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Differences in the Usage of Credit Guarantee Across Banks†

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Abstract

The paper investigates how banks use credit guarantees in their business lending by using data at the bank-firm level from Japan. By controlling for loan demand factors and guarantee supply factors using fixed effect estimators a la Khwaja and Mian (2008), we find differences in the ratio of guaranteed loans to total loans across banks. However, we also find that the differences do not stem from a difference in banks' financial conditions including capital ratio, bank types, or the strength of the bank-borrower relationships. Our results suggest that other observable and/or unobservable bank characteristics determine the different usage of credit guarantees by banks.

Keywords: Credit guarantee; banks; loan supply; moral hazard

1. Introduction

Credit guarantees are a type of guarantee that a guarantor provides on loans to corporate borrowers underwritten by financial institutions. In return for obtaining a fee in advance, the guarantor makes the repayment for the borrower if a borrower cannot make a promised repayment and the loan defaults.

Many countries around the world provide public credit guarantee programs by the governments to facilitate loans by private financial institutions to firms that have difficulty in raising funds, especially small and medium-sized enterprises (SMEs) (Beck, Klapper, and Mendoza 2010). Credit guarantee programs are also extensively used to cope with the financial crisis. For instance, 19 out of 23 OECD member countries employed or enhanced their credit guarantee schemes following the onset of the Global Financial Crisis (Uesugi, Sakai, and Yamashiro 2010).

As predicted by theoretical studies (Stiglitz and Weiss 1981, Mankiw 1986, Gale 1990, 1991), the promotion of loan provision by private lenders to ease financial constraint due to asymmetric information is the most important expected benefit of credit guarantee programs. However, the theory also suggests that the benefit might accompany inefficiencies, and the most significant concern is promotion of underwriting unprofitable loans by banks (de Meza and Webb 1987 and de Meza 2002). For banks, guaranteed loans are safer than non-guaranteed loans, and banks might provide guaranteed loans even if they recognize that the likelihood of repayment is small and would not provide loans otherwise (i.e., without guarantee). Also, banks might have smaller incentives to screen and monitor loans if they are guaranteed. Furthermore, guaranteed loans are more preferable to non-guaranteed loans for banks because the risk weight of guaranteed loans for regulatory capital ratios is smaller. Thus, the willingness to use credit guarantees might differ across banks, especially depending on the adequacy of their capital ratios.

Behind this background, this paper examines as a fact finding study the difference in the usage of guaranteed loans among banks. We use data from a corporate survey, the "Survey on Current Situation of Corporate Finance in Japan," conducted in Japan from October to November 2010, construct a unique bank-firm matched dataset, and examine the ratio of guaranteed loans to total loans at the bank-firm level.

The most significant advantage of this dataset is that for each responding firm, information on two loans from two different banks is available: one from the bank that lends the largest amount of loans to the firm (the largest lender) and the other from the bank that lends the second largest. Thus, despite

that the data are cross sectional, we can use individual firm dummies as independent variables in our regression for the ratio of guaranteed loans to total loans, and thereby control for firm fixed effects. This control allows us to eliminate the effects of borrower characteristics, or loan demand factors on the use of credit guarantees. We can also eliminate the effects of guarantors' characteristics, or guarantee supply factors, because in the guarantee programs in Japan, the location of the borrower determines its guarantor.We can therefore extract the difference in the ratio of guaranteed loans within firm and across banks as the so-called *fixed effect estimator* (Khwaja and Mian 2008). This remaining difference is solely due to factors on the supply side of loans, or banks.

In the regression analysis, we use two specifications. In the first, which we call the bank fixed effect regression, we regress the ratio of guaranteed loans on bank fixed effects after controlling for firm fixed effects. Through this specification, we examine whether there are significant differences in the usage of guaranteed loans across banks. In the second specification, the bank characteristics regression, we use variables at the bank or the bank-firm level, instead of using the bank fixed effect. This specification is to examine whether any difference in the usage of credit guarantees across banks stems from differences in bank characteristics or bank-firm relationships.

In this specification, we use four financial indicators (regulatory capital ratio, return on asset (ROA), non-performing loans (NPL) ratio, and bank size), bank type dummies, and the duration (year) of bank-firm relationships, as the main independent variables. The most important variable is bank capital ratio, because less capitalized banks might want to use more guaranteed loans to retain regulatory capital ratios. Unprofitable banks and banks suffering from non-performing loans might also use guaranteed loans to increase profitability or reduce risk by holding more *safe* assets.

Our results show that there is some significant difference in the usage of guaranteed loans across banks. The bank fixed effect regression show that even after controlling for the loan demand and guarantee supply factors, there remain non-negligible differences in the ratio of guaranteed loans to total loans across banks, especially for a few banks with particularly high guarantee ratios. However, from the bank characteristic regression, we find that the use of credit guarantees does not depend on

banks' observable characteristics that we consider, i.e., their financial conditions, types, and relationships with borrowers. This finding implies that the usage of credit guarantees across banks that we find in the bank fixed effect regression are not due to differences in banks' capital ratio, profitability, and risk, and rather they are due to differences in other observable and/or unobservable characteristics of banks.

The main contribution of this paper is in its extraction of the difference in the usage of credit guarantees across banks that purely stems from differences across banks. There are many empirical studies on public credit guarantees, but most of them focus on the relation between the use of credit guarantees and the ex-post characteristics of borrowers.[1] However, there are few papers on the use of guarantees from the viewpoint of the lenders. To the best of our knowledge, ours is the first to take advantage of the strong identification using the fixed effect estimator to extract differences in the usage of credit guarantees across banks.

The rest of the part is composed as follows. Section 2 reviews the previous empirical literature, and Section 3 provides with some institutional background behind the credit guarantee programs in Japan. We then explain our data and the methodology in Section 4. Section 5 reports and discusses the results. Section 5 concludes this paper.

2. Existing evidence on credit guarantees

There have been many empirical studies on public credit guarantee programs, and the academic interest is increasing recently. The primary focus in many studies is on whether or not the programs increase credit availability of potential borrowers, or fill the "funding gap" (also referred to as "incrementality" or "additionality") (Cowling 1998, Cowling and Mitchell 2003, Riding and Haines 2001, Cowling 2010, Riding, Madill, and Haines 2007, Zecchini and Ventura 2009, Boschi, Girardi, and Ventura 2014). To examine whether the increased availability is efficient or not, many

[1] See section 2 for the prior empirical studies.

studies also examine the ex-post performance of the borrowers of guaranteed loans such as their profitability and riskiness, or real outcomes such as employment and productivity (Riding and Haines 2001, Boocock and Shariff 2005, Kang and Heshmati 2008, Oh, Lee, Heshmati, and Choi 2009, Craig, Jackson, and Thomson 2007, Brown and Earle 2017, Mullins and Toro 2017, and Lee 2018).

Some studies deal with these issues using data from Japan. Examining the effect of the Special Credit Guarantee Program for Financial Stability (1998–2001), which is an emergency 100% guarantee program to support SMEs after the banking crisis in Japan, Uesugi, Sakai and Yamashiro (2010) find that the program significantly increased credit availability of borrowers, and the borrowers, especially low-risk firms, became more efficient. Consistent with these findings, Wilcox and Yasuda (2008) find that the benefit was larger for the first-time users of the program. However, later study on the Emergency (Safety-Net) Credit Guarantee Program, which is another emergency 100% guarantee program implemented after the Global Financial Crisis, find that the improved credit availability accompanies poorer ex-post performance of the borrowers and a portfolio substitution by the borrower's main banks away from non-guaranteed loans to guaranteed loans (Ono, Uesugi, and Yasuda 2013).

Compared with much interest in borrowers' outcomes, there is relative scarcity of research on the behavior of lenders, or how they use credit guarantees. Saito and Tsuruta (2018) examine the association between default rates of borrowers and their ratio of guaranteed loans to total loans to answer whether banks provide loans to high risk borrowers, and find affirmative evidence. Wilcox and Yasuda (2008) and Ono, Uesugi, and Yasuda (2013) focus on the relation between guaranteed and non-guaranteed loans to examine their substitutability or complementarity. Different from these papers, we directly examine whether the ratio of guaranteed loans depends on lender characteristics.

The study that is methodologically closest to ours is Hancock and Wilcox (1998). They examine the effects of banks' financial variables on different financial and real economic activities at the state level in the U.S., and one of their dependent variables is the amount of credit guarantees. They find

no significant effect of the financial variables on this amount. Different from this paper, we use data at the bank-firm level, and control for the firm fixed effect to exclude effects from any unobservable (and observable) borrower-specific factors. This approach allows us to extract the difference in the usage of credit guarantees solely due to lender-specific factors.

3. Credit guarantee programs in Japan

In the public credit guarantee programs in Japan, Credit Guarantee Corporations (CGCs), government-affiliated institutions established based on the Credit Guarantee Corporation Law, provide guarantees on loans by private banks to SMEs.[2] There are 51 CGCs in Japan (47 prefecture-level corporations and 4 city-level ones) that provide guarantees to borrowers in the respective areas.[3] The outstanding amount of liabilities guaranteed by the corporations is 35.1 trillion yen at the end of March 2011, and 23.9 trillion yen at the end of March 2017 (Japan Federation of Credit Guarantee Corporations 2012, 2017).

Historically, the CGCs had provided guarantees by assuming all the credit risk of lenders, i.e., they had provided 100% guarantees only. However, due to concerns for reduced screening and monitoring incentives for lenders due to the complete guarantee, the 2007 program reform reduced the coverage to 80% (the so-called Responsibility-Sharing scheme). However, there remained some "exceptional" 100% guarantee programs, including the massive Emergency (Safety-Net) Credit

[2] The guaranteed liabilities associated with the loans are (re)insured by the Japan Finance Corporation's Small and Medium Enterprise Unit. See Nitani and Riding (2005) and Japan Federation of Credit Guarantee Corporations (2017) for more institutional background behind the credit guarantee programs in Japan.

[3] For firms located in the 4 cities (Yokohama, Kawasaki, Nagoya, and Gifu), it is possible to obtain credit guarantees from the city's Credit Guarantee Corporation (CGC) as well as from the CGC of the prefecture where the city is located. To the extent that firms in these cities can freely choose a CGC, it is hard to perfectly control for guarantee supply effects by using firm fixed effects. However, the number of such firms is small in our sample (32 firms), and controlling for them using four city dummies does not qualitatively change the results.

Guarantee Program from 2008 to respond to the Global Financial Crisis and the Great East Japan Earthquake Recovery Emergency Guarantee Program from 2011 to respond to the Great Tohoku Earthquake.

In this paper, we use data obtained from a corporate survey conducted in the fall of 2010. Unfortunately, we have no information in our data to breakdown the amount of guaranteed loans based on whether they are 100% or 80% guarantees. The aggregate statistics indicate that among the 35.1 trillion yen of the outstanding amount of guaranteed loans at the end of March 2011, 17.7 trillion yen (50.5%) is of the Emergency Credit Guarantee Program (100% guarantee), 6.1 trillion yen (17.5%) is of the other 100% guarantee programs, and the responsibility-sharing 80% guarantee accounts for 11.2 trillion yen (32.0%).[4]

4. Data and Methodology

4.1. Data set and sample selection

The data used in this study are collected from the *Survey of Corporate Finance in Japan*, which a group of researchers including one of the authors conducted in the period from October to November 2010. The questionnaire was sent to 13,579 target firms that were selected from the database of Tokyo Shoko Research (TSR), which is one of the largest business credit information providers in Japan.[5]

[4] These figures are obtained from a document presented at the 7th meeting (May 31, 2017) of the Finance Working Group, the Council for Small and Medium Enterprise Policy, the Small and Medium Enterprise Agency of the Government of Japan (available in Japanese at: http://www.chusho.meti.go.jp/koukai/shingikai/kihonmondai/2016/download/160531kihonmondai3.pdf) (checked on June 5, 2018).

[5] The TSR database has been used by the SME Agency of the Government of Japan for their annual issues of the White Paper on Small and Medium Enterprises. The selection criteria for the 13,579 target firms are: (i) firms that have financial statements that are available from TSR for fiscal 2007 and 2009, and (ii) firms that have transactions

Among the 13,579 firms, 2,703 firms responded (response rate of 19.9%). The survey consists of six parts: “Company Profile”, “Financial Transaction between Companies and

Bank”, “Defaulting on Loans and Related Bank”, “Supervision”, “Policy” and “Credit Guarantee”.[6]

The top three industries of responding firms are Construction (57.9%), Manufacturing (12.2%) and Wholesale (9.7%). Most of them (61.7%) are firms established more than 30 years ago, and 68.7% of them have 20 employees or less. More than 60% of the responding firms utilize credit guarantees (64.9%), where 43.8% utilize the guarantees for more than 10 years.[7]

4.2. Guarantee ratio and firm fixed effects

Our main variable is the credit guarantee ratio defined as the ratio of the amount of guaranteed loans to the total loans. The survey contains questions that enable us to measure the ratio at the bank-firm level. Specifically, each respondent firm answers the amount of loans obtained during 2009 from the banks that lend the most (the largest lender) and the second most (the second largest lender) to the firm, together with the amount of guaranteed loans from the respective banks. We can thus calculate two guarantee ratios per firm, one for the largest lender and another for the second largest. Because not all responding firms answer the relevant questions, the number of observation is smaller than two times the number of the responding firms. We have 802 observations for the guarantee ratio at the bank-firm level.[8]

with one of the pre-specified 286 regional financial institutions (31 regional banks, 183 Shinkin banks, and 72 credit cooperatives).

These are the criteria to obtain data suitable for research other than the present one.

[6] Studies using data from this survey include Hattori, Shintani, and Uchida (2015) and Nakaoka, Takada, and Uchida (2017).

[7] For more information on the characteristics of the responding firms, see Nakaoka, Uchida, and Yamori (2011a, b).

[8] We drop the observations with the ratio being smaller than 0% or larger than 100%.

In our regression analysis, we use the credit guarantee ratio as the dependent variable, and regress it on bank variables as well as firm fixed effects by simple OLS. The advantage of using these data is that we can control for the firm fixed effects despite that they are cross-sectional data. Among the 802 observations, 430 are for the firms with 2 observations (of 215 firms). For these observations, we can use dummies for the relevant firms to control for the firm fixed effects. To check the robustness of our results, we run the regression for the full sample of 802 observations as well as the subsample of 430 observations.

< Insert Table 1 here >

Table 1 reports descriptive statistics for dependent variables for the 802 and 430 observations, together with those for other variables explained below. As for the full sample of 802 observations, the mean value of the guarantee ratio is 7.8%, but the ratio ranges from 0% to 100%. The mean ratio is higher than that for the subsample with two observations per firms, which is 5.3%.

4.3. Bank variables

4.3.1. Bank fixed effects

In our first specification, we use bank fixed effects as our main independent variables, and examine whether there are significant differences in the usage of guaranteed loans across banks. We can identify 260 different banks for 802 bank-firm observations. However, because some of these banks lend only to one firm, we can use 178 bank dummies for this sample, which we label as bank_dummy_2_1 through bank_dummy_2_178. For a robustness checks, we alternatively focus on banks lending to 5 or more firms. There are 47 such banks, for which we create dummy variables labeled bank_dummy_5_1 through bank_dummy_5_47. When we use the subsample for firms with

more than 2 observations (430 observations), the number of banks lending to more than 1 firm decreases to 95, and that for banks lending to more than 4 firms decreases to 17.

After obtaining the bank fixed effects as estimated coefficients for these bank dummies, we sort them out in the order of their magnitudes and depict in a figure. We also perform several tests to examine whether the differences in the usage of credit guarantees across banks are statistically significant.

4.3.2. Bank characteristics regression

As an alternative specification, we use different variables for bank characteristics and bank-firm relationships as our main independent variables. This specification is to examine whether differences in the guarantee ratio across banks stem from differences in banks' characteristics. We first use four financial indicators for banks: regulatory capital ratio, ROA, non-performing loan (NPL) ratio, and asset size. The data sources for these variables are banks' financial statements obtained through the Nikkei Financial Quest Database (Nikkei Inc.) and the Financial Statements of Credit Cooperatives in Japan (Kin-yu Tosho Consultant Sha). We match the survey data and the financial statement data using the names of the firms' largest and the second largest lenders that the responding firms identified in the survey.

We define bank ROA as the ratio of current profit to total asset, bank NPL ratio as the ratio of risk management loans to total loans, and bank size as the natural logarithm of total asset.[9] Because there are both banks that comply with the Basel (international) standard and those that comply with the domestic standard in Japan, we use a dummy variable for the former as an additional independent variable. Because the financial statement data are not available for a small number of banks, we have 788 observations of these indicators for the whole sample, and 412 observations for the firms with 2 observations.

[9] Not taking the natural logarithm does not qualitatively change the results.

Among the four variables, the most important variable is bank capital ratio, because less capitalized banks might want to use more guaranteed loans to retain regulatory capital ratios. Bank ROA and NPL ratio are also important, because unprofitable banks and banks suffering from nonperforming loans might also use guaranteed loans to increase profitability, or reduce risk, by holding more guaranteed loans as *safe* assets.

We also use other bank variables. First, to take into account different usage of credit guarantees by bank type, we add bank type dummies based on the information obtained from the survey. The survey asks the types of the responding firm's largest and the second-largest lenders, and the options to choose are city banks, regional banks, second regional banks, Shinkin banks, and credit cooperatives.[10] Because no firms in our baseline sample choose credit cooperatives, we use dummies for regional, second regional, and Shinkin banks, with treating city banks as default. Second, we use a variable for bank-firm relationships to examine whether the usage of credit guarantees differ depending on the strength of the relationships. Specifically, using the information from the survey, we use the duration (year) of lending relationships between the responding firm and its largest or the second-largest lender. To consider any non-linear effect, we take the natural logarithm of the duration.[11] Because there are some observations for which the information for duration is not available, we report the results both using and not using this variable. Third, we use the indicator for whether the relevant observation is for the firms' largest lenders as opposed to that for the second largest lenders.

Table 1 shows the descriptive statistics for these variables. The mean regulatory capital ratio for our sample firms is 12.5%. For an average bank, ROA is 0.2%, the NPL ratio is 4.5%, and the asset

[10] City banks provide universal banking services and operate in the whole country. Regional banks are smaller banks that operate regionally. Second regional banks are similar to regional banks but with smaller size and different historical background (they used to be former Sogo banks, a type of cooperative banks). Shinkin banks and credit cooperatives are smaller cooperative banks that provide banking services mostly to their members. See Uchida and Udell (2014) for more on types of banks in Japan.

[11] The main results are unchanged even if we do not take the natural logarithm.

size is 7.2 trillion yen. For the majority of firms, their largest lenders are either regional banks or second regional banks, with comparative ratios for these two types. The average duration of the bank-firm lending relationship is 14.0 years. For the subsample with two observations per firm, capital ratio, ROA, and NPL ratio are comparable. As for bank types, the ratio of regional banks (50%) is larger than that for second regional banks (40%). The average duration of relationships is 14.9 years, which is slightly longer than that for the full sample.

5. Results

5.1. Results for bank fixed effect regression

Figure 1 reports the results for the bank fixed effect regression. In the four panels of this figure, we plot the values of the coefficients for the bank dummies in the order of their magnitudes, together with their confidence interval (the significance level of 95%). Panels A and B are for the result using the full 802 observations, while panels C and D are for the results using the sub-sample of 430 observations for the firms with 2 observations. Panels A and C show the results using the dummies for the banks lending to more than 1 firms (bank_dummy_2_1 through bank_dummy_2_178), while panels B and D show the results using the dummies for the banks lending to more than 4 firms (bank_dummy_5_1 through bank_dummy_5_47). As explained above, the numbers of banks shown in panels A, B, C, and D are respectively 178, 47, 95 and 17.

<Insert Figure 1 here>

As shown in panel A, the coefficients for 178 bank_dum_2 dummies ranges from less than -0.2 to around 0.8. More specifically, the relevant regression result shows that the coefficients for the bank dummies is -0.279 at the minimum and 0.758 at the maximum. However, for most of the bank dummies, the confidence interval include the value of zero, which means that there is no difference

in the usage of credit guarantees between most banks and an *average* bank. This interpretation is confirmed by an F-test for the null hypothesis of the equivalence of the coefficients for all 178 banks, which reports the p-value of 0.134. However, we can see some banks that have a large coefficient and their confidence intervals do not include the value of zero (there are 14 such banks). Pairwise tests (t-tests) for differences in the coefficients between two arbitrary banks also demonstrate a non-negligible difference. The tests indicate that the highest coefficient (0.758) is statistically different from all but two coefficients that are smaller than 0.40, and the smallest coefficient (-0.279) is different from all the coefficients that are larger than 0.18, both at the 10% level of statistical significance.

However, the results in panel A suffer from some drawbacks. Most importantly, the difference between the maximum and the minimum coefficients being larger than 1 is economically difficult to interpret, because the maximum value of the ratio of guaranteed loans does not exceed 1 in practice. Part of this extraordinary result should stem from an imperfect control for the firm fixed effects, because we have no firm dummies for 372 (= 802 - 430) observations. The regression results supports this view. Although the R-squared for this regression is relatively high at 0.5338, this is due to a large number of independent variables, as the low adjusted R-squared of 0.0848 indicates.

Panel B shows the results when we use dummies for the 47 banks that lend to more than 4 firms. The range of the coefficients is now between -0.149 to 0.225, and is more plausible. The confidence interval now include the value of zero for all the 47 banks, and the F-test for the equivalence of all coefficients is rejected with the p-value of 0.879. The findings of no banks that excessively use credit guarantees is not necessarily inconsistent with the results in panel A. The majority of the 14 banks that exhibit positive and significant coefficients in panel A lend to less than 4 firms, and only 1 of them is included in panel B, whose confidence interval ranges between -0.035 and 0.424. However, these are again the results without fully controlling for the firm fixed effects. The Rsquared for the regression for panel B is 0.345, but the adjusted R-squared is only 0.0267. It is thus plausible to focus on the results using 430 observations (i.e., panels C and D).

Turning to panel C, the coefficients for the 95 bank dummies ranges between -0.360 and 0.443. Again, most of the coefficients are not different from zero, and the F-test for the equivalence of all the coefficients yield the p-value of 0.4267. However, we find 4 (and 3) banks for which the lower (upper) bound of the confidence interval for their coeffcients are larger (smaller) than zero. The pairwise t-tests for the difference between the maximum or the minimum and the other coefficients show that the maximum coefficient (0.443) is statistically different from the coefficients that take the value smaller than 0.13, and the minimum (-0.360) is statistically different from the coefficients taking the value larger than -0.1 with a few exceptions (both at the 10% level of statistical significance). Thus, it is plausible to conclude that there is some meaningful differences in the usage of credit guarantees across banks. These results are trustable because both the R-squared and the adjusted R-squared for this regression are high (respectively 0.9229 and 0.726).

Finally, panel D shows the sub-sample results for banks lending to more than 4 firms. The estimated coefficients ranges from -0.0564 to 0.0756 and the band is very narrow. The F-test for the equivalence of the coefficients is rejected with the p-value of 0.9925. For no bank, the estimated coefficient is statistically different from zero. The t-tests show no pairwise differences between the maximum or the minimum and the other coefficient, except for the difference between the minimum and the second largest.[12] Although these results seem to be inconsistent with those in panel C, we need to take into account the fact that the numbers of banks shown in these panels are only 17. Note that in this regression (for panel D), the R-squared and the adjusted R-squared are both high (respectively, 0.8667 and 0.7106).

On balance, it is difficult to make a strong claim. But, based on the results in panel C, and on relatively robust results on the significant difference between the largest and the smallest coeffcients,

[12] The bank with the second largest coefficient is one of the four banks with a statistically significant positive coefficient in the regression for panel C. The other three banks (and yet another three banks with a statistically significant negative coefficient in the regression for panel C) are not included in panel D because they do not lend to more than 4 banks.

we can at least conclude that there is a significant difference in the ratio that stems solely from factors on the lenders' side.

<Insert Figure 2 here>

5.2. Results for bank characteristics regression

Table 2 reports the result for the bank characteristics regression. The first four columns of this table report the results using the full sample, while the remaining four columns report the results using the sub-sample with two observations per firm. Columns with odd numbers do not use Log(duration) and the number of observation is larger, while those with even numbers use it and the number of observation is smaller. Columns (1), (2), (5) and (6) report the results without controlling for the firm fixed effects, while columns (3), (4), (7) and (8) report the results with the controlling. Higher R-squared (or adjusted R-squared) for the latter set of results indicates that the control for the firm fixed effects is important, so we should focus on columns (3), (4), (7) and (8). Additionally, whether or not to control for the duration does not make much of a difference in the results, so here we focus on the results in columns (4) and (8).

From columns (4) and (8), we find that the overall results are somewhat different depending on whether we control for the firm fixed effects completely or partially. In column (4) where we include a non-negligible number of one observation firms and only partially control for the firm fixed effects, the usage of credit guarantees depends on bank size and bank type. However, we find no statistically significant coefficients in column (8) where we completely control for the firm fixed effects. This difference indicates that the variables with significant effects in column (4) might pick up the uncontrolled firm fixed-effects. A higher adjusted R-squared for column (8) than for column (4) supports this interpretation. It is therefore reasonable to focus on the results in column (8).

Column (8) shows the overall insignificance of the effects of the independent variables. This finding indicates that the use of credit guarantee does not even depend on bank capital ratio, profitability, or risk. The insignificance might stem from the lack of statistical power due to a small number of observations. However, we need to take into account the previous result from the bank fixed effect regression (panel (C) of Figure 1), where we did find some significant difference in the usage of credit guarantees across banks. On balance, we can conclude that although there is a difference in the usage of guaranteed loans across banks, the difference does not stem from the differences in bank characteristics or bank-firm relationships that we can observe.

<Insert Table 2 here>

6. Conclusion

By using unique data at the bank-firm level from Japan, this paper investigates whether and why, if any, the use of credit guarantees differs across banks. After controlling for loan demand and guarantee supply factors by using a fixed effect estimator a la Khwaja and Mian (2008), we find a significant difference in the ratio of guaranteed loans to total loans across banks. We also find that the difference does not stem from differences in banks' financial conditions, bank type, or the strength of bank-firm relationships.

These findings suggest that although there are differences in the usage of credit guarantees across banks, the differences do not stem from the bank characteristics that we can observe. Although it is beyond the scope of this paper, our findings call for additional research on what other observable and/or unobservable factors are that drive the difference in the usage of credit guarantees.

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Table 1 Basic Statistics

This table reports descriptive statistics for our main variables. Guarantee ratio is the ratio of guaranteed loans to total loans. We have 802 observations for this variable, but when we limit the sample to the firms with 2 observations only, we have 430 observations. The remaining variables are for bank characteristics. Bank regulatory capital ratio is the capital ratio of the Basel standard for banks operating internationally, and of the domestic standard for the others. Bank ROA is the ratio of current profit to total asset. Bank NPL ratio is the ratio of risk management loans to total loans. Bank size is the natural logarithm of total asset. Because the financial statement data are not available for a small number of banks, we have 788 observations of these indicators for the whole sample, and 412 observations for the firms with 2 observations.

	Full					Sub sample with 2 observations per firm				
	# of obs.	Mean	St. Dev.	Min.	Max.	# of obs.	Mean	St. Dev.	Min.	Max.
Guarantee ratio	802	0.0776	0.2380	0.0000	1.0000	412	0.0556	0.1935	0.0000	1.0000
Bank capital ratio	788	12.5156	5.2818	4.6500	65.1500	412	12.3911	4.5782	4.6500	65.1500
Bank ROA	788	0.0021	0.0020	0.0002	0.0285	412	0.0021	0.0018	0.0002	0.0248
Bank NPL ratio	788	0.0452	0.0331	0.0000	0.2748	412	0.0407	0.0323	0.0000	0.2748
Bank size (asset)	788	7176719.1	24969820.3	23517	153920000	412	9020002.6	28380338.3	55576	153920000
Bank capital BIS dummy	788	0.8934	0.3088	0	1	412	0.8641	0.3431	0	1
Regional bank	788	0.4302	0.4954	0	1	412	0.5000	0.5006	0	1
Second regional bank	788	0.4619	0.4989	0	1	412	0.3956	0.4896	0	1
Shinkin bank	788	0.0609	0.2393	0	1	412	0.0413	0.1991	0	1
Duration (years)	693	13.9911	13.9245	0	60	352	14.9067	14.5478	0	60
Largest lender dummy	788	0.6739	0.4691	0	1	412	0.5000	0.5006	0	1

Table 2 Bank Characteristics Regression

This table reports the result for the bank characteristics regression. The dependent variable is Guarantee ratio, the ratio of guaranteed loans to total loans. The independent variables are the four financial indicators, bank type dummy variables and the firm-fixed effects (see Table 1). Columns (1)-(4) report the results using the full sample, while columns (5)-(8) report the results using the sub-sample with two observations per firm. Columns with odd numbers do not use Log(duration), while those with even numbers use it. Columns (1), (2), (5) and (6) report the results without controlling for the firm fixed effects, while columns (3), (4), (7) and (8) report the results with the controlling.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	Full				Sub sample with 2 observations per firm			
Dependent Variable	Guarantee ratio							
Bank capital ratio	-0.0009	-0.0004	-0.0014	-0.0009	0.0006	0.0009	-0.0003	-0.0001
	(0.0012)	(0.0013)	(0.0016)	(0.0017)	(0.0015)	(0.0017)	(0.0007)	(0.0008)
Bank ROA	3.1061	-4.9837*	5.2701	-4.9241	-6.4146	-6.4623	-2.1538	-3.4674
	(6.6233)	(2.6495)	(8.5019)	(3.1931)	(4.1878)	(4.7511)	(4.0942)	(4.9629)
Bank NPL ratio	0.3263	0.4956	0.1172	0.2289	0.4777	0.8119*	0.2831	0.4892
	(0.3208)	(0.3729)	(0.4009)	(0.4607)	(0.3904)	(0.4717)	(0.3617)	(0.4290)
Log (bank size)	0.0190**	0.0202*	0.0299**	0.0321**	-0.0062	-0.0046	0.0028	0.0070
	(0.0094)	(0.0105)	(0.0126)	(0.0141)	(0.0106)	(0.0123)	(0.0120)	(0.0134)
BIS capital ratio dummy	-0.0132	-0.0088	-0.0089	-0.0172	-0.0113	0.0054	0.0145	0.0299
	(0.0344)	(0.0378)	(0.0508)	(0.0560)	(0.0310)	(0.0356)	(0.0275)	(0.0266)
Regional bank	0.1022**	0.1037**	0.1091*	0.1288*	-0.0037	-0.0091	-0.0510*	-0.0472
	(0.0443)	(0.0509)	(0.0563)	(0.0659)	(0.0492)	(0.0606)	(0.0274)	(0.0309)
Second regional bank	0.1442**	0.1365**	0.1910**	0.2094**	-0.0307	-0.0571	-0.0362	-0.0449
	(0.0575)	(0.0655)	(0.0747)	(0.0873)	(0.0649)	(0.0802)	(0.0322)	(0.0462)
Shinkin bank	0.1325*	0.1403*	0.1580*	0.1801*	0.0200	0.0340	-0.0637	-0.0708
	(0.0725)	(0.0830)	(0.0916)	(0.1077)	(0.0996)	(0.1227)	(0.0985)	(0.1330)
Largest lender dummy	0.0152	0.0253	-0.0001	0.0113	-0.0225	-0.0125	-0.0187	-0.0106
	(0.0198)	(0.0214)	(0.0155)	(0.0178)	(0.0236)	(0.0263)	(0.0134)	(0.0130)
Log (duration)		-0.0178**		-0.0116		-0.0208**		-0.0098
		(0.0073)		(0.0119)		(0.0091)		(0.0098)
Constant	-0.3172*	-0.2979	-0.4574*	-0.4713*	0.1662	0.1707	-0.0334	-0.0957
	(0.1789)	(0.2026)	(0.2338)	(0.2647)	(0.2038)	(0.2404)	(0.2344)	(0.2089)
Firm fixed effects	no	no	yes	yes	no	no	yes	yes
Observations	788	690	788	690	412	342	412	342
R-squared	0.0119	0.0196	0.3253	0.3315	0.0131	0.0329	0.8573	0.8754
Adjusted R-squared	0.000427	0.00521	0.0717	0.0751	-0.00900	0.00364	0.702	0.736

Robust standard errors in parentheses.

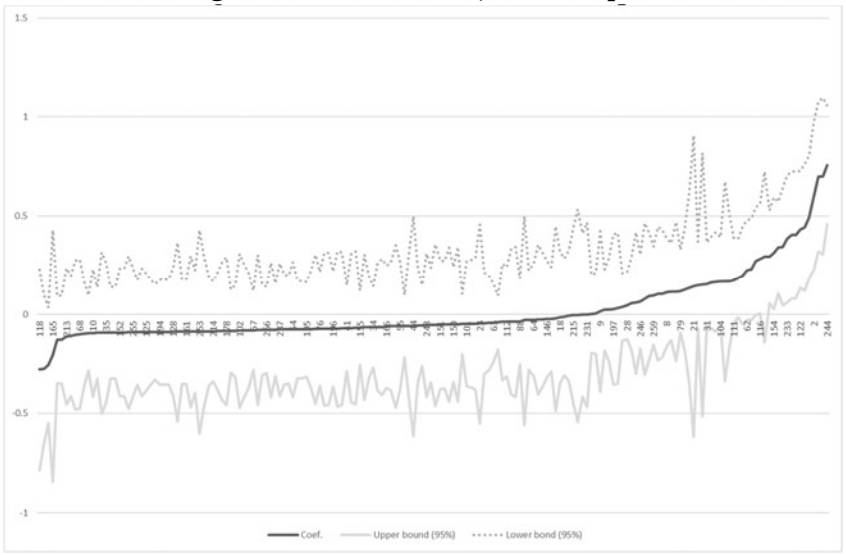
*** p<0.01, ** p<0.05, * p<0.1

Figure 1 Bank fixed effects

This figure reports the results for the bank fixed effect regression, where we plot the values of the coefficients for the bank dummies in the order to their magnitudes. Panels A and C are the result using the whole sample, while panels B and D are the results using the subsample of firms with more than

2 observations. In panels A and B, we use the dummies for banks that lend to 2 or more firms, while in panels C and D, we use the dummies for banks that lend to 5 or more firms.

Panel A: Banks lending to more than 1 firm (whole sample of 802 observations)



Panel B: Banks lending to more than 4 firm (whole sample of 802 observations)

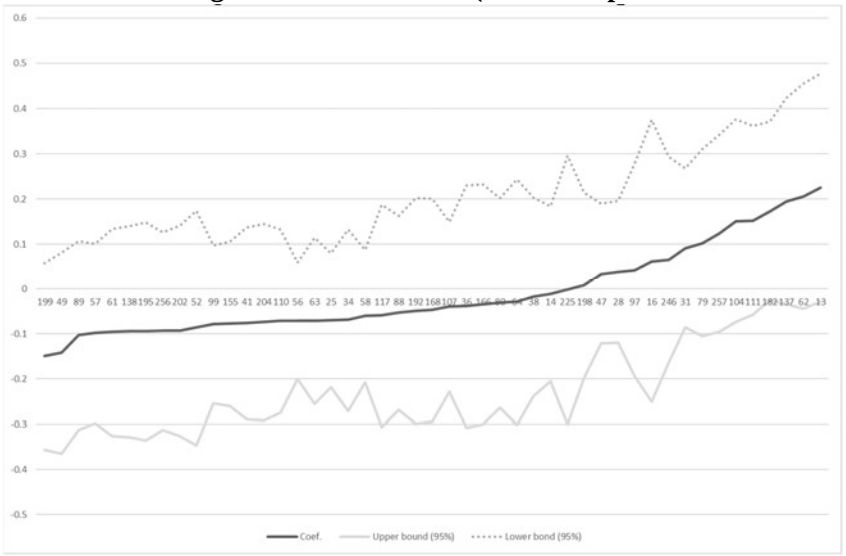
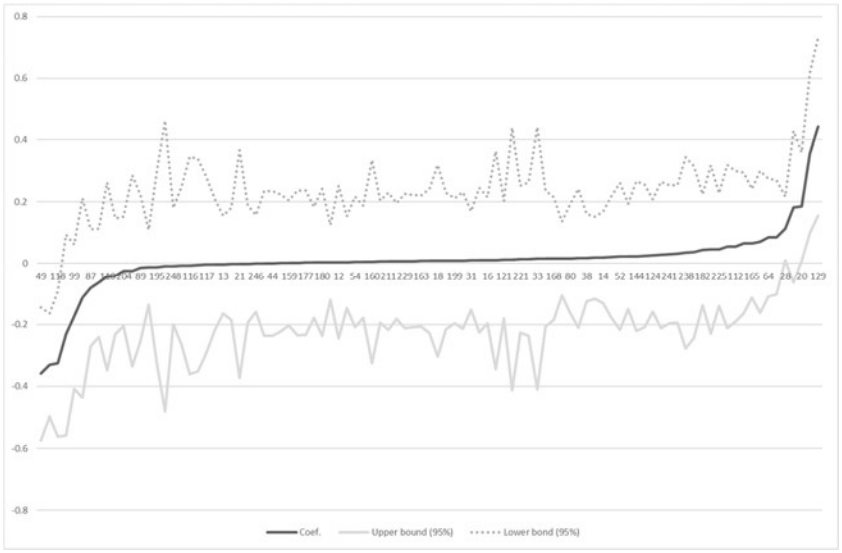


Figure 1 (continued)

Panel C: Banks lending to more than 1 firm (sub-sample of firms with 2 observations: 430 observations)



Panel D: Banks lending to more than 4 firm (sub-sample of firms with 2 observations: 430 observations)