SOFT BUDGET CONSTRAINT PROBLEMS IN THE JAPANESE BANKING SYSTEM *

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ABSTRACT

This paper investigates theoretically and empirically why Japanese banks continued to extend bad loans during the 1990s. The discretionary enforcement of minimum capital requirements is found to be the primary reason for this perverse lending behavior by Japanese banks. Our theoretical analysis shows that when the government imposes high capital adequacy standards but banks can easily manipulate regulatory capital, poorly capitalized banks tend to roll over bad loans in order to maintain their regulatory capital ratios. This managerial incentive is strengthened when banks are allowed to issue subordinate debt as a part of regulatory capital. Our empirical results are consistent with the hypothesis that three tiers of agents – the government, banks, and borrowing firms – faced soft budget constraints. Japanese banks were induced to bail out firms by exploiting the discretionary enforcement of minimum capital requirements, which eventually prolonged the non-performing loan problem.

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I. INTRODUCTION

Japan's non-performing loan problem and the banking crisis by now have lasted more than a decade.[1] Yet, why the bad loan problem has persisted for this long continues to puzzle economists and policy-makers, especially since the Japanese banking system had been believed to be well-functioning before the crisis began.

We attempt to explain the bad loan problem in Japan in terms of the soft budget constraint problem among three tiers of agents: the government, banks, and borrowing firms. Our hypothesis is motivated by the fact that although the collapse of asset prices in the early 1990s triggered the non-performing loan problem, the current stock of non-performing loans has been newly accumulated after 1993, i.e. when asset prices had already collapsed.[2] Our reasoning is based on the framework developed by Berglof and Roland [1995] and Aghion *et al.* [1999], which suggests that banks bail out unprofitable firms by extending loans because they expect to be bailed out by the government when they fall into trouble.

In this paper we build a theoretical model that explains a significant part of the Japanese bad loan problem and then provide the empirical evidence that supports the hypothesis of the soft budget constraint. The notion of the soft budget constraint was originally formulated by Kornai [1979] to illuminate the economic performance of socialist economies. Recently, this concept has been applied to phenomena not only in post-socialist but also in market economies. Even in market economies, it is quite rare for a large bank in severe trouble to go out of business.

Dewatripont and Maskin [1995], Qian and Roland [1998], and others have developed theoretical models explaining the soft budget constraint problem, but few studies have investigated this hypothesis empirically, probably because it is difficult to find an appropriate measure of the softness of budget constraints.[3] Furthermore, policies leading to softening budget constraints, such as subsidies or government loans, are much more pervasive in transition economies than in advanced market economies; thus, if it has proved difficult to find a suitable measure of the softness of budget constraints in the former, it is even more difficult in the latter.[4] Consequently, one of our major tasks in this paper is to find appropriate measures

of the softness of budget constraints that Japanese banks faced in the 1990s.

Most bank regulations, such as minimum capital adequacy requirements, are designed for the purpose of avoiding bank failures, but not necessarily intended to deal with an actually troubled bank. When faced with a banking crisis, regulators have little guidance on how to restructure or liquidate an insolvent bank and are often forced to rescue it [e.g., Aghion et al. 1999]. The weakness of capital adequacy requirements was revealed as soon as Japanese banks experienced capital shortages as a result of the deterioration in the quality of their assets. The Japanese government softened banks' capital constraints by allowing banks to engage in discretionary accounting and to count subordinate debt issued on non-market terms as part of regulatory capital.[5] Furthermore, the discretionary enforcement of capital regulation motivated banks to extend loans to unprofitable firms, which eventually prolonged the non-performing problem. Such behavior is in sharp contrast with the response of troubled U.S. banks that have tended to shrink their lending in order to increase their risk-based-capital (RBC) ratio [e.g. Peek and Rosengren [1995]].

In the first part, we develop a theoretical model explaining why a bank manager continues to extend loans to unprofitable firms. We consider the following situation. First, a bank manager has private information about the quality of the loan portfolio. Second, shareholders' control over the manager is so weak that the manager derives utility not only from the bank's earnings but also from staying in his position. Third, the manager is dismissed when the bank cannot meet the minimum capital requirement. Under these assumptions, our theoretical analysis yields several interesting results. First, when the government sets high capital adequacy standards but cannot observe the quality of loan portfolios and thus true bank capital, a bank manager has an incentive to inflate the regulatory capital, i.e., the numerator of the RBC ratio, by extending loans to unprofitable firms in an attempt to meet the minimum capital requirement.

Second, recapitalization by subordinate debt does not necessarily diminish the managerial incentive to bail out unprofitable firms although it always relaxes the

bank's capital constraint. When the bank can manipulate regulatory capital, recapitalization by subordinate debt and the rollover of bad loans are complementary means for banks to meet the capital requirement.

In the second part we conduct an empirical investigation of the soft budget constraint hypothesis for three tiers of agents: the government, banks, and borrowing firms. Our sample covers a panel of all Japanese banks that were subject to the Basel capital standards for the sample period of 1991–1999. We investigate empirically whether banks have an incentive to extend loans to unprofitable firms when the government sets a high capital standard but banks expect to be bailed out either by recapitalization or by various kinds of accounting manipulation. Bad loans are classified as the sum of loans to three industries, real estate, construction, and finance, all of which were seriously hit by the decline in land prices. We regress bad loans on the softness of the capital regulation measured by banks' subordinate debt or discretionary accounting indexes newly constructed in this paper.

We find evidence that poorly capitalized banks maintained their regulatory capital by issuing subordinate debt and rolling over bad loans, which supports our soft budget constraint hypothesis. Underlying this tendency was the government's "too-big-to-fail" policy, which gave the major banks more leeway to use such strategies." The discretionary enforcement of minimum capital requirements aggravated the soft budget constraint problem, eventually increasing bad loans.

The present paper is related to a number of theoretical papers that analyze the bad loan problem in the presence of asymmetric information, including Rajan [1994], Berglof and Roland [1995], Aghion et al. [1999], and Mitchell [2001]. Rajan [1994] explains the bad loan problem as a consequence of rational behavior on the part of bank managers who have short-term horizons. Berglof and Roland [1995] point out that banks may "gamble for bailout" by exploiting government forbearance. Aghion et al. [1999], and Mitchell [2001] analyze the impact of the government bailout policies on a bank manager's incentive to disclose truthfully his non-performing loans. The present paper incorporates all of these ideas but differs from these studies in that it stresses another reason for the bank bailouts. Namely, the soft

budget constraint problem springs from the minimum capital requirement and the related forbearance policy on the part of the government.

Recently there is a growing literature that sees the soft budget problem in the banking system and the misallocation of credit as an important factor underlying the prolonged stagnation of the Japanese economy. Studies along these lines include Peek and Rosengren [2003], Kobayashi et al. [2002], Hori and Osano [2002], Caballero et al. [2003], and Nishimura et al. [2003].

In particular, the present paper is complementary to Caballero et al. [2003] and Peek and Rosengren [2003]. Caballero et al. [2003] attempt to quantify the amount of subsidized lending for the publicly traded firms and find that the level of subsidized lending increased markedly during the 1990s, and that the subsidies were far more common for non-manufacturing firms and for manufacturing firms. In addition, they argue how unprofitable "zombie" firms that are protected by banks distort competition throughout the economy. Peek and Rosengren [2003] find that, based on panel data of individual firms and banks, banks with reported capital ratios closer to their required ratios were more likely to make loans to weaker firms. Our analysis differs from theirs in two respects. First, we develop a theoretical model and analyze the relationship among bad loans, capital ratios, and recapitalization by subordinate debt of capital-constrained banks. Second, based on the model we develop we utilize measures of the softness of the budget constraint that banks face that are broader than the ones used by theirs.

The remainder of this paper is organized as follows. Section 2 sets up the model. Section 3 conducts the theoretical analysis. Section 4 reports our empirical method and results. Section 5 concludes.

II. MODEL

We consider a two-period economy with one bank and many potential borrowers. At date 0, the bank is endowed with capital A and has access to insured deposits provided at zero interest rate.[6] Assume that depositors are repaid at the end of the period. The bank is run by a manager and in what follows we use the terms "bank"

and “manager” interchangeably.

The bank potentially makes two types of loans. One type is a safe loan that needs I units of funds and returns X with certainty at the end of the period. The net present value of the safe loan is positive, such that $X > I$. The other type is a risky loan that the bank inherited and initially needed I units of funds. The continuation of this loan additionally needs I units at date 0, and returns Y_H with probability p and $Y_L (< Y_H)$ with probability $1-p$ at date 1. When the bank does not make the additional loan, the investment terminates and the bank receives Z by liquidating the borrower's asset through a fire sale. We assume that the liquidation is costly, such that $Z < I$. The bank then invests another I units of funds in government bonds with zero interest rate. It follows that at date 0 the bank collects deposits $2 \times I - A$.

At date 0, the manager privately receives a signal about the return of the risky loan. Suppose for simplicity that the signal the manager receives is perfectly correlated with the performance of the risky loan. If the signal is “good”, the final return is Y_H with certainty while if the signal is “bad”, the return is Y_L with certainty. On the basis of that signal, the manager decides whether to continue or terminate the risky loan.

We impose several restrictions on the parameters. First, assume that $Y_L < I + Z < Y_H$. The first inequality says that when the signal is bad, the bank earns more by terminating the risky loan, while the second inequality says that when the signal is good, the bank earns more by continuing that loan. Second, assume that $(X - I) + (Y_L - 2I) + A > 0$, which says that, conditional on the signal being bad, the bank's final equity value is positive even if the risky loan is continued.[7] This assumption is in contrast with the one made by Aghion et al. [1999] and Mitchell [2001], who argue that the manager of an insolvent bank will attempt to hide bad loans.

Imperfections in the accounting system are incorporated in our model as follows. First, the manager is never punished even if he is observed to have chosen a loan portfolio that turned out to deteriorate the bank's final earnings. Second, the

manager is never punished even if he is found not to have disclosed latent gains/ losses from loans in progress. In other words, the bank is not forced to disclose true earnings on the basis of market value accounting.

The bank manager not only benefits from holding the stock of the bank but also enjoys a private benefit as a result of managing the bank. Formally, the manager maximizes the expected date-1 value of

(1) $$U = \alpha \times \max\{E, -A\} + (1-\alpha) \times \tilde{B}, \text{ with } 0 < \alpha \leq 1,$$

where E represents the bank's final earnings net of the cost of capital, and $\tilde{B}$ stands for the private benefit that the manager enjoys by retaining his job.[8] The weight α may be related to the manager's share of the bank's stock, the degree of shareholding with affiliated firms, and the government's forbearance policy. The second term includes not only the manager's salary but also non-monetary benefits, such as perks or the satisfaction derived from controlling the bank. We assume that the manager receives the private benefit $\tilde{B} = B(>0)$ when retaining his job until date 1 and receives $\tilde{B} = 0$ when losing his job. This term is meant to capture a situation where the manager is not effectively disciplined to behave in the interest of outside shareholders and may create an incentive for the manager to extend bad loans and hence worsen the bank's profitability. In fact, in Japan, bank managers are shielded from the influence of outside shareholders through mutual shareholdings with affiliated firms and financial companies.

Finally, we assume a regulatory policy in which the manager is fired and loses his private benefits at date 0 when the bank cannot meet the minimum capital adequacy ratio k. Although the decision to fire the manager is formally made by the board of directors, the government influences the decision indirectly through its pressure on weak banks. (In this way, the government complements outside shareholders in exerting the corporate control.

III. THEORETICAL ANALYSIS OF THE BASIC MODEL

In this section we conduct a formal analysis based on the model developed in Section II. We do this by first establishing a benchmark case and then introducing

various aspects of the model.

A. Benchmark without Capital Requirements

As a benchmark, it is useful to examine a world with no capital regulation. The manager does not worry about losing his job, and so does not have any short-term concerns. The manager cares only about the bank's final earnings. When the signal is good, the manager continues the risky loan, and when the signal is bad, the manager terminates it.

B. Minimum Capital Requirements

Now we analyze the portfolio choice in the presence of capital regulation. The manager may deviate from the "first-best" choice due to considerations of his own private benefit. Having received the signal at date 0, the bank has to decide whether to terminate or continue the risky loan. When the bank follows the "termination strategy", the bank incurs the loss $(Z-I)(<0)$ as a result of the liquidation of the risky investment. The other I units are then invested in government bonds. Since the bank writes off loan losses, it follows that at date 0 the bank reports the risk-based-capital (RBC) ratio as $\{A+(Z-I)\}/I$, where the numerator represents the sum of the initial capital and the disclosed loan losses and the denominator states that (only I units of loans will be made. On the other hand, when the bank follows the "continuation strategy", it is normally obliged to make provisions against possible loan losses, and hence in the face of a bad signal, the bank has to report at least some of (Y_L-2I) as loan-loss provisions. In fact, if the continued loan is discovered to be a bad loan, the government may force the bank to promptly write off that loan. However, since the quality of the continuing loan is the bank's private information, the manager attempts to behave as if he received a good signal. Additionally, the practice of historical cost accounting helps the bank to hide the bad loan. When continuing the risky loan, the bank reports the RBC ratio as $A/2I$, which is greater than the ratio of the termination strategy $(A+Z-I)/I$ if $2(I-Z)>A$ is met. This inequality is more likely to hold if the

bank's capital is small or the liquidation of the bad loan is costly. We assume that this inequality holds throughout this paper. It follows that the manager is given the option of overstating the RBC ratio by extending the bad loan.

Outsiders attempt to gauge from the disclosed RBC ratio what strategy the bank takes. However, when the disclosed RBC ratio is $A/2I$, outsiders cannot discern whether the quality of the continued loan is good or bad.

It matters whether the reported RBC ratio exceeds the minimum capital adequacy ratio k or not. If $\{A+(Z-I)\}/I \geq k$, the bank can meet the minimum capital requirement either by continuing or terminating the risky loan. However, if $\{A+(Z-I)\}/I < k$, the manager cannot meet it by terminating the risky loan. If the signal is bad, although outside shareholders want the manager to terminate the risky loan, the manager may prefer to continue it due to the private benefits he enjoys.

Since our goal is to analyze the mechanism underlying the continuation of bad loans, in what follows we concentrate on the conditions under which the bank continues the risky loan conditional on the signal being bad. We expect that the manager will behave differently, depending on the severity with which capital regulations are enforced. We continue the analysis by distinguishing banks in terms of their initial capital level. First of all, we examine the behavior of a well-capitalized bank that can meet the minimum capital requirement either by continuing or terminating the risky loan, so that $\min[\{A+(Z-I)\}/I, A/2I] \geq k$. This inequality is more likely to be met when the initial level of bank capital A is relatively high. The capital regulation does not distort the portfolio choice. The manager cares only about the bank's final earnings in deciding whether or not to continue the risky loan. In the face of a good signal, the manager continues the risky loan, while in the face of a bad signal, the manager terminates it.

Proposition 0: If the signal is bad, the manager of the well capitalized bank terminates the risky loan.

Next we examine the behavior of a bank that is still fairly well-capitalized but can meet the capital requirement only by continuing the risky loan, so that $\{A+(Z-I)\}/I < k < A/2I$. This inequality is more likely to be met when the initial level of bank capital A is relatively low. When the signal is bad, the manager may face the choice of whether to consider the bank's equity value or his private benefit in his decision. Conditional on the signal being bad, the manager obtains $\alpha(X+Z-2I)$ under the termination strategy, and $\alpha(X+Y_L-3I)+(1-\alpha)B$ under the continuation strategy If the manager writes off the loss by terminating the loan and the RBC ratio falls below the threshold level of k percent, he will be fired and lose his private benefits. We obtain the following.

Proposition 1: Having received the bad signal, the manager of the fairly well-capitalized bank continues the risky loan if the following inequality is met:

(2) $$(1-\alpha)B > \alpha(Z+I-Y_L).$$

The L.H.S. of inequality (2) represents the manager's private benefit of meeting the capital requirement, and the R.H.S. represents the cost of continuing the bad loan. For some range of parameters, the manager chooses to continue the risky loan although outside shareholders would want the manager to terminate it. The regulatory policy induces the manager to extend loans to unprofitable firms, which then leads to a deterioration of the bank's loan portfolio. If the government alternatively were to take a "loose" regulatory approach under which the manager could keep his position even after the bank had violated the BIS constraint, the manager would choose to terminate the risky loan.[9]

Proposition 1 is closely related to the fact that it is difficult to evaluate bank capital. In terms of the model, since the loan quality is the bank's private information, the bank can manipulate the numerator of the RBC ratio by continuing the risky loan. What is more, it is important to note the impact of the government's policy with regard to allowing or not allowing banks to engage in discretionary accounting has. A forbearance policy on the part of the government

will soften the bank's budget constraint, which in turn will soften the borrowing firm's budget constraint and ultimately result in a non-performing loan. Very often the government does not force banks to use current market accounting. The government's lax enforcement of banking regulations allowed banks to hide latent losses and induced them to bail out struggling borrowers.

Finally we examine the behavior of a poorly capitalized bank that can meet the capital requirement neither by continuing nor terminating the risky loan, so that $\max[\{A+(Z-I)\}/I, A/2I\}] < k$. This inequality is most likely to apply when the initial level of bank capital A is very low.

If the signal is bad, the manager would obtain $\alpha(X+Z-2I)$ under the termination strategy and $\alpha(X+Y_L-3I)$ under the continuation strategy. Since the bank cannot meet the requirement either by continuing or terminating the risky loan, the manager has no incentive to roll over the bad loan.

Proposition 2: Having received the bad signal, , the manager of the poorly capitalized bank terminates the risky loan.

Propositions 0, 1, and 2 jointly imply a nonlinear relationship between the portfolio choice and levels of bank capital. At low or high levels of bank capital, the bank's profitability is more important to the manager than his private benefit. Only for intermediate levels, the bank manager places more weight on his private benefit than on the bank's profitability.

We now make a few comments on the government's behavior of allowing banks to engage in discretionary accounting. One story is that the government cannot observe banks' loan portfolios and thus is forced to allow banks to engage in discretionary accounting. Another is that the government also prefers the continuation of bad loans because it cares not only about the bank's profit but also cares about depositors and borrowers that would suffer in the case of bank insolvency. Given such consideration, the situation can be characterized as one of soft budget constraint problems relating to three tiers of agents – the government,

banks, and borrowing firms – where banks are induced to bail out firms because they can exploit the government's softness.

C. Recapitalization by Subordinate Debt

We have thus far assumed that our bank can raise funds only by collecting deposits. Here we extend the basic model to allow the bank to issue subordinate debt as another means of raising funds. Subordinate debt is, in case of bank insolvency, senior to equity but junior to any other debt including insured deposits, and admitted as a component of tier 2 capital under the special rule of the Basel Accord. Moreover, subordinate debt is, in principle, expected to play a disciplinary role on banks and thus limit banks' incentive to take on risk [e.g. Calomiris [1999]]. Banks that take on excessive risk will find it difficult to sell their subordinate debt, and will be forced to shrink their lending to satisfy capital adequacy requirements.

The situation in Japan deserves some comments. In the 1990s, Japanese banks used subordinate debt to restore capital bases undermined by asset price deprecation and non-performing loans (Horiuchi and Shimizu [1998] and Ito and Sasaki [2002]). However, for a number of reasons, subordinate debt was not fairly priced to reflect banks' default risk. For example, subordinate debt was never publicly traded and instead was purchased by associated life insurance companies and the government. What is more, the government often repaid creditors on behalf of insolvent banks.[10]

Suppose that at date 0, having received the signal, the bank decides whether to issue subordinate debt to outside investors at date 0. Let the date 0 price of subordinate debt be denoted by D_0 ; the bank raises the fund D_0 by issuing subordinate debt and promises to repay D at date 1. Suppose that D_0 is given exogenously. This assumption is justified by the fact that tier 2 capital should be less than tier 1 capital. Suppose also that the government repays the subordinate debt on behalf of the bank when the bank is insolvent although this assumption might destroy the primary role of subordinate debt. Assume finally that the bank invests the raised cash in government bonds.

Since the government guarantees repayment, it is easy to see that $D_0 = D$.[11] The subordinate debt does not influence the bank's final earnings and works only as a buffer to relax the original minimum capital requirement. The bank can raise the RBC ratio up to $\{A+(Z-I)\}/I$ under the termination strategy, and up to $(A+D)/2I$ under the continuation strategy.

Let us now consider the role of subordinate debt in the strategy of a fairly well-capitalized bank. The manager of the fairly well-capitalized bank determines the portfolio according to whether $\{A+(Z-I)+D\}/I$ exceeds the threshold ratio of k. If $\{A+(Z-I)+D\}/I < k$, the manager does not have any incentive to issue subordinate debt. (As Proposition 1 suggests, the manager will roll over a bad loan to unprofitable firms. If, conversely, the subordinate debt D is large enough to meet $\{A+(Z-I)+D\}/I \geq k$, the manager may have an incentive to issue subordinate debt because this may provide the bank with the opportunity to meet the minimum capital requirement. In the face of a bad signal, the manager would obviously prefer to terminate the loan.

Proposition 3: Suppose that $\{A+(Z-I)+D\}/I \geq k$ holds. Having received a bad signal, the manager of the fairly well-capitalized bank issues subordinate debt and terminates the risky loan.

Comparing Propositions 1 and 3 reveals that the fairly well-capitalized bank, when allowed to issue subordinate debt, is more likely to refrain from continuing the bad loan. The option to issue subordinate debt diminishes the managerial incentive to continue the bad loan and rectifies the perverse effect of capital requirements on the loan portfolio.

We next turn to the case of the poorly capitalized bank. Proposition 2 shows that the manager of a poorly capitalized bank never rolls over a bad loan when the funds that the bank can raise are limited to deposits. However, if the bank can also raise funds by issuing subordinate debt and the amount thus raised is large enough to satisfy $\max[\{A+(Z-I)+D\}/I, (A+D)/2I] > k$, the poorly capitalized bank may

have an incentive to issue subordinate debt. Since it is tedious to analyze all possible cases, we focus on the interesting case when the bank can meet the minimum capital requirement only by a combination of issuing subordinate debt and continuing the risky loan, such that $\{A+(Z-I)+D\}/I < k \le (A+D)/2I$.

When the signal is bad, the manager would obtain $\alpha(X+Z-2I)$ under the termination strategy and $\alpha(2X+Y_L-4I)+(1-\alpha)B$ under the continuation strategy. We obtain the following:

Proposition 4: Suppose that $\{A+(Z-I)+D\}/I < k \le (A+D)/2I$. Having received the bad signal, the manager of the poorly capitalized bank issues subordinate debt and continues the risky loan if inequality (2) holds.

Note that if inequality (2) holds, the poorly capitalized bank will also issue subordinate debt and continue the risky loan when it receives a good signal. Comparing Propositions 2 and 4 reveals that the poorly capitalized bank is more likely to extend the bad loan when it is allowed to issue subordinate debt. Recapitalization by subordinate debt, together with the continuation of the bad loan, provides the manager with room to meet the capital requirement, strengthening the managerial incentive to continue the bad loan.

The effect of recapitalization on the managerial incentive for moral hazard is mixed, depending on the initial level of the bank's capital relative to the threshold ratio. The recapitalization diminishes the managerial incentive to extend bad loans for the fairly well-capitalized bank, but strengthens it for the poorly capitalized bank. When banks are allowed to recapitalize by subordinate debt, banks that are initially better capitalized tend to terminate bad loans, whereas less well capitalized banks tend to continue them.

We briefly discuss the case when the bank becomes insolvent when the risky loan fails, that is, $(X-I)+(Y_L-2I)+A<0$. The analysis is a little complicated because the effect of the managerial incentive interacts with the equityholders' risk-shifting. Consider the same case as that analyzed in Proposition 4, such that

$\{A+(Z-I)+D\}/I < k \leq (A+D)/2I$. When the signal is bad, the manager of the poorly capitalized bank receives, as before, $\alpha(X+Z-2I)$ under the termination strategy but $(1-\alpha)B-\alpha A$ under the continuation strategy due to the limited liability constraint. The manager of the poorly capitalized bank issues the subordinate debt and continues the risky loan if $(1-\alpha)B > \alpha(X+Z-2I+A)$. So long as the subordinate debt is government-guaranteed, the managerial incentive to roll over the bad loan can be preserved.

The perverse impacts of subordinate debt could be eliminated if the price of subordinate debt reflects the bank's credit risk. Lift the assumption of the government guarantee. Furthermore, assume that some information regarding the signal the bank receives is revealed to outsiders. Given these modifications, the price of subordinate debt would reflect the credit risk, and subordinate debt would play a role in disciplining banks that otherwise would roll over bad loans.

D. Empirical Implications

The discussion in this section so far implies the following relationship between the RBC ratio and bad loans as a proportion of total loans :

$$RBC = \frac{A+(1-d)(Z-I)+D}{(1+d)I}, \tag{3}$$

where d is an indicator, taking on zero when the risky loan is liquidated, and one when continued. The RBC ratio depends on the initial true capital A, whether the bad loan is extended, and whether subordinate debt is issued. Which component of the capital base contributes to raising the RBC ratio significantly affects the correlation between the RBC ratio and the bad loan ratio. If a high RBC ratio is associated with high initial true capital or high earnings, the manager is more likely to liquidate the bad loan; a high RBC ratio tends to be associated with a low bad loan ratio. On the other hand, if a high RBC ratio is associated with low initial true capital, the manager is likely to continue bad loans and to issue subordinate debt; a high RBC ratio tends to be associated with a high bad loan ratio (when $A/2 < I-Z$) (Propositions 1 and 4).

Additionally, we have the following relationship between subordinate debt and the bad loan ratio. If recapitalization by subordinate debt works to weaken the incentive for banks to roll over bad loans, as is the case for fairly well-capitalized banks, a high ratio of subordinate debt will be associated with a high bad loan ratio (Proposition 3). If, conversely, recapitalization works to promote the rolling over of bad loans, as is the case for poorly capitalized banks, a high ratio of subordinate debt will be associated with a high bad loan ratio (Proposition 4).

The model thus allows us to posit the following hypotheses concerning poorly capitalized banks which will be examined empirically further below. The first hypothesis is that the correlation between the bad loan ratio and the RBC ratio is positive, reflecting poorly-capitalized banks' incentive to roll over bad loans. The second is that the correlation between the bad loan ratio and the true capital ratio or earnings is negative, because banks with a really low level of true capital or earnings cannot meet the minimum capital requirement in any way. The third hypothesis is that the correlation between the bad loan ratio and subordinate debt is positive because subordinate debt strengthens poorly capitalized banks' incentive to roll over bad loans.

IV. Empirical Analysis

A. Basel Capital Standards and the Manipulation of Regulatory Capital

In this subsection, we briefly explain how the regulatory authorities assisted Japanese banks in manipulating regulatory capital while implementing the Basel capital standards. The RBC ratio is defined as the capital base divided by risk-adjusted bank assets. The capital base consists of tier 1 "core" capital and tier 2 "supplementary" capital. Tier 1 capital comprises mainly stock issues and disclosed reserves, including share premiums and retained earnings, while tier 2 capital comprises undisclosed reserves, including unrealized capital gains on securities, provisions for general loan losses, and subordinate debt with maturities exceeding five years. Tier 2 capital cannot exceed the amount of tier 1 capital as a contribution

to total capital.

Though both tier 1 and tier 2 capital are subordinate to deposits, tier 1 capital is more "explicit" and "permanent" than tier 2 capital (e.g., Dewatripont and Tirole, [1994]), and is defined in a consistent manner for all countries. In contrast, tier 2 capital, the definition of which depends on national discretion, is easier to manipulate than tier 1 capital.

When the stock market bubble collapsed but stock prices were still relatively high at the beginning of the 1990s, Japanese banks were permitted to count unrealized capital gains on securities as tier 2 capital.[12] Banks were also allowed to count subordinate debt as tier 2 capital even though this was held by *keiretsu*-affiliated life insurance companies who also issued subordinate debt to these banks. Such mutual holding of subordinate debt has increased further since 1996 when the regulatory authorities imposed risk-based capital adequacy requirements, the so-called "solvency margin" standards, on life insurance companies. Afterward, when the stock market declined further and many banks' unrealized capital gains melted away, the regulatory standards concerning capital gains on securities changed. Banks were allowed to count stocks at acquisition cost and ignore any unrealized capital losses. On the other hand, banks were allowed to count unrealized capital gains on land assets as capital base. Banks were able to inflate their capital base because a large proportion of the land they held had been acquired long before the price hike in the late 1980s. Additionally, the value of deferred taxes was also permitted to count as tier 1 capital.

As a result of these accounting manipulations, regulatory capital considerably diverged from true or economic capital. Figure I reports the RBC ratio for the major banks as of March 1997. Hokkaido Takushoku Bank and Long-Term Credit Bank of Japan recorded RBC ratios above 8 percent although both of them eventually failed within two years of March 1997. Only Nippon Credit Bank, which failed in 1998, recorded a ratio short of 8 percent.

As one measure of true capital, we use the market-valued capital measured by the number of stocks multiplied by end-of-fiscal-year stock prices. Figure I also

reports the market capital ratio, defined as the market-valued capital divided by the sum of the market-valued capital and total debt. Most of the major banks displayed lower market capital ratios than RBC ratios. Notably, the market-valued capital ratios of the three failed banks displayed even lower values than those of the other, surviving banks. Thus, the stock market valuations reflected the risk of failure of these three banks even though they had disguised the true level of their regulatory capital.

Let us now look at the components of the capital base in detail. Figure II reports the tier 1 capital and the major components of tier 2 capital as a proportion of risk-adjusted assets for the major banks as of March 1997. Almost all the major banks reported tier 1 capital ratios above 4 percent. Among the components of tier 2 capital, subordinate debt accounted for a dominant portion among many banks, especially at Hokkaido Takushoku Bank and Long-Term Credit Bank of Japan, two of the three failed banks. This observation suggests that banks did not issue subordinate debt at market conditions but were able sell it to affiliated life insurers (e.g., Horiuchi and Shimizu [1998]; Ito and Sasaki [2002]).

B. Overview of Bank Portfolios in the 1990s

Before formally analyzing the impact of the discretionary implementation of capital regulations on bank portfolios, we briefly review the trend of Japanese banks' portfolios in the 1990s.

Even though they were burdened with huge amounts of nonperforming loans, Japanese banks did not shrink loans outstanding until 1998. Figure III presents Japanese banks' outstanding corporate loans by industry. While Japanese banks decreased their lending to manufacturing industries, the most profitable sector, they increased their lending to the real estate and the construction sector, which were suffering from the persistent decline in land prices [13] [14].

To examine the financial health of these industries, we estimatehow many years it would take borrowing companies to repay their debts by calculating the sum of total borrowing and corporate bonds outstanding divided by operating profits.

Comparing the average estimated years of debt repayment in the 1990s with the average values of the 1980s, we find that they increased sharply from 15 to 36 years for the real estate sector and from 8 to 14 years for the construction sector, while they rose moderately from 6 to 9 years for the manufacturing sector.[15] The shift in bank loan portfolios is inconsistent with what one would expect to happen if banks were profit-motivated, suggesting that Japanese banks continued to extended loans to unprofitable industries even though it was unlikely that those loans would be recovered.[16]

This tendency was especially pronounced among those major banks that later failed, i.e., Hokkaido Takushoku Bank, Long-Term Credit Bank of Japan, and Nippon Credit Bank. Figure IV reports the sum of loans to the real estate, the construction, and the finance sector as a proportion of total loans – summarily referred to as "real estate-related bad loans" or simply "bad loans" hereafter – for these failed banks as well as the surviving major banks. Long-Term Credit Bank of Japan and Nippon Credit Bank both sharply increased their share of bad loans just before their failure.

C. Hypotheses and Estimation Method

We empirically investigate the hypothesis of the soft budget constraint among three tiers of agents, the government, banks, and borrowing firms, by analyzing how discretionary accounting of regulatory capital affected banks' loan portfolios. While it is difficult to directly observe the rolling over of bad loans from the available data, the hypotheses we presented in section III. D should enable us to test the relationships between bad loan ratios on one hand and RBC ratios and their components on the other.

Given that land prices declined and the quality of loans deteriorated during the 1990s, we may safely assume that Japanese banks received bad signals from their borrowers. Furthermore, we may also assume that Japanese banks most closely resembled the case of the "poorly capitalized bank" in the discussion above. If these two assumptions hold, then Proposition 4 applies to Japanese banks and the share

of bad loans should be positively related to the RBC ratio and the ratio of subordinate debt in risk-adjusted assets, while it should be negatively related to the market-valued capital ratio and the rate of return on bank assets.

To test these hypotheses, we estimate the following equation:

$$Bad\ \ Loan\ \ Share_{i,t} = \beta_0 + \beta_1 RBC_{i,t-1} + \beta_2 MVC_{i,t-1} + \beta_3 ROA_{i,t-1} + \beta_4 PLAND_{i,t-1} + \beta_5 X_{i,t-1} + f_i + \sum_{s=1992}^{1999} \delta_s Year(s)_t + \varepsilon_{i,t} \quad (4)$$

The dependent variable is bad loans as a proportion of total loans. RBC is the risk-based capital ratio as defined by the Basel standards, MVC stands for the market-valued capital ratio, ROA represents the operating profit as a proportion of total assets, and $PLAND$ is the rate of change in land prices. X is a vector of additional characteristics that may affect banks' loan portfolios. Examples of additional characteristics that we include are bank size and share ownership. When we examine the effect of subordinate debt, we decompose the RBC ratio into the shares of tier 1 capital and the major components of tier 2 capital. We use loans to the real estate, the construction, and the finance sector as a measure of bad loans. Our reasons are as follows. First, real estate loans are inherently risky because real estate prices tend to move in the same direction and it is therefore difficult for banks to diversify away the credit risk associated with changes in real estate prices. Second, the profitability of real estate loans declined after the collapse of the asset bubble in the early 1990s. Third, as recent bank disclosure reports have shown, these three sectors accounted for a major fraction of disclosed non-performing loans.[17] Finally, we include financial companies because Japanese banks often used their financial subsidiaries as dummy companies to lend to real estate companies. The rate of change in land prices, denoted by $PLAND$ is used to capture the profitability of bad loans. The profitability of real estate-related bad loans is more sensitive to the change in land prices than other loans because these industries use land more intensively than others. Profit-motivated bank managers are supposed to contract lending to these three industries as land prices decline, but if managers deviate from profit-maximization and pursue their own private goal, the share of

bad loans will be uncorrelated or even negatively correlated with land prices. Land prices also influence borrowing firms' collateral values and thus banks' profits since a large fraction of bank loans is collateralized with land.

As for bank governance, we use two kinds of variables. One is the proportion of managerial ownership, denoted by *MANAGER*. A bank manager who holds a sufficient proportion of shares of his bank tends to be profit-motivated, refraining from extending bad loans to poorly performing firms. The share of bad loans may be correlated negatively with the manager's share ownership. However, if the manager holds a sufficiently large proportion of shares beyond some threshold, he may entrench himself to avoid large shareholders' intervention [e.g., Gorton and Rosen [1995]]. To take into account a possible nonlinear effect of share ownership on bank lending, we include also its squared value as an explanatory variable.

The second ownership variable we consider is the number of shares held by financial institutions as a proportion of the total number of shares issued, denoted by *KEIRETSU*. The larger the proportion of a bank's shares held by financial institutions, the stronger is the latter's incentive, as block shareholders, to induce banks to pursue profits. On the other hand, if banks and other financial institutions cross-hold shares within the same *keiretsu*, the proportion of bank stocks held by financial institutions may represent a proxy for the closeness of the *keiretsu* affiliation.[18] If this is the case, managers of banks and other financial institutions can potentially entrench themselves and pursue their private goals. To take into account these conflicting effects of the share of financial institutions' ownership, we include *KEIRETSU* and its squared values as explanatory variables.

The size of a bank, which we measure by the logarithm of bank assets (*ASSET*), may affect the share of bad loans via several routes. Large banks can diversify their loan portfolios and avoid the concentration of loans to particular industries, which may decrease the share of real estate-related bad loans. On the other hand, anticipating the government's "too-big-to-fail" policy, large banks are more inclined to extend risky real estate-related loans and/or to roll over bad loans. Therefore, the share of real estate-related loans may be correlated either negatively

or positively with bank size.

To control for other bank characteristics, we estimate a fixed bank effect model by including a bank dummy, f_i.[19] Macroeconomic variables that may affect a bank's loan portfolio are all captured by a year dummy, *Year*. Note that all the explanatory variables except for the dummies are one-year lagged values to avoid any possible endogeneity problem.

D. Data

Our main source for banks' balance sheet data is the *Nikkei Financial Statement Data of Banks (CD-ROM version, 2000)*. This data set covers all Japanese banks, including city banks, long-term credit banks, trust banks, and regional banks. Our sample consists of those banks that were subject to the Basel capital standards. Banks are divided into major banks (city banks, long-term credit banks and trust banks) which operate nation-wide and regional banks which operate in and around the prefecture where their head office is located.

The sample period is from March 1991 to March 1999, i.e. the period following the collapse of the bubble in land prices. When two or more banks are involved in a merger or acquisition, we exclude these banks for that year and the following year from our sample because of the lag structure in the estimated equation.

Data on the RBC ratio and its components are collected from each bank's financial statements. For stock price data, we use the *Kabuka* [*Stock Price*] CD-ROM, 2002, and (*Kabuka Soran* [*List of Stock Prices*], both published by Toyo Keizai Shimposha. For land prices, we use the posted price index for land for commercial use for the prefecture where a bank's head-office is located. This land price index is published by the Ministry of Land, Infrastructure and Transport.

Table I reports descriptive statistics of bank characteristics. The figures for (ASSET) in the first row imply that, on average, the assets of the major banks were about ten times as large as those of the regional banks. The RBC ratio was almost the same for major and regional banks. The although the required capital ratio was 8 % (international standard) for major banks and 4% (domestic standard) for many

regional banks. This suggests that major banks were more severely constrained by capital requirements. bad loan share was higher for major banks than for regional banks. Importantly, the capital composition was different. Tier 1 capital made up a smaller proportion of the regulatory capital for major banks than for regional banks; consequently, major banks relied more on tier 2 capital, particularly subordinate debt, than the regional banks did. Greater subordinate debt accounts for most of the larger share of tier 2 capital held by the major banks. Furthermore, the lower part of Table I shows that the correlation between the market-valued capital ratio and the RBC ratio is negative for major banks but positive for regional banks.

These statistics suggest that Japan's regulatory authorities have exercised greater forbearance toward the major banks than the regional banks by allowing the former to recapitalize using subordinate debt. Therefore, we estimate the lending behavior of the major banks separately from that of the regional banks.

(Table I should be placed around here.)

E. Determinants of bad loans

We now turn to the results of our estimation. Table II presents the estimation results for the major banks. In all the tables depicted hereafter, White's heteroskedasticity-consistent standard errors are reported in parentheses. In addition, symbols, "**" and "*" show the significance at 5 percent and 10 percent, respectively. Column 1 shows the results of the basic estimation that includes only the fundamental variables, such as *ROA*, *PLAND*, and *ASSET*.

(Table II should be placed around here.)

The coefficients on *ROA* and *PLAND* are both significant and negative. This

result suggests that banks' behavior was not governed by the profit motive. According to standard banking theory, in a frictionless world, banks should be striving to decrease the share of bad loans if they have a low ROA and/or land prices fall. The negative coefficients on *ROA* and *PLAND* support the hypothesis that managers of Japanese behaved or were forced to behave in way that diverged from the principle of profit maximization.

Column 2 shows the estimation result when we add the RBC ratio. The coefficient on *RBC* is significant and positive. A high RBC ratio was associated with a high bad loan ratio. This finding suggests that, as stated in Section 3.D, banks with low true capital extended bad loans in order to dress up their balance sheet. Column 3 shows the estimates when we further add the market-valued capital ratio. The coefficient on *MVC* is significant and negative, while the coefficient on *RBC* remains significant and positive. The opposing signs of the two capital ratio coefficients suggest that banks attempted to exploit the difference between true capital and regulatory capital. To check this, we add the difference of the two capital ratios (denoted by *ACCOUNT*) as an explanatory variable (column 4). This variable is meant to capture the degree of discretionary accounting: a higher value of *ACCOUNT* implies a greater degree of discretionary accounting. The coefficient on *ACCOUNT* is positive and significant. This finding is consistent with our hypothesis that banks that are severely constrained by capital requirements tend to engage in discretionary accounting and the rolling over of bad loans. This finding is consistent with Peek and Rosengren [2003] who use an alternative way to estimate the same hypothesis by examining whether banks with reported capital ratios closer to their required ratios are more likely to make loans to weaker firms.

The above interpretation is based on the hypothesis that Japanese banks were severely constrained by capital requirements. In the next step we investigate this hypothesis by examining the effects of components of regulatory capital on bad loans in detail. Regressions of bad loans on each component of regulatory capital may reveal the banks' attitude to capital requirements because banks can easily

manipulate several components of tier 2 capital.[20] We divide the RBC ratio into tier 1 capital and the three major components of tier 2 capital, i.e., unrealized capital gains on securities, general loan loss provisions, and subordinate debt, all of which we divide by risk-adjusted assets.[21] The variables for the three major components are denoted by *GAIN* (for unrealized capital gains on securities), *LOANLOSS* (for general loan loss provisions) and *SD* (for subordinate debt). Banks with large unrealized capital gains on securities and hence large true capital are expected to refrain from extending bad loans. Consequently, we expect the coefficient on *GAIN* to be negative. The effect of general loan loss provisions on bad loans needs some discussion. One might naturally suppose that banks with large bad loans tend to report large general loan loss provisions. Alternatively, according to the discretionary accounting view presented in the previous sections, capital-constrained banks are more likely to underreport general loan loss provisions and to continue bad loans. The coefficient on *LOANLOSS* could therefore be either positive or negative.

The effect of subordinate debt on bad loans is also ambiguous. If recapitalization by subordinate debt diminishes the managerial incentive to extend bad loans as in Proposition 3, we would expect the coefficient on *SD* to be negative. On the other hand, if recapitalization works to promote bad loans as in Proposition 4, we would expect the coefficient on *SD* to be positive.

The estimation result in column 5 shows that the coefficients on *GAIN* and *LOANLOSS* are both negative, though only the latter is significant. The finding on general loan loss provisions supports the hypothesis that capital-constrained banks manipulate regulatory capital. The estimation result also shows that the coefficient on *SD* is significant and positive. This finding supports Proposition 4, according to which, for a severely capital constrained bank, the ability to issue subordinate debt strengthens the managerial incentive to continue bad loans.

We further investigate the perverse effect of subordinate debt on bad loans. In March 1998 and March 1999, the regulatory authorities injected public money into major banks by purchasing subordinate debt. The regulatory authorities may have

had better access to bank information and been able to monitor bank risk-taking behavior more intensively than the private agents that cross-held subordinate debt within the same business group. Taking this supervisory effect into account, we separate the subordinate debt held by private agents from the one held by the government. The result in column 6 shows that the coefficient on subordinate debt held by private agents, denoted by PSD, is significant and positive, while the coefficient on subordinate debt held by the government, denoted by GSD is negative but not significant. The government did not seem to effectively reduce the incentive for banks to roll over bad loans.

Finally, we add four share ownership variables, i.e., $MANAGER$, $KEIRETSU$, and their squared values (column 7). However, none of these turn out to be significant.

We now turn to the estimation results for the regional banks. These are displayed in table III. Some of the results are similar to those for the major banks, but others are not. Column 1 shows that, unlike in the case of the major banks, the coefficients on ROA and $PLAND$ are insignificant. In column 2, the coefficient on RBC is also insignificant. Implementation of the Basel capital standards may not have worked well to restrain regional banks' risk-taking, though its perverse effect is not as clear as in the case of major banks. In column 3, the coefficient on MVC is significant and negative. In column 4, $ACCOUNT$ is significant and positive. This finding seems to support the discretionary accounting hypothesis also for the regional banks.

(Table III should be placed around here.)

Dividing banks' capital into subcategories, we find that the coefficient on SD is significant and positive (column 5). This finding suggests that regional banks also rolled over bad loans by issuing subordinate debt though subordinate debt as a proportion of risk assets is lower on average for the regional banks than for the major banks (Table I). Among the share ownership variables, only $MANAGER^2$ is

marginally significant (column 6).

F. Determinants of subordinate debt levels

Our theoretical model predicts that banks with low true capital are more likely to issue subordinate debt. To test this hypothesis, we estimate the determinants of subordinate debt. The sample period is the same as that of the baseline estimation, 1991–1999.

The dependent variable is SD and the explanatory variables are the same as in equation (4) above, except that the risk-based capital ratio is now calculated with subordinate debt subtracted in the numerator. This adjusted risk-based capital ratio is denoted by $(RBC - SD)$. Table IV reports the results for the major banks. In columns 1 and 2, we see that the coefficient on $(RBC - SD)$ is significant and negative, which is consistent with our theoretical prediction. Columns 3 and 4 show that the coefficient on $GAIN$ is significant and negative, which suggests that subordinate debt was used to offset the decline in tier 2 capital caused by asset depreciation. The magnitude of the coefficient in column 4 implies that for every 100 basis point decrease in unrealized capital gains on securities as a proportion of risk based assets, subordinate debt increases by 44.6 basis points. The coefficient on $PLAND$ is significant and negative in all specifications (columns 1 to 4). Taken together, these results suggest that banks issued subordinate debt and tried to restore RBC ratios damaged by asset depreciation and worsening overall economic conditions. These results are consistent with Ito and Sasaki [2002]) who conducted similar estimations for the period of 1990–1993.

The share ownership variables are also significant (column 4). Point estimates suggest that both $MANAGER$ and $KEIRETSU$ have a positive effect on subordinate debt for most of the relevant ranges (up to 0.15 percent for $MANAGER$ and up to 50.7 percent for $KEIRETSU$). The latter result suggests that banks that had close ties with financial institutions found it easier to issue subordinate debt on non-market terms. Columns 5 to 8 show the results of our estimation of the determinants of privately-held subordinate debt, which are similar to the results

reported in columns 1 to 4.

(Table IV should be placed around here.)

Table V reports the estimation results for the regional banks. From the negative coefficients on $(RBC - SD)$ and its components we see that regional banks also sought to repair damaged capital bases by issuing subordinate debt. The coefficients on $PLAND$ and share ownership, however, are insignificant.

(Table V should be placed around here.)

V. CONCLUSIONS

This paper examined why soft budget problems emerged in the Japanese credit market during the 1990s. We identified the Japanese bad loan problem as a soft budget constraint problem among three tiers of agents, the government, banks, and borrowing firms. At least to our knowledge, this paper is the first that formally analyzes the soft budget problem in a market economy. Our empirical results suggest that poorly capitalized banks attempted to improve their RBC ratios jointly by issuing subordinate debt and by rolling over bad loans. The government responded to the banking problem by allowing the discretionary enforcement of minimum capital requirements, which softened the budget constraints faced by banks and contributed to the increase in bad loans.

The findings of this study have important implications for government policy and how to resolve the banking problem. The theoretical model and the empirical results underpinning it suggest that there remains an incentive for poorly capitalized banks to increase bad loans and hence recapitalization by the government is likely to bring little improvement as long as bank managers are not effectively controlled by outside shareholders, the accounting system is discretionary, and the market for subordinate debt is poorly developed.

None of these conditions has been met so far in the course of the reconstruction

of the Japanese banking system. Although the government encouraged a number of mergers of major banks, the performance of these banks has not improved. Non-performing loans have not declined but rather continued to increase until the beginning of 2003.[22] Values of deferred taxes accounted for a significant part of tier 1 capital for many large banks. It was not until the end of 2002 that the government began to recognize the harmful influences of discretionary accounting. What is more, market forces have just begun to play a role as foreign investors have gradually been replacing *keiretsu*-affiliated firms as bank shareholders. On the other hand, a market for subordinated debt has not yet developed. Only recently, Resona Bank and UFJ Bank, two major banks that emerged as a result of the mergers of smaller outfits and that were recapitalized by the government in the late 1990s, fell into financial difficulties once again.

This paper also provides new insights in the study of the effectiveness of capital requirements. While most studies struggle with the incentive problem of bank shareholders given that bank capital is verifiable (e.g., Koehn and Santomero [1980]; Gennotte and Pyle [1991]; Davies and McManus [1991]), this paper asks to what extent the argument on capital regulation given verifiable bank capital is, in fact, relevant. (If bank capital is actually banks' private information, as our findings suggest, the analysis in this field can be enriched by incorporating this more plausible assumption.

The Japanese experience tells us what happens in the credit market when banks face high minimum capital standards but an accurate evaluation of bank capital is difficult. A bank is an incentive-compatible means to efficiently control agency problems associated with loan assets, as was shown by Diamond [1984] and Boyd and Prescott [1986]. As a result, bank loans are often not marketable and hence bank capital is not observable to or verifiable by outsiders. The government may face difficulties in placing capital requirements at the center of prudential banking regulation.

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Footnotes

1. Hutchison and McDill [1999] report that the average duration of a banking crisis is 3.9 years. For example, the crisis began in 1991 in Sweden and ended in 1994. It began in 1997 In Korea and almost over in 2000.

2. As of March 1993, non-performing loans were estimated at 28.2 trillion yen; however, this is less than the cumulative NPL write-offs amounting to 31.9 trillion yen as of March 2002. It follows that the current stock of non-performing loans, worth 24.5 trillion yen as of March 2002, has been newly accumulated after 1993.

3. Lizar and Svejnar [2002], for example, defined firms that increased their investment in spite of a decrease in cash flow as those subject to a soft budget constraint and applied this definition to an empirical examination of Czech firms. Their definition is indirect, however, in the sense that they do not measure the degree of government support that relaxes firms' budget constraints.

4. The empirical literature on soft budget constraints has a difficult time finding an empirical measure for the softness of the budget constraint. Kornai *et al.* [2003, p1100] observe: "Unfortunately, the empirical measure of hardness and softness vary considerably from study to study and are sometimes quite rough. Furthermore, they are typically not closely grounded in theory,…".

5. Shrieves and Dahl [2003] investigated the accounting practices of Japanese banks and found that less capitalized and less profitable banks tended to report greater security gains and loan loss provisions than healthier banks.

6. Strictly, we assume risk-insensitive, flat-rate deposit insurance pricing, and normalize the deposit insurance premium to be zero.

7. This might be a non-standard assumption in light of the literature on deposit insurance under which facing the possibility of bank insolvency, the bank can exploit

the implicit subsidy from the fixed-rate deposit insurance scheme (e.g. Merton [1977] and Keeley [1990]

8. This objective function is also employed in Rajan [1994], Aghion et al [1999], and Mitchell [2001].

9. However, although we do not pursue this problem further in this paper, such a soft policy would carry the danger that it provides banks with an *ex ante* incentive to choose a riskier loan portfolio

10. As a matter of fact, the case of Hyogo Bank, a regional bank that failed in 1995, is the last one when creditors of subordinate debt were not protected. Since then, creditors of subordinate debt of failed banks have been protected.

11. Strictly speaking, the bank is always solvent to the creditors of subordinate debt under the parameter space satisfying $(X-I)+(Y_L-2I)+A\geq 0$. This can be proved as follows. At the end of the period, the bank is obliged to repay $(3I-A)$ to the depositors. Creditors of subordinate debt are senior to equityholders, but junior to depositors, and so only if $A+2X+Y_L+D_0\geq 3I+D$ creditors of subordinate debt are fully repaid. If $A+2X+Y_L\geq 3I$, $A+2X+Y_L+D_0\geq 3I+D$ automatically holds because creditors are satisfied with $D_0=D$.

12. The Ministry of Finance allowed Japanese banks to count 45 percent of their latent capital gains as part of tier 2 capital in 1990. This is a special rule applied to Japanese banks, but not to banks in the United States or United Kingdom.

13. Hoshi [2000] first pointed out that Japanese banks increased the share of loans to the real estate industry after the collapse of the real estate bubble until 1997.

14. Accordingly, while the loan share to the manufacturing sector was almost constant about 15% over the 1990s, loan shares to the real estate sector and the construction sector rose from 11% to 13% and 5% to 6%, respectively. See Hosono and Sakuragawa [2002] in detail.

15. The data are from the Financial Statement Statistics of Corporations published by Ministry of Finance.

[16] Smith [2003] finds that Japanese banks charged lower interest rates than did foreign banks on syndicated loans, and varied pricing less across risks than did foreign banks.

16. According to the Nihon Keizai Shinbun (June 13, 2001), among the total of non-performing loans, real estate accounted for 32.8 percent, construction for 9.6 percent, and finance for 7.1 percent.

17. Though double gearing through subordinate debt was prevalent between banks and life insurance companies, financial institutions' shareholding ratio is the most-widely available measure for the closeness of *keiretsu* affiliation.

18. We have tested the null hypothesis that bank dummies are jointly zero and have obtained results that reject the null in most of the equations.

19. Shrieves and Dahl [2003] followed a similar approach in order to investigate the behavior of capital-constrained Japanese banks and the practice of discretionary accounting.

20. We ignore land appraisal profits, tax effect accounting and other minor items.

21. Hoshi and Kashyap [2004] describe how severely Japan's banks faced capital shortage problems as of 2003.

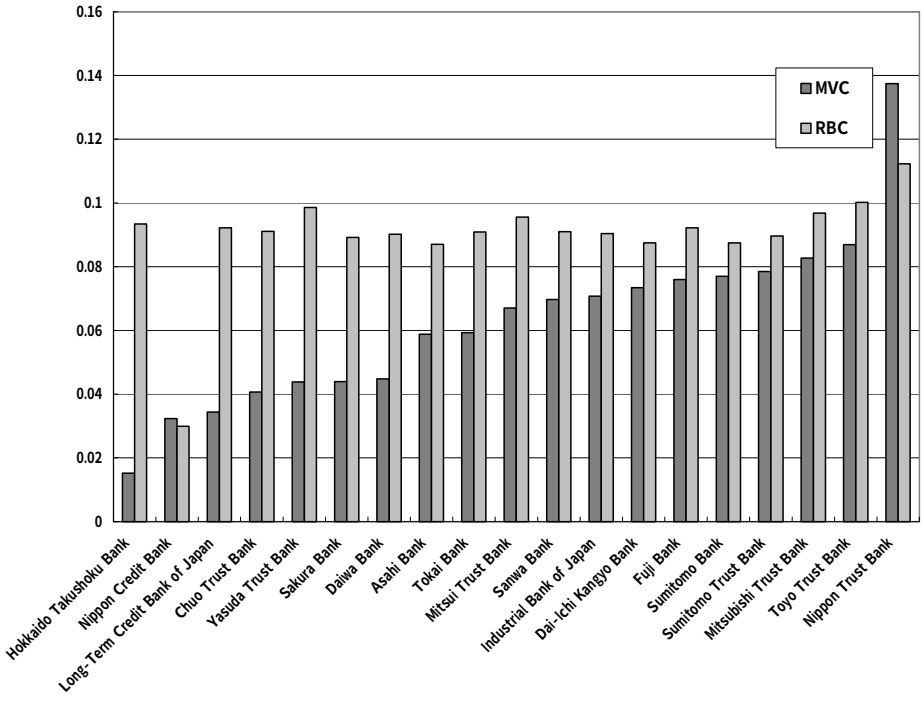

Figure I

The risk-based capital ratio (RBC) and the market-valued capital ratio (MVC) for Japan's major banks as of March 1997

Source: Financial statement of banks and *Kabuka* [*Stock Price*] CD-ROM 2002 published by Toyo Keizai Shimposha.

Note: Market-valued capital is the number of stocks multiplied by the end-of-fiscal-year stock price. MVC is its ratio of the market-valued capital to the sum of the market-valued capital and total debt.

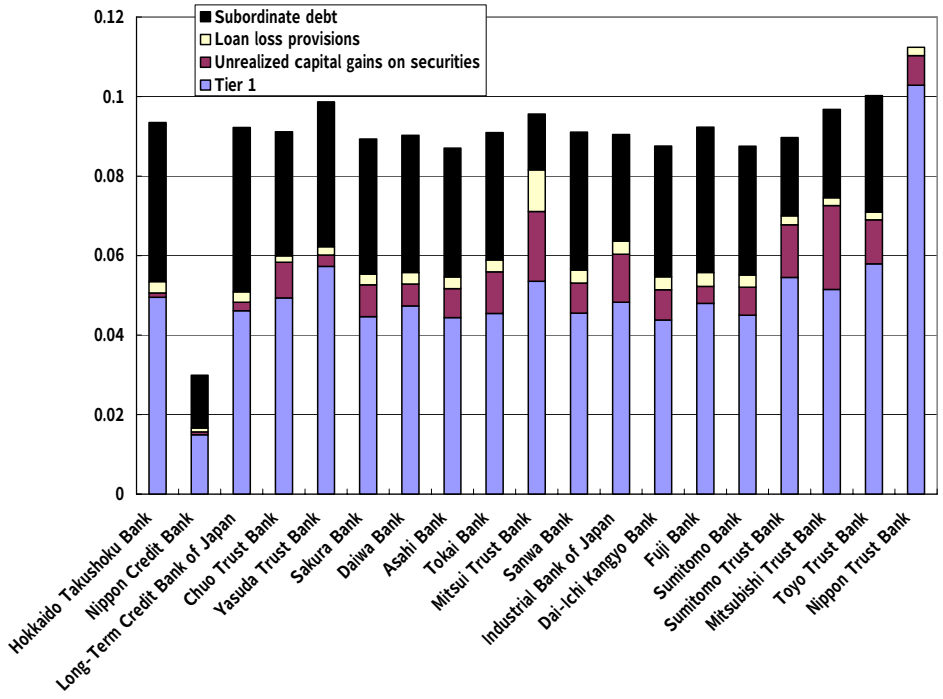

Figure II

Components of the risk based capital (RBC) ratio of Japan's major banks as of March 1997

Source: Financial statements of banks.

Note: The major components of capital as defined by the Basel capital standards as a proportion of risk-adjusted asset are depicted.

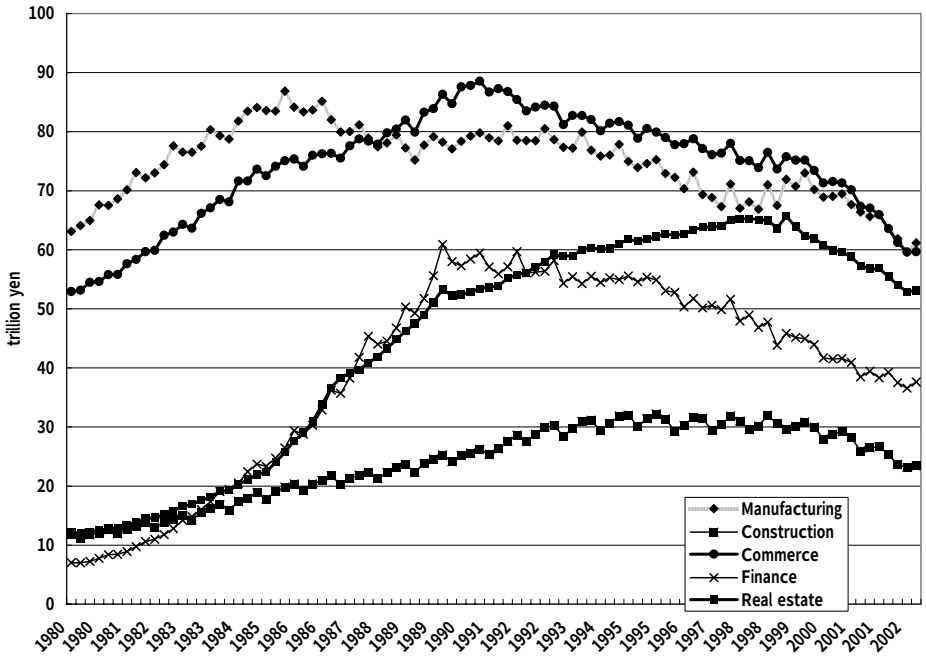

Figure III

Loans outstanding of domestically-licensed Japanese banks,
by industry of borrowing firms

Source: Bank of Japan, www.boj.or.jp

Note: Overdrafts before March 1993 were not included in the original data source and hence estimated by the authors to obtain consistent time series data.

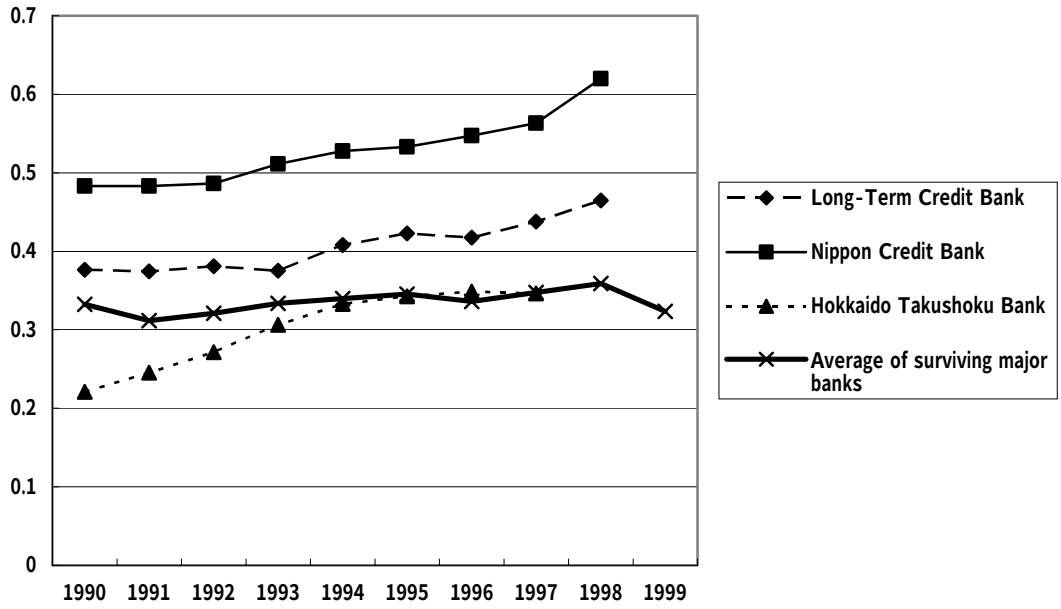

Figure IV

Share of bad loans in total loans: failed major banks
and the average of surviving major banks

Source: Financial statements of banks.

Note: Bad loans are defined as the sum of loans outstanding to the real estate, construction, and financial industries.

TABLE I

Descriptive statistics: 1991-1999

	Major banks		Regional banks	
	Mean	Std. Dev.	Mean	Std. Dev.
Total assets(trillion yens)	28.655	18.925	3.288	2.157
Return on assets (ROA)	0.0058	0.0039	0.0058	0.0020
Bad loan share	0.3450	0.0904	0.2296	0.0452
Change in bad loans	0.0211	0.0871	0.0441	0.0780
RBC ratio (RBC)	0.0961	0.0130	0.0931	0.0090
Market-valued capital ratio (MVC)	0.0817	0.0304	0.0639	0.0186
RBC ratio - Market-valued capital ratio (ACCOUNT)	0.0143	0.0343	0.0292	0.0175
Tier1	0.0548	0.0119	0.0627	0.0111
Tier2	0.0413	0.0095	0.0304	0.0078
Unrealized capital gains on securities (GAIN)	0.0140	0.0107	0.0151	0.0083
Loan loss provisions (LOANLOSS)	0.0036	0.0017	0.0034	0.0010
Subordinate debt (SD)	0.0233	0.0139	0.0117	0.0082
Managers' shareholding ratio (MANAGER)	0.0004	0.0003	0.0044	0.0058
Fin. Inst.'s shareholding ratio (KEIRETSU)	0.3282	0.1178	0.4138	0.1112

Coefficients of correlation with market-valued capital ratios (MVC)

RBC ratio (RBC)	-0.1054	0.3597
RBC ratio - Market-valued capital ratio (ACCOUNT)	-0.9261	-0.8791
Tier1	0.0721	0.3446
Tier2	-0.2340	-0.0783
Unrealized capital gains on securities (GAIN)	0.5788	0.3550
Loan loss provisions (LOANLOSS)	-0.0709	-0.0951
Subordinate debt (SD)	-0.5738	-0.4018
No. of obs.	172	497

TABLE II

The determinants of bad loans: Major banks

Dependent variable: Share of Bad Loans

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Return on assets (ROA)	-1.261 *	-1.352 *	-1.380 *	-1.322 *	-1.778 **	-1.966 **	-1.797 **
	(0.680)	(0.694)	(0.702)	(0.689)	(0.669)	(0.648)	(0.612)
Rate of increase in land prices (PLAND)	-0.064 **	-0.059 **	-0.064 **	-0.068 **	-0.070 **	-0.073 **	-0.075 **
	(0.029)	(0.027)	(0.026)	(0.027)	(0.025)	(0.022)	(0.023)
Logarithm of assets (ASSET)	0.047	0.052 *	0.047	0.043	0.057 *	0.033	0.051 *
	(0.029)	(0.030)	(0.030)	(0.028)	(0.030)	(0.029)	(0.027)
RBC ratio (RBC)		0.460 *	0.523 *				
		(0.274)	(0.278)				
Market-valued capital ratio (MVC)			-0.186 *				
			(0.109)				
RBC ratio - Market-valued capital ratio (ACCOUNT)				0.218 **			
				(0.110)			
Tier1					-0.084	0.077	0.714
					(0.451)	(0.426)	(0.494)
Unrealized capital gains on securities (GAIN)					-0.250	-0.399	-0.472
					(0.457)	(0.419)	(0.352)
Loan loss provisions (LOANLOSS)					-3.495 **	-3.489 **	-2.717 **
					(1.451)	(1.365)	(1.321)
Subordinate debt (SD)					0.949 **		
					(0.390)		
Subordinate debt held by private agents (PSD)						1.523 **	1.372 **
						(0.460)	(0.518)
Subordinate debt held by government (GSD)						-1.752	-2.247
						(1.083)	(1.783)
Managers' shareholding ratio (MANAGER)							3.403
							(35.620)
Managers' shareholding ratio^2 (MANAGER^2)							-11886.0
							-10017.5
Fin. Inst.'s shareholding ratio (KEIRETSU)							0.323
							(0.550)
Fin. Inst.'s shareholding ratio^2 (KEIRETSU^2)							-0.385
							(0.552)
No. of obs.	172	172	172	172	172	172	171
No. of banks	23	23	23	23	23	23	23
Adjusted R^2	0.961	0.962	0.963	0.963	0.964	0.967	0.969

TABLE III
The determinants of bad loans: Regional banks

Dependent variable: Share of bad loans

	(1)	(2)	(3)	(4)	(5)	(6)
Return on assets (ROA)	0.097	0.121	0.232	0.163	0.022	0.049
	(0.542)	(0.550)	(0.551)	(0.543)	(0.546)	(0.550)
Rate of increase in land prices (PLAND)	-0.011	-0.010	-0.010	-0.011	-0.006	-0.006
	(0.009)	(0.009)	(0.008)	(0.008)	(0.009)	(0.010)
Logarithm of assets (ASSET)	-0.014	-0.014	-0.016	-0.015	-0.007	-0.006
	(0.017)	(0.017)	(0.017)	(0.017)	(0.018)	(0.018)
RBC ratio (RBC)		-0.048	0.031			
		(0.125)	(0.128)			
Market-valued capital ratio (MVC)			-0.161 **			
			(0.051)			
RBC ratio - Market-valued capital ratio (ACCOUNT)				0.150 **		
				(0.049)		
Tier1					-0.196	-0.168
					(0.153)	(0.159)
Unrealized capital gains on securities (GAIN)					-0.297	-0.329
					(0.215)	(0.233)
Loan loss provisions (LOANLOSS)					2.923	2.669
					(1.878)	(1.881)
Subordinate debt (SD)					0.403 **	0.395 **
					(0.181)	(0.188)
Managers' shareholding ratio (MANAGER)						-0.747
						(0.500)
Managers' shareholding ratio^2 (MANAGER^2)						13.364 *
						(7.597)
Fin. Inst.'s shareholding ratio (KEIRETSU)						0.002
						(0.124)
Fin. Inst.'s shareholding ratio^2 (KEIRETSU^2)						-0.126
						(0.165)
No. of obs.	504	504	504	504	504	500
No. of banks	70	70	70	70	70	70
Adjusted R^2	0.942	0.941	0.943	0.943	0.943	0.945

TABLE IV
The determinants of subordinate debt: Major banks

Dependent variable	Subordinate debt outstanding as a share of risk assets				Subordinate debt outstanding held by private agents as a share of risk assets			
	(1)		(3)	(4)	(5)	(6)	(7)	(8)
Return on assets (ROA)	0.574 **	0.574 **	0.655 **	0.671 **	0.243	0.242	0.262 *	0.261 *
	(0.184)	(0.184)	(0.185)	(0.189)	(0.154)	(0.150)	(0.158)	(0.144)
Rate of increase in land prices (PLAND)	-0.009 *	-0.009 *	-0.010 *	-0.011 **	-0.008	-0.008	-0.009 *	-0.010 **
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Logarithm of assets (ASSET)	-0.020 **	-0.020 **	-0.019 **	-0.008	-0.015	-0.014	-0.014	0.000
	(0.009)	(0.009)	(0.008)	(0.008)	(0.010)	(0.010)	(0.009)	(0.007)
RBC ratio − SBD/Risk asset (RBC−SD)	-0.337 **	-0.344 **			-0.211 **	-0.230 **		
	(0.093)	(0.102)			(0.082)	(0.093)		
Market-valued capital ratio (MVC)		0.006				0.018		
		(0.038)				(0.036)		
Tier1			-0.195	0.010			-0.147	0.097
			(0.121)	(0.117)			(0.117)	(0.100)
Unrealized capital gains on securities (GAIN)			-0.380 **	-0.446 **			-0.201	-0.264 **
			(0.140)	(0.118)			(0.123)	(0.098)
Loan loss provisions (LOANLOSS)			0.349	0.765 **			-0.118	0.449
			(0.301)	(0.285)			(0.306)	(0.275)
Managers' shareholding ratio (MANAGER)				23.212 **				14.699 *
				(9.097)				(8.056)
Managers' shareholding ratio^2 MANAGER^2)				-7863.2 **				-5985.1 **
				(2720.3)				(2517.9)
Fin. Inst.'s shareholding ratio (KEIRETSU)				0.191 **				0.305 **
				(0.084)				(0.083)
Fin. Inst.'s shareholding ratio^2 (KEIRETSU^2)				-0.188 **				-0.309 **
				(0.089)				(0.085)
No. of obs.	172	172	172	171	172	172	172	171
No. of banks	23	23	23	23	23	23	23	23
Adjusted R^2	0.895	0.895	0.894	0.907	0.883	0.883	0.880	0.904

TABLE V
The determinants of subordinate debt: Regional banks

Dependent variable	Subordinate debt outstanding as a share of risk assets			
	(1)	(2)	(3)	(4)
Return on assets (ROA)	0.008	0.004	0.020	-0.061
	(0.179)	(0.178)	(0.181)	(0.132)
Rate of increase in land prices (PLAND)	0.000	0.000	-0.001	0.000
	(0.002)	(0.002)	(0.002)	(0.002)
Logarithm of assets (ASSET)	-0.017 **	-0.017 **	-0.019 **	-0.019 **
	(0.003)	(0.003)	(0.003)	(0.003)
RBC ratio − SBD/Risk asset (RBC−SD)	-0.404 **	-0.408 **		
	(0.035)	(0.037)		
Market-valued capital ratio (MVC)		0.005		
		(0.013)		
Tier1			-0.427 **	-0.415 **
			(0.041)	(0.039)
Unrealized capital gains on securities (GAIN)			-0.319 **	-0.310 **
			(0.053)	(0.049)
Loan loss provisions (LOANLOSS)			-1.429 **	-1.384 **
			(0.475)	(0.479)
Managers' shareholding ratio (MANAGER)				-0.160
				(0.119)
Managers' shareholding ratio^2 (MANAGER^2)				1.222
				(1.911)
Fin. Inst.'s shareholding ratio (KEIRETSU)				-0.022
				(0.029)
Fin. Inst.'s shareholding ratio^2 (KEIRETSU^2)				0.067
				(0.041)
No. of obs.	497	497	497	493
No. of banks	70	70	70	70
Adjusted R^2	0.909	0.909	0.911	0.923