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# Do Government Loan Guarantees Lower, Or Raise, Banks' Non-Guaranteed Lending? Evidence From Japanese Banks

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# Purpose of the Paper and Results

## ■ Key Questions

- Did loan guarantees affect total lending?
  - Might loan guarantees even raise non-guaranteed lending?
- Did government capital injections increase banks' lending?

## ■ We show how guaranteed loans might stimulate, rather than displace, non-guaranteed loans

## ■ Estimates suggest

- Loan guarantees did stimulate total lending
  - Loan guarantees also raised non-guaranteed lending
- Capital injections also increased banks' lending

# Introduction

- The Japanese economy had a long slump during the 1990s and beyond
- Troubled banks and borrowers were numerous
  - “Zombies” walked countrywide
- Bad loans were increasing
  - “Evergreening”
  - Banks’ large loan losses eventually drained capital
- Bank lending was decreasing
  - Capital-constrained Credit Crunch
- Japanese Govt. tried to stimulate bank lending
  - Added the Special Credit Guarantee Program (SCGP)
  - Injected bank capital

# Japanese Government Loan Guarantee Programs

- **Several Features of Loan Guarantees in Japan**
  - Guarantees for SME loans were widespread
    - About ½ of SMEs had guaranteed loans
  - Guarantees covered 100% of a loan's principal
  - Premiums for loan guarantees were not adjusted for risk
  
- **Special Credit Guarantee Program (SCGP)**
  - Added, during 1998-2001, about 30 trillion (>US\$250 billion)
  - Relaxed acceptance standards

# Capital Injections Into Banks

- Public funds were injected as bank capital in 1998 and 1999
  - Via public sector purchases of bank-issued subordinated debt and preferred stock
  - More than 9 trillion (>US\$75 billion) injected
- Injected capital was likely better measured
  - Government reported how much it spent to purchase bank bonds and preferred stock
  - Prior, and thus total, capital was likely subject to considerably more “measurement error”
    - Artificial capital due to under-reporting of already-nonperforming loans and of anticipated loan losses

# Previous Studies of Effects of Loan Guarantees in Japan

- Mixed Results
- Prefecture-level-data Studies
  - Matsuura and Takezawa (2001) found no effect on banks' total loans to SMEs as guaranteed loans rose
  - Konishi and Hasebe (2002), including data after 1999 plus data for credit banks and coops, implies that non-guaranteed loans to SMEs rose by a large (e.g.  $7.5-1=6.5$ ) multiple of guaranteed loans to SMEs
- Bank-level-data Study
  - Sui (2004), based on data from the 1980s through 2001, implies that non-guaranteed loans fell as guaranteed loans rose

# Borrower's Balance Sheet

- Start with the borrower's simplified (market-valued) balance sheet

Assets		Liabilities	
Assets (a)	100	Liabilities (l)	80
		Equity (e)	20
Total	100	Total	100

# Borrower's Balance Sheet

- Start with the borrower's simplified (market-valued) balance sheet
- Borrower's asset values decline from 100 to 70

Assets		Liabilities	
Assets (a)	100	Liabilities (l)	80
		Equity (e)	20
Total	100	Total	100

# Borrower's Balance Sheet

- Start with the borrower's simplified (market-valued) balance sheet
- The assets value declined from 100 to 70

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

# Loan Guarantees and Loss Given Default (LGD)

- Additional guaranteed loans reduce the loss (to the bank) given default (of the borrower)
  - Reduced LGD gives the bank an incentive an incentive to make more guaranteed loans
- We posit that banks might loan amounts so as to hold unchanged their LGD
  - Following more guaranteed loans, LGD reverts to its original level if bank adds more non-guaranteed loans
- Suppose that the borrower has a new project with  $R=1.05$  that needs 10 units of additional funding

# Loss Given Default Before Guaranteed Loans

- How much would the bank lose if the borrower defaulted before it took out 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)=80-70=10

$$\text{Equation 1) } LGD^B = l - a(1 - \delta) = l - (l + e)(1 - \delta) \quad \text{Loss ratio: } \delta$$

# Loss Given Default After Guaranteed Loans

- In practice, upon default, after the payouts from the guarantor to the bank, the remaining assets will be shared between the bank and guarantor

Assets		Liabilities	
Assets (a)	70	Liabilities (l)	80
Project Gross Return (Rg)	10.5	Guaranteed Loan (g)	10
		Equity (e)	-9.5
Total	80.5	Total	80.5

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

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

# Borrower's Opportunities and Net Worth and the Effects of Guaranteed on Non-guaranteed Loans

## ■ Equation 4)

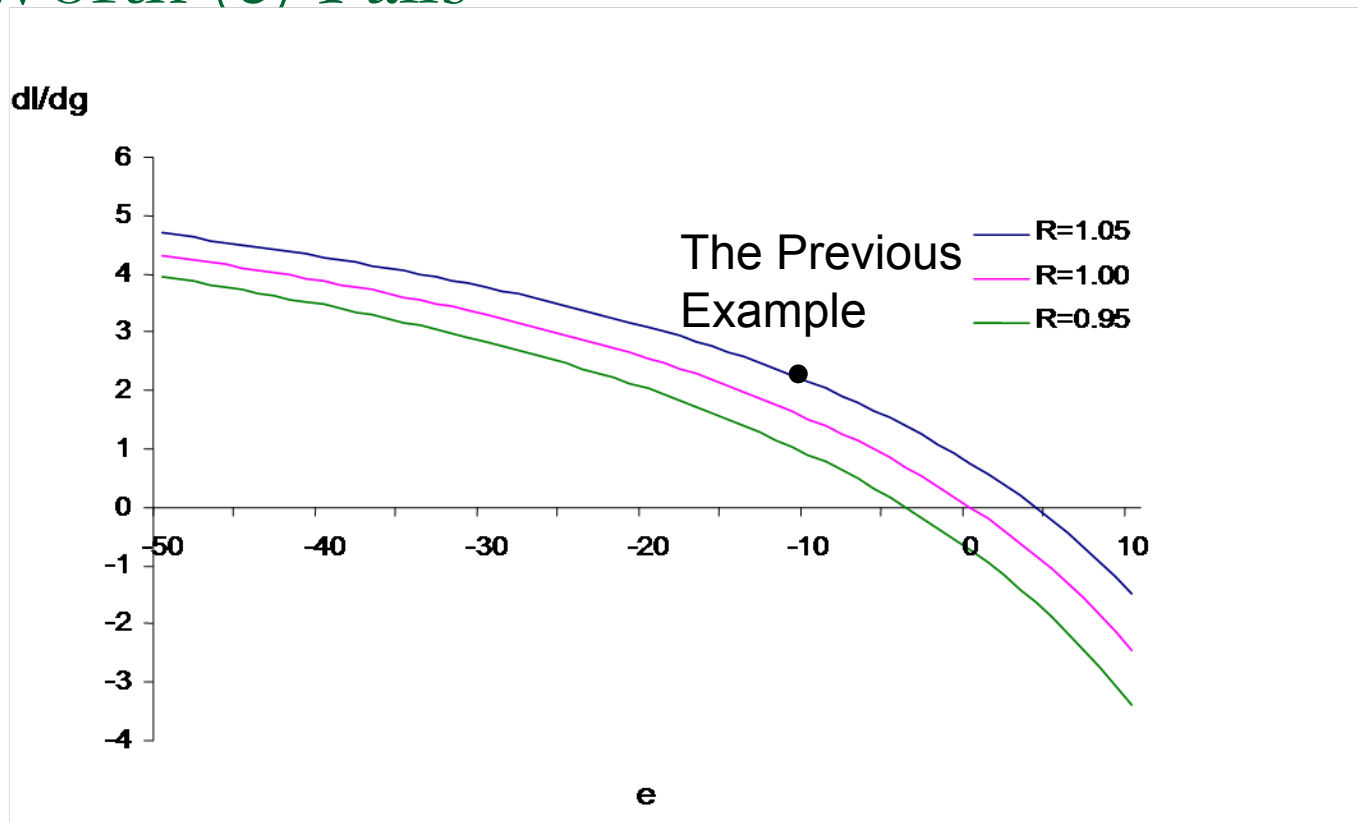
$$LGD^B \geq LGD^A \Leftrightarrow R \geq 1 + \frac{e}{l} \Leftrightarrow r \geq \frac{e}{l}$$

Totally differentiating Equation 2) and setting  $dLGD^A = 0$ , we get:

## ■ Equation 6)

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

# Figure 10: Increases in Non-Guaranteed Loans, per Additional Guaranteed Loan, Rise as Borrowers' Net Worth ( $e$ ) Falls



- Individual, Japanese commercial banks
- Separate samples of city and of regional banks
  - About 10 “city banks” operated nationally, and beyond
  - About 120 “regional banks” operated more locally
  - Omitted credit banks and credit co-operatives
- Annual, 1997-2002 (FY1996-2001)
  - FY2001 ends in March 2002
  - Data were not made public after FY2001, ending sample period
  - 1997-2002, and split at 1998 inception of SCGP

# Estimated Specification

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

**Key Variables**      Variables are scaled by each bank's assets

*CG* : Stock of loan guarantees, millions of yen at the end of fiscal year t

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

*CAPINJECT* : Stock of publicly-injected capital, millions of yen at the end of fiscal year t

## **Control Variables**

*BASEL* : Dummy variable=1 if the bank was subject to Basel standards

*PG* : Payouts by loan guarantee agencies, millions of yen in year t

*BUSLAND* : Prefecture-level price index for commercial land

*GDP* : Prefecture-level economic activity

# Estimation Choices

## ■ Year dummies and fixed effects

- To control national factors common across banks, such as government policy, macroeconomy, etc.
- To allow for constant, bank-specific differences across banks

## ■ Instrumental Variables (IV) estimates

## ■ Instruments for CG

- Initial “CG intensity” via bank’s initial share of total national guaranteed loans times estimate of national supply of CG (based on legislative changes and “run-off” of CG)

$$\text{Exogenous part of CG: } \frac{CG_{i,1996}}{\sum CG_{i,1996}} \times \text{Estimate of National Supply of CG}$$

- One-year lag of dependent variable and of CG
- Current and lagged exogenous variables

**Table 4**  
**Effects on Bank Loans of Loan Guarantees, Capital, and Loan Losses**  
**City banks, Fixed effects (IV/Two stage Least Squares)**

Independent Variable	1997:03-2002:03 (FY1996-2001)			1999:03-2002:03 (FY1998-2001)			1998:03-2002:03 (FY1997-2001)		
	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 CG	2.906 (2.93) ***	1.805 (1.90) *	1.263 (1.15)	7.010 (4.15) ***	6.688 (2.73) **	1.384 (1.07)	3.448 (2.74) **	2.500 (2.09) **	1.380 (1.07)
2 EQCAPLEV	-0.152 (-0.24)	-1.213 (-2.08) **	1.061 (1.52)	0.588 (0.68)	-0.024 (-0.03)	0.785 (1.03)	-0.025 (-0.03)	-0.792 (-1.20)	0.785 (1.03)
3 BASEL	-0.009 (-0.67)	-0.003 (-0.25)	-0.005 (-0.36)	0.000 (0.01)	0.013 (0.69)	-0.005 (-0.30)	-0.007 (-0.44)	0.000 (-0.04)	-0.005 (-0.30)
4 CAPINJECT	2.642 (2.85) ***	3.553 (4.19) ***	-0.923 (-0.92)	1.453 (0.27)	5.339 (0.96)	-0.414 (-0.38)	3.188 (2.99) ***	3.569 (3.78) ***	-0.414 (-0.38)
5 PG	-22.62 (-1.10)	-43.28 (-2.30) **	20.44 (0.91)	-0.319 (-0.01)	4.738 (0.13)	9.798 (0.39)	-32.21 (-1.30)	-41.27 (-1.88) *	9.798 (0.38)
6 ASSETS (×1million)	-0.007 (-5.52) ***	-0.005 (-4.38) ***	-0.002 (-1.39)	-0.006 (-3.31) ***	-0.003 (-1.22)	-0.003 (-1.84) *	-0.008 (-5.28) ***	-0.008 (-3.80) ***	-0.003 (-1.84) *
F-statistic	35.91	34.34	20.82	37.33	29.15	19.49	30.44	31.48	19.49
Adjusted R <sup>2</sup>	0.95	0.94	0.90	0.95	0.93	0.90	0.95	0.93	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, Fixed effects (IV/Two stage Least Squares)**

Independent Variable	1997:03-2002:03 (FY1996-2001)			1999:03-2002:03 (FY1998-2001)		
	Total Loans (1)	Small Loans (2)	Large Loans (3)	Total Loans (4)	Small Loans (5)	Large Loans (6)
1 CG	0.526 (3.80) ***	0.606 (3.68) ***	-0.053 (-0.32)	0.033 (0.06)	-1.306 (-1.69) *	2.005 (2.56) **
2 EQCAPLEV	0.529 (4.09) ***	0.443 (2.87) ***	0.088 (0.56)	0.113 (0.75)	-0.086 (-0.38)	0.236 (1.04)
3 BASEL	0.001 (0.33)	0.003 (0.73)	-0.002 (-0.49)	0.030 (3.83) ***	0.019 (1.61)	0.008 (0.68)
4 PG	-1.906 (-1.12)	1.782 (0.87)	3.817 (-1.86) *	0.342 (0.20)	5.858 (2.31) **	-6.112 (-2.36) **
5 GDP	0.003 (3.52) ***	0.003 (2.39) **	0.001 (0.53)	0.011 (5.20) ***	0.009 (2.97) **	0.000 (-0.02)
6 BUSLAND	-0.001 (-2.63) ***	0.000 (-0.09)	-0.001 (-2.06) **	-0.004 (-4.61) ***	-0.002 (-2.01) **	-0.001 (-0.55)
7 ASSETS (x1million)	-0.032 (-7.72) ***	-0.030 (-6.11) ***	-0.002 (-0.39)	-0.087 (-7.52) ***	-0.080 (-4.65) ***	-0.002 (0.10)
F-statistic	50.55	53.32	17.98	51.64	41.83	15.18
Adjusted R <sup>2</sup>	0.91	0.91	0.77	0.93	0.91	0.76
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.

# Empirical Results

## ■ Results for City Banks

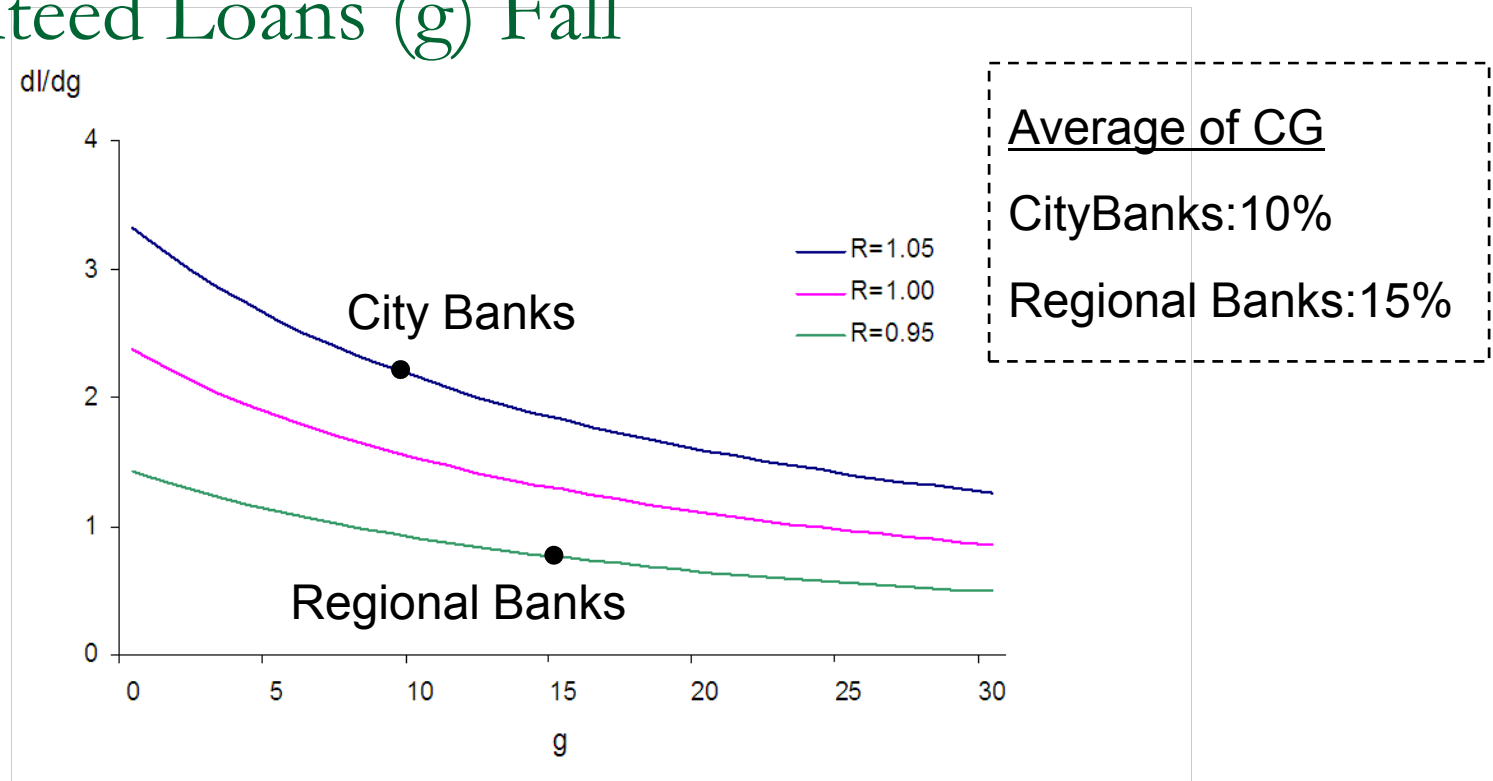
- Total loans, SME loans, but not large loans, rose with CG (row 1)
- Capital levels were insignificant (row 2)
- Capital injections, however, were important (row 4)

## ■ Results for Regional Banks

- Total loans, SME loans did not rise (row 1)
- Capital levels were significant (row 2)
- GDP and Commercial land prices had effects (row 5, 6)

## ■ Can the model account for the differences between results for city and regional banks?

# Figure 11: Increases in Non-guaranteed Loans, per Additional Guaranteed Loan, Rise as Borrowers' Guaranteed Loans (g) Fall



# Summary

- Loan guarantees and capital injections apparently increased bank lending in Japan around the year 2000
  - Loan guarantees raised total lending
  - Capital injections raised lending
- More non-guaranteed loans accompanied more guaranteed loans
  - The effects on total loans were often in the range of 1-6
  - That implies that the effects on non-guaranteed loans ranged from about zero to about 5
- More lending accompanied capital injections
  - The effects on total loans were often in the range of 2-3
  - The ranges are similar to those based on U.S. data