Japanese Banks' Monitoring Activities and the Performance of Borrower Firms: 1981-1996[*]

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ABSTRACT

Using micro data of Japanese banks and borrower firms, we construct an index measure that quantitatively describes the monitoring activities of Japanese banks. We examine the effects of bank monitoring on the profitability of borrower firms. We find significant positive effects in the periods 1986-1991 and 1992-1996, although there is no significant effect in the 1981-1985 period . We also examine *how* banks' monitoring affects borrowers. The results show that the positive effects of banks' monitoring on borrowers' profitability are mostly caused by screening effects, not performance-improving effects.

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One of the most dramatic developments in the Japanese economy during the 1990s concerns the fate of the country's banks. During the heydays of the latter half of the 1980s, Japanese banks and the "main bank" system were considered a major source of the strength of "Mighty Japan." Then, following the burst of the so-called Bubble Economy around 1990, Japanese banks faced a precipitous decline in their profitability and a pile-up of non-performing loans. In the late 1990s, several large banks failed, including the once-powerful Long-Term Credit Bank of Japan. The remaining banks are still in bad shape: in the early 2000s, the specter of bank failure and financial crisis are looming in every corner of Japan.

This dramatic rise and fall of Japanese banks poses serious questions regarding the role of Japanese banks in the economy. In financial intermediation theory, one of the *raisons d'etre* of banks is considered to lie in their information production function (see Diamond (1984)). Information production activities of banks include the search for projects and firms of profitable prospects, the monitoring of borrowers to continuously assess their profitability, consulting services for borrowers, if necessary, and support to borrowers in temporary financial distress if such support is profitable in the long run. However it is not clear-cut how these activities really worked. In fact, the so-called "main bank" function arouses much controversy in the case of Japan. Thus, it is necessary to measure such information production activities of Japanese banks and their effects on economic activities in order to examine the role of Japanese banks in the boom of the 1980s and the bust of the 1990s.

Unfortunately, however, very few studies have tackled the issue of measuring information-production activities and attempted to examine quantitatively the effect of such activities on the economy. As briefly surveyed in Section I, most studies on Japanese banks have

simply focused on whether the main bank in the *keiretsu* (industrial groups) produced a significant difference in the economic activities of borrower firms and did so by using a main bank dummy or its variants. They failed to measure the magnitude of possible effect. In cases where more direct methods were employed, past studies typically shunned measuring monitoring activities and resorted to the indirect approach of estimating the production function of deposits, loans and the like.

The purpose of this paper is to fill this significant gap between financial intermediation theory and empirical analysis, and at the same time to shed light on the plight of Japanese banks in the late 1990s and the early 2000s. In Section III, we present a measure of gauging Japanese banks' monitoring activities. By utilizing this new measure, we investigate how Japanese banks' monitoring activities influenced the performance of borrower firms in the period before and after the bust of the Bubble Economy (Sections IV and V).

The measure of monitoring activities we construct is the ratio of loan-project examining officers to the total employees in the headquarters of a bank. This measure, based on personnel data, is clearly one measure of the importance that the bank puts on monitoring activities. In fact, as shown in Section II, Japanese banks have been subject to several institutional "reform" waves that have a significant effects on the quality and quantity of banks' monitoring activities, and our measure tracks very well these changes in the institutional structure.

In Section III, we examine whether banks' monitoring activities influence borrower firms' profitability by using our measure of monitoring activities. We find statistically significant positive effects of monitoring activities on borrower firms' profitability in the 1986-1991 and 1992-1996 periods, although there is no significant effect in the 1981-1985 period. These results clearly show that banks' monitoring activities do matter after 1986 as financial deregulation took place and our measure captures their effects. However, the findings also suggest that in the early stage of the institutional reforms (before 1985), monitoring activities may not have been so important for the economic activities of borrower firms. In the period before 1985, when the banking industry was

heavily regulated, banks were likely to have been more prone to increasing regulatory rents instead of putting more efforts into monitoring activities.

In Section IV, we examine the nature of banks' monitoring activities and their effects on borrower firms' profitability. In fact, two different interpretations are possible for the type of effects that banks' monitoring activities have on borrower firms' profitability. The first possible type is performance-improving effects in which banks with intensive monitoring activities can provide better advice to borrower firms to increase their profitability. The second type is screening effects, in which banks can screen out unprofitable firms and keep only profitable firms as their customers. The empirical results in Section IV show that a positive correlation of banks' monitoring activities and borrower firms' profitability is mostly caused by screening effects, not performance-improving effects.

This result casts light on the puzzle of the sudden and dramatic fall of Japanese banks as witnessed in the past decade. If screening effects work but performance-improving effects do not, then banks would be more vulnerable to economic downturns than would otherwise be the case since they themselves cannot improve borrower firms' performance and thus have to secure their loans by themselves. In that case, considering the depressed economic conditions after the bust of the Bubble Economy, it is no wonder that Japanese banks acted rather passively and fell into the troubles of the early 2000s.

I. A Brief Review of the Related Literature

In this section, we briefly review the existing empirical literature on the role of Japanese banks in relation to our major research interest, the effects of banks' monitoring activities on the performance of borrower firms. We argue that past studies are insufficient in the sense that they fail to measure directly banks' monitoring activities and depend on indirect evidence that is often not statistically robust. The review here is not exhaustive, and only issues related to banks' monitoring

activities are examined.

The recent literature on Japanese banks may be divided into two groups. The first group of studies assumes that the so-called main banks of industrial groups (the *keiretsu*) mostly engage in information production. It also assumes that whether a particular firm is a *keiretsu* member or not makes a significant difference to its business activities. Depending on the particular business activities these studies focus on, there are four sub-groups in this type of literature. The second group of studies tries to measure the performance of banks and its relation to the information production activities of these banks.

A. Main-Bank Dummy Approaches

A.1. Keiretsu and Member Firms' Profitability

The first group of the literature on Japanese banks examines the effect of the *keiretsu* on the profitability of firms. Since each industrial group is organized around a bank that acts as a main bank to its member firms, the effect of industry groups has been frequently regarded as the effect of their main bank.

The research into the economic functions of Japanese *keiretsu* has a long history. Most studies examine whether *keiretsu* member firms performed better or worse than non-members. In early studies such as Caves and Uekusa (1976) and Nakatani (1984), both the profitability and the asset growth rate of non-members were found to be higher than that of members. Their results suggest that the role of Japanese banks is not positive with respect to the profitability of borrower firms.

These early results have been confirmed by more recent studies. Weinstein and Yafeh (1998) compared the profit/sales ratio of *keiretsu* members and non-members using the classification of Dodwell Marketing Consultants. They found that the profitability of member firms was lower than that of non-member firms even after controlling for other factors that may affect the performance.

Along similar lines, Hanazaki and Horiuchi (2000) reported that the TFP (total factor productivity) of firms that have kept a stable bank-firm relationship is not significantly higher than that of other firms. Morck and Nakamura (1999) used a similar methodology and obtained a similar result.[1]

In this type of studies it is assumed that if a firm is a *keiretsu* member, then it has access to the same services based on the main bank's information production as other member firms. In other words, there is no quantitative measure of the bank's information production from its monitoring activities.

A.2. Liquidity Constraints and the Main Bank Relationship

The rather negative assessment of the main bank's effect on the performance of its borrower firms in early studies was reversed by an influential study by Hoshi, Kashyap and Sharfstein (1991). They, and many researchers after them, focused on the issue of how main-bank relationships affect firms' investment behavior. Their research is based on the methodology developed by Fazzari, Hubbard and Petersen (1988) that assumes the internal-fund elasticity of investment is a good measure of market imperfections in the form of liquidity constraints. Based on this assumption, Hoshi, Kashyap and Sharfstein compared the investment functions of *keiretsu* members and non-members. They found that the internal funds effect on non-member firms' investment was significantly larger than in the case of member firms. They interpreted this finding as evidence that *keiretsu* membership and the main bank relation associated with it helped the firm to overcome liquidity constraints. This conclusion can also be seen as one piece of evidence that Japanese banks

[1] They examined the determinants and consequences of banker appointments to firms' board of directors. With respect to the determinants, they found banker appointments to be more sensitive to firms' poor liquidity and cash flow than stock performance. As to the consequences, downsizing effects after banker appointments were larger in the case of non-*keiretsu* firms. They concluded that "bank oversight need not lead to value maximizing corporate governance" (Morck and Nakamura 1999, p. 319).

play the important role of producing information in the *keiretsu*, since liquidity constraints are often considered a symptom of asymmetric information and/or agency problems. Okazaki and Horiuchi (1992) used a more sophisticated method to identify whether a firm had a strong banking tie or not, and obtained a similar result to that of Hoshi, Kashyap and Sharfstein.

However, there are several studies that question these findings. Kaplan and Zingales (1997) showed that internal-fund elasticity may not always be a good measure of liquidity constraints. Hayashi (1997) re-estimated the Hoshi-Kashyap-Sharfstein equations and found no significant results with respect to internal-fund effects, suggesting some misspecification problems in their work.[2]

Regardless of their statistical validity, these studies are unsatisfactory in that they suffer from the same problem as those in the first sub-group. They do not measure monitoring activities directly but assume that all *keiretsu* member firms get the same "main-bank services", while non-member firms enjoy no such services.

A.3. Main-Bank Relationship, Agency Costs and Capital Structure

Another strand of research on Japanese banks goes beyond gauging the effect of the *keiretsu* and directly examines the role of banks in information production. This line of research assumes main-bank relationships reduce agency costs. Thus, main-bank relationships are expected to affect firms' capital structure.

Hirota and Ikeo (1992) pursued this line of research in regressing firms' debt-to-asset ratio to main bank dummies and other variables. Finding a significant positive correlation between the debt-to-asset ratio and main bank dummies, they interpreted this result as the positive effect of main-bank relationships on firms' ability to borrow by reducing agency costs. Prowse (1990)

[2] Miwa and Ramseyer (2002) also pointed out some other problems in the findings of Hoshi, Kashyap and Scharfstein (1990).

pointed out that U. S. firms' debt-to-asset ratio was highly correlated with measures of potential agency problems (R&D, liquidity etc.) while such strong correlation was not found for their Japanese counterparts. He argued that this difference was caused by the fact that U. S. firms do not have a strong relationship with banks compared with their Japanese counterparts.

Here, the effect of banks' information production activities is again examined in the form of a zero-one dummy of main banks like in analyses on the *keiretsu* explained above.

A.4. The Main Bank as a Last Resort

There is another strand of research focusing on the so-called "last resort" function of the main bank. Hoshi, Kashyap and Scharfstein (1990), focusing on financially distressed firms, found that the investment level of firms with strong banking ties was higher than that of other firms. They interpreted their finding as evidence that the main bank, possessing superior information about these firms, played an active role in pulling them out of trouble. Many other studies, for example Shikano (1994) and Hirota and Miyajima (2000), report the same kind of results.

There is, however, a problem with the interpretation of the results of this approach. As Shleifer and Vishny (1997) pointed out, when there exist large investors, regardless of whether they are equity holders, banks or other kind of stake holders, ex-post bargaining becomes easy since large investors are likely to take the initiative to rescue financially distressed firms if such a move has a good prospect. Consequently, findings in the above mentioned studies on the last resort function of banks do not provide direct evidence for banks' superior information production.

B. Bank-Performance Measure Approaches

B.1. The Production Function Approach

There exist a large number of studies examining the production efficiency, economies of scale and economies of scope in the Japanese banking industry. These studies are mostly based on the

method of estimating the production, cost and/or profit functions of banks.[3]

These studies, however, involve serious measurement problems with respect to what are the outputs and inputs of the banking sector. Some, like Tsutsui (1988), define the amount of loans as banks' output, others, such as Royama and Iwane (1972) and Kasuya (1986), regard deposits or profits as a measure of output. These studies do not directly measure information-production activities.

To complicate things further, the Japanese banking industry is, like in other countries, one of the most heavily regulated sectors of the economy. Until recently, banks had no freedom to set up a new branch and to change interest rates on deposits. Thus, these banks' profits are likely to involve regulatory rents and thus the amount of deposits, loans, and even profits may not reflect banks' real production of information. These conceptual problems cast serious doubts on the methodology of using loans, deposits or profits as a proxy measure of banks' production of information.

B.2. Non-Performing Loan Ratio

Several recent studies have focused on the "performance" of banks other than the amount of deposits and loans. For example, Horiuchi and Shimizu (2001) used the ratio of non-performing loans to total loans as an indicator. They evaluated the effects of the so-called *amakudari* system – whereby banks provide regulators with high-ranking job opportunities after their retirement – on this non-performing loan ratio and found a negative correlation between *amakudari* and sound banking. In a similar vein, Tomiyama (2001) used profitability and the non-performing loan ratio as performance measures in examining the effect of the governance structure. She found the bad-performance-triggered turnover of top executives to be lower for banks having more *amakudari* directors, thus also suggesting a negative relationship between *amakudari* and sound banking. These studies, however, do not attempt to measure directly the level of monitoring activities of banks.

[3] See Tsutsui (2000) for a survey of these studies.

It is not clear in what ways *amakudari* or other institutional characteristics of Japanese banking affect the monitoring activities of banks.

In sum, we find most studies on Japanese banking do not attempt to measure banks' monitoring activities. Instead, they either use dummy variables or some proxies that are considered to have a close relationship with monitoring activities. However, these are at best indirect measures, and in many cases their relation to banks' monitoring activities is vague and subject to an embarrassingly large number of possible interpretations. It is now clear that we need a direct measurement of monitoring activities. We turn to this issue in the next section.

II. Measurement of Monitoring Activities

Whereas most studies reviewed in Section 2 stress the importance of the information production activities of banks, they fail almost unanimously to measure how intensively banks are involved in such information production activities. They tend to use crude methods such as employing main-bank dummies or simply assuming that information production is proportional to the amount of loans or deposits.

There is, however, one important exception. Fujiwara (1998) tries to measure the strength of monitoring activities by looking at the degree of independence of the monitoring department in the bank. Since his study has served as a stimulus to our own, we examine his method and results more closely. We then explain our own approach to measuring banks' monitoring activities in detail.

A. Fujiwara's Qualitative Index of Monitoring Activities

In the early 1980s, many major Japanese banks overhauled their institutional structure, in particular the relationship between the headquarters and downstream divisions. Let us take Sumitomo Bank as an example, which reformed its organizational system – a step that other banks soon followed. Under the old system, which was often called the "function-oriented system", the

department of loan-project examination, like other departments such as the personnel or the loan-making department, was directly under the direction of the board of directors. However, under the new system, these departments were divided and re-grouped according to types of customer or geographical area, such as the international division, the general business division and so on. The chief director in charge of each division was given the right to decide on almost all activities within the division except personnel decisions. In fact, there was no obligation to report loan-project examination results to the board of directors.

Under the old system, almost all of the important issues were examined and decided in the meeting of the board of directors until June 1981. This system was called "the consensus system (Gogi Seido)." However, according to Sumitomo Bank (1985, p. 87), the President at that time, Isobe "had serious doubts about the efficiency of the consensus system, and decided to extend the authority of the chief director of each division as much as possible."

Such a "reform" (if it deserves such a label since it hardly represent an improvement) is likely to limit the independence of loan-project examining from loan-making personnel, and may seriously hamper the quality of such examinations and thus the quality of monitoring. Fujiwara (1998) recognizes this possibility and constructs a measure of banks' monitoring activities in the following way.

Using the information of the organization of headquarters and divisions published by Nihon Kinyu Tsushinsha, Fujiwara identifies whether a city bank or regional bank was function-oriented or not and defines a dummy variable to represent this. He also defines a measure of the relative independence of the loan-project examining personnel in the bank. For banks that were identified as function-oriented (the old system), he uses information such as the relative position in the bank of the loan-project examining personnel to personnel of other operation departments, their career history and so on. For banks that adopted a new system, he uses information such as the power structure among divisions or whether the chief director of the division had ever worked in the

loan-examination department. Fujiwara constructs a measure of independence of loan-project examining personnel, which ranges from 0 to 1.

Next, Fujiwara (1998) uses the ratio of non-performing loans as a performance measure of banks. He then regresses the non-performing loan ratio on this independence measure coupled with the organization dummy and other control variables. The results show the statistical significance of his index. While the organizational dummy (new or old system) is not statistically significant, the independence measure shows a significant effect on the non-performing loan ratio. That is, the higher the independence measure, the lower is the non-performing loan ratio.

Fujiwara's study is certainly a seminal one, but there exist several problems. Firstly, Fujiwara derives his measure of loan-project examining personnel's independence using his subjective weights, though they seem to be reasonable. In addition, whether one bank follows the old or a new system is not always clear. Moreover, not only the independence of the loan-project examining personnel but also the quantitative strength of monitoring activities is likely to determine the performance.

B. The Quantitative Measure of Monitoring Activities

Taking account of the above shortcomings of Fujiwara's qualitative measure of monitoring activities, we construct a *quantitative* measure of monitoring activities. Our quantitative measure is based on the premise that the number of loan-project examining officers is a good measure of the quantity of monitoring activities. In particular, we use the ratio of the number of officers in the division responsible for examining loan projects at the headquarters to the total number of employees there. Hereafter we call this the ratio of examining officer at the headquarters or simply the EOH ratio.

The necessary data for the calculation of the EOH ratio can be found in the organization chart of the bank, which is taken from the *Nihon Kinyu Meinkan* (Japanese Financial Almanac) published

by Nihon Kinyu Tsushinsha. We construct the ratios of EOH for long-term trust banks, city banks, regional banks, trust banks, and second-tier regional banks during 1980-2000.

There are two caveats about the EOH ratio reported here. Firstly, we were unable to obtain data on monitoring activities at branch level. Consequently, as stated above, the EOH ratio is based on information relating to the headquarters. It is common practice that loan projects that are smaller than a certain amount are examined in branch offices and only those projects larger than this limit come under the scrutiny of loan-project examining officers at the headquarters.[4] However, so long as there is no drastic change in this limit in real terms, the EOH ratio is still likely to be a good measure of monitoring activities with respect to large firms whose borrowing amount exceeds this limit. In fact, in Sections 4 and 5, we examine mostly large firms. The second caveat is that not all banks report the number of loan-project examining officers every year. The resulting percentages of missing data in the periods of 1981-86, 1987-91, and 1992-96 (these three periods are the sample periods in our investigation in the next section) are 14.8%, 40.4% and 12.8%, respectively. To minimize information loss due to such missing data, we interpolate missing observations by cubic splines in the following way. The time-series of the average show a nonlinear pattern. In situations like ours where the continuity of derivatives is a concern, cubic splines are the most commonly used method of interpolation.[5] They are smooth and tend to be more stable than polynomials, with less possibility of wild oscillations between the tabulated points (Press at al. 1992). We interpolate the

[4] According to a survey conducted by a trade journal (*Kinyu Zaisei Jijou*, 1991, April 1, pp. 24-29), the limit loan amount at branches' discretion is on average 91.5 million yen for regional banks and 81.2 million yen for second-tier regional banks. Unfortunately, we do not have any comparable information for city banks and trust banks.

[5] While linear interpolation gives an interpolation formula with a zero second derivative in the interior of each interval, cubic spline interpolation gives an interpolation formula that is smooth in the first derivative, and continuous in the second derivative, both within an interval and at its boundaries (Press at al. (1992)).

deviation from the bank-type means and calculate the estimated value.[6]

Figure 1 plots the movement of the EOH ratios calculated for city banks, long-term trust banks, regional banks, trust banks, and second-tier regional banks from 1980 to 2000.[7] This figure reveals two remarkable facts in the two decades. Firstly, there is a considerable difference between large banks (city banks, trust banks, and long-term credit banks) and the medium and small banks (regional banks and second-tier regional banks). The level of the EOH ratio is significantly lower for city, trust and long-term banks than regional and second-tier regional banks. This difference might be a sign of the existence of economies of scale, since customers of small banks are small and numerous.[8] Secondly, we find a U-shaped movement in the EOH ratio. The values are high between 1980 and 1986, then drop sharply between 1987 and 1991, and increase steadily and noticeably after 1992. Moreover, the EOH ratios of each bank group tend to move in a similar pattern. The co-movement of the EOH ratios in fact exemplifies the change in monitoring activities during the 1980s and 1990s. It is related to organizational reforms undertaken in these periods.

In the previous subsection, we outlined the drastic organizational changes in Sumitomo Bank in relation to Fujiwara's quality index of monitoring activities. Following Sumitomo Bank, other banks, regardless of their size and customer bases, embarked on similar reforms in the early 1980s, although there were differences with respect to the name of the new organizations, the timing of changes, and the extent of what remnants of the old organization were left. For example, Mitsubishi Bank started its reform in July 1981 for the same reason as Sumitomo Bank: to get rid of the shackle of the old system which was believed to be too slow in making loan decisions. The dramatic decline

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[6] The estimated value is nearly identical to the actual value whenever the latter is available.

[7] The above procedure is not enough to interpolate all missing data, and there are some banks in some periods of which the EOH ratio is still missing. In preparing Figure 1 we simply ignored them and took the average of only positive values of this ratio.

[8] More evidences are needed to obtain a definitive answer on this issue. We will not tackle it in this paper.

in the EOH ratios across long-term credit, city, trust, regional and second-tier regional banks clearly shows the impact of this type of reform.

Around 1986, there was another wave of reforms. For example, Mitsubishi Bank started a new reform plan in October 1986. However, the reforms around 1986 and after were not an overhaul of the system of that time but an attempt to move further along the path embarked on in the early 1980s. Although the reforms themselves did not aim at the reduction of monitoring activities, strong pressure from the top management to the chief director of each division to be an independent "profit center" led the division directors to "often put greater weight on business development and as a result, pay little attention to credit examination" (*Kinyu Zaisei Jijo*, 18 February 1991, p.16). However, there were some side effects, which were clearly recognized around 1990.

Consequently, after 1990 and the burst of the Bubble Economy, many banks began to reconsider the organizational reforms of the 1980s and to reposition their institution to be function-oriented once again. For example, Tokai Bank (in June 1986), Hokkaido Takushoku Bank (in February 1990), Mitsubishi Bank (in November 1990) and Dai-ichi Kangyo Bank (in February 1991), gave up the market-oriented (or in other words, customer-base oriented) organizational framework and returned to the old function-oriented organization. Most prominently, in November 1990, Sumitomo Bank, the leader of the reforms in the 1980s, also abolished the organizational framework it had then pursued, once again putting the loan-project examination department directly under the direction of the board of directors, independent of other divisions and departments.

The U-shaped behavior of the EOH ratio in Figure 1 tracks very well the above-mentioned organizational changes in banking institutions. The sharp decline in EOH for the early 1980s shows the far-reaching impact of the organizational change lead by Sumitomo Bank, while the stable movement in the late 1980s reveals the stable functioning of the new system. This is followed by a significant increase in EOH ratios after 1991, indicating the return to the old, function-oriented system.

The above discussion suggests that there are three distinctive periods in our sample period of 1980 to 2000. The first period is between 1980 and 1986, in which the first wave of institutional reform took place, following the initiative of Sumitomo Bank. The second period corresponds to the stable movement of EOH ratios between 1987 and 1991, showing the second wave that stretched the reform further in the same direction. The third period is after 1992, in which the institutional reforms of the 1980s lost momentum and many banks gradually returned to the old system.

In the remainder of this section, we briefly examine the relationship between banks' monitoring activities during the era of the Bubble Economy and their performance in the 1990s.

After the burst of the Bubble in the early 1990s, many loans to the finance, insurance, and real estate sector became uncollectible. Using data for 1990, Figure II plots the relationship between each bank's EOH ratio and the ratio of loans to the finance, insurance and real estate sector to total loans. We find a statistically significant (at the 1% level) negative correlation between the two variables. In Figure III, we compare each bank's EOH ratio in 1990 to the ratio of non-performing loans to total loans in 1997. Again, we find a statistically significant (at the 5% level) negative correlation between the two variables. It thus seems that banks with a low monitoring-intensity during the Bubble period ended up with inferior loans in the 1990s.

These two negative effects of banks' EOH ratio on their lending to the finance, insurance, and real estate sector and on their non-performing loans afterwards were statistically significant even when we control for the size of each bank. There was also a significantly positive correlation between the EOH ratio in 1990 and the average value of the current profit/total asset ratio in 1992-1996. These findings indicate that our EOH ratio is a promising candidate as a measure of banks' monitoring activities. In the next section, we conduct a more thorough econometric examination of the effects of banks' monitoring activities as measured by the EOH ratio on the performance of borrowers.

III. Monitoring Activities and the Performance of Borrowers

In the previous section we argued that the EOH ratio, which is the ratio of loan-project examining officers to the total number of employees at the headquarters, is a good estimate of the magnitude of banks' monitoring activities. We showed that the EOH ratio captures very well the profound dynamic changes in banks' monitoring activities over time as exemplified by the institutional changes in the 1980s and 1990s. In this section, we examine the effects of bank's monitoring activities on the economy, using the EOH ratio.

There are many possible measures of the performance of economic agents that may be influenced by banks' monitoring activities. Here, we take one of the most direct measures of the performance of economic agents, which is the profitability of borrower firms. Thus, we investigate whether higher monitoring activities of banks lead to a higher profitability of the firms that borrow from these banks.

Here, however, the issue of main-bank and non-main bank relationships should be addressed at the outset. Usually, a firm borrows from many banks. However, it is natural to assume that the bank from which a particular firm borrows the most has the largest stake in this particular firm among the lending banks. Consequently, the effectiveness of their monitoring activities should be the largest if they were ever effective. Following this reasoning, we divide lending banks into the main bank and other, non-main banks, and investigate monitoring activities of the main bank and of non-main banks separately. We define the main bank simply as the bank from which a particular firm borrows the most.[9]

A. The Estimation Equation

[9] In this sense, the words "main-bank" and "non-main bank" have no special meaning, and thus we do not deal with the issue of the effectiveness or non-effectiveness of the "main bank system" associated with the *keiretsu* industry groups.

To examine the possible relationship between banks' monitoring activities and the profitability of borrower firms, we estimate the following equation to explain borrower firms' profitability:

$$y_{i,j,t+1} = \alpha + \beta\Gamma_j + \gamma r_{i,j,t} + \delta L_{i,j,t} + \mathbf{n}_{j,t}\eta + \mathbf{w}_{i,t}\theta + \mathbf{TDUM}_t\lambda + \varepsilon_{i,j,t+1}, \quad (1)$$

where

$$\varepsilon_{i,j,t+1} = v_j + e_{i,j,t+1}. \quad (2)$$

We will now explain this equation in detail. The parameters to be estimated are α, β, γ, δ, η, θ, and λ.

We consider three periods: (a) 1981-1986, (b) 1987-1991, and (c) 1992-1996. The start year 1981 is chosen because of data availability. The end year is 1996 because this is the last year of normal financial market conditions: In 1997, financial crisis struck Japan, and bank-firm relationships thus were likely to have changed discontinuously after 1997. In fact, some banks failed and others were under immense pressure to restructure or merge with or acquire other banks. This period of financial crisis is a subject of future research independent of the current one.

The dependent variable $y_{i,j,t+1}$ in equation (1) represents the profitability of firm i in year $t+1$, whose main bank is j. This variable is the ratio of operating profits to total assets.

The first group of explanatory variables relates to the main bank. As explained earlier, we define the firm's main bank as the largest lender at each particular point in time, following Sheard (1989) and Hoshi *et al*. (1990).[10]

Firstly, Γ_j is the period-average of the EOH ratio of main bank j. Since the effect of monitoring activities is not likely to change year by year but rather is constant for a period in which there is no institutional change, we assume that it is constant for each of the periods outlined earlier.

[10] We exclude those firms where two or more banks are the largest lender at the same time for the technical reason that we cannot determine which of them is the main bank. Such cases exist but they are practically unimportant.

In particular, we assume that Γ_j is constant and equal to the period average of the EOH ratio within periods. We also include bank-type dummies in order to control for differences in average EOH ratios among different types of banks.

Secondly, $r_{i,j,t}$ is the borrowing interest rate of firm i from main bank j in year t, and $L_{i,j,t}$ is firm i's share in the total loans of main bank j in year t. Since data on the borrowing interest rate of a firm from a particular bank are not available, following Asako et al. (1992) we use the average borrowing rate of the firm as a proxy.

Thirdly, the vector $n_{j,t}$ stands for other factors that determine the effectiveness of main bank j's monitoring activities. In particular, we consider whether the main bank's stake in the borrower influences its monitoring activities (the firm's loan share in the main bank's total loans).

In addition to the bank's stake, there may be other determinants of the effectiveness of monitoring activities. In Japan, many regulations on access to the capital market were gradually removed during the 1980s, resulting in an upsurge of unsecured bond issues by financially sound large firms (Ogawa and Kitasaka (1998), Miyajima and Arikawa (1999)). This implies that banks continued to lose good client firms and were thus obliged to lend more to small and medium sized firms as new customers. Since the number of loan-project examining officers could not be adjusted immediately to the increase in new lending to small and medium sized firms, loan officers may have suffered from work overload, reducing their efficiency. To gauge this possible effect, we also take the following factors into account: (a) whether a large number of project to be examined by officers affects the effectiveness of monitoring activities[11] (the ratio of the number of the projects to which the bank lends to the bank's total loans), and (b) whether the effectiveness is reduced if more new small firms are in the queue for loan projects (the share of the number of projects that the bank lent

[11] If this has a statistically significant negative sign, this would suggest a "congestion effect", i.e. that the effectiveness of monitoring activities may be compromised if there are a large number of projects that the officers have to examine. If instead we have a statistically significant positive sign, this would be consistent with "economies of scale" in loan-project examining activities.

to small and medium-sized firms).

Fourthly, the vector $w_{i,t}$ comprises other control variables that affect the profitability of borrower i in year t. We include proxies of corporate governance structure such as the top-ten shareholders' holding ratio, the ratio of debts to total assets, the ratio of loans to total debts, and the ratio of loans from the main bank to total loans. We also consider non-main banks' corresponding averages of variables Γ_j, $n_{j,t}$,[12] and industry dummies to take account of possible inter-industry differences.

Finally, we also include time dummy variables $TDUM$ to control for macro-economic shocks.

The error term $\varepsilon_{i,j,t+1}$ is the sum of the random effect associated with bank j (v_j) and the remainder the disturbance $e_{i,j,t+1}$. We assume $v_j \sim IID(0,\sigma_v^2)$, $e_{i,j,t+1} \sim IID(0,\sigma_e^2)$ and that they are independent of each other and among themselves. We use a random effect specification to obtain the true standard errors for the coefficient of the EOH ratio.

We assume that equation (1) is a structural equation that determines the firm's profitability, except for the borrowing rate $r_{i,j,t}$. We first estimate equation (2) using feasible generalized least squares (FGLS) with group-wise heteroskedasticity for the three periods: 1981-86, 1987-91, and 1992-96.

B. Data

Our sample of borrowers consists of non-financial firms that are listed on the first and second sections of the Japanese stock markets from 1980 to 1996. We exclude the electricity, gas and water supply industries because these are heavily regulated industries. We match firms' financial statement data with banks' financial statement data and loan data to obtain an unambiguous correspondence between firms and lending banks. We include those banks that have experienced a

[12] The counterpart of $r_{i,j,t}$ is not included because of data availability problems mentioned earlier.

large merger, such as Taiyo Kobe bank (merged with Mitsui bank in April, 1990) and Saitama bank (merged with Kyowa bank in April, 1991) during our sample period.[13] Omitting incomplete or apparently erroneous data, we obtain 18,521 firm-year observations.

The loan data source is the *Shakunyukin File* of the Nikkei Quick data service. It covers non-financial companies listed on the first and second sections of the Japanese stock markets and those traded in the over-the-counter markets. Two aspects of this data set need to be kept in mind in interpreting estimation results. Firstly, the data set does not include those firms that have failed or ceased to be listed. Thus, we cannot examine the effectiveness of banks' monitoring activities in cases of corporate failure. [14] Secondly, the firms in our sample are relatively large (the median of the total assets of our sample is ¥43.77 billion during 1986-1996) and may be less constrained to obtain outside financing. Thus, it should be noted that our sample does not include most of the small and medium sized firms that approximately account for more than 90 percent of banks' total loan customers.

We obtain firms' accounting data from *Firm Financial Statement Data* and banks' accounting data from *Bank Financial Statement Data*; both are supplied by Nikkei Quick data service.

Table I shows summary statistics of the major variables used in the regression analysis and the

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[13] Inclusion of those merged banks does not affect the estimation of the bank effects on the firm's profitability since we estimate the bank effect in the separated periods and within each period they do not experience the merger. Although there were some other mergers among the regional banks and second-tier regional banks, those smaller merged banks are not included in our sample because either most of them did not play the role of main bank in our data or we do not have data on the EOH ratio. Note that for the Saitama Bank, we do not have the EOH ratio for the 1987-91 period and cannot estimate the bank effect.

[14] This data set is based on firms' financial reports and annual reports. Thus, when a company collapses or goes bankrupt, the data of that firm are not included after they are de-listed - a potential source of sample selection bias. However, in our sample period, corporate failures were rather rare: there were only twenty among all the firms listed on the first and second sections according to the Tokyo Shoko Research, *Zenkoku Tosan Hakusho*.

industry distribution of the sample. Panel A presents descriptive statistics for the main bank variables. Panel B presents those of other non-main banks' averages. As we have noted earlier, the EOH ratio shows a U-shape trend. It is also interesting to note that as large firms start to finance their investment through the bond market the sample firm's loan share in the bank's total loans decreased by about a half during 10 years. Panel C shows the characteristics of the borrowing firms. Note that the set of our sample firms changed over time and the statistics do not necessarily show within changes of the firm's characteristics in the same sample. The sample firms became less profitable during these periods. They also reduced their liabilities but their bank-loan-to-debt ratio and ratio of loan from main bank to total bank loan did not substantially decline. Lastly, Panel D shows the industry distribution of the sample firms. About 64 to 68% of the sample consist of manufacturing firms.

C. Estimation Results

Table II shows the estimation results of equation (1) in which we utilize the method of feasible generalized least squares (FGLS) with group-wise heteroskedasticity.

One of the most important results in Table II is that the coefficient of the EOH ratio for the main bank is significantly positive at the 1% significance level during both the 1987-91 and the 1992-96 periods, while it is insignificant during the 1981-86. This result suggests that, in the period of initial reform, banks' monitoring activities captured by EOH is not correlated with borrower firms' performance in a statistically significant way. In the period before 1985, in which the banking industry was still heavily regulated, banks were more eager to increase regulatory rents instead of putting more effort into monitoring activities. However, as financial deregulation took place and banks' institutional reforms went into the second stage, monitoring activities of the main banks began to show a statistically significant correlation with borrower firms' performance. However, the magnitude of this correlation seems to be reduced after the collapse of the Bubble Economy.

We discuss other results only briefly here because of the limitation of space, though they are all interesting in themselves. The coefficient on the borrowing rate is insignificant in all three periods. One possible explanation for the insignificance of the borrowing rate is that it is measured with error. Since the data on the borrowing rate of a firm from a particular bank is not available, we used the average. Firms' loan share is negatively correlated with their profitability in the period 1992-96 at the 5% significance level. The coefficient on the ratio of the number of projects to which the bank lends to the bank's total loans is positive at the 1% significant level in the period 1992-96. This may be interpreted as indicating that economies of scale in lending may finally have materialized in recent years. However, other explanations are also possible so that it is premature to draw any definite conclusions from this result.

It might be argued that there is a possibility of simultaneity between the profitability measure and the borrowing rate (see Appendix for more detail on this issue) and a specification test must be conducted. We tested for endogeneity, using the Davidson and MacKinnon (1993) test. To generate an estimate of the average borrowing rate, we use one-year lagged and two-year lagged values of itself as instruments. The test cannot reject exogeneity for all three periods. Therefore we can conclude that we can ignore the possibility of an endogeneity bias of the estimator.

Finally, we add one more remark on the EOH ratio. As explained in Section III, there is a non-negligible number of missing data, and we use interpolated estimates for these missing data. One may argue that these interpolations may cause a problem of measurement errors that may mar our result. Keeping this possible criticism in mind, we estimated equation (1) on a restricted data set excluding data with estimated EOH ratios. The results are similar to the ones reported here.[15]

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[15] These results are available from the authors upon request. One may still want to point out that there may still be some sample selection biases. However, there is no sign of systematic bias in non-reporting of the number of loan-project examining officers, which implies such sample-selection biases, if they exist, are rather negligible.

D. Controlling for Firm's Fixed Effects

In the previous section, we found that the EOH ratio of the main bank and the ex-post performances of its client firms are positively correlated after the mid-1980s: both during 1986-1991 and 1992-1996. It should be noted that we have pointed to a positive *correlation*, but have carefully avoided referring to a positive (direct) *influence*.

If the profitability of the firm that borrows from the monitoring-intensive banks is high due to the firm's unobservable characteristics that are not measured in equation (1), the positive coefficients merely reflect spurious correlation. To eliminate this spurious correlation we use the firm-fixed effects procedure by estimating the following equation:

$$y_{i,j,t+1} = \alpha + \beta\Gamma_j + \gamma r_{i,j,t} + \delta L_{i,j,t} + \mathbf{n}_{j,t}\eta + \mathbf{w}_{i,t}\theta + \mathbf{TDUM}_t\lambda + \mu_i + e_{i,j,t+1}, \qquad (3)$$

where μ_i denotes a firm-fixed effect. With the fixed effect removed, the EOH ratio of the main bank does not have significant effects both for the 1987-1991 and 1992-1996 periods. This result shows that when observed and unobserved heterogeneity among firms are controlled for, the profitability is not higher for firms that are affiliated with a monitoring -intensive bank.

V. Screening Effects versus Performance-Improving Effects

In this section, we examine whether the positive correlation of monitoring activities with firm performance implies a causal link in a direct way. In fact, we are not the first to address the positive link between monitoring activities of the bank and its client's accounting profitability[16]. However, to our knowledge, there seems to be no empirical work examining in what way the bank's monitoring activities positively correlated with the firm's profitability.

[16] Using a sample of some large German firms, Cable (1985) also found evidence that the proportion of voting equity controlled by banks, the ratio of bank loan to total debt, and a binary measure of whether banks represented on the supervisory board, do improve borrower firms' profits. However this study did not examine whether this kind of improvement was due to the ability of enforcing efficient behavior or of picking high-quality firms.

Two different interpretations are possible for this positive correlation: screening effects and performance-improving effects. Banks with intensive monitoring activities tend to have relatively profitable borrowers through the following two alternative mechanisms. First, banks with intensive monitoring activities can provide better advice to their borrower firms based on banks' superior information. They can also keep corporate managers under discipline. These effects will make borrower firms more profitable. We hereafter call the effect of this *direct* mechanism "profitability-improving effects". Second, by intensive monitoring, banks can screen out unprofitable firms and keep only profitable firms as their clients. We call the effect of this *indirect* mechanism "screening effects." In the Appendix, we develop a simple illustrative model of a loan market with profit-maximizing banks and firms where these two effects are present.[17]

It is important to distinguish which mechanism is at work, since they have different implications for social welfare. If performance-improving effects are at work, then monitoring activities unambiguously improve social welfare. In contrast, if screening effects are dominant, then, whether monitoring activities improve social welfare or not is not clear-cut. It depends on the conditions in financial and industrial markets such as accessibility to capital markets and so on.

We empirically examine the validity of these hypotheses by using the "Two-Stage Double-Fixed-Effects Model" developed by Bartel and Sicherman (1999).[18] At the first stage, we

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[17] A remark on the relationship between the profitability and the borrowing rate: in the case of "screening effects," even banks with advanced screening ability will lend funds to relatively bad firms, if they can expect higher interest payments. In the case of "performance-improving effects," firms' profitability depends not only on lenders' monitoring intensity but also on firms' own productivity level. And firms with higher productivity can borrow funds at lower interest rates in the lending market. Therefore, in both cases the profitability of the borrowing firm is a decreasing function of the interest rate of the lending contract in equilibrium. The borrowing rate has been shown to be statistically significant and to have the correct sign in the estimation results of the previous section.

[18] Using panel data of workers, they investigated why wages in high tech industries were higher. They found that the positive correlation between wages and technological change in industries is

estimate (a) the firm's unobservable characteristics effect and (b) the effect of each bank as a main bank (using a dummy variable for each bank) on the profitability of the firm, *excluding the period-average of the EOH ratio of the main bank.* The firm's unobservable effect is the fixed component of the firm's profitability that is not explained by the bank's characteristic or the bank's affiliation. The bank effect is the component of the firm's profitability that is given to the borrowing firm, but is not explained by the firm's observable and unobservable characteristics. For example, when a firm changes its main bank from bank A to bank B, we can expect that the firm's unobservable characteristics do not change and we can identify bank A's effect in comparison with bank B's effect. We assume that the monitoring activities improve the firm's profitability so long as the bank-firm relationship remains and does not affect the firm's unobservable characteristics. Then, in the second stage, we regress the firm-specific effect and the bank-specific effect on the EOH ratio. If a bank's monitoring activities as a main bank directly improve borrower firms' profitability (we call this mechanism "performance-improving effects"), then the EOH ratio of this particular bank should be positively correlated with this bank-specific effect in the profitability of all firms that borrow from this bank. In contrast, if a bank with higher monitoring activities picks out only those firms with higher profitability (screening effects), then firm-specific effects should be positively correlated with the EOH ratio. Here, we examine which of these are consistent with our data.

A. First Stage: Firm Premium and Bank Premium

The estimation proceeds as follows. At the first stage, we estimate the following equation:

$$y_{i,j,t+1} = \alpha + \gamma r_{i,j,t} + \delta L_{i,j,t} + \boldsymbol{n}_{j,t}\eta + \boldsymbol{w}_{i,t}\theta + \boldsymbol{TDUM}_t\lambda + \mu_i + \boldsymbol{d}_{i,t}\varphi + \varepsilon_{i,j,t+1}. \quad (4)$$

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significantly weakened when they controlled for individual unobserved effects. Based on their regression results of a two-stage double-fixed-effect model, they concluded that we can explain the observed higher wages in high-tech industries mainly by a sorting of workers among industries and not by the effect of technological change on workers' productivity.

The variables of $y_{i,j,t+1}$, $r_{i,j,t}$, $L_{i,j,t}$, $\boldsymbol{n}_{j,t}$, $\boldsymbol{w}_{i,t}$ and $\boldsymbol{TDUM}_t$ are the same as in equation (1). The error term is assumed to be $e_{i,j,t+1} \sim IID(0,\sigma_e^2)$. The term μ_i represents the unobservable characteristics effect, which is interpreted as the "firm premium" on the firm's profitability. We assume this term is constant over time. The firm premium is unobservable to the econometrician and market participants, but it is revealed over time as a firm-specific constant in the regression. The firm premium is independent from the observable characteristics of the firm and bank premiums, the latter of which we now turn to.

It should be noted that there is a sizable number of firms that change their main bank in our sample period. The percentage of firms that has changed their main bank at least once is 17.2% among the 1379 sample firms in the 1987-91 period, and 12.8% among the 1513 sample firms in the 1992-96. Taking this into account, we construct a dummy variable for each bank that has a value of unity if this particular bank is the main bank of a firm in consideration in a particular period, and zero if otherwise. The vector $\boldsymbol{d}_{i,t}$ is the vector of thus-constructed bank dummy variables. The coefficient vector φ of these bank dummy variables therefore represents the "bank premium" of each main bank to the firm's profitability. It represents bank-specific effects that cannot be explained by other observable characteristics of the firm, those of the bank, or the unobserved firm-specific characteristics.

In the first stage, we estimate equation (3) for 1987-91 and 1992-96 (in which the EOH ratios are statistically significant) by using fixed-effects estimators to obtain the estimated parameters of interest: the estimated firm premium $\hat{\mu}_i$, and the estimated bank premium $\hat{\varphi}_j$.

Table III presents the estimated bank premium by fixed-effects estimators. Heteroskedasticity-consistent standard errors are in parentheses. To save space, we do not show firm premiums here.[19] The Davidson and MacKinnon test does not reject the exogeneity of the borrowing interest rate

[19] These results are available from the authors upon request.

either in the 1987-91 or in the 1992-92 period.

B. Second Stage: Screening Effects versus Performance-Improving Effects

At the second stage, we examine whether the firm premium and/or the bank premium is significantly correlated with the EOH ratios in order to discern whether screening effects or performance-improving effects are effective. As explained earlier, if the bank's screening is effective, the EOH ratios should be positively correlated with firm premiums, while the EOH ratios should be correlated with bank premiums if monitoring activities enhance borrower firm's profitability directly.

In particular, we estimate the following two equations:

$$\hat{\mu}_i = \rho_1 + \rho_2 \widetilde{\Gamma}_i + u_i , \qquad (5)$$

$$\hat{\varphi}_j = \rho_3 + \rho_4 \Gamma_j + \omega_j . \qquad (6)$$

In equation (5), the dependent variable is the estimated firm specific effects μ_i. Here $\widetilde{\Gamma}_i$ represents the magnitude of monitoring activities of firm i's main bank. Since a non-negligible number of firms changed their main bank, we proceed in the following way. For example, if the firm changes its main bank from Bank A to Bank B, we take the weighted average of the EOH ratio of A and B as $\widetilde{\Gamma}_i$, where the weight to Bank A's (B's) index is the fraction of the period in which Bank A (B) is the main bank of this firm. In addition to this adjusted EOH ratio, industry dummy variables and period-averages of the logarithm of total assets are included to control for industry and size effects, respectively.

In equation (6), the dependent variable is the set of the estimated coefficients of the bank dummies. Here Γ_j represents the period-average value of the EOH ratio of bank j. Dummy variables to control for the type of bank (city, long-term credit, regional, trust, and second-tier regional) are added to equation (6).

Equations (5) and (6) are estimated using WLS since the dependent variables are estimated

coefficients. Tables IV and V present the estimation results of equations (5) and (6), respectively.[20] These tables show that firm premiums are positively correlated with the period-average of the EOH ratio of the main bank at the 1% level both in the 1987-1991 and the 1992-96 period. In contrast, bank premiums are not statistically significantly correlated with the EOH ratios for both periods.

These results suggest that the positive correlation between firms' profitability and the EOH ratios of the main bank found in the previous section is induced mostly by the selection mechanism. In contrast, there is no statistically significant evidence for the performance-improving effects of monitoring activities.

One might argue that it takes time to observe performance-improving effects. We examine this argument by regressing the dependent variable at time $t + 3$ on explanatory variables at time t. The results are the same and again consistent with the screening hypothesis.

VI. Conclusions and Implications for Further Research

In this paper, we have presented a measure of gauging Japanese banks' monitoring activities. The measure we constructed is the ratio of loan-project examining officers to the total employees in the headquarters of a bank. By utilizing this new measure, we tested two competing hypotheses about the nature of banks' monitoring, (1) the monitoring improved profitability of borrowing firms and (2) it simply "screened" out unprofitable firms, by using the data of all Japanese corporations listed on the Tokyo Stock Exchange between 1981 and 1997. The result was inconsistent with the profitability-improving hypothesis of banks' active involvement in borrowing firms, and strongly suggested a passive role as a screening device for banks. It means that banks are more vulnerable to economic downturns than otherwise would be the case since they themselves do not have the ability to improve borrower firms' performance and thus to secure their loans by themselves. Then, taking account of the depressed economic conditions after the bust of the Bubble Economy, it is no wonder

[20] It should be noted here that we assume away any possible endogeneity of firm-bank matching.

that Japanese banks acted rather passively and fell into the difficulties of the early 2000s.

We also found that many banks dramatically reduced their monitoring activities between 1981 and 1985. Probably this reorganization contributed to the Bubble Economy in the second half of 1980s. There is a strong case to be made for analyzing what economic conditions caused this boom of reorganizations and banks with what characteristics could resist the temptation of this risky reorganization.

APPENDIX

In this Appendix we present a simple model of banks' monitoring activities and borrowers' performance. By constructing a theoretical model of a lending market with profit-maximizing banks and borrowing firms, we analyze the relationship between banks' monitoring activities and the profitability of borrowing firms. As we discussed in section IV, banks with intensive monitoring activities tend to have relatively profitable borrowers through the following two alternative mechanisms. Firstly, through intensive monitoring, banks can screen out unprofitable firms. In the first section of this appendix we present a model of this "screening mechanism." Secondly, banks applying intensive monitoring can provide better advice to borrowers based on superior information. They can also keep corporate managers under discipline. These activities will make borrowing firms more profitable. In the second section we will present a model of this "profitability-improving mechanism."

A. A. Model of the Screening Effect

First, we focus on the screening effect of banks' monitoring activities. In screening processes we may have phenomena which are specific to transactions under asymmetric information such as adverse selection and signaling. Additionally, as a result of the screening, bad firms may not be able to obtain funds. In this case, observations of borrowers will be a result of a selection process. These phenomena make both the theoretical and the econometric analysis very complicated. To simplify our analysis we will not take these factors into account in our model.

We consider an economy with many firms and banks. In period 0, each firm borrows funds from a bank and invests these in its own project. In period 1, the firm ends the project and returns the funds to the bank. We assume that firms do not have their own funds and they borrow the total amount necessary for the project. The total cost of each firm's project, L_i , is assumed to be given.

We start by considering firm i which borrowed funds from bank j in period 0. Its total value

(including the money to be returned to its bank) in period 1 is expressed by

$$L_i \exp(m_i + u_i)$$

where m_i denotes firm i's specific determinant of profitability of the project and u_i denotes a stochastic variable. The above value is the maximum amount of money which firm i can return to the bank. At the beginning of period 0, the value of m_i is only known by firm i. The expectation of u_i is 0 and the standard deviation is σ. Let $f(u_i)$ denote the probability density function.

In order to know the profitability of firm m_i, a bank needs to conduct a screening. We assume that under our parameter values there exists no "pooling" equilibrium, in which banks lend to all the firms at an identical interest rate with no screening.

Bank j's cost of screening firm i is expressed by

$$C_i^{\,j} = C(Z_j, v_i)$$

where Z_j denotes bank j's monitoring capability. v_i is the index of the difficulty of screening firm i. $C(\ )$ is a decreasing function of Z_j and an increasing function of v_i. We assume that Z_j is an increasing function of the intensity of bank j's monitoring activities Γ_j:

$$Z_j = Z(\Gamma_j, \boldsymbol{n}_j)$$

where $\boldsymbol{n}_j$ denotes a vector of the other determinants of bank j's monitoring capability. Γ_j, the intensity of each bank's monitoring activity, is assumed to be predetermined. Function $C(\ )$ is continuously twice differentiable and satisfies

$$\frac{\partial C}{\partial v_i} > 0, \quad \frac{\partial^2 C}{\partial Z_j^{\,2}} > 0, \quad \frac{\partial C}{\partial Z_j}_{|\Gamma_j = 0} < 0, \quad \lim_{\Gamma_j \to \infty} \frac{\partial C}{\partial Z_j} > 0, \quad \frac{\partial^2 C}{\partial Z_j \partial v_i} < 0$$

Figure 2 shows the relationship between screening cost $C(\ )$ and bank j's monitoring capability Z_j for a given v_i, the difficulty of screening firm i. The upper curve denotes this relationship for those firms where screening is relatively difficult. Under these assumptions, banks with higher monitoring capabilities tend to have a comparative advantage in lending to firms where screening is relatively difficult. As Figure 2 shows, the screening-cost minimizing value of bank j's monitoring capability Z_j

is uniquely determined for each v_i, the difficulty of screening firm i. We express this relationship by

$$Z = \gamma(v) \tag{A1}$$

where $\gamma(\ )$ is an increasing function.

In period 0, the expected present value of firm i's net profit in period 1 is expressed as

$$L_i \int_{r^j{}_i - m_i}^{+\infty} \{\exp(m_i + u_i) - \exp(r_i^j)\} f(u_i) du_i \tag{A2}$$

where r_i^j denotes the interest rate charged by bank j to firm i. In period 0, the expected present value of bank j's gain from its lending to firm i is expressed by

$$\begin{aligned} & L_i \int_{-\infty}^{r^j{}_i - m_i} \exp(m_i + u_i) f(u_i) du_i + L_i \int_{r^j{}_i - m_i}^{+\infty} \exp(r_i^j) f(u_i) du_i \\ & - (L_i + A + C(Z_j, v_i)) \exp(r_m) \end{aligned} \tag{A3}$$

The first integral denotes the present value of the money the bank can collect when the firm defaults. A denotes the fixed costs of each loan and r_m denotes the interest rate in the inter-bank market, which is equal to banks' opportunity cost of lending.

Since each lending is extended on a face-to-face basis, the interest rate depends on the bargaining powers of each side. To simplify our analysis we assume that firms can make a "take it or leave it" offer and that the interest rate of each loan is determined at the level that makes banks' marginal gain from lending equal zero. We assume that Γ_j (each bank's monitoring intensity), $\boldsymbol{n}_j$ (other factors determining banks' capability of screening), v_i (the difficulty of screening firm i) and L_i (the total cost of each firm's project) are known by all firms and banks in period 0.

We also assume that each firm can choose its bank. Then we can easily show that each firm with v_i will choose the bank, with the screening capability Z_j, which minimizes the screening cost $C(Z_j, v_i)$. We assume that there is a sufficient variety of banks so that each firm with v_i can find a bank with Z_j which satisfies equation (A1).

Under the above assumptions, firm i can borrow money at the interest rate that satisfies the following zero-profit condition of the bank:

$$L_i \int_{-\infty}^{r^j{}_i - m_i} \exp(m_i + u_i) f(u_i) du_i + L_i \int_{r^j{}_i - m_i}^{+\infty} \exp(r_i^j) f(u_i) du_i - (L_i + A + C(Z_j, v_i)) \exp(r_m) = 0 \quad \text{(A4)}$$

where Z_j is determined by[21]

$$Z_j = \gamma(v_i)$$

Using the above two equations we can express the equilibrium interest rate as a decreasing function of the profitability of firm m_i and the loan amount L_i^j and as an increasing function of v_i, the difficulty of screening firm i.

$$r_i^j = r(m_i, v_i, L_i) \quad \text{(A5)}$$

We also assume that the screening cost $C(\ )$ is small so that all firms will have an incentive to borrow funds.

Using the implicit function theorem, we can derive the following equation.

$$m_i = m(v_j, r_i^{\ j}, L_i) \quad \text{(A6)}$$

which satisfies

$$\frac{\partial m}{\partial v_j} > 0 \quad \text{(A7)}$$

$$\frac{\partial m}{\partial r_i^j} < 0 \quad \text{(A8)}$$

$$\frac{\partial m}{dL_i} < 0 \quad \text{(A9)}$$

Using equation (A6) and function $Z(\ )$, we can derive the following equation for empirical analysis.

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[21] More rigorously, we assume the following sequential process in the period 0 negotiation.

1. Each firm chooses a bank to negotiate with.
2. Firm i offers bank j borrowing conditions that define the size of the funds L_i^j and the interest rate schedule, which is a function of m_i. m_i is not yet known by bank j.
3. Each bank decides whether to accept firms' offers.
4. Banks start their screening of those firms whose offer they accepted.
5. Once bank j knows m_i, the level of the interest rate r_i^j is decided.

$$m_i + u_i = m(v_i, r_i^{\ j}, L_i) + u_i$$
$$= m(\gamma^{-1}(Z(\Gamma_j, \boldsymbol{n}_j)), r_i^{\ j}, L_i) + u_i$$

The left-hand side of the first equality denotes the ex-post profitability of firm *i*'s project. This equation can be rewritten as

$$m_i + u_i = g_1(\Gamma_j, \boldsymbol{n}_j v_i, r_i^{\ j}, L_i) + u_i \qquad \text{(A10)}$$

On the right-hand side of the equation all the variables except the error term are observable. $g_1(\ )$ is an increasing function of Γ_j and a decreasing function of Li and r_i^j.

B. A. Model of the Performance-Improving Effect

Next we present a model of the profitability-improving mechanism. We assume that banks pursuing intensive monitoring can provide good advice to their borrowers based on superior information. They can also keep corporate managers disciplined. These activities will make borrowing firms more profitable.

The intensity of each bank's monitoring activity is assumed to be predetermined. Let Γ_j denote the monitoring intensity of bank *j*. We assume that banks with a relatively higher monitoring intensity can provide good advice to the borrowing customers; and this advice increases the profitability of the borrowing firms. Let

$$L_i \exp(m_i + \psi_j + u_i)$$

denote the total value of firm *i* in period 1, including the funds obtained from bank *j* in period 0 which need to be returned. m_i denotes the firm-specific determinant of the profitability of the project, ψ_j denotes the contribution of bank *j*'s monitoring activities to the profitability of the project, and u_i denotes the stochastic variable. We assume that firms do not have their own funds and the total cost of each firm's project, L_i is given. u_i denotes a stochastic variable which follows a normal distribution. The average is zero and the standard deviation is σ. Let $f(u_i)$ denote the probability density function.

We assume that ψ_j is an increasing function of Γ_j which denotes the intensity of bank j's monitoring activity:

$$\psi_j = \psi(\Gamma_j, \boldsymbol{n}_j)$$

where $\boldsymbol{n}_j$ denotes bank j's other characteristics which affect its contribution to its borrowers' profitability.

In period 0 the expected present value of firm i's net profit in period 1 is expressed as

$$[L_i \int_{r^j{}_i - m_i - \psi_j}^{+\infty} \{\exp(m_i + \psi_j + u_i) - \exp(r_i^j)\} f(u_i) du_i] \exp(-r_m)$$

where r_i^j denotes the interest rate of bank j's loan to firm i. In period 0, the expected present value of bank j's gain from its lending to firm i is expressed by

$$L_i \int_{-\infty}^{r^j{}_i - m_i - \psi_j} \exp(m_i + \psi_j + u_i) f(u_i) du_i + L_i \int_{r^j{}_i - m_i - \psi_j}^{+\infty} \exp(r_i^j) f(u_i) du_i - (L_i + A + C(\Gamma_j, \boldsymbol{n}_j)) \exp(r_m) \quad \text{(A12)}$$

Here we assume that bank j's screening cost $C(\ )$ is an increasing function of bank j's intensity of monitoring and a function of bank j's other characteristics $\boldsymbol{n}_j$. In equation (A12) the definition of the other variables is the same as in equation (A4).

As we have already discussed in our model of the screening mechanism, the level of the equilibrium interest rate will depend on the bargaining power of banks and borrowers. But as we will show later, in the case of our profitability-improving model, the assumption regarding which side possesses greater bargaining power does not affect the basic functional form of the derived equation for empirical analysis

In order to make our explanation easy to understand, we first analyze a situation in which greater bargaining power rests with the banks. Suppose a case where lenders' monitoring activity does not contribute to firms' profit. We assume that in this case firms can easily find banks eager to lend. In the case of such borrowing, the interest rate is determined by the following zero-profit condition of the bank.

$$L_i \int_{-\infty}^{r^*_i - m_i} \exp(m_i + u_i) f(u_i) du_i + L_i \int_{r^*_i - m_j}^{+\infty} \exp(r_i^*) f(u_i) du_i - (L_i + A)\exp(r_m) = 0 \tag{A13}$$

where *ri* denotes the interest rate for this loan. Firm *i*'s reservation profit is determined by

$$R_i = L_i \int_{r^*_i - m_i}^{+\infty} \{\exp(m_i + u_i) - \exp(r_i^*)\} f(u_i) du_i \tag{A14}$$

From the above two equations we can rewrite firm *i*'s reservation profit as

$$R_i = L_i \int_{-\infty}^{+\infty} \exp(m_i + u_i) f(u_i) du_i - (L_i + A)\exp(r_m) \tag{A15}$$

We assume that in the case of banks that can make a positive contribution ψ to their borrowers' profit, greater bargaining power rests with the banks. Bank *j* can lend money to firm *i* at the interest rate that satisfies the following reservation-profit condition of the firm.

$$L_i \int_{r^j{}_i - m_i - \psi_j}^{+\infty} \{\exp(m_i + \psi_j + u_i) - \exp(r_i^j)\} f(u_i) du_i = L_i \int_{-\infty}^{+\infty} \exp(m_i + u_i) f(u_i) du_i - (L_i + A)\exp(r_m) \tag{A16}$$

The loan interest rate is determined by the above equation.

We next derive an equation for empirical analysis. In order to apply the implicit function theorem to equation (A16), we assume that ψ_j is not so large that there exists a positive value δ which satisfies the following inequality for any m_i and r_i^j.

$$B = \int_{-\infty}^{+\infty} \exp(m_i + u_i) f(u_i) du_i - \int_{r^j{}_i - m_i - \psi_j}^{+\infty} \exp(m_i + \psi_j + u_i) f(u_i) du_i > \delta \tag{A17}$$

We also introduce a new function, $\Omega(\ )$, which is defined by

$$\Omega(m_i, \psi_j, r_i^j, L_i) = L_i \int_{r^j{}_i - m_i - \psi_j}^{+\infty} \{\exp(m_i + \psi_j + u_i) - \exp(r_i^j)\} f(u_i) du_i - L_i \int_{-\infty}^{+\infty} \exp(m_i + u_i) f(u_i) du_i - (L_i + A)\exp(r_m)$$

$\Omega(\ )$ is a continuously differentiable function of the four variables. Under the assumption of

inequality (A17), $\Omega(\ )$ is also a decreasing function of m_i and takes a positive value for small enough values of m_i and takes a negative value for large enough values of m_i. Therefore we can apply the implicit function theorem to equation (A16) and express m_i as a function of ψ_j, r_i, L_i.

$$m_i = m(\psi_j, r_i^{\ j}, L_i) \tag{A18}$$

which satisfies

$$\frac{\partial m}{\partial \psi_j} = -\frac{\dfrac{\partial \Omega}{\partial \psi_j}}{\dfrac{\partial \Omega}{\partial m_i}} = \frac{\displaystyle\int_{r^j{}_i - m_i - \psi_j}^{+\infty} \exp(m_i + \psi_j + u_i) f(u_i)\, du_i}{B} > 0 \tag{A19}$$

$$\frac{\partial m}{\partial r_i^j} = -\frac{\dfrac{\partial \Omega}{\partial r_i^j}}{\dfrac{\partial \Omega}{\partial m_i}} = \frac{-\displaystyle\int_{r^j{}_i - m_i - \psi_j}^{+\infty} \exp(r^j{}_i) f(u_i)\, du_i}{B} < 0 \tag{A20}$$

$$\frac{\partial m}{dL_i} = -\frac{\dfrac{\partial \Omega}{\partial L_i}}{\dfrac{\partial \Omega}{\partial m_i}} = \frac{-\dfrac{A}{L_i}\exp(r_m)}{B} < 0 \tag{A21}$$

Using equation (A18) and function $\psi(\ )$ we can derive the following equation for the empirical analysis.

$$m_i + \psi_j + u_i = m(\psi(\Gamma_j, \boldsymbol{n}_j), r_i^{\ j}, L_i) + \psi(\Gamma_j, \boldsymbol{n}_j) + u_i \tag{A22}$$

which can be rewritten as

$$m_i + \psi_j + u_i = g_2(\Gamma_j, \boldsymbol{n}_j, r_i^{\ j}, L_i) + u_i \tag{A23}$$

$g_2(\ )$ is an increasing function of Γ_j and a decreasing function of L_i, and r_i^j.

Finally, we study the case where firms enjoy the greater bargaining power and can borrow funds at the interest rate that satisfies the following zero-profit condition of the bank.

$$L_i \int_{-\infty}^{r^j{}_i - m_i - \psi_j} \exp(m_i + \psi_j + u_i) f(u_i)\, du_i + L_i \int_{r^j{}_i - m_i - \psi_j}^{+\infty} \exp(r_i^j) f(u_i)\, du_i - (L_i + A + C(\Gamma_j, \boldsymbol{n}_j))\exp(r_m) = 0 \tag{A23}$$

Again we can apply the implicit function theorem to the above equation and derive

$$m_i + \psi_j + u_i = h(r_i^{\ j}, L_i, C(\Gamma_j, \boldsymbol{n}_j)) + u_i$$

which can be rewritten as

$$m_i + \psi_j + u_i = g_3(\Gamma_j, \boldsymbol{n}_j, r_i^{\ j}, L_i) + u_i$$

$g_3(\ )$ is an increasing function of Γj and a decreasing function of Li and r_i^j.

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Figure I. EOH Ratio (the Ratio of Examining Officer at the Headquarters) by Bank-Type and by Year

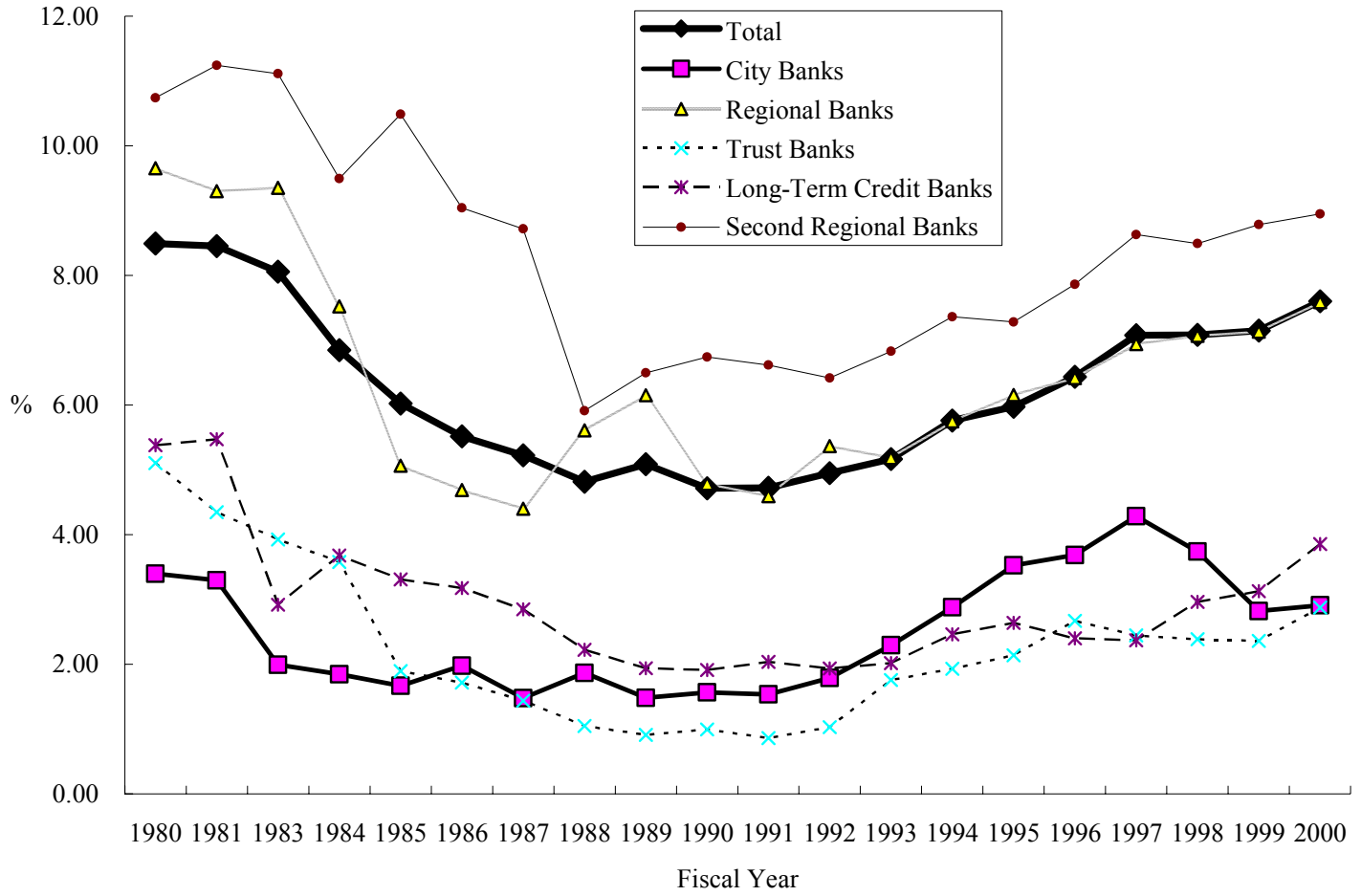

Figure II. The EOH ratio and the ratio of loans to the finance, insurance, and real estate sector to total loans in 1990

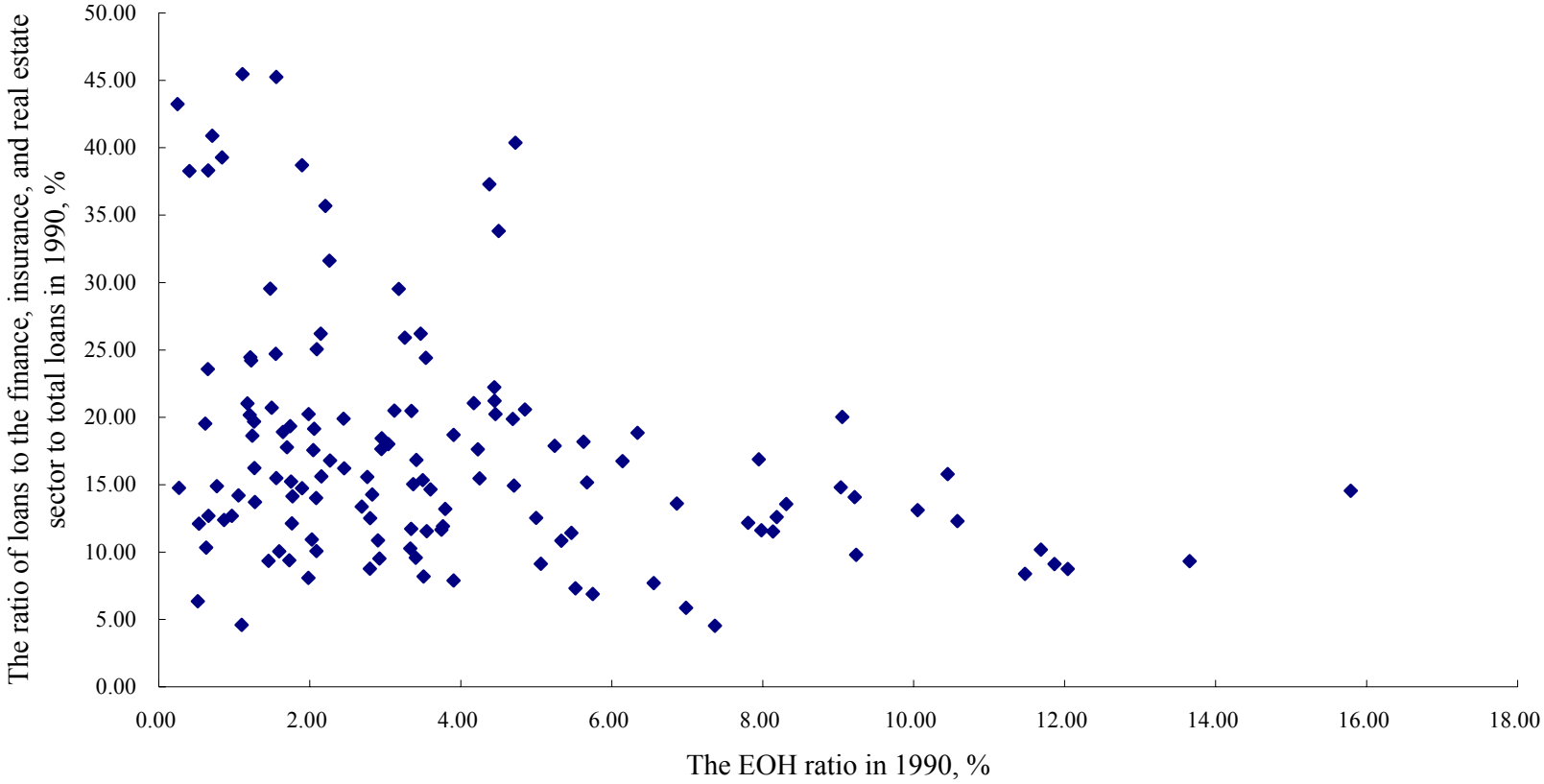

Figure III. The EOH ratio in 1990 and the ratio of non-performing loans to total loans in 1997

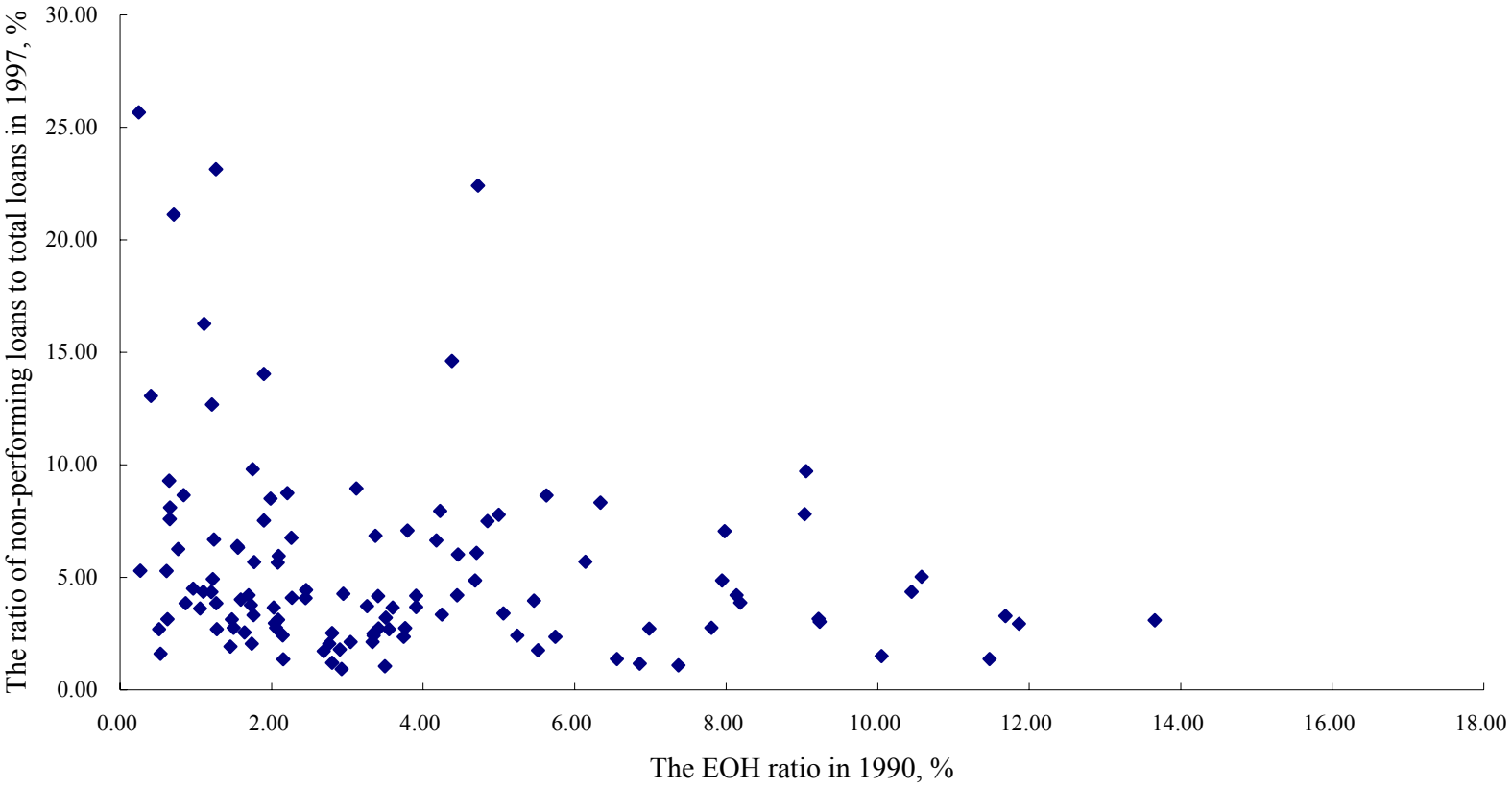

Table I. Means and Standard Deviations of the Variables and Industry Distribution

The table contains summary statistics of the major variables used in the regression analysis and the industry distribution of the sample firms.The sample consists of non-financial firms that are listed on the first and second sections of the Japanese stock markets from 1980 to 1996. We exclude the electricity, gas and water supply industries because these are heavily regulated industries. Each observation represents a firm/main bank pairs in any year from 1981 to 1996. Panel A presents descriptive statistics of the main bank. Main bank is defined here as the largest lender in each year. This sample do not include those firms where two or more banks are the largest lender at the same time. The EOH ratio is the period average of the ratio of loan-project examining officers to total employees at headquarters of the bank. Panel B presents those of other non-main banks' average. Panel C contains data on the borrowing firms. Panel D shows the industry distirobution of the borrowing firms.

	1981-86		1987-91		1992-96	
Variable	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Panel A: Main banks' characteristics						
EOH ratio (%)	2.673	(1.822)	1.566	(1.048)	2.020	(1.517)
Firm's loan share in the bank's total loans (%)	0.089	(0.208)	0.050	(0.115)	0.046	(0.123)
Ratio of the number of projects to which the bank lends to the bank's total loans	0.038	(0.030)	0.019	(0.011)	0.035	(0.021)
Small and medium-sized firms' share in the number of projects to which the bank lend	0.974	(0.050)	0.976	(0.048)	0.989	(0.019)
Panel B: Non-main banks' average						
EOH ratio (%)	3.105	(0.818)	1.894	(0.606)	2.338	(0.729)
Firm's loan share in the bank's total loans (%)	0.036	(0.069)	0.024	(0.047)	0.021	(0.047)
Ratio of the number of projects to which the bank lends to the bank's total loans	0.051	(0.018)	0.027	(0.011)	0.043	(0.014)
Small and medium-sized firms' share in the number of projects to which the bank lend	0.958	(0.035)	0.956	(0.038)	0.983	(0.013)
Panel C: The characteristics of the borrowing firms						
Ratio of operating profits to total assets (%)	5.174	(4.284)	4.591	(3.673)	2.878	(3.521)
Average borrowing rate	0.136	(0.399)	0.081	(0.069)	0.072	(0.109)
Shareholding by top 10 shareholders (%)	48.276	(14.062)	48.927	(13.781)	48.905	(13.405)
Ratio of debt to total assets	0.743	(0.155)	0.690	(0.167)	0.646	(0.178)
Ratio of loan to debt	0.376	(0.184)	0.351	(0.201)	0.346	(0.210)
Ratio of loan from the main bank to total bank loans	0.267	(0.134)	0.284	(0.138)	0.287	(0.140)
Logarithm of total assets	10.414	(1.325)	10.716	(1.383)	10.960	(1.378)

Panel D: Share of each industry in the number of total samples

	1981-86	1987-91	1992-96
Manufacturing	0.683	0.662	0.637
Wholesale and retail trade	0.112	0.127	0.142
Agriculture, forestry and fishing	0.004	0.004	0.004
Mining	0.009	0.007	0.007
Construction	0.097	0.085	0.080
Other finance	0.002	0.010	0.013
Real estate	0.015	0.017	0.018
Transport and communications	0.052	0.053	0.046
Service	0.027	0.034	0.053
Number of observations	6758	5535	6228

Table II. Estimation Results of the Bank Monitoring Activities on Borrower Firms' Profitability

The dependent variable is the firm's operating profits to total assets. We estimate the same regression model for the three periods of 1981-86, 1987-91, and 1992-96. All independent variables exept EOH ratio are the vaules at t-1. The EOH ratio is the period average of the ratio of loan-project examining officers to the total employees at headquarters. Estimated coefficients are obtained by FGLS where we assume the error term is composed of the random effect associated with the bank and the idiosyncratic error. All regressions include industry dummies, bank type dummies, and time dummies, which are not reported here to save space. Robust standard errors are in parentheses.

	1981-86			1987-91			1992-96		
Variable	Coef.	Std. err.	P>|z|	Coef.	Std. err.	P>|z|	Coef.	Std. err.	P>|z|
Main bank: EOH ratio	-0.048	(0.031)	0.126	0.131	(0.045)	0.004	0.112	(0.028)	0
Main bank: Lending rate (approximated by average borrowing rate)	-0.099	(0.112)	0.379	0.356	(0.677)	0.599	0.419	(0.318)	0.188
Main bank: Firm's loan share in the main bank's total loans	-0.089	(0.279)	0.751	-0.223	(0.507)	0.66	-0.665	(0.328)	0.043
Main bank: Ratio of the number of the projects to which the bank lends to the bank's total loans	-1.582	(3.251)	0.627	2.018	(6.544)	0.758	9.531	(2.621)	0
Main bank: Small and medium-sized firms' share in the number of projects to which the bank lends	3.627	(1.402)	0.01	2.683	(1.765)	0.129	0.381	(1.357)	0.779
Non-main banks: Average of EOH ratio	0.110	(0.061)	0.07	-0.102	(0.083)	0.216	0.013	(0.066)	0.841
Non-main banks: Average of the firm's loan share in the bank's total loans	0.367	(0.927)	0.692	-0.496	(1.382)	0.72	0.601	(1.249)	0.631
Non-main banks: Average of the number of projects to which the bank lends to the bank's total loans	-5.994	(3.901)	0.124	29.161	(4.488)	0	11.079	(3.441)	0.001
Non-main banks: Average of small and medium-sized firms' share in the number of projects to which the bank lends	2.687	(1.256)	0.032	4.988	(1.096)	0	2.043	(2.643)	0.44
Shareholding by top 10 shareholders	0.013	(0.003)	0	0.011	(0.003)	0.001	0.014	(0.003)	0
Ratio of debt to total assets	-10.564	(0.363)	0	-5.698	(0.304)	0	-2.734	(0.267)	0
Ratio of loan to debt	-0.565	(0.305)	0.064	-2.243	(0.288)	0	-3.683	(0.242)	0
Ratio of loan from the main bank to all bank loans	-0.509	(0.377)	0.177	-1.199	(0.339)	0	-0.629	(0.311)	0.043
Logarithm of total assets	0.256	(0.049)	0	-0.113	(0.049)	0.021	0.078	(0.042)	0.068
Constant	4.914	(1.944)	0.011	1.339	(2.194)	0.542	0.797	(3.002)	0.791
Number of observations	6758			5535			6228		
Number of banks	71			70			75		
Log likelihood	-18338.4			-14313.7			-15985.1		
Wald chi2	1865.53			1241.78			1181.56		
Prob>chi2	0			0			0		

Table III. Estimated Bank Premium (Results of the First-Stage Regression)

This table shows the estimated coefficients and standard errors of the bank dummy variables obtained from the first-stage regression for the periods of 1987-91 and 1992-96. The dependent variable is the firm's operating profits to total assets. All regressions include the same explanatory variables as in Table 3, except that EOH ratio is excluded while bank dummies (reported here) and firm specific effects (not reported here) are included. Estimated coefficients are obtained by a firm fixed-effects procedure. The Industrial Bank of Japan is excluded. We use the bank name in March, 1995. Robust standard errors are in parentheses.

	1987-91			1992-96		
Bank dummy variable	Coef.	Std. err.	P>|t|	Coef.	Std. err.	P>|t|
INDUSTRIAL BANK OF JAPAN	.	.	.	.	.	.
LONG-TERM CREDIT BANK OF JAPAN	0.291	(0.432)	0.501	1.232	(0.667)	0.065
NIPPON CREDIT BANK	1.125	(0.750)	0.133	1.857	(0.788)	0.018
DAI-ICHI KANGYO BANK	-1.334	(0.543)	0.014	1.354	(0.574)	0.018
SAKURA BANK	-0.771	(0.693)	0.266	0.248	(0.538)	0.645
FUJI BANK	0.817	(0.671)	0.223	-0.394	(0.663)	0.552
MITSUBISHI BANK	-0.367	(0.577)	0.525	0.731	(0.766)	0.34
ASAHI BANK	.	.	.	0.711	(0.702)	0.311
SANWA BANK	-0.703	(0.568)	0.216	1.281	(0.540)	0.018
SUMITOMO BANK	0.275	(0.579)	0.634	0.550	(0.593)	0.353
DAIWA BANK	1.370	(0.908)	0.131	0.680	(0.810)	0.401
TOKAI BANK	0.343	(0.677)	0.613	0.434	(0.590)	0.462
HOKKAIDO TAKUSHOKU BANK	0.127	(0.535)	0.813	1.745	(1.137)	0.125
TAIYO KOBE BANK	-0.231	(0.504)	0.647	.	.	.
BANK OF TOKYO	0.018	(0.951)	0.985	2.554	(0.786)	0.001
SAITAMA BANK	-0.859	(1.997)	0.667	.	.	.
AKITA BANK	-10.254	(4.342)	0.018	6.271	(1.328)	0
BANK OF IWATE	-4.210	(1.288)	0.001	.	.	.
77 BANK	-7.265	(0.989)	0	.	.	.
GUNMA BANK	1.772	(2.377)	0.456	-2.481	(0.545)	0
ASHIKAGA BANK	1.540	(2.276)	0.499	2.148	(0.851)	0.012
JOYO BANK	.	.	.	1.173	(0.808)	0.147
CHIBA BANK	-0.660	(0.793)	0.406	-0.742	(1.591)	0.641
CHIBA KOGYO BANK	2.978	(1.357)	0.028	-2.998	(1.665)	0.072
TOKYO TOMIN BANK	-1.211	(3.851)	0.753	0.656	(1.138)	0.565
BANK OF YOKOHAMA	2.552	(0.891)	0.004	0.705	(0.661)	0.286
DAISHI BANK	-0.556	(0.852)	0.514	-2.843	(1.081)	0.009
HOKUETSU BANK	.	.	.	0.772	(1.191)	0.517
HACHIJUNI BANK	.	.	.	-0.213	(1.204)	0.859
HOKURIKU BANK	0.213	(0.766)	0.781	0.738	(0.993)	0.458
HOKKOKU BANK	-1.284	(1.227)	0.295	0.312	(0.851)	0.714
FUKUI BANK	2.055	(1.788)	0.251	.	.	.
SHIZUOKA BANK	-0.725	(1.254)	0.563	1.681	(0.675)	0.013
SURUGA BANK	-0.985	(1.855)	0.596	-2.369	(1.337)	0.077
JUROKU BANK	-0.196	(1.242)	0.875	.	.	.
HYAKUGO BANK	0.359	(0.959)	0.708	-1.655	(0.982)	0.092
SHIGA BANK	0.270	(1.289)	0.834	.	.	.
BANK OF KYOTO	-5.190	(1.102)	0	-4.377	(1.663)	0.009
BANK OF IKEDA	.	.	.	-0.107	(0.535)	0.842
KIYO BANK	.	.	.	0.588	(1.156)	0.611
SAN-IN GODO BANK	.	.	.	2.490	(1.514)	0.1
CHUGOKU BANK	-0.765	(1.347)	0.57	.	.	.
HIROSHIMA BANK	-0.155	(1.202)	0.897	0.002	(1.133)	0.999
YAMAGUCHI BANK	1.443	(1.696)	0.395	-0.983	(1.063)	0.355
HYAKUJUSHI BANK	.	.	.	0.397	(0.701)	0.572
IYO BANK	.	.	.	-1.090	(0.812)	0.179
BANK OF FUKUOKA	1.708	(2.190)	0.435	-0.413	(0.573)	0.471
BANK OF SAGA	8.654	(1.761)	0	.	.	.
EIGHTEENTH BANK	-2.226	(6.732)	0.741	-1.807	(1.806)	0.317
MIYAZAKI BANK	.	.	.	-0.067	(0.926)	0.942
KAGOSHIMA BANK	-1.483	(1.399)	0.289	.	.	.
MITSUI TRUST AND BANKING	-0.934	(0.890)	0.294	0.424	(0.886)	0.632
MITSUBISHI TRUST AND BANKING	0.429	(0.847)	0.613	0.684	(0.765)	0.371
YASUDA TRUST AND BANKING	0.163	(0.773)	0.833	0.907	(0.852)	0.287
TOYO TRUST AND BANKING	0.054	(0.886)	0.952	4.156	(1.558)	0.008
CHUO TRUST & BANKING	0.378	(1.413)	0.789	-5.290	(0.617)	0
NIPPON TRUST BANK	.	.	.	0.001	(1.384)	1
SUMITOMO TRUST AND BANKING	0.413	(0.683)	0.546	-0.130	(0.872)	0.882
NORTH PACIFIC BANK	.	.	.	-0.088	(1.529)	0.954
KEIYO BANK	.	.	.	-6.789	(1.771)	0
TOKYO SOWA BANK	0.844	(1.405)	0.548	-0.061	(0.932)	0.947
TAIKO BANK	1.633	(2.816)	0.562	.	.	.
AICHI BANK	.	.	.	-1.153	(1.033)	0.265
BANK OF NAGOYA	.	.	.	-4.481	(4.532)	0.323
DAISAN BANK	.	.	.	-2.200	(0.970)	0.023
BIWAKO BANK	-1.514	(1.068)	0.156	7.684	(2.583)	0.003
BANK OF KINKI	4.233	(1.628)	0.009	.	.	.
BANK OF NANIWA	.	.	.	7.371	(1.715)	0
FUKUTOKU BANK	.	.	.	-0.340	(1.221)	0.781
BANK OF KANSAI	-3.481	(1.503)	0.021	9.266	(1.663)	0
HANWA BANK	.	.	.	-0.567	(1.579)	0.719
MIDORI BANK	2.763	(1.477)	0.061	.	.	.
NISHI-NIPPON BANK	2.900	(1.820)	0.111	-0.860	(1.019)	0.399
FUKUOKA CITY BANK	.	.	.	-1.066	(1.258)	0.397
Number of observations	5535			6228		
Adjusted R-squared	0.7497			0.7584		

Table IV. Main Bank Monitoring Activities and Firm Premium (Results of the Second-Stage Regression)

The dependent variable is the estiamted firm specific effects obtained from the regression analysis in Table 4 (not reported). The EOH ratio is weighted mean of the ratio of loan-application examining officers to total employees at headquarters of the main bank. Logarithm of total assets are the period average. All second-stage regressions include industry dummy variables. Estimated coefficients are obtained by WLS. Robust standard errors are in parentheses.

	1987-91			1992-96		
Variable	Coef.	Std. err.	P>|t|	Coef.	Std. err.	P>|t|
EOH ratio (main bank)	0.246	(0.094)	0.009	0.229	(0.078)	0.003
Logarithm of total assets	2.510	(0.067)	0	0.880	(0.085)	0
Constant	-26.928	(0.754)	0	-9.936	(0.972)	0
Number of observations	1377			1512		
R-squared	0.5099			0.0973		

Table V. Main Bank Monitoring Activites and Bank Premium (Results of the Second-Stage Regression)

The dependent variable is the estiamted coefficient of bank dummy reported in Table 4. The EOH ratio is the ratio of loan-application examining officers to total employees at headquarters of the main bank. All second-stage regressions include bank type dummy variables. Estimated coefficients are obtained by WLS. Robust standard errors are in parentheses.

	1987-91			1992-96		
Variable	Coef.	Std. err.	P>|t|	Coef.	Std. err.	P>|t|
EOH ratio (main bank)	-0.051	(0.219)	0.816	-0.214	(0.146)	0.15
Constant	0.842	(0.637)	0.192	2.045	(0.408)	0
Number of observations	53			60		
R-squared	0.0056			0.0468		