Bank Organization and Screening Performance

Takeo Hoshi

Working Paper No. 110

Takeo Hoshi
Graduate School of International Relations and Pacific Studies
University of California, San Diego
La Jolla, CA

This paper was presented at the conference Emerging Trends in Japanese Financial Markets held at Columbia University on December 8-9, 1995. The conference was sponsored by the Center on Japanese Economy and Business and organized by Professor Yasushi Hamao

Working Paper Series
Center on Japanese Economy and Business
Graduate School of Business
Columbia University
February 1996
ABSTRACT

This paper develops a simple model of organization design for a bank by modifying the model by Sah and Stiglitz (1986). Two alternative forms of bank organization are considered. In the “single-layered” organization, each loan candidate is screened only once. In the “double-layered” organization, loans are screened twice and have to be accepted by two independent decision units. It is shown that the single-layered organization originates more loans but its portfolio includes a higher proportion of bad loans compared with the double-layered organization. The profits for a bank with single-layered organization are higher than that with double-layered organization if (a) the quality of initial portfolio is high, (b) the problem of Type I error is serious, (c) the problem of Type II error is small, and/or (d) the screening cost is high. When the bank optimally chooses the intensity of screening, given the organizational structure, the bank with single-layered organization chooses a higher level of efforts to improve the screening skill. The preliminary empirical analysis suggests that the model is consistent with the recent experience in Japanese banking.

1. Introduction

Japanese banks currently face an enormous problem of bad loans. The amount of bad loans is estimated to be 23.4 trillion yen (about 234 billion dollars) for 21 major banks (city banks, trust banks, and long-term credit banks), and 37.4 trillion yen (roughly 374 trillion dollars) for all the financial institutions, or 7.8% of GDP.\(^1\) If one includes the amount of loans for which the interest rate was reduced but not to below the discount rate, the amount of bad loans would increase a lot. Some non-governmental estimates suggest the amount of bad loans in this broader sense may exceed 100 trillion yen, or more than 20% of GDP. Then, the size of the problem is comparable to the insolvency problem that the Japanese banks faced immediately after the war when the Japanese government repudiated the war debts, when the amount of repudiated government debts and guarantees amounted to almost 20% of GNE (gross national expenditure). To tackle the insolvency problem, Japanese banks had to go through massive restructuring, which wiped off most of their capitals, forced many of them to cancel some deposits, and required them to recapitalize.\(^2\)

Many bad loans today are those made in the late 1980s when the Japanese economy was moving and both stock and land prices were rising. Many loans were made to real estate related business with land as collateral. As the stock and land prices started to fall rapidly and the economy entered in a recession in the 1990s, the real estate related loans have turned into troubled loans. At the same time, the value of collaterals of those loans also fell because of the land price fall. This made the problem for banks more serious: the market values of collaterals were often far less than the book value of loans.

\(^1\) The numbers are the sum of loans for failed companies, loans for which the interest payment has been suspended for more than 6 months, and loans with interest rates below the official discount rate, as of the end of September 1995. The Ministry of Finance surveyed all the financial institutions and published the result on November 14, 1995.

\(^2\) See Hoshi (1995) for a detailed account of bank restructuring and recapitalization in the postwar reconstruction period.
Besides the increase of real estate loans, the 1980s noticed another change in the Japanese banking. This change happened inside the bank organization. Many banks changed the internal organization to simplify and speed up the loan origination process. More specifically, many banks abolished credit supervision divisions that used to double check the loans proposed by branches.

This paper argues that the change in bank portfolio toward real estate loans is related to the organizational change. Applying a model of economic organization developed by Sah and Stiglitz (1986), I show the type of organizational change that many Japanese banks went through in the 1980s increases the proportion of bad loans in bank assets. The paper also reports a preliminary empirical result that suggests the organizational change to abolish an independent credit supervision division in fact lead to worsening of portfolio.

The paper is organized as follows. The next section examines what type of organizational change that many Japanese bank went through, by examining the case of Sumitomo Bank, which first carried out such a reorganization among Japanese banks. Section 3 develops a model of bank organizational structure and loan origination based on Sah and Stiglitz (1986). Section 4 reports the preliminary empirical result, and the final section concludes.

2. Organizational Change: Case of Sumitomo

Sumitomo Bank was the first one among Japanese banks to implement an organizational change that eliminated credit evaluation function independent of other business promotion. Around 1977, Sumitomo Bank started contemplating a major reorganization of bank structure to increase its profitability, which had been falling consistently. In early 1978, Sumitomo invited McKinsey & Company, Inc. to work on a major reorganization plan. The work by Sumitomo/McKinsey joint team culminated in a proposal, which stressed the importance of six principles: (i) capturing profit opportunities in international operation, (ii) responding to market needs in each region, (iii)

---

3 The description of Sumitomo case depends on Sumitomo Bank (1985).
stressing the importance of profits at branches, (iv) dealing with large corporate customers who are reducing their dependence on banks, (v) systematically managing assets and liabilities, and (vi) striking balance between decentralization of decision and control of assets quality. The report advocated the organization divided according to market segment (i.e., by region, domestic/international, large customers/small customers, etc.) rather than the traditional one divided according to function (business promotion, credit supervision, foreign exchange, etc.) It also suggested improving decision making process to achieve efficient responses to profit opportunities.

The report, which was submitted on December 1, 1978, formed the foundation for the reorganization that Sumitomo undertook in 1979. The new organizational structure started on July 2. Figures 1 and 2 compare the old and the new structures of Sumitomo Bank. The new structure defines a division by the market segment it serves. For example, the Main Office Business Operation Department (Honten Eigyo Honbu) deals with large corporate customers in western Japan, and the Tokyo Business Operation Department (Tokyo Eigyo Honbu) serves large corporate customers in eastern Japan. Similarly, the Tokyo Business Department (Tokyo Gyomu Honbu) and the Business Department (Gyomu Honbu) handle small corporate customers and individual customers in eastern and western Japan respectively. All the functions, including both business promotion and credit monitoring, are done within a business division, which handles the customer, and there is no division like the credit supervision division in the old structure, which evaluates the loan independently from a business department. Although there is Credit Planning Division under the Planning Department, it cannot evaluate individual loans. Business Headquarter (Gyomu So-Honbu) and Business Operation Headquarter (Eigyo So-Honbu) could extend loans without consulting the Planning Headquarter (Kikaku So-Honbu).

Compared with the old structure, the new structure has more streamlined decision making process. Duplications of efforts between divisions are minimized by assigning each customer to only one division and by not requiring double check of loans at the Credit Supervision Division.
After Sumitomo Bank changed its organizational structure, many Japanese banks followed. Many of those reorganizations had the same idea: making the decision making process more efficient by eliminating the double check by a credit supervision division. What are the implications of this type of organizational change? Did it lead to more efficient banking and higher profits? Did it have some unwanted side effects? This paper tries to answer these questions in the next two sections.

3. Bank Organization and Screening: A Model

This section develops a model that allows us to discuss the relation between bank organization and loan portfolio. The model is a simple version of Sah and Stiglitz (1986) modified to fit the banking issues.

3.1. Basic Model

I consider two types of bank organization distinguished by whether credit supervision divisions are present or not. In both types of organization, the bank has a branch banking (or business promotion) division, which identifies good loans and recommends the bank to originate the loans. In one type of organization, which is from now on called “double-layered,” the bank has a credit supervision division, which rechecks the loan opportunities suggested by the branch banking division. The bank generates only those loans recommended also by the credit supervision division. The other type, which is from now on called “single-layered,” does not have a credit supervision division, and the bank originates all the loans suggested by the branch banking division.

Figure 3 shows the structure of single-layered organization and that of double-layered organization graphically. A reader who is familiar with Sah and Stiglitz (1986) paper will immediately recognize that the double-layered structure is the same as what they call “hierarchy”: a project must be accepted by both divisions. The single-layered structure, however, is slightly different from “polyarchy,” the other type of organization that Sah and Stiglitz (1986) consider. In
the polyarchy, a project rejected by one division would be reconsidered by the other division, and the project would be included in the final portfolio if either one of the two divisions accepts it. The single-layered organization screens projects only once. If a project is accepted, it is included in the final portfolio. If a project is rejected, it does not have a second chance. The organizational change at Sumitomo Bank, which was summarized in the last section, can be considered as a shift from a double-layered system to a single-layered system.

A bank is assumed to face a continuum of loan candidates, each of which requires the same amount of lending. An individual loan can be either "good" or "bad." The total size of loan candidates for each bank is assumed to be the same and normalized to one. A good loan yields the net revenue of \( X \) to the bank with probability one, and a bad loan yields the net loss of \( Z \) to the bank with probability one. Let \( q \) be the proportion (and amount, because of our normalization) of good loans in the population. Then, the proportion of bad loans is given by \( 1-q \). The bank does not know ex ante if a loan is good or bad, but the branch banking division can get a signal for the loan quality. The branch banking division recommends the bank to originate the loan when it receives a "good" signal. Let \( p_g \) be the probability that the signal is good when the loan is good. Let \( p_b \) be the probability that the signal is good when the loan is bad. Assume the signals are better than the totally random signal, i.e., \( 0 \leq p_b < 1/2 < p_g \leq 1 \). A credit supervision division, if it exists, receives a same time of signal that is independent of the signal that branch banking division receives.

The tasks of branch banking division and credit supervision division are essentially the same in this simple model. Both evaluate loan candidates using the same type of signal. Branch banking and credit supervision divisions represent what Sah and Stiglitz (1986) call screening rules. In a single-layered system, the screening happens only once at branch banking. In a double-layered system, however, the screening is done twice: once by branch banking and for the second time by credit supervision. The difference of single screening and double screening leads to a difference in the resulting loan portfolios, as we will see below.
In a single-layered bank organization, a good loan is accepted with probability $p_g$, and a bad loan is accepted with probability $p_b$. Since the proportion of good loans in the initial portfolio is $q$, the amount of loans generated by a single-layered system is given by $p_g q + p_b (1-q)$. In a double-layered organization, the loan candidates have to pass two screens. Thus, the probability of acceptance for a good loan is given by $p_g^2$ and that for a bad project is $p_b^2$. Then, the amount of loans originated is $p_g^2 q + p_b^2 (1-q)$. It is straightforward to see the followings.

**Proposition 1:**

1. The amount of loans originated by a bank with single-layered organization is higher than that by a bank with double-layered organization, i.e.,
   
   \[ p_g q + p_b (1-q) > p_g^2 q + p_b^2 (1-q). \]

2. The proportion of bad debt in bank portfolio is lower for a bank with double-layered organization, i.e.,

   \[ \frac{p_b (1-q)}{p_g q + p_b (1-q)} > \frac{p_b^2 (1-q)}{p_g^2 q + p_b^2 (1-q)}. \]

**Proof:** Straight forward. Omitted.

Thus, holding $p_g$ and $p_b$ constant (no changes in the screening ability), a shift from a double-layered system to a single-layered system will increase the amount of loans and the proportion of bad debts.

Next, let us compare the profits under the two alternative organizational structures. Letting $c$ be the cost of evaluating one unit of loan candidates, the profit of a bank with a single-layered organization is given by $p_g q X - p_b (1-q) Z - c$, and that of a bank with a double-layered organization is $p_g^2 q X - p_b^2 (1-q) Z - 2c$. The difference of profits can be written as:
(1) \( (1-q)Z[\alpha p_g(1-p_g) - p_b(1-p_b)] + c, \)

where \( \alpha = qX/[Z(1-q)] \) is a measure of the quality of loans in the population. If there are as many good loans as bad loans (i.e., \( q=1/2 \)), \( \alpha \) is greater than one if and only if the revenue from a good project, \( X \), exceeds the loss from a bad project, \( Z \).

Let \( f(p_g, p_b, \alpha, c) \) be the expression (1). A single-layered organization brings higher profits than a double-layered organization if and only if \( f(p_g, p_b, \alpha, c) > 0 \). Figure 4 shows loci of \( f(p_g, p_b, \alpha, c) = 0 \) in the relevant portion of \( p_g-p_b \) space for several values of \( \alpha \) and \( c \). If \( \alpha = 1 \) and \( c=0 \), \( f(p_g, p_b, \alpha, c) = 0 \) is given by the straight line with slope \(-1\). If \( c > 0 \) or \( \alpha \neq 1 \), \( f(p_g, p_b, \alpha, c) = 0 \) is not a straight line anymore. The curve AC shows an example of \( f(p_g, p_b, \alpha, c) = 0 \) when \( \alpha \) is large, i.e., \( qX \) is large compared with \( (1-q)Z \), suggesting high profitability of the initial portfolio. More specifically, the condition for the curve to look like AC (\( f(p_g, p_b, \alpha, c) = 0 \) hits the \( p_b = 1/2 \) line) is given by \( (1-\alpha)/4\alpha < c/qX \). The curve BC gives another possibility, which may arise when \( \alpha \) is small. The condition for the curve to look like BC is given by \( (1-\alpha)/4\alpha > c/qX \).\(^4\) Both AC and BC are drawn for the same value of \( c \), and the point C is given by \( (p_g, p_b) = (1, (1-\sqrt{1-4c/(1-q)Z})/2) \).

In each case, \( f(p_g, p_b, \alpha, c) < 0 \) in the region above the curve, and \( f(p_g, p_b, \alpha, c) > 0 \) in the region below the curve. Higher \( \alpha \) and/or higher \( c \) push up the curve, so that the region where

\(^4\) If \( (1-\alpha)/4\alpha \) is exactly equal to \( c/qX \), \( f(p_g, p_b, \alpha, c) = 0 \) goes through \( (p_g, p_b) = (1/2, 1/2) \), but it is not a straight line and goes through \( (p_g, p_b) = (1, (1-\sqrt{\alpha})/2) \).
Proposition 2: Single-layered organization tends to yield higher profits when:

(i) $p_g$ and $p_b$ are small,

(ii) $\alpha$ is large, and

(iii) $c$ is large.

Double-layered organization tends to do yield higher profits when:

(i) $p_g$ and $p_b$ are large,

(ii) $\alpha$ is small, and

(iii) $c$ is small.

The results can be interpreted intuitively. As Sah and Stiglitz (1986) point out, two systems differ in the relative likelihood of Type I error (rejecting a good loan) and Type II error (accepting a bad loan). Since a loan has to go through the screening process twice to get approved under a double-layered system, Type I error increases while Type II error falls. Thus, when Type II error is a more serious problem than Type I error, the double-layered organization tends to do better than the single-layered organization. Note $(1-p_g)$ is the probability of Type I error in each screening and $p_b$ is the probability of Type II error. The proposition shows that when $1-p_g$ is small (i.e., low Type I error) and $p_b$ is large (i.e., high Type II error), the double-layered structure does better. Type II error becomes a serious problem when there are many bad loans out there and the cost of making a bad loan is large, i.e. when the quality of initial portfolio, $\alpha$, is low. In such a case, the double-layered structure does better. Finally, unlike the model of hierarchy and polyarchy by Sah and Stiglitz (1986), two alternative organizational structures considered in this paper have different costs. The cost is unambiguously higher for the double-layered structure because it screens each
loan twice. Thus, when the screening cost, \( c \), is high, the single-layered structure tends to do better.

3.2. Endogenous Monitoring Intensity

Effectiveness of screening, represented by \( p_g \) and \( p_b \), has been assumed constant so far. It is probably more reasonable, at least for the long run, to assume that a division in a bank can improve its ability to evaluate loans by putting in some efforts. Then, the difference in organizational structures may influence the amount of efforts taken by each division and the overall screening performance. This subsection considers such an extension of the basic model.

Assume that \( p_g \) and \( p_b \) are now functions of the effort level, \( m (>0) \), of a division. Let \( p_g(m) \) and \( p_b(m) \) denote those functions, and assume \( p_g' > 0, p_b' < 0, p_g'' < 0, \) and \( p_b'' > 0 \), where \( f' \) denotes the first derivative of function \( f(\cdot) \) and \( f'' \) denotes its second derivative. Assume \( p_g(0) = p_b(0) = 1/2, \lim_{m \to \infty} p_g(m) = 1, \) and \( \lim_{m \to \infty} p_b(m) = 0 \), so that zero level of efforts implies totally random screening and the infinite level of efforts implies the perfect screening. By putting more efforts, they can lower both Type I error \((1-p_g)\) and Type II error \((p_b)\). For simplicity, assume that a marginal increase in the effort level reduces both types of errors by the same magnitude, i.e., \( p_g' = -p_b' \). The marginal reduction of those errors is decreasing in the effort level. Efforts are costly, and the cost of efforts is assumed to be \( C(m) \) with \( C' > 0 \) and \( C'' > 0 \).

To ensure internal solutions to the maximization problems below, assume \( p_g'(1/2) = \infty, p_b'(1/2) = -\infty, \lim_{m \to \infty} p_g'(m) = 0, \lim_{m \to \infty} p_b'(m) = 0. \)

First, consider the choice of effort level in a single-layered organization. The profit maximizing level of effort is the solution to the following maximization problem:

\[
(2) \quad \max_m qXp_g(m) - (1-q)Zp_b(m) - C(m).
\]

The first order condition is given by:

\[
qXp_g'(m) - (1-q)Zp_b'(m) - C'(m) = 0.
\]

Noting that \( p_g' = -p_b' \), one can rewrite this as:
where \( m^* \) denotes the optimal level of \( m \) under the single-layered organization.

Similarly, the optimal level of effort in the double-layered organization is given by the solution to the following maximization problem:

\[
\max_m qX[p_g(m)]^2 - (1 - q)Z[p_b(m)]^2 - 2C(m).
\]

Note that a loan must go through screening twice and each division must pay for the efforts. The first order condition for the maximization is given by:

\[
2qXp_g(m)p_g'(m) + 2Zp_b(m)p_b'(m) - 2C'(m) = 0,
\]

which can be rewritten as:

\[
\frac{C'(m^d)}{p_g'(m^d)} = qXp_g(m^d) + (1 - q)Zp_b(m^d),
\]

noting that \( p_g' = -p_b' \). The optimal level of \( m \) under the double-layered organization is denoted by \( m^d \).

Comparing (3) and (5), and noting \( p_g \) and \( p_b \) are probabilities (i.e., between 0 and 1), one can show:

\[
\frac{C'(m^d)}{p_g'(m^d)} < \frac{C'(m^s)}{p_g'(m^s)}.
\]

Because \( C'' > 0 \) and \( p_g'' < 0 \), the function \( C'/p_g' \) is increasing in its argument. This establishes the following proposition.

**Proposition 3:** If the effectiveness of loan screening process is a function of efforts, and an increment to an effort level always lowers the two types of errors by the same magnitude (i.e., \( p_g' = -p_b' \)), the optimal level of effort for the single-layered organization is strictly higher than that for
the double-layered organization.

Because the single-layered organization screens the loan candidates only once, it invests more in screening technology than a double-layered organization would to make the right decision.

When the banks are allowed to choose the magnitude of screening optimally, the profits comparison between alternative organizational structures becomes difficult. The earlier analysis does not apply because each organizational structure has different screening technology. The following proposition establishes a very limited condition that enables a simple performance comparison between two structures.

**Proposition 4:** Let \( m^s \) and \( m^d \) denote the optimal level of screening effort in the single-layered organization and that in the double-layered organization respectively. Then,

(i). If \( (p_g(m^d), p_b(m^d)) \) lies in the region below the threshold \( f(p_g, p_b, \alpha, c) = 0 \) in Figure 4, the profits of the single-layered organization are higher than those of the double-layered organization.

(ii). If \( (p_g(m^s), p_b(m^s)) \) lies in the region above the threshold \( f(p_g, p_b, \alpha, c) = 0 \) in Figure 4, the profits of the double-layered organization are higher than those of the single-layered organization.

**Proof:** The region below the threshold \( f(p_g, p_b, \alpha, c) = 0 \) in Figure 4 is where the single-layered organization has higher profits than the double-layered organization when they have the same screening technology. If \( (p_g(m^d), p_b(m^d)) \) lies in the region, it means that the single-layered organization has higher profits than the double-layered organization when they are forced to put in the level of efforts that is optimal for the double-layered organization, which is suboptimal for the single-layered organization. Since the single-layered organization has higher profits than the double-layered organization at a suboptimal level of \( m \), it must have higher profits at the optimal
level. A similar argument can be made to prove the second part.

4. Empirical Exploration

The simple model developed in the last section has several interesting empirical implications to organizational changes in Japanese banking. The type of organizational change that many Japanese banks went through can be considered as the shift from the double-layered organizational structure to the single-layered organizational structure. The analysis in the last section suggests the following empirical implications.

If the magnitude of screening does not change when the organizational structure changes, which may be a reasonable assumption in the short run, the shift to the single-layered structure leads to a larger amount of lending (Proposition 1). In addition, Proposition 1 also implies deterioration of bank portfolio. Proposition 2 implies that the organizational change increases the profits if the quality of the initial portfolio of loan candidates is high, Type I error is more serious problem than Type II error (i.e., high $1-p_g$ and low $p_b$), and screening cost is high. If the initial portfolio has a low quality, Type II error is more serious, and screening cost is low, the organizational change should decrease the profits.

As a bank adapts to its new organizational structure, it may start to change the level of screening efforts. Proposition 3 shows that the shift from the double-layered organization to the single-layered organization must be accompanied by an increase in the intensity of screening.

This section tries to check if the data from Japanese banks are consistent with these empirical implications. The data on organizational structure and performance for 11 city banks were collected, and I made simple calculations to check if the model seems to fit the data.\(^5\)

I have collected the organizational charts for 13 city banks as of the end of March, 1985.

\(^5\) Obviously, the number of observation (11) is too small for me to allow any reliable statistical tests. I plan to expand the analysis to include the other 140 banks (regional, trust, and long-term credit) in Japan in the future version of this paper.
and March 1989. The two dates roughly correspond to the beginning and the peak of asset markets boom in Japan, frequently called “bubble economy.” Since many problem loans were made at the peak of the bubble economy, we expect the organizational structure in 1989 is more closely related to the performance in the 1990s.

The model in the last section suggests that we can distinguish between organizational structures by examining whether the loan decision at branch division or business promotion division is rechecked at a credit supervision division. Wakabayashi (1991) suggests that we observe three different ways to arrange the credit supervision division and business promotion division. Figure 5 shows the three alternative arrangements suggested by Wakabayashi (1991). In the arrangement A, the business promotion department handles credit supervision. In the arrangement B, the business promotion and credit supervision are two sub-departments in the same head department. Finally, in the arrangement C, there is a credit supervision department that is independent of a business promotion department.

From the point of view of our model, the arrangements A and B are not very much different, because loan candidates are screened only once. In the arrangement C, a loan accepted by a branch and the business department will be rechecked at the credit supervision department. Thus, I ignore the difference between the arrangements A and B, and distinguish only two types of organizational structures, “single-layered” (A or B) or “double-layered” (C).

Table 1 shows the organizational structures for all city banks in 1985 and 1989. Because the merger between Mitsui and Taiyo Kobe that created Sakura had not happened in the 1980s, the table shows the organizational structures of both Mitsui and Taiyo Kobe. In 1985, both banks had double-layered structure, but by 1989, Taiyo Kobe’s organizational structure had changed to a single-layered one. Similarly, the merger between Kyowa and Saitama that formed Asahi had not

---

6 There were 13 city banks in the 1980s. The merger between Mitsui Bank and Taiyo Kobe Bank in 1990 and that between Saitama and Kyowa in 1991 reduced the number of banks to 11.
happened in the 1980s. Accordingly, the table shows the organizational structure for both Kyowa and Saitama banks. Fortunately for our analysis, both Kyowa and Saitama had single-layered organizational structure in both 1985 and 1989.

The model in the last section predicts that bank organization influences the portfolio selection of the bank. Table 2 shows the result of a preliminary analysis. For each bank, the table shows (i) the growth rates of loans, (ii) the proportion of bad loans in total loans, and (iii) the proportion of loans to real estate sector in total loans. The averages of these variables for the banks with double-layered organization are compared to those for the banks with single-layered organization, and we will check the difference is consistent with the implications of the model. Given the number of observations, we cannot expect to get a statistically significant result.7

The model in the last section predicts that a single-layered organization makes more loans than a double-layered organization, given the same screening technology at each division. Table 2 shows the result for city banks is consistent with this implication, as far as the point estimates are concerned. If we use the organizational structure in 1985 to distinguish between single-layered organization and double-layered organization, the growth rate of loans from 1985 to 1989 was on average 53.65% for double-layered organization and 59.83% for single-layered organization. If we use the structure in 1989 for distinction, the loan growth was on average 54.43% for double-layered organization and 58.11% for single-layered organization. Similarly, the loan growth from 1989 to 1993 was also higher for banks with single-layered organization.

The simple average may give too much weight on a single bank. To avoid this problem, the table also shows the average growth rate weighted by the amount of loans. Thus, the weighted average is equivalent with the growth rate of the sum of loans. Using the weighted averages instead of simple averages does not change the results. The single-layered organization encourages the growth of loans more than the double-layered organization does, which is consistent with the

---

7 In a future version of this paper, I plan to do more formal tests by expanding the sample to include regional banks, long-term credit banks, and trust banks.
The model also implies that the proportion of bad loans will be higher for the single-layered organization. Table 2 reports the proportion of bad loans to total loans for each bank. The bad loans here are defined as the loans for failed companies and the loans for which the payments have been suspended for more than 6 months. The loans with interest rate concessions are not included in the definition of bad loans, because Japanese banks did not have to (and did not) disclose those loans until very recently. The numbers for bad loans ratios in the table were taken from the financial statements for the period ending on September 30, 1993. Again comparing the average for double-layered organization to that for single-layered organization, we can check if the result is consistent with the model’s implication. The differences in averages are all consistent with the model, although the difference is sometimes very small. The difference gets larger when the organizational structures in 1989 are used to divide banks into two groups. This is promising because it is believed that many bad loans were made at the peak of the bubble economy, which was 1989, and the organizational structure at that time must have mattered more than that in 1985.

The last column of Table 2 shows the proportion of the loans made to the real estate industry as of March of 1991 for each bank. The data were taken from Yuka Shoken Hokokusho, which is the Japanese equivalent of 10-K form. Since many bad loans are real estate related loans, the proportion of real estate lending is believed to be closely correlated with the quality of bank portfolio. The table shows the result depends on whether one looks at the organizational structure of 1985 or that of 1989. If we divide the sample banks according to their organizational structures in 1985, we find that double-layered organization depended on real estate lending more than the single-layered organization did. If we divide the sample according to the structures in 1989, the result is opposite. Banks with the single-layered organization had higher proportion of real estate loans in their portfolio than those with the double-layered organization had. If we believe the organizational structure at the peak of the bubble economy (1989) was more relevant, the result is consistent with the model.
Overall, the preliminary analysis suggests that the model developed in the last section shows a promise in explaining what happened in the Japanese banking in the last decade. Because of the limited number of observations, the results are not entirely decisive. More formal analysis is required before we draw a conclusion.

The model also suggests that a profit maximizing bank with the single-layered organization should put in more efforts in the screening process, essentially because the loans are screened only once. The data in Table 2 cannot check if this is really the case. Some case studies may be useful in studying whether shifts to single-layered organizations were accompanied by increased screening efforts.\(^8\)

5. Concluding Remarks

This paper has presented a simple model of bank organization and loan screening, motivated by the Japanese experience in the 1980s. Given the technology of loan screening at each division, the model predicts that the single-layered organization (i) originates more loans, (ii) has a higher proportion of bad loans than the double-layered organization. It also implies that the single-layered organization has higher profits than the double-layered organization if (a) the quality of initial portfolio is high, (b) the problem of Type I error is serious, (c) the problem of Type II error is small, and/or (d) the screening cost is high. When the bank optimally chooses the intensity of screening, given the organizational structure, the bank with single-layered organization chooses a higher level of efforts to improve the screening skill. The preliminary empirical analysis reported in the last section suggests that the model shows some promise in explaining the experience in Japanese banking.

It would be impossible to explain the Japanese experience only from the organizational changes. Many other factors, including unexpected fall of land prices, deep recessions, and

---

\(^8\) Sumitomo Bank (1985), on which I based the case study in Section 2, does not suggest any efforts to strengthen screening at branch level or at the branch banking division. This may suggest that the organizational change at Sumitomo was suboptimal.
sometimes pure fraud, influenced the performance of Japanese banks. Even with the right organizational form and the right degree of screening, the Japanese banks would not have avoided the problem entirely. Thus, the organizational design is only one factor that influences the bank loan portfolio. The economic importance of the organizational factor must be determined by more systematic empirical studies.

Loan business is only one aspect of banking. With the arrival of new financial commodities, the importance of loan business for banks is now declining. Thus, making bad loan decision is not the only way for a bank to lose money. The recent scandals at Baring and Daiwa suggest factors other than loan business can decide the fate of banks. Many other cases suggest, however, that making bad loan decision is still the most popular way for banks to lose money. This was the case for *jusen* (Japanese housing corporations), many agricultural cooperatives that lend to *jusen*, many credit unions that invested in poor real estate related projects, and many Japanese banks.
References

Federation of Bankers Associations of Japan *Analysis of Financial Statements of All Banks.* various issues.


<table>
<thead>
<tr>
<th>Bank</th>
<th>1985</th>
<th>1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumitomo Bank</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Daiichi Kangyo Bank</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Sakura Bank</td>
<td>D (Mitsui)</td>
<td>D (Mitsui)</td>
</tr>
<tr>
<td></td>
<td>D (Taiyo Kobe)</td>
<td>S (Taiyo Kobe)</td>
</tr>
<tr>
<td>Fuji Bank</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Sanwa Bank</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Mitsubishi Bank</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Tokai Bank</td>
<td>D</td>
<td>S</td>
</tr>
<tr>
<td>Asahi Bank</td>
<td>S (Kyowa)</td>
<td>S (Kyowa)</td>
</tr>
<tr>
<td></td>
<td>S (Saitama)</td>
<td>S (Saitama)</td>
</tr>
<tr>
<td>Tokyo Bank</td>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Daiwa Bank</td>
<td>D</td>
<td>S</td>
</tr>
<tr>
<td>Hokkaido Takushoku Bank</td>
<td>D</td>
<td>D</td>
</tr>
</tbody>
</table>

* S shows the organization has single-layered screening, and D shows the organization has double-layered screening.

Table 2. Bank Organization, Loan Growth, and Bad Loans Ratio

<table>
<thead>
<tr>
<th>Bank</th>
<th>1985</th>
<th>1989</th>
<th>Loan 85-89</th>
<th>Loan 89-93</th>
<th>Bad Loans</th>
<th>Real Estate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sumitomo</td>
<td>S</td>
<td>S</td>
<td>73.72%</td>
<td>26.00%</td>
<td>3.38%</td>
<td>12.09%</td>
</tr>
<tr>
<td>Daiichi Kangyo</td>
<td>S</td>
<td>S</td>
<td>61.90%</td>
<td>18.07%</td>
<td>4.11%</td>
<td>9.82%</td>
</tr>
<tr>
<td>Sakura*</td>
<td>D</td>
<td>D/S</td>
<td>57.54%</td>
<td>14.34%</td>
<td>4.04%</td>
<td>13.08%</td>
</tr>
<tr>
<td>Fuji</td>
<td>S</td>
<td>S</td>
<td>65.99%</td>
<td>22.21%</td>
<td>3.94%</td>
<td>10.37%</td>
</tr>
<tr>
<td>Sanwa</td>
<td>S</td>
<td>S</td>
<td>75.93%</td>
<td>27.01%</td>
<td>2.72%</td>
<td>11.06%</td>
</tr>
<tr>
<td>Mitsubishi</td>
<td>D</td>
<td>D</td>
<td>66.57%</td>
<td>23.91%</td>
<td>1.91%</td>
<td>9.21%</td>
</tr>
<tr>
<td>Tokai</td>
<td>D</td>
<td>S</td>
<td>55.17%</td>
<td>20.81%</td>
<td>4.30%</td>
<td>8.11%</td>
</tr>
<tr>
<td>Asahi**</td>
<td>S</td>
<td>S</td>
<td>43.22%</td>
<td>22.69%</td>
<td>2.68%</td>
<td>8.24%</td>
</tr>
<tr>
<td>Tokyo</td>
<td>D</td>
<td>D</td>
<td>47.47%</td>
<td>6.67%</td>
<td>3.02%</td>
<td>6.75%</td>
</tr>
<tr>
<td>Daiwa</td>
<td>D</td>
<td>S</td>
<td>45.96%</td>
<td>26.78%</td>
<td>3.06%</td>
<td>13.77%</td>
</tr>
<tr>
<td>Hokkaido Takushoku</td>
<td>D</td>
<td>D</td>
<td>46.77%</td>
<td>20.04%</td>
<td>5.39%</td>
<td>9.56%</td>
</tr>
<tr>
<td>Average for D (85)</td>
<td></td>
<td></td>
<td>53.65%</td>
<td>18.35%</td>
<td>3.48%</td>
<td>10.47%</td>
</tr>
<tr>
<td>Average for S (85)</td>
<td></td>
<td></td>
<td>59.83%</td>
<td>22.80%</td>
<td>3.52%</td>
<td>9.95%</td>
</tr>
<tr>
<td>Weighted Average for D (85)</td>
<td></td>
<td></td>
<td>56.61%</td>
<td>22.39%</td>
<td>3.23%</td>
<td>11.02%</td>
</tr>
<tr>
<td>Weighted Average for S (85)</td>
<td></td>
<td></td>
<td>63.78%</td>
<td>29.83%</td>
<td>3.52%</td>
<td>10.27%</td>
</tr>
<tr>
<td>Average for D (89)</td>
<td></td>
<td></td>
<td>54.43%</td>
<td>16.87%</td>
<td>3.44%</td>
<td>8.51%</td>
</tr>
<tr>
<td>Average for non-D (89)</td>
<td></td>
<td></td>
<td>58.11%</td>
<td>22.24%</td>
<td>3.53%</td>
<td>10.82%</td>
</tr>
<tr>
<td>Weighted Average for D (89)</td>
<td></td>
<td></td>
<td>58.05%</td>
<td>24.07%</td>
<td>2.68%</td>
<td>8.69%</td>
</tr>
<tr>
<td>Weighted Average for non-D (89)</td>
<td></td>
<td></td>
<td>61.77%</td>
<td>27.78%</td>
<td>3.58%</td>
<td>10.98%</td>
</tr>
</tbody>
</table>

* Before 1990, Mitsui Bank and Taiyo Kobe Bank had not merged to form Sakura Bank. In 1985, they both had a double-layered organization. In 1989, Mitsui Bank had a double-layered organization and Taiyo Kobe had a single-layered organization. The amounts of loans for 1985 and 1989 are calculated by adding up the amounts of loans for two banks.

** Before 1991, Kyowa Bank and Saitama Bank had not merged to form Sakura Bank. Both in 1985 and 1989, their organizations exhibited the double-layered organizational structure. The amounts of loans for 1985 and 1989 are calculated by adding up the amounts of loans for two banks.
Figure 1. Sumitomo Bank Organization before 1979
Figure 2. Sumitomo Bank Organization after July 2, 1979
Figure 3. Single-layered and Double-layered Structures

(S) Single-layered Organization

Initial portfolio \[\rightarrow\] branch banking \[\rightarrow\] final portfolio

\[\rightarrow\] reject

(D) Double-layered Organization

Initial portfolio \[\rightarrow\] branch banking \[\rightarrow\] credit supervision \[\rightarrow\] final portfolio

\[\rightarrow\] reject

\[\rightarrow\] reject
Figure 4. Comparison of Profits under Two Alternative Organizational Structure

Double-layered organization has higher profits

Single-layered organization has higher profits
Figure 5. Three Types of Arrangement of Business Promotion and Credit Supervision

Type A.

Executive Committee  --  Business Promotion

Type B.

Executive Committee  --  Head Department

Business Promotion

Credit Supervision

Type C.

Executive Committee

Business Promotion

Credit Supervision