can say that selection is unnatural if

$$E_{i\in S(t,\tau)}Q_i(t,\tau) - E_{i\in D(t,\tau)}Q_i(t,\tau) < 0, \tag{2-1}$$

The first term is the expected value of the firm's performance (Q) in year t by the firms born in year τ that survive into year t+1. Higher Q means better performance, such as operating profit. The second term represents the expected value of Q for the firms born in year τ that default in year t+1. In terms of borrowing costs, selection is unnatural if

$$E_{i\in S(t,\tau)}R_i(t,\tau) - E_{i\in D(t,\tau)}R_i(t,\tau) > 0, \tag{2-2}$$

where R is a variable representing the firm's borrowing cost.

[Insert tables 2-3 and 2-4]

Table 2-3 presents the results of a one-tailed t-test against the null hypothesis that equation (2-1) holds. Similarly, table 2-4 presents the results against the null hypothesis that equation (2-2) holds. In both cases, we can reject the null hypotheses, not only for the entire sample, but also for almost all sub-samples divided by cohort years and industries. For the entire sample, defaulters have lower operating profit than survivors by 2.3 percent, while they pay higher borrowing costs by 0.6 percent. One of the few exceptions is the real estate industry, where we cannot reject the null hypothesis for borrowing costs, although we can safely reject it for operating profit.

Hence, with a few minor exceptions, we observe that low quality SMEs are separated and eventually forced out, which improves the overall efficiency of the market. Moreover, interest payments charged by financial institutions distinguish between good and bad firms, and facilitates the proper selection of SMEs. These findings are strong evidence for natural selection among SMEs.

### 2.4 Selection Mechanism including Voluntary Exit

It should be noted that there exists a different definition of selection than the one introduced in the previous analysis. To this point, we have defined selection in terms of "default" – because a firm fails to repay a loan, it is separated from non-defaulters, and is eventually forced from the market. Financial institutions are directly affected by the default in that they are not able to receive repayments from the defaulting firm.

Selection can alternatively be defined in terms of "voluntary exits," in which a firm regularly repays a loan but stops operating due to non-financial reasons, including meager sales prospects and failure of CEOs to find successors. Since financial institutions generally continue to receive payments from firms that have voluntarily shut down, they are clearly less concerned with voluntary exits than with defaults. It should be noted, however, that voluntary exits outnumber defaults by a large margin, and thus have a significant impact on the efficiency of the economy.[9] Hence, we additionally examine the selection process including "voluntary exit" to see if natural selection story holds again.

Since firms that voluntarily exit are not required to officially report discontinuing operations, identifying these exits is impossible with the CRD. Other census statistics need to be employed. Following Shimizu and Miyagawa (2003), we use the Censuses of Manufacturers, for the years 1993-2003, issued by the Ministry of Economy, Trade and Industry. Note that our analysis is limited to the manufacturing industry since equivalent government statistics for other industries fail to provide the necessary figures on firm productivity.

We construct our sample by classifying firms according to their appearance in, and disappearance from, the Census. Firms recorded as manufacturing establishments during the 1993-2003 period are labeled as "surviving establishments." Firms that are recorded during 1993-1998 but not recorded in any one year in the 1999-2003 period are labeled as "exiting establishments." Finally, firms that did not exist in 1993 but show up in the Census in the 1994-1997 period are labeled as "startup establishments." The exiting establishments are believed to either be in default, or have voluntarily closed during the years 1999-2003. Due to the lack of data for interest payments, we compare exiting and surviving firms only in terms of their quality and not in terms of their borrowing costs.

For each of the 577 subgroups of manufacturing industry, we estimate the following:

$$\ln L_i = \gamma_1 D_{1i} + \gamma_2 D_{2i} + \gamma_3 D_{3i} + \gamma_4 D_{4i} + \beta \ln X_i + \varepsilon_i , \qquad (2\text{-}3)$$

where $\ln L_i$ represents the log of labor input of the $i$th establishment in 1998, $\ln X_i$ is the log of the annual shipment amount in 1998, and $D_{1i}, D_{2i}, D_{3i}$, and $D_{4i}$ are dummies for a surviving, startup, exiting, and other establishment, respectively. This equation estimates the necessary amount of labor force for the fixed amount of shipment. Lower $\gamma$ indicates a more efficient production process. Therefore, we can derive a formula for unnatural selection, which is similar to (2-1):

$$\gamma_1 - \gamma_3 > 0 \qquad (2\text{-}4)$$

The inequality implies that exiting firms require a smaller amount of labor force for a fixed amount of output than surviving firms, which indicates that exiting firms are more efficient in producing goods. We summarize the results in table 2-5.

[Insert table 2-5]

The right column of table 2-5 shows the number of industry subgroups that satisfy or do not satisfy (2-4) in 1998. For reference, the left column shows the equivalent results obtained by Shimizu and Miyagawa (2003), where they examined the same inequality in the year 1990. We find that, in the manufacturing industry, the number of subgroups that satisfy (2-4) is larger than the number of those that do not. Furthermore, the results are qualitatively the same in 1990 and 1998. Hence, in a majority of sub-sectors of the manufacturing industry, we observe that high quality establishments exit either voluntarily or

[9] During the years from 2001 to 2004, the number of defaults per year is about 15,000, while that of voluntary exits is presumed to far exceed 250,000 a year. See SMEA (2006; p28, p40) for description.

involuntarily, which may exacerbate the overall efficiency of the market.

### 2.5 Discussion

If we take voluntary exits into account, there is strong evidence of unnatural selection in that high quality manufacturing establishments exit and low quality ones remain in the market. This result contrasts with the results of the previous subsections.[10] Due to a lack of data, however, we do not have evidence on whether the credit market for SMEs contributes to the unnatural selection. Should financial institutions be blamed?

Indirect evidence, provided by Harada (2006), says that financial institutions play a negligible role in the voluntary exits of efficient enterprises. Based on the Survey of Retirement of Small Firm Managers, Harada (2006) provides several possible reasons for the exit, either through default or not, of small firms. A majority of respondents chose either "Despairing perception of further business," "Aging of the manager," or "Illness or injury of the manager." In contrast, only about one percent of the respondents chose "Rejection or reduction of loan by financial institution" as the reason for exit. Thus, the role played by financial institutions in the voluntary exit of efficient small businesses appears minimal, for better or for worse.

## 3. Effectiveness of Government Credit Guarantees[11]

In this section, we examine the role played by the government in the credit market. Government interventions often aim to facilitate the flow of funds to SMEs, the goal of which is to stimulate profitable investments and to increase economic efficiency. In spite of abundant theoretical literature on how interventions affect firms' performance,[12] empirical evidence on the effectiveness of federal credit programs has been rather hard to come by.[13] The Japanese government, in an effort to stimulate the flow of funds to the small business sector, temporarily implemented a massive credit guarantee program that was unprecedented in both scale and scope. Because the program was accessible by nearly every small firm, we are able to clearly identify the policy effect. Utilizing a new panel data set of Japanese firms, which covers the implementation period of the program, we empirically test the effectiveness of the program.

### 3.1 The Special Credit Guarantee Program

In the 1990s, as the Japanese economy entered a period of prolonged stagnation, public guarantees were frequently included in government economic stimulus packages. This culminated with the introduction of the Special Credit Guarantee Program for Financial Stability (SCG program), which ran from October 1998 to March 2001. The purpose of the measure was to alleviate the severe credit crunch faced by the small business sector. Beneficiaries of the program were subject to little in the way of collateral or third-party guarantor requirements. The scale of the SCG program, in terms of funding, was unprecedented. It is presumably the largest single credit guarantee program ever implemented in any

---

[10] Note, however, that there are several differences in methodology between the analyses of subsections 2-2-2-3 and subsection 2-4. They include measurement of business performance (number of employees for unit production versus profitability), data sets (Census of Manufacturers versus CRD), and economic entity used for analysis (establishments versus incorporations).

[11] This section is based on Uesugi, Sakai, and Yamashiro (2006).

[12] For example, see Mankiw (1986), Gale (1990a, 1990b, 1991), Smith and Stutzer (1989), and Innes (1991).

[13] Among the many possible instruments used in credit market interventions, credit guarantee programs are the most frequently investigated. For example, Craig et al. (2005) examine the effectiveness of these programs in the U.S., Cowling and Mitchell (2003) do so for the U.K., Riding and Haines (2001) for Canada, and Matsuura and Hori (2003) for Japan. Most of these studies, however, do not have control samples even when they have access to firm-level data.

country. Funding was initially capped at 20 trillion yen, but, in 1999, the cap was increased to 30 trillion yen.

Another unique feature of the SCG program was its loose examination policy. An applicant could be rejected for a guaranteed loan only under certain conditions: significantly negative net worth, tax delinquency, default, or window dressing of balance sheets.[14] Needless to say it was very difficult to be rejected. In most cases, the credit risk of an applicant was no longer a concern for approval, which meant that there was virtually no incentive for a risky firm to masquerade as an eligible firm to obtain funding. Hence, an astonishing number of small businesses (1.7 million approvals totaling about 28.9 trillion yen in guaranteed loans) benefited from the SCG program. Figure 3-1 displays the amount of SME loans backed by guarantees. It is clear from the figure that the introduction of the SCG program led to a significant increase in the amount of guaranteed loans.

[Insert figure 3-1]

### 3.2 Investment versus Adverse Selection Effect

Based on the above characteristics of the SCG program, we compare the positive and the negative impact of intervention. The positive effect of the program was that the 100% repayment ratio reduced the borrowing cost to the risk-free rate. As the market interest rate falls, loans are more available and more investment projects are undertaken. However, profitability of each undertaken project depends on the creditworthiness of the firm. Low creditworthy firms are less likely to repay the debt, as they are more likely to default. Since their expected cost of repayment is low, they are allowed to undertake less profitable projects. In contrast, high creditworthy firms are more likely to repay the debt and need to implement only profitable projects to break even. In sum, loans and projects are uniformly more available among program users, and profitability improvement is expected only among high creditworthy firms. We call this the "investment effect."

On the other hand, a series of media reports have exposed the blatant misuse of funds by some borrowers, suggesting the negative aspect of the program. Some borrowers made stock investments with loans guaranteed for daily company operations (Nikkei Financial Newspaper, February 16, 2000), others filed for bankruptcy less than one month after receiving loans (Nikkei Newspaper, January 11, 1999), and finally some firms, who were in no need of financing, simply obtained the loans because they could (Nikkei Newspaper, January 11, 1999). Most of these abuses can be attributed to information problems, which were worsened by the SCG program. Inherently, informational asymmetries exist between lenders and SMEs. Two features of the program magnified these effects. First, due to the complete coverage of default costs by the credit guarantee corporation, private financial institutions had no incentive to properly screen or monitor their borrowers. Secondly, since the number of SCG applications was enormous due to the generous guarantee conditions, it was impossible for the credit guarantee corporations to adequately examine the credit risk of each applicant.

One of the typical realizations of worsening information asymmetries is adverse selection, where creditworthy firms are excessively discouraged from undertaking profitable projects and less creditworthy ones are excessively encouraged to undertake unprofitable projects. The changes wrought upon the market by the adverse selection effect are unequivocally "profitability-reducing." In sum, more loans and projects are undertaken by high risk firms, while a smaller number are undertaken by low risk firms, all of which reduce firms' profitability. We call this the "adverse selection effect." Table 3-1 summarizes the "investment effect" and "adverse selection effect." Hereafter, we examine which of these hypotheses is consistent with the empirical findings.

[Insert table 3-1]

### 3.3 Data

We construct a firm-level, balanced panel data set based on the Survey of Financial Environments. In

[14] This list of "negative" conditions was also unprecedented.

conducting this survey, the SMEA sends questionnaires to 15,000 corporations annually, and typically receives 7,000 to 8,000 replies. The 2001 survey includes a question on whether the firm made use of the SCG program between October 1998 and March 2001. Based on the answer to this question, we divide the entire sample of SMEs into two groups: (1) SCG users and (2) Non SCG users. The sample is made up of 1,344 SCG user firms and 2,144 non-SCG user firms. For each responding firm in the 2001 survey, we add annual balance sheet data, provided by the Tokyo Shoko Research Incorporated, from 1997 to 2003. Summary statistics for users and non-users are shown in table 3-2. We then further divide the sample into three periods: (t-1) the pre-crisis period (January 1997 and December 1998), (t) the crisis period (January 1999 and December 2001), and (t+1) the post-crisis period (January 2002 and December 2003). The crisis period roughly coincides with the period of the SCG program.

[Insert table 3-2]

**3.4 Hypothesis Tests: Summary Statistics**

To test the effect of the SCG program on both the allocation of credit and profitability we consider the following variables:

- Leverage (Total liabilities / Total assets; %)
- Long-term borrowing ratio (Long-term loans / Total assets; %)
- Interest rate (Interest payment/Short- and long-term loans outstanding; %)
- Fixed tangible asset ratio (Fixed tangible assets / Total assets; %)
- ROA (Business profit / Total assets; %)

The first two of these variables are measures of credit allocation. We measure firm investment with the fixed tangible asset ratio. We use the rate of return to measure firms' profitability. The idea is that if the SCG users efficiently allocate guaranteed loans, they will be more profitable. To test the theoretical predictions of the model we first calculate the time series development of each variable by comparing their pre-crisis values to their post-crisis values. We then calculate the differences across users and non-users.

[Insert table 3-3]

In table 3-3, we summarize the development of these variables over the sample period after controlling for industry, region and year. Looking at the credit allocation variables, we see that users of the program, relative to non-users, became increasingly more dependent on loans. Users increased their leverage by 2.71%, while non-users decreased their leverage by 1.35%. SCG users, therefore, increased their holdings of debt by 4.06% more than non-users. Furthermore, users increased their dependence on long-term loans by more than non-users, as shown by the 2.49% increase in the long-term borrowing ratio for users, and the 1.31% decrease for non-users. These findings are consistent with the set-up of the program. The SCG program allowed financial institutions to extend five- to seven-year guaranteed loans. Note that the differences in leverage and long-term loans between users and non-users are significant at the 1% level.

In contrast to the improved availability of funds, no significant reduction is observed in terms of interest payments. Though insignificant, we find that SCG users *increase* their interest rate by 0.07% more than non-users. We also find that SCG users increase their fixed tangible asset ratio by 0.70% more than non-users. Notably, the numbers also reveal that ROA increases by 0.69% for users, while it decreases by 0.33% for non-users, or a difference of almost 1%. The developments in ROA significantly differ between users and non-users at the 1% level.

Since the theoretical predictions of the model depend on the repayment probability of the firm, to more clearly determine the effectiveness of the program we must further divide the sample according to the riskiness of the firm. We use the capital ratio as a proxy for creditworthiness, with high capital ratios corresponding to low-risk firms and low capital ratios corresponding to high-risk firms. The model predicts that under the investment effect, high capital ratio firms possibly become more profitable, while

low capital ratio firms become less profitable. In addition, the capital ratio is crucial for controlling selection bias. The difference-in-means estimator, presented in table 3-2, is only consistent when the SCG user samples are chosen randomly. In most cases, however, randomization of the policy treatment is not feasible even when a policy program is accessible by every firm. A firm's decision on whether or not to apply for a program is based on the expected benefit, to the firm, of that program, and the expected benefit depends on each firm's characteristics. In our case, the benefit of the SCG program is dependent upon the creditworthiness of a firm, which is relevant for loan availability. Less creditworthy firms are often credit rationed by private financial institutions, and, thus, greatly benefit from the program. Hence, by sub-dividing our sample by the capital ratio we are able to control for a significant portion of the self-selection bias.

[Insert table 3-4]

In table 3-4, we present summary statistics for loan allocation, investment, and profitability for each quartile of net worth. We still find that, regardless of the pre-crisis capital ratio, SCG users are more likely to increase their leverage and their use of long-term loans. For all levels of the capital ratio, these variables significantly differ across users and non-users at the 1% level. We also still find that, except for the highest capital levels, investment, as measured by the change in the fixed tangible asset ratio, increases more among users than non-users. Finally, we find that profitability depends crucially on the ex-ante capital ratio. SCG users are more likely to improve their ROA when their net worth is high, while the ROA for users is more likely to fall when net worth is low.

### 3.5 Hypothesis Tests: Two-step Estimations

While the results of section 3.4 suggest that the SCG program improved the funds availability and in some cases profitability of Japanese SMEs, the use of summary statistics is admittedly not thoroughly convincing. If, however, we could formally estimate that government intervention led to more investment and improved firm performance we would clearly have much stronger evidence. What is necessary is to use an estimation method that can consistently measure the treatment effect of a policy program.[15]

For the purposes of this study, we use a simple two-step estimation procedure.[16] Our primary objective is to adjust for the self-selection bias of the treatment effect. In the first step, to account for the selection process of the SCG program, we estimate the propensity score $p(w_t = 1)$, which is the response probability for a policy program. $w_t$ is a binary variable indicating whether a firm participates in the program in period t: 0 = non-user and 1 = user. We then include the predicted values, $\hat{p}(w_t = 1)$, in the second stage regression, in which we regress the policy outcomes on the use of a policy program.

We begin by specifying a vector of observed variables $X_{t-1}$. Included in $X_{t-1}$ are the variables that a firm considers (in t-1) when deciding whether to apply for the policy program (in t). For example, we expect firms with lower levels of capital to need guaranteed loans much more than firms with higher capital ratios since they are more likely to be denied non-guaranteed loans (by private financial institutions). It is also likely that smaller or younger firms with little collateralizable assets, or cash, would make more frequent use of the program. We, therefore, include in $X_{t-1}$ the capital ratio, firm size as measured by the number of employees, firm age, the collateralizable asset to total asset ratio, the cash and marketable securities to total asset ratio, the long-term borrowing to total borrowing ratio, industry dummies, and region dummies.

Next, we use the predicted value of the propensity score $\hat{p}(w_t = 1)$ in the second stage of the estimation. The dependent variable $y^k_{t+1,t-1}$ represents policy outcomes. In our case, $y^0_{t+1,t-1}$ is the

[15] The treatment effect measures the difference in outcomes between when a policy program is applied to when it is not applied.

[16] Detailed descriptions of the procedure can be found in Wooldridge (2001) pp. 603 - 621.

change, from period t-1 to t+1, in profitability among firms who do not use the program (no policy treatment), and $y^1_{t+1,t-1}$ is the change in profitability of the program users (policy treatment). Included along with $\hat{p}(w_t = 1)$ as explanatory variables are program choice $w_t$ and the cross-term of $w_t$ and $\hat{p}(w_t = 1) - \hat{\mu}_p$, where $\hat{\mu}_p$ is the sample average of $\hat{p}(w_t = 1)$. Hence, we estimate the following two equations:

$$p(w_t = 1) = \alpha + \beta X_{t-1} + e_t \quad (3\text{-}1)$$

$$\Delta ROA_{t+1,t-1} = \gamma + \phi w_t + \delta \hat{p}(w_t = 1) + \eta w_t(\hat{p}(w_t = 1) - \hat{\mu}_p) + \psi industry_t + \xi region_t + u_t \quad (3\text{-}2)$$

The coefficient $\phi$ on $w_t$, in equation (4), is the consistent estimator of the treatment effect of the SCG program.

[Insert table 3-5]

We first implement the two-step procedure for each quartile. The purpose of this exercise is to determine if, as the theory predicts, creditworthiness matters for profitability. The results for each quartile are presented in the first four columns of table 3-5. The first thing to notice is that the coefficients for firm size are negative and significant across all quartiles, implying that smaller firms participate in the program more frequently than their larger counterparts. Firm age and the collaterlizable asset ratio are not significant. For firms with lower levels of net worth the cash ratio has a positive (and significant) effect on program participation. It may be that these firms build up their cash reserves in anticipation of being credit rationed, and use the SCG as an opportunity to fund additional projects. Finally, the long-term borrowing coefficient is positive perhaps implying that long-term loans are difficult to obtain. Firms that already have long-term loans use the program as a means to secure even more of them.

In the second step OLS estimation, the coefficient of interest is on the SCG dummy. Consistent with the model's predictions we estimate a negative value for firms with low net worth (L-firms), and positive for firms with higher levels of net worth (H-firms). We find that the SCG program results in a 1.4% increase in the profitability of borrowers with the second highest net worth. The program also has a positive, though insignificant, impact on firms with the highest levels of net worth. In contrast, for firms with the lowest levels of net worth, the program has an insignificant, but negative impact on profitability. Thus, the story suggested by the summary statistics is told much more strongly here. The investment effect hypothesis is more in line with the results than the adverse selection effect hypothesis. In other words, the implementation of the SCG program by the Japanese government resulted in increased profitability of high-creditworthy SMEs.

Finally, we examine whether the program resulted in an overall improvement in the performance of participating firms. We test for this by implementing the two-step estimation on the entire sample. The results are displayed in the last column of table 3-5. Because the sample now includes firms with different levels of net worth, we add dummies for each net worth category in the first step. Also, since we expect net worth to matter for some of our explanatory variables we include some cross-term variables. Once again, we find the SCG dummy to be significantly positive. On average, the ROA of program users increase by 0.5% more than non-users, providing more evidence that the SCG program resulted in significant improvements in profitability.

### 3.6 Discussion

Overall, our findings are more consistent with the investment effect rather than the adverse selection and/or moral hazard effect. This is not to say, however, that all of the evidence is supportive of this hypothesis. We now briefly discuss each of these issues.

Regarding the availability of funds, there exists, uniformly, a more sizable dependence on loans, particularly long-term loans upon the introduction of the SCG program. Since one of the objectives set by the government was to alleviate the severe credit crunch among SMEs, the program is able to claim success in this respect. It should be noted that the period of analysis was characterized by a large amount

of non-performing loans in the financial sector. In this environment, financial institutions may have been perversely motivated to keep lending to the riskiest (doomed-to-fail) program participants in an effort to avoid having to increase their loan loss reserves. This bank policy of forbearance loans results in the riskiest firms making heavy use of the program, which possibly reduces the overall effectiveness of SCG users. In spite of this possible bias, however, we still find that the overall positive effects of the program dominate the negative ones in terms of the profitability.

In contrast to the positive aspects of the program, several problems loom when we take a closer look at the profitability across firms with different levels of creditworthiness. Low-creditworthy participants show no significant improvement in profitability over non-users even though they increase leverage. They appear to be unable to find lucrative projects with positive net present values. Another problem is that the interest rate being charged to SCG users is no lower than non-users. Since the SCG program provides financial institutions with 100% coverage of the principal and the interest, the program is regarded as an interest rate subsidy paid by the government to the private sector. The Ministry of Internal Affairs and Communications estimates that the annual income transfer from the government to the private sector by the credit guarantee program during the period 1998-2001 amount to approximately 580 billion yen. If we were able to attribute these government subsidies fully to program participants, the estimated interest rate would be equivalent to the risk-free rate. Unfortunately, however, this is not at all the case. A document by the SMEA, compares average interest rates charged by *shinkin* banks to average interest rates covered by credit guarantees, and shows that the latter are 0.1 to 0.3 percentage points higher than the former. This suggests that much of the benefits of the SCG program actually goes to financial institutions rather than to the SMEs themselves. If these interest rate subsidies are fully received by SMEs rather than by financial institutions, they will need to pay less for interest payments and will have a higher cash flow.

## 4. Conclusion

It is clear that SMEs in Japan remain heavily dependent on financial institutions for funding. Our finding that the debt market functions in an efficient manner may be good news for borrowers and lenders. *Why* this is so, however, is much more difficult to answer. There are possibly a few things worth mentioning. First, most of individual SME loans are too small to be renegotiated in times of distress, which limits the extent of forbearance lending. If the loans are fully guaranteed by the public sector, things become even simpler for banks. When they encounter delinquencies in the guaranteed loans, they request repayment from the Credit Guarantee Corporations. Loans extended to large-sized firms are often repeatedly renegotiated because their loss realization significantly impairs banks' balance sheets. In contrast, SME loans are not as problematic for banks. This could explain why we observe natural selection among SMEs, and unnatural selection among large-sized firms.

However, as pointed out in the section 2.4, when we revisit the manufacturing industry with a different definition of selection, we do find evidence of unnatural selection, as efficient establishments voluntarily exit and inefficient incumbents remain. While most of the exits are due to non-financial reasons, such as the aging of CEOs and the grim prospects of future sales, it may be possible for financial institutions to improve the selection process. Banks may threaten to either withdraw funds from inefficient firms or charge higher interest rates, or they may assist in the smooth succession of efficient businesses by extending loans or bringing in professional managers from outside.

The government can also play a role in improving the efficiency of credit markets. For credit guarantee programs to improve profitability, reputations are crucial, because banks and guarantee corporations play repeated games. If a bank constantly forwards applications by doomed-to-fail firms to a guarantee corporation, which results in heavy losses for the corporation, future applications are more likely to be rejected. This implies that there exists a non-pecuniary default cost shared by financial institutions, even with the current 100% guarantee coverage.

Though we find evidence for the efficiency of the SME credit market, we do acknowledge that further improvements are needed, especially in the pricing of loans. We have found that government

interventions significantly alleviate the effects of a credit crunch by increasing the availability of long-term financing. In contrast, we find no evidence that the credit guarantee program reduces interest rates.[17] One possible explanation is that banks who usually act on behalf of small businesses in the filing of guarantee applications gain bargaining power and, as a result, are able to demand payments above the risk free rate. If this is the case, excessively high interest payments may discourage Japanese SMEs from undertaking more profitable projects, and thus, increasing profitability. This is more of a serious concern among lenders and borrowers in Japan, where the economy is overcoming deflation, and where it is expected that interest rates will increase significantly after many years of the zero-interest rate policy set by the Bank of Japan.

[17] This is not limited to the provision of public credit guarantees. Provision of collateral and personal guarantees does not significantly reduce interest payments either. For details, see Ono and Uesugi (2005) and Watanabe (2005).

**References**

Ahearne, A., and Shinada, N., 2004, "Zombie Firms and Economic Stagnation in Japan," Presented at the conference Macro/Financial Issues and International Economic Relations: Policy Options for Japan and the United States, at University of Michigan, Ann Arbor, MI, October 22-23, 2004.

Caballero, R., Hoshi, T., and Kashyap, A., 2006, "Zombie Lending and Depressed Restructuring in Japan," NBER Working Paper No. W12129.

Cowling, M. and Mitchell, P., 2003, "Is the Small Firms Loan Guarantee Scheme Hazardous for Banks or Helpful to Small Business?" Small Business Economics, Vol. 21, 63-71.

Craig, B. R., Jackson, W. E., and Thomson, J. B., 2005, "SBA-Loan Guarantees and Local Economic Growth," Federal Reserve Bank of Cleveland Working Paper 05-03.

Gale, W. G., 1990a, "Collateral, Rationing, and Government Intervention in Credit Markets," In Asymmetric Information, Corporate Finance, and Investment, edited by R. Glenn Hubbard, 43-61, Chicago: University of Chicago Press.

Gale, W. G., 1990b, "Federal Lending and the Market for Credit," Journal of Public Economics, Vol. 42, 177-193.

Gale, W. G., 1991, "Economic Effects of Federal Credit Programs," American Economic Review, Vol. 81, No. 1, 133-152.

Innes, R., 1991, "Investment and Government Intervention in Credit Markets When There is Asymmetric Information," Journal of Public Economics, Vol. 46, 347-381.

Mankiw, G. N., 1986, "The Allocation of Credit and Financial Collapse," Quarterly Journal of Economics, Vol. 101, No. 3, 455-470.

Matsuura, K. and Hori, M., 2003, "Tokubetsu Shinyo Hosho to Chusho Kigyo Keiei no Sai Kochiku," (Special Credit Guarantee and Restructuring of Small Firms), ESRI Discussion Paper Series No.50, (in Japanese).

Nishimura, K., Nakajima T., and Kiyota, K., 2005, "Does the Natural Selection Mechanism Still Work in Severe Recessions? Examination of the Japanese Economy in the 1990s," Journal of Economic Behavior and Organization Vol. 58, 53-78.

Ono, A. and Uesugi, I., 2005, "The Role of Collateral and Personal Guarantees in Relationship Lending: Evidence from Japan's Small Business Loan Market," RIETI Discussion Paper Series 05-E-027.

Peek, J. and Rosengren, E. R., 2005, "Unnatural Selection: Perverse Incentives and the Misallocation of Credit in Japan," American Economic Review, Vol. 95, No. 4, 1144-1166.

Riding, A. L. and Haines, G. Jr., 2001, "Loan Guarantees: Costs of Default and Benefits to Small Firms," Journal of Business Venturing, Vol. 16, 595-612.

Sakai, K., Uesugi, I., and Watanabe, T., 2005, "Firm Age and the Evolution of Borrowing Costs: Evidence from Japanese Small Firms," RIETI Discussion Paper Series 05-E-026.

Sekine, T., Kobayashi, K., and Saita, Y., 2003, "Forbearance Lending: The Case of Japanese Firms,"

Monetary and Economic Studies, 21(2), 69-91.

Shimizu, M. and Miyagawa, K., 2003, Sannyu Taishutsu to Takakuka no Keizai-bunseki (Economic Analysis of Entry-Exit and Diversification of Firms), Keio University Press, Tokyo (in Japanese)

Small and Medium Enterprises Agency, 2006, 2007, Chusho-kigyo Hakusho (White Paper on Small and Medium Enterprises), Gyosei, Tokyo (in Japanese).

Smith, B. D. and Stutzer, M. J., 1989, "Credit Rationing and Government Loan Programs: A Welfare Analysis," AREUEA Journal, Vol. 17, No. 2, 177-193.

Uesugi, I., Sakai, K., and Yamashiro, G. M., 2006, "Effectiveness of Credit Guarantees in the Japanese Loan Market," RIETI Discussion Paper Series 06-E-004.

Watanabe, W., 2005, "How Are Loans by Their Main Bank Priced? Bank Effects, Information and Non-price Terms of Contract," RIETI Discussion Paper Series 05-E-028.

**Table 2-1: Number of Observations**

| Year | All Firms | Surviving Firms | Defaulting Firms | Default Ratio (%) |
|---|---|---|---|---|
| 1997 | 240,384 | 232,811 | 7,573 | 3.150 |
| 1998 | 232,811 | 224,005 | 8,806 | 3.782 |
| 1999 | 224,005 | 215,404 | 8,601 | 3.840 |
| 2000 | 215,404 | 208,644 | 6,760 | 3.138 |
| 2001 | 208,644 | 203,337 | 5,307 | 2.544 |
| 2002 | 203,337 | 203,337 | | |
| Total | 1,324,585 | 1,287,538 | 37,047 | 2.797 |

**Table 2-2: Summary Statistics**

| Variables: | All Firms<br>Mean<br>Std. Dev. | Surviving Firms<br>Mean<br>Std. Dev. | Defaulting Firms<br>Mean<br>Std. Dev. |
|---|---|---|---|
| Borrowing Cost (%) | 2.83 | 2.82 | 3.45 |
| | (1.22) | (1.21) | (1.63) |
| Default Probability (%) | 1.94 | 1.84 | 5.40 |
| | (3.23) | (3.02) | (6.68) |
| Prime Rate (%) | 2.38 | 2.38 | 2.42 |
| | (0.59) | (0.59) | (0.54) |
| Age | 23.16 | 23.27 | 19.75 |
| | (13.44) | (13.44) | (12.92) |
| Assets (1,000 Yen) | 594550.30 | 600352.50 | 389908.00 |
| | (1113733.00) | (1119771.00) | (849531.90) |
| Number of Employees | 23.87 | 24.18 | 12.94 |
| | (35.27) | (35.54) | (21.40) |
| Operating Profit (%) | 0.40 | 0.46 | -1.56 |
| | (7.72) | (7.65) | (9.81) |
| Net Worth (%) | 8.95 | 9.51 | -11.49 |
| | (30.17) | (29.71) | (38.56) |

**Table 2-3: One-tailed t-Test for Operating Profit**

| | Cohort | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1950－1955 | 1956－1960 | 1961－1965 | 1966－1970 | 1971－1975 | 1976－1980 | 1981－1985 | 1986－1990 | 1991－1995 | All |
| All | 2.113 a | 1.897 a | 1.973 a | 1.264 a | 1.596 a | 1.879 a | 2.170 a | 1.993 a | 2.291 a | 2.320 a |
| | (0.219) | (0.257) | (0.222) | (0.190) | (0.169) | (0.175) | (0.182) | (0.162) | (0.202) | (0.057) |
| Construction | 0.952 c | 0.942 c | 1.911 a | 0.195 | 1.249 a | 1.193 a | 1.457 a | 0.927 a | 1.322 a | 1.448 a |
| | (0.590) | (0.656) | (0.473) | (0.377) | (0.316) | (0.308) | (0.332) | (0.295) | (0.353) | (0.116) |
| Manufacturing | 2.951 a | 3.060 a | 2.524 a | 1.519 a | 1.782 a | 1.981 a | 3.069 a | 2.336 a | 2.892 a | 2.934 a |
| | (0.408) | (0.451) | (0.407) | (0.378) | (0.347) | (0.386) | (0.410) | (0.373) | (0.527) | (0.112) |
| Wholesale | 2.084 a | 1.144 a | 2.068 a | 2.132 a | 1.413 a | 2.637 a | 2.267 a | 1.831 a | 2.089 a | 2.171 a |
| | (0.339) | (0.442) | (0.439) | (0.381) | (0.386) | (0.392) | (0.415) | (0.394) | (0.515) | (0.121) |
| Retail | 1.132 b | 1.127 c | 1.889 a | 0.595 | 2.454 a | 1.908 a | 1.811 a | 3.131 a | 3.172 a | 2.388 a |
| | (0.579) | (0.749) | (0.672) | (0.580) | (0.525) | (0.522) | (0.527) | (0.461) | (0.546) | (0.170) |
| Real Estate | 5.301 a | 2.168 b | 0.944 | 3.998 a | 2.491 a | 2.150 a | 1.240 b | 0.850 c | 4.317 a | 2.464 a |
| | (1.378) | (1.023) | (0.855) | (0.642) | (0.577) | (0.652) | (0.635) | (0.585) | (0.889) | (0.226) |
| Service | 2.645 a | 1.793 c | 1.715 b | 2.021 a | 1.351 b | 3.447 a | 2.338 a | 2.976 a | 2.974 a | 2.797 a |
| | (1.072) | (1.208) | (0.963) | (0.744) | (0.671) | (0.657) | (0.596) | (0.495) | (0.595) | (0.215) |

1) Standard errors are in parentheses
2) a: Significant at the 1 percent level. b: Significant at the 5 percent level. c: Significant at the 10 percent level.

**Table 2-4: One-tailed t-Test for Borrowing Costs**

| | Cohort | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1950－1955 | 1956－1960 | 1961－1965 | 1966－1970 | 1971－1975 | 1976－1980 | 1981－1985 | 1986－1990 | 1991－1995 | All |
| All | -0.410 a | -0.529 a | -0.521 a | -0.614 a | -0.562 a | -0.600 a | -0.614 a | -0.689 a | -0.729 a | -0.613 a |
| | (0.032) | (0.038) | (0.032) | (0.029) | (0.027) | (0.027) | (0.027) | (0.023) | (0.027) | (0.008) |
| Construction | -0.348 a | -0.674 a | -0.510 a | -0.646 a | -0.626 a | -0.802 a | -0.770 a | -0.879 a | -0.847 a | -0.726 a |
| | (0.097) | (0.104) | (0.071) | (0.059) | (0.050) | (0.048) | (0.050) | (0.041) | (0.048) | (0.017) |
| Manufacturing | -0.529 a | -0.521 a | -0.568 a | -0.748 a | -0.618 a | -0.614 a | -0.531 a | -0.649 a | -0.706 a | -0.612 a |
| | (0.054) | (0.058) | (0.052) | (0.052) | (0.050) | (0.055) | (0.058) | (0.051) | (0.069) | (0.015) |
| Wholesale | -0.401 a | -0.598 a | -0.418 a | -0.587 a | -0.616 a | -0.535 a | -0.689 a | -0.559 a | -0.623 a | -0.570 a |
| | (0.058) | (0.076) | (0.071) | (0.065) | (0.067) | (0.066) | (0.068) | (0.064) | (0.076) | (0.020) |
| Retail | -0.386 a | -0.594 a | -0.598 a | -0.574 a | -0.488 a | -0.549 a | -0.477 a | -0.651 a | -0.578 a | -0.523 a |
| | (0.082) | (0.112) | (0.097) | (0.084) | (0.079) | (0.077) | (0.072) | (0.063) | (0.068) | (0.024) |
| Real Estate | 0.404 | 0.185 | 0.607 | -0.009 | 0.179 | 0.279 | 0.033 | -0.511 a | -0.865 a | -0.050 |
| | (0.247) | (0.201) | (0.178) | (0.126) | (0.119) | (0.126) | (0.124) | (0.106) | (0.175) | (0.044) |
| Service | 0.222 | -0.318 b | -0.227 b | -0.464 a | -0.406 a | -0.278 a | -0.516 a | -0.437 a | -0.521 a | -0.405 a |
| | (0.151) | (0.167) | (0.134) | (0.113) | (0.098) | (0.092) | (0.080) | (0.064) | (0.072) | (0.029) |

1) Standard errors are in parentheses
2) a: Significant at the 1 percent level. b: Significant at the 5 percent level. c: Significant at the 10 percent level.

**Table 2-5: Comparison between $\gamma_1$ and $\gamma_3$**

| | As of year 1990<br>Shimizu and Miyagawa (2003) | As of year 1998<br>SMEA (2007) |
|---|---|---|
| $\gamma_1 - \gamma_3 > 0$ | 147 | 337 |
| $\gamma_1 - \gamma_3 < 0$ | 52 | 35 |
| Insufficient number of sample firms, Insufficient estimation fit, Omitted subgroups | 378 | 205 |
| Total Number of Subgroups | 577 | 577 |

Note: Estimations are implemented for each manufacturing industry subgroups. $\gamma_1 - \gamma_3 > 0$ indicates that exiting establishments require less amount of labor force to produce a unit of goods than survivors.

**Table 3-1: Predicted Effects of a Credit Guarantee Program**

| | Firm Type | Investment Effect | Adverse Selection |
|---|---|---|---|
| Loan Allocation & Newly Undertaken Projects | H | + | - |
| | L | + | + |
| Efficiency | H | + (possibly) | - |
| | L | - | - |

Note: H firms are high credit-worthy firms and L firms are low credit-worthy firms.

**Table 3-2: Summary Statistics**

| | User | Non-user | All |
|---|---|---|---|
| | Mean | Mean | Mean |
| | Std. Dev. | Std. Dev. | Std. Dev. |
| Asset (1 Thousand Yen) | 1,951,822 | 4,092,362 | 3,266,990 |
| | (3,175,077) | (6,959,977) | (5,893,597) |
| Sales (1 Thousand Yen) | 2,226,895 | 4,131,651 | 3,397,094 |
| | (3,033,945) | (5,822,400) | (5,023,496) |
| Number of Employees | 51.85 | 86.24 | 72.97 |
| | (55.88) | (104.75) | (90.68) |
| Age (years) | 34.50 | 37.19 | 36.15 |
| | (14.04) | (14.58) | (14.43) |
| ROA (business profit / total asset; %) | 1.86 | 2.61 | 2.32 |
| | (4.91) | (5.63) | (5.38) |
| Leverage (liabilities / total asset; %) | 82.96 | 65.94 | 72.50 |
| | (18.01) | (24.23) | (23.54) |
| Short-term borrowing to total asset ratio ( | 26.26 | 17.05 | 20.60 |
| | (19.75) | (17.83) | (19.13) |
| Long-term borrowing to total asset ratio ( | 30.36 | 17.14 | 22.23 |
| | (19.77) | (18.56) | (20.09) |
| Interest payment rate | 2.83 | 2.58 | 2.69 |
| (interest payment / total borrowings; %) | (2.30) | (3.58) | (3.12) |
| Fixed tangible asset to total asset ratio (% | 30.30 | 30.57 | 30.47 |
| | (19.64) | (21.08) | (20.54) |
| Number of Observations | 9,408 | 15,008 | 24,416 |

**Table 3-3: Development of Variables between Pre and Post Crisis Periods**

| | | Pre-crisis | Post-crisis | Difference (Post-Pre) | t-test (User vs. Non-User) |
|---|---|---|---|---|---|
| Leverage (%) | User | 8.93 | 11.64 | 2.71 | 4.06[a] |
| | | (15.81) | (19.7) | (11.76) | (.45) |
| | Non-user | -5.07 | -6.42 | -1.35 | |
| | | (21.75) | (25.12) | (14.05) | |
| Long-term borrowing ratio (%) | User | 6.82 | 9.31 | 2.49 | 3.79[a] |
| | | (18.2) | (19.05) | (13.67) | (.47) |
| | Non-user | -4.08 | -5.39 | -1.31 | |
| | | (17.58) | (17.88) | (12.7) | |
| Interest payment rate (%) | User | 0.1 | 0.26 | 0.16 | 0.07 |
| | | (2.71) | (1.97) | (2.75) | (.09) |
| | Non-user | -0.22 | -0.13 | 0.09 | |
| | | (2.28) | (2.54) | (2.24) | |
| Fixed tangible asset ratio (%) | User | -0.1 | 0.29 | 0.39 | 0.70[b] |
| | | (17.84) | (18.78) | (9.76) | (.34) |
| | Non-user | -0.1 | -0.41 | -0.31 | |
| | | (18.1) | (18.9) | (9.22) | |
| ROA (%) | User | -0.75 | -0.06 | 0.69 | 1.02[a] |
| | | (4.3) | (4.42) | (5.25) | (.19) |
| | Non-user | 0.42 | 0.08 | -0.33 | |
| | | (4.95) | (5.04) | (5.47) | |

Notes:
1) We display the mean values for each variable.
2) Standard errors are in parentheses.
3) Each variable is a residual from a regression on year, industry and region dummies.
4) a, b, and c represent significance at the 1% level, 5% level, and 10% level, respectively.

**Table 3-4: Development of Variables between Pre and Post Crisis Periods, by Capital Ratio**

| | All | Lowest | 2nd quartile | 3rd quartile | Highest |
|---|---|---|---|---|---|
| Leverage (%) | +4.06 a | +3.50 a | +2.84 a | +4.74 a | +3.42 a |
| Long-term borrowing ratio | +3.79 a | +3.61 a | +2.64 a | +3.98 a | +4.03 a |
| Fixed tangible asset ratio (%) | +0.70 b | +0.65 | +0.93 | -0.53 | +1.14 |
| ROA (%) | +1.02 a | -0.11 | -0.28 | +0.94 b | +0.49 |

Notes:
1) We display the mean values for each variable. Standard errors are in parentheses.
2) Each variable is a residual from a regression on year, industry and region dummies.
3) a, b, and c represent significance at the 1% level, 5% level, and 10% level, respectively.

**Table 3-5: Two-Step ROA Estimation**
**(1) First step: Probit Estimation**

| | Smallest quartile | Second quartile | Third quartile | Largest quartile | All firms |
|---|---|---|---|---|---|
| ln (Number of employees) | -0.212** | -0.386** | -0.331** | -0.372** | -0.212** |
| | (0.054) | (0.056) | (0.059) | (0.074) | (0.054) |
| ln (Age) | 0.127 | 0.031 | -0.090 | 0.050 | 0.127 |
| | (0.080) | (0.096) | (0.107) | (0.140) | (0.080) |
| Collateralizable asset ratio | 0.002 | 0.000 | -0.005 | -0.002 | 0.002 |
| | (0.003) | (0.003) | (0.003) | (0.004) | (0.003) |
| Cash and deposit ratio | 0.010 | 0.011* | 0.001 | -0.006 | 0.010* |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| Long-term to total borrowing ratio | 0.005* | 0.002 | 0.003 | 0.000 | 0.005 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Second quartile dummy | | | | | -0.320 |
| | | | | | (0.553) |
| Third quartile dummy | | | | | -0.161 |
| | | | | | (0.564) |
| Largest quartile dummy | | | | | -0.232 |
| | | | | | (0.684) |
| Constant | 0.157 | 0.951 | 1.101 | -1.030 | 0.277 |
| | (0.390) | (0.919) | (0.709) | (0.755) | (0.359) |
| Dependent Variable: SCG program use (0 = non-user, 1 = user) | | | | | |
| Indusrty dummies | Yes | Yes | Yes | Yes | Yes |
| Region dummies | Yes | Yes | Yes | Yes | Yes |
| Number of Observation | 834 | 846 | 817 | 672 | 3171 |
| Pseudo R-sq | 0.067 | 0.088 | 0.089 | 0.088 | 0.160 |
| Log likelihood | -513.6 | -534.3 | -475.0 | -287.6 | -1810.5 |

**(2) Second step: OLS Estimation**

| | Smallest quartile | Second quartile | Third quartile | Largest quartile | All firms |
|---|---|---|---|---|---|
| Special guarantee user dummy | -0.127 | -0.033 | 1.365** | 0.676 | 0.477* |
| | (0.456) | (0.307) | (0.400) | (0.601) | (0.214) |
| Propensity score | -2.769 | -2.517 | -3.021 | 3.154 | 4.548** |
| | (2.809) | (1.381) | (1.764) | (2.742) | (0.622) |
| Interaction term | -2.525 | -2.021 | -6.682** | -7.230 | -3.211** |
| | (3.095) | (1.862) | (2.578) | (4.595) | (0.979) |
| Constant | 3.837* | 2.375 | 2.629 | -0.068 | -2.814** |
| | (1.937) | (2.576) | (2.487) | (1.437) | (0.673) |
| Dependent Variable: Development of ROA between pre- and post-crisis period | | | | | |
| Indusrty dummies | Yes | Yes | Yes | Yes | Yes |
| Region dummies | Yes | Yes | Yes | Yes | Yes |
| Number of Observation | 832 | 845 | 817 | 672 | 3168 |
| Adj R-sq | 0.018 | 0.035 | 0.046 | 0.032 | 0.041 |

Notes:
a) Standard errors in parentheses.
b) The collateralizable asset ratio is identical to the fixed tangible asset ratio.
c) For the "all firms" estimation, the first step includes interaction terms between quartile dummies and all other explanatory variables.

d) Coefficients for these terms are not reported here.
e) We also include an "interaction term" variable in the second step estimation, which we define as (SCG user dummy) * [(Propensity score) - (sample average of Propensity score)].
f) * and ** represent significance at the 5% and 1% levels, respectively.

**Figure 3-1: Guaranteed Loans Amount Outstanding in Japan**