Financial Relations between Banks and Firms: New Evidence from Japanese Data[*]

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Abstract

This paper considers how firm-specific factors affected the financial relations between banks and firms in Japan during the period in which deregulation and reform of the financing decisions of firms were almost completed. This was also a period in which Japanese banks incurred large bad loans. Our empirical results suggest that: (i) main banks make more short-term loans to firms with smaller prospects for growth and a greater likelihood of financial distress; (ii) main banks misuse their private information for their self-interest at the expense of the other banks in bond underwriting, and (iii) main banks hold a greater number of shares of firms with smaller prospects for growth. These findings indicate that the role of main banks as a lender to firms with greater prospects for growth but a greater likelihood of financial distress is constrained. To overcome this problem, the authorities may be allowed to nationalize most of the major Japanese banks and attempt to reorganize a new banking system that promotes lending to firms with greater prospects for growth but a greater likelihood of financial distress.

1 Introduction

The purpose of this paper is to consider the effect on corporate governance of a change in corporate financial policy, using Japanese market data for the period in which deregulation and reform of the financing decisions of firms were almost completed and Japanese banks incurred large bad loans. We also discuss how financial relations between banks and firms in Japan should be reorganized following the recent depression and financial crisis.

The Japanese banking system is often characterized as a main bank system. A main bank is conventionally defined as a bank that holds the largest single share, among the private financial institutions, of loans made to a firm. The main bank usually owns some of the firm's equities, and may even send bank executives into top management positions within the firm. It is often stated that most large Japanese firms have close financial, shareholding and managerial ties with their main banks. However, the recent deregulation and reform processes, combined with the large bad loan issues in the banking sector, have changed this historical financing pattern of the Japanese firms.

When the deregulatory process began at the end of the 1970s, the restrictions on the public bond market in Japan were gradually relaxed and the segmentation of the banking system began to decline. Although unsecured straight and convertible bonds were permitted in the public bond market in 1979, the Bond Issue Criteria remained prohibitively stringent. Throughout the 1980s and the early 1990s deregulation of the public bond market continued. However, until the beginning of 1993, the issue of corporate bonds required commissioned or trustee bank-managed collateral of secured bonds. Because the commissioned or trustee bank monitored the issuing firm, secured bonds were essentially similar to bank loans. The rating criteria were finally removed in 1996, and all the rules governing bond issuance were abolished.

In relation to the segmentation of the banking system, the 1993 Financial System Reform Act lowered the traditional barriers between banks and securities firms, and enabled banks to enter the security business through their subsidiaries. Although the range of security services of these subsidiaries remained limited, in less than three years from their initial establishment the bank-owned securities subsidiaries were able to become the leading underwriters (see Hamao and Hoshi (2000)).

Despite the progress associated with such deregulation, Japanese banks incurred huge bad loans after the burst of the bubble economy. Because of

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a need to clean up their balance sheets, Japanese banks were required to sell portions of the stocks of their customer firms for the purpose of cross-shareholding. This tendency was strengthened by the need to stabilize the price fluctuations of the banks' assets, since the recent reform of the accounting system demands a more stringent standard for bank capital requirements.

The deregulation and associated reforms, in combination with the huge bad loan issues in the Japanese banking system, have changed the historical financing patterns of Japanese firms. The deregulation of the public bond market has caused some bank customers to shift from bank borrowing to public bond issuance. The declining segmentation of the banking system has also enabled bank-owned securities subsidiaries to become major players in the corporate bond market. Huge bad loans and the reform of the accounting system have gradually weakened cross-shareholding between banks and firms. Nevertheless, this pattern may not be uniform: it is possible that the change in the historical financing patterns of Japanese firms is more drastic in some types of firms, but only slight in other types of firms.

In this paper, using data for the 1998 fiscal year in which deregulation and reform were almost completed and Japanese banks incurred huge bad loans, we consider how firm-specific factors affected the change in the historical financing patterns of Japanese firms. More specifically, we exploit the sample selection and double hurdle models that incorporate the truncated nature of dependent variables, and investigate how firm-specific characteristics determine financial relations between banks and firms in the following four fields: bank versus bond financing; the role of main banks in bank loans; the choice of underwriters; and cross-shareholdings. The corporate governance of Japanese firms strongly depends on these four financial factors. Our research also discusses how the recent deregulation and reform process, combined with the huge bad loan issues in the banking sector, changed the conventional main bank system.

Our empirical analysis has two distinguishing features. The first concerns our chosen sample period. If some stringent regulations remain, the firm's financial choice will reflect these regulations, and empirical analysis will be more likely to capture inappropriate relations between firm characteristics and financing decisions that are merely artifacts of the regulatory process. However, since our sampling period is based upon a period in which bond issuance criteria were drastically reduced, many Japanese firms were able to choose freely between bank borrowing and corporate bond issuance in this period. In particular, we can assume that secured bonds were not similar to

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bank loans in this period. Furthermore, bank-owned securities subsidiaries became major leading underwriters because the Financial System Reform Act was effective in this period. Finally, cross-shareholdings between banks and firms were gradually weakened to clear the balance sheets of banks and fulfill the criteria of the newly reformed accounting system. Our sampling period is therefore highly suitable for the purpose of investigating the change in the historical financing patterns of Japanese firms in response to deregulation and the reform process.

The second characteristic of our analysis involves the estimation method. The most straightforward estimation method for the financial relations problem between banks and firms under the main bank system is to estimate the ratio of loans from the main bank to total loans, the probability of the main bank-owned securities subsidiary (or other bank-owned securities subsidiaries) underwriting bonds as a lead underwriter, and the shareholding ratio of the main bank (or other financial intermediaries) by Ordinary Least Squares (OLS).

However, there are several difficulties relating to the data, which have to be handled with caution if we use the OLS approach. First, not all firms receive loans from the main bank, and some firms receive no loans from any banks. Thus, we must first consider whether firms choose to borrow from banks or to issue bonds, and then discuss whether or not firms depend on main bank loans. Second, not all firms issue straight bonds. In particular, few of the firms with credit ratings lower than or equal to BBB issue straight bonds. Furthermore, firms that issue straight bonds often use existing security companies as a lead underwriter for bond underwriting instead of bank subsidiaries. This suggests that we must first investigate whether firms issue bonds, and then check whether firms use main bank (or other bank) subsidiaries as a lead underwriter for bond underwriting. Finally, almost all of the firms have shareholdings with the main bank or the other financial intermediaries that lend to the firms.

These features lead us to exploit the sample selection model to overcome the sample selection bias that may be caused in estimating the ratio of loans from the main bank to total loans or the probability of the main bank subsidiary (or other bank subsidiaries) underwriting bonds as a lead underwriter. Furthermore, since firms with bank loans may not borrow from their main banks, or firms with bond issues may not choose their main bank (or other bank) subsidiaries as a lead underwriter for bond underwriting, it is more appropriate for our purpose to exploit the double hurdle model. This model

takes account of the conditional probability of these events more precisely than the sample selection model. On the other hand, we can use the OLS method to estimate the shareholding ratio of the main bank (or the other financial intermediaries) because we need not consider the sample selection bias in the estimation of cross-shareholdings.

Our principal empirical results are summarized as follows:

(i) In relation to bank versus bond financing, Japanese firms with a smaller Tobin's q and lower interest coverage ratios depend significantly more on bank loans.

(ii) In relation to the role of main banks in bank loans, Japanese firms with a smaller Tobin's q and lower interest coverage ratios depend significantly more on short-term bank loans provided by main banks.

(iii) In relation to the firm's choice of underwriters, Japanese firms with higher interest coverage and higher debt-asset ratios are more likely to use their main bank-owned securities subsidiaries than other bank-owned securities subsidiaries as a lead underwriter for bond underwriting.

(iv) In relation to cross-shareholdings, a smaller Tobin's q indicates that Japanese firms have significantly more shareholdings by main banks than by the other financial intermediaries.

Results (i) and (ii) show that the banks lend more to firms with smaller prospects for growth and a greater likelihood of financial distress. In particular, main banks lend more to these firms by short-term loans. This result can be interpreted such that main banks are forced to make additional loans in order to support financially distressed firms with lower growth potential. Results (i) and (iii) suggest that firms with greater prospects for growth and a smaller likelihood of financial distress tend to issue bonds. Furthermore, main bank subsidiaries are more likely to underwrite less financially distressed firms than other bank subsidiaries. This result is consistent with the conflict of interest effect hypothesis which states that main banks misuse their private information for their self-interest at the expense of the other banks. Result (iv) indicates that main banks hold more shares belonging to firms with smaller prospects for growth. The greater shareholding by main banks resolves the liquidity constraint problem of firms with smaller prospects for growth, to which the main banks lend. Combined with result (ii), this finding may support the liquidity constraint hypothesis that firms belonging to declining industries or firms with smaller growth opportunities are more likely to have close financial relationships with main banks in order to avoid the liquidity problem.

Results (ii) and (iii) indicate strongly that the lending behavior of the main bank system is constrained because main banks are forced to make additional loans to firms that have a smaller prospect of growth and a greater likelihood of financial distress, whereas main banks misuse their private information for their self-interest at the expense of the other banks in bond underwriting. Furthermore, result (iv) may imply a negative view of the main bank system with respect to shareholdings. These findings suggest that most of the major Japanese banks cannot decrease their bad loans by themselves. To overcome this problem, the authorities may need to nationalize most of the major Japanese banks and attempt to organize a new banking system that promotes bank lending to firms with greater prospects for growth but a greater likelihood of financial distress.[1]

Although there are many empirical studies in relation to our subject, as reviewed in the following section, each of these studies is limited in that they deal with only one of the four topics that we consider. Furthermore, their estimation methods are not immune from the sample selection bias. Thus, the most significant difference between those studies and ours is that the former examine each individual topic separately without considering the sample selection bias fully, whereas the latter explores the four topics in an integrated manner using the sample selection or the double hurdle model that incorporates the truncated nature of dependent variables. Furthermore, in contrast to our study, the empirical studies of Japanese firms, with the exception of only a few studies, do not use data from the period in which radical deregulation and reforms occurred.

The paper is organized as follows. Section 2 reviews the theoretical hypotheses about the determinants of financial relations between banks and firms, and summarizes the empirical literature that tests these hypotheses. Section 3 describes the estimation method and presents the sample selection and double hurdle models. Section 4 discusses data and estimation results. The final section is devoted to the conclusion.

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[1]Osano (2002) discusses a theoretical foundation for the nationalization of financially distressed banks.

2 Review of Theoretical Hypotheses and Empirical Evidence

2.1 Bank versus bond financing

We begin by examining the theoretical hypotheses and the empirical evidence with respect to a firm's choice between bank and bond financing.

2.1.1 Theoretical hypotheses

Diamond (1991a) and Rajan (1992) indicate that the agency costs of debt determine the mix of monitored bank debt and arm's-length public debt. Firms with high agency costs are more likely to depend on monitored bank debt than arm's-length public debt. Since monitoring creditors have access to private information and can monitor investment decisions, they can efficiently make the liquidation or refinancing decision in relation to their financially distressed firms. As a result, monitored bank debt is more valuable to firms with high agency costs, in particular, small firms or firms without established reputations. Since firms with high agency costs are likely to be young and highly technological, they are likely to have greater growth opportunities. The agency cost hypothesis thus suggests a positive relation between growth opportunities and bank debt.

In contrast to the agency cost hypothesis, the hold-up hypothesis emphasizes an additional cost of monitored bank debt (see Sharpe (1990) and Rajan (1992)). Monitoring creditors have some monopolistic power at the refinancing stage because borrowing from other creditors is more costly. Since firms with greater growth opportunities are more likely to improve their future reputations and thus have a greater incentive to avoid the additional cost at the refinancing stage, the hold-up cost hypothesis suggests a negative relation between growth opportunities and bank debt.

The third theoretical hypothesis is the liquidity constraint hypothesis, which is similar to that proposed by Hoshi, Kashyap, and Scharfstein (1990, 1991). In this view, firms that have close financial relationships with banks can more effectively avoid problems associated with financial distress. The reason is that those banks are well informed about the firms and their prospects, and the free-rider problems of renegotiating financial claims at times of financial distress are less prevalent. Thus, having a close financial relationship with a bank relaxes liquidity constraints by lessening information

and incentive problems. Since firms belonging to declining industries or firms with smaller growth opportunities are more likely to be liquidity constrained, they are more likely to prefer bank borrowing rather than bond financing in order to avoid the liquidity problem. This hypothesis thus implies a negative relation between growth opportunities and bank debt, as indicated by the hold-up hypothesis.

Finally, whichever hypothesis holds true, we can see that lower-rated firms find it more difficult to borrow arm's-length public debt than monitored bank debt. This argument leads us to state that there exists a negative relation between credit quality and bank debt.

2.1.2   Empirical evidence

The outcome of the empirical studies of U.S. firms depends on the size of the firms. For small U.S. firms, Peterson and Rajan (1994) and Berger and Udell (1995) show that close banking ties reduce credit costs, thus supporting the agency cost hypothesis. On the other hand, for large U.S. firms, Houston and James (1996) suggest a negative relation between growth opportunities and bank debt, thus supporting the hold-up hypothesis or the liquidity constraint hypothesis.

Several researchers have undertaken empirical studies of data from large Japanese firms, but their results are mixed. Hoshi, Kashyap, and Scharfstein (1990, 1991) indicate that firms with strong bank ties tend to be less liquidity constrained. This result provides support for the liquidity constraint hypothesis. Using data from the late 1980s—before the deregulation of the corporate bond market—Hoshi, Kashyap, and Scharfstein (1993) find no relation between growth opportunities and bank debt. On the other hand, Anderson and Makhija (1999) report a positive relation between growth opportunities and bank debt, which supports the agency cost hypothesis. In contrast, using data from 1993-1997—after the deregulation of the corporate bond market—Shirasu and Xu (2000) find a negative relation between growth opportunities and bank debt, thus supporting the hold-up hypothesis or the liquidity constraint hypothesis. In addition, they report a negative relation between credit quality and bank debt.

2.2 The role of the main banks in bank loans

Next we review the theoretical hypotheses and their empirical evidence with regard to the role of the main banks in bank loans.

2.2.1 Theoretical hypotheses

The stylized view suggests that the main bank system plays two important roles in the Japanese bank market. One role is the monitoring function of the main bank (see Aoki (1994)). In addition to the fact that the main bank typically holds the largest single share, among private financial institutions, of loans to a firm, it usually owns some of the firm's equities and may even send bank executives into top management positions within the firm. Furthermore, the main bank normally holds the major payment settlement accounts of the customer firm and can monitor its daily transactional operations. These instruments enable the main bank to monitor its customer firm intensively, both on its own behalf and for the sake of other lenders. This also serves to avoid costly duplication of monitoring costs. Since the main bank's monitoring is more likely to be required by firms with high agency costs, the implication of the main bank's monitoring role is equivalent to that of the agency cost hypothesis discussed in the preceding section; that is, it suggests a positive relation between growth opportunities and main bank debt.

The other important role of the main bank system depends on the risk-shifting mechanism by which the main bank reduces deadweight losses associated with corporate bankruptcy and reorganization. The key component of the risk-shifting mechanism from a firm to its main bank is summarized as follows. The firm pays "insurance premiums" to the main bank in normal times, whereas the main bank gives "financial support" in times of financial distress even though this means incurring additional losses. The "insurance premiums" paid to the main bank in normal times do not necessarily imply a higher nominal interest rate on loans. These premiums can be paid as a higher effective interest rate through maintaining balances or as a higher and more stable level of borrowing. The main bank can also be compensated for the premiums by preferential treatment that designates the main bank as a place of settlement of bills of payment issued by the firm, or allows the main bank to make loans to affiliates and for consumer-related sales of the firm. In return for these "insurance premiums", the main bank will absorb a share of any losses that is much greater than its loan share at default by granting

interest or principal concessions on bank borrowings for a specified period. The main bank bears a greater share of the burden of the default of the firm than the other banks and financial institutions. The rationale for such a risk-shifting mechanism is given by Sheard (1994) and Osano (1998). The implication of the risk-shifting mechanism of the main bank is equivalent to that of the liquidity constraint hypothesis examined in the preceding section. That is, this view suggests a negative relation between growth opportunities and main bank debt. Furthermore, since firms belonging to declining industries are given lower credit ratings, this view also implies a negative relation between credit quality and main bank debt.

2.2.2 Empirical evidence

Several empirical studies attempt to examine the ex post monitoring role of the main bank. Using data from the early 1980s, Prowse (1990) suggests that the main bank relationship does not cause risky, sub-optimal investments. Kaplan and Minton (1994) and Kang and Shivdasani (1995), using data from the 1980s, also give evidence that main banks play an important monitoring and disciplinary role through the appointment of outside directors or the top executive turnover. On the other hand, Morck and Nakamura (1999) indicate that during the 1980s the group firms of main banks did not undergo sharp downsizing following bank appointments to their boards. The risk-shifting role of the main bank is also investigated by Nakatani (1984), Suzuki and Wright (1985), Sheard (1986, 1991), and Hoshi, Kashyap, and Scharfstein (1990). These studies provide empirical evidence for the risk-shifting hypothesis.

2.3 The choice of underwriters

We now proceed to discuss the theoretical hypotheses and their empirical evidence with respect to a firm's choice of underwriters. We also reinterpret these hypotheses as those that express the relation between credit quality and main bank subsidiary underwriting.

2.3.1 Theoretical hypotheses

A conventional argument suggests that the underwriting of commercial banks has a stronger certification effect than that of investment banks or security

companies (see Puri (1996, 1999)). This view stresses that commercial banks can obtain private information about their customer firms through their loan monitoring activities, whereas investment banks cannot. If the underwriting of commercial banks produces more accurate and credible information, firms with less established reputations prefer the underwriting of commercial banks to that of investment banks. Since firms with less established reputations are more likely to have a lower credit rating, they are more likely to prefer the underwriting of commercial banks to that of investment banks. Thus, the certification effect implies a negative relation between the credit rating grade and commercial bank underwriting.

However, the certification effect is offset by the conflict of interest effect (see Puri (1996, 1999)). If commercial banks misuse their private information for their own self-interest, they could systematically underwrite securities issued by firms to which they have outstanding bad loans, and use the proceeds from the issued securities to make the firms repay these loans. If this is the case, lower credit-rated firms are more likely to prefer the underwriting of investment banks to that of commercial banks because the securities of such firms underwritten by commercial banks will be more discounted than those by investment banks. Thus, the conflict of interest effect suggests a positive relation between credit quality and commercial bank underwriting.

The third theoretical hypothesis with respect to the choice of underwriters is the liquidity constraint hypothesis. In this hypothesis, firms that have close financial relationships with commercial banks can more effectively avoid problems associated with financial distress. If firms desire to build close financial relationships with commercial banks, they are more likely to prefer the underwriting of commercial banks. Since firms belonging to declining industries or firms with smaller growth opportunities are more likely to be liquidity constrained, these firms are more likely to prefer commercial bank underwriting to investment bank underwriting. Given that firms belonging to declining industries have smaller growth opportunities and lower credit ratings, this hypothesis implies not only a negative relation between growth opportunities and commercial bank underwriting, but also a negative relation between credit quality and commercial bank underwriting.

Indeed, although these three hypotheses are concerned with the relation between credit quality and commercial bank underwriting, we can easily reinterpret them so that they explain the relation between credit quality and main bank subsidiary underwriting. In the next sections, we will apply the implications of these three hypotheses to the underwriting of main bank

subsidiaries.

2.3.2 Empirical evidence

Examining underwritten security prices or the long-run performance of underwritten securities on U.S. firms, Ang and Richardson (1994), Kroszner and Rajan (1994), and Puri (1994, 1996) give evidence for the certification effect in the era prior to the Glass-Steagall Act. Gande, Puri, Saunders, and Walter (1997) obtain similar results for the period after 1990 in bank underwritings through Section 20 subsidiaries. Furthermore, Puri (1996) and Gande, Puri, and Saunders (1999) report the result of the probit test in which commercial bank underwriting varies inversely with credit quality. These results support the certification effect on U.S. data.

Using Japanese data for the period after the deregulation of the corporate bond market (1994-1996), Hamao and Hoshi (2000) compare the characteristics of straight corporate bonds underwritten by existing securities firms with those by bank subsidiary securities firms, and investigate what factors affect the identity of the lead underwriter. Their results show that no significant differences exist between the characteristics of straight corporate bonds underwritten by existing securities firms and those underwritten by bank subsidiary securities firms.

2.4 Cross-shareholdings

We finally investigate theoretical hypotheses and their empirical evidence with respect to shareholdings by banks.

2.4.1 Theoretical hypotheses

Conventionally, cross-shareholdings are explained by the motive of preventing a potential raider from making a hostile takeover bid (see Aoki (1988), Sheard (1991), and Osano (1996)).

In contrast to this conventional view, Flath (1993) presents an agency cost hypothesis with respect to shareholdings. In this view, by holding a part of the shares of the firm, the main bank has access to privileged or inside information on the firm's creditworthiness and can reduce the possibility of the manager wastefully transferring wealth from debtholders to some stockholders. Stockholdings by lenders to a firm can also forestall the

asset substitution problem (as emphasized by Prowse (1990)), which states that borrowing biases the investment decisions of the firm towards projects that enrich shareholders at the expense of debtholders. Hence, the largest debtholder or the main bank of a firm is more likely to hold a large part of the stocks of the firm as it becomes more difficult to obtain information about the firm's credit quality or if asset substitution is more likely to arise. Since these problems are more severe in firms with greater growth opportunities, the agency cost hypothesis particularly suggests a positive correlation between growth opportunities and the main bank's shareholdings.[2]

The second theoretical hypothesis with respect to stockholdings by banks is the liquidity constraint hypothesis, which implies that firms having close financial relationships with banks can more effectively avoid problems associated with financial distress. If firms desire to build close financial relationships with banks, they are more likely to have their main banks hold their stocks. Since firms belonging to declining industries or firms with smaller growth opportunities are more likely to be liquidity constrained, they are more likely to prefer the main bank's shareholdings. Given that firms belonging to declining industries have smaller growth opportunities and lower credit ratings, this hypothesis suggests not only a negative relation between growth opportunities and the main bank's shareholdings, but also a negative relation between credit quality and the main bank's shareholdings.

2.4.2   Empirical evidence

There are very few empirical studies on this issue. The exception is Flath (1993), who estimates a pair of simultaneous equations using data from 1980, with one equation explaining each firm's debt-to-equity ratio and the other explaining shareholdings in each firm by the firm's largest debtholder (the main bank). His results provide evidence that main banks in keiretsu president's council firms hold more stocks of the firms if the firms borrow heavily or have a greater prospect of growth, and that keiretsu president's council firms in which debtholders hold more stocks borrow more.[3]   These results

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[2]Flath (1993) also indicates that factors that exacerbate the agency problem of borrowing will inhibit borrowing. To identify the structural interaction between debt to equity ratios and shareholdings by the main bank, he estimates a simultaneous equation system explaining these two variables.

[3]In 1980, the keiretsu were six groups that were comprised of most of the largest corporations in Japan including the largest commercial banks.

support the agency cost hypothesis about the main bank's stockholding.

3   Empirical Methods

3.1   Testable implications

Our concerns about the relations between banks and firms in Japan can be reduced to two issues: first, how financial relations between banks and firms in Japan have changed after the recent depression and financial crisis; and second, whether main banks can play their specific role in the corporate financial policy of firms among financial intermediaries that hold some business relations with the firms.

It is frequently stated that the recent changes in the Japanese financial system have affected the strength of ties between non-financial firms and their main banks. Nevertheless, even though firms can gain access to the public bond market, there is a possibility that the ability of the main bank-owned securities subsidiaries to underwrite bond issues may leave the strength of the ties unchanged. On the other hand, the possibility also exists that only the main bank system will disappear while the banking system as a whole will maintain its traditional role in the capital market. In fact, we consider that both the roles of the main bank system and the banking system as a whole may be changed.

In the subsequent estimations, we make the following assumptions in relation to how the managers of each firm make decisions about how to raise funds. First, the managers determine the methods for raising funds, that is, whether to borrow from banks, whether to issue bonds, and whether to issue equities. Next, they choose which financial institutions they will have dealings with. Japanese banks are not merely providers of loan capital, but also are often underwriters of bonds and major shareholders. Since main banks are conventionally the most important financial institutions to Japanese firms, these decisions primarily involve whether to continue each of the business relationships with the main bank; that is, whether to borrow from the main bank, whether to choose the main bank-owned securities subsidiary as a lead underwriter, and whether to keep cross-shareholdings with the main bank.

Our testable implications are derived from the theoretical hypotheses re-

viewed in section 2.[4] The hypotheses about bank versus bond financing are examined by estimating two kinds of regressions as follows: (i) the dummy variable indicating whether to borrow from banks is regressed on the indexes of the firm's growth prospects and the firm's likelihood of financial distress, and (ii) the dummy variable indicating whether to issue bonds is regressed on the indexes of the firm's growth prospects and the firm's likelihood of financial distress. We expect a positive relation between the firm's growth prospects and the firm's choice of bank loans if the agency cost hypothesis holds. In contrast, we anticipate a negative relation between the firm's growth prospects and the firm's choice of bank loans if the hold-up or the liquidity constraint hypothesis holds. For all three hypotheses, we also expect a positive relation between the firm's likelihood of financial distress and the firm's choice of bank loans.

If the firm borrows from banks, then we discuss the hypotheses about the role of main banks in bank loans. These hypotheses are tested by regressions in which the main bank loan ratio is regressed on the indexes of the firm's growth prospects and the firm's likelihood of financial distress. If the agency cost hypothesis is supported, the expected result is a positive relation between the firm's growth prospect and the main bank loan ratio. On the other hand, if the liquidity constraint hypothesis holds, the expected result is a negative relation between the firm's growth prospects and the main bank loan ratio, but a positive relation between the firm's likelihood of financial distress and the main bank loan ratio.

If the firm issues bonds, then we investigate the hypotheses about the firm's choice of underwriters by regressions. The probability of the main bank-owned securities subsidiary being a lead underwriter for the issue of the firm's straight bond is regressed on the indexes of the firm's growth prospects and the firm's likelihood of financial distress. If the conflict of interest effect is stronger than the certification effect, the estimated coefficient of the firm's likelihood of financial distress is expected to be negative. If the liquidity constraint hypothesis holds, the estimated coefficient of the firm's growth prospect (the firm's likelihood of financial distress) is expected to be negative (positive). We also estimate the probability of other bank-owned securities subsidiaries being a lead underwriter. We then compare these two regression results and examine the implications in regard to the role of the main bank in the public bond market.

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[4]Since our sample firms are listed on the Tokyo Stock Exchange, they all issue equities.

Finally, we test the hypotheses about shareholdings by regressions. The stockholding ratio of the main bank is regressed on the indexes of the firm's growth prospects and the firm's likelihood of financial distress. If the agency cost hypothesis holds, the estimated coefficient of the firm's growth prospect is expected to be positive. In contrast, if the liquidity constraint hypothesis holds, the estimated coefficient of the firm's growth prospect (the firm's likelihood of financial distress) is expected to be negative (positive). As in the case of the firm's choice of underwriters, we estimate regressions for the stockholding ratio of the other financial intermediaries in addition to those of the main bank.

3.2 Data

To investigate the testable implications, we use data on Japanese manufacturing firms listed on the Tokyo Stock Exchange first and second sections in fiscal year 1998. We work with five databases obtained from the Nikkei Economic Electronic Databank System (NEEDS) financial data, the Development Bank of Japan (DBJ) financial data, the Quarterly Corporate Report (Toyo Keizai Shimposha), the Nikkei Amsus Data Base, and the analysis of financial statements of all banks (Federation of Bankers' Associations of Japan). The number of firms chosen as a sample is 848.

The dependent variables in our estimation models are as follows.

<Bank versus bond financing>

- **Bank loan dummy variable**, assigned the value one if the firm newly borrows long-term loans from banks, and otherwise assigned the value zero, in fiscal year 1998.

- **Bond dummy variable**, assigned the value one if the firm issues a straight bond, and otherwise assigned the value zero, in fiscal year 1998.

<The role of the main banks in bank loans>

- **Main bank loan ratio** (MAINLOAN) ≡ Amount of loans from the main bank / Total amount of loans from financial institutions

<The firm's choice of underwriters>

- Probability of the main bank-owned securities subsidiary being a lead underwriter for the issue of straight bonds (MAINBOND) ≡ Frequency that the main bank-owned securities subsidiary becomes a lead underwriter in fiscal year 1998 / Frequency of the issue of straight bonds in fiscal year 1998.

- Probability of other bank-owned securities subsidiaries being a lead underwriter for the issue of straight bonds (OTHERBOND) ≡ Frequency that other bank-owned securities subsidiaries become a lead underwriter in fiscal year 1998 / Frequency of the issue of straight bonds in fiscal year 1998.

<Shareholdings>

- Stockholding ratio by the main bank (MAINSTOCK) ≡ (Number of stocks that the main bank holds / Total number of stocks) ∗ 20.

- Stockholding ratio by the other financial intermediaries except for the main bank (FINSTOCK) ≡ Number of stocks that other financial intermediaries (excluding the main bank) hold / Total number of stocks.

We calculate MAINLOAN for each of the short-term and long-term loans. To specify the main bank of each firm, we select the bank that is listed first on the Quarterly Corporate Report among the banks holding business relationships with the firm. We thus assume that every firm has a main bank relationship with a bank.

We use only the data on domestic straight bonds because underwriters of other bonds cannot be identified in our data set. The frequency of the issue of straight bonds in fiscal year 1998 and underwriters for the bonds are also obtained from our data set. All the data on the bond issue are taken from the Nikkei Amsus Data Base.

The main independent variables are the index of the firm's growth potential and the index of the firm's likelihood of financial distress. A simple Tobin's q (market-to-book ratio) is used as a proxy for the index of the firm's growth potential.[5] We use the long-term bond-rating indexes (BONDRATE) evaluated by rating agencies or the interest coverage ratio (ICR) as a proxy

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[5]In this paper, the sum of the aggregate market values of stocks and interest-bearing debts is defined as the market value of the firm. The amount of total assets is used as a proxy for the book value.

for the index of the firm's likelihood of financial distress.[6] The one-period lagged values are also employed to avoid a simultaneity bias.

However, there are some problems in using BONDRATE as a proxy for the index of the firm's likelihood of financial distress. The reason is that only about 900 firms are evaluated by at least one of the rating agencies, and the number of these firms is rather less than that of all firms listed on the Tokyo Stock Exchange first and second sections. Thus, BONDRATE is not suitable to examine the solvency of all our sample firms. Instead, we use mainly ICR rather than BONDRATE as a proxy that shows the firm's likelihood of financial distress.[7]

The additional explanatory variables are the firm size (SIZE), the debt-asset ratio (DEBT), the main bank's capital adequacy ratio (CAR), the non-commercial bank dummy variable, the trust bank dummy variable, and the industrial dummy variables.

We measure SIZE as the natural logarithm of sales. As Anderson and Makhija (1999) point out, the firm size could be a proxy that captures several aspects of the investment opportunity set for Japanese firms. First, large firms tend to have established reputations, and can thus make more firm-specific information publicly available than small firms. Second, large firms tend to have more diversified portfolios of investment opportunities, and their portfolios could be less risky than those of small firms. Third, large firms are more likely to enjoy benefits from economies of scale when issuing bonds, since the large size of their bond issues makes average underwriting costs lower. Finally, large firms tend to borrow funds from several banks through

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[6]The long-term bond-rating indexes are dummy variables in our estimation. In Japan, four bond rating agencies—Rating and Information (R&I), Japan Credit Rating agency (JCR), Standard and Poors (S&P), and Moody's Japan—provide long-term bond ratings. Japanese firms are usually given long-term bond ratings by more than two agencies. When different agencies provide different ratings, we use the highest rating as BONDRATE.

[7]In this paper, we define the interest coverage ratio for the i-th firm (ICR_i) by $\frac{1}{1+\exp(-(A_i/B_i))}$, where A_i is the business profit equal to the sum of the operating income, the amortization of consolidation difference in general administration expenses, and the interest and dividends received; and B_i is the interest paid, including amortization of bond premiums. The interest coverage ratio is usually defined as (business profit)/(interest paid including amortization of bond premiums). However, since the denominator can be zero if the usual definition of the interest coverage ratio is used, we cannot calculate the interest coverage ratio of firms if they do not raise their funds by debt. In contrast, using our definition of the interest coverage ratio, we can define the ICR_i of such a non-debt firm as one. Thus, our ICR_i is distributed on the $[0, 1]$ interval.

syndicated loans because they enjoy lower average monitoring costs as well as underwriting costs.

The variable DEBT is defined as the total amount of debt divided by the total amount of assets. This ratio may also be interpreted as an additional proxy for the index of the firm's likelihood of financial distress: firms with larger DEBT are supposed to be more likely to default. Furthermore, DEBT also indicates potential cost caused by renegotiation among creditors and debtors if a firm is financially distressed. Thus, firms with larger DEBT are expected to incur higher renegotiation costs. As shown in Rajan (1992), banks can reorganize financially distressed firms more efficiently than can arm's length investors. This would be particularly true in Japan: since the main bank makes an implicit promise to accept disproportionate shares of write-offs, it is thought that the main bank plays an active role in reorganization. Thus, firms with larger DEBT are more likely to rely on their main banks as a provider of funds because they expect that their main banks can reduce the potential cost due to renegotiation.

The variable CAR captures possible effects of the solvency status of the main bank on the corporate financial policy. First, this variable reflects the bank's capability to lend to non-financial firms. Thus, we expect that larger MAINLOAN is associated with larger CAR. Second, CAR can also be interpreted as a proxy that expresses the degree of the risk management of the firm's main bank. If the firm's main bank makes bad loans because it lacks the ability to manage risk, then the capital adequacy ratio of the firm's main bank is low. In this view, if larger MAINLOAN is associated with smaller CAR, this can be interpreted as describing a main bank that fails in the liquidation of inefficient firms and makes many bad loans to inefficient firms.

If the main bank is a government financial institution such as the Development Bank of Japan, the noncommercial bank dummy variable is assigned the value one; otherwise, it is assigned the value zero. The trust bank dummy variable is equal to one if the main bank is a trust bank, and is equal to zero otherwise. The reason for adding the trust bank dummy variable to the explanatory variables is that the stockholdings by trust banks include trust assets such as the investment trust. A set of the industrial dummy variables is classified by industry midrange categories. The descriptive statistics of the variables we use are summarized in Table 1 except for the dummy variables.

3.3   Econometric methods

3.3.1   Potential possibilities of the sample selection bias

The simplest way of dealing with our empirical study is to estimate three kinds of OLS regressions where the dependent variables are the main bank loan ratios, the probabilities of main bank-owned or other bank-owned securities subsidiaries being a lead underwriter for the issue of straight bonds, and the shareholding ratios by the main bank or the other financial intermediaries. We then evaluate the estimation results and determine which hypothesis is consistent with the sign of the estimated coefficients of the independent variables. However, we need to consider the features of the Japanese corporate loan market before we begin the estimation procedure.

First, it should be noted that not all the firms borrow from their main banks. Among the firms included in our sample, 234 firms do not incur any short-term debts to their main banks, and 334 firms do not incur any long-term debts to their main banks. Furthermore, 198 firms do not incur short-term debts to any banks, and 212 firms do not incur long-term debts to any banks. Hence, we need to examine whether the firm selects a bank loan as a method of raising funds, and then discuss whether the firm borrows from its main bank if the firm chooses the bank loan to raise funds. If we do not consider this point, the estimation results may contain the sample selection bias.

Second, firms that issue straight bonds are still not a large proportion of the firms listed on the Tokyo Stock Exchange even though regulation of the straight bond issue has been eased. In addition, we should note that few firms with a credit rating below BBB issue straight bonds. In our sample set, only 92 firms actually issued straight bonds in fiscal year 1998. Furthermore, in many cases bank-owned securities subsidiaries do not underwrite the straight bond issue at all, while existing securities companies underwrite it. Thus, to avoid the sample selection bias, we need to investigate whether the firm selects the issue of straight bonds as a method of raising funds, and then if it does so, discuss whether the firm makes the main bank-owned securities subsidiary underwrite the newly issued bond.

Third, although the sample selection problems are caused when the firm borrows from banks or chooses bank-owned securities subsidiaries as an underwriter of the bond issue, these problems do not occur for cross-shareholdings. Since all the firms included in our sample set are companies listed on the

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Tokyo Stock Exchange, they raise funds by issuing equities. Thus, we need not consider whether the sample firm chooses the issue of stocks as a method of raising funds.[8] The remaining concern is whether banks really hold shares issued by the sample firms. In fact, in most of our sample firms, not only do their main banks hold a part of their shares, so also do other financial intermediaries that lend them funds. Thus, we can ignore the sample selection problem when we estimate the shareholding ratio.

Finally, in the subsequent analysis, we examine only the holding ratios of non-financial firms' shares held by main banks and the other financial intermediaries. We do not discuss the holding ratios of financial intermediaries' shares held by non-financial firms because we could not obtain the relevant data.

The above arguments suggest that if we use only firms that borrow from banks or issue straight bonds as our sample set, our estimation results are not immune from the sample selection bias. Thus, we use the sample selection model to incorporate the truncated nature of the dependent variables— MAINLOAN, MAINBOND and OTHERBOND—in the subsequent discussion. Furthermore, since there are firms that do not borrow from their main banks but take out loans from the other financial intermediaries (MAIN-LOAN = 0) or firms which do not choose the main bank-owned securities subsidiary or other bank-owned securities subsidiaries as a lead underwriter but issue straight bonds (MAINBOND = 0 or OTHERBOND = 0),[9] it is more desirable to use the double hurdle model.

3.3.2   The sample selection model

The sample selection model has the following form

$$y_i^* = x_i'\beta + u_i, \qquad i = 1, \cdots, N, \tag{1}$$

$$I_i^* = z_i'\gamma + v_i, \qquad i = 1, \cdots, N, \tag{2}$$

where y_i^* and I_i^* are latent variables, x_i and z_i are the vectors of explanatory variables, β and γ are unknown parameter vectors to be estimated, and u_i

---

[8]This does not exclude the possibility of the sample selection bias occurring as a result of the fact that we only chose firms which raise funds through the issue of equities. However, we cannot consider the bias problem because we do not have data on unlisted firms.

[9]For firms that choose existing securities companies as a lead underwriter, note that MAINBOND = 0 and OTHERBOND = 0.

and v_i are error terms that are assumed to have the following bivariate normal distribution:

$$\begin{pmatrix} u_i \\ v_i \end{pmatrix} \sim N \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2 & \rho\sigma \\ \rho\sigma & 1 \end{pmatrix} \right),$$

where ρ is a correlation coefficient between u_i and v_i, and $var\,(u_i) \equiv \sigma^2$. Note that we can set $var\,(v_i) \equiv \sigma_v^2 = 1$ without any loss of generality. Equation (1) is the regression in which we are primarily interested. Equation (2) is the sample selection that represents the firm's choice of whether to borrow from banks or issue straight bonds.

However, we cannot observe y_i^* or I_i^* directly because they are assumed to be latent variables. Thus, the sample selection model has the observability criteria described below:

$$y_i = y_i^* \cdot 1\,\{I_i^* > 0\}, \tag{3}$$

where $1\,\{I_i^* > 0\} \equiv I_i$ takes one if $I_i^* > 0$, and takes zero otherwise. In our model, y_i is the main bank loan ratio or the probability of the main bank-owned (other bank-owned) securities subsidiary (subsidiaries) being a lead underwriter.

The likelihood function for the sample selection model is then

$$L = \prod_{y_i = 0} \Pr\,(I_i = 0 \mid z_i) \cdot \prod_{y_i > 0} f\,(y_i \mid x_i, z_i, I_i = 1), \tag{4}$$

where f is the density function of y_i.

To begin with, we consider the probability of a censored observation, $\Pr\,(I_i = 0 \mid z_i)$. The probability based on the observability criteria of (3) is

$$\Pr\,(I_i = 0 \mid z_i) = \Pr\,(v_i < -z_i'\gamma) = 1 - \Phi\,(z_i'\gamma), \tag{5}$$

where Φ is the standard bivariate normal probability distribution function.

For an uncensored observation, we can decompose $f\,(y_i \mid x_i, z_i, I_i = 1)$ into a product of the conditional probability of I_i^* and the unconditional density for y_i:

$$f\,(y_i \mid x_i, z_i, I_i = 1) = \Pr\,(I_i^* > 0 \mid y_i) \cdot f\,(y_i). \tag{6}$$

Since u_i and v_i are assumed to have the bivariate normal distribution, we can derive the conditional probability of $I_i^* > 0$ for given y_i:

$$\Pr\,(I_i^* > 0 \mid y_i) = \Pr\,(v_i > -z_i'\gamma \mid u_i) = \Phi\left(\frac{z_i'\gamma + \rho\,(y_i - x_i'\beta)}{1 - \rho^2} \right). \tag{7}$$

Substituting (5)-(7) into (4), we obtain the likelihood function for the sample selection model

$$L = \prod_{y_i=0} \left[1 - \Phi\left(z_i'\gamma\right)\right] \cdot \prod_{y_i>0} \left[\Phi\left(\frac{z_i'\gamma + \rho\left(y_i - x_i'\beta\right)}{\sqrt{1-\rho^2}}\right) \frac{1}{\sigma}\phi\left(\frac{y_i - x_i'\beta}{\sigma}\right)\right],$$

where ϕ is the standard bivariate normal density function. Applying the maximum likelihood (ML) method to this likelihood function, we can obtain the estimates of the parameter vectors β and γ.

3.3.3 The double hurdle model

The double hurdle model proposed by Cragg (1971) is an alternative to the sample selection model. The double hurdle model modifies the sample selection model by supposing that y_i is censored at 0. Thus, we can interpret the double hurdle model as a tobit model with sample selection. Formally, the double hurdle model is represented by the same form as the sample selection model consisting of (1) and (2), except that the observability criteria (3) is replaced with

$$y_i = y_i^* \cdot 1\left\{y_i^* > 0 \text{ and } I_i^* > 0\right\},$$

where $1\left\{y_i^* > 0 \text{ and } I_i^* > 0\right\}$ takes one if $y_i^* > 0$ and $I_i^* > 0$, and takes zero otherwise.

Using this observability criteria, the probability of an uncensored observation is defined by

$$\Pr\left(y_i > 0 \mid x_i, z_i\right) = \Pr\left(y_i^* > 0 \text{ and } I_i^* > 0\right)$$
$$= \Pr\left(u_i > -x_i'\beta \text{ and } v_i > -z_i'\gamma\right) = \Phi\left(z_i'\gamma, \frac{x_i'\beta}{\sigma}; \rho\right).$$

Hence, the conditional probability of $y_i > 0$ for given x_i and z_i is defined in a similar way to that of the sample selection model, (7).

The probability of a censored observation becomes $\Pr\left(y_i = 0 \mid x_i, z_i\right) = 1 - \Phi\left(z_i'\gamma, \frac{x_i'\beta}{\sigma}; \rho\right)$. This probability is decomposed into the following two parts:

$$\Pr\left(y_i = 0 \mid x_i, z_i\right) = \Pr\left(I_i = 0 \mid z_i\right) + \Pr\left(y_i = 0 \text{ and } I_i = 1 \mid x_i, z_i\right). \quad (8)$$

The first part of the right-hand side of (8) is identical to equation (5). Jones (1992) points out difficulties in expressing the second part of the right-hand

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side of (8)—$\Pr(y_i = 0 \text{ and } I_i = 1 \mid x_i, z_i) = \Phi_2\left(z_i'\gamma, -\frac{x_i^0\beta}{\sigma}; \rho\right)$ — as an explicit likelihood function because the form of the likelihood function is complex (Φ_2 is also the standard bivariate normal probability distribution function). However, he shows how the double hurdle model can be applied to econometric software packages such as GAUSS and LIMDEP. Greene (1998) also provides the code for the double hurdle model in LIMDEP. We utilize this code in the subsequent estimation.

Finally, the likelihood function for the double hurdle model can be represented by

$$
L = \prod_{I_i = 0} \left[1 - \Phi\left(z_i'\gamma\right)\right] \cdot \prod_{y_i = 0, I_i = 1} \Phi_2\left(z_i'\gamma, \frac{-x_i'\beta}{\sigma}; \rho\right)
$$
$$
\cdot \prod_{y_i > 0, I_i = 1} \left[\Phi\left(\frac{z_i'\gamma + \rho\left(y_i - x_i'\beta\right)}{1 - \rho^2}\right) \frac{1}{\sigma}\phi\left(\frac{y_i - x_i'\beta}{\sigma}\right)\right].
$$

The details of the derivation of this likelihood function are given by Jones (1992). We obtain the estimates of the parameter vectors by applying the ML method. To sum up, the double hurdle model is more suitable than the sample selection model for a data set that includes many samples $y_i^* = 0$ although $I_i^* > 0$.

4 Empirical Results

4.1 Bank versus bond financing

Before exploring the ties between firms and their main banks, we investigate which firms borrow from banks and which firms issue straight bonds. To this end, we estimate the following bivariate probit model:

$$
I_i^1 = z_i'\gamma^1 + \varepsilon_i^1,
$$
$$
I_i^2 = z_i'\gamma^2 + \varepsilon_i^2.
$$

Here, the variable I_i^1 takes a value of one if the firm newly borrows long-term loans from banks, and takes zero otherwise, in fiscal year 1998. The variable I_i^2 equals one if the firm issues straight bonds, and takes zero otherwise, in fiscal year 1998. The elements of the vector z_i consist of one, Tobin's q, ICR and the industrial dummy variables. The remaining terms ε_i^1 and ε_i^2

are error variables which are assumed to have the following bivariate normal distribution:

$$
\begin{pmatrix} \varepsilon_i^1 \\ \varepsilon_i^2 \end{pmatrix} \sim N \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_1^2 & \rho_\varepsilon \sigma_1 \\ \rho_\varepsilon \sigma_1 & 1 \end{pmatrix} \right).
$$

We need to use the bivariate probit model in order to consider the hypotheses about bank versus bond financing. We obtain consistent estimators of the equations of the bivariate probit model even though we estimate only one of these equations (as shown in the following subsections 4.2 and 4.3). However, this procedure is inefficient because the correlation between the disturbances ε_i^1 and ε_i^2— represented by ρ_ε— is ignored.

Table 2 reports the estimated results. These results suggest that the attributes of firms that choose loans from banks can be clearly distinguished from those of firms which choose the issue of bonds: firms with larger (smaller) Tobin's q and ICR tend to issue bonds (borrow from banks). These findings support the hold-up and liquidity constraint hypotheses.

4.2   Main bank loans

In this subsection, we consider the sample selection and double hurdle models represented by (1) and (2). Here, y_i is the main bank loan ratio (MAINLOAN); and I_i is assigned a value of one if the firm borrows from banks, and is assigned zero otherwise. The elements of the vector x_i in (1) consist of one, Tobin's q, ICR, SIZE, DEBT, CAR, and the noncommercial bank dummy variable. The vector z_i in (2) is made up of one, Tobin's q, ICR, and the trust bank dummy variable.

We examine MAINLOAN by distinguishing between short-term and long-term loans. The estimation results for the short-term loans are reported in Table 3. Both the coefficients of Tobin's q and ICR in the sample selection are significantly negative, as shown in the top half of Table 3. These results imply that firms with a lower prospect of growth and a greater likelihood of financial distress are more likely to choose bank loans for their short-term debt, which is consistent with the results obtained in the bivariate probit model in Table 2.

For the results of the regression indicated in the bottom half of Table 3, both the coefficients of Tobin's q and ICR are significantly negative. Thus, firms that choose bank loans for their short-term debt are more likely to depend on their main banks if their growth opportunities are lower and their

likelihood of financial distress is greater. This result is consistent with the liquidity constraint hypothesis of the main bank. Our findings also suggest that smaller sized firms have a closer relation with their main banks because all the estimates of the coefficient of SIZE are significantly negative, which agrees with our conjecture that larger firms tend to borrow in the form of a syndicated loan. However, both the coefficients of DEBT and CAR are significantly negative. These results are quite surprising because we expected firms with larger DEBT to be more likely to depend on their main banks, and main banks with larger CAR to be more likely to lend aggressively. The reason for the unexpected results will be discussed in subsection 4.5. For short-term bank loans, we do not find any clear differences between the results based on the sample selection and double hurdle models.

Table 4 shows the estimation results for the long-term bank loan. Both the coefficients of Tobin's q and ICR in the sample selection are significantly negative. As verified in the case of short-term loans, these results suggest that firms with a lower prospect of growth and a greater likelihood of financial distress use more bank loans to finance their long-term debt.

In the regression, our estimation results based on the sample selection model differ from those based on the double hurdle model as follows: (i) the estimated coefficients of Tobin's q and ICR are significantly negative in the former model, whereas these coefficients are insignificant in the latter model; and (ii) the other estimated coefficients fail to obtain unambiguous results in the former model, while the estimated coefficients of SIZE, DEBT and CAR are clearly significant in the latter model. The reason why the results depend on the estimation models is due to the fact that there are many firms that choose bank loans to finance their long-term debt but do not take out long-term loans from their main banks.[10] From the results based on the double hurdle model, the coefficient of SIZE is negative, whereas those of DEBT and CAR are positive. These results are consistent with our conjecture.

We focus on the results of the double hurdle model and compare the results of the regression for long-term loans with those for short-term loans. Then, both Tobin's q and ICR have a significantly negative correlation with MAINLOAN for the short-term loan, whereas neither of them has any clear relationships with MAINLOAN for the long-term loan. Furthermore, in con-

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[10] In our sample, there are 122 firms that take out long-term loans from some banks but do not borrow any long-term loans from their main banks, while there are only 36 firms that borrow short-term loans from some banks but do not borrow any short-term loans from their main banks.

trast to the results for the short-term loan, the estimated coefficients of DEBT and CAR are significantly positive for the long-term loan. These findings suggest that the role of the main bank as a short-term lender is rather different from that as a long-term lender.

4.3   Firm's choice of underwriters

In this subsection, we again use the sample selection and double hurdle models represented by (1) and (2). Here, y_i is the probability of the main bank-owned securities subsidiary being a lead underwriter for the issue of straight bonds (MAINBOND) or the probability of other bank-owned securities subsidiaries being a lead underwriter for the issue of straight bonds (OTHER-BOND); and I_i is a variable that takes a value of one if the firm issues straight bonds in fiscal year 1998, and takes zero otherwise. The vector x_i in (1) consists of one, Tobin's q, BONDRATE, ICR, SIZE, DEBT, CAR, the noncommercial bank dummy variable, and the trust bank dummy variable. The vector z_i in (2) is made up of one, Tobin's q, ICR, and the industrial dummy variables.

The estimated results for MAINBOND are presented in Table 5. In the sample selection, most of the estimated coefficients based on the sample selection model are insignificant. On the other hand, in the double hurdle model, although the estimated coefficients on Tobin's q are positive but not necessarily significant, the corresponding estimates on ICR are significantly positive. In the regression, most of the estimated coefficients based on the sample selection model are still insignificant, while the estimated coefficients of ICR and DEBT based on the double hurdle model are highly significant. Such differences arise from the existence of firms that issue straight bonds but do not choose the main bank-owned securities subsidiary as a lead underwriter.

In this subsection, BONDRATE and ICR are used as a proxy for the likelihood of financial distress. In fact, it follows from the results that no estimated coefficients of BONDRATE are significant, while the estimated coefficients of ICR are significantly positive. One possible explanation for the results is that the interest coverage ratio is more important than the long-term bond ratings in determining the probability of the main bank-owned securities subsidiary being a lead underwriter.

Table 6 reports the results for OTHERBOND. In contrast to the results obtained in the sample selection part of MAINBOND, the estimated coef-

ficients of Tobin's q are significantly positive in the double hurdle model. However, the corresponding estimates of ICR are significantly positive only in the double hurdle model with dropping long-term bond ratings instead of adding ICR and the trust bank dummy variable in the regression part.[11]

In the regression, we focus on the estimated results based on the double hurdle model that includes ICR as an explanatory variable, and compare the results of OTHERBOND with those of MAINBOND. Then, we see that the estimated coefficients of ICR and DEBT are insignificant in OTHERBOND although they are significantly positive in MAINBOND. Furthermore, the estimated coefficients of SIZE and CAR are significantly positive in OTHERBOND, while they are insignificant in MAINBOND.

We now discuss the plausibility of the hypotheses about the firm's choice of underwriters by inspecting the estimated coefficients of Tobin's q and ICR in the regression part of the double hurdle model in Tables 5 and 6. Our results imply that firms with a smaller likelihood of financial distress are more likely to use their main bank-owned securities subsidiaries as a lead underwriter rather than other bank-owned securities subsidiaries. Our results are therefore consistent with the implications of the hypothesis of the conflict of interest effect between main banks and other investors, but are inconsistent with those of the certification effect and liquidity constraint hypotheses.

We should add several comments on the interpretation of other estimates in the regression section of the double hurdle model in Tables 5 and 6. The result that the estimated coefficients of DEBT are significantly positive only in MAINBOND is consistent with our conjecture that firms with larger DEBT are more likely to depend on their main banks. The variable SIZE has a positive effect only in OTHERBOND. This is because firm-specific information on large-sized firms is more useful to other bank-owned securities subsidiaries that are less informed than main bank-owned securities subsidiaries. The variable CAR also has a positive effect only in OTHERBOND. If a bank's capital is adequate (CAR is larger), the bank can keep a business relationship with its customers by making loans, not by having its subsidiary underwrite the customers' bonds. Furthermore, other bank-owned securities subsidiaries

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[11]In Table 6, we exclude the trust bank dummy variable from the explanatory variables in the double hurdle model that includes long-term bond ratings as an explanatory variable. When we include the trust bank dummy variable as an explanatory variable in this case, we cannot obtain the estimated coefficients. The reason is that the estimated variance matrix is singular.

are then more likely to be induced to underwrite bonds issued by firms with larger CAR. This is because the main bank and its subsidiary are less likely to misuse their customers' private information for their self-interest.

4.4   Shareholdings

All of our sampling firms issue stocks because they are listed on the Tokyo Stock Exchange first and second sections. Hence, it is not necessary to use either the sample selection model nor the double hurdle model to avoid the sample selection bias. Instead, in this subsection, the independent variable—the stockholding ratio by the main bank (MAINSTOCK) or the stockholding ratio by the other financial intermediaries except for the main bank (FINSTOCK)—is regressed on the explanatory variables consisting of Tobin's q, ICR, SIZE, DEBT, CAR, the noncommercial bank dummy variable, the trust bank dummy variable, and the industrial dummy variables.

The results from OLS estimations of MAINSTOCK are presented in Table 7, which indicates that the estimated coefficients of Tobin's q, SIZE, and the noncommercial bank and trust bank dummy variables are significant. In addition, we give Logit estimation results. All the estimated coefficients of the explanatory variables are significant, but their signs are totally opposite to those of the OLS estimations.

One possible explanation of why the estimated results depend strongly on the estimation methods arises from the regulations governing shareholdings owned by financial intermediaries. The anti-trust law stipulates that shareholdings by financial intermediaries are restricted to 5% of the outstanding shares of each domestic firm. As a result, in many cases the main bank has to make do with holding the outstanding shares at most up to 5%. Thus, the data of MAINSTOCK suffers from such a distributive bias.

Given this bias, we define the following variable:

$$p_i \equiv 1.00 - \text{MAINSTOCK} \tag{9}$$

Combined with the definition of MAINSTOCK, equation (9) implies that $p_i = 0$ if the main bank holds 5% outstanding shares, while $p_i = 1$ if the main bank holds no outstanding shares. We replace MAINSTOCK with p_i as an independent variable and estimate the regression equation using OLS, Logit, and Tobit. This procedure deals with $p_i = 0$ as a censored observation and will provide consistent estimators.

Table 8 presents the results using p_i as an independent variable. The results based on the three methods are qualitatively similar except for the estimates of the coefficient of the trust bank dummy variable. These results imply that main banks hold more shares of firms with a smaller prospect of growth and a larger scale.

The results from both OLS and Logit estimations of FINSTOCK are reported in Table 9. As shown in Table 8, the results based on OLS and Logit are qualitatively similar: in both regressions, the estimated coefficients of Tobin's q and SIZE are significantly positive, whereas those of DEBT are significantly negative. These results suggest that shareholdings by the other financial intermediaries increase with the growth prospects of the firm and the size of the firm, but decrease with an increase in the debt-asset ratio. In the preceding subsection, we showed that the probability of other bank-owned securities subsidiaries being a lead underwriter increases with CAR. Since main bank (other bank) loans and main bank (other bank) shareholdings are complements, while main bank (other bank) loans and main bank (other bank) subsidiary bond underwritings are substitutes, the expected estimate of CAR would be negative. In fact, the estimation results of CAR in Table 9 are not sufficiently strong because they depend on the estimation methods. Thus, we cannot give any unambiguous interpretations of these results.[12]

Comparing the results in Table 8 with those in Table 9, we see that main banks hold more shares of firms with smaller prospects for growth and a larger dependence on debt than do the other financial intermediaries. This finding implies that the liquidity constraint hypothesis can explain why main banks hold equities of non-financial firms.

4.5 Discussion

Our empirical results are now summarized as follows:
(i) For bank versus bond financing, Japanese firms with a smaller Tobin's q

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[12]Some readers might wonder if the estimates of SIZE in Tables 3, 4, and 8 would not imply the complementary relation between main bank loans and main bank shareholdings. In fact, small firms are more likely to have a concentrated ownership structure of shareholdings than large firms. Hence, small firms may have less incentive to depend on cross-shareholdings with their main banks than large firms. Readers might also wonder if the estimates of DEBT in Tables 3 and 9 would be inconsistent because the ratio of the other banks' loans to total loans decreases with an increase in the main bank loan ratio. This question will be discussed in the next subsection by considering the interpretation of the estimates of DEBT in Table 3.

and lower interest coverage ratios depend significantly more on bank loans.
(ii) In relation to the role of main banks in bank loans, Japanese firms with a smaller Tobin's q, lower interest coverage ratios, smaller size, lower debt-asset ratios, and lower capital adequacy ratios of their main banks, depend significantly more on short-term bank loans provided by main banks. On the other hand, Japanese firms with a smaller size, higher debt-asset ratios, and higher capital adequacy ratios of their main banks depend significantly more on long-term bank loans provided by main banks.
(iii) In relation to the firm's choice of underwriters, Japanese firms with higher interest coverage and higher debt-asset ratios are more likely to use their main bank-owned securities subsidiaries rather than other bank-owned securities subsidiaries as a lead underwriter for bond underwriting.
(iv) In relation to cross-shareholdings, Japanese firms with a smaller Tobin's q and larger size have significantly more shares held by main banks, whereas Japanese firms with a larger Tobin's q, larger size, and lower debt-asset ratios have significantly more shares held by other financial intermediaries.

Results (i) and (ii) show that banks lend more to firms with smaller prospects for growth and a greater likelihood of financial distress; in particular, main banks make more short-term loans to those firms. These results reveal that main banks are forced to make additional loans in order to support financially distressed firms with lower growth potential. Our findings also support the hold-up or the liquidity constraint hypothesis, thereby providing some evidence that firms with smaller prospects for growth and a greater likelihood of financial distress tend to borrow from banks (as reported in Shirasu and Xu (2000)). In contrast to the arguments of Anderson and Makhija (1999), our results do not support the agency cost hypothesis that firms with a greater prospect of growth are more likely to borrow from banks. The reason is that they use the data of Japanese firms for the late 1980s when the bond issuance criteria had not been drastically loosened. The difference between the two results reflects the current trend that the deregulation of the public bond market enabled Japanese firms to utilize arm's-length public debt, which has caused Japanese banks to lose valued customers.

Although firms with a smaller prospect of growth and a greater likelihood of financial distress depend heavily on short-term loans from their main banks, it may be premature to interpret these results as evidence of the reckless behavior of main banks, because lending money to such customers is one of the main bank's functions as the lender of last resort to non-financial companies. This argument can be justified only if the main banks provide

funds to such non-financial firms, taking larger risks in anticipation of higher expected returns. However, result (ii) suggests that the main bank short-term loan ratio decreases with an increase in the debt-asset ratio of the customer firm, whereas the main bank long-term loan ratio increases with the debt-asset ratio of the customer firm. Since Diamond (1991b, 1993) shows that short-term loans are a more useful tool for the banks to discipline borrowers than long-term loans, this finding provides some evidence that main banks have been forced to abandon some of their disciplinary measures against firms with higher debt-asset ratios. Furthermore, result (ii) also indicates that the main bank short-term loan ratio decreases with an increase in the capital adequacy ratio of the main bank, although the main bank long-term loan ratio does not. As already discussed in subsection 3.2, the higher main bank loan ratio associated with the lower capital adequacy ratio of the main bank can be interpreted as indicating that the main banks fail in the liquidation of inefficient firms and grant them many bad loans. These findings thus imply that main banks are forced to generously assist inefficient customer firms to survive, thereby causing the soft budgeting problem.

Results (i) and (iii) suggest that firms with a greater prospect of growth and a lesser likelihood of financial distress issue straight bonds. In particular, main bank-owned securities subsidiaries are more likely to underwrite less financially distressed firms than other bank-owned securities subsidiaries. This result is consistent with the conflict of interest effect hypothesis that main banks misuse their private information for their self-interest at the expense of the other banks. Hamao and Hoshi (2000) report that there are no significant differences not only between the characteristics of straight corporate bonds underwritten by existing securities firms and bank-owned subsidiary securities firms, but also between those underwritten by bank-owned subsidiary securities firms and main bank-owned subsidiary securities firms. Hamao and Hoshi's results may arise from their estimation procedure, which neglects the sample selection bias for underwriters, making their estimates inconsistent.

Result (iv) indicates that main banks hold more shares of firms with smaller prospects of growth than the other financial intermediaries: the greater stockholdings by main banks resolve the liquidity constraint problem of the firms with smaller growth prospects to which main banks lend. Combined with result (ii), this finding may support the liquidity constraint hypothesis that firms belonging to declining industries or firms with less growth opportunities are more likely to have close financial relationships with main banks in order to avoid the liquidity problem. Flath (1993), using

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1980s data, shows that main banks are likely to hold stocks of firms with greater growth prospects and a greater likelihood of financial distress. However, his data set is not appropriate for the study of the corporate governance of Japanese firms in the 1990s. Our empirical results suggest that in the late 1990s main banks are more likely to hold stocks of firms with less prospects for growth and a greater likelihood of financial distress than are the other financial intermediaries. In other words, main banks need to liquidate unrealized capital gains from their holding stocks of firms with greater growth prospects or less likelihood of financial distress in order to write off their huge bad loans.

Results (ii) and (iii) strongly indicate that the main bank system is constrained with respect to its lending behavior. Furthermore, result (iv) implies the negative view of the main bank system with respect to shareholdings. This interpretation is particularly true because main banks misuse their private information for their own self-interest at the expense of the other banks in bond underwriting, as main banks are forced to make additional loans to firms that have smaller prospects for growth and a greater likelihood of financial distress. Before the burst of the bubble economy, the main bank system was regarded as one of the key elements behind the rapid economic growth of Japan. However, our results suggest that the main bank system prevented the Japanese economy from recovering during the late 1990s. The main banks have now become a life-support system for inefficient, insolvent firms, by providing such firms with loans for the continuation of their inefficient business. This seems to suggest that most major Japanese banks cannot decrease their bad loans by themselves. To overcome this problem, the authorities may need to nationalize most of the major Japanese banks and attempt to organize a new banking system that promotes bank lending to firms with greater prospects for growth but a greater likelihood of financial distress.[13]

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[13] Our results explain why the large bad loans have not vanished even though the government injected public funds into the large Japanese banks in March 1998 and March 1999, and encouraged them to write off their bad loans. With regard to the theoretical foundation for the nationalization of financially distressed banks, see Osano (2002).

5　Conclusion

We considered how firm-specific factors affected the choice of the financing pattern of Japanese firms for the period in which deregulation and reform of the financing decision of firms were almost completed and Japanese banks incurred huge bad loans. Our main empirical results suggest that: (i) main banks make more short-term loans to firms with smaller prospects of growth and a greater likelihood of financial distress; (ii) main banks misuse their private information for their self-interest at the expense of the other banks in bond underwriting; and (iii) main banks hold more shares of firms with smaller prospects for growth. These findings indicate that the role of the main banks as a lender to firms with greater prospects for growth but a greater likelihood of financial distress is constrained. To overcome this problem, the authorities may need to nationalize most of the major Japanese banks and attempt to organize a new banking system that promotes bank lending to firms with a greater prospect of growth but a greater likelihood of financial distress.

Table 1: Descriptive statistics

Variables	Average	Std. dev.	Maximum	Minimum
MAINLAON (short-term)	0.2325	0.2058	1.0000	0.0000
MAINLOAN (long-term)	0.1750	0.2134	1.0000	0.0000
MAINBOND	0.0292	0.1373	1.0000	0.0000
OTHERBOND	0.0146	0.0907	1.0000	0.0000
MAINSTOCK	0.7380	0.3360	1.0000	0.0000
FINSTOCK	0.2727	0.1498	0.6600	0.0000
Tobin's q	0.9329	0.3979	4.1850	0.0138
ICR	0.8896	0.2390	1.0000	0.0000
SIZE	4.7288	0.5645	6.8904	3.1452
DEBT	0.5341	0.2005	0.9937	0.0593
CAR	1.3325	1.0879	6.5600	0.0000

Notes:

- MAINLOAN is the main bank loan ratio defined as (amount of loans from the main bank) / (total amount of loans from financial institutions).

- MAINBOND is the probability of the main bank-owned securities subsidiary being a lead underwriter for the issue of straight bonds defined as (frequency that the main bank-owned securities subsidiary becomes a lead underwriter in fiscal year 1998) / (frequency of the issue of straight bonds in fiscal year 1998).

- OTHERBOND is the probability of other bank-owned securities subsidiaries being a lead underwriter for the issue of straight bonds defined as (frequency that other bank-owned securities subsidiaries become a lead underwriter in fiscal year 1998) / (frequency of the issue of straight bonds in fiscal year 1998).

- MAINSTOCK is the stockholding ratio by the main bank defined as ((number of stocks that the main bank holds) / (total number of stocks))×20.

- FINSTOCK is the stockholding ratio by the other financial intermediaries except for the main bank defined as (number of stocks that the other financial intermediaries except for the main bank hold) / (total number of stocks).

- ICR is the interest coverage ratio.

- SIZE is the natural logarithm of sales.

- DEBT is the debt-asset ratio defined as (total amount of debt) / (total amount of assets).

- CAR is the capital adequacy ratio of the main bank.

Table 2: Bank versus bond financing

	Bank loan	Bond issue
Constant	6.6668	-0.9931
	(288719.67)	(0.7884)
Tobin's q	-0.3488***	0.3296*
	(0.1290)	(0.1928)
ICR	-0.9708***	1.7861***
	(0.1853)	(0.7189)
ρ_ε	0.2868	

Notes:

- This table reports parameter estimates obtained from the following bivariate probit model:

$$I_i^1 = z_i' \gamma^1 + \varepsilon_i^1,$$
$$I_i^2 = z_i' \gamma^2 + \varepsilon_i^2.$$

Here, I_i^1 takes a value of one if the firm borrows newly from banks, and takes zero otherwise; I_i^2 takes a value of one if the firm issues straight bonds, and zero otherwise; z_i consists of one, Tobin's q, ICR (interest coverage ratio), and the industrial dummy variables; and ε_i^1 and ε_i^2 are error terms that have a bivariate normal distribution with mean 0, $var(\varepsilon_i^1) = \sigma^2$, $var(\varepsilon_i^2) = 1$, and $cov(\varepsilon_i^1, \varepsilon_i^2) = \rho_\varepsilon \sigma^2$.

- The estimated coefficients of the industrial dummy variables are omitted.

- ρ_ε in the table is the estimated correlation coefficient between ε_i^1 and ε_i^2.

- The figures in ( ) indicate standard errors.

- *, **, *** indicate significance at the 10%, 5%, 1% levels, respectively.

Table 3: Main bank loan ratio (short-term)

Estimation process	Sample selection part			
Estimation method	Sample selection		Double hurdle	
Constant	2.7516***	2.4950***	2.7514***	2.5982***
	(0.2494)	(0.2531)	(0.2494)	(0.2515)
Tobin's q	-0.7150***	-0.6593***	-0.7156***	-0.6815***
	(0.1277)	(0.1232)	(0.1276)	(0.1255)
ICR	-1.4726***	-1.2945***	-1.4718***	-1.3677***
	(0.2194)	(0.2265)	(0.2194)	(0.2237)
Trust bank dummy	0.9022*	0.7327	0.9003*	0.8343*
	(0.4839)	(0.4677)	(0.4834)	(0.4491)
Estimation process	Regression part			
Constant	0.8376***	0.8250***	0.8393***	0.8594***
	(0.0721)	(0.0753)	(0.0740)	(0.0761)
Tobin's q		-0.0817***		-0.0755***
		(0.0237)		(0.0249)
ICR		-0.1097***		-0.1021***
		(0.0334)		(0.0342)
SIZE	-0.0887***	-0.0710***	-0.0900***	-0.0794***
	(0.0147)	(0.0138)	(0.0150)	(0.0142)
DEBT	-0.1489***	-0.1147***	-0.1431***	-0.1214***
	(0.0392)	(0.0400)	(0.0414)	(0.0427)
CAR	-0.0131*	-0.0129*	-0.0136*	-0.0131*
	(0.0067)	(0.0072)	(0.0071)	(0.0076)
Noncommercial bank dummy	0.0035	-0.0016	0.0019	-0.0007
	(0.0221)	(0.0212)	(0.0232)	(0.0228)
ρ	-0.1801	0.0397	-0.2043	0.7882

Notes:

- The sample selection section corresponds to equation (2): $I_i^* = z_i'\gamma + v_i$. The regression section corresponds to equation (1): $y_i^* = x_i'\beta + u_i$. In the sample selection section, $I_i^* = 1$ if the non-zero value is described in the item of short-term loans payable on the balance sheet, and $I_i^* = 0$ otherwise; and z_i consists of one,

Tobin's q, ICR (interest coverage ratio), and the trust bank dummy variable. In the regression section, y_i is the main bank loan ratio (MAINLOAN) for short-term loans; and x_i consists of one, Tobin's q, ICR (interest coverage ratio), SIZE (natural logarithm of sales), DEBT (debt-asset ratio), CAR (capital adequacy ratio of the main bank), and the noncommercial bank dummy variable. The error terms u_i and v_i have a bivariate normal distribution with mean 0, $var(u_i) = \sigma^2$, $var(v_i) = 1$, and $cov(u_i, v_i) = \rho\sigma^2$.

- ρ in the table is the estimated correlation coefficient between u_i and v_i.

- The figures in ( ) indicate standard errors.

- *, **, *** indicate significance at the 10%, 5%, 1% levels, respectively.

Table 4: Main bank loan ratio (long-term)

Estimation process	Sample selection part			
Estimation method	Sample selection		Double hurdle	
Constant	2.5364***	1.5507***	2.5320***	2.5236***
	(0.2076)	(0.2902)	(0.2079)	(0.2083)
Tobin's q	-0.5368***	-0.3902**	-0.5372***	-0.5357***
	(0.1246)	(0.1534)	(0.1248)	(0.1248)
ICR	-1.4743***	-0.7604***	-1.4695***	-1.4629***
	(0.1944)	(0.2759)	(0.1947)	(0.1953)
Trust bank dummy	0.3540	-0.4598	0.3683	0.3971
	(0.3912)	(0.7989)	(0.3882)	(0.3866)
Estimation process	Regression part			
Constant	0.7976***	0.4010***	0.7784***	0.7748***
	(0.0849)	(0.1456)	(0.1014)	(0.1276)
Tobin's q		-0.1022***		-0.0083
		(0.0373)		(0.0583)
ICR		-0.1952***		0.0250
		(0.0498)		(0.1080)
SIZE	-0.1296***	-0.0004	-0.1430***	-0.1449***
	(0.0178)	(0.0270)	(0.0208)	(0.0212)
DEBT	0.0289	0.0026	0.1151**	0.1216**
	(0.0422)	(0.0613)	(0.0540)	(0.0542)
CAR	0.0184**	-0.0001	0.0213**	0.0211**
	(0.0084)	(0.0142)	(0.0106)	(0.0106)
Noncommercial bank dummy	0.0354	-0.0025	0.0451	0.0462
	(0.0279)	(0.0417)	(0.0339)	(0.0339)
ρ	1.0000	1.0000	-0.0366	-0.0964

Notes:

- The sample selection section corresponds to equation (2): $I_i^* = z_i'\gamma + v_i$. The regression section corresponds to equation (1): $y_i^* = x_i'\beta + u_i$. In the sample selection section, $I_i^*=1$ if the non-zero value is described in the item of long-term loans payable on the balance sheet, and $I_i^*=0$ otherwise; and z_i consists of one,

Tobin's q, ICR (interest coverage ratio), and the trust bank dummy variable. In the regression section, y_i is the main bank loan ratio (MAINLOAN) for long-term loans; and x_i consists of one, Tobin's q, ICR (interest coverage ratio), SIZE (natural logarithm of sales), DEBT (debt-asset ratio), CAR (capital adequacy ratio of the main bank), and the noncommercial bank dummy variable. The error terms u_i and v_i have a bivariate normal distribution with mean 0, $var(u_i) = \sigma^2$, $var(v_i) = 1$, and $cov(u_i, v_i) = \rho\sigma^2$.

- ρ in the table is the estimated correlation coefficient between u_i and v_i.

- The figures in ( ) indicate standard errors.

- *, **, *** indicate significance at the 10%, 5%, 1% levels, respectively.

Table 5: Probability of the main bank-owned securities subsidiary being a lead underwriter

Estimation process	Sample selection part			
Estimation method	Sample selection		Double hurdle	
Constant	-2.6285	-3.0964***	-2.3062**	-2.9944**
	(2.9831)	(0.5982)	(1.0281)	(1.3385)
Tobin's q	0.2811	0.3392*	0.3365*	0.2951
	(0.2709)	(0.1863)	(0.1864)	(0.1936)
ICR	0.6746	0.9325	0.8875*	1.6306***
	(0.8138)	(0.5747)	(0.4723)	(0.5604)
Estimation process	Regression part			
Constant	-1.3324**	-1.6619***	-3.8633**	-3.9596**
	(0.5463)	(0.4219)	(1.6308)	(1.6108)
Tobin's q	0.2302	0.0531	0.1788	0.1022
	(0.1450)	(0.1039)	(0.2736)	(0.2173)
AA	0.0465		0.0699	
	(0.2074)		(0.3296)	
A	0.0836		0.0472	
	(0.1179)		(0.1926)	
BBB	-0.0192		-0.1369	
	(0.1019)		(0.1775)	
ICR		0.3276*		0.9755**
		(0.1917)		(0.4904)
SIZE	0.0098	0.0862	0.1755	0.1140
	(0.0960)	(0.0609)	(0.2075)	(0.1824)
DEBT	0.4862*	0.3430	2.0841***	1.6672***
	(0.2830)	(0.2317)	(0.7841)	(0.6435)
CAR	0.0427	0.0105	0.0272	-0.0199
	(0.0329)	(0.0354)	(0.1140)	(0.1181)
Noncommercial bank dummy	-0.0236	0.0637	0.1144	0.0996
	0.1213	(0.0745)	(0.2380)	(0.2060)
Trust bank dummy	0.4310	0.4595	1.1088	0.9208
	(0.5723)	(0.6725)	(1.1604)	(0.8731)
ρ	1.0000	0.9919	1.0000	0.9998

Notes:

- The sample selection section corresponds to equation (2): $I_i^* = z_i' \gamma + v_i$. The regression section corresponds to equation (1): $y_i^* = x_i' \beta + u_i$. In the sample selection section, $I_i^* = 1$ if the firm issues straight bonds, and $I_i^* = 0$ otherwise; and z_i consists of one, Tobin's q, ICR (interest coverage ratio), and the industrial dummy variables. In the regression section, y_i is the probability of the main bank-owned securities subsidiary being a lead underwriter for the issue of straight bonds (MAIN-BOND); and x_i consists of one, Tobin's q, the credit rating dummy variables (AA, A, BBB) based on the highest rating among the long-term bond ratings provided by R&I, JCR, S&P, and Moody's Japan, ICR (interest coverage ratio), SIZE (natural logarithm of sales), DEBT (debt-asset ratio), CAR (capital adequacy ratio of the main bank), the noncommercial bank dummy variable, and the trust bank dummy variable. The error terms u_i and v_i have a bivariate normal distribution with mean 0, $var(u_i) = \sigma^2$, $var(v_i) = 1$, and $cov(u_i, v_i) = \rho \sigma^2$.

- The estimated coefficients of the industrial dummy variables are omitted.

- ρ in the table is the estimated correlation coefficient between u_i and v_i.

- The figures in ( ) indicate standard errors.

- *, **, *** indicate significance at the 10%, 5%, 1% levels, respectively.

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Table 6: Probability of other bank-owned securities subsidiaries being a lead underwriter

Estimation process	Sample selection part			
Estimation method	Sample selection		Double hurdle	
Constant	-2.1254***	-2.0171*	-2.2474***	-2.5514***
	(0.4293)	(1.0566)	(0.5284)	(0.4140)
Tobin's q	0.3570	0.1377	0.4272**	0.3189*
	(0.2500)	(0.2369)	(0.1917)	(0.1800)
ICR	0.9606	0.9730	1.1678	1.4041***
	(0.7648)	(0.5974)	(0.8053)	(0.5145)
Estimation process	Regression part			
Constant	0.7610	-0.9187***	2.1288	-5.6246**
	(0.5638)	(0.3396)	(1.4362)	(2.6539)
Tobin's q	-0.1092	0.0435	-0.5827	0.1305
	(0.1752)	(0.0901)	(0.3313)	(0.2802)
AA	-0.1210		-0.3419	
	(0.2280)		(0.4995)	
A	0.0386		-0.1535	
	(0.1337)		(0.2850)	
BBB	-0.0253		-0.2024	
	(0.1295)		(0.2784)	
ICR		0.3430*		1.6359
		(0.2017)		(1.7152)
SIZE	0.1165	0.0169	0.1816	0.2985*
	(0.0985)	(0.0519)	(0.2403)	(0.1755)
DEBT	-0.1961	-0.0262	-0.5770	1.0304
	(0.3590)	(0.1574)	(0.8156)	(0.7492)
CAR	0.0225	0.0077	0.0378	0.1877*
	(0.0753)	(0.0215)	(0.1780)	(0.1114)
Noncommercial bank dummy	-0.0776	0.0055	0.2540	-0.1498
	(0.1625)	(0.0760)	(0.3586)	(0.2921)
Trust bank dummy	-0.4431	-0.0622		-1.6935
	(1.1595)	(0.3091)		(261.8513)
ρ	1.0000	1.0000	-1.0000	0.9861

Notes:

- The sample selection section corresponds to equation (2): $I_i^* = z_i'\gamma + v_i$. The regression section corresponds to equation (1): $y_i^* = x_i'\beta + u_i$. In the sample selection section, $I_i^* = 1$ if the firm issues straight bonds, and $I_i^* = 0$ otherwise; and z_i consists of one, Tobin's q, ICR (interest coverage ratio), and the industrial dummy variables. In the regression section, y_i is the probability of other bank-owned securities subsidiaries being a lead underwriter for the issue of straight bonds (OTHER-BOND); and x_i consists of one, Tobin's q, the credit rating dummy variables (AA, A, BBB) based on the highest rating among the long-term bond ratings provided by R&I, JCR, S&P, and Moody's Japan, ICR (interest coverage ratio), SIZE (natural logarithm of sales), DEBT (debt-asset ratio), CAR (capital adequacy ratio of the main bank), the noncommercial bank dummy variable, and the trust bank dummy variable. The error terms u_i and v_i have a bivariate normal distribution with mean 0, $var(u_i) = \sigma^2$, $var(v_i) = 1$, and $cov(u_i, v_i) = \rho\sigma^2$.

- The estimated coefficients of the industrial dummy variables are omitted.

- ρ in the table is the estimated correlation coefficient between u_i and v_i.

- The figures in ( ) indicate standard errors.

- *, **, *** indicate significance at the 10%, 5%, 1% levels, respectively.

Table 7: Main bank shareholding ratio (1)

Estimation method	OLS	Logit
Constant	0.4677**	-0.3261
	(0.2236)	(0.7445)
Tobin's q	-0.1078***	1.9820***
	(0.0291)	(0.0968)
ICR	-0.0503	1.0503***
	(0.0527)	(0.1753)
SIZE	0.0861***	-0.7268***
	(0.0215)	(0.0714)
DEBT	0.0018	-0.5813***
	(0.0617)	(0.2054)
CAR	-0.0208	0.1599***
	(0.0128)	(0.0427)
Noncommercial bank dummy	0.2561***	-4.0588***
	(0.0609)	(0.2026)
Trust bank dummy	0.1409**	-1.4055***
	(0.0690)	(0.2299)
Adjusted R^2	0.0781	
F-statistic	4.11***	

Notes:

- The OLS section presents results from OLS regressions based on the following equation:

  MAINSTOCK = α_0 + α_1Tobin's q + α_2ICR + α_3SIZE + α_4DEBT + α_5CAR + α_6(Noncommercial bank dummy) + α_7(Trust bank dummy) + α_8(Industrial dummy).

  The dependent variable is MAINSTOCK ((stockholding ratio by the main bank)×20). The independent variables are Tobin's q, ICR (interest coverage ratio), SIZE (natural logarithm of sales), DEBT (debt-asset ratio), CAR (capital adequacy ratio of the main bank), the noncommercial bank dummy variable, the trust bank dummy variable, and the industry dummy variables. The LOGIT section presents results

from logit regressions based on an equation which is identical to that used in the OLS section. The dependent variable is a dummy variable assigned the value of one if the firm's stock is held by the firm's main bank.

- The estimated coefficients of the industrial dummy variables are omitted.

- The figures in ( ) indicate standard errors.

- *, **, *** indicate significance at the 10%, 5%, 1% levels, respectively.

Table 8: Main bank shareholding ratio (2)

Estimation method	OLS	Logit	Tobit
Constant	0.5323**	0.3706	0.4868
	(0.2236)	(1.7039)	(0.3977)
Tobin's q	0.1078***	0.5618***	0.1909***
	(0.0291)	(0.2036)	(0.0511)
ICR	0.0503	0.2785	0.1505
	(0.0527)	(0.3836)	(0.0993)
SIZE	-0.0861***	-0.4631***	-0.1245***
	(0.0215)	(0.1573)	(0.0390)
DEBT	-0.0018	0.0127	-0.0154
	(0.0617)	(0.4423)	(0.1137)
CAR	0.0208	0.1108	0.0351
	(0.0128)	(0.0899)	(0.0235)
Noncommercial bank dummy	-0.2561***	-1.3458***	-0.3315***
	(0.0609)	(0.4591)	(0.1095)
Trust bank dummy	-0.1409**	-0.8408	-0.2143
	(0.0690)	(0.5707)	(0.1305)
Adjusted R^2	0.0781		
F-statistic	4.11***		

Notes:

- The OLS section presents results from OLS regressions based on the following equation:

$p_i = \alpha_0 + \alpha_1 \text{Tobin's q} + \alpha_2 \text{ICR} + \alpha_3 \text{SIZE} + \alpha_4 \text{DEBT} + \alpha_5 \text{CAR} + \alpha_6 (\text{Noncommercial bank dummy}) + \alpha_7 (\text{Trust bank dummy}) + \alpha_8 (\text{Industrial dummy}).$

The dependent variable is $p_i \equiv 1.00 - \text{MAINSTOCK}$ ((stockholding ratio by the main bank)×20). The independent variables are Tobin's q, ICR (interest coverage ratio), SIZE (natural logarithm of sales), DEBT (debt-asset ratio), CAR (capital adequacy ratio of the main bank), the noncommercial bank dummy variable, the trust bank dummy variable, and the industrial dummy variables. The LOGIT section presents results from logit regressions based on an equation which is identical

to that used in the OLS section. The TOBIT section provides results from tobit regressions based on the equation which is identical to that used in the OLS part.

- The estimated coefficients of the industrial dummy variables are omitted.

- The figures in ( ) indicate standard errors.

- *, **, *** indicate significance at the 10%, 5%, 1% levels, respectively.

Table 9: Shareholding ratio of the other financial intermediaries

Estimation method	OLS	Logit
Constant	-0.5363***	-4.9047***
	(0.0805)	(0.5309)
Tobin's q	0.0230**	0.1547**
	(0.0108)	(0.0710)
ICR	0.0102	-0.1009
	(0.0190)	(0.1253)
SIZE	0.1637***	0.7982***
	(0.0078)	(0.0515)
DEBT	-0.0818***	-0.7388***
	(0.0225)	(0.1483)
CAR	-0.0084*	0.0932***
	(0.0046)	(0.0304)
Noncommercial bank dummy	-0.0290	0.2755*
	(0.0219)	(0.1442)
Trust bank dummy	0.0218	-0.0953
	(0.0248)	(0.1637)
Adjusted R^2	0.3971	
F-statistic	25.20	

Notes:

- The OLS section presents results from OLS regressions based on the following equation:

FINSTOCK = α_0 + α_1Tobin's q + α_2ICR + α_3SIZE + α_4DEBT + α_5CAR + α_6(Noncommercial bank dummy) + α_7(Trust bank dummy) + α_8(Industrial dummy).

The dependent variable is FINSTOCK (stockholding ratio by the other financial intermediaries except for the main bank). The independent variables are Tobin's q, ICR (interest coverage ratio), SIZE (natural logarithm of sales), DEBT (debt-asset ratio), CAR (capital adequacy ratio of the main bank), the noncommercial

bank dummy variable, the trust bank dummy variable, and the industrial dummy variables. The LOGIT section presents results from logit regressions based on an equation which is identical to that used in the OLS section. The dependent variable is a dummy variable assigned the value of one if the firm's stock is held by the other financial intermediaries except for the firm's main bank.

- The estimated coefficients of the industrial dummy variables are omitted.

- The figures in ( ) indicate standard errors.

- *, **, *** indicate significance at the 10%, 5%, 1% levels, respectively.

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