Chapter 4
Multiple Bank Relationships and the Main Bank System: Evidence from a Matched Sample of Japanese Small Firms and Main Banks

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Abstract Based on a matched sample of Japanese small firms and main banks we investigate the bank-firm relationships in the early 2000s. We obtain new findings. First, even small firms with a main bank relation have multiple bank relationships. Second, firms tied with a financially weak main bank increase the number of bank relations. Third, longer duration of a main bank relation increases the number of bank relations. Moreover we find that firms with fewer bank relations pledge personal guarantees to their main banks and are charged a higher interest rate. This suggests that firms take actions against the monopoly power of a main bank.

Introduction

Diamond (1984) demonstrates that the cost of information production of financial intermediation is minimized by delegating information production to a single bank rather than direct monitoring by individuals. Interpreting the delegated monitoring argument from the point of view of borrowers, it is optimal for the firm to borrow from one bank to avoid duplicating information production.

In Japan main banks have played the role of delegated monitors as well as the suppliers of loans to their affiliated firms. Information of affiliated firms is accumulated in main banks by way of long-term, multiple, transactions. Moreover, main

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banks have provided affiliated firms with a variety of services besides loans. Main banks are often delegated to collect bills as well as settlement of bills payable and give customers professional advices on financial affairs, production and investment plans. Main bank employees often hold managerial positions in, sometimes financially troubled, client firms for purpose of direct monitoring.[1]

However, there are also costs of a single bank relation. In the course of single lending borrower's information is exclusively accumulated into this single bank, which leads to an informational monopoly. An information monopoly enables banks to extract rents from borrowers. For example, main banks sometimes charge a higher loan interest rate. In fact Weinstein and Yafeh (1998) obtain the evidence that the cost of capital for firms with a close bank relation is higher than that for their peers. The information lock-in effect also makes it difficult for firms to switch lenders.[2] This is well-known as the hold-up problem. One solution to solve this problem is to engage in multiple bank relationships.

There is another factor that prompts firms to establish multiple bank relations. Massive bad loans and subsequent shortage of equity capital in the late 90s to the early 2000s plunged a number of Japanese financial institutions into financial difficulties. Faced with poor main bank health, the affiliated firms had incentives to diversify loan transactions with other banks in order to reduce liquidity risk. Therefore it is interesting to see how bank-firm relations in Japan changed in the midst of financial turmoil of the late 90s to the early 2000s. This study is an empirical attempt along this line and examines whether Japanese small and medium-sized firms (SMEs hereafter) with main bank relations relied upon these multiple bank relations and if so why.[3]

Our study has several features. First, we use a unique micro data set of small and medium-sized firms called Survey of the Corporate Financial Environment (abbreviated as SCFE). The survey has been conducted by the Small and Medium Enterprise Agency of Japan since 2001. The questionnaire contains a number of interesting issues on bank-firm relations such as the number of bank relations, the name of the main bank the firm is affiliated with and the duration of a main bank relationship. This enables us to construct a matched sample of main banks and client firms. Based on this matched sample, we investigate how a main bank health affects the number of bank relations of the affiliated firms.

Secondly, we investigate how serious the hold-up problem is for the firm tied with its main bank. The SCFE has qualitative information on the strength of main bank relations such as whether firms disclose their information to the main bank or

[1] Hoshi et al. (1991), using firm-level data, obtain the evidence that the firms affiliated with a main bank enjoy a lower external finance premium than independent firms.

[2] See Sharpe (1990) and Rajan (1992) for a theoretical analysis of the association of banking relation with an information monopoly.

[3] Ogawa et al. (2007) examine the determinants of multiple bank relationships for large listed firms. Uchida et al. (2006) examine the effect of bank size on the strength of the bank-firm relationships which among other things is measured by the number of bank relations. They use the same data set as ours, but only the 2002 survey.

whether firms pledge for collateral or a personal guarantee. This information is useful in measuring the extent to which the main bank exploits its client as information monopolist.[4]

Let us summarize our main findings. We find that firms with longer relations with their main banks also have more relations with other banks. A firm, whose main bank has a low capital ratio, increases the number of relations with other banks. It is more likely that firms pledge personal guarantees when firms have longer relations with their main banks, disclose information to their main banks and the number of banks with which the firms have relations at all is smaller. Our evidence suggests that even the SMEs indeed diversified liquidity risk in the period of financial turbulence in the late 90s to the early 2000s by increasing transactions with other banks. We also confirm that there is dark side of the main bank system or a hold-up problem for SMEs.

This paper is organized as follows. Section Data Characteristics and Descriptive Statistics of Bank-Firm Relationships, explains the characteristics of the data set we use and shows a variety of descriptive statistics on bank-firm relations. Section Determinants of Multiple Bank Relations and the Impact of Main Bank Relations on Loan Contracts sets up an empirical model to determine the multiple bank relationships and examines the impact of main bank relations on loan contracts. Section Estimation Results and Their Implications to Main Bank Relationship presents the estimation results and an interpretation of the results. Section Concluding Remarks summarizes and concludes the paper.

Data Characteristics and Descriptive Statistics of Bank-Firm Relationships

The SCFE, conducted by the Small and Medium Enterprise Agency of Japan, is the first Japanese micro survey to ask small and medium-sized firms a number of questions regarding bank-firm relations. In each wave of the survey, a questionnaire is sent to about 15,000 firms, mainly SMEs, of which about 7,000–9,000 firms respond.

Since our interest lies in multiple bank relations in case a firm has contact with a main bank, we show some descriptive statistics on this issue. The sample period covers the years 2001–2003. First, we can compute the fraction of firms that have a main bank relation. In the survey a main bank is defined as the financial institution which the firm perceives to be the main bank, irrespective of the loan shares.[5] Table 4.1 shows the fraction of firms with a main bank relation and illustrates that more than 90% of the firms have a link with a main bank. Table 4.2 shows the

[4] Ono and Uesugi (2005) also examine the role of collateral and personal guarantees in bank-firm relationships using the SCFE. Their study relies on cross sectional data of the 2002 survey but ours are a panel data of 2001–2003.

[5] The firms are asked to choose only one bank as their main bank, so that there are no multiple main banks by the design of the survey.

Table 4.1 Reply to the question: Do you have your "Main Bank"?

		(Percentages)		
		2001	2002	2003
(1)	Yes	95.6	94.4	92.6
(2)	No	4.4	5.6	7.4

Source: Small and medium enterprises agency, *Survey of the corporate financial environment*, 2001, 2002, 2003

Table 4.2 Main bank by type of financial institutions

		(Percentages)		
		2001	2002	2003
(1)	City banks, long-term credit banks (LTCB) and trust banks	34.9	33.7	28.9
(2)	Regional banks including second-tier regional banks	49.6	51.6	53.5
(3)	Shinkin banks and credit cooperatives	12.4	11.7	15.2
(4)	Public financial institutions	2.3	2.1	1.8
(5)	Others	0.8	0.8	0.6
(6)	Total	100.0	100.0	100.0

Source: Small and medium enterprises agency, *Survey of the corporate financial environment*, 2001, 2002, 2003

type of main banks. About half of the main banks are regional banks and one-third is in the class of large banks, such as city banks, long-term credit banks and trust banks. The fraction of shinkin banks or credit cooperatives as a main bank is only 12–15%.

The average length of a main bank relation of firms in 2002 is 26.4 years, which indicates that SMEs have longstanding close ties with their main banks. But SMEs have multiple bank relationships, too. Table 4.3 shows the descriptive statistics of the number of bank relationships. The average number of bank relationships is 3.47 in 2003 to 5.12 in 2002 and the median number is 3 in 2001 and 2003 to 4 in 2002 for firms with a main bank relation and this number is as large as that for the firms without a main bank. Firms have multiple relationships with both large banks and regional banks. It should be noted that the median is rather low, compared to Japanese large listed firms. In fact Ogawa et al. (2007) report that the median number of bank relations is 6–7 for Japanese listed firms for the period of 1981–1999.

Three variables on the terms of loan contracts with main banks are available in the SCFE. The first is whether a firm pledges collateral to its main bank and the second one is whether a firm pledges personal guarantees.[6] Table 4.4 shows that the fraction of firms that pledge collateral or personal guarantees to their main banks is more than 70 irrespective of the sample year. The third variable is the short-term interest rate of borrowings from a main bank. Figure 4.1 shows the histogram of

[6] A personal guarantee is defined as a contractual obligation of the firm owner or other parties to repay the principal in case of default.

Table 4.3 Mean and median numbers of bank relationship

	2001			2002			2003		
	Firms with main bank	Firms without main bank	Total	Firms with main bank	Firms without main bank	Total	Firms with main bank	Firms without main bank	Total
(1) City banks, LTCB and trust banks	1.36 (1)	1.64 (0)	1.38 (1)	1.44 (0)	1.52 (0)	1.44 (0)	0.88 (0)	0.90 (0)	0.89 (0)
(2) Regional banks	1.48 (1)	1.28 (1)	1.47 (1)	1.74 (1)	1.59 (1)	1.73 (1)	1.22 (1)	0.84 (0)	1.19 (1)
(3) Shinkin banks and credit cooperatives	0.50 (0)	0.48 (0)	0.50 (0)	0.55 (0)	0.45 (0)	0.54 (0)	0.43 (0)	0.32 (0)	0.42 (0)
(4) Public financial institutions	0.54 (0)	0.42 (0)	0.54 (0)	0.65 (0)	0.37 (0)	0.63 (0)	0.48 (0)	0.31 (0)	0.46 (0)
(5) Others	0.50 (0)	0.81 (0)	0.51 (0)	0.75 (0)	1.45 (0)	0.79 (0)	0.46 (0)	0.65 (0)	0.48 (0)
(6) (1)+(2)+(3)	3.34 (3)	3.40 (2)	3.35 (3)	3.72 (3)	3.56 (2)	3.72 (3)	2.53 (2)	2.07 (1)	2.50 (2)
(7) (1)+(2)+(3)+(5)	3.72 (3)	4.11 (3)	3.74 (3)	4.47 (3)	5.01 (3)	4.50 (3)	2.99 (2)	2.72 (2)	2.97 (2)
(8) (1)+(2)+(3)+(4)+(5)	4.39 (3)	4.63 (3)	4.40 (3)	5.12 (4)	5.38 (3)	5.13 (4)	3.47 (3)	3.03 (2)	3.44 (3)
(9) Number of observations	7,204	330	7,534	7,570	450	8,020	6,821	549	7,370

Source: Small and medium enterprises agency, *Survey of the corporate financial environment*, 2001, 2002, 2003
Notes: The values in parenthesis are median observations

Table 4.4 Fraction of firms that pledge collateral and / or personal guarantees to their main banks

	(Percentages)		
	2001	2002	2003
(1) Pledge collateral	75.8	71.3	–
(2) Pledge personal guarantees	70.0	71.7	73.7

Source: Small and medium enterprises agency, *Survey of the corporate financial environment*, 2001, 2002, 2003

this short-term interest rate in 2002. It should be noted that the distribution of the short-term interest rate is skewed to the right and thus high interest rate relative to its mean is charged on some firms reflecting a loan risk premium.

In the subsequent analysis we pick the firms in the SCFE with information on bank-firm relations available for the entire period of 2001–2003. This sample consists of 2,138 firms in total. We further choose the firms that satisfy the following conditions. First, we select firms with a main bank that is a private bank, defined as a city bank, long-term credit bank, regional bank, shinkin bank or credit cooperative. Second, the firm has a bank-firm relation with the main bank in 2002 for

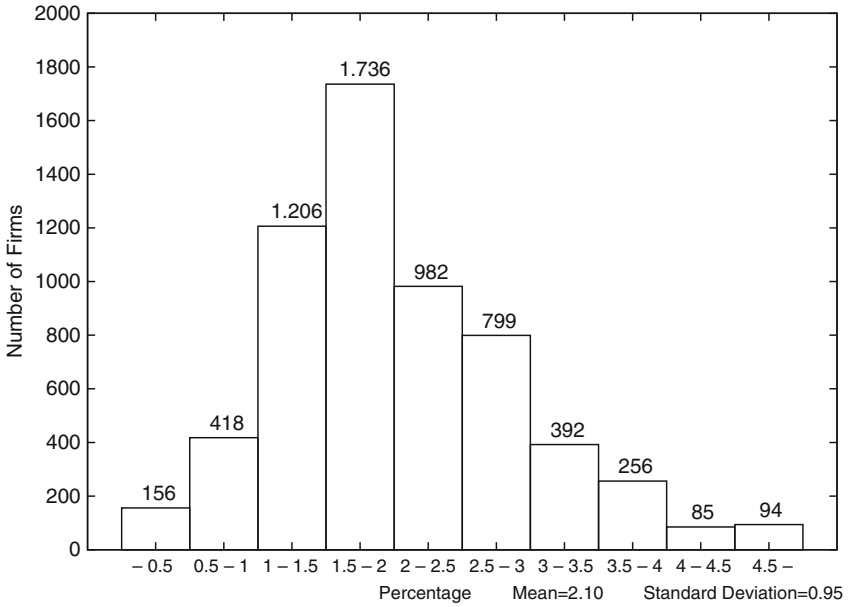

Fig. 4.1 Frequency distribution of the short-term interest rate of borrowing from a main bank: 2002 Survey

2 years or more.[7] So our panel data is unbalanced and the final number of firm-year observations is 5,166. Table 4.5 shows descriptive statistics of the major variables. For all variables but the debt-asset ratio, the mean value is larger than the median, indicating that the frequency distribution is skewed to the right. The large standard deviations also imply that the frequency distributions have a wide dispersion.

For our sampled firms, the information on the bank-firm relations in the SCFE is combined with the balance sheet information as well as the profit-loss statements of the TSR (Tokyo Shoko Research) database. Moreover, we can make use of the financial statements of the main bank itself as well, so we now have a matched sample of borrowers and main banks.

Determinants of Multiple Bank Relations and the Impact of Main Bank Relations on Loan Contracts

In this section we discuss the determinants of the number of bank relations of small Japanese firms. We also relate the terms of loan contracts, like the pledge of personal guarantees and the contract interest rate, that gauge the effects of main bank relations on the design of loan contracts.

[7] We can identify the main bank of the sampled firms in the SCFE only in 2002, so that the firms of which the length of the main bank relation is less than two years are excluded since we cannot identify their main banks in 2001 or 2003.

Table 4.5 Descriptive statistics of major variables in our panel data set

Variables		Mean	Median	Standard deviation
(1)	Tangible assets excluding land and construction in progress / total assets	0.1814	0.1391	0.1652
(2)	Inventories / total assets	0.1004	0.0696	0.1071
(3)	Loans payable / total assets	0.3694	0.3509	0.2655
(4)	Accounts receivable-trade / total assets	0.2590	0.2337	0.1766
(5)	Accounts payable-trade / total assets	0.2146	0.1754	0.1789
(6)	Debt-asset ratio	0.7036	0.7472	0.2517
(7)	Total assets	4,050.4	1,364.7	8,024.8
(8)	Sales	4,027.3	1,618.6	7,271.2
(9)	Number of employees	141.6	44.0	644.5

Units: one million yen for total assets and sales and person for number of employees
Source: Small and medium enterprises agency, *Survey of the corporate financial environment* 2001, 2002, 2003

Determinants of Multiple Bank Relations Under the Main Bank System

Why does a firm, closely tied with its main bank, have multiple bank relations? To find a clue to this question, it is important to understand why main bank financing is so prevalent in Japan. A main bank holds a large share of loans of affiliated firms, which gives a strong incentive to collect information about firms' prospects and to monitor the firms. It helps to mitigate problems due to asymmetric information that lead to adverse selection and/or moral hazard. The studies of Kaplan and Minton (1994), Sheard (1994a), Kang and Shivdasani (1995, 1997), Miyajima (1998), and Morck and Nakamura (1999) provide evidence that main banks closely monitor their client firms and dispatch directors to them in the event of financial distress. Close monitoring also helps to identify the types of distress their clients face and thus reduce the cost of this distress (Hoshi et al. (1990) and Sheard (1994b)). However, it should be noted that concentration of information about client firms by a main bank is a double-edged sword and creates monopoly exploitation, the hold-up problem.

Thus one important determinant of a multiple bank relation is the extent to which the hold-up problem is severe for the firm. If a main bank relation is not affected by heavy competition, a main bank might consider using the acquired private corporate information to extract rents, thus distorting entrepreneurial incentives and causing inefficient investment choices. The firm affiliated with the main bank might increase the number of bank relationships in order to act against this exploitation. Thus it is natural to include a variable to measure the degree of the hold-up problem in explaining the number of bank relations. We choose the length of a main bank relation, measured by the number of years since the inception (*MYEAR*). It should be noted that this variable plays another role in explaining the number of bank relations. Since the information of the client firm is accumulated in the main bank in the course of making loans, the news that the main bank has a long and stable relation

with the client firm signals that the firm is a good one in terms of profitability, sales growth, and financial conditions, and so on. Other banks might judge the quality of the firm from the news and start business with the firm without investing much in gathering information about the firm.

This is quite similar to the case where a firm's stock price rises when good news about the relation with its main bank is revealed to the market.[8] It is also similar to a sequential complementarity between bank loans and public debt financing. It is only after borrowers are exposed to strict monitoring by banks that firms can raise funds in the capital market. In our context the firm earns good reputation after long and strict monitoring by the main bank, which attracts outside banks granting new loans to the firm.[9]

Another incentive for the firm with a main bank to have multiple bank relations is insurance against lack of liquidity. Suppose that a firm has a long-term profitable project. When that project is liquidated prematurely at the refinancing stage, the firm will incur a tremendous loss. This might happen if the main bank cannot roll over its initial loan and the firm in liquidity need has to apply for loans from non-relation banks (arm's – length financiers). These banks probably think that the applying firms have lemon projects. To avoid this disastrous situation, the firm might have multiple bank relations and diversify its liquidity risk. Detragiache et al. (2000) present a theoretical model in which multiple bank contacts can reduce liquidity risk. In the early stage of financing a project, a main bank acquires private information about the continuation value of the project. At the refinancing stage the firm might need to borrow from non-main banks due to unexpected liquidity shocks that makes it difficult to roll over initial loans. In the worst case, where the firm faces a severe adverse selection problem, the firm is unable to refinance the project by getting loans from other banks. Thus it will be profitable for the firm to establish multiple relations, because it reduces the probability of early liquidation. This model is applicable to the late 90s to the early 2000s in Japan when banks suffered from massive non-performing loans and the banks' balance sheets deteriorated severely. To test this conjecture, we include the banks' balance sheet variables as explanatory variables in explaining the number of bank relations. We choose two variables: the ratio of non-performing loans to total loans (*BADLOAN*) and the equity capital ratio of the bank. The Basel Accord states that banks, engaged in international business, should keep the capital ratio above 8% and domestic banks should maintain 4% capital base at minimum. Therefore we construct two capital ratio variables. The *CAPITAL1* variable stands for the capital ratio of the main bank engaged in international business, while the *CAPITAL2* variable stands for the capital ratio of a domestic main bank.

Lastly we incorporate the type of main bank to give additional information on the bank-firm relation. In order to estimate the effects of bank type on the number of

[8] For the announcement effect of bank loans on stock prices there are numerous event studies. For example, see James (1987), Billett et al. (1995), and Shockley and Thakor (1998).

[9] For complementarity between bank loans and public debt, see Diamond (1991), Hoshi et al. (1993), and Chemmanur and Fulghieri (1994).

bank relations, we include two dummy variables for the type of main bank: *DCITY* for city, long-term credit, and trust banks and *DREGION* for regional banks.

We also include conventional explanatory variables to determine the number of bank relations.[10] These are the debt-asset ratio (*DEBTR*), the ratio of operating profits to sales (*PROFITSL*), the ratio of liquid assets (cash, deposits and securities) to total assets (*LIQAST*), the ratio of land asset to total assets (*LNDAST*), and the logarithm of total assets (*LASSET*). The debt-asset ratio measures the effect of a firm's capital structure on the number of bank relations. A large debt-asset ratio may increase the probability of multiple bank relations, because the probability of default is likely to be higher for more leveraged firms and the adverse selection problem is more severe. Profitability of the firm, measured by the *PROFITSL* variable, will have a positive effect on the number of bank relations and the liquidity-rich firm does not need additional bank loans, thus leading to a lower number of bank relations. The ratio of land to total assets, proxy of the collateral size, has a positive effect on the number of bank relations, because having abundant collateral assets will attract non-relation banks. The effect of firm size on the number of bank relations is measured by the logarithm of total assets of the firm. The industry dummies (*DIND*1-*DIND*26) as well as year dummies (*YEAR*1, *YEAR*2) are also included.[11,12] The equation to determine the number of bank relationships of small firms is given by:

$$\begin{aligned} NBANK_{it} = {} & a_0 + a_1 MYEAR_{it} + a_2 BADLOAN_{it} + a_3 \frac{1}{CAPITAL1_{it} - 0.08} \\ & + a_4 \frac{1}{CAPITAL2_{it} - 0.04} + a_5 DEBTR_{it} + a_6 PROFITSL_{it} \\ & + a_7 LIQAST_{it} + a_8 LNDAST_{it} + a_9 LASSET_{it} + a_{10} DCITY_{it} \\ & + a_{11} DREGION_{it} + \sum_{J=1}^{26} b_J DINDJ_{it} + c_1 DYEAR1_{it} \\ & + c_2 DYEAR2_{it} + \varepsilon_{it} \end{aligned} \tag{4.1}$$

where $NBANK_{it}$: number of bank relationships for the i-th firm in period t.

In (4.1), where ε_{it} denotes a white-noise residual, we take account of nonlinear effects of the capital ratio on the number of bank relations. As the capital ratio of a main bank approaches the lower bound of the capital requirement, the affiliated firm may accelerate transactions with other banks in fear that its main bank might stop providing loans.

[10] There are numerous empirical studies on the number of bank relationships. For example, see Ongena and Smith (2000a,b) and Volpin (2000) for international evidence on multiple bank relationship. Horiuchi (1993, 1994) present a descriptive analysis of multiple bank relations of Japanese firms.

[11] The SCFE records industry code to which each sample firm belongs.

[12] The subscripts i and t refer to firm and period, respectively.

Impact of a Main Bank Relationship on the Loan Contract Terms

When a firm's main bank is the sole supplier of loans, the main bank accumulates proprietary information of the firm and might take advantage of its information monopoly. The terms of loan contracts are written so that they are favorable to the main bank. For example, the main bank might charge a higher loan interest rate or demand personal guarantees to secure monopoly rents. However, as the number of bank relations increases, the borrower gains more bargaining power and the terms of loan contracts become more favorable to the borrower. In other words, severity of the hold-up problem will be reflected in the terms of the loan contract.

To test this hypothesis, we estimate the following equations that associate the terms of a loan contract with main bank relation variables. The terms of the loan contract are measured by two variables: a binary variable whether a borrower pledges personal guarantees to its main bank (*GUARANT* equals 1 if borrower pledges personal guarantees, and 0 otherwise) and the short-term interest rate charged by its main bank (*INTRATE*).[13] We include three explanatory variables that represent a main bank relation. First, the bargaining power of the borrower is measured by the number of bank relations (*NBANK*) examined above. More bank relations increase the bargaining power of the borrower, which decreases the probability that the borrower pledges personal guarantees. The borrower will also face a lower interest rate. Second, the extent to which a borrower is informationally exploited is measured by the length of a main bank relation measured in years (*MYEAR*). The longer the main bank relation is, the more likely a borrower pledges personal guarantees and the borrower will face a higher interest rate. The third description is a binary variable whether the firm discloses information about the firm's balance sheet, profit-loss statement and other situations surrounding the firm to its main bank (*DINFORM* equals 1 if a main bank is informed, and 0 otherwise).

We also include the variables of firm attributes as well as main bank attributes. As for the firm and main bank attributes, we use the same explanatory variables of (4.1) to determine the number of bank relations. We include two additional variables to represent lending attitudes of the main bank towards the firm. One is a dummy variable (*DINCREASE*) that takes 1 if the firm is asked to borrow more than applied, and 0 otherwise. The other is a dummy variable (*DREJECT*) that takes 1 if the loan application by the firm is rejected or reduced by its main bank.[14]

The equation to be estimated is as follows:

$$GUARANT_{it} = a_0 + a_1 NBANK_{it} + a_2 MYEAR_{it} + a_3 DINFORM_{it} + a_4 BADLOAN_{it} + a_5 \frac{1}{CAPITAL1_{it} - 0.08}$$

[13] Pledging collateral to a main bank is also useful information to gauge the impact of information monopoly on the terms of loan contract. However, information of collateral is not available in the 2003 SCFE.

[14] 26 Industry dummy variables (*DINDJ*) as well as year dummies (*DYEAR*) are also included as explanatory variables.

$$+ a_6 \frac{1}{CAPITAL2_{it} - 0.04} + a_7 DEBTR_{it} + a_8 PROFITSL_{it} + a_9 LIQAST_{it} + a_{10} LNDAST_{it} + a_{11} LASSET_{it} + a_{12} DCITY_{it} + a_{13} DREGION_{it} + a_{14} DINCREASE_{it} + a_{15} DREJECT_{it} + \sum_{J=1}^{26} b_J DINDJ_{it} + c_1 DYEAR1_{it} + c_2 DYEAR2_{it} + u_{it} \quad (4.2)$$

where u_{it}: a white noise error term.

The short-term interest rate equation is similar to (4.2) except that we substitute *GUARANT* by *INTRATE* and add the *GUARANT* variable to the explanatory variables to estimate the effects of personal guarantees on the short-term interest rate.

Estimation Results and Their Implications to Main Bank Relationship

Determinants of Multiple Bank Relationship under Main Bank System

The number of bank relationships takes positive integers, so we apply two estimation models for count data: a Poisson random-effects model where a gamma distribution is assumed for random firm-specific effects and a negative binomial random-effects model wherein it is assumed that the dispersion parameter is a random variable with a beta distribution.[15] We measure the number of bank relations in two different ways. One is the total number of bank relationships (*NBANK*1) including borrowings from non-banks, insurance companies and public financial institutions. The other is the one that excludes public financial institutions (*NBANK*2). Estimation of the number of bank relations including and excluding public financial institutions may yield different results because public financial institutions for SMEs may have business with firms led by different motives.

We first show the estimation results with *NBANK*1 as the number of bank relations. The first column of Table 4.6 shows the results of the Poisson model and the second column shows the results obtained with the negative binomial model. The length of the main bank relation (*MYEAR*) has a positive effect on the number of bank relations and it is significant at the 10% level in the Poisson model. This result can be interpreted in two different ways. In one interpretation the length of a main bank relation is taken as the extent to which the hold-up problem is severe.

[15] See Hausman et al. (1984) and Cameron and Trivedin (1998) for details on the estimation of a count data model in a panel data setting.

Table 4.6 Determinants of multiple bank relationships: estimation results of the poisson random effects model and the negative binomial random effects model

Dependent variable: *NBANK*1			
		Poisson	Negative binomial
Bank-firm relationship variable			
(1)	*MYEAR*	0.000075 (1.65)	0.000065 (1.36)
Bank-related variables			
(2)	*BADLOAN*	−0.1208 (−0.43)	−0.0970 (−0.33)
(3)	$\frac{1}{CAPITAL1-0.08}$	0.0021 (3.17)[a]	0.0018 (2.55)[b]
(4)	$\frac{1}{CAPITAL2-0.04}$	−0.0003 (−0.59)	−0.0002 (−0.41)
(5)	*DCITY*	0.2026 (4.42)[a]	0.1729 (3.72)[a]
(6)	*DREGION*	0.0184 (0.44)	0.0044 (0.10)
Firm-related variables			
(7)	*DEBTR*	0.6136 (10.2)[a]	0.5836 (9.74)[a]
(8)	*PROFITSL*	−0.0025 (−0.20)	−0.0032 (−0.25)
(9)	*LIQAST*	−0.5744 (−5.34)[a]	−0.5190 (−4.74)[a]
(10)	*LNDAST*	−0.0646 (−0.60)	−0.0335 (−0.31)
(11)	*LASSET*	0.0869 (9.93)[a]	0.0987 (10.8)[a]
(12)	*ALPHA*	0.2503 (24.1)[a]	
(13)	*R*		55.6299 (6.31)[a]
(14)	*S*		4.5797 (20.7)[a]
(15)	Log likelihood	−11,104.96	−11,082.16
(16)	Number of observations	4,917	4,917

Notes: *ALPHA* is the variance estimate of the gamma distribution of the exponential random effects. *R* and *S* are the parameters of the beta distribution. The coefficient estimates of constant, year dummies and industry dummies are suppressed. The values in parentheses are *t*-ratios

[a], [b]: significant at the 1% and 5% level, respectively

The longer the main bank relation is, the more severe the hold-up problem is, so that the main bank extracts a monopoly rent from the affiliated firm. To prevent informational exploitation, the firm increases the number of bank relations. The other interpretation takes the length of a main bank relationship as an indicator of reputation of the firm gained through close monitoring by the main bank. It reveals that the affiliated firm has a good record of business which makes other banks think the firm worth lending to. For the time being we do not have evidence to distinguish between the two interpretations, but we will come back to this point later.

As for the effects of the main bank health on the number of bank relations, the capital ratio of the main bank has a significantly negative effect on the number of bank relations of the affiliated firms, irrespective of the estimation model. It implies that the firm whose main bank has a low capital ratio increases the number of bank relations and that the effect gets larger as the capital ratio approaches to the

minimum level. In the late 90s to the early 2000s the capital ratio of Japanese banks deteriorated rapidly and it induced the affiliated firms to diversify liquidity risk by increasing transactions with other banks.

We also have significantly positive effects of the city bank dummy on the number of bank relations. The news that a firm has a tie with a city bank as its main bank sends a signal that the main bank is large enough to bail out the affiliated firm in financial distress backed up by the policy authority, which in turn induces other banks to lend to the firm.

The other variables have an anticipated effect on the number of bank relations. The firm size, measured by the logarithm of total assets, and the debt-asset ratio have significantly positive effects on the number of bank relations, while the ratio of liquid assets to total assets has a significantly negative effects on the number of bank relations.

As for the case with *NBANK*2 as the number of bank relations, the estimation results, which is not shown in the text, remain essentially unaltered. The length of a main bank relation has a positive effect on the number of bank relations and main bank health has a negative effect on the number of bank relations as before.

Impact of Main Bank Relationship on Loan Contracts

To examine the effect of a main bank relation on the terms of loan contracts, we estimate the following two equations. The first relates the main bank relation to the *GUARANT* variable that takes 1 if borrower pledges personal guarantees to its main bank. We apply the probit random-effects model to estimate (4.2).[16] The estimation results of (4.2) are shown in Table 4.7. The first column corresponds to the estimation result with the total number of bank relationships measured by *NBANK*1. All the variables of a main bank relation (*NBANK*, *NYEAR*, *DINFORM*) exert a significant effect on whether firms pledge personal guarantees to their main banks. The firms with longer relations with their main banks and fewer number of bank relations are more likely to pledge personal guarantees. Moreover, the firms disclosing information to their main banks are more likely to pledge personal guarantees. This indicates that a main bank can take a strong stand on the terms of loan contract by making its affiliated firm pledge personal guarantees when the main bank has accumulated information on the client firm in the course of a long relationship and the client firm has fewer banks to rely on. In other words, a main bank extracts monopoly rents from its affiliated firms.

We also obtain interesting findings on the effects of other explanatory variables on whether firms pledge personal guarantees to their main banks. It is more likely that smaller firms with a higher debt-asset ratio pledge personal guarantees to their

[16] For the probit random-effects model, the likelihood is expressed as an integral which is computed using a Gauss–Hermite quadrature.

Table 4.7 Determinants of personal guarantees pledge: estimation results of the probit random effects model

		*NBANK*1	*NBANK*2
Bank-firm relationship variables			
(1)	*MYEAR*	0.00087 (4.90)^a	0.00085 (4.80)^a
(2)	*NBANK*1 or *NBANK*2	−0.0183 (−2.11)^b	−0.0359 (−3.93)^a
(3)	*DINFORM*	1.3668 (6.83)^a	1.4310 (6.94)^a
Bank-related variables			
(4)	*BADLOAN*	−2.7377 (−2.45)^b	−2.4523 (−2.19)^b
(5)	$\frac{1}{CAPITAL1-0.08}$	−0.0025 (−0.94)	−0.0025 (−0.95)
(6)	$\frac{1}{CAPITAL2-0.04}$	0.0012 (0.88)	0.0011 (0.80)
(7)	*DCITY*	−1.2893 (−6.88)^a	−1.2409 (−6.66)^a
(8)	*DREGION*	−0.4656 (−2.75)^a	−0.4497 (−2.68)^a
Firm-related variables			
(9)	*DEBTR*	1.9062 (8.72)^a	1.9292 (8.83)^a
(10)	*PROFITSL*	0.0529 (0.88)	0.0529 (0.91)
(11)	*LIQAST*	1.5664 (4.04)^a	1.5429 (3.99)^a
(12)	*LNDAST*	2.7176 (6.75)^a	2.6954 (6.71)^a
(13)	*LASSET*	−0.2126 (−6.02)^a	−0.2104 (−6.03)^a
(14)	*DINCREASE*	0.2164 (2.74)^a	0.2256 (2.85)^a
(13)	*DREJECT*	0.3671 (2.35)^b	0.3277 (2.10)^b
(14)	σ_{u_i}	1.5086 (18.9)^a	1.4853 (18.7)^a
(15)	Number of observations	4,888	4,841

Notes: σ_{u_i} is the standard deviation of firm-specific error component. See the notes in Table 4.6 for the other notations

main bank. Smaller banks, such as shinkin banks and credit cooperatives, are more likely to demand personal guarantees to their client firms in loan contracts. The estimation results are essentially unaltered when the total number of bank relationships is measured by *NBANK*2 (the second column of Table 4.7). Note that the coefficient estimate of the total number of bank relations is almost doubled in absolute value. It implies that the firms with fewer numbers of private bank relations are more likely to pledge personal guarantees, which appears consistent with the informational position monopoly by the main bank.

The other equation relates the main bank relation including the *GUARANT* variable to the short-term interest rate charged by the main bank (*INTRATE*). The estimation results are shown in Table 4.8.[17] The first column of Table 4.8 corresponds to the estimation results with the total number of bank relations measured

[17] We apply the random-effects GLS model to the short-term interest rate equation so that it is consistent with the personal guarantee equation.

Table 4.8 Determinants of the short-term interest rate: estimation results of GLS random effects model

		*NBANK*1	*NBANK*2
Bank-firm relationship variables			
(1)	*MYEAR*	0.0720 (1.06)	0.0777 (1.13)
(2)	*NBANK*1 or *NBANK*2	−4.2441 (−1.36)	−6.9002 (−2.06)^b
(3)	*DINFORM*	176.7622 (1.86)	194.2020 (2.02)^b
(4)	*GUARANT*	165.0629 (5.28)^a	165.0432 (5.25)^a
Bank-related variables			
(5)	*BADLOAN*	945.0657 (2.40)^b	937.7299 (2.37)^b
(6)	$\frac{1}{CAPITAL1-0.08}$	−1.7653 (−1.86)	−1.7245 (−1.81)
(7)	$\frac{1}{CAPITAL2-0.04}$	0.1875 (0.40)	0.1884 (0.40)
(8)	*DCITY*	−466.1888 (−7.75)^a	−463.5448 (−7.70)^a
(9)	*DREGION*	−256.6120 (−4.87)^a	−257.4379 (−4.88)^a
Firm-related variables			
(10)	*DEBTR*	930.7149 (11.7)^a	928.9016 (11.6)^a
(11)	*PROFITSL*	31.8776 (1.86)	31.7974 (1.85)
(12)	*LIQAST*	−119.7744 (−0.84)	−128.4952 (−0.90)
(13)	*LNDAST*	222.0394 (1.61)	215.7634 (1.57)
(14)	*LASSET*	−153.2928 (−12.0)^a	−152.2786 (−12.0)^a
(15)	*DINCREASE*	−156.0833 (−5.78)^a	−159.3143 (−5.86)^a
(16)	*DREJECT*	406.0307 (8.47)^a	410.0320 (8.51)^a
(17)	σ_{u_i}	585.2917	583.3151
(18)	$\sigma_{e_{it}}$	572.4374	574.2528
(19)	Number of observations	4,159	4,139

Notes: σ_{u_i} is the standard deviation of firm-specific error component, while $\sigma_{e_{it}}$ is the standard deviation of idiosyncratic error component. See the notes in Table 4.6 for the other notations.

by *NBANK*1. Here we also find that the main bank extracts rents from its affiliated firms in a relatively weak position. That is to say, a main bank charges a higher short-term interest rate on the client firms that disclose their information and pledge personal guarantees to their main bank. The effects of the *DINFORMT* and *GUARANT* variables on the short-term interest rate are also significantly positive when the total number of bank relationships is measured by *NBANK*2, which is shown in the second column of Table 4.8. However the effect of the number of bank relations on the short-term interest rate differs between the two cases. When the number of bank relations is confined to private financial institutions, it has a significantly negative effect on the short-term interest rate. However, once the public financial institutions are taken into consideration, it is no longer significant. This evidence lends further support to our findings that firms face the hold-up problem. It is because public financial institutions are less likely to offer a high interest rate in order to extract monopoly rents, and thus inclusion of public financial institutions in the

number of bank relations makes the association of the short-term interest rate with informational monopoly less clear.

Lastly note that the level of the short-term interest rate is also dependent on the firm characteristics as well as bank characteristics. A higher short-term interest rate is charged on a smaller firm with a high debt-asset ratio and high profitability. Smaller banks with a high bad loan ratio tend to charge higher short-term interest rate on their client firms.

Concluding Remarks

In this study we constructed a matched sample of firms and their main banks by combining a unique micro survey of SMEs collected by the Small and Medium Enterprise Agency of Japan with financial statements of firms and banks. Based on the matched sample, we investigated the bank-firm relations of SMEs in the presence of a main bank as dominant lender in the early 2000s when Japanese banks were burdened with massive non-performing loans. We obtain new findings on a bank-firm relation of SMEs. After confirming that SMEs have multiple bank relations even when the firms had their main bank, we examined the determinants of multiple bank relations. Among others, we found that the firms tied with a financially weak main bank increased the number of bank relationships to diversify liquidity risk. We also found that the length of a main bank relationship had positive effects on the number of bank relations. This is interpreted as either the influence of a reputation effect of client firms or firms' counterbalance actions against the monopoly power of main bank. To go further into this issue, we examined the determinants of personal guarantees pledge in loan contracts and the short-term interest rate charged by the main bank. It was found that firms with fewer bank relations that disclosed their private information to their main banks were more likely to pledge personal guarantees to their main bank and were charged a higher short-term interest rate. Our evidence lends support for the prevalence of the hold-up problem and thus we may conclude that main bank extracts rents from their client firms.

It is often argued that relationship banking is important for SMEs. It is true that relationship banking can mitigate asymmetry of information between a main bank and client firms that leads to inefficient loan allocation due to adverse selection and the lemon problem, but we also have to bear in mind that too much concentration of information in one bank creates another hold-up problem and monopoly rents earned by main bank also distorts firms' resource allocation.

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