March 9, 2018

Do Government Guarantees of Bank Loans Lower, or Raise, Banks' Nonguaranteed Lending?

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The authors thank Rafael Bostic, Erik Feyen, Maria Soledad Martiniz-Peria, George Kahn, Bill Keeton, Til Schuermann, Greg Udell, Bob DeYoung, Stavros Peristiani, Beverly Hirtle, Adam Ashcraft, Joao Santos, Nicola Cetorelli, Kevin Davis, Iichiro Uesugi, Arito Ono, Nobuyoshi Yamori, Minho Yoon, and seminar participants that the Federal Reserve Bank of New York, the Federal Reserve Bank of Kansas City, the Bank Structure Conference at the Federal Reserve Bank of Chicago, the World Bank, the ASSA annual meetings, and the Asian Finance Association & NFA meetings for helpful comments and suggestions.

The second author thanks the Grant-in-Aid for Scientific Research (C) (No. 25380407&No.17K03798) of the Ministry of Education, Science, Sport and Culture, and Tokyo Keizai University Research Fund.

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Abstract

The government vastly increased loan guarantees and capital injections for banks during the late-1990s crisis in Japan. We model when loan guarantees would raise, or lower, nonguaranteed lending. We found that nonguaranteed loans to small businesses rose by more than guaranteed loans rose. We also found that capital, which was injected only into the largest banks, was associated with significant increases in their lending. Thus, both the capital injections and the "synthetic capital" generated by government loan guarantees tended to raise bank lending in Japan. In addition, individual businesses' nonguaranteed and guaranteed loans rose together under a later guarantee program.

Key words:
Loan guarantees, bank capital, Japanese banks, Special Credit Guarantee Program, Basel, synthetic capital.

1. Introduction

In response to the global financial crisis in the late 2000s, several countries dramatically expanded their governments' implicit and explicit repayment guarantees of bank loans. For example, in the U.K., a large program of guarantees of banks' loans was instituted. In the U.S., the U.S. Small Business Administration lowered its guarantee fees and raised the maximum percentage that it guaranteed on small business loans. In addition, the U.S. Treasury provided repayment guarantees for loans that the Federal Reserve made to private-sector investors under the PPIP program. The recent financial crisis also prodded several countries to inject capital into their countries' banks. Like several other countries, the U.K. injected large amounts of capital into its banking system. In the U.S., the TARP program injected capital into banks large and small.

These expansions of guarantees on bank loans and injections of capital echo the expanding loan guarantees and capital injections that Japan used a decade earlier. By the late 1990s, Japanese banks were seriously troubled: enormous losses, especially on loans to the real estate and construction sectors had drained their capital. With weakened businesses in Japan and with a growing consensus that U.S. banks had curtailed lending in response to bank capital shortfalls in the early 1990s, policymakers in Japan had reason to be concerned. The combination of weak businesses and weak banks led to lower amounts of business loans outstanding both to small and to large businesses at both the very large, "city" banks and at the smaller, "regional" banks.[1] Concern about the implications of these developments for the macroeconomy then led the Japanese government to begin its Special Credit Guarantee Program (SCGP), which vastly increased its already considerable supply of guarantees for bank loans made to small businesses (or small and medium-sized enterprises, "SMEs").[2]

While the data clearly show that the SCGP boosted the volume of guaranteed loans outstanding, the few systematic studies of the effects of the SCGP have provided only mixed and limited evidence that it increased *total* business lending. Indeed, it has been suggested that the small estimated increases in total

[1] City banks tended to have operations that were national in scope, while regional banks were smaller and operated over smaller areas. See Ito and Sasaki (2002), Konishi and Yasuda (2004), and Watanabe (2007).
[2] See Motonishi and Yoshikawa (1999) and Credit Guarantee Corporation (2006).

lending relative to the size of the SCGP are explained by substitution effects; [3] that is, although the program explicitly forbade it, refinancing of existing, nonguaranteed loans with guaranteed loans might have occurred. To the extent that it did, it benefited both borrowers (via lower interest rates) and banks (via lower credit losses) at the expense of the loan guarantee agencies.[4] And, of course, complete substitution of guaranteed for nonguaranteed loans would not directly raise total lending, which was, after all, the stated goal of the program.

In this paper, we argue not only that the SCGP was effective in raising total lending, but also that it gave rise to complementarity effects. In particular, we present a theoretical model that shows how an increase in loan guarantees under SCGP rules might raise not only guaranteed lending but also nonguaranteed lending above what it would have been otherwise.[5] Thus, quite apart from any program prohibitions, the model identifies conditions of borrowers for which banks might willingly supply not only more guaranteed loans, but also more nonguaranteed loans. In that case, total loans would rise by even more than the total size of the loan guarantee program. The model also shows how the extent of such complementarity in banks' loan supplies changes with changes in borrowers' financial conditions and with the other parameters in the model.

We used annual data for 1996-2002 for bank loans to SMEs and to large businesses at virtually all individual banks in Japan. (After 2002, in part perhaps because of suggestions that guaranteed loans were being substituted for nonguaranteed loans, individual banks no longer reported the amounts of guaranteed loans on their books.) Our empirical specifications allowed us to examine whether the following factors affected individual banks' loans outstanding to SMEs and to larger businesses: banks' loan loss rates, banks' capital positions, government injections of capital into banks, and whether an individual bank was

[3] See Motonishi and Yoshikawa (1999).
[4] Nitani and Riding (2005) concluded that "… it is impossible for banks to move their existing bad loans to the guaranteed-loan category…".
[5] Below we discuss how the guarantee percentages and loss allocation rules differed under the SCGP from those of the loan guarantee programs of the U.S. Small Business Administration (SBA).

subject to Basel capital requirements. We also allow for fixed effects across banks and for common, "national" effects on banks over time via year dummies. We used instrumental-variables (IV) estimation in order to cope with the (very likely) endogenous feedback from individual banks' lending to their volume of loan guarantees.

Our empirical analysis of the model's predictions finds evidence of perhaps surprisingly large 'complementarity effects of guaranteed on nonguaranteed lending to distressed borrowers. Increases in the national supply of government guarantees on loans made to small businesses raised the amounts of total (guaranteed plus nonguaranteed) loans made to these borrowers. At the very large city banks, we estimated that total SME loans rose by more than twice as much as guaranteed bank loans. There were only weak indications that loans to large businesses rose with the supply of guarantees on SME loans. At the smaller regional banks, the estimated effects of loan guarantees on lending to SMEs were also statistically significant but smaller than those estimated for city banks.

Our model attributes differences in the magnitudes of responses to loan guarantees to differences in the amounts of borrowers' market values of equity and in the amounts of guaranteed loans that borrowers already had. The model indicates that complementary, or multiplier, effects of guaranteed lending on total lending might rise from around zero when a borrowing firm's net worth was around zero. The model also shows that those multiplier effects would be expected to rise as the firm became more distressed. The model shows that the multiplier effects would shrink as the share of a firm's liabilities that were composed of guaranteed loans expanded.

In addition to estimating the effects of loan guarantees, we estimated the effects of banks' reported, or measured, capital levels on their lending. These results should be viewed with some caution, however, since reported capital data are widely judged to be rife with measurement error, especially at the larger banks. Reported capital depended upon banks' reports of (supposedly unbiased estimates of) the magnitudes of their charged-off and otherwise depleted-value loans, which themselves were unreliably reported.

To obtain a more accurate picture of banks' capital situations, we estimated separately the effects on lending of the two large injections of capital that banks received from the Japanese government at the end

of the 1990s. The data we used recorded how much capital was actually (explicitly) injected, and when, bank by bank, via the government's purchases of individual banks' securities.

Perhaps because of the measurement errors, we did not detect economically or statistically significant effects on lending of changes in city banks' reported capital. For the injected capital, we did detect much larger and more significant effects on lending. Indeed, these estimated effects were quite similar to the capital effects found in U.S. banks.

2. Background on Loan Guarantees in Japan

This section presents some historical and institutional information on government guarantees in Japan of banks' loans to SMEs, including how the program operated, how the size of the program grew, how losses were apportioned, what prices were charged for the guarantees, and how guarantees reduced banks' capital requirements. It also presents some information about the Japanese government's bank capital injection programs.

2.1. The Credit Guarantee System in Japan

Japanese government guarantees of loans made by banks to SMEs date back to the Credit Guarantee System (CGS), which was established in 1937, well before the U.S. established the Small Business Administration (SBA). The CGS consists of 52 Credit Guarantee Corporations (CGCs), each of which guarantees loans made to SMEs by banks.[6] Backing of the CGS by the central government was conferred in 1953 by the Credit Guarantee Corporation Law.[7]

The large size of the program reflects the strength of the Japanese government's commitment to support lending to smaller businesses. Nitani and Riding (2005) note that 99 percent of Japanese firms qualify as SMEs. They also note that the Japanese system guaranteed more loans and for higher loan values than the

[6] Its guarantees of only bank loans reflect the fact that almost all loans to small businesses in Japan were originated and held by commercial banks.
[7] See Credit Guarantee Corporation (2006).

guarantee schemes of all of these countries combined: France, Germany, the Netherlands, the United Kingdom, Canada, and the United States.[8] Based on data from Christensen et al. (1999), which antedated the SCGP, Nitani and Riding (2005) concluded that "(e)ssentially one out of three SMEs used at least one guaranteed loan." The Credit Guarantee Corporation (2006) reported that, by March 1999, 43 percent of SMEs had guaranteed loans and these borrowers had an average of two guaranteed loans.

2.2. The Special Credit Guarantee Program: 1998-2001

In the late 1990s, the CGS expanded as the economy and the banking sector continued to contract. Intended to alleviate the downward pressure on bank lending to small businesses that resulted from the combination of weakened banks and a weakened economy throughout the 1990s, the government established the Special Guarantee System for the Financial Stabilization of Small Businesses, which is typically referred to as the Special Credit Guarantee Program (SCGP). The SCGP supplied additional guarantees for banks' loans to SMEs from October 1998 through March 2001. The guarantees provided for complete repayment of any losses of principal or interest. The authorized ceiling on the cumulated gross flow of these additional guarantees was initially set to cover 20 trillion yen of loans; the ceiling was raised in 1999 to 30 trillion yen, where it remained.

Compared with the long-running predecessor loan guarantee programs in Japan, the SCGP used less strict criteria. The SCGP made the underwriting decisions about which loans it would guarantee) An application from an SME for a loan guarantee, which typically was shepherded through the SCGP process by the SME's bank, was in principle accepted unless the SME was on a "negative list" (e.g., it had a tax delinquency, its books documented negative net worth, it had already defaulted on bank loans, etc.). The Credit Guarantee Corporation (2006) reported that, over the life of the SCGP, guarantees were approved for over 90 percent of the loan applications.

[8] Christensen et al. (1999) reported that, in 1998, for example, the Japanese system guaranteed 17 times as many loans as these other six countries combined.

The Japanese CGS is relatively unusual in that its loan guarantees cover 100 percent of the losses (to banks) of principal and interest due to loan defaults. Therefore, banks bore none of the credit risks associated with the guaranteed loans that they extended to SMEs. And, regardless of their credit risk, SMEs with guaranteed loans paid a fixed premium, as a percent of the book value of the loan, of 1.35 percent for uncollateralized loans and a fixed premium of 1.25 percent for collateralized loans. Table 1, based on data from Ono (2006), shows that the lower its credit score, the more likely was an SME to have guaranteed loans and the larger the share of its total loans that were likely to be guaranteed.

Another salient feature of the Japanese loan guarantee program is that all unsecured loans have equal priority in the event of default. Thus, when banks extended guaranteed loans to borrowers with pre-existing, nonguaranteed debt, the loan guarantee agency had no more claim on a defaulting borrower's assets than the other, unsecured creditors. We show that, in the Japanese context of equal priority, because of their effects on LGD (viz., loss (to banks) given default (of borrowers)), additional guaranteed loans enable banks to extend additional nonguaranteed loans to borrowers without raising banks' LGDs above levels that prevailed before the guaranteed and nonguaranteed loans were added to borrowers' and banks' balance sheets.

The outstanding stock of loan guarantees, i.e., the volume of loans that were guaranteed by the CGCs, greatly increased starting in 1998, after the initiation of the SCGP, rising to about 7 trillion yen, which was about a 30 percent increase in guaranteed loans. The ratio of the stock of guaranteed loans outstanding to total outstanding SME loan balances for this period is plotted in Figure 1. (The payout ratio, the ratio of losses to the government due to its loan guarantees to guaranteed loans, is plotted in Figure 8.) The stock then gradually declined when the ensuing flow of loan guarantees was smaller than the sum of the volumes of guaranteed loans that were repaid and smaller than the sum of defaulted loans. By the time the SCGP stopped issuing new guarantees in March 2001 (FY2000), more than one-third of SMEs that had bank loans and over one-tenth of total outstanding balances of loans to SMEs were covered by the Japanese government's regular credit guarantee programs and the SCGP.

2.3. Comparison with SBA Loan Guarantees

Loan guarantees provided by the SBA in the United States have tended to be less generous than those in Japan. First, lenders in the U.S. bore 25 percent of any net losses, in contrast to the Japanese system where lenders bore little and, under the SCGP, none of the losses. Some SBA guarantees cover only 50 percent of losses. During the financial crisis, in some cases, the SBA did lower the fees that it charged borrowers and did raise the lenders' shares of net losses to 10 percent. The SBA's America's Recovery Capital (ARC) guaranteed loan program started in 2009 in response to the financial crisis. The ARC program intended to help "viable", for-profit businesses stay current on their existing, qualifying loans by offering 100 percent guarantees on new, bank-originated loans that required no principal repayments from small-business borrowers for the first year and had zero interest cost to borrowers for the life of the ARC loans. The ARC program covered only very small loans--of no more than $35,000. In practice, very few ARC loans were ever made and the ARC program soon expired.[9]

Because they still bear some credit risk, U.S. lenders have considerable incentives to evaluate and minimize the risks of credit losses. It is generally thought that neither lenders nor the SBA are inclined to make guaranteed loans unless borrowers' repayment prospects are regarded as being quite high. In contrast, Nitani and Riding (2005) concluded that the Japanese system was often implemented so as to "rescue" firms that were in great distress. The Ono (2006) data show that more distressed businesses were more likely to borrow and to borrow more in Japan.

Posting collateral is one way to minimize the expected and unexpected losses on loans. In practice, the SBA typically requires that borrowers post a great deal of collateral at the time of loan origination, in contrast to Japan, where many guarantees are extended in the absence of any effective collateral. Beyond posting both business and personal collateral, SBA loan guarantees sometimes are accompanied by business owners' posting of personal guarantees of loan repayments.

[9] By the time the ARC program expired in September 2010, fewer than 9,000 loans totaling less than $300 million had been made.

3. Government Loan Guarantees and Government Injections of Bank Capital

3.1. Government Loan Guarantees

During these same years, under the Basel Accord, Japanese banking regulators purportedly required their internationally active banks to maintain their risk-weighted capital ratios at least 8 percent. Banks that operated only domestically were not subject to Basel capital requirements and thus faced only a 4 percent minimum capital requirement.

Severe loan losses following the end of the bubble economy reduced Japanese bank capital ratios so much during the early 1990s that many Japanese banks, especially the larger, city banks, had difficulty meeting required minimum capital ratios. Banks could then boost their capital ratios by reducing their supplies of bank credit, especially supplies of loans, such as nonguaranteed loans, that had 100 percent risk weights. Reductions of loan supplies impeded economic recovery, hurt businesses, and engendered considerable criticism from both the private and public sectors.

Alternatively, banks might have boosted their risk-weighted (Basel) capital ratios by refinancing existing, nonguaranteed loans with new, government-guaranteed loans, which carried lower risk weights. The attraction of refinancing was that the risk weight on government-guaranteed business loans was a mere 10 percent, while nonguaranteed business loans had risk weights of 100 percent. The incentive to undertake this kind of "asset substitution" was especially strong for the banks that had lower capital ratios and for internationally-active banks that were subject to Basel's higher minimum capital requirements than the Japanese banks that were subject to lower, domestic, capital minimums. Although the SCGP must have tempted Japanese banks and their borrowers to substitute new, guaranteed loans for their nonguaranteed loans, the SCGP intended to prohibit such re-financings.

The SCGP offered banks not only lower capital requirements, of course, but also lower credit risk. The SCGP was especially generous to banks and borrowers in that it covered 100 percent of the losses associated with default by the borrower. Thus, lower capital costs and lower credit risks provided Japanese banks with two strong incentives to refinance their pre-existing loans to SMEs that had become financially distressed with new loans that were guaranteed under the SCGP. To the extent that such substitutions occurred, the

net effects of this aspect of the SCGP on total bank loans outstanding would be tempered, or perhaps even completely nullified.

3.2. Government Injections of Bank Capital

Not directly related to the SCGP, but surely related to the parlous state of the Japanese macroeconomy and of its banks at the end of the 1990s was the decision by the Japanese government to inject 1.8 trillion yen of public funds as capital into city banks in March 1998. This injection mainly took the form of subordinated loans from the government to the banks. Carried out via the Financial Functions Stabilization Law of February 1998, these injections into banks counted as additions to banks' regulatory capital. Hoshi and Kashyap (1999) state that financial firms initially refused the government's capital injections, but that later banks relented, with each major bank asking for the same amount of public funds.

The Japanese government added a second large bank recapitalization program in October 1998. This program enabled weak, but avowedly solvent, banks to receive additional public funds that could also be counted as capital. This recapitalization program was initiated by the Financial Function Early Strengthening Law, which set up a Financial Revitalization Committee to oversee the restructuring process in recapitalized banks. Fifteen city banks then applied for a total of 7.5 trillion yen of additional capital funding in March 1999. To obtain the funds, each bank issued preferred stock and/or subordinated loans or subordinated debt to the Deposit Insurance Corporation. Participation in the program required a bank to submit a Business Revitalization Plan to the Financial Revitalization Committee. Participation also required that a bank hit several targets, such as meeting minimum Basel capital ratios, increasing lending to SMEs, reducing staffing levels, and so on.[10]

[10] See Shimizu (2006).

4. Literature on Loan Guarantees in Japan

The literature on guarantees of small business loans in Japan paints a mixed picture. Some studies found that SME lending rose by less than the extra guaranteed loans. Others reported large responses of total loans.

Matsuura and Takezawa (2001) conducted one of the first studies of the effects of Japanese government loan guarantees on bank lending. Based on their panel of annual data by prefecture for the fiscal years 1998 and 1999, they found no statistically significant effect of loan guarantees on banks' total lending to SMEs.[11] One possible explanation for their failing to detect any effects of loan guarantees on lending to SMEs is that the data are from the beginning of the SCGP period. Given that guaranteed SME lending surely rose, the failure of total SME lending to rise implied that nonguaranteed lending to SMEs declined. Such results provided fuel for the view that banks were, in effect, adding guarantees to pre-existing loans.

Konishi and Hasebe (2002) then estimated nearly the same specifications that Matsuura and Takezawa had used with data that extended through 2001. However, Konishi and Hasebe (2002) also included in their data the lending done not only by city and regional banks but also by credit banks and credit cooperatives. Based on their panel of data (annually, by prefecture), they estimated an elasticity of total SME loans to guaranteed SME loans of about three-quarters. Converting that estimated elasticity to units suggests that total lending to SMEs rose by a large multiple of the increase in guaranteed SME loans. For example, based on an estimated share of guaranteed SME loans in total SME loans of about 10 percent, their estimates suggest that each additional unit of guaranteed SME loans was associated with an increase of about 7½ units of total SME loans (and thus an increase in nonguaranteed loans of about 6½ units).

Sui (2004) used data for individual city and regional banks over a longer period. Based on data for the 1990s, he found a very small elasticity (about 0.025) of total SME loans to guaranteed SME loans. That elasticity suggests that total SME loans rose by much less than the increase in guaranteed SME loans and that, as a result, nonguaranteed SME loans declined when guaranteed loans rose.

[11] Matsuura and Takezawa (2001) did find that higher land prices stimulated lending and loan loss rates reduced lending.

Uesugi et al. (2010) showed that, relative to a control group, loan balances at Japanese businesses that participated in SCGP did rise, suggesting that guaranteed loans didn't merely replace nonguaranteed loans. Their data were not suited, however, to answering how much, if at all, total lending rose as a result of the SCGP.

Thus, evidence from prior studies about the effects of guaranteed SME loans in Japan is limited and mixed: One study implied very large effects on nonguaranteed and, thus, total loans at the prefecture level when credit banks and cooperatives were included, but two other studies, which were based on data for individual commercial banks, found very small effects on total SME loans.

No consensus has emerged from studies of guarantees on small business loans in Japan. Some studies found that SME loans rose, but by much less than guaranteed SME loans rose. Others reported negligible increases in the total of banks' loans to small and to large businesses.

Rather than increases in loan guarantees in Japan, Gropp, et al. (2014) analyzed the effects of a judicial decision in 2001 that suddenly removed government guarantees on loans at German (savings) banks. In contrast to banks that did not have guaranteed loans before the decision, banks that lost their access to loan guarantees reduced the amounts of credit that they extended to their riskiest borrowers, shifted their liabilities away from more rate-sensitive categories, and saw yields on their bonds rise.

5. Loss Given Default, Guaranteed Loans, and Nonguaranteed Loans

Based on a simple specification of a borrower's balance sheet, in this section we show that a bank can reduce its LGD by increasing its guaranteed loans to a distressed borrower. Then we show the extent to which a bank can extend more nonguaranteed loans to the same borrower without increasing LGD when it is also extending more guaranteed loans.[12]

[12] For simplicity, we assume that the borrower has prior and new loans outstanding only from its main bank. The results are similar if the borrower also has outstanding loans from another lender.

In the event that a borrower defaults on a bank loan, Japanese law and practice regards the claims of banks and of the government loan guarantee agency as having equal priority.[13] Equal priority holds regardless of the identity of the lender and regardless of the order in which the loans were extended. Equal priority has important implications at the margin for the risks and returns of additional, nonguaranteed loans when banks also have granted guaranteed loans to a borrower. One implication of equal priority is that, when a borrower defaults, the guarantor makes a net contribution to the all the borrower's creditors. If, instead, the bank's claim against the defaulter were subordinate to that of the guarantor, then the guarantor might contribute nothing, thereby discouraging the bank from making additional nonguaranteed loans to zombie businesses.

Consider a nonfinancial firm that initially has assets with book value equal to 100, book value liabilities in the form of (uncollateralized) bank loans equal to 80, and positive net worth equal to +20. (In the Appendix, we show that collateralization of loans has relatively little effect on the implications of our model.) Figure 9-B, with B indicating "before" a nonguaranteed loan was made, shows the nonfinancial firm's balance sheet. Then, suppose that the borrower becomes financially distressed for some reason, with the book value of its assets declining by 30 percentage points to 70. The distressed borrower then has assets (a) that have a market value of 70, has book-value liabilities (l) of 80, and therefore net worth, or equity (e), equal to -10:[14]

$$a = l + e \Rightarrow e = a - l = 70 - 80 = -10$$

If the borrower defaults, the bank recovers 70 and loses 10 of its original loan of 80 units.[15]

Next, suppose that the borrower, despite its current condition and how it became insolvent (in the sense that its net worth is negative), has some profitable projects. In particular, we assume that, for example, if the borrower acquires 10 units of additional funds, it can invest in a project that offers an expected gross

[13] We suppose that the government's loan guarantee agency, in the event of default, never loses more than the book value of the loan that it guaranteed and always endures some loss.
[14] Although the market value of nonguaranteed liabilities may also fall when the value of assets falls, here we term the difference between the market value of assets and the book value of liabilities as net worth or equity.
[15] We assume that default conveys the entire firm to the bank.

return, *R*, where 1.05; that is, it can expect to earn a 5 percent net return on the project. Thus, although past events have turned this business into a "zombie," we suppose that it currently has profitable opportunities.[16] Such a zombie might well have had the same profitability all along, but commercial real estate price declines might have rendered the firm's net worth negative. Figure 9-A (with A denoting "after" the borrowing firm obtains a guaranteed loan) shows the effect on the borrowing firm's balance after a guaranteed loan funded a project that yielded a net return of 5 percent.

We also assume that, if the borrower fails and defaults on its loans, then the loss ratio on its assets is 5 percent: $\delta = 0.05$. Given that assets have already been marked down to their market value, this 5 percent loss can be regarded as transactions or liquidation costs beyond those implied by marking down the original book value of assets of, say 100, to a market value of 70, as we assumed in Figure 9-B and 9-A.

How much would the bank lose if the borrower defaults before (B) it takes out a guaranteed loan? The loss (to the bank) given default (of the borrower), LGD^B, can be expressed as:

1) $LGD^B = l - a(1-\delta) = l - (l+e)(1-\delta)$

LGD is the amount of outstanding loans minus the amount recovered from the sale of the repossessed assets of the borrower. The first term on the right-hand-side is the amount of credit extended to the borrower, i.e., the size of the outstanding loan. The second term is the net amount that the main bank recovers in the event of default, the post-liquidation value of the borrower's assets.

How much would the bank lose if the borrower defaults after (*A*) it receives a guaranteed loan that it uses to fund a successful project? In that case, LGD^A can be expressed as:

2) $LGD^A = l + g - g - (a+Rg)(1-\delta)\frac{l}{l+g} = l - (l+e+Rg)(1-\delta)\frac{l}{l+g}$

When the borrower has both nonguaranteed and guaranteed loans, then the total owed to the bank equals $(l+g)$. Regardless of whether the borrower defaults, the bank recovers g, the amount of the guaranteed

[16] Zombie and even some solvent businesses might well have strong incentives to borrow even if they have available only negative NPV projects. Undertaking negative NPV projects might not only importantly affect LGD, but presumably it also would raise a bank's expected losses because of the effects of the project's raising the borrower's probability of default. We analyze only the case where the business has positive NPV projects.

loans (see also Figure 9-A). Furthermore, the main bank will share, with the government (via its loan guarantee program) the value recovered by selling the repossessed assets of the borrower. In addition to the (reduced) market value, *a*, of the assets that the borrower had prior to taking on the guaranteed loan, the borrower also has Rg units of assets that it received from the successful project as the gross return on the g units of guaranteed loans that it took on during the period. If the borrower then defaults, under the equal priority rule, the bank's share of the market value that is recovered from the borrower's total assets $l/(l+g)$, and the government's share is $g/(l+g)$. Thus, the bank's total recovery, which appears as the last set of terms in equation 2) above, can be expressed as:

3) $(l+e+Rg)(1-\delta)\frac{l}{l+g}$

Making this additional loan to the firm in Figure 9-A not only exposes the bank to no loss on the loan, but it also actually reduces the bank's LGD by more than the net return (0.5 units = 5% of the project cost of 10). In the event of default by the borrower in Figure 9-A, the loss to the bank will be:

$$80+10-10-(80.5)\left(\frac{80}{80+10}\right)=8.44$$

Equation 2) implies that the bank's LGD^A falls as the volume of guaranteed loans, g, rises, when the net rate of return on the project, *r*, exceeds the ratio of (the market value of) net worth, *e*, to the prior, nonguaranteed loans:

4) $\frac{\partial LGD^A}{\partial g} \leq 0 \; if \; r \geq \frac{e}{l}$ and $\frac{\partial LGD^A}{\partial g} > 0 \; if \; r < \frac{e}{l}$

An equivalent way to express equation 4) is:

5) $LGD^B \geq LGD^A \Leftrightarrow R \geq 1+\frac{e}{l} \Leftrightarrow \mathrm{r} \geq \frac{e}{l}$

Thus, if $r > e/l$, the bank can, perhaps not surprisingly, reduce the LGD associated with this borrower by extending an additional guaranteed loan. Since a borrower can always realize a zero net return by holding cash, one case that satisfies this condition is when net worth, *e*, is negative, as we have posited above. (Indeed, one might argue that LGD is especially relevant when net worth is negative, i.e., when $e < 0$. Solvent borrowers (i.e., those with $e > 0$) are presumably very much less likely to default.) Note that, given

an expected return on the additional project that is too low or equity that is too high, then the LGD may rise as the borrower takes on more guaranteed loans. But, in the case at hand, where $e < 0$, the bank (quite apart from other considerations associated with its own condition, such as the bank itself being a zombie), can reduce its LGD by extending more guaranteed loans to distressed (i.e., $e < 0$) borrowers. Thus, banks have incentives to offer guaranteed loans when the government offers underpriced loan guarantees. (Here, the underpricing stems from the low fee and the high insurance coverage.) Indeed, we observed that virtually the entire fixed supply of loan guarantees that the government provided during this period was taken up.

5.1. Effects on Nonguaranteed Loans

The next question is what effect these guaranteed loans would be expected to have on nonguaranteed loans. Here we will demonstrate that a bank could hold the LGD associated with a given borrower constant if it extended both guaranteed loans and nonguaranteed loans. Recall the LGD for a bank that has extended a guaranteed loan to a borrower:

6) $LGD^A = l + g - g - (a + Rg)(1 - \delta)\frac{l}{l+g} = l - (l + e + Rg)(1 - \delta)\frac{l}{l+g}$

Totally differentiating LGD^A, we get:

7) $dLGD^A = \left[\frac{(l^2+2gl)\{1-(1-\delta)\}+g^2-(1-\delta)(e+Rg)g}{(l+g)^2}\right]dl - \left[\frac{(1-\delta)\{l^2(R-1)-el\}}{(l+g)^2}\right]dg$

Setting $dLGD^A = 0$ produces:

8) $\left.\frac{dl}{dg}\right|_{dLGD^A=0} = \frac{(1-\delta)\{l^2(R-1)-el\}}{(l^2+2gl)\{1-(1-\delta)\}+g^2-(1-\delta)(e+Rg)g}$

Thus, equation 8) shows the change in nonguaranteed loans per unit of guaranteed loans that would leave the bank with an unchanged LGD. That change is positive, i.e., $dl/dg > 0$, when the borrower is insolvent ($e<0$). Borrower insolvency is a sufficient condition for the effect to be positive; it can also be positive even if the borrower is solvent ($e>0$), depending on the values of other parameters.

An important factor in the magnitude, and even the sign, of the impact on nonguaranteed lending, l, of additional guaranteed loans, g, is the economic condition of the borrower. As our model makes explicit, the more negative the net worth or equity of the borrower, i.e., the more zombie-like the business is, the larger the complementarity between the guaranteed and nonguaranteed loans for an individual bank that keeps its

LGD unchanged. The role of borrower distress then is vital in assessing the net effects of such loan guarantee programs, and thus, presumably, whether such programs are to be recommended as ongoing supports for SMEs or primarily introduced as countercyclical measures. The model implies that, holding LGD constant, dl/dg rises as the condition of borrowers deteriorates and that dl/dg falls as borrowers rely more heavily on guaranteed loans.

Figure 10 plots the values, as e ranges from -50 to +10 percent, for as varies that are implied by equation 8), under the assumptions that l = 80, g= 10, r = 0.05 (as well as for r = 0 and for r = -0.05), and . For a wide range of values for net worth (e), dl/dg is positive: If banks operate so as to hold LGD constant, then each additional unit of guaranteed lending brings forth a much larger increase in nonguaranteed lending. At net worth of -10 percent (e = -10), each unit of guaranteed loan would elicit more than 2 units of additional nonguaranteed lending, l.

Figure 10 also shows how much larger that response coefficient is as a borrower becomes more financially distressed. For example, given a project that offers r = 0.05, comparing a borrower with zero net worth with a borrower that is so severely distressed that = -40, Figure 10 shows that the response coefficient is positive and rises substantially, from about one to more than four. Further, Figure 10 shows that the response of nonguaranteed lending is larger, the larger is the rate of return on the projects that are funded by the additional guaranteed and nonguaranteed loans.

Figure 11 shows the model's implications for the response coefficient of the extent to which the borrower already has guaranteed loans for given values of the parameters assumed above, e = -10, and three different values for r: 0.05, 0, and -0.05. In Figure 11, we see again that the implied responses are positive, are larger the larger are the project returns (r), and decline considerably, from about three to about one, as g rises from zero toward 30 percent and more. That is, as the government's share of net recoveries rise, the benefits to the bank decline.

5.2. LGD, Expected Loss, and Profits

The model and discussion so far are based on a bank's willingness to make a combination of additional guaranteed plus nonguaranteed loans that would maintain the original value of that borrower's LGD. An

alternative model might have specified that banks acted as if they held constant expected loss (EL), which is the product of the LGD and the probability of default (PD). When a borrower has profitable investment opportunities, then additional loans would likely lower the borrower's PD.17 If additional guaranteed loans tended to lower both LGD and PD, then the bank's expected loss would be lower, too. A bank that sought to hold its EL constant then could, to the extent that its EL was reduced by the additional guaranteed loans, also make additional nonguaranteed loans while maintaining its original level of EL. To the extent that PD was reduced by more loans, as would be the case when the gross return exceeded one, then banks that sought to maintain their expected loss would lend more to a borrower that received an additional guaranteed loan than banks that sought to hold steady their LGD.

Whether Japanese banks operated as if they were attempting to maximize expected (risk-adjusted) profits during our sample is difficult to ascertain. Hoshi and Kashyap (2000) showed that, whatever the motives of Japanese banks, for very many years, and long before troubles erupted in the 1990s, they had strikingly low profits. Cargill (2000) concluded that Japanese banks acted as if they had a "… lack of concern with profits…" and that they "continued to support weak firms…". But, regardless of whether they were profit-maximizing, Japanese banks might well have boosted their nonguaranteed loans when more loan guarantees were supplied. Wilcox and Yasuda (2017) showed that a profit-maximizing bank would make more nonguaranteed loans in response to a larger supply of loan guarantees if the bank itself is sufficiently troubled. The model above, instead, focuses on the bank's incentives to lend to its troubled business borrowers.

[17] Oh, et al. (2009) concluded that providing more guaranteed loans reduced default probabilities for small Korean businesses.

6. Data Specifications, and Estimation

6.1. Sample

We built a panel dataset for individual, Japanese city and regional banks for the fiscal years 1995-2001.[18] At the end of March 2002 (fiscal year 2001), despite the loan-guarantee programs' continuing, the loan-guarantee agencies quit publicly disclosing the amounts of guaranteed loans at individual banks. That forced an end to our sample period then (fiscal year 2001). Our sample period began around the time of the announcement of the Japanese "Big Bang", which was a substantial reform of the Japanese banking system.

City banks in Japan are commercial banks that are effectively national in that they are large banks that operated in the major cities of almost every prefecture.[19] Regional banks are generally smaller and typically operate in the major cities of one prefecture. On average over our total sample period, for each year we had data for nine city banks and 122 regional banks.

Data for the volume of loans (i.e., the outstanding balances on the stock of loans) that are covered by loan guarantees were collected from the Annual Reports on Credit Insurance Statistics, which provide data for guarantees by individual bank for each year through fiscal year 2001. Our final sample contained 145 banks.20 Data for GDP and land prices at the prefecture level were collected from SNA Statistics. Data for the amounts of public funds injected into individual banks as bank capital were collected from the Financial Service Agency. The remaining data were collected from the Nikkei NEEDS database. Our sample period ended with the data for fiscal year 2001 (as of the end of March 2002), because the government stopped making the data on guaranteed loans at individual banks available as of the end of March 2002.

[18] Our sample included neither credit banks nor credit cooperatives.
[19] There are 47 prefectures in Japan.
[20] When two banks merged, we treated them as three separate banks, two before the merger and a distinct one after the merger.

6.2. Data Overview

Tables 2 and 3 present descriptive statistics for city and for regional banks, respectively, for the entire 1996-2002 period and for two sub-periods: the years 1996-1998, which cover the period before the introduction of the Special Credit Guarantee Program (SCGP), and for the years 1999-2002, which cover the period when the SCGP was guaranteeing SME loans. Table 2 shows city banks' assets, total loans, loans outstanding to SMEs, loans outstanding to large businesses, amounts of guaranteed SME loans (CG), ratio of equity capital to total bank assets (EQCAPLEV), and losses reimbursed by the government loan guarantee agency to banks (PG). Table 3 shows data for the same variables for regional banks. Table 1 shows the extent to which SMEs had loan guarantees, classified by borrowers' credit scores.

Figures 1-7 provide an overview of some of the annual data for 1996-2002 that we used for our regressions. (The dates on the horizontal axes of the figures refer to March of that calendar year, which is the date of the end of the prior fiscal year. Thus, the 2002 observation in Figure 1, for example, shows data for March 2002, the end of FY2001. Unless otherwise noted, the dates in the text refer to the calendar year.) Figure 1 plots total (outstanding nominal yen balances of) business loans separately for city and for regional banks annually for the 1996-2002 period.[21] Total (business) loans for all banks declined throughout this period, even after the SCGP was introduced. The extra loans guaranteed under the SCGP are included in the data from 1999 onward. Loans at city banks and at regional banks continued to decline quite consistently from 1997 through the end of the data period in March 2002. Over this period, the percentage rate of decline of (outstanding balances on business) loans at regional banks was slower than at city banks.

Figure 2 plots the same data for loans made to SMEs. Despite having many fewer total (business) loans, regional banks had more SME loans than city banks did. SME loans at regional banks declined by about 10 percent from 1996 through 2002 and by about twice that percentage at city banks. Notably, SME loans at

[21] Data in the figures refer to fiscal years. Japanese fiscal years begin in April of the calendar year. Fiscal year 2000, for example, starts at the beginning of the second quarter of 1999 (April 1999). For the variables used to produce the statistical tables, year 2002 refers to data for banks as of the end of March 2002 (which is the end of fiscal year 2001).

city banks rose considerably in 2000, while changing little at regional banks. By 2002, however, SME loans at city banks had fallen back toward their prior trend.

Figure 3 plots balances of loans made to larger businesses, calculated as the difference between the series plotted in Figures 1 and 2. Loans to large businesses at city banks declined by about 10 percent over the entire period, while large loans were largely trendless at regional banks. Thus, these data hardly point to the additional loan guarantees as having stimulated total lending or even lending to SMEs, at either city or at regional banks.

Nonetheless, additional guarantees were being made. Figure 4 plots the outstanding balances of SME loans with government guarantees at city and at regional banks annually over the 1996-2002 period. While guaranteed loans initially rose by upwards of 20 percent at city banks after the introduction of the SCGP, by 2002 balances on guaranteed (SME) loans at city banks were somewhat lower than they had been before the inception in 1999 of the SCGP. In contrast, at regional banks, guaranteed loans spiked up by more than one-third after the inception of the SCGP and stayed at about that level through 2002.

Figure 5 displays another view of the amount of guaranteed loans. It plots the ratio of guaranteed to total SME loans. At city banks, the ratio initially rises noticeably and then reverts toward its initial value of about 10 percent. At regional banks, again by contrast, the ratio rises by nearly 50 percent and remains near that level through 2002, the year after the SCGP finished guaranteeing additional loans.

One can see why casual observation might lead to the notion that additional loan guarantees did little to stimulate lending: About 30 trillion yen of guarantees were issued, the ratio of guaranteed loans, of course, rose, but total SME loans were significantly lower after than before the SCGP. The data in Figures 1-5 suggest that lending at regional banks may have been boosted, but even lending to SMEs at those banks rose little. Of course, so far, we have not controlled for any of the other, relevant factors that might affect loans to SMEs and large businesses. We now turn to some of those factors.

Figure 6 plots the reported (equity) capital (to total, unweighted assets) ratios of city and of regional banks for the 1996-2002 period. By the end of the 1990s, loan losses had decimated capital ratios at Japanese banks, especially at city banks. Figure 8 shows the proximate cause for the capital rebound at city

banks: The (explicit) injections of capital into city banks by the central government boosted capital by a small amount in 1998 and again, but by a much larger amount, in 1999. Figure 7 plots the aggregate, explicit capital injections made into city banks (as a share of total bank assets). The effect of the capital injections in 1998 and 1999 was to raise the aggregate capital ratio of city banks by about two full percentage points. Despite shrinking their assets, renewed losses at city banks after 2000 again pulled their capital ratios down. Figure 6 shows that capital ratios at regional banks also rose starting in 1999 but, then, they too fell back by a modest amount in 2002.

Figure 7 shows how much the loan guarantee agencies paid out to banks on guaranteed loans that defaulted by plotting the losses as a percentage of guaranteed loans for each year during the 1996-2002 period. At city banks, the ratio was already trending upward when the SCGP was initiated. After the SCGP was in operation, the payout ratio rose markedly, both at city banks and at regional banks.

Column 4 in both tables presents t-statistics that test whether the means differed over the earlier and later sub-periods. At city banks, although total and large loans were detectably lower after 1998, total assets and total SME loans were not detectably lower. One reason may have been that there were more guaranteed SME loans later—but the share of guaranteed loans in total assets at city banks was not statistically significantly higher in the later period. At regional banks, although guaranteed SME loans were clearly higher on average in the later period, total small loans were actually lower in the later period (compare row 4 with row 2 in Table 3). Despite large loans being slightly higher in the later period, the decline in small loans was so drastic that total loans actually declined. Thus, the data in Tables 2 and 3 provide little reason to expect that the SCGP, or any other developments in the later period, raised lending to SMEs, much less to large businesses.

6.3. Specification and Estimation

6.3.1. City Banks

To investigate the effects of the SCGP on bank loans, while controlling for other factors that might have affected loans, we applied panel data estimation techniques to the following specification for loans at city banks:

$$9) \quad LOAN_{i,t} = \alpha_0 + \alpha_1 CG_{i,t} + \alpha_2 EQCAPLEV_{i,t} + \alpha_3 BASEL_{i,t} + \alpha_4 CAPINJECT_{i,t} + \alpha_5 PG_{i,t} + \alpha_6 ASSETS_{i,t} + \varepsilon_{i,t}$$

The dependent variable, $LOAN_{i,t}$, was the stock of loans outstanding (in millions of yen at the end of fiscal year *t*) at bank *i* at time *t*. As alternative dependent variables, we used three measures of loans: Total loans (TL), small loans (SL), and large loans (OL), where OL (for "other loans") was calculated as the difference between total loans and small loans.[22] Each of the variables, except for the dummy variables, was standardized by dividing it by the total assets of each bank for each year. Our full sample period covered the 1996-2002 period.

We define the loan guarantee and control variables of Equation 9) as follows:

CG: Stock of loan guarantees, millions of yen at end of fiscal year t.[23]

EQCAPLEV: Book value of equity, millions of yen at end of fiscal year t.

BASEL: Dummy variable=1 only if a bank was subject to Basel in year t.

CAPINJECT: Government-injected capital, millions of yen at end of fiscal year t.

PG: Payouts by government on loan guarantees, millions of yen in year t.

ASSETS: Total assets, millions of yen at end of fiscal year t.

$CG_{i,t}$ was the amount of (credit) guaranteed SME loans at bank *i* in year *t*. Estimation of equation 9) controlled for the effects of several other variables. *EQCAPLEV* was the reported capital of each bank. Banks, whether in the United States or in Japan, who faced capital shortfalls have often been shown to have reduced their loans and thus their assets, in part to boost their ratios of capital to assets.[24] Indeed, typically the rationale for government injections of capital is to forestall declines in bank lending. Equation 9) also included two other capital-related control variables. *BASEL* was a dummy variable that indicated whether a bank was subject to the (stricter) Basel capital minimum requirements.

[22] We refer to loans made to SMEs as small loans, even though we have no information about the sizes of loans. Banks in Japan, in contrast to the United States, report loans by size of borrower, but not by size of loan.
[23] *CG* includes both the guarantees made under the SCGP and other, pre-existing guarantee programs.
[24] Numerous studies have estimated capital effects on lending. Peek and Rosengren (1995, 1997) and Hancock and Wilcox (1994, 1998), for example, are based on data for U.S. banks. Ito and Sasaki (2002), Montgomery and Shimizutani (2009), and Watanabe (2007, 2010) are based on data for Japanese banks.

CAPINJECT was the amount of capital that was injected by the Japanese government. To help control for the effects of economic conditions on their borrowers, we included *PG*, the payouts on guaranteed loans. *PG* might then serve as a more general indicator of how a bank's loans did and might perform.

6.3.2. Regional Banks

We used nearly the same specification for regional banks that we used above for city banks.

While most (but not all) city banks received them, relatively few (16 out of 117) regional banks received capital injections. Typically, the regional banks that did receive capital injections from the government were those that were in especially severe financial distress—so severe that most of them soon merged into other banks, had just emerged from a failed bank, or actually failed shortly after getting a capital injection. Partly because their conditions were especially dire, the reported financial statements for the regional banks that got capital injections may have been particularly inaccurate. That may have been why we estimated significant negative effects on their lending of additional capital injections. The negative estimates in fact may have resulted precisely from that serious mis-measurement of their capital. In light of the tendency to have more capital injected at the most impaired regional banks, we omitted *CAPINJECT* from the specification that we used for regional banks.

6.4. Fixed Effects and Year Effects

Data and other limitations often make it likely that some relevant variables were omitted from the specifications that we used to estimate the effects of loan guarantees. Allowing for fixed and year effects is one way to reduce the deleterious effects on the estimated effects of included variables of such omissions. For the results shown in Tables 4, 5, and 6, each specification included fixed-effects and year dummies, the former to allow for persistent, unmeasurable differences across individual banks and the latter to allow for the "national" effects that were common across banks but differed across years. We do not report the effects of the bank-specific or year dummies that we included in each specification.

Since they operated typically within a single prefecture rather than nationally, for regional banks, we added a variable that was available annually and that differed across regions, *BUSLAND*, which is a price

index for commercial land. In the regional bank regressions, we also included *GDP*, which measured economic activity in the prefecture of each regional bank.

Because it was never significant in the regressions based on city bank data, we omitted national *GDP* from the specifications that we used for city banks. Although a national measure of *BUSLAND* was available, rather than include national *BUSLAND* and/or national *GDP*, in each of the city bank regressions, we included the more flexible year dummies. Of course, including a dummy variable for each year in the regressions for city banks then precluded having national GDP, BUSLAND, or any other national variable, which would have been perfectly collinear with year dummies.

6.5. Estimation via Instrumental Variables

We present results based on separate data for individual city banks and regional banks, both for entire period and for sub-periods. All of our results were based on estimation via instrumental-variables (IV).

At an individual bank, stronger loan demand might lead simultaneously to more of both guaranteed and nonguaranteed loans. Suppose, for example, that either bank-specific loan officers or business borrowers at a bank increase the demand for a bank's business loans. As a result, guaranteed and nonguaranteed loans might rise in tandem, not because an increase in the government's supply of loan guarantees, but rather because an omitted factor is pulling up both types of loans. In that case, the amount of guaranteed loans, *CG*, should be treated as if it were endogenous. Because the resulting amount of guaranteed loans at each bank in each year ($CG_{i,t}$) in that case would be correlated with the error term in the loan equation, we instrumented *CG*.

Our primary instrument for $CG_{i,t}$ is a variable that combined how "guarantee intensive" each individual bank's loan portfolio had been long before the SCGP began and the amount of additional loan guarantees that were supplied "exogenously" by the national SCGP. We calculated that instrumental variable as the product of (1) the shares of the total national amount of SME loan guarantees outstanding in Japan that each bank had at the beginning of the entire sample period (March 1996) and (2) an estimate of the (exogenous) annual total national amount of SME loan guarantees in Japan extended under the SCGP based on its legislative mandate. This instrumental variable intends to be correlated with the amounts of supply of loan

guarantee to each bank for each year without being correlated with the unmeasured factors that likely affect the actual amounts of loan guarantees (and loans) at each bank in each year. Basing this instrumental variable solely on legislatively-capped, national amount of guarantees and the each bank's share of loan guarantees prior to our sample period is designed to capture the changing supply of guarantees while avoiding correlation with the unmeasured factors.[25]

Next we describe how we estimated this latter amount for each year since the inception of the SCGP through FY2001. Figure 12 displays the legislated cap on the national, total (across all banks), cumulated, gross flow of additional SME loan guarantees supplied by the SCGP. Available for the first time during FY1998, the legislation initially capped SCGP loan guarantees at 20 trillion yen. The cap on the national, cumulated, gross flow was raised from 20 to 30 trillion yen during FY2000.

Many guaranteed loans, like nonguaranteed loans, had quite short maturities. Under the rules of the SCGP, which specified a cap on the cumulated gross flow of loan guarantees that could be made, rolling over maturing short-term loans used more of the available (cumulated gross flow) supply of loan guarantees than did a single, longer-term guaranteed loan. As a result of the short effective maturities of many business loans, the outstanding stock of guaranteed loans made under the SCGP (and under the standard guarantee program as well) was typically far below the total gross stock of guarantees that had been issued.

We had data for both the annual gross flows of new guarantees and the resulting net stock of guaranteed loans. Based on those data series, we estimated that the "depreciation", or "run-off", rate for guaranteed loans was about 50 percent annually. We used a 50 percent depreciation rate, the fact that the SCGP was instituted part way through FY1998, and the legislated caps on the SCGP to estimate the annual amounts of the maximum national total supply of loan guarantees under the SCGP. The resulting values for this second term in the instrumental variable for the exogenous amount of loan guarantees associated with each bank are shown as IV1 in Figure 12. The IV1 value of 15 (3/4 * 20) trillion yen for (March of) 1999 reflects that the SCGP operated for ¾ of FY1998. Its value for 2000 then reflects that 7.5 trillion yen (50 percent

[25] Watanabe (2007, 2010) used a similar approach to constructing an instrument for bank capital at Japanese banks.

of the 15 supplied in FY1998) had run off by the end of FY1999 (March 2000), leaving the maximum net supply remaining from the capped amount of 20 at 12.5 trillion yen.

To assess whether our results were sensitive to the values of this instrumental variable, we also calculated an alternative instrument, IV2. Starting with 1999, the annual values for IV2 were arbitrarily set to equal 10, 15, 20, and then 10 trillion yen. The values for IV2 are also plotted in Figure 12. Because the results based on IV2 differed only slightly from those based on IV1, we do not show them.

In addition to the primary instrumental variable discussed above, we simultaneously included the following instrumental variables for each specification in Tables 4-6: the one-year lag of the dependent variable, the one-year lag of *CG* itself, and the current values and one-year lags of each of the right-hand-side variables other than *CG*. (Using IV with lagged variables as instruments meant that we could not estimate our specifications with data only for the few years before the SCGP began in fiscal year 1998.)

7. Empirical Results

In this section, we present the results of estimating the effects on bank lending of loan guarantees, bank capital, and government payouts on loan guarantees.

7.1. Results Based on the Sample of All Banks

Table 4 presents the estimates that we obtained when we app lied our IV method and instrumental variable, IV0, to a panel of data that included all banks, both city and regional. City banks, on average, are far larger than regional banks, but constitute only about 7 percent of the observations of this combined sample. Tables 5 and 6 present estimates based solely on city banks and on regional banks, respectively. The sample of all banks is dominated by the much more numerous regional banks given our specification that included fixed effects and that scaled the bank balance sheet variables by each bank's total assets. Because the absolute and relative conditions (and thus model-implied and estimated effects) at city banks differed so much from regional banks, we provide a brief discussion of Table 4 and more detailed discussion of Tables 5 and 6.

The full (time-period)-sample results for all banks are presented in columns 1-3. Total (business) loans are the sum of small loans (i.e., loans made to SMEs) and large loans. Row 1 shows the estimated effects of an additional unit of guaranteed (SME) loans, *CG*: Total loans rose by a statistically and economically significant amount: 3.036. (t-statistics are shown in parentheses under each coefficient in Tables 4-6.) The estimated size of this effect suggests that, for each additional unit of guaranteed loan, banks tended to extend about 2 (3.036-1) units of additional, nonguaranteed loans. The estimated coefficients in Columns 2 and 3 indicate that small (i.e., loans to SMEs) loans rose, significantly, by upwards of 2 units, while large loans were estimated to rise by a statistically-insignificant ½ unit.[26] (Note that, unlike least squares estimates, IV estimates of the component coefficients (i.e., those on small and large loans) need not sum to the estimated coefficient on total loans.) The results of Sargan tests of over-identifying restrictions reported at the bottoms of each of the columns in Tables 4-6 provide no evidence against the hypothesis that our instrumental variables were uncorrelated with the errors.

Recall the loan guarantees included in the variable *CG* applied directly only to SME loans. A bank that sought to maintain the LGD of its entire portfolio, however, might simultaneously extend more guaranteed loans to SMEs and nonguaranteed loans to larger businesses. Despite the guarantees applying directly only to SME loans, row 1, however, shows (as does Table 5 below) that the estimated effects on large loans, though statistically insignificant, were sometimes apparently about as important as the estimated effects on SME loans.

As we move rightward across the columns of Table 4, estimates based on shortened sample periods are presented. For the shortest period, which is restricted to dates for which the SCGP was in operation, we see that the effects of guaranteed loans were even larger than in the full sample period. In general, however, the effects on total loans were quite similar across the earlier and later sub-periods. Across sample periods, however, the point estimates for *CG* for small loans and for large loans differed somewhat.

[26] We refer to loans made to large businesses, i.e., those that are not SMEs, as large loans. Of course, large businesses might have small loans, and vice versa, but in general we expect loan and borrower size to be quite highly but not perfectly correlated. We don't have data on the size of the loans themselves.

The larger estimated effects of *CG* in latest sub-period would be consistent with borrowers' being more financially distressed on average then. As Figure 10 shows, the model predicts that total loans should then respond more per unit of additional loan guarantees.

The remaining rows of Table 4 show the estimated effects of a number of control variables that we included to reduce the likelihood of important omitted variable bias.[27] Row 2 shows the estimated effects of a unit of (reported) equity capital and of capital injections on lending. Small and total loans tended to rise modestly with capital: In the two longer sample periods, the estimated effects were statistically significant but less than one. For the sample period that excludes pre-capital injection years (columns 4-6), we detected no capital effects. In connection with the results for city banks that are presented in Table 5, we discuss whether "measurement error" in *EQCAPLEV*, presumably due to under-stated loan losses (and thus over-stated capital) during the 1990s contributed to these results.

The estimated effects of PG, the payouts by the government on its loan guarantees, were negative and statistically significant for the total sample period, but less reliably so in the shorter subsamples. Row 6 shows that the estimated effects of bank size, as measured by assets, were consistently statistically significant and negative, despite our having allowed for fixed (bank) effects.

7.2. Results Based on City Banks

Table 5 presents the IV estimates for our panel data, based only on data for city banks, for each sample period. The full (time-period)-sample results are presented in columns 1-3. Row 1 shows the estimated effects of an additional unit of guaranteed (SME) loans, CG: Total loans rose by a statistically and economically significant amount: 3.440. (t-statistics are shown in parentheses under each coefficient in Tables 4-6.) Thus, nonguaranteed loans at city banks rose by 2.440 units when guaranteed loans rose by one unit. The estimated coefficients in Columns 2 and 3 indicate that SME and large-business loans each rose by more than 2 units per unit of additional guaranteed (SME) loan. These estimated effects were statistically significant only at the 10 percent level. Recall the loan guarantees included in the variable CG applied

[27] Tables 4-6 follow a similar, but not identical, format. We include more controls for regional banks.

directly only to SME loans. A bank that sought to maintain the LGD of its entire portfolio, however, might simultaneously extend more guaranteed loans to SMEs and nonguaranteed loans to larger businesses. Despite guarantees' applying only to SME loans (and not to all SME loans), column 3 of row 1, however, shows that the estimated effects on loans to large businesses (i.e., large loans) were nearly as large as the estimated effects on SME loans.

For each sub-period in Table 5, the effects on total and SME loans were large and statistically significant and the effects on loans to larger businesses were quite large, but insignificant. One difference across time periods, however, stands out: Columns 4-6 show that the size and (statistical) significance of the effect of CG was considerably larger in the shortest, most recent sub-period. A larger coefficient during the later period is consistent with borrowers' being more financially distressed in the later period and therefore, as Figure 10 depicted, responding more per unit of loan guarantee.

The remaining rows of Table 5 show that the estimated effects of the control variables that we included to reduce any important omitted-variable bias. Row 2 shows the estimated effects of a unit of (reported) equity capital on lending. With the exception of the negative effect shown in column 2, the estimated effects of EQCAPLEV were all small and statistically insignificant. In contrast, in U.S. data, for example during the early 1990s—when banks were under capital pressure, similar specifications produced estimated bank capital effects that were generally statistically significant and fell within a range of, say two to four.

One possible, even likely, reason that the estimated effects of EQCAPLEV were so low is "measurement error." The large, Japanese city banks generally have been thought to have under-stated loan losses (and thus over-stated their capital) during the 1990s, and since. As a result, there has long been suspicion that the reported capital data for Japanese city banks during this sample period were not very accurate. Hoshi and Kashyap (2010) show estimates of "modified capital" that were about half as large as reported capital during fiscal years 1998-2001. Wilcox and Luengnaruemitchai (2004) produced evidence that Japanese banks tended to report more loan losses when they had higher cash flows, a practice that tended to keep reported capital just above the regulatory requirements. This practice would also tend to introduce

systematic measurement errors that might well seriously bias downward our estimates of the effects of EQCAPLEV.

Fortunately, we had available another capital variable that was subject to less of that measurement error. CAPINJECT is the amount of capital that the central government had cumulatively injected into each individual bank. Because the government (presumably very accurately) recorded how much capital it injected in each bank for each year, the data for CAPINJECT are presumably much more reliable capital measures than those for EQCAPLEV. Accordingly, the estimated effects of CAPINJECT, shown in row 4, are generally much larger than those for EQCAPLEV, which are shown in row 2.

For the full sample period and for the sub-period that began in 1998, we estimated that both total loans and SME loans rose by about 3 units per unit of capital injection. (These estimates are close to the estimated capital effects reported for the U.S. by Peek and Rosengren (1998) and Hancock and Wilcox (1999). We cannot tell how much of the increase in SME loans resulted purely from economic incentives and how much (if any) resulted from, in conjunction with their getting publicly-funded capital injections, banks' feeling compelled by regulators, to increase their loans to SMEs in particular. We do note that banks were less likely to feel regulatory pressure to lend more to larger businesses and that our estimated effects of CAPINJECT on loans to larger businesses were economically and statistically insignificant.

Row 3 presents the estimated effects of the dummy variable that indicated whether a bank was subject to the Basel capital minimum requirements. Though all city banks were subject to the Basel requirements early in our sample period, by the end some city banks had reduced their international operations sufficiently that they were no longer subject to them. Regardless, none of the estimated effects of the BASEL dummy variable were economically or statistically significant.

Row 5 presents the estimated effects of payouts by the government agencies on the guarantees on SME loans. We interpret this variable, PG, as an indicator of the extent of problem loans generally, and not just problem guaranteed loans. In row 5, only for the total sample period for small loans was the estimated effect of PG was significantly negative. Row 6 shows controls for the effects of changes in banks' sizes. (This effect operates separately from the effects of bank size that were absorbed by the bank fixed-effects that we

included in each of these specifications.) Quite consistently, larger bank size in Japan, as in the United States, was associated significantly with less SME lending.

As a robustness and efficiency check, we re-estimated Table 5, except that we excluded the EQCAPLEV, BASEL and the PG variables, which typically were insignificant. Not surprisingly perhaps, estimates that excluded the insignificant control variables produced estimated effects of loan guarantee that differed little from in Table 5.

7.3. Results Based on Regional Banks

Table 6 presents the results of estimating the fixed-effects specification by IV to data for regional banks. Columns 1 and of row 1 show that, for the full sample period, total and SME loans (small loans) rose by economically and statistically significant amounts per unit of additional loan guarantees. As for city banks, we estimated that nonguaranteed loans, especially nonguaranteed loans to SMEs, rose at a bank when its guaranteed loans rose. The estimate in column 3 suggests that, if anything, loans to large businesses may have fallen when more SME loans were guaranteed. When we only included the years when the SCGP operated, columns 4-6 show that the estimated effects of *CG* was much smaller and less statistically significant. One reason for those results is likely that excluding the pre-SCGP observations drastically reduced the variation in the data for *CG* and loans and thereby reduced the precision of the estimated effects.

At regional banks, the estimated effects of *EQCAPLEV* were somewhat larger and more significant. Based on the full sample period, column 1 shows that total loans rose by 0.687 and small loans by 0.483 per unit of additional bank capital, *EQCAPLEV*. For the shorter sample period, we detected no effect of bank capital on loans. The absence of capital injections by the government into any but the most-troubled regional banks precluded our estimating the effects of *CAPINJECT* on regional banks.

One possible explanation for weaker estimated effects of capital in the later sub-period is that a number of the weaker regional banks switched from being subject to the Basel capital minimum requirements to being subject to the much lower, domestic bank requirements, which were only about half as high. It may be that the reduction in required, and thus actual (*EQCAPLEV*), capital allowed the switching banks to hold

less capital while increasing their lending, thereby diluting the normally-positive relation between capital and lending, which appeared statistically strongly when we included data for the earlier sub-period.

Like at city banks, loans at regional banks showed no consistent relation to banks' Basel status. Loans to larger businesses were lower when regional banks received more payouts from the government on defaulted guaranteed small loans. Somewhat surprisingly, prefecture-level *GDP* had no detectable relation to small or large loans at regional banks. In contrast, Column 1 shows that, (only) for the whole sample period, prefecture-level prices of commercial land had a significant, positive effect on total loans and a somewhat weaker effect on small loans. The prices of commercial land presumably indicated how healthy local businesses were and how much banks might recoup via the collateral associated with defaulted loans. When those prices sank, both the demand and supply of loans were likely to retrench. Like city banks, regional banks tended to reduce the share of their assets in small loans when bank assets grew.

8. Systematically-Varying Effects of Loan Guarantees

Notable in row 1 of Table 5 is the increase in the estimated effect of loan guarantees on loans at city banks over time. The estimates of the *CG* coefficients increased as the starting dates of the samples advanced, shifting more of the sample period toward the SCGP period: The estimated coefficients approximately doubled (from 3.440 to 7.008) when the starting date moved from 1997 to 1999. Thus, as more zombie businesses stalked Japan and threatened its banks, we estimated that loans guarantees were becoming ever more stimulative, in the sense that each guarantee was coming to be associated with more non-guaranteed lending.

In contrast, Table 6 shows that the effects of *CG* were estimated to be shrinking as the sample shifted toward the later time period. The estimated effect fell more than half (4.553 to 2.031) and into statistical insignificance when the starting date of the sample period moved from 1997 to 1999. During the most recent sample period, then, the coefficients based on data for city banks were much larger and more statistically significant than those based on data for regional banks.

How much of the difference across bank categories and across time and conditions can we account for with the model that we presented above? Based on the expression for *dl/dg* given in equation 8) above, Table 7 helps answer those questions. (Figures 10 and 11 depict many of these same implications of the model.) Table 7 shows the marginal effects that are implied by our model of an additional unit of guaranteed loans. Those effects vary with gross and net project returns (R and r=R-1), market-value equity (e), the share of loans that are guaranteed (g), and the percent of the market value of assets that is sacrificed due to liquidation (delta).

Panels A and B in Table 7 show the model-implied values for *dl/dg*, the effects of an additional unit of guaranteed loans on the amounts of nonguaranteed loans for various values of e, R, and delta. These top two panels show how the model accounts for the effects' approximately doubling from about 2 to about 4. (Table 5 showed that our estimated effects approximately doubled in the most recent sample period for city banks.) The top panel examines the case for g = 10 percent. (15 percent is about the amount of loans guaranteed by the time that the SCGP was fully implemented; in the years just before that, g was about 10 percent.) Panel A shows that, when delta = 0.05, the gross return, R, is 1.00 (and thus r=0), and borrower net worth (e) is -15 percent, then the model implies that *dl/dg* = 2.08. Our model also implies that if delta shrinks to 0.02, R rises to 1.05, and e improves to -10 percent, then the implied effect on nonguaranteed loans of an additional unit of guaranteed loans rises markedly, to 4.30 units.

Panel B in the middle of Table 7 shows analogous implied changes in the effects on nonguaranteed loans of an additional unit of guaranteed loans, based on g = 0.10 and R = 1.00. (For city banks, g was in the range of 0.10.) Panel B shows a more plausible way than Panel A for how the model might account for the much larger estimated effects at city banks that we showed in Table 5 for the latest sample period. For city banks, suppose that, for the longer sample period, that e = -15, that is that business borrowers were seriously insolvent on a market-value basis. Such borrowers might fit into the category of the "walking dead," the zombie businesses who were deeply insolvent but still could walk into their city banks. Given low enough liquidation costs (delta = 0.02), Panel B shows that our model implies that the effect on an additional unit of guaranteed loans would be to raise nonguaranteed lending by about 2.08 units

If the borrower's condition deteriorated, so that e fell then fell to -20 and delta (liquidation cost) fell to 0.02, then the model-implied effect on nonguaranteed loans more than doubles, to 4.38. In Table 5, we saw that the estimated coefficient on *CG* more than doubled (to 7) for the latest sample period, when indeed borrowers were in worse conditions, as represented here by a decline in e from -15 to -20. In this way, the model accounts for about ½ of the estimated increase in the effect of *CG* from 3 to 7 that we showed in row 1 of Table 5. While the model may not account for all of the estimated increase in the effect of *CG*, it gives a creditable account of why the estimated effects might rise substantially.

On the other hand, Row 1 of Table 6 showed that the estimated effects on total loans of guaranteed loans (*CG*) fell approximately in half, from over about 4½ to 2 as the sample shifted toward the latest period. The estimated effect on nonguaranteed lending then fell from 3½ to 1. Might our model account for that large decline? Given the increasing amounts of guaranteed loans and the worsening state of the economy, perhaps it does. Figure 5 showed that g, the amount of guaranteed loans, did in fact rise substantially in the later sample period, though not by as much as 10 percentage points.

The long-slumping Japanese economy may well have had reduced investment opportunities by the end of the 1990s. For example, the aggregate payout ratio of the government's loan guarantee agency rose from about 1.4% of guarantees in 1997 to about 3.8% by 2002. Then, Panel C shows that, given e = -10 and delta = 0.02, when g rises from 10 to 20 percent and R declines from 1.05 to 0.95, the implied effect of guaranteed on nonguaranteed loans, dl/dg, declines dramatically, from 4.30 to 0.98, a decline somewhat larger than we estimated. Thus, the rise and fall of the estimated effects of guaranteed loans can be squared with the systematic variation in those effects that our model implies.

9. Individual Firms' Guaranteed and Non-Guaranteed Loans in 2009

We also look for evidence in survey data about individual firms for whether guaranteed and nonguaranteed loans were substitutes or complements, as suggested by our findings based upon bank-level data.

Kim and Yasuda (2015) used responses from small and medium-sized enterprises (SMEs) to a survey that was conducted in February 2009 by the Research Institute of Economy, Trade and Industry (RIETI), a

research institution that is affiliated with Japan's Ministry of Economy, Trade and Industry). The 2009 RIETI survey questionnaire was sent to the 5,979 surviving firms that had responded to the 2008 RIETI survey. Of those firms, the 4,103 responding firms constituted a 69 percent response rate. The 2009 RIETI survey collected the yen amounts of government-guaranteed loans that each SME had obtained through the Emergency Credit Guarantee Program (ECGP), which was launched right after the September 2008 Lehman shock.[28] In addition to the amounts of guaranteed loans that were originated (LOANECGP), the 2009 RIETI survey also collected data for the amounts of each firm's non-guaranteed loans that were recently originated by the firm's largest lender, often referred to as a firm's "main bank," LOANNONG.

We focused on data for firms in Kim and Yasuda (2015) that reported amounts both for guaranteed loans (LOANECGP) and for non-guaranteed (LOANNONG) loans in the 2009 RIETI survey. To reduce the influence of outliers, the data were winsorized by converting observations of LOANECGP and of LOANNONG that were in their respective 1 percent top and bottom tails to the values of those quantiles. The data also omitted the one firm whose ratio of new guaranteed loans to its assets was an extreme outlier. Because very many of the SMEs that responded did not answer all of the many dozens of survey questions, the final sample size was reduced to 335 firms.

Figure 13 plots the resulting data from Kim and Yasuda (2015) for LOANNONG against LOANECGP for each of the 335 firms that remained in our sample. The visual and statistical correlations between them is positive, which supports our bank-based results that non-guaranteed loans were complements to guaranteed loans. For example, at the same time that 45 firms got 80 million yen or more of guaranteed loans (LOANECGP), 32 of those same firms also got 80 million yen or more of non-guaranteed loans from their largest lenders. And, as Figure 13 shows, many of those 32 firms got much more than 80 million yen of non-guaranteed loans.

[28] See Section 2 of Ono, et al. (2013) for details about the ECGP. The ECGP is the Lehman shock analog to the SCGP that Japan launched in October 1998 in response to the banking crisis at that time.

Figure 14 plots the same individual firms' (winsorized) new, non-guaranteed and guaranteed loans after the loan amounts were scaled by each firm's (winsorized) total assets, LOANECGP_AT and LOANNONG_AT. Similar visual and statistical correlations appear there: Firms that got new guaranteed loans also tended to get new non-guaranteed loans. Of the 67 firms that got more new guaranteed loans that amounted to more than ½ of one percent (0.005) of their assets, 45 of those firms also got non-guaranteed loans of that amount or more.

Table 8 provides more formal evidence by regressing individual firms' new non-guaranteed loans on their new guaranteed loans and several control variables. In columns 1 and 2, the dependent variables are MBLOANS and MBLOANS_AT, which are newly-originated non-guaranteed loans, in millions of yen and as a percent of their assets. Analogously, guaranteed loans are expressed in millions of yen (AMECG) and as a percent of individual firms' assets (AMECG_AT). Rows 1 and 2 show statistically-significant, positive effects of guaranteed loans on non-guaranteed loans. The control variables were generally insignificant. Omitting them did not importantly affect the significance of the guaranteed-loan variables. As Figures 13 and 14 implied, the simple correlations between non-guaranteed and guaranteed loans were strongly positive. Thus, despite the 2009 survey pertaining to borrowing during 2008 and our bank-level sample period ending in 2002, both samples and sample periods provided evidence that the loan categories were complements: Non-guaranteed loans tended to rise when guaranteed loans rose.

10. Summary and Conclusions

By the late 1990s, many Japanese banks and business borrowers were in dire straits. Actual and potential insolvency plagued both borrowers and banks. To alleviate the contractionary pressures on banks and borrowers of financial distress, the Japanese government dramatically increased the supply of guarantees for bank loans that were made to small and medium-sized enterprises. In much the same way that a government's deposit guarantees can be viewed as providing support indirectly to banks, so do loan guarantees. In fact, the original Merton (1977) article that analyzed the value of deposit guarantees also contained "loan guarantees" in its analysis (and title). In addition to the risk-shifting aspects of loan guarantees that Merton

highlighted, we note that loan guarantees, given the lower capital requirements for guaranteed loans, raised actual capital relative to its minimum requirements. Thus, like deposit guarantees, loan guarantees can provide valuable "synthetic capital" to banks.

Our estimates suggest that the increased supply of loan guarantees raised not only guaranteed loans, but also raised nonguaranteed loans, and often by more than guaranteed loans rose. With plausible assumptions about various parameters and banks' lending decisions, the model predicted that a bank might extend from two to four units of additional nonguaranteed loans to a borrower that got an additional unit of guaranteed loan from the bank. Our estimates were consistent those predictions. And, as our model further predicted, we found that that guaranteed loans boosted nonguaranteed loans by especially large amounts when business borrowers were especially troubled.

At the same time that it increased its supply of loan guarantees, the Japanese government also made large capital injections into banks. While we found little evidence that the amounts of loans were related to the amounts of that banks (incredibly) reported, we found considerable evidence that the better-measured, government injections of capital did produce more loans.

The estimates here parallel those reported elsewhere for U.S. banks and their lending. The estimated effects of the capital injections were similar to those found for U.S. banks when they were under capital pressure in the early 1990s.In addition, like Hancock, Peek, and Wilcox (2006), we found here that government loan guarantees seemed to act like "high-powered capital," albeit synthetic capital, in that the increases in total loans were a substantial multiple of the increases in guaranteed loans.

Thus, our estimates suggest that the Japanese government's efforts did stimulate lending, which in turn presumably did lead overall economic activity to be larger than it would have been otherwise. How much the Japanese economy more broadly benefited from these efforts and whether the efforts should have been sooner or larger, or both, is beyond the scope of our study. But, on the narrower issue of whether such efforts at least their intended, more-direct, and sizable effects had, our results suggest that the Japanese government's injections of synthetic and actual capital did provide substantial stimulus to bank lending.

References

Caballero, Richard J, Hoshi, Takeo, and Anil K. Kashyap, 2008, "Zombie Lending and Depressed Restructuring in Japan," *American Economic Review* 98:5 (2008), 1943-1977.

Cargill, Thomas F., "What Caused Japan's Banking Crisis," in Takeo Hoshi and Hugh Patrick (Ed.), Crisis and Change in the Japanese Financial System (Norwell: Kluwer AP, 2000), 44-45, 48-51.

Christensen, J.L, Jackson, S., Mensah, S. and A. Riding, "Loan Guarantee Schemes in Six Countries," Working Paper, Aalborg University, 1999.

Credit Guarantee Corporation, 2006, Credit Guarantee System in Japan.

Eser, Zekeriya, Peek, Joe, and Eric S. Rosengren, "Secondary Bank Lending in Japan," in Michael M. Hutchinson and Frank Westermann, Japan's Great Stagnation. (Cambridge: MIT Press, 2006), Chapter 6.

Gropp, Reint, Grundl, C., and Guttler, A., "The Impact of Public Guarantees on Bank Risk- Taking: Evidence from a Natural Experiment," *Review of Finance* 18, (2014), 457-488.

Hancock, Diana, and James A. Wilcox, "Bank capital, loan delinquencies, and real estate lending," *Journal of Housing Economics* 3:1 (1994), 31-50.

Hancock, Diana and James A. Wilcox, "The 'credit crunch' and the availability of credit to small business," *Journal of Housing Economics* 22:6-8, (1998), 983-1014.

Hancock, Diana, Peek, Joe, and James A. Wilcox, "The Repercussions on Small Banks and Small Businesses of Bank Capital and Loan Guarantees," Working Paper (2006).

Hoshi, Takeo, "Economics of the Living Dead," *The Japanese Economic Review* 57:1 (2006), 30-49.

Hoshi, Takeo, and Anil K. Kashyap, "The Japanese Banking Crisis: Where Did It Come From and How Will It End?," in Ben S. Bernanke and Julio J. Rotemberg (Ed.), NBER Macroeconomics Annual 14 (1999), 129-212.

Hoshi, Takeo, and Anil K. Kashyap "Will the U.S. Bank Recapitalization Succeed? Eight Lessons from Japan," *Journal of Financial Economics* 97 (2010), 398-417.

Ito, Takatoshi and Yuri N. Sasaki, "Impacts of the Basel Capital Standard on Japanese Banks' behavior," *Journal of the Japanese and International Economics* 16 (2002), 372-397.

Kim, Hyonok, and Yukihiro. Yasuda, "Accounting Information Quality and Government Guaranteed Loans: Evidence from Japanese SMEs," RIETI Discussion Paper Series 15-E-138 (2015).

Konishi, Masaru and Ken Hasebe, "Kouteki sinyouhoshou no seisaku kouka," *The Hitotsubashi Review* 5 (2002), 36-47 (in Japanese).

Konishi, Masaru and Yukihiro Yasuda, "Evidence on a cause of Japan's prolonged banking crisis," *Applied Economics Letters* 10 (2004), 853-855.

Matsuura, Katsumi, and Yasuko Takezawa, "Ginnkou no chuushoukigyou muke kasidasi kyoukyuu to tannpo, sinnyouhosho and furyou saikenn" (The supply of small business bank loans, collateral, guarantees and nonperforming assets), *Yuusei Kennkyuujo Discussion Paper Series* 01 (2001) (in Japanese).

Merton, Robert C., "An analytic derivation the cost of deposit insurance and loan guarantees: An application of modern option pricing theory," *Journal of Business* 1 (1977), 3-11.

Montgomery, Heather and Satoshi Shimizutani, "The Effectiveness of Bank Recapitalization Policies in Japan," *Japan and the World Economy* 21 (2009), 1-25.

Motonishi, Taizou and Hiroshi Yoshikawa, "Causes of the long stagnation of Japan during the 1990s: Financial or real?" *Journal of the Japanese and International Economics* 13 (1999), 181-200.

Nitani, Miwako and Alan Riding, "Promoting Enterprise Development or Subsidizing Tradition?" *International Small Business Journal* 23 (2005), 48-71.

Oh, Inha, Lee, Joeong-Dong, Heshmati, Almas, and Gyoung-Gyu Choi, "Evaluation of credit guarantee policy using propensity score matching," *Small Business Economics* 33 (2009), 335-351.

Ono, Arito, "Sikinn choutatu kannkyo no kyuugekina akka ha nai" (Little Risk of the change of financing environment), *Kinnyuu zaisei Jijo* 5 (2006), 16-21(in Japanese).

Peek, Joe and Eric S. Rosengren, "The Capital Crunch: Neither a Borrower nor a Lender Be," *Journal of Money, Credit and Banking* 27:3 (1995), 625-38.

Peek, Joe and Eric S. Rosengren, "The International Transmission of Financial Shocks: The Case of Japan," *American Economic Review* 87:4, (1997), 495-505.

Peek, Joe and Eric S. Rosengren, "Unnatural Selection: Perverse Incentives and the Misallocation of Credit in Japan," *American Economic Review* 95:4 (2005), 1144-1166.

Shimizu, Katsutoshi, "How can we effectively resolve the financial crisis: Empirical evidence on the bank rehabilitation plan of the Japanese government," *Pacific-Basin Finance Journal* 14 (2006), 119-134.

Singer, Jason, and Phred Dvorak, “Shinsei Bank Pressured to Keep Shaky Loans -- Regulators’ Moves Raise Questions on Japanese Overhaul,” The Wall Street Journal, New York, NY: Sep, 26, 2011, C.1.

Sui, Qing-yuan, “Kyoukyuu saido karano chuushou kasidasi bunseki” (Supply side analysis of small loans), Manuscript presented at Japan Society of Monetary Economy Meeting at Aichi University (2004) (in Japanese).

Uesugi, Iichiro, Sakai, Koji, and Guy M. Yamashiro, “The Effectiveness of Public Credit Guarantees in the Japanese Loan Market,” *Journal of the Japanese and International Economies* 24 (2010), 457-480.

Watanabe, Wako, “Prudential Regulation and the “Credit Crunch”: Evidence from Japan,” *Journal of Money, Credit and Banking* 39:2-3 (2007), 639-670.

Watanabe, Wako, “Does a Large Loss of Bank Capital Cause Evergreening? Evidence from Japan,” Journal of the Japanese and International Economies 24 (2010), 116-136.

Wilcox, James A. and Pipat Luengnaruemitchai, “Pro-cyclicality, Banks’ Reporting Discretion, and ‘Safety in Similarity’” in Benton E. Gup (Ed.), The New Basel Capital Accord (South-Western Publishing 2004), 151-175.

Wilcox, James A. and Yukihiro Yasuda, “Government Guarantees of Loans to Small Businesses: Effects on Banks’ Risk-Taking and Non-Guaranteed Lending,” Manuscript (2017).

APPENDIX

Extending the Model to Include Collateralized Loans

l^{coll} : collateralized loans (e.g., 40)

l^{unoll} : uncollateralized loans (e.g.,40)

α : recovery ratio of collateralized loans $\alpha \in [0,1]$

$$LGD = l^{coll} + l^{uncoll} + g - g - \alpha l^{coll} - \left(a + Rg - \alpha l^{coll}\right)(1-\delta)\frac{(1-\alpha)l^{coll} + l^{uncoll}}{(1-\alpha)l^{coll} + l^{uncoll} + g}$$

$$= (1-\alpha)l^{coll} + l^{uncoll} - \left\{(1-\alpha)l^{coll} + l^{uncoll} + e + Rg\right\}(1-\delta)\frac{(1-\alpha)l^{coll} + l^{uncoll}}{(1-\alpha)l^{coll} + l^{uncoll} + g}$$

$$LGD = l^{uncoll} - \left(l^{uncoll} + e + Rg\right)(1-\delta)\frac{l^{uncoll}}{l^{uncoll} + g} \qquad \text{if } \alpha = 1,$$

This is the same form as Eq. (2). Thus, when loans are collateralized, they act as if they were guaranteed loans, and thus have a smaller coefficient than the benchmark case in the text.

Generally, if we define $L \equiv (1-\alpha)l^{coll} + l^{uncoll}$, then

$$LGD = L - (L + e + Rg)(1-\delta)\frac{L}{L+g}$$

Again, this is the same form as Eq. (2). Then, note that

$$\frac{dl^{uncoll}}{dg}\Big|_{l^{coll},\ g\ given} = \frac{dl^{uncoll}}{dL}\frac{dL}{dg}\Big|_{l^{coll},\ g\ given} = \frac{dL}{dg}\Big|_{l^{coll},\ g\ given}$$

Thus,

$$\frac{dl^{uncoll}}{dg}\Big|_{dLGD=0} = \frac{(1-\delta)\left[\left\{(1-\alpha)l^{coll} + l^{uncoll}\right\}^2 (R-1) - e\left\{(1-\alpha)l^{coll} + l^{uncoll}\right\}\right]}{\left[\left\{(1-\alpha)l^{coll} + l^{uncoll}\right\}^2 + 2g\left\{(1-\alpha)l^{coll} + l^{uncoll}\right\}\right]\{1-(1-\delta)\} + g^2 - (1-\delta)(e+Rg)g}$$

Despite its additional terms, this is quite similar to the case without collateralized loans.

Figure 1
Banks' Aggregate Loans to Businesses

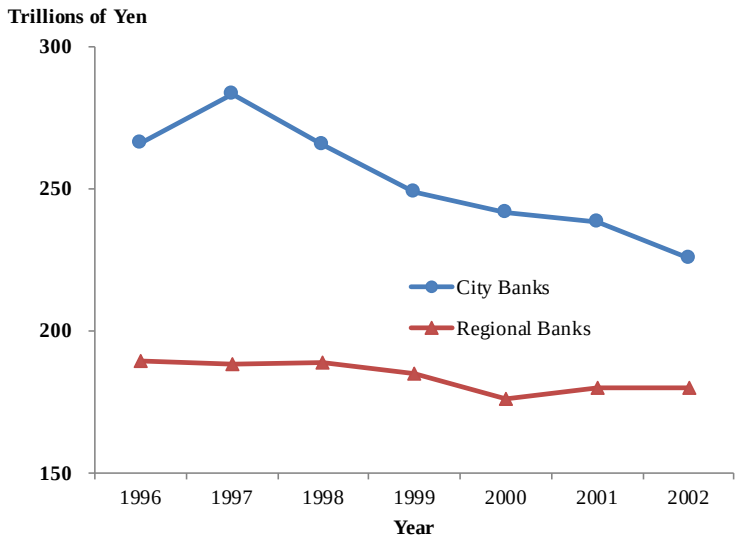


Figure 2
Banks' Aggregate Loans to Small and Medium-Size Enterprises

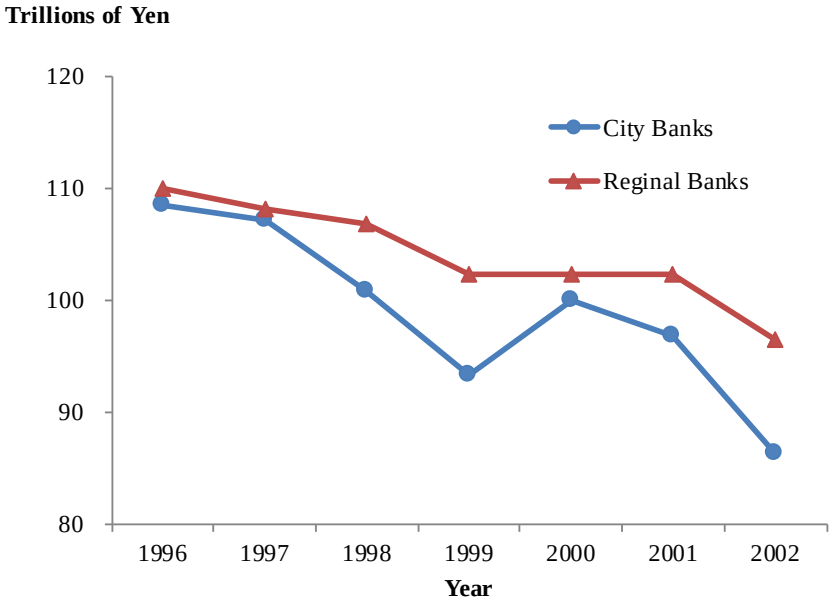


Figure 3
Banks' Aggregate Loans to Large Businesses

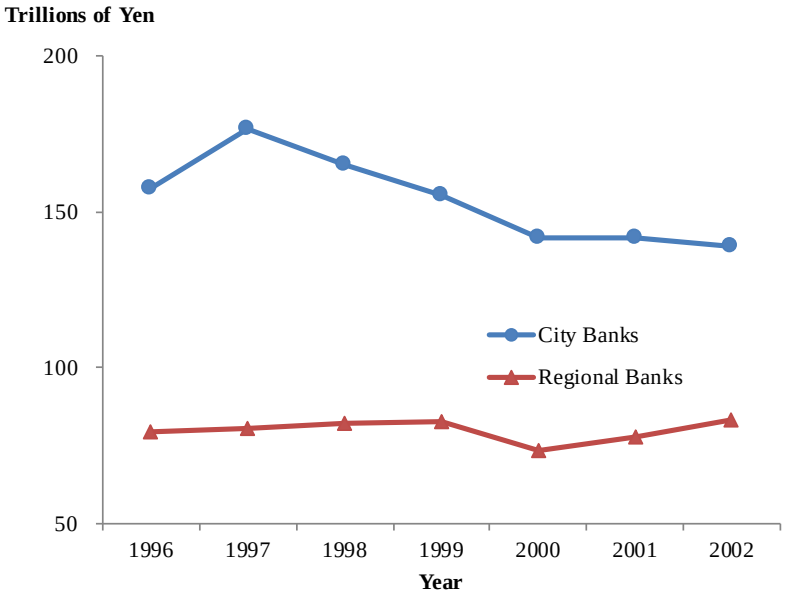


Figure 4
Banks' Aggregate Loans to SMEs

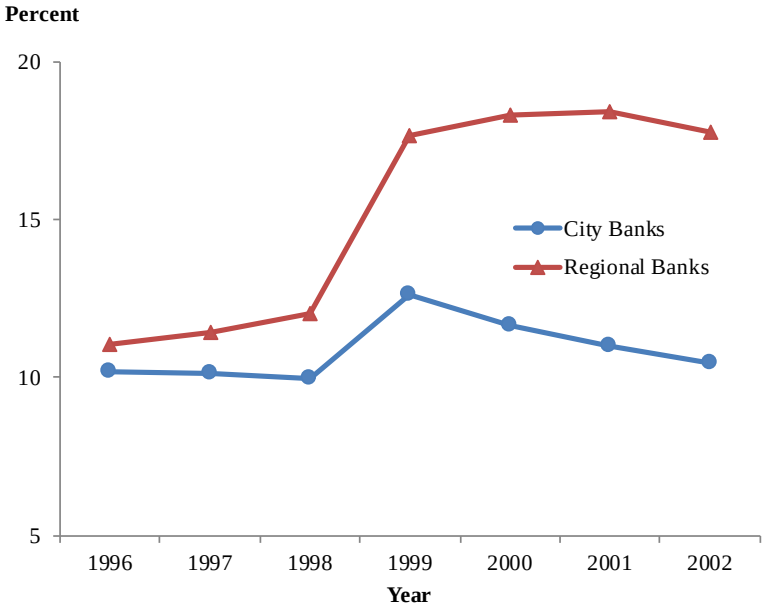


Figure 5
Ratio of Banks' Aggregate Guaranteed SME Loans to Aggregate SME Loans

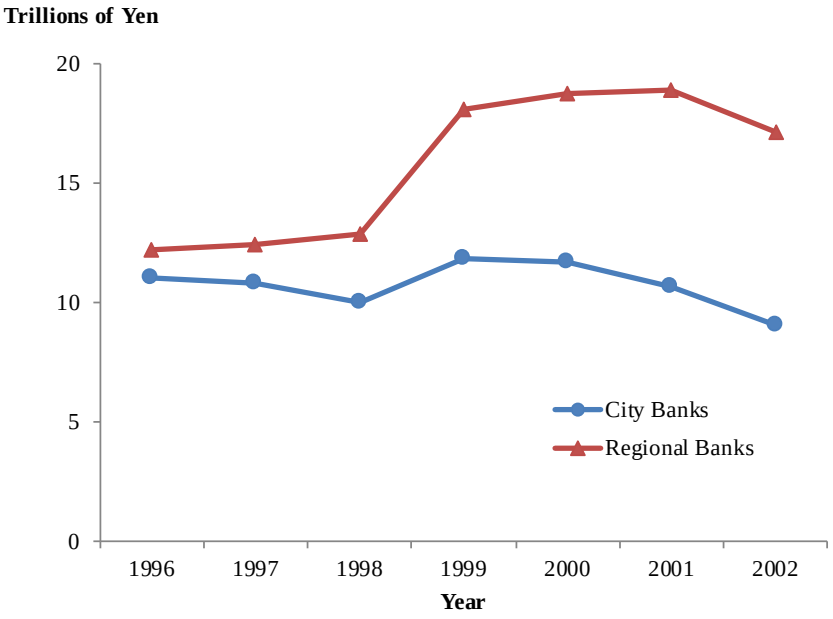


Figure 6
Average Ratio of Banks' Reported Equity Capital to Their Total Assets

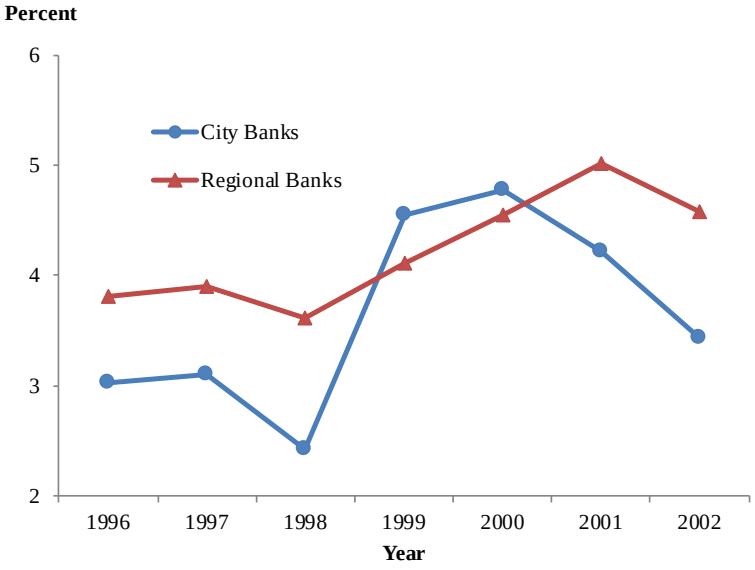


Figure 7
Ratio of Aggregate, Government-Injected Capital to Aggregate Assets at City Banks

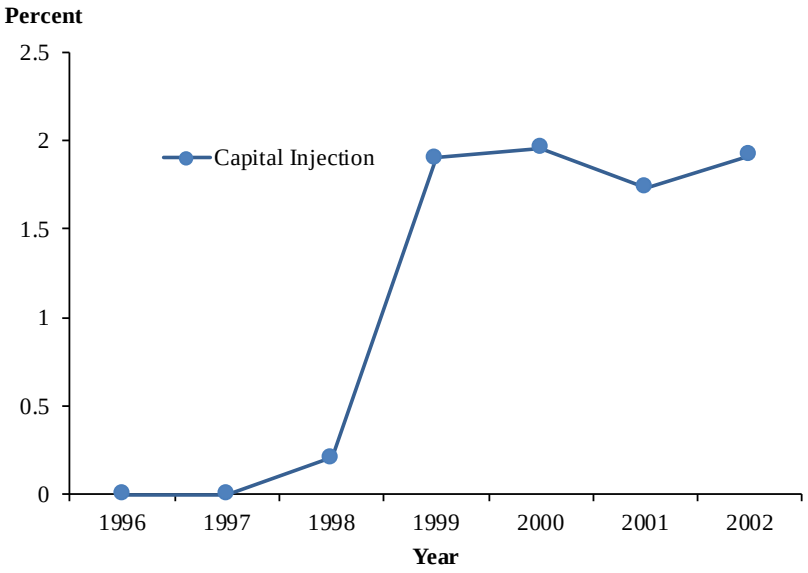


Figure 8
Ratio of Aggregate Payouts to Banks for SME Loan Guarantees to Banks' Aggregate Guaranteed SME Loans

Figure 9-B
Example of a Distressed Borrower's Balance Sheet and Loss Given Default:
Before Getting a Guaranteed Loan

Assets		Liabilities	
Assets (a)	70	Liabilities (l)	80
		Equity (e)	-10
Total	70	Total	70

Loss (to Bank) Given Default (of Borrower) = LGD = 80-70 = 10

Figure 9-A
Example of a Distressed Borrower's Balance Sheet and Loss Given Default:
After Getting a Guaranteed Loan that Funded a Successful Project

Assets		Liabilities	
Assets (a)	70	Liabilities (l)	80
Project Gross Return(Rg)	10.5		
		Equity (e)	-9.5
Total	80.5	Total	80.5

Loss (to Bank) Given Default (of Borrower) = LGD = $80 + 10 - 10 - 80.5\left(\frac{80}{80+10}\right) = 8.44$

Figure 10
Increases in Nonguaranteed Loans (*l*), per Additional Guaranteed Loans (*g*), Rise as a Borrower's Net Worth (*e*) Declines

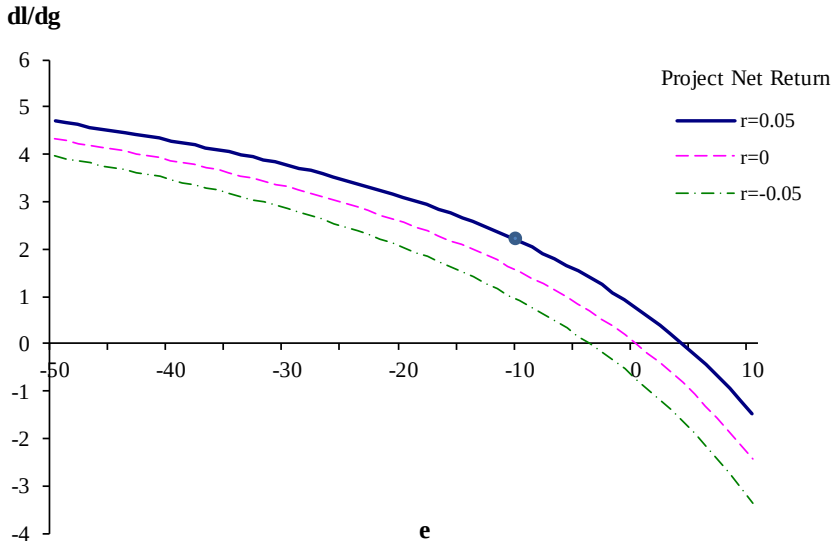


Figure 11
Increases in Nonguaranteed Loans (*l*), per Additional Guaranteed Loans (*g*), Fall as a Borrower's Guaranteed Loans (*g*) Rise

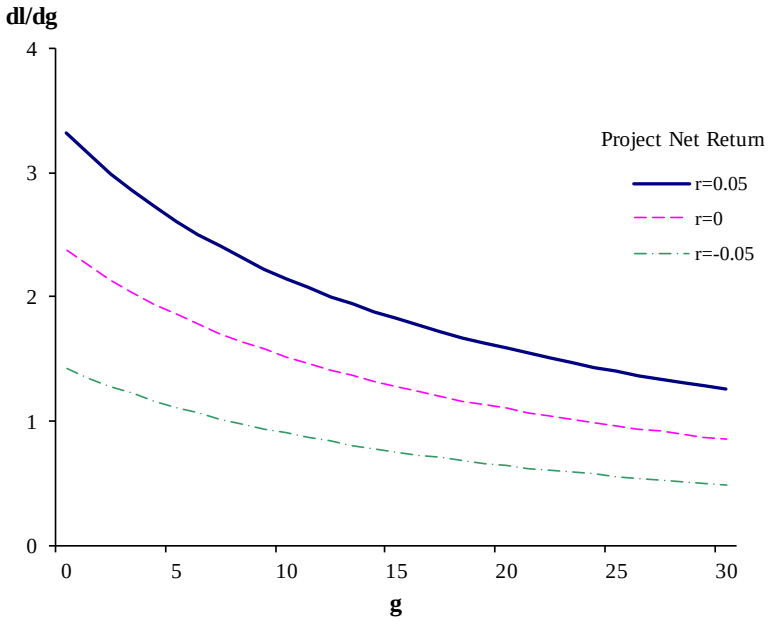


Figure 12
Legislated Ceiling on Cumulative Gross Flows of SCGP Guaranteed Loans and Estimated Exogenous Supply of SCGP Loan Guarantees

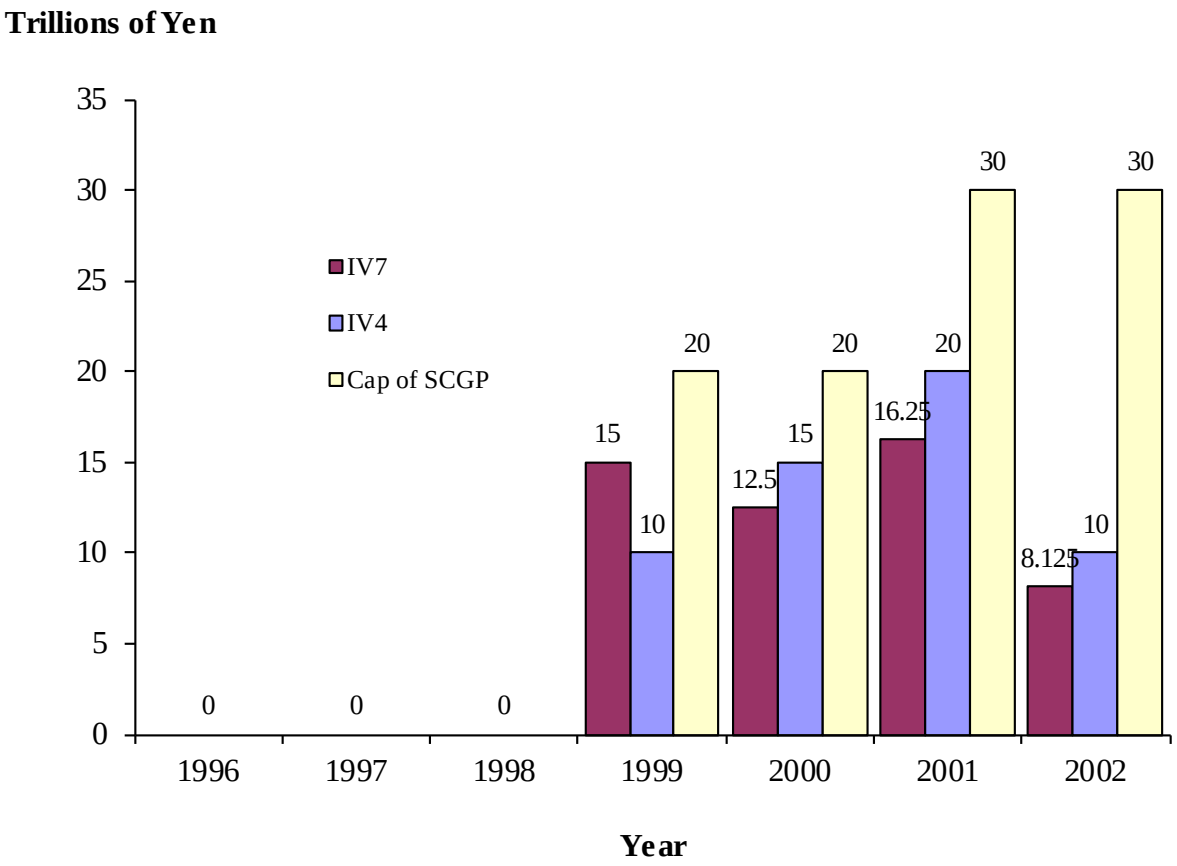
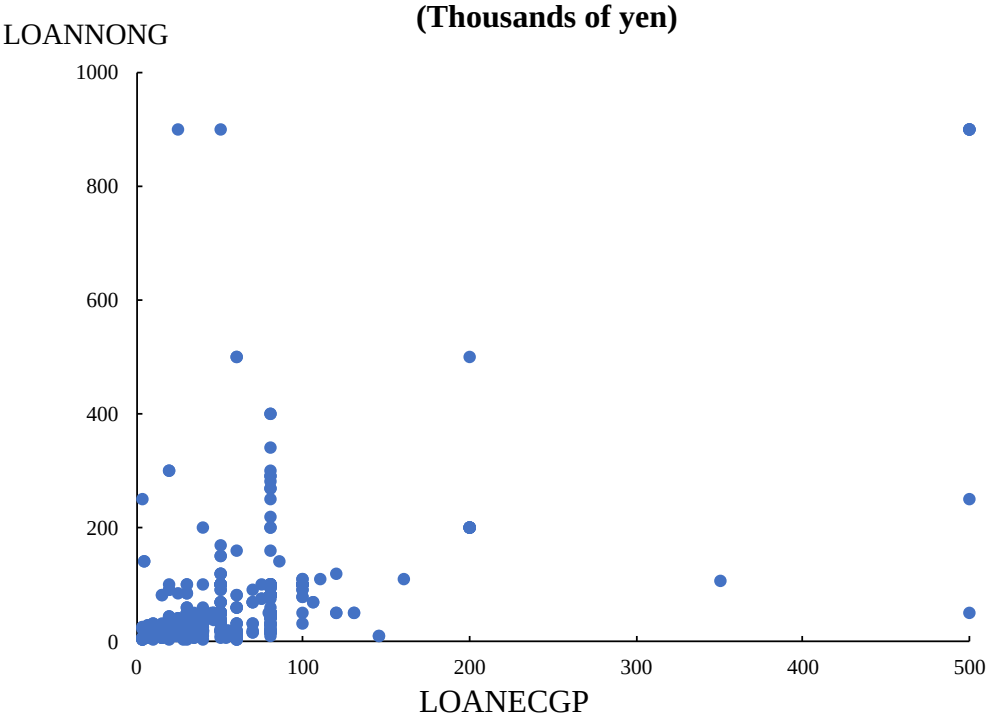
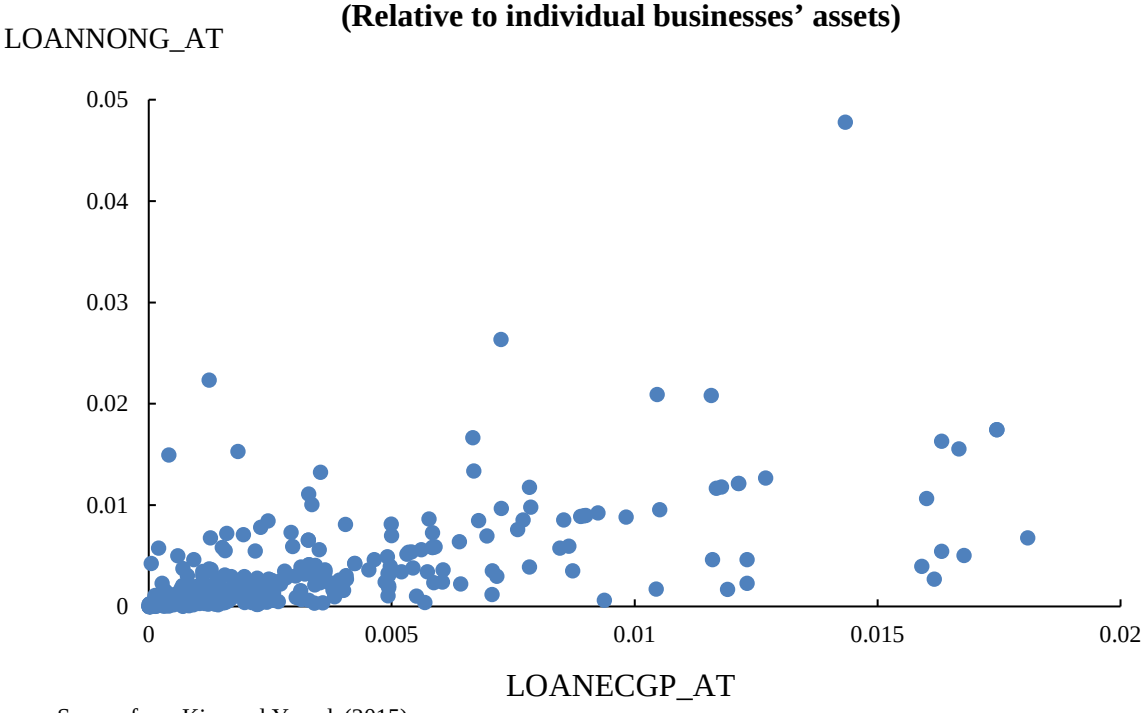


Figure 13
Individual Businesses' New Guaranteed Loans and New Nonguaranteed Loans
(Thousands of yen)



Source from Kim and Yasuda(2015)

Figure 14
Individual Businesses' New Guaranteed Loans and New Nonguaranteed Loans
(Relative to individual businesses' assets)



Source from Kim and Yasuda(2015)

Table 1

Numbers of SMEs, Percent of SMEs with Guaranteed Loans, Percent of SME Loans Guaranteed, by SME Credit Scores

	Total	Credit Scores (better→)					
		<50	50-54	55-59	60-64	65-69	>69
Number of SMEs (percent of SMEs)	7491 (100)	1130 (15.1)	1956 (26.1)	1814 (24.2)	1238 (16.5)	1055 (14.1)	298 (4.0)
Percent of SMEs with guaranteed loans	48.2	77.7	66.3	49.2	29.5	15.7	4.0
Percent of SMEs, by share of loans guaranteed							
0-40%	61.2	51.9	56.6	66.3	76.2	83.7	91.7
40-60%	13.7	13.8	14.9	13.9	11.2	8.4	0
60-100%	14.4	17.4	17.5	12.7	6.6	2.4	0
100%	9.1	15.1	9.5	5.4	4.4	4.2	0

Source: Ono (2006).

Table 2

Descriptive Statistics: City Banks

		1996:03-2002:03 (FY1995-2001) N=63	1996:03-1998:03 (FY1995-1997) N=29	1999:03-2002:03 (FY1998-2001) N=34	Test Statistics
		(1)	(2)	(3)	(4)
1	Total Loans (%)				
	Mean	63.6	65.6	62.0	-2.5 **
	Standard deviation	6.0	4.6	6.6	
2	Small Loans (%)				
	Mean	26.0	26.7	25.5	-0.9
	Standard deviation	5.0	4.5	5.5	
3	Large Loans (%)				
	Mean	37.6	38.9	36.5	-2.2 **
	Standard deviation	4.6	3.9	4.8	
4	CG (%)				
	Mean	2.9	2.7	3.08	1.5
	Standard deviation	1.1	0.9	1.2	
5	EQCAPLEV (%)				
	Mean	3.7	2.8	4.44	9.5 ***
	Standard deviation	1.1	0.4	0.9	
6	PG (%)				
	Mean	0.07	0.05	0.09	5.7 ***
	Standard deviation	0.03	0.02	0.03	
7	Assets(trillion yen)				
	Mean	45.2	43.6	46.5	0.6
	Standard deviation	19.1	18.6	19.8	

N is the number of observations (bank-years). Test statistics are t-tests for equality of means. % denotes percent of total assets. *** indicates significance at the 1% level. ** indicates significance at the 5% level.

Table 3

Descriptive Statistics: Regional Banks

		1996:03-2002:03 (FY1995-2001) N=854	1996:03-1998:03 (FY1995-1997) N=380	1999-2002 (FY1998-2001) N=474	Test Statistics
		(1)	(2)	(3)	(4)
1	Total Loans (%)				
	Mean	70.8	71.7	70.1	-4.0 ***
	Standard deviation	6.0	5.9	6.1	
2	Small Loans (%)				
	Mean	42.5	43.6	41.6	-4.0 ***
	Standard deviation	7.5	7.1	7.7	
3	Large Loans (%)				
	Mean	28.3	28.1	28.5	1.2
	Standard deviation	4.6	4.4	4.7	
4	CG (%)				
	Mean	6.7	5.1	8.0	16.5 ***
	Standard deviation	3.0	2.0	3.0	
5	EQCAPLEV (%)				
	Mean	4.0	3.6	4.4	10.5 ***
	Standard deviation	1.2	1.0	1.2	
6	PG (%)				
	Mean	0.12	0.07	0.16	14.3 ***
	Standard deviation	0.11	0.05	0.12	
7	Assets(trillion yen)				
	Mean	2.2	2.1	2.2	0.7
	Standard deviation	1.92	1.9	1.9	

N is the number of observations (bank-years). Test statistics are t-tests for difference of means. % denotes percent of total assets..*** indicates significance at the 1% level. ** indicates significance at the 5% level.

Table 4

Effects on Bank Loans of Loan Guarantees, Capital, and Loan Losses

All Banks, Bank Fixed-Effects, Year Effects, IV Estimates

	1997:03-2002:03 (FY1996-2001)			1999:03-2002:03 (FY1998-2001)			1998:03-2002:03 (FY1997-2001)		
Independent Variable	Total Loans (1)	Small Loans (2)	Large Loans (3)	Total Loans (4)	Small Loans (5)	Large Loans (6)	Total Loans (7)	Small Loans (8)	Large Loans (9)
1 CG	3.036 (7.17) ***	1.744 (5.16) ***	0.544 (1.42)	3.890 (2.68) ***	-1.284 (-0.90)	2.633 (1.44)	2.711 (5.60) ***	1.382 (3.18) ***	0.642 (1.34)
2 EQCAPLEV	0.652 (3.47) ***	0.381 (2.29) **	0.212 (1.33)	0.276 (1.12)	-0.365 (-1.46)	0.443 (1.67) *	0.448 (2.36) **	0.166 (0.89)	0.219 (1.21)
3 BASEL	-0.015 (-3.01) ***	-0.005 (-1.14)	-0.006 (-1.46)	0.006 (0.56)	0.004 (0.34)	0.009 (0.79)	-0.007 (-1.13)	-0.002 (-0.38)	-0.002 (-0.29)
4 CAPINJECT	0.786 (2.48) **	0.770 (2.79) ***	-0.245 (-0.90)	0.237 (0.62)	0.540 (1.38)	-0.080 (-0.20)	0.903 (2.99) ***	0.657 (2.23) **	0.092 (0.32)
5 PG	-16.38 (-4.58) ***	-7.71 (-2.60) ***	-3.52 (-1.11)	-3.194 (-0.96)	6.497 (1.94) **	-5.673 (-1.49)	-10.71 ***	-2.66 (-0.84)	-4.137 (-1.24)
6 ASSETS (×1million)	-0.008 (-6.13) ***	-0.005 (-4.38) ***	-0.003 (-2.36) **	-0.007 (-3.96) ***	-0.005 (-2.70) ***	-0.004 (-2.02) **	-0.008 (-6.52) ***	-0.004 (-3.36) ***	-0.004 (-3.25) ***
F-statistic	52.01	63.36	22.54	40.84	48.18	17.85	44.87	54.81	20.04
Sargan Test(p-value)	0.92	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adjusted R^2	0.82	0.92	0.80	0.86	0.92	0.78	0.86	0.92	0.81
Observations	765	765	765	497	497	497	630	630	630

Note: Each regression includes year dummies. t-ratios are in parentheses below estimated coefficients.
*** Significant at the 1% level.** Significant at the 5% level. * Significant at the 10% level.

Table 5

Effects on Bank Loans of Loan Guarantees, Capital, and Loan Losses

City Banks, Bank Fixed-Effects, Year Effects, IV Estimates

	1997:03-2002:03 (FY1996-2001)			1999:03-2002:03 (FY1998-2001)			1998:03-2002:03 (FY1997-2001)		
Independent Variable	Total Loans (1)	Small Loans (2)	Large Loans (3)	Total Loans (4)	Small Loans (5)	Large Loans (6)	Total Loans (7)	Small Loans (8)	Large Loans (9)
1 CG	3.440 (3.14) ***	2.889 (1.77) *	2.607 (1.74) *	7.008 (4.14) ***	8.376 (2.71) **	3.563 (1.56)	3.760 (2.80) ***	4.079 (2.16) **	2.481 (1.50)
2 EQCAPLEV	-0.153 (-0.24)	-1.214 (-2.00) **	1.060 (1.50)	0.588 (0.68)	0.230 (0.21)	1.100 (1.03)	-0.012 (-0.16)	-0.730 (-1.01)	0.828 (1.07)
3 BASEL	-0.007 (-0.52)	0.001 (0.07)	0.000 (-0.01)	0.000 (0.01)	0.018 (0.80)	-0.005 (-0.21)	-0.006 (-0.37)	0.005 (0.34)	-0.001 (-0.37)
4 CAPINJECT	2.601 (2.82) ***	3.468 (3.91) ***	-1.028 (-1.00)	1.452 (0.27)	5.874 (0.93)	-2.861 (-0.44)	3.165 (2.98) ***	3.449 (3.33) ***	-0.497 (-0.45)
5 PG	-23.356 (-1.14)	-44.777 (-2.28) **	18.579 (0.81)	-0.337 (-0.01)	18.626 (0.45)	21.598 (0.56)	-31.68 (-1.28)	-38.60 (-1.60)	11.662 (0.46)
6 ASSETS (×1million)	-0.007 (-5.53) ***	-0.005 (-4.17) ***	-0.002 (-1.32)	-0.006 (-3.31) ***	-0.002 (-0.75)	-0.002 (-0.90)	-0.008 (-5.27) ***	-0.005 (-3.33) ***	-0.003 (-1.73) *
F-statistic	37.09	34.08	22.21	36.99	35.57	15.07	30.75	33.30	20.55
Sargan Test(p-value)	0.06	0.24	0.98	0.31	0.94	0.79	0.70	0.62	1.00
Adjusted R^2	0.95	0.93	0.89	0.95	0.91	0.71	0.95	0.92	0.90
Observations	50	50	50	32	32	32	41	41	41

Note: Each regression includes year dummies. t-ratios are in parentheses below estimated coefficients.
*** Significant at the 1% level.** Significant at the 5% level. * Significant at the 10% level.

Table 6

Effects on Bank Loans of Loan Guarantees, Capital, and Loan Losses

Regional Banks, Bank Fixed-Effects, Year Effects, IV Estimates

		1997:03-2002:03 (FY1996-2001)			1999:03-2002:03 (FY1998-2001)		
	Independent Variable	Total Loans (1)	Small Loans (2)	Large Loans (3)	Total Loans (4)	Small Loans (5)	Large Loans (6)
1	CG	4.553	2.398	-1.461	2.031	-0.502	1.986
		(4.51) ***	(4.50) ***	(-2.03) ***	(1.74) *	(-0.38)	(1.41)
2	EQCAPLEV	0.687	0.483	-0.017	0.280	0.028	0.227
		(2.57) ***	(2.61) ***	(0.10)	(1.55)	(0.13)	(0.98)
3	BASEL	-0.026	-0.010	0.009	0.019	0.012	0.009
		(-2.76) ***	(-1.79) *	(1.39)	(1.78) *	(0.95)	(0.71)
4	PG	-22.328	-8.835	6.035	-1.162	4.923	-5.440
		(-3.57) ***	(-2.46) ***	(1.38)	(-0.50)	(1.77) *	(-1.85) *
5	GDP	-0.007	0.014	-0.018	-0.010	0.011	-0.017
		(-0.37)	(1.26)	(-1.37)	(-0.64)	(0.56)	(-1.87)
6	BUSLAND	0.002	0.001	0.000	0.001	0.001	0.000
	(×1million)	(2.75) ***	(1.98) **	(-0.34)	(0.77)	(0.92)	(-0.43)
7	ASSETS	-0.012	-0.025	0.001	-0.070	-0.083	0.003
	(×1million)	(-1.15)	(-3.89) ***	(-1.50)	(-3.14) ***	(-3.21) ***	(0.12)
	F-statistic	54.51	55.00	18.34	46.13	41.35	14.82
	Overidentification Test (p-value)	1.00	1.00	1.00	1.00	1.00	1.00
	Adjusted R^2	0.72	0.87	0.74	0.91	0.91	0.72
	Observations	715	715	715	465	465	465

Note: Each regression includes year dummies. t-ratios are in parentheses below estimated coefficients.
*** : Significant at the 1% level. ** : Significant at the 5% level. * : Significant at the 10% level.

Table 7

Panel A. Model Implied Effects of Guaranteed Loans on Nonguaranteed Loans: Changes Implied by Changes in e and in r

	dl/dg	Parameter values
e=-15, r=0, δ=0.05	2.08	g=10
e=-10, r=0.05, δ=0.02	4.30	g=10

Panel B. Model Implied Effects of Guaranteed Loans on Nonguaranteed Loans: Changes Implied by Changes in e and in δ

	dl/dg	Parameter values
e=-15, δ=0.05	2.08	R=1.00, g=10
e=-20, δ=0.02	4.38	R=1.00, g=10

Panel C. Model Implied Effects of Guaranteed Loans on Nonguaranteed Loans: Changes Implied by Changes in g and in r

	dl/dg	Parameter values
g=10, r=0.05	4.30	δ=0.02, e=-10
g=20, r=-0.05	0.98	δ=0.02, e=-10

Table 8

Effects of Individual Businesses' ECGP Guaranteed Loans on Their Nonguaranteed Loans

	Independent Varable	MBLOANS (1)	MBLOANS_AT (2)
1.	AMECG	1.175	
		(8.99)***	
2.	AMECG_AT		0.869
			(17.18)***
3.	CAPITAL_RATIO		-0.000
			(-0.05)
4.	PD	3.393	0.000
		(2.39)**	(1.38)
5.	LN_SALES	19.536	0.001
		(4.08)***	(3.96)***
6.	ROA	-49.751	-0.003
		(-0.51)	(-0.87)
	CONST	4.951	-0.001
		(0.06)	(-0.51)
	R-squared	0.336	0.516
	Observations	314	314

Note: Each regression includes year dummies. t-ratios are in parentheses below estimated coefficients.
*** Significant at the 1% level.** Significant at the 5% level. * Significant at the 10% level.
The explanatory varilabes are defined as follows: CAPITA_RATIO is the ratio of equity to total assets.
PD is TSR score that shows a firm's creditworthness. LN_SALES isnatural log of total assets.
ROA is business income divided by average total assets. Source from Kim and Yasuda(2015)

Appendix Table A

1st Stage of IV for CG, All Banks, Bank Fixed-Effects, Year Effects, OLS

Independent Variable	1997:03-2002:03 (FY 1996-2001)			1999:03-2002:03 (FY 1998-2001)			1998:03-2002:03 (FY 1997-2001)		
	Total Loans (1)	Small Loans (2)	Large Loans (3)	Total Loans (4)	Small Loans (5)	Large Loans (6)	Total Loans (7)	Small Loans (8)	Large Loans (9)
1. CGNATL	0.215	0.226	0.212	0.214	0.213	0.212	0.272	0.280	0.275
	(4.20)	(4.47)	(4.10)	(2.45)	(2.45)	(2.43)	(4.87)	(5.06)	(4.89)
2. EQCAP	-0.061	-0.040	-0.059	-0.064	-0.057	-0.066	-0.062	-0.049	-0.065
	(-1.05)	(-0.70)	(-1.00)	(-1.30)	(-1.16)	(-1.34)	(-1.05)	(-0.85)	(-1.10)
3. EQCAP (-1)	-0.041	-0.046	0.010	0.036	0.033	0.039	-0.001	-0.004	0.031
	(-0.62)	(-0.71)	(0.16)	(0.63)	(0.59)	(0.69)	(-0.02)	(-0.07)	(0.46)
4. CAPINJ	-0.162	-0.194	-0.199	0.115	0.113	0.115	-0.062	-0.077	-0.086
	(-1.53)	(-1.86)	(-1.86)	(1.37)	(1.35)	(1.37)	(-0.61)	(-0.76)	(-0.83)
5. CAPINJ (-1)	-0.171	-0.163	-0.189	-0.152	-0.138	-0.136	-0.179	-0.170	-0.186
	(-1.35)	(-1.30)	(-1.47)	(-1.62)	(-1.47)	(-1.43)	(-1.51)	(-1.45)	(-1.55)
6. PG	5.90	6.16	6.52	1.66	1.80	1.91	4.65	4.86	5.12
	(7.88)	(8.41)	(8.67)	(2.81)	(3.12)	(3.28)	(6.45)	(6.88)	(7.12)
7. PG (-1)	-0.49	-0.75	-0.64	-0.45	-0.55	-0.45	0.03	-0.19	-0.05
	(-0.54)	(-0.83)	(-0.69)	(-0.66)	(-0.80)	(-0.65)	(0.03)	(-0.21)	(-0.05)
8. ASSETS	0.36	0.53	0.43	-0.37	-0.40	-0.45	0.19	0.31	0.25
	(0.93)	(1.37)	(1.08)	(-1.09)	(-1.17)	(-1.31)	(0.52)	(0.84)	(0.66)
9. ASSETS (-1)	1.21	1.21	0.80	0.63	0.54	0.42	1.07	1.06	0.79
	(2.69)	(2.73)	(1.79)	(1.75)	(1.55)	(1.19)	(2.51)	(2.54)	(1.87)
10. BASEL	4.86	5.11	5.29	1.78	2.32	2.41	4.19	4.15	4.17
	(3.60)	(3.83)	(3.87)	(0.79)	(1.04)	(1.07)	(2.19)	(2.19)	2.17
11. LDV2ND	0.080	0.086	-0.036	0.031	0.026	-0.010	0.059	0.063	-0.028
	(4.65)	(6.14)	(-2.36)	(1.94)	(2.16)	(-0.75)	(3.30)	(4.45)	(-1.84)
OBS.	765	765	765	497	497	497	630	630	630
R^2	0.76	0.76	0.75	0.36	0.36	0.35	0.73	0.74	0.73
F	119.	123.	115.	14.2	14.3	13.9	88.0	90.2	86.2

Appendix Table B

1st Stage of IV for CG, City Banks, Bank Fixed-Effects, Year Effects, OLS

Independent Variable	1997:03-2002:03 (FY 1996-2001)			1999:03-2002:03 (FY 1998-2001)			1998:03-2002:03 (FY 1997-2001)		
	Total Loans (1)	Small Loans (2)	Large Loans (3)	Total Loans (4)	Small Loans (5)	Large Loans (6)	Total Loans (7)	Small Loans (8)	Large Loans (9)
1. CGNATL	0.400	0.425	0.393	0.447	0.651	-0.450	0.419	0.395	0.518
	(2.22)	(1.79)	(1.83)	(0.88)	(0.52)	(-0.63)	(2.00)	(1.40)	(2.07)
2. EQCAP	0.235	0.046	0.094	0.266	-0.006	0.140	0.244	0.049	0.135
	(1.71)	(0.27)	(0.61)	(2.30)	(-0.03)	(0.89)	(1.67)	(0.27)	(0.80)
3. EQCAP (-1)	-0.098	-0.006	-0.220	0.433	0.391	0.339	-0.183	-0.057	-0.336
	(-0.58)	(-0.02)	(-1.06)	(2.52)	(1.05)	(1.38)	(-0.89)	(-0.20)	(-1.33)
4. CAPINJ	-0.396	-0.252	-0.215	1.420	1.510	-0.264	-0.458	-0.332	-0.388
	(-1.66)	(-0.81)	(-0.77)	(2.75)	(0.95)	(-0.39)	(-1.87)	(-1.03)	(-1.33)
5. CAPINJ (-1)	-0.102	-0.031	0.326	-0.398	-0.362	-0.076	0.039	0.004	0.523
	(-0.44)	(-0.09)	(1.21)	(-2.25)	(-0.84)	(-0.31)	(0.16)	(0.01)	(1.80)
6. PG	3.94	2.58	1.41	0.26	-1.72	-7.11	1.88	1.03	-1.20
	(1.01)	(0.50)	(0.31)	(0.08)	(-0.22)	(-1.78)	(0.47)	(0.19)	(-0.26)
7. PG (-1)	-13.68	-9.51	-12.07	-8.73	-2.46	-12.16	-12.27	-6.62	-12.83
	(-2.52)	(-1.35)	(-1.87)	(-2.84)	(-0.35)	(-2.61)	(-2.17)	(-0.90)	(-1.84)
8. ASSETS	0.45	0.20	0.13	0.72	0.54	-0.41	0.42	0.24	0.07
	(1.88)	(0.65)	(0.49)	(2.36)	(0.56)	(-1.18)	(1.71)	(0.73)	(0.27)
9. ASSETS (-1)	0.73	0.40	0.02	1.00	0.79	0.34	0.57	0.44	-0.23
	(2.16)	(0.85)	(0.06)	(4.20)	(1.23)	(1.17)	(1.58)	(0.78)	(-0.59)
10. BASEL	-9.11	-6.10	-8.50	-4.04	-0.89	-4.80	-8.40	-5.42	-7.93
	(-3.22)	(-1.68)	(-2.51)	(-2.21)	(-0.23)	(-1.78)	(-2.87)	(-1.50)	(-2.32)
11. LDV2ND	0.147	0.077	0.118	0.156	0.137	0.146	0.134	0.089	0.116
	4.61	(1.47)	(2.82)	(6.23)	(1.20)	(3.77)	(4.12)	(1.50)	(2.58)
OBS.	50	50	50	32	32	32	41	41	41
R^2	0.82	0.68	0.74	0.96	0.82	0.92	0.86	0.74	0.79
F	.663	3.20	4.24	15.81	2.96	7.36	6.68	3.29	4.31

Appendix Table C

1st Stage of IV for CG, Regional Banks, Bank Fixed-Effects, Year Effects, OLS

Independent Variable	1997:03-2002:03 (FY 1996-2001)			1999:03-2002:03 (FY 1998-2001)			1998:03-2002:03 (FY 1997-2001)		
	Total Loans (1)	Small Loans (2)	Large Loans (3)	Total Loans (4)	Small Loans (5)	Large Loans (6)	Total Loans (7)	Small Loans (8)	Large Loans (9)
1. CGNATL	0.146 (2.71)	0.157 (2.96)	0.131 (2.45)	0.135 (1.51)	0.139 (1.56)	0.140 (1.56)	0.171 (2.93)	0.179 (3.09)	0.165 (2.84)
2. EQCAP	-0.058 (-0.97)	-0.039 (-0.67)	-0.050 (-0.84)	-0.039 (-0.78)	-0.033 (-0.67)	-0.034 (-0.67)	-0.051 (-0.86)	-0.038 (-0.65)	-0.048 (-0.80)
3. EQCAP (-1)	0.004 (0.06)	-0.004 (-0.06)	0.043 (0.67)	0.028 (0.54)	0.026 (0.50)	0.029 (0.56)	0.024 (0.37)	0.016 (0.26)	0.043 (0.68)
4. GPP	2.96 (0.64)	1.45 (0.32)	1.93 (0.42)	4.69 (1.18)	4.16 (1.05)	4.14 (1.04)	2.99 (0.64)	1.64 (0.35)	1.99 (0.42)
5. GPP (-1)	-1.27 (-0.27)	-2.24 (-0.48)	-1.68 (-0.35)	-5.28 (-1.43)	-5.49 (-1.49)	-5.38 (-1.46)	-3.22 (-0.72)	-3.71 (-0.84)	-3.48 (-0.78)
6. PBUSLAND	-0.35 (-0.70)	-0.45 (-0.92)	-0.36 (-0.72)	-1.09 (-1.74)	-1.16 (-1.86)	-1.15 (-1.84)	-1.04 (-1.74)	-1.17 (-1.99)	-1.11 (-1.86)
7. PBUSLAND (-1)	-0.040 (-0.10)	0.007 (0.16)	-0.000 (-0.00)	0.655 (1.38)	0.720 (1.51)	0.715 (1.50)	0.476 (0.91)	0.626 (1.20)	0.577 (1.10)
8. PG	5.36 (7.13)	5.49 (7.45)	5.73 (7.64)	1.61 (2.78)	1.63 (2.84)	1.71 (2.97)	4.17 (5.83)	4.24 (6.04)	4.41 (6.23)
9. PG (-1)	-1.16 (-1.21)	-1.45 (-1.54)	-1.33 (-1.39)	-0.94 (-1.33)	-1.04 (-1.46)	-1.01 (-1.42)	-0.79 (-0.88)	-1.01 (-1.13)	-0.93 (-1.03)
10. ASSETS	-9.0 (-3.58)	-8.3 (-3.34)	-8.9 (-3.52)	-16.3 (-4.91)	-16.6 (-4.87)	-16.6 (-5.10)	-11.8 (-4.36)	-11.3 (-4.24)	-12.1 (-4.51)
11. ASSETS (-1)	6.14 (2.61)	6.60 (2.89)	4.15 (1.82)	1.42 (0.80)	1.78 (1.03)	1.24 (0.74)	4.84 (2.13)	5.49 (2.48)	3.95 (1.80)
12. BASEL	6.37 (4.58)	6.52 (4.77)	6.95 (4.99)	4.37 (1.72)	4.39 (1.75)	4.71 (1.88)	6.71 (3.32)	6.41 (3.21)	6.76 (3.36)
13. LDV2ND	0.062 (3.19)	0.079 (5.24)	-0.041 (-2.65)	0.005 (0.31)	0.017 (1.36)	-0.015 (-1.17)	0.032 (1.63)	0.054 (3.59)	-0.036 (-2.35)
OBS.	715	715	715	465	465	465	589	589	589
R^2	0.78	0.78	0.77	0.41	0.42	0.41	0.76	0.76	0.76
F	109.	113.	108.	14.4	14.5	14.5	82.0	84.5	82.7