Does the Policy Lending of a Government Financial Institution to Mitigate the Credit Crunch Improve Firm Performance? Evidence from loan level data in Japan

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Abstract

Using the data of individual loan contracts extended by the government-owned Japan Finance Corporation for Small and Medium Enterprise (JASME), we examine how the JASME's lending from December 1997 through March 1999 that aimed at mitigating the adverse effects of the credit crunch affected firm performance. We find that the return on assets (ROA) and earnings before income, tax, depreciation and amortization (EBITDA) to total assets ratio are negative a few years after the loans are made, but that this negative effect dissipates afterward.

1. Introduction

In the 1980's, Japanese banks that had lost loans to large *keiretsu* firms reoriented their lending portfolios toward lending to the real estate sector since real estate lending was largely secured by real estates whose collateral values kept rising and banks had expected somewhat wrongly ex-post that they would never fall.   Real estate prices finally began to slide in 1991 very rapidly.   As a result, many of loans that had been made during the real estate price bubble period became non-performing as borrowers became underwater.   Banks, however, decided to leave these problem loans unrecognized for the time being, partly expecting that real estate prices would bounce back shortly and partly being reluctant to see their capital severely eroded by disposing these non-performing assets.

It is in March 1998, or at the end of FY 1997, that the Ministry of Finance, then a banking regulator, requested banks to rigorously self assess their assets as the Prompt Corrective Action (PCA) framework based on the capital adequacy was about to begin in April 1998, the beginning of the following FY 1998, so that an individual bank's capital adequacy needed to be more accurately measured.   This resulted in large losses of banks' capital, triggering the credit crunch, as capital depleted banks attempted to drum up their capital adequacy ratios by reducing their risk assets, which are the weighted sum of classes of assets with a weight assigned to each asset class being positively associated with its perceived risk.   Since under the Basel I that was in effect at that time all corporate loans were assigned the highest risk weight of 1 regardless of how risky a loan was, banks cut back on loans made to firms across the board, or worse reduced lending more modestly to unhealthy or unproductive firms at the cost of aggressive reduction in lending to relatively healthy and potentially productive firms because banks attempted to avoid further recognitions of non-performing loans by

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defaulting unhealthy firms through treating them more generously using rescue lending. The banks' cutting back on lending even to healthy firms became known as a credit crunch and well documented in the literature (Bernanke and Lown, 1991, Woo, 2003, Watanabe, 2007).

The credit crunch is detrimental to the real economic activities because the reduced credit supply constrains firms' investments. Small and medium enterprises (SMEs) that constitute the lion's share of firms operating in Japan are generally less transparent than larger firms because very few SMEs are publicly listed so that they are not required to make their financial statements publicly available. Therefore, SMEs are mostly financially dependent on banks. As it is hard for these SMEs to raise capital externally, they cannot help but hold off investment when banks are reluctant to lend to them.

As such, the governments are entitled to conduct policies aiming at offsetting such adverse effects of the credit crunch inflicted on the real economic activities. One such policy is to expand policy lending by government financial institutions (GFIs), particularly lending to SMEs that are highly bank dependent in finances. In December 1997, the Japan Finance Corporation for Small and Medium Enterprise (JASME) established the "Fund to Respond to Changes in Financial Environments" and began to help smooth SMEs raising working capital. It is the efficacy of the lending by this government lender who targets SMEs that we explore in this study.[1]

The roles played by state owned banks (SOBs) during economic downturns and financial crises have become the focus of the recently evolving literature particularly in light of the global financial crisis of 2008 and 2009, but the empirical results are

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[1] Sekino and Watanabe (2014) discuss other policies to soften adverse effects of the credit crunch. They are public capital infusions, expanding the deposit insurance protection and expanding public credit guarantees of loans originated by private banks.

mixed.[2]

In a companion study, Sekino and Watanabe (2014) found that the JASME extended the larger total amount of loans, particularly of working capital loans to the firms whose main banks reduced lending more greatly due to the poorer capital adequacy.   The extent of an individual bank's reduction in lending supply is computed based on Watanabe (2007) who estimates the effect of the shortage of the capital adequacy relative to its target on the lending growth for the sample of domestically licensed banks during the period of the credit crunch.

In this study, we investigate how the JASME's lending aimed at mitigating the credit crunch faired ex post.   To this end, we examine how the JASME's lending as explained by the extent of reduced lending supply of a firm's main bank affected the firm's ex-post performance.

The primary sources of the data we use in this study as well as Sekino and Watanabe (2014) are the data provided by the Japan Finance Corporation (JFC) that include the data of loan contracts extended by the JASME, a predecessor to the JFC's Small and Medium Enterprise Unit, the data about the firms that borrowed from the JASME, and the data about these firms' lenders.[3]   The regression of Watanabe (2007) whose results we use when estimating a measure for a bank's reduction in lending is run on the sample of domestically licensed banks.

Using the sample of loan contracts extended by the JASME during the period from December 1997 through March 1999, we find that the JASME's lending that played a

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[2] Chapter 4, " Direct State Interventions", of the World Bank (2013) is a good survey of the relevant empirical studies.   We add the more recent relevant studies in subsections 2.3 and 2.4.
[3] The JFC was established in October, 2008, by consolidating the JASME with three other government financial institutions.   The functions of the former JASME was taken over by the JASME's Small and Medium Enterprise Unit.

role of mitigating the credit crunch was negatively associated with a firm's performance as measured by ROA and EBITDA to total assets ratio in the few years immediately after loans were made but that this negative effect of the JASME's loans on a firm's performance dissipated afterward.

The paper is arranged as follows. The next section discusses the credit crunch and policy measures including a state owned bank's lending to deal with it and introduce the literature about state-owned banks. Section 3 explains the data and the empirical methodology. Section 4 presents the empirical results. Section 5 concludes.

2. The Credit Crunch, Policy Measures and the Literature about State-Owned Banks

2.1. The Credit Crunch

According to Bernanke and Lown (1991), a credit crunch is defined as a "a significant leftward shift in the supply curve of bank loans, holding constant both the safe real interest rate and the quality of potential borrowers." A credit crunch is likely caused as a side effect of the capital adequacy requirements, which are central to the modern day banking regulations. The requirements request a bank to hold capital no less than the minimum amount of capital proportional to the bank's risk assets that increase in risks of its assets. The basic premise behind the requirements is that a better capitalized bank is resilient to negative shocks to its assets such as asset devaluations caused by non-performing loans, thus less susceptible to insolvency.

The capital adequacy requirements, however, likely exacerbates a bank's inability to lend. This is well known problem of procyclicality. Because the capital adequacy

ratio is defined as the ratio of capital to risk assets, in response to losses on capital, a bank compresses its risk assets by reducing assets designated as high risk assets under the regulatory framework such as corporate loans. This reduction in lending is detrimental to investment of firms that are liquidity constrained and seek external credits to finance their investment. Theoretically speaking, poorly capitalized banks can issue equity to prop up their capital adequacy ratios, but as Stein (1998) discusses, it is impractical for capital depleted banks to raise equity in the presence of asymmetric information between banks and their potential shareholders. [6] [7]

Bernanke and Lown (1991) point out that a finding that declining bank lending and bank capital losses coincide does not necessary mean an occurrence of a credit crunch. During an economic downturn, lending demand tends to decline and banks tend to incur capital losses because their borrowers tend to perform poorly and have difficulty repaying debt to their lenders.

Watanabe (2007) disentangles the effect of bank capital on bank lending supply with the positive association between the slower (greater) demand for loans and capital losses (retained earnings) due to the contemporaneous economic downturn (economic upturn) by employing an instrumental variable for bank capital, the share of loans to the real estate industry among total loans at the end of the bubble period, which captures a structural cause of capital losses after the bust of the bubble in the late 1990s that is independent of a contemporaneous business cycle fluctuation. By doing so, one is able to measure the causal effect of bank capital on bank lending supply. Measuring a

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[6] For the theoretical explanations of the difficulty to raise equity externally faced by a bank when its capital is depleted, see Stein (1998).

[7] As another mean to prop up capital adequacy, the practice known as forbearance lending or evergreening to prevent loans from being classified as non performing by conducting rescue lending to borrowers to whom existing loans outstanding are de fact non-performing became widespread among Japanese banks. For details about this practice, see Sekine et al. (2003) and Peek and Rosengren (2005).

bank's capital adequacy by the differential between the bank's actual capital adequacy and its target, Watanabe (2007) finds that in FY 1997, in aggregate, the bank's insufficient capital adequacy reduced lending to the manufacturing industry and the lending to "healthy" non-manufacturing industries, which exclude the industries to which the share of loans that became non-performing was higher than the industry wide average, by 5.7% and 8.5%, respectively, confirming that the credit crunch made the access to bank credit by relatively healthy firms challenging.

2.2. The JASME and Government Interventions in Lending to Mitigate the Japanese Credit Crunch

As a credit crunch became increasingly evident, the Government of Japan took a wide range of actions to ease the stress felt by the firms, particularly bank dependent SMEs that were having increasing difficulty in meeting their financing needs. The Government announced a comprehensive policy package, "Emergency Economic Measures to Clear a Path for the 21st Century" in November 1997.[8] In response to this package, by inaugurating the working capital targeting "Fund to Respond to Changes in Financial Environments" (hereafter referred to as the "Fund"), the JASME became more committed to greatly expanding its policy lending to SMEs likely adversely affected by the credit crunch.[9]

The amount of JASME's loans extended under the "Fund" is far greater than the total amount of its loans extended under various measures employed under two later

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[8] Two policy packages followed. The "Comprehensive Economic Measures" were released in April 1998 and the "Outline of the Measures for SMEs Affected by the Banks' Less Willingness to Lend" was approved in August 1998. For details of these policy packages, see Sekino and Watanabe (2014).
[9] The "Fund to Respond to Changes in Financial Environments" was transferred to the "Special Lending Program to Respond to Changes in Financial Environments" in April 1998.

packages. Thus, our primary interests lie in the JASME's lending behavior after its establishment of the "Fund" in December 1997. As Figure shows, the JASME's working capital loans the "Fund" targeted grew more rapidly during the period from FY 1997 through FY 1999, while its equipment loans did not.[10]

2.3. The Relevant Literature: The Counter-Cyclicality of the State Owned Banks

The World Bank (2013) reports that in developed economies the asset share of state owned banks in the financial system increased from 6.7 percent during the period 2001-2007 to 8 percent during the period 2008-2010, while in developing economies the share decreased from 20.5 percent to 17.3 percent.

The extant studies using the bank level data or the firm level data report the mixed results about SOBs in relation to the business cycle or the financial crises. Ianonetta et al. (2010) find that European SOBs were not more counter-cyclical (less procyclical) than private banks over the 2000-2009 period. Cull and Peria (2013) find that during the crisis period of 2008 and 2009 lending by SOBs was counter-cyclical in Latin America but that it was not in Eastern Europe. Bertay et al. (2015) find that lending by SOBs is less pro-cyclical than lending by private banks in developing countries and that it is counter-cyclical in developed economies. Duprey (2015) finds that SOBs are less cyclical than private banks in high income and middle income countries but are not in low-income countries. Coleman and Feler (2015) find that in Brazil the share of

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[10] The amount of equipment loans outstanding had substantially exceeded that of working capital loans outstanding over the 1990s until FY 1996. The latter almost overtook the former at the end of FY 1997. The latter had exceeded the former since FY 1998, reflecting the faster growth of the latter than that of the former. During the period from December 1 through March 31. 1999 (the end of FY 1998), 81 percent of firms in our sample described in subsection 3.1. borrowed working capital loans only, while only 9 percent and 10 percent of firms borrowed both working capital loans and equipment loans, and equipment loans only, respectively. This suggests that during the credit crunch period the JASME shifted its focus toward working capital loans in order to help mitigate financial difficulties faced by firms.

government bank branches in a locality during the crisis period of 2008 and 2009 is positively associated with greater lending in that locality.

There are a few studies that look at the roles played by SOBs (GFIs) during the crisis periods in Japan.   Using the data the same as ours provided by the JFC, Ogura (2015) finds that during the period of the global financial crisis Japanese SMEs increased the share of borrowing from GFIs if their main banks were large banks whose loans outstanding to SMEs decreased in aggregate.

2.4. The Relevant Literature: The State-Owned Banks and Firm Performance

Another concern about SOBs is whether their lending helps firms become more productive or profitable, particularly their counter-cyclical lending during the crisis period does so.

Using the data of localities in Brazil, Coleman and Feler (2015) find that, the share of government branches in a locality is not statistically significantly associated with the firm productivity of that locality as measured by output per firm, wage bill per firm and exports per firm during the crisis of 2008 and 2009.   Using the data of Japanese listed firms over the period from 1978 through 1996, however, Lin et al. (2015), find that the lending to a listed firm by GFIs is positively associated with the contemporaneous investment and ex-post ROA one year later and these associations are stronger in the crisis period of 1991 through 1994 when the real GDP growth slowed down markedly.

Using the plant level data of manufacturing firms in Brazil during the non-crisis period from 1995 through 2005, Carvalho (2014) finds that the firms eligible for borrowing loans from SOBs shift their employment to the states politically attractive to incumbents but do not expand the overall employment.   Using the data of listed firms

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in Brazil over the period from 2002 through 2009, Lazzarini et al. (2015) find that the amount of loans a firm borrows from BNDES, a government development bank, affects the firm's performance as measured by ROA, the EBTDA to total assets ratio and Tobin's q neither positively nor negatively. Using the establishment level data of manufacturing firms in Colombia from 2004 through 2009, Eslava et al. (2014) find that small firms that borrowed loans from Bancoldex, a public development bank, are associated with larger employment, larger investment and larger output. Using the data of firms in China over the period from 1998 through 2009, Ru (2015) finds that the public funding of state owned enterprises (SOEs) through the lending to a local government by state owned China Development Bank is associated with greater employment by SOEs and smaller employment by private firms in a locality.

3. Data and Methodology

3.1. The Hypothesis and the Empirical Models

Sekino and Watanabe (2014) run the following regression.

$$JASME_i = \alpha + \beta CAPSUR_i + \gamma Z_i + \varepsilon_i \quad \cdots (1)$$

$JASME_i$ is the logarithm of amount of total loans that are a sum of amounts of equipment loans and working capital loans that the JASME extended to firm i during the period from December 1997 through March 1999, which we call the JASME credit crunch policy period. [11] Z_i is a set of control variables, the logarithm of total assets

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[11] Watanabe (2007) examines the relationship between the actual capital to asset ratio and its target

and ROA as defined by net income divided by total assets and the leverage, which is defined as total liabilities, which equals total assets less net wealth, divided by total assets.[12] These financial statement based variables are measured as of the fiscal year closing for a firm between April 1997 and March 1998 if the earliest loan contract was extended until March 1998, and are measured as of FY closing for a firm between April 1998 and March 1999 if the earliest contract was extended after April 1998. $CAPSUR_i$ is the growth rate of lending (supply) by firm i's main bank due to the bank's capital adequacy in excess of its target.

CAPSUR is constructed based on the regression run by Watanabe (2007). Watanabe estimates the following regression equation using the data extracted from the Nikkei NEEDS bank financial data.

$$\Delta lnL_{j,97} = \alpha_0 + \alpha_1 \Delta lnL_{j,96} + \beta \left\{ \frac{K_{j,97}}{A_{j,97}} - \left(\frac{K_j}{A_j} \right)^{target} \right\} + \phi X_j + \epsilon_j \quad \cdots (2)$$

Where $ln\Delta L_{j,97}$ is the growth rate of bank j's loans excluding loans to "troubled" industries that consist of real estate, construction, services and wholesale and retail industries, which are the industries where the share of non-performing loans exceeds the average across the entire industries . $\frac{K_{j,97}}{A_{j,97}}$ is the ratio of capital to total assets of bank j, $\left(\frac{K_j}{A_j} \right)^{target}$ is its time invariant target as estimated by the time series average of bank j's ratio of capital to total assets over the three year period from FY 1992 through FY 1994.

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year by year and finds that all 14 large banks failed to meet their target in FY 1997, that many large banks were able to meet their target in FY 1998 thanks primarily to the massive public capital infusions and that all but three large banks achieved their target in FY 1999.

[12] In order to avoid taking logarithm of 0, when taking logarithm of a variable such as total assets, we take logarithm of 1 plus the value for that variable.

X_j is a set of dummy variables for such bank types as city banks, trust banks and regional banks while regional 2 banks are a base group. ϵ_j is an error term. Watanabe (2007) identifies the estimate of β, $\hat{\beta}$ by employing a bank's share of lending to the real estate industry in FY 1989 and the bank's 10 year-growth of lending share to the real estate industry since FY 1980 as instrumental variables that are independent of the business cycle driven correlation between bank capital and borrowing demand.[13]

CAPSUR is constructed as the product of the differential between the actual ratio of capital to total assets and its target, which Watanabe calls the capital surplus, $\left\{\frac{K_{j,97}}{A_{j,97}} - \left(\frac{K_j}{A_j}\right)^{target}\right\}$ and $\hat{\beta}$, $\hat{\beta}\left\{\frac{K_{j,97}}{A_{j,97}} - \left(\frac{K_j}{A_j}\right)^{target}\right\}$. CAPSUR is the growth rate of loans excluding loans to "troubled" industries that can be explained by the capital surplus of a bank. A negative CAPSUR means that to what extent a bank's inadequate capital slowed the bank's lending growth. Thus, (the negative of) CAPSUR is a measure for the extent of bank j's reduction in lending supply due to poor capital adequacy, which is a variable to measure the extent of the credit crunch a firm that borrows from bank j faces.[14]

Our primary objective is to examine the effect of the JASME's lending on a

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[13] Ideally, we could employ a change in a firm's loans outstanding owed to its main bank in FY 1997 as an independent variable and then instrument this variable by CAPSUR. The loans outstanding of a firm's main bank are available in the JFC financial institutions data. Thus, theoretically, one could compute $\Delta lnL_{ij,97} = lnL_{ij,97} - lnL_{ij,96}$, which is the log growth of loans firm i borrows from bank j, a firm i's main bank, in FY 1997, and then compute a firm specific CAPSUR. By doing so, we could capture the JASME's direct response to a firm's finances affected by its main bank's capital adequacy. To do so, one requires the data about firm i's loans outstanding borrowed from bank i for FY 1996. As we will report in Table 1-1, there are 2,061 firms in our base sample. Among these firms, it is only for 107 firms that the information about their main bank including the loans outstanding they are owed to it are available for FY 1996. Thus, using the individual firm level data about the loan growth would substantially reduce the number of observations and be impractical.

[14] For details about estimating equation (2), see Watanabe (2007).

borrowing firm's ex-post performance.   We run the following regression.

$$PERFORMANCE_i = \delta_0 + \delta_1 JASME_i + \delta_3 W_i + \nu_i \quad \cdots (3)$$

Where $PERFORMANCE_i$ is a measure for a firm i's ex-post performance.   We

employ ROA as of fiscal years after the period of JASME loans being lent, the period

from December 1997 through March 1999, as a performance measure.   As robustness

tests, we examine EBITDA to total assets ratio, where EBITDA is cnstructed as a sum

of the operating profit and the depreciation cost.   As for our main independent variable,

$JASME_i$, we use the logarithm of total loans firm i borrowed from the JASME. W_i is

a set of control variables.   We employ the lagged logarithm of total assets and/or the

lagged logarithm of sales as control variables. ν_i is an error term.   We run the 2SLS

regressions using all the independent variables employed in equation (1), which

includes CAPSUR, in order to examine the effect of JASME loans executed as a

measure to mitigate the credit crunch faced by a firm on its performance.   Note that the

control variables for equation (1), the variables contained in a vector W, are not used as

instrumental variables because they are measured after the JASME executed loans.

3.2. Data

    The data used in this study are primarily firm level and contract level micro data

provided by the JFC.   We select contracts agreed over the period of one year and four

months from December 1, 1997 through March 31, 1999, which corresponds to the

period from the date of inauguration of the "Fund to Respond to Changes in Financial

Environments" through the end of FY 1998.   We end the sample period at the end of

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FY 1998 because the credit crunch largely subsided after FY 1999 owing to the overall success of the mix of various policy measures.

The data provided by the JFC are the data about loan contracts extended by the JFC (the JFC contract data) along with the data about financial statements of the firms collected by the JFC (the JFC financial statements data) and the data about the information about financial institutions each firm borrows from including the JFC (the JFC financial institutions data). What is unique about our loan contract data is that they are not randomly sampled but cover all the contracts extended by the JFC.

The JFC contract data record the contract details such as the facility size and the date of loan execution. The JFC financial statements data record the financial statements of the firms at dates of their annual fiscal closing. Similarly, the JFC financial institutions data record the details about the financial institutions a firm borrows from at dates of their annual fiscal closing. We, however, are unable to identify any other attribute of a firm including its industry. Our dataset is compiled by merging the data about firms extracted from the JFC financial statement database, the data about firms' main banks extracted from the JFC financial institutions database and the data about contracts that were extended from December 1st, 1997 through March 31st, 1999 extracted from the JFC contract database so that every firm recorded in it has at least one contract the JFC extended to during this period.[15]

We link the abovementioned dataset constructed based on the data provided by the JFC with the data about firms' main banks. We utilize the data about firms' main banks used by Watanabe (2007) originally collected from the Nikkei NEEDS databank. As Watanabe analyzes 126 domestically licensed banks under the Banking Act that

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[15] A firm's main bank is self reported by the firm to the JASME.

operated as of the end of FY 1997, we drop the contracts extended to the firms whose main bank was not a domestically licensed bank under the Banking Act such as a *shinkin* bank.   After consolidating multiple contracts for a firm, we are left with 2,061 firms in our base sample.[16]

The samples used for performance regressions of equation (3) are constructed by merging this dataset of 2,061 firms with the financial data of firms for respective fiscal year and for its previous year (the data of the previous year are used for a lagged variable) extracted from the JFC financial data.   The resulting sample sizes for fiscal years 1999, 2000, 2001, 2002 and 2003 are 1,988, 1,962, 1,650, 1,425 and 1,201, respectively.[17]

4. Results

4.1. Descriptive statistics

Table 1 presents the descriptive statistics of dependent variables, independent variables and instrumental variables used when running the regressions of equation (3). The firms whose ROA is below or at the 1 percentile or those whose ROA is above or at the 99 percentile are dropped as outliers and those whose EBITDA to total assets ratio is below or at the 1 percentile or those whose EBITDA to total assets ratio is above or at the 99 percentile are dropped, when the ROA and the EBITDA to total assets ratio are used as a dependent variable, respectively.   As years go by, ROA trends down as

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[16] We consolidate all loans extended to a given firm because we are interested in how the JASME responded to the credit crunch.   The JASME did not necessarily deal with a firm affected by the credit crunch in a single loan contract.   Any follow up loan contract subsequent to the first contract was likely intended to mitigate the effect of the credit crunch on the firm.

[17] For details about assembling our data, see the Appendix of Sekino and Watanabe (2014).

indicated by its mean and its distributions becomes widened. We do not find any substantial changes in other variables over time.

4.2. The Results

Table 2 shows the regression results of equation (3) with ROA as of FY 2001 as a dependent variable. The first column shows the results without control variables, whereas the second, the third and the fourth columns show the results of the regressions with independent variables that include the logarithm of lagged total assets (as of FY 2000), the logarithm of the lagged sales and the logarithms of both total assets and sales, respectively. Except in column 1 where the corresponding J statistic shows that the null of instrumental variables being independent of an error term is rejected, the coefficients of the logarithm of JASME total loans are negative and statistically significant at least at the 10 percent significance level. This effect is economically significant. The coefficient of -0.153 in column 4 means that an increase in the amount of JASME loans by one standard error leads to a decrease in ROA by 16% when the logarithm of JASME loans is evaluated at its mean.[18]

Table 3 reports the regression results for equation (3) with the ROA as a performance measure in every fiscal year after the period from December 1997 through March 1999, the period of JASME loan executions we examine, until FY 2003. We find that the coefficients of the instrumented logarithm of JASME loans are negative and statistically significant at least at the 10 percent significance level for ROA of fiscal years 1999 through 2001 but that they are negative and insignificant afterward. Thus,

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[18] A change in a firm's ROA resulting from one standard error of JASME loans (84.5 million yen) equals $-0.153 \times \frac{84.5}{80.8 \ (=\text{the mean of the amount of JASME loans})} = -0.160$.

the negative effect of JASME loans on a firm's ROA dissipates four years after loans are lent.

Table 4 reports the regression results for equation (3) with the EBITDA to total assets ratio as a performance measure. The results are qualitatively the same as the results reported in Table 5 except that the effect of the instrumented logarithm of JASME total loans becomes statistically insignificant one year earlier in FY 2001.

We are left with the question of why the larger amount of JASME's loans not only does not make firms more profitable ex post but even seem to make them less profitable at least in the short run?

The initial negative effect may have to do with the fact that the JASME chose to lend to ex-ante less profitable firms that faced their main banks' reduced credit supply. In fact, the correlation coefficient between the logarithm of JASME total loans predicted by a set of instrumental variables used in the 2SLS regressions of equation (3) excluding ROA and ROA in FY 1998 is -0.126. [19]

These results may also reflect the fact that loans lent by the JASME generally have longer maturities than those lent by private banks. [20] The positive effects of the

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[19] Sapienza (2004), Khwaja and Mian (2005) and Imai (2009) find the evidence that SOBs conduct politically motivated lending in Italy, Pakistan and Japan, respectively. As our data do not provide information that implies a firm's political affiliation such as a firm's location, we are unable to discuss whether the JASME lent to ex-ante unprofitable firms for political objectives.

[20] The average maturity of all the loan contracts agreed from December 1997 through March 1999 weighted by the amount of respective loan recorded in the original JFC contract data is 8.5 years. The average maturities of equipment loans and working capital loans are 12.8 years and 6.3 years, respectively. It is harder to compute the average maturity of loans by private banks because our data do not contain loan contracts extended by private banks. So a guesswork is needed. In the dataset used for the regression of ROA in FY 1999 as a dependent variable, the averages of short-term loans and of long-term loans borrowed from private banks over the sample of 1988 firms are 290 million yen and 609 million yen, respectively. A short-term loan is a loan whose maturity is equal to or less than one year. Thus, we assume that the average maturity of short-term loans is 0.5 years. For long-term loans, we use the only available average maturity of long-term loans surveyed in "The Fact-Finding Survey on Transactions between Enterprises and Financial Institutions", which was conducted in February 2008 by the RIETI, 5.2 years. We estimate the average maturity of loans extended by private banks to be 3.7 years by computing the weighting

JASME's lending to improve a firm's profitability may emerge after several years. One way to test this conjecture is to use a change in a firm's performance over the longer period instead of its level per se as a dependent variable. Should this conjecture be true, the effect of JASME loans over a longer-term performance change would be positive. Table 5 reports the results of the regressions with a change in a performance measure, ROA or EBITDA to total assets ratio, over a period from FY 1998 through FY 2001 or through FY 2003 as a dependent variable. Regardless of a performance measure employed and whether a change is taken over a relatively shorter period or a longer period, the coefficient of the logarithm of JASME loans is statistically insignificant, contradicting a positive sign of the coefficient predicted by this conjecture.

Another caveat is that the weaker effects of JASME loans on firm profitability in later years, however, may be partially attributable to the bias caused by the non random sample selection, where underperforming firms drop out of the sample as time goes by.

In a related study, Uesugi et al. (2010) find that the firms that were provided public guarantees on the loans borrowed from private lenders under the Special Credit Guarantee program that was in effect from October 1998 through March 2001, the period that coincides the period of the JASME's expanded lending, did not improve more than those that were not. Our study reinforces their study in that the package aimed to mitigate the credit crunch that alleviated credit availability to SMEs did not improve their ex-post performance. Our findings are also largely in line with Lazzarini et al. (2011) who find that the amount of loans a Brazilian firm borrowed from a

average of 0.5 years and 5.2 years with 290 million yen and 609 million yen as respective weights. The average maturity of loan contracts extended by private banks estimated as such is far shorter than 8.5 years, the average maturity of loan contracts extended by the JASME.

government development bank influenced the firm's profitability neither positively nor negatively and with Coleman and Feler (2015) who find that, in Brazil, the share of government branches in a locality is not statistically significantly associated with the firm productivity of that locality during the crisis of 2008 and 2009.   Lin et al. (2015), however, find that the lending to a listed firm by GFIs is positively associated with ex-post ROA one year later and this association is stronger in the crisis period of 1991 through 1994 when the real GDP growth slowed down markedly.   The evidence of Lin et al. (2015) that is inconsistent with our findings may have to do with the fact that they look at the effects of GFIs on large listed firms that performed well with positive average ROA.   Our sample firms performed much poorer with negative average ROA. GFIs studied by Lin et al. (2015) may have been less likely to target poorly performing firms as Sekino and Watanabe (2014) reported that the JASME did so.[21]

5. Conclusion

In this paper, using the data of loan contracts extended by the JASME, we examined whether its lending behavior was consistent with its policy mission of mitigating adverse effects on SMEs caused by the credit crunch of the late 1990.   As the JASME launched the "Fund to Deal with Changes in Financial Environments" on December 1, 1997, whose primary objective was to deal with the credit crunch, we

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[21] Some argue that the JFC's loans to a firm induce loans to the firm by private banks.   Such positive effects of the JFC's loans on private loans are popularly known as "cowbell effects" in Japan.   This is because a private bank regards the JFC's loans to a firm as the JFC's successful loan review of the firm.   Using the data of firms that borrowed from the JFC provided from the JFC and that of firms that did not borrow from the JFC over the period from 2003 through 2010, Uesugi et al. (2014) find that such effects are present only for loans originated in 2006, 2007 and 2008.   Some also argue that the JFC's loans did not contribute to higher profitability but did contribute to lower likelihood of bankruptcy.   We, however, cannot examine this claim using our data.

selected the sample of the JASME's loan contracts extended over the period from December 1997 through the end of the next fiscal year, March 1999, and examined whether the JASME's lending targeting the firms adversely affected by their main bank's cut back on lending lead to the ex-post higher profitability.   We found that the logarithm of JASME's total loans instrumented by the extent of the growth of lending supply by a firm's main bank caused by the bank's capital constraint had a negative effect on a firm's performance as measured by ROA and EBITDA to total assets ratio in the earlier few years but that this negative effect of the JASME's lending on a firm's performance dissipated afterward.

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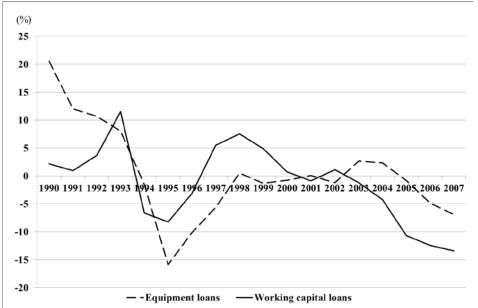
Figure. The Trends of Growths of Working Capital Loans and Equipment Loans by the JASME (JFC).

Source: Disclosure reports of the Japan Finance Corporation for Small and Medium Enterprise (JASME)

Table 1. Descriptive Statistics of the Variables Used in the Performance Measure Regressions

Fiscal year	Variable name	N	Mean	Median	Standard Error	Minimum	Maximum
FY 1999	ROA	1988	-0.008	0.002	0.052	-0.421	0.098
	EBITDA/total assets	1988	0.031	0.031	0.057	-0.262	0.205
	JASME total loans	1988	78.55	50	81.39	5	900
	Total assets (million yen)	1988	1626	877	2540	0.1	41632
	Sales (million yen)	1988	1765	908	2744	0.1	41579
FY 2000	ROA	1862	-0.009	0.002	0.056	-0.365	0.115
	EBITDA/total assets	1862	0.031	0.031	0.060	-0.240	0.219
	JASME total loans	1862	79.36	50	82.98	5	900
	Total assets (million yen)	1862	1613	865	2692	0.1	47722
	Sales (million yen)	1862	1714	840	2744	0.1	35666
FY 2001	ROA	1650	-0.016	0.001	0.079	-0.734	0.222
	EBITDA/total assets	1650	0.025	0.029	0.066	-0.352	0.227
	JASME total loans	1650	80.77	50	84.52	5	900
	Total assets (million yen)	1650	1656	876	2942	13	51900
	Sales (million yen)	1650	1717	811	2888	0	43236
FY 2002	ROA	1425	-0.016	0.002	0.087	-0.707	0.352
	EBITDA/total assets	1425	0.027	0.029	0.064	-0.271	0.231
	JASME total loans	1425	81.09	50	84.61	5	900
	Total assets (million yen)	1425	1604	827	2968	14	56767
	Sales (million yen)	1425	1605	753	2627	0	42528
FY 2003	ROA	1201	-0.019	0.002	0.106	-1.023	0.229
	EBITDA/total assets	1201	0.032	0.033	0.067	-0.295	0.248

Note: ROA is defined as net income divided by total assets.　The leverage is defined as total liabilities, which equals total assets less net wealth, divided by total assets.

Table 2. The Results of the Regressions of ROA in FY 2001

	(1)	(2)	(3)	(4)
Logarithm of JASME Total Loans	0.008 **	-0.177 **	-0.143 *	-0.153 *
	(2.245)	(-2.333)	(-1.944)	(-1.913)
Logarithm of Lagged Total Assets		0.097 **		0.021
		(2.438)		(0.143)
Logarithm of Lagged Sales			0.079 **	0.063
			(2.030)	(0.499)
Constant	-0.048 ***	0.038	0.031	0.034
	(-3.217)	(0.871)	(0.701)	(0.805)
Number of observations	1650	1650	1650	1650
J	42.368	3.075	2.512	2.476
	(0.000)	(0.688)	(0.775)	(0.780)
F statistic for excluded instruments for the logarithm of JASME loans	265.06	265.06	265.06	265.06

Note: *, ** and *** show that the estimated coefficient is statistically significant at the 10 percent significance level, the 5 percent level and the 1 percent level, respectively.   t statistics based on robust standard errors are in parentheses.   A dependent variable is a firm's ROA in FY 2001.   Instrumental variables are CAPSUR and three financial statement based variables, the logarithm of total assets, ROA and leverage, which are measured as of the fiscal year closing for a firm between April 1997 and March 1998 if the earliest loan contract was extended until March 1998, and are measured as of FY closing for a firm between April 1998 and March 1999 if the earliest contract was extended after April 1998.

Table 3. The Year by Year Results of the Regressions of ROA

Fiscal Year	coefficient	N	J statistic
1999	-0.289 **	1988	3.197
	(-2.181)		(0.670)
2000	-0.153 **	1862	7.821
	(-2.557)		(0.166)
2001	-0.153 *	1650	2.476
	(-1.913)		(0.780)
2002	-0.043	1425	0.201
	(0.049)		(0.999)
2003	-0.121	1201	2.687
	(0.098)		(0.748)

Note: *, ** and *** show that the estimated coefficient is statistically significant at the 10 percent significance level, the 5 percent level and the 1 percent level, respectively. t statistics based on robust standard errors are in parentheses.   The reported results for each fiscal year are based on the regression equation with a firm's ROA as a dependent variable and logarithms of total assets and sales as additional independent variables. The presented coefficients are those of the logarithm of JASME total loans. Instrumental variables are CAPSUR and three financial statement based variables, the logarithm of total assets, ROA and leverage, which are measured as of the fiscal year closing for a firm between April 1997 and March 1998 if the earliest loan contract was extended until March 1998, and are measured as of FY closing for a firm between April 1998 and March 1999 if the earliest contract was extended after April 1998.

Table 4. The Year by Year Results of the Regressions of the EBITDA to Total assets Ratio

Fiscal Year	coefficient	N	J statistic
1999	-0.296 ** (-2.247)	1988	5.322 (0.378)
2000	-0.176 ** (-2.305)	1862	3.796 (0.579)
2001	-0.119 (-1.163)	1650	1.751 (0.882)
2002	-0.079 (-1.502)	1425	1.894 (0.429)
2003	0.025 (0.264)	1201	0.001 (1.000)

Note: *, ** and *** show that the estimated coefficient is statistically significant at the 10 percent significance level, the 5 percent level and the 1 percent level, respectively. t statistics based on robust standard errors are in parentheses.   The reported results for each fiscal year are based on the regression equation with a firm's EBITDA to total assets ratio as a dependent variable and logarithms of total assets and sales as additional independent variables.   The presented coefficients are those of the logarithm of JASME total loans.   Instrumental variables are CAPSUR and three financial statement based variables, the logarithm of total assets, ROA and leverage, which are measured as of the fiscal year closing for a firm between April 1997 and March 1998 if the earliest loan contract was extended until March 1998, and are measured as of FY closing for a firm between April 1998 and March 1999 if the earliest contract was extended after April 1998.

Table 5. The Results of the Regressions with a Change in a Performance Measure from FY 1998 as a Dependent Variable

A change until	Performance measure	coefficient	N	J statistic
2001	ROA	0.370 (1.030)	1650	4.410 (0.492)
	EBITDA /Total Assets	0.037 (0.120)	1201	0.318 (0.997)
2003	ROA	-0.181 (-0.247)	1650	0.064 (0.999)
	EBITDA /Total Assets	0.121 (0.326)	1201	0.0246 (1.000)

Note: *, ** and *** show that the estimated coefficient is statistically significant at the 10 percent significance level, the 5 percent level and the 1 percent level, respectively. t statistics based on robust standard errors are in parentheses. The reported results are based on the regression equations with logarithms of total assets and sales as additional independent variables. The presented coefficients are those of the logarithm of JASME total loans. Instrumental variables are CAPSUR and three financial statement based variables, the logarithm of total assets, ROA and leverage, which are measured as of the fiscal year closing for a firm between April 1997 and March 1998 if the earliest loan contract was extended until March 1998, and are measured as of FY closing for a firm between April 1998 and March 1999 if the earliest contract was extended after April 1998.