

The disclosure of non-performing loan prevented banks' evergreening policy? : Lessons from Japanese banks' experiences¹

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Abstract

This paper examines how the Basel Accord and an increase of non-performing loans affected Japanese banks' lending behaviors during the recent Japanese recession following the collapse of Japan's "bubble economy" in the early 1990s. I show that the "credit crunch" hypothesis applies to Japanese banks in this period; Japanese banks' lending decreased when the risk based capital (RBC) ratio decreased. Non-performing loans also had a big impact on Japanese banks; banks lend less when non-performing loans increase.

This paper found these effects on lending behavior across nearly all industries, with the construction and real estate sectors as the only exceptions. Lending was not effected by either the RBC ratio or non-performing loans in these two sectors. This may be due to the fact that banks continued to roll over loans to insolvent borrowers to avoid more bankruptcies; they wished to delay the bailout of the non-performing loans' hidden parts. In this sense, the Basel Accord seems to have accelerated Japanese banks' evergreening policy.

JEL: G18, G21, G28

Key words : Japanese Banks, Basel Accord, Credit Crunch, Non-performing Loan, Credit Allocation, Evergreening policy.

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1. Introduction

In the early 1990s, the Japanese bubble economy burst, which was followed by a long recession. Land prices and stock prices fell sharply, many companies went bankrupt, and banks' loans to bankrupt companies turned into non-performing loans. Alongside these economic changes, a new regulation was introduced in the early nineties known as the Basel Accord. The accumulation of non-performing loans and the introduction of the Basel Accord had a strong impact on Japanese banks during the 1990s. In this paper, I will examine how these two factors affected Japanese bank behavior.

The Basel Committee decided to introduce the Basel Capital Accord to countries with active international banks in 1988. The regulation required banks to keep their risk based capital ratio (RBC ratio) above 8%. When this regulation was introduced, the Japanese banks with international branches did not have enough capital to meet the criteria. However, by March 1993, the period by which Japanese banks were required to achieve the Basel capital standard, the RBC ratio of Japanese banks with international branches successfully rose above 8%. Since then, almost all the Japanese banks have kept the ratio above 8%.

Some believe that it was not hard for Japanese banks to achieve a minimum capital standard of 8% because most banks kept their ratios above 8%. But in fact, the Basel Accord had been casting a heavy burden on Japanese banks. To keep the RBC ratio above 8%, the Japanese banks tried to maximize the numerator and minimize the denominator of the ratio. To increase the numerator, they issued subordinated debts. To decrease the denominator, they restricted or reduced their lending lower than usual. This behavior may have caused credit crunches and worsened the Japanese economy.

Furthermore, serious problems arose when the risk of loans to the private sector were weighted "equally" at 100%. Banks were indifferent towards the health of loan-holding companies when reducing loans for the purpose of increasing the RBC ratios. These regulations sometimes induced a misallocation of credit. It seems natural for banks to reduce lending to bad companies rather than reduce lending to healthier companies. However, there were times when banks wanted to help bad companies, which resulted in this misallocation of credit.

Unfortunately, the non-performing loan problem of the 1990s gave banks an incentive to reduce lending to healthy companies rather than reduce lending to bad companies. After the bubble burst, the accumulation of non-performing loans became the most serious problem for Japanese banks. At first, Japanese banks pretended that they did not have too many non-performing loans. In order to cover up their unrevealed non-performing loans, Japanese banks continued to roll over loans

The disclosure of non-performing loan prevented banks' evergreening policy? : Lessons from Japanese banks' experiences to nearly bankrupt companies instead of abandoning them. This is known as the 'evergreening' policy, or Zombie Lending². As banks continued to roll over loans to companies damaged by the bubble burst, they reduced loans to healthier companies. Thus, when the RBC ratio fell, banks reduced lending overall, but did not reduce loans to nearly bankrupt companies.

To examine this, I will investigate the type of borrower banks that reduced their loans to raise their RBC ratios. First, I will examine bank lending behavior during the 1990s with panel regressions that control for certain factors at individual banks. I will also investigate the influence of the Basel Accord and the prevalence of non-performing loans on lending behavior. Second, I will examine bank lending behavior using the data classified by the sector of borrower. Third, I will discuss the implications of the empirical evidence for evergreening policy. I conduct this analysis using panel data on 85 banks from the years between 1990 and 1999.

Japanese bank lending increased when the risk based capital (RBC) ratio increased. This means that banks with higher capital ratios lent more money. It also means that a bank increased its lending when the bank achieved a higher ratio. I will also show that banks lent less when the number of non-performing loans increased. This implies that the burden of non-performing loans made banks restrict their lending.

This kind of loan behavior shows up in almost all industries; however, loans to the construction sector and loans to the real estate sector were not affected by either the RBC ratio or non-performing loans. This may be due to the fact that banks continued to roll over loans to insolvent borrowers to avoid more company bankruptcies. They wished to delay the bailout of the non-performing loans' hidden parts.

There are many papers that examine the impact of implementing risk-based capital standards on the behavior of Japanese banks. This paper adds to the existing literature by examining how Japanese bank lending decisions vary by type of borrower. In so doing, this paper contributes to our understanding of the misallocation of credit in late 1990s Japan.

The structure of the paper is as follows: in Section Two, I review previous papers; in Section Three I give an overview of the data; in Section Four I show the empirical evidence; and in Section five I state my conclusions.

2. Literature review

There are many empirical papers on bank lending before and after the introduction of Basel I.

² Caballero, Hoshi and Kashyap (2008) defines lending to unprofitable borrowers as zombie lending. See more detailed explanation of the definition of zombies in Section 2 of Caballero, Hoshi and Kashyap (2008).

Most of these are reviewed in Jackson et al. (1999). Here I review empirical papers on Japanese banks' lending behavior. First, I will pick up papers on the period immediately following the introduction of the Basel standards (1986-1995). These include Kim and Moreno (1994), Ueda (1993), Yoshikawa, Eto and Ike (1994), Honda, Kawahara and Kohara (1995), and Ito and Sasaki (2002)³.

2.1 The Impact of Introduction of Basel I

Kim and Moreno (1994) examined the effect of stock price movements on bank lending. They showed that the response of bank loans to innovations in stock prices was positive and significant. Ueda (1993) analyzed the effects of non-performing loans, latent capital gains, and the RBC ratio on Japan's bank lending using cross-sectional data from 1993. He showed that the RBC ratio did not affect the growth rate of regional banks' loans, but negatively affected the growth rate of major banks' loans. Honda, Kawahara, and Kohara (1995) attempted to measure the impact of capital ratios and non-performing loans on Japanese banks' lending. They showed that the RBC ratios and non-performing loan variables affected the lending behavior of major banks, but these variables did not affect the lending behavior of regional banks. Ito and Sasaki (2002) examined how the RBC ratio influenced Japanese bank behavior between 1990 and 1993. As Japanese stock prices fell, banks' latent capital gains, a part of Tier II capital, became smaller. Their empirical findings are consistent with the view that banks with lower capital ratios had a tendency to issue more subordinated debts (included in Tier II capital), and to reduce lending (risk-weighted assets).

Among these papers, only Yoshikawa, Eto and Ike (1994) stressed that the decline in lending was induced by the decline in demand for lending. They examined the cross-sectional data from March 1993 for banks' lending behaviors. They found that increases in banks' lending were negatively correlated with banks' non-performing loans among regional banks, but not among major banks. Furthermore, lending to small and medium sized firms was not correlated with non-performing loans for any category of bank. They concluded that a shift in demand, rather than a shift in supply, explained the decline in lending.

2.2 The Basel I's effects on Japanese banks during the 1990s

There are many papers analyzing the Japanese banks lending behavior during the 1990s, so called Heisei recession period. Ogawa and Kitasaka (2000), Sasaki (2000) and Montgomery (2005) showed that Japanese banks reduced lending when their RBC ratio declined. Ogawa and Kitasaka (2000) and Sasaki (2000) found that the credit crunch was observed especially for internationally operated banks. Montgomery (2005) showed that the credit crunch happened only after the Basel I intro-

³ There are also other papers which cover this topic; however, I will focus on the papers mentioned above.

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duced. Hayashi and Prescott (2002) examined the reason for the Japanese economy's stagnation during the 1990s and they concluded that the problem was not a breakdown of the financial system, but a low productivity growth rate in Japan.

Peek and Rosengren (2005) found that negative shocks to bank capital result in a shift to lower quality loan portfolios. Fukuda et al (2006) shows the effect of credit crunch was harder on smaller firms. Peek and Rosengren (1997) test the impact of bank capital shocks to Japanese parent banks on lending by their subsidiaries in the U.S. Kobayashi et al. (2003) documents that the growth of loans to highly leveraged firms accelerated.

Some papers found that credit crunch happened in 1997. Woo (2003) shows that credit crunch happened only for total new loans in 1997. Motonishi and Yoshikawa (1999), Watanabe (2005) explains that credit crunch occurred in 1997.

Among the many papers on Japanese credit crunch, Sasaki (2000), Watanabe (2007) and Watanabe(2010), which also put emphasis on the significant change in 1997, are very closely related to this paper. The feature of these papers are empirical analysis using industry-level lending data and focusing on the difference of the credit crunch effect among industries. Watanabe (2007) showed that banks cut back on their lending supply in 1997 because they lost large capital, which is caused by the self-assessment of assets requested by the regulator. Watanabe (2010) found that the large loss of bank capital caused by the regulator's tougher policy towards banks in 1997 induced the contraction of the bank lending supply and also caused the banks' reallocation of their lending supply to unhealthy industries with a higher concentration of non-performing loans. Sasaki (2000) found that both the RBC ratio and non-performing loan variable affected bank lending, but that the effects on the construction sector and real estate sector were not affected by the RBC ratio. This paper is an expanded version of Sasaki (2000) and will show the effects of the RBC ratio in more detail, and non-performing loans on bank lending, and credit allocation.

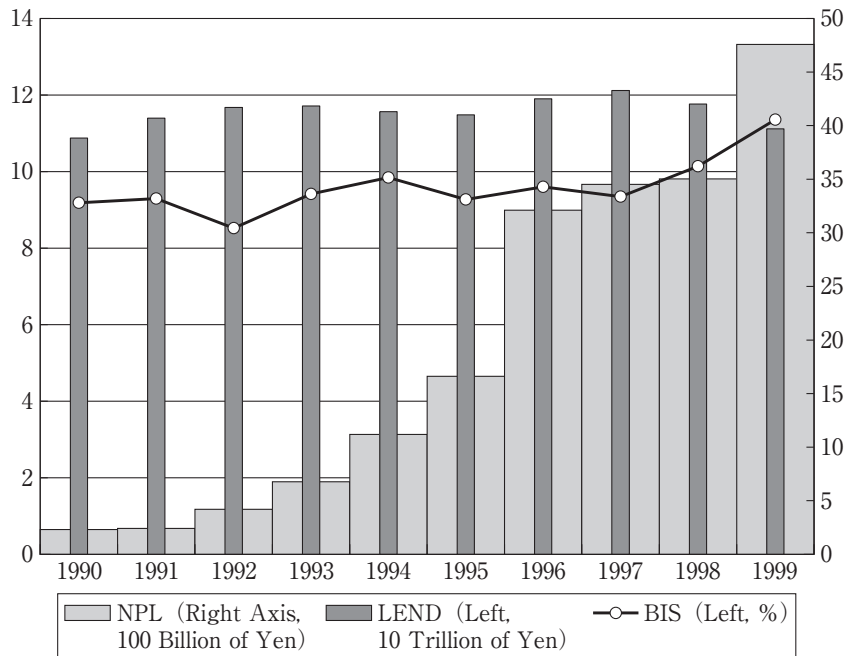
3. Overview of the Japanese Economy during the 1990s

The 1990s are referred to as the Japanese economy's "lost decade." Japan enjoyed a huge boom during the 1980s, and then the bubble burst at the beginning of the 1990s. During that period, two events had strong effects on Japanese banks. One was the introduction of the Basel Accord, which was introduced in a tentative way in 1989, and became effective in 1993. Thus, the effects of the Basel Accord might be observed from 1989. The other event was the accumulation of non-performing loans. Increasing numbers of loans became non-performing loans when the bubble burst in 1990. The effect of the non-performing loans on lending behavior might be observed following this event.

Figure 1 graphs the average RBC ratio of Japanese major banks against the average Japanese yen amount of loans (LEND) and non-performing loans (NPL)⁴. Initial assessment of Figure 1 shows no direct effects from these two events. It seems that Basel Accord did not have any effect on Japanese bank lending because the average RBC ratio moved above the 8% line during this period. However, it is important to note that it was hard for Japanese banks to achieve that ratio. When Japanese stock prices started falling in 1990, latent capital gains, 45% of which are included in Tier II capital, declined unexpectedly and made the ratios much lower.

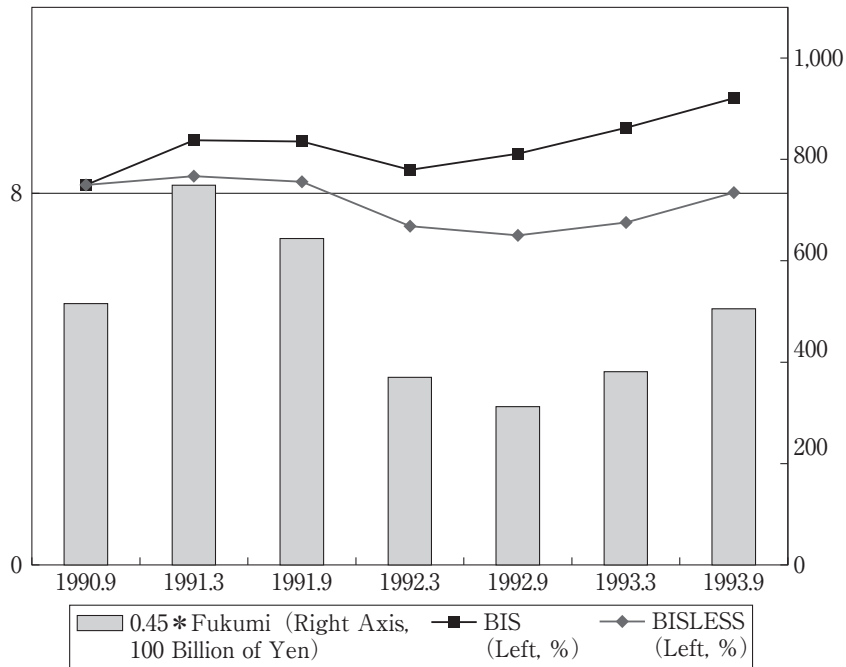
Figure 2 partly shows this fact. In order to eliminate the effect of the banks' reaction function in issuing subordinated debts, Ito and Sasaki (2002) constructed a variable, the subordinated debts-adjusted RBC ratio (BISLESS), which excludes subordinated debts in calculating the RBC ratio. Analyses of the BISLESS variable show how much the RBC ratio would have been lowered if the subordinated debts were not issued. Figure 2 shows the average BISLESS was much lower than the average BIS, and went below 8% from 1991 to 1993. This shows how the sharp decline in latent capital gains affected the RBC ratios of Japanese banks. Japanese banks tried to make up for this decline by issuing subordinated debts, and by restricting or declining loans. Although not identifiable in Figure 1, when controlling for subordinated debts' effect, the Basel capital accords effect is clearer, as seen in Figure 2.

Figure 1: The average RBC ratio and average lending



⁴ I pick up banks which are active internationally in 1990 as major banks.

Figure 2: BIS and BISLESS



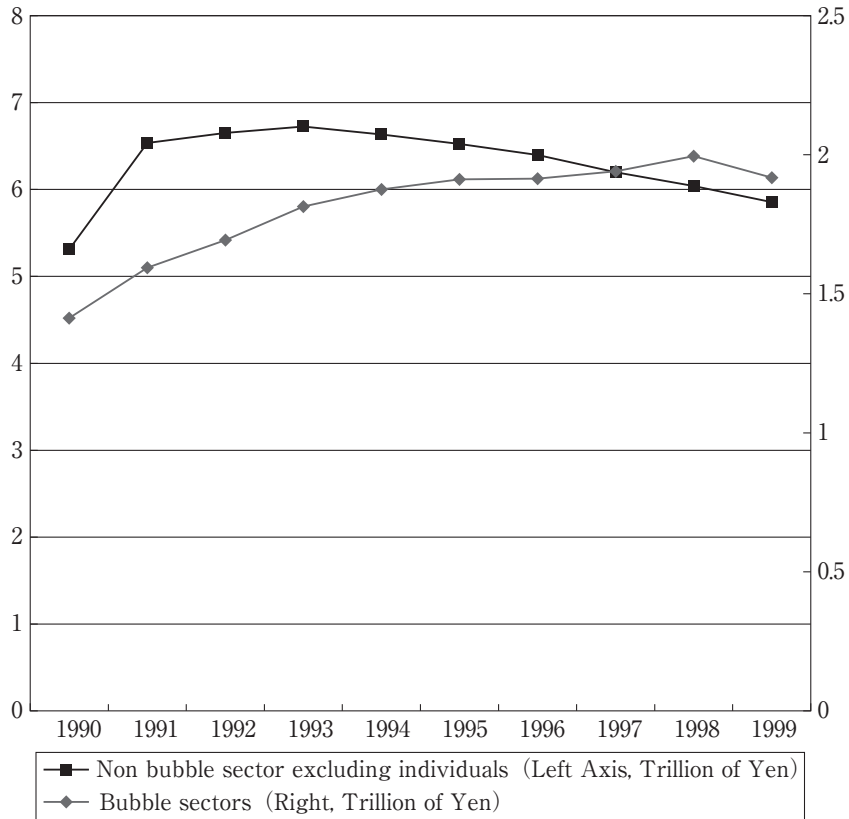
During the 1990s, the Japanese media often criticized Japanese banks, saying that the banks made the recession worse by reducing lending to companies. However, the purpose of the Basel Accord was to make banks healthy by decreasing risky lending when capital losses occurred. Therefore, the reduction in bank lending to private companies was in line with the Basel Accord's requirements and should not be criticized. Rather, the problems that arose from the distortion of credit allocation caused by the Basel Accord should be considered.

The Basel I determined that the risk weights of loans to the private sector were weighted "equally" at 100%. When the Basel Accord was introduced, Japanese banks wanted to keep bad companies, or so-called "zombie companies," alive in order to cover up the amount of loans that would become non-performing. For this reason, Japanese banks reduced lending to healthier companies rather than zombie companies, in order to boost the RBC ratio.

Figure 3 shows the loans to the bubble sectors (sum of the real estate sector and the construction sector) and other loans. Non-bubble sector lending moved downwards, but lending to the bubble sectors did not decline. In fact, bubble sector lending continued to increase during the 1990s despite the fact that these industries suffered the most damage from the burst of the bubble.

After the bubble burst, almost all sectors lost profits; however, profits to the real estate and construction sectors saw the sharpest decline. Figure 4 shows the change rate ratio of profit to sales. Almost all of the change rates of the bubble sectors' profit-sales ratio were negative, similarly to the

Figure 3: Loans to the Bubble Sectors and The Others



non-bubble sectors. In some stances, the change rates were very low; the bubble sectors' profit-sales ratio fell sharply. The profit-sales ratio of the non-bubble companies also declined, but the sharpest decline occurred among bubble companies. From this figure, the profit-sales ratio cannot be the reason banks increased loans to the construction and real estate sectors.

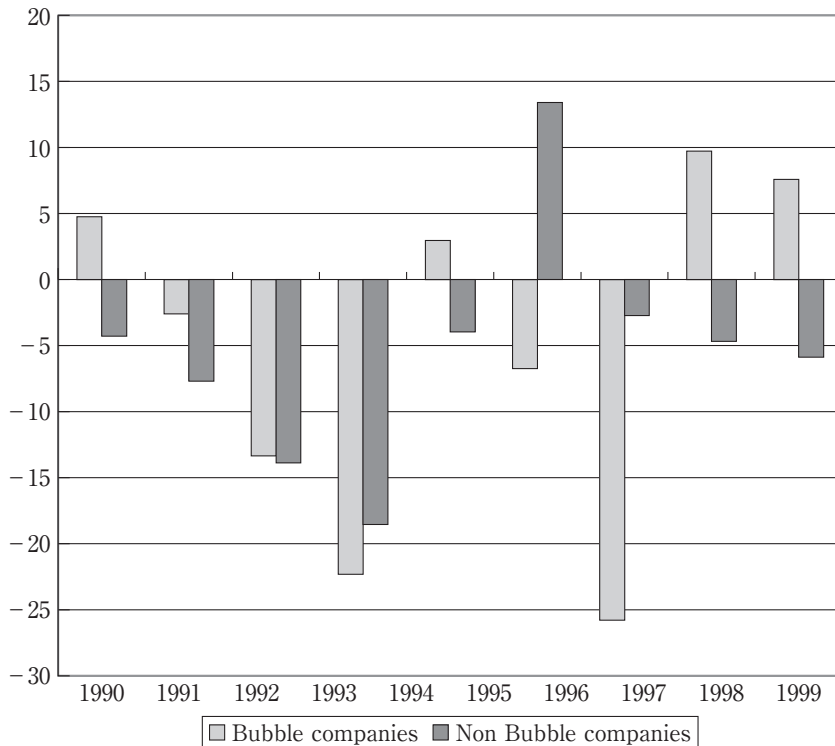
Also, for the non-performing loan, the direct effect on Japanese bank lending from Figure 1 is unclear. To separate out the effects of the capital ratio and non-performing loan from various factors, I will examine Japanese bank behavior using panel data, controlling for several factors, in the next section.

4. Empirical analysis

4.1 Behavioral assumption of banks

In this section, I examine the lending behavior of Japanese banks, but I want to clarify the Ba-

Figure 4: Change Rate of Profit/Sale ratio (%)



sel Accord's effects on lending behavior. Some papers assume that the RBC ratio is a constraint on banks. Those papers assume that banks maximize profits under the constraint of keeping the RBC ratio at more than 8%. However, it seems that banks are not satisfied with 8%, and try to boost the ratio to a higher percentage. This is because the higher the RBC ratio are, the more credibility banks can get. Thus the RBC ratio is not just a constraint for banks, and I will assume that banks want to raise the ratio above 8%⁵. Lending is a major component of the denominator of the RBC ratio. I expect to discover whether banks react by reducing lending in an attempt to raise the RBC ratio, by examining the loan data and controlling for other factors.

As the asset prices sharply declined in the beginning of the 1990s, many corporations became bankrupt, and loans to those corporations became non-performing loans. Thus, the size of non-performing loans grew, and banks became more cautious in lending. Further examination of lending behavior during this period requires taking into account the effect of this increase in non-performing loans.

Considering the effects of the Basel Accord and the effects of non-performing loans, I estimate

⁵ This argument is mentioned in detail in Ito and Sasaki (2002).

the following equation:

$$dL_{ijt} = a + b dBIS_{it} + c dNPL_{it} + d dGDP_{jt} + e dProf_{jt} + u_{it} \quad (1)$$

Where L denotes loans, BIS denotes the risk-based capital ratio, NPL denotes nonperforming loans, GDP denotes GDP, and $Prof$ denotes the profit-sales ratio of each industry. “ d ” indicates that the variable is a rate of change. “ dL_t ” is the rate of change $(L_{t+1}-L_t)/L_t$, and similarly for other variables in this equation. The subscript i denotes bank i , j denotes borrower’s sector j and t denotes time t .

As I discussed, I expect banks to reduce lending when the RBC ratio declines, and also when non-performing loans increase. Other macro variables that affect either demand for lending and supply of lending are included in the explanatory variables. GDP represents the demand for bank loans, thus GDP is positively correlated with lending. The $Prof$ is the profit-sales ratio of each industry. Banks are supposed to increase lending when the profits of the industry increase. These industrial-level variables are common to all banks.

4.2 Description of the data

The data are annual panel data covering the periods from March 1990 to March 1999. The data covers 85 banks that were internationally active in 1990. GDP and variable $Prof$ are industry level data.

For NPL data, I use the sum of loans to borrowers that became bankrupt (*hatan-saki saiken*) and loans to borrowers that are in arrears on interest payments (*entail saiken*). Because some of the non-performing loan data were not disclosed by 1995, I constructed a proxy in the following manner for NPL data from 1990 to 1995⁶:

$$NPL_t = SP_t (NPL_{96}/SP_{96}) \quad (2)$$

Where SP denotes special provisioning for non-performing loans (*Saiken Tokubetsu Shokyaku Kanjo*), NPL_{96} denotes 1996 NPL data and SP_{96} denotes 1996 SP data.

The amount of special provisioning for non-performing loans (*Saiken Tokubetsu Kanjo*) is the only data available for a proxy for non-performing loans before 1995. If provisioned amounts are a con-

⁶ Japanese city banks have disclosed both loans to borrowers that became bankrupt (*hatan-saki saiken*) and loans to borrowers that are in arrears on interest payments (*entail saiken*) since 1993. Loans to borrowers that became bankrupt (*hatan-saki saiken*) of regional banks started to be disclose in 1993. This way of approximation is also adopted in Ito and Sasaki (2002)

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 stant proportion of non-performing loans, then Equation 1 is a good proxy to the non-performing ratio.

4.3 Results

To regress the equations in this paper, I adopt the Fixed Effect Model to control the effects of individual banks. I expect the coefficient of *BIS* to be positive. The accumulation of non-performing loans might make banks more prudent in lending. Therefore, I expect the coefficient of *NPL* to be negative. *GDP* and *Prof* are industry-level data used to capture macro situations. *GDP* is a demand-side variable, and I expect the sign of the coefficient to be positive. *Prof* is a proxy for the expected profit of the firms in each sector. I expect the coefficient of *Prof* to be positive.

Total Lending

I investigate the lending behavior of Japanese banks using total loan data during the 1990s before examining the behavior with sectoral data. In Table 1, I show the effect of the *RBC* ratio and the effect of non-performing loans on total loans⁷. Table 1-1 shows the results using 1990-1999 data. The coefficient of *NPL* is negative and significant (as expected), but the coefficient of *BIS* is negative. One reason that the coefficient of *BIS* has an unexpected sign might be that in 1998 and in 1999 the *RBC* ratio jumped due to public capital injections. The other reason might be that the definition of non-performing loans and the *RBC* ratio changed in 1998.

To see the effect of the public capital injection and the definition change, I separate the data into two periods: 1990-1997 (Table 1.2) and 1997-1999 (Table 1.3). In Table 1.2, both the coefficients of *NPL* and *BIS* are significant and have the expected signs (negative and positive, respectively). In Table 1.3, neither *BIS* nor *NPL* have the expected signs. The purpose of the public capital injections was to eliminate the need for banks to decrease lending in order to raise their *RBC* ratios. The negative sign of *BIS* in Table 1 - 3 means that banks decreased their lending when the *RBC* ratios increased. As the shock of capital injections and the definition change might have affected banks' be-

Table1: Regression Results – Total Loans

	Dependent Variable: Total loans								
	Table 1.1. 1990-1999			Table 1.2. 1990-1997			Table 1.3. 1997-1999		
	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.
<i>BIS</i>	-0.017	-0.54	0.59	0.092 **	2.33	0.02	-0.148 **	-2.36	0.02
<i>NPL</i>	-0.030 **	-5.49	0.00	-0.040 **	-6.55	0.00	0.004	0.26	0.79
R-bar Sq.	0.050			0.089			0.133		
Total Observation	605			541			64		

⁷ The reason I do not include the macro variables *GDP* and *Prof* in this equation is that the coefficients cannot be calculated because of singularity using 3 years (1997-1999) data.

Table2: Regression Results – Loan Data by Type of Banks

	Dependent Variable: Total loans								
	2.1. City banks			2.2. Trust banks			2.3. Regional banks		
	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.
BIS	0.357 **	3.33	0.00	0.036	0.60	0.56	0.214 **	5.43	0.00
NPL	0.002	0.15	0.88	0.020	1.57	0.13	-0.014 **	-2.38	0.02
GDP	2.084 **	7.97	0.00	1.601 **	5.99	0.00	1.396 **	13.74	0.00
Profit	0.113	1.41	0.17	-0.056	-0.83	0.41	0.083 **	3.17	0.00
R-bar Sq.	0.619			0.480			0.464		
Total Observation	63			49			429		

havior in 1998 and 1999, I exclude the 1998 and 1999 data, and use 1990-1997 data in the following analysis⁸.

Lending behavior by type of banks

In this section I examine lending equations by type of bank. In Japan, banks were classified into four types: city banks, long-term credit banks, trust banks and regional banks⁹. The results are shown in Table 2. The coefficients of *BIS* are positive and significant in Table 2.1 (city banks) and Table 2.3 (regional banks). The coefficient of city banks is 0.357, and the coefficient of regional banks is 0.214. It seems that capital standards have larger effects on city banks than on regional banks. This might be because city banks are more active on the international stage than regional banks. That is, city banks are more eager to raise the RBC ratio than regional banks. The coefficient of *NPL* is negative and significant only in the case of regional banks. For trust banks, neither *BIS* nor *NPL* is significant. The much smaller risk weights for assets in trust accounts might be the reason that the results for trust banks are different from those of other banks.

Lending by type of borrower

In order to examine banks' lending behavior by type of borrower, I classified the loan data into nine sectors of borrowers: manufacturing, construction, finance and insurance, wholesale and retail trade, real estate, transport and communications, service, individuals, and small companies. I estimate Equation (1) separately for each sector. The results are shown in Table 3.

Table 3.1 shows the results of the manufacturing sector. It shows that loans to the manufacturing sector increase when *BIS* increases. The coefficient of *NPL* is negative and significant as expected. *GDP* and *Prof* are positive and significant as expected. In eight sectors out of nine, the coeffi-

⁸ It is better to separate the data into two periods covering 1990-1997 and 1998-1999 and analyze both of the periods. But two years is too short of a time to do panel analysis, so I focus only on 1990-1997.

⁹ In this analysis, I group city banks and long term credit banks together because the results of these two types of banks are very similar.

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coefficients of BIS are positive as expected. Among those, loans to manufacturing, finance and insurance, transport and communications and individuals are positive and significant. The industries with a positive BIS coefficient are construction, real estate and service. The coefficient of loans to the service sector is not positive. The coefficients of BIS in Table 3.2 (construction) and in Table 3.5 (real estate) are both 0.002, the smallest of all the results (except for the negative case in the service industry). The results show that loans to both the construction sectors and real estate sectors are not affected by the Basel Accord. This means that, when the RBC ratio declines, banks do not reduce their loans to construction companies and real estate companies, but reduce lending to the other sectors (except the service sector).

The *NPL* coefficient for five types of borrowers (manufacturers, wholesale and retail, financial and insurance, transportation and communications and services) out of nine are negative and significant as expected. The *NPL* coefficients in Table 3-2 (construction) is -0.001 and the *NPL* coefficient in Table 3-5 (real estate) is -0.006. Like the *BIS* coefficients, the absolute value of the coefficient of construction and the coefficient of real estate are the smallest of all the results. The results show that loans to both construction companies and real estate companies are not affected by *NPL*. This means that, when *NPL* increases, banks do not reduce lending to construction companies and real estate companies, but reduce loans to the other sectors (except to individuals).

Table3: Regression Results – Loan Data by Type of Borrowers

Dependent variable	Table 3.1. Manufacturing			Table 3.2. Construction			Table 3.3. Wholesale and retail trade		
	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.
BIS	0.152 **	2.98	0.00	0.002	0.04	0.97	0.036	0.73	0.47
NPL	-0.023 **	-2.88	0.00	-0.001	-0.16	0.88	-0.026 **	-3.84	0.00
GDP	1.115 **	12.43	0.00	0.957 **	7.16	0.00	1.720 **	18.38	0.00
Profit	-0.061 **	-2.65	0.01	0.157 **	3.01	0.00	-0.173 **	-6.40	0.00
R-bar Sq.	0.297			0.398			0.498		
Total Observation	541			541			541		

	Table 3.4. Finance and insurance			Table 3.5. Real estate			Table 3.6. Transport and communications		
	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.
BIS	0.307 **	2.80	0.01	0.002	0.05	0.96	0.198 **	3.20	0.00
NPL	-0.066 **	-4.17	0.00	-0.006	-0.91	0.36	-0.033 **	-3.16	0.00
GDP	0.456 *	1.71	0.09	0.445 **	2.29	0.02	1.262 **	5.00	0.00
Profit	0.082	0.79	0.43	0.016	0.79	0.43	-0.016	-0.29	0.77
R-bar Sq.	0.057			0.012			0.109		
Total Observation	541			541			541		

	Table 3.7. Services			Table 3.8. Individuals			Table 3.9. Small companies		
	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.	Coefficient	T-Stat.	Signif.
BIS	-0.057	-1.41	0.16	0.349 **	8.18	0.00	0.138 *	1.75	0.08
NPL	-0.014 **	-2.19	0.03	0.012 *	1.86	0.06	-0.004	-0.35	0.72
GDP	1.150 **	11.66	0.00	1.845 **	15.27	0.00	1.180 **	5.30	0.00
Profit	0.061 *	1.99	0.05	0.300 **	9.39	0.00	0.158 **	2.68	0.01
R-bar Sq.	0.284			0.476			0.091		
Total Observation	541			541			541		

All the coefficients of *GDP* are positive and significant as expected. The coefficient of *Prof* is positive as expected only in the construction sector.

4.4 Evergreening Policy and Zombie Lending

The empirical evidence in this section show that the RBC ratios negatively affected the total amount of Japanese bank lending, while non-performing loans positively affected the total amount of Japanese bank lending. Thus, the introduction of the Basel capital standard and the accumulation of non-performing loan had impacts on Japanese banks' lending behavior. However, the empirical evidence from industry-level data showed that loans to construction companies and real estate companies were not affected by the *BIS* and *NPL*, which is evidence that there was a misallocation of credit in Japan. In this subsection, I will focus on the issue of credit misallocation.

The analysis of lending by type of borrower showed that both construction companies and real estate companies were not affected by the RBC ratio or non-performing loans. This result implies that loans from Japanese banks to construction and real estate companies remained unchanged after the bubble burst. During this period, the balance sheets of some construction companies and those of real estate companies deteriorated. If banks had reduced or abandoned their loans to such companies, the companies would have gone bankrupt, and the amounts of their latent non-performing loans would have surfaced. Thus, banks continued to roll over loans to nearly bankrupt companies in order to delay recognition of their latent non-performing loan amounts.

This kind of bank action is called "evergreening policy," or, the more recently popular term, "zombie lending." This paper does not directly investigate this kind of lending, but Figure 3 and Figure 4 show that the lending to the real estate and construction sectors increased, though their profits declined. This could be evidence that some of that lending was zombie lending. Some papers have started to directly examine this kind of lending by Japanese banks. Among those, Caballero, Hoshi and Kashyap (2008) develop several zombie indices. They mention that "the zombie problem was more serious for non-manufacturing firms than for manufacturing firms," (P.11) and that "in real estate and construction, it appears that our measure of zombies is identifying firms that are systematically less profitable than the non-zombies, particularly from the mid-1990s onward." (P.12) A survey of papers that directly examine zombie lending in 1990s Japan is included in Sekine, Kobayashi, and Saita (2003) and Hoshi and Kashyap (2004). These papers on the zombie lending showed that the zombie problem appeared in the real estate and construction sectors, and thus support this paper's results.

5. Conclusion

This paper examines Japanese bank lending behavior during the 1990s. First, a summary of my results are as follows: the RBC ratio had the strongest impact on lending by Japan's city banks. Second, loans to almost all sectors were influenced by both of the RBC ratio and non-performing loans. The exceptions are loans to the construction sector and loans to the real estate sector. They were not affected by either the RBC ratio or by non-performing loans.

Although the balance sheets of some construction companies and real estate agents deteriorated after Japan's bubble burst, Japanese banks did not reduce loans to these companies. Banks continued lending to these companies instead of abandoning them in order to delay recognition of latent non-performing loan amounts. Though banks did not reduce lending to companies in these sectors, banks had to reduce overall lending in order to boost the RBC ratio. Therefore, banks reduced loans to healthy companies. This result is supported by the evidence presented in other papers that examine zombie lending more directly.

In 1998, FSA started to require banks to disclose self-assessments of their loans. The disclosure of assessments meant that banks couldn't cover their latent non-performing loans any more. Banks probably changed their strategy of continuing loans to bad companies in 1998. For this, the credit reallocation problem might become somewhat softer.

The credit reallocation problem focused in this paper was caused by the Basel capital accord, which defined that the risk weights of private corporations are equal. This point is improved in Basel II, revised international capital framework, which will be introduced in 2007. The new Basel II regulatory framework contains internal-rating-based (IRB) capital requirements. The Basel II will reduce pricing distortions across loan categories. However, we should note that Basel II doesn't solve completely the reallocation problem. First, banks can choose standard approach for calculating credit risk and the standard approach is not so improved than Basel Accord. Second, there remains the same problem between companies with the same credit ratings.

There is an argument that banks allowed the bad companies to remain alive because they believed that some part of the non-performing loans or hidden non-performing loans will disappear as the Japanese economy would recover from the recession and land prices would go up. However, even if some part of the non-performing loans would have recovered, it is still bad for an economy to keep "bad" companies alive, since credit is inappropriately reallocated.

This paper only shows the results of estimations using bank lending data, and I don't directly examine evergreening policy of banks. I hope to examine firm data to show banks' evergreening policy in future work.

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