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What are the determinants of the number of bank relations of Japanese firms?

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Abstract

We explore the determinants of the number of long-term bank relations of listed Japanese firms in a unique data set covering 1982-1999. Japanese listed firms had about seven long-term bank loan relations on average, but show a large variation around the average. We analyze the determinants of the choice for the number of bank relations. We use special data on loan and equity ownership to address the impact of the Japan-specific corporate governance structure on loan decisions. Having a relation with a top-equity holding bank reduces the number of bank relations, while debt-rich and cash-poor firms have more bank relations.

Keywords: Bank relations, Single versus Multiple Borrowing, Governance, Discrete Choice Models

JEL: G21, G32

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1 Introduction

In this paper we analyze in detail the endogeneity of the number of long-term banking relations Japanese listed firms had in the period 1982-1999. These two decades are of special interest, since they represent the so-called Japanese bubble- and post-bubble periods. Contrary to earlier studies on the optimal number of bank relationships (see *e.g.* Detragiache *et al*., 2000, and Farinha and Santos, 2000) we exploit the time variation in our unique data set. Moreover, we are able to include information with respect to the Japanese corporate control mechanism via identification of top loan and equity ownership on the firm level. This feature is especially relevant to the Japanese case of industrial group structures (*keiretsu*). Our study intends to provide new insights into Japanese borrowing decisions by presenting both descriptive statistics and various econometric borrowing choice models.

Why is it interesting to analyze the long-term borrowing decisions of Japanese firms? First, it is widely believed that especially long-term loans were essential to enhance the rapid Japanese economic growth in the 1970s and 1980s. The role of the financial system in providing financial means for investment that generated the high GDP growth rates has been crucial. As known, in post-war Japan long-term bank loans were the number one source of external funds for almost all firms (see Fukuda, 2001). Except for a few cash-rich firms internal financing was limited in general. As Ito (1992) shows, internal financing in the 1960s and 1970s was about 20% of the total financial needs (as compared to 50% for the U.S.) This is even true for firms within the business groups, wherein banks play a well-known key position in providing external finance. The dominant role of long-term loans in external finance is reflected in the fact that until the mid-1980s bond financing was strictly regulated (even after 1985 only very large firms were able to issue bonds). So private long-term loans formed the financial core of the investment-led Japanese growth. It is good to illustrate that the major providers of the long-term loans in the 1980s and 1990s were the three long-term credit institutions, so-called city banks (about 10 on average in the last two decades), and for smaller firms the about 120 local (or regional) banks. Secondly, the long-term loans are also seen as the

key to the current economic depression in Japan. The bad loan problem has a serious impact on real economic activity since the beginning of the 1990s. When the bubble burst in 1990 the average quality of especially the long-term loans appeared not to be as good as expected. Third, as explained above banks play a key role in the Japanese industrial structures. Lending activity, combined with equity ownership, is therefore relatively more important than in any other market economy.

The theoretical background of our paper is a key problem in financial economics: what is the optimal number of creditors? These creditors can be holders of either public or private claims. In this paper we analyze the private component, namely the number of bank contacts per firm. Our goal is to get a deeper understanding of the motives of Japanese firms to contact more than one bank or in some cases even more than 10 banks (and about 6 as a median value). For other countries similar work has been carried out (see *e.g.* Ongena and Smith, 2000a, for an international comparative study on 20 countries). Ongena and Smith (2000b) report an overview of studies for various individual countries on this issue. They illustrate that for instance in Norway the number of bank relations is very low (with a median of one), while for Italy median values of 11 relations are reported. Ongena and Smith (2000a) argue that firms in countries with stable and unconcentrated banking systems maintain more banking relations, while firms in countries with strong judicial systems and stronger creditor protections maintain fewer relations. Volpin (2000) adds that countries with low shareholder protection allow for higher private benefits of control and through that allow for more banking relations.

Horiuchi (1993, 1994) presents the most detailed descriptive analysis for the borrowing decisions by Japanese firms up to now. Horiuchi (1993) reports for 1990 an average number of bank relations for 126 firms with less than 300 employees of 3.4 and for 309 firms with more than 300 employees an average number of relations of 7.7. Horiuchi (1994) reports for 1992 an average (and median) number of 3 relations for 364 firms (including small firms with less than 10 employees). So indeed Japanese firms do have multiple banking contacts on average and the question to be answered is why. In our

study we extend Horiuchi's work by updating statistical evidence and presenting models that explain the number of banking relations.

For Japanese firms who belong to a keiretsu structure a strong and long-lasting relation with the bank that belongs to the group seems to be natural. But having this line of credit it might also been easier to attract more loans from other banks. It is known in the literature that long-lasting relations with principle banks could lead to higher interest rates to be paid by Japanese firms (see Kaplan and Minton, 1994). So firms might weight the benefits of having one bank (and keep their information secret) or try to let banks bid for the lowest interest rates. It might also be true that some firms want a portfolio of loan-providers in order to reduce the risk of shortage of financial capital (see Section 2 for a more extensive review of the theoretical literature).

The rather unique feature of our data is the time-series information for long-term loans: 1982-1999. As known, this period covers the 'bubble' and the post-'bubble' years. One of the items covered by us is the analysis of these two rather distinct periods. Macroeconomic conditions might affect individual borrowing decisions. On the other hand, loans are essential in explaining macroeconomic fluctuations (the 'credit view'). So it is natural to analyze the relation between macroeconomic conditions and the number of banking contacts firms tend to have on average. How is the macro bad loan problem affecting individual firm decisions to contact banks? We illustrate this in Figure 1 that gives the percentage of single-bank relations of 14055 firm-year observations for the years 1982-1999. Figure 1 suggests that during an economic expansion firms tend to rely on a single relation, while in the period of downturn the average percentage of multiple contracts seems to increase. So, current profitability seems to limit the number of bank relations. Without giving a detailed explanation here, this finding stresses the need for our analysis.

Insert Figure 1 about here

We proceed as follows. First we give a review of the theoretical and empirical literature on the determination of the optimal number of bank relations. This literature is largely based in the theory of corporate finance. In this literature one is interested in the game between the provider of capital and the firm regarding the control rights that belong to the assets. This game can cover the choice between equity and debt, the rights of equity holders (Shleifer and Vishny, 1997), or the composition of external financing (Bolton and Scharfstein, 1996). We review the relevant literature and derive the variables that might influence the choice of the number of bank contacts. Next we describe the data we use. The data are provided by the Development Bank of Japan and form an unexplored rich set of detailed balance sheet and profit-loss account data as well as indicators of ownership of both (long-term) loans and equity. We give an extensive descriptive overview of the variables of interest in Section 3. In Section 4 we present an econometric analysis of he decision to borrow from different banks. Since our main dependent variable, the number of bank relations, is a discrete variable we estimate several types of discrete choice models. Moreover, we present results for the explanation of the loan concentration ratio (measured by the Herfindahl index). In the last section we summarize and conclude.

2 Theory and empirical evidence on the optimal number of banking relations

One of the most interesting fields in finance is the topic of coordination problems between suppliers of capital. These problems hold with respect to owners of equity (which lead to the governance problems like described by Shleifer and Vishny, 1997) and the suppliers of debt. Such coordination failures can be harmful and lead to takeover failures (like the depositors in the Diamond-Dybvig (1983) model) or renegotiation problems (see Bolton and Scharfstein, 1996). For debt it is natural to distinguish between public debt (bonds) and credit. By definition, by selecting private credit the firm opts for a higher concentration of claims (see Bris and Welch, 2001).

In this paper we add to the empirical literature on creditor concentration in a very specific way: we focus on concentration of the most concentrated debt component: bank loans. So

we do not contribute to a large extent to the work on the choice between public and private finance. Still, bank loan concentration is in itself an interesting phenomenon. Across the globe it is widely observed that firms deal with more than one bank. Ongena and Smith (2000b) present an overview of studies of various countries and find a range of the average number of banking relationships between 1.6 for small US firms in 1987 to even 33.2 for Italian firms with a credit line over 500 billion Lira in 1993. Ongena and Smith (2000a) observe that larger firms (as measured by sales) hold more bank relations, but firms that do more foreign business typically have less domestic banking contacts. Moreover, there seem to be cross-country financial system variables that are relevant to explain national differences. Firms that reside in countries with poor creditor rights and inefficient judicial systems typically have more banking relationships. If the banking sector is lowly concentrated but stable and private bond markets are effective, the number of relationships per firm is higher. These statistical observations demand an explanation. Why would a firm operate via more than one bank?

2.1 **The theory of multiple bank relationships**

The most intuitive explanation of single banking is based on cost minimization. To deal with more than one bank is costly. First, transaction costs increase, because both screening and monitoring costs are duplicated. It is more expensive to market debt claims to multiple creditors (see Bris and Welch, 2001). These arguments are at the core of the Diamond (1984) delegated monitoring model. The Diamond model predicts a firm to deal with a single bank that pools the costs of asymmetric information. A single bank moreover avoids free-riding problems by private investors. So in all activities prior and during the loan contract it would be cheaper to deal with a single bank. But also in ex post cases, like in the case of bankruptcy, multiple relations will increase the costs of *e.g.* handling debt renegotiation (see Boot and Thakor, 1994, and Bolton and Scharfstein, 1996).

The second determinant of the number of banking relationships is the degree of competition on the banking market. If competition is low (a few institutions dominate the

market) it is likely that the number of banking relationships drops. On the other hand if competition is fierce and a large number of competing banks fight for new loans, firms will try to benefit and increase the number of bank contacts.

Third, and related to the second item, is the hold-up problem. If a relationship bank is not affected by heavy competition it might consider using the acquired private corporate information to extract rents, thus distorting entrepreneurial incentives and causing inefficient investment choices (see Sharpe, 1990, and Rajan, 1992). Indeed, there is some evidence that the longer the credit relation exists, the higher the costs of the credit line are (Kaplan, 1994). Carletti (2003) presents a theoretical monitoring model to explain this. Multiple banking entails duplication of effort and sharing of benefit, which lead to a reduction in the overall monitoring intensity but not necessarily to higher loan rates, due to the presence of diseconomies of scale in monitoring. Another form of the holdup problem might also exist. In a competitive banking environment a high-quality firm that tries to switch from its previous to a new loan provider gets pooled with low-quality firms and might be forced to pay too high an interest rate. This prevents a high-quality firm from increasing the number of banking relationships. How do these issues affect the desired quantity of banking relations of a firm? A firm that faces a monopolistic banking industry might want to increase the number of contacts and try to force banks to compete in making offers (see Von Thadden, 1994). This is true for symmetrically informed banks. If we have the opposite case, an inside bank that competes with outside banks, this might change. If outside banks start to compete, the inside bank can use its knowledge on the quality of firms to select the good firms and leaving the lemons as leftovers to the outside banks. This might lead to too high interest rates and a reduction of the number of credit lines. So it is relevant to determine the nature of the existing firm-bank relationships. Petersen and Rajan (1995) give a final argument to the competition issue. They argue that borrowing from banks with great market power facilitates intertemporal sharing of the rent surplus and through that stimulates a single banking relation. Competition in credit markets hinders this process. It might even be so that competition forces rents to the point where it is no longer in the interest of any bank to lend to the firm. Petersen and Rajan

(1995) argue that the intertemporal rent sharing is especially crucial to smaller and younger firms.

A fourth class of arguments against the case of single banking relates to using multiple contacts as insurance against liquidity or liquidation risk. The worst case for the firm is that a profitable project has to be liquidated prematurely. Suppose that the loan includes a refinancing stage. If the relation bank cannot rollover their initial loan 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 (see also Detragiache *et al*., 2000).

A fifth class of arguments is formed by the ability among lenders to coordinate activities in an environment with so-called soft-budget constraints. In a largely decentralized economy banks cannot commit to finance unprofitable long-term projects because dispersed banks with limited capital will find it costly to coordinate actions (Dewatripont and Maskin, 1995). Bolton and Scharfstein (1996) and Bris and Welch (2001) give a similar argument. In the Bolton-Scharfstein-model the manager has an incentive to strategically default the project (*e.g.* by diverting cash to herself). Coordinating with multiple lenders disciplines the manager. On the other hand it might be the case that fewer creditors have more incentives to check managers. Such creditors have an incentive to invest more in monitoring activity (see Bris and Welch, 2001). Writing debt contracts with multiple lenders is costly though (see the first class of arguments). In any case, a decrease of default risk will increase the number of lenders. The same holds to the degree of synergy between the assets of the firm (the degree to which the assets are worth more together than apart) or the liquidation value.

Finally, the type of business activity might affect the number of creditors. Take the example of a highly innovative, high quality firm that invests to a large extent in R&D. If this firm believes that it will be successful, it will not be willing to give all the information to multiple financiers (see Yosha, 1995). Low-quality firms on the other hand might want to contact multiple banks. Von Rheinbaben and Ruckes (1998) analyze

a model that includes the competition on the output market for firms. The main point is again that leakage of information is detrimental to a firm's success on the output market. The firm can avoid this in two ways. First, it decides on the amount of information given to creditors, and second, it can change the number of contacts. If a firm gives more information to a bank and its quality is high, it can get a lower interest rate. More creditors again intensify competition. Highly rated firms optimally try to deal with many banks and will disclose as little information as they can. Bhattacharya and Chiesa (1995) stress the point that it might be optimal for a bank to inform competitors of the innovating firm with respect to the new technology in order to avoid financial distress. Bolton and Scharfstein (1996) also predict that firms in non-cyclical industries will chose a lower number of lenders.

2.2 **Empirical evidence**

The empirical literature on explaining the number of banking contacts is typically more concentrated than its theoretical equivalent. In Table 1 we present an overview of the results of five relevant studies: Detragiache et al. (2000) for Italian firms, Farinha and Santos (2000) for Portugese data, Ongena and Smith (2000a) for multiple countries, Degrijse and Ongena (2001) for Norwegian firms, and Houston and James (2001) for U.S. firms. We classify the determinants of single-banking relationships along the six theoretical classes presented above (so a + in Table 1 is a positive stimulus for single banking). The classification of variables is in some cases arbitrary, but illustrative for our purposes.

There is at least mixed evidence for the first class: cost minimization. The age of the firm is only found to be important in the Portuguese case. The evidence on firm size is mixed. With respect to the industrial organization of the banking market (which we combine with the hold-up problem) there seem to be clues that a more concentrated banking market predicts single relations. Not all the studies present results with a straightforward interpretation though. By far the most important category is the class of liquidity/liquidation risk. Here we do find some evidence of its relevance. The coordination problems seem to be less relevant. With respect to the business activity there

is not much hard statistical evidence to be favored. An important characteristic is profitability. Degryse and Ongena (2001), using data for Norwegian publicly listed firms for the period 1979-1995, find a robust and economically relevant negative two-way correspondence between the number of relationships and sales profitability. They also find that firms replacing a single relationship are on average smaller and younger than those firms choosing not to replace a single relationship.

Insert Table 1 about here

3 Description of the data

The primary source of the data used is the *Financial Statement Data* (FSD) and *Sources of Loans Data* (SLD) of individual firms. Both sets are provided by the *Development Bank of Japan*. The FSD includes more than 500 items in balance sheet accounts, profit and loss accounts and cash flow statements. Moreover, the set contains other qualitative information on stock ownership, like the names of the top-10 shareholders and their holding share of equity. SLD indicates from which financial institution the firms attract their long-term loans.[1] This implies that we know the identity of the top-10 equity and loan owners (we will use this hereafter). The FSD data covers more than 2000 firms listed on the main Japanese stock markets (Tokyo, Osaka, Nagoya, etc.) from 1957 onwards. The SLD data is, however, available only after 1982. We combine both sources and transform all available information into firm-year observations. We checked whether our data reflect the industrial sector of the Japanese economy by mapping our sample on the SNA-classification. Indeed we have a representative sample, although listed firms have an overrepresentation in manufacturing (see Table A in the Appendix).

We need to define our interpretation of a bank relation. We define the total number of banks that provided long-term loans in year *t* as the number of long-term loan banking

[1] The label financial institution refers to life- and non-life insurance companies as well as public and private banks. Insurance companies and banks are the main long-term funds

contacts. For most of those loans it will be likely that the relationship continues up to the next year, but we do not check whether the same bank actually provides a long-term loan next year. So suppose that a normal long-term loan will last for three years and a firm has two providers: bank A grants the loan at *t-1*, bank B at time *t.* In our set we observe one bank contact at time *t-1*, 2 at times *t* and *t+1* and only 1 at time *t+2*. So we don't measure the length of an individual loan relation (which we of course could do with our data).

The total number of firm-year observations in the original dataset from 1982 to 1999 is 34939. In combining the two sets, however, some of the observations are excluded mainly due to inconsistencies between the two data sets. For instance, the outstanding long-term loans in the SLD data sometimes do not match the balance sheet registration of long-term loans in the FSD source. Also, the source of the long-term loans is in some cases classified by miscellaneous financial institutions. In this case we cannot identify the number of bank relations. This is also true for the case of classification as foreign banks; that is to say, the data set does not indicate the specific name of the foreign bank (this holds for only 5 per cent of the firms at the maximum). Since our main concern is the determinants of the number of bank relations, sample firms with above characteristics are excluded from the analysis. As a result of this data screening, we have 20740 firm-year observations in terms of unbalanced panel data from 1982 to 1999.[2]

Table 2 presents the number of long-term bank relations over the sample period. We show the time series of the number of banking relations for various cases. We distinguish: no loans (0), a single loan (1), 2 to 4 loans, 5 to 7 loans, 8-10 loans, 11-15 loans, and over 16 loans. In the bottom line of Table 2 we give the percentage of single loans (see also Figure 1). Table 2 shows that there is a general increase of the number of

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suppliers in Japan. Note that we are not able to identify the identity of foreign banks. In our sample foreign banks supply less than five per cent of the loans.

[2] It should be noted, however, that the calendar year does not correspond to the actual accounting period of the firm. For example, the firm with the accounting period starting in April 1998 and ending in March 1999 is classified as 1999 in spite that the firm actually operates 9 months in 1998 and only 3 months in 1999.

loans over time. It also appears that especially the classes with multiple loans (over 10 loans) seem to increase above average.

Insert Table 2 about here

We also provide a figure of the mean and median number of long-term loan relations (Figure 2). As can be seen from Figure 2 the average number of relations decreases from 7.74 in 1982 and it reaches it bottom level 6.65 in 1989. After 1990, it fluctuates around 7 except for the sharp decline in 1997. This means that the concentration of the long-term loans has been gradually promoted towards the bubble period but recovered to the original level with the collapse of the Bubble. As shown in Figure 2, however, the median of the number of long-term bank relations is quite stable over the sample period. It remains at 6 except for 1982, 1983, and 1993, where the median is 7.

Insert Figure 2 about here

We also computed the Herfindahl index for long-term loans per firm (see Figure 3). The average of this index increases from 0.370 in 1982 to its maximum of 0.409 in 1990. The same tendency can be seen for the median value. The concentration, however, gradually decreases towards its lowest level 0.335 in 1995 and increases again towards 1997.

Insert Figure 3 about here

We also highlight one specific feature of our data set: financial governance of Japanese firms. The Japanese industrial organization differs to a large extent from most western equivalents. Mutual ownership of stock is quite common, especially in the industrial group structures (keiretsu). Within the group structure long-lived equity holdings and lender relations are the key financial characteristics. As known, banks play a central role in these business groups, so it is valuable to give some idea of the relation between simultaneous holdings of loans and equity, especially if we want to test the hypothesis that firms that have some form of a main bank relation want fewer banking contacts. In

order to consider the relationship between loan activity and equity ownership, we classify our firm-year observations into the following seven categories with respect to a so-called Main Bank Dummy (*MBD*):

MBD_1: if the largest equity owner is also the largest debt owner;
MBD_2: if the largest equity owner resorts under the top-3 debt owners;
MBD_3: if the largest equity owner resorts under the top-10 debt owners;
MBD_4: if the largest debt owner resorts under the top-3 equity owners;
MBD_5: if the largest debt owner resorts under the top-10 equity owners;
MBD_6: if one of the top-3 equity owners resorts under the top-3 debt owners;
MBD_7: if one of the top-10 equity owners resorts under the top-10 debt owners.

Table 3 presents the percentage of firms for the above seven cases in our sample by year. As is expected, the first class is the most rare case: a little more than 5 percent of the firm-year observations fall into this class. Although the equity ownership by banks is highly restricted in Japan[3], about half of the firm-year observations are classified in MBD_6 and about 90 percent of the firm-year observations in our sample fall in the class MBD_7.

How does the governance variable *MBD* affect the number of bank contacts? First of all, moving from MBD_1 to MBD_3 for instance will increase the probability of multiple bank contacts. Although debt contains also non-loans, the probability of a single lending relation decreases if the largest equity holder moves from the first debt holder to a top-ten debt holder. If a top-ten debt holder moves from a top-ten equity holding position to the single top equity holder one could argue that the relative probability of a single loan relation will become larger. The bank can control the firm not only via the supply of loans, but also as a top equity holder. So the bank is probably willing to offset the liquidity risk the firm faces, lowering the firm's intentions to contact multiple banks. The

[3] In Japan the maximum share of equity holding of a bank for one firm is restricted to 5 percent. It should be noted that in our data set the financial institution includes life-

firm has less costs of asymmetric information and will also prefer a single relationship more.

Insert Table 3 about here

Finally we note some basic statistical evidence from our data with respect to the differences between the characteristics of the Japanese financial system in the 1980s and the 1990s. First, profitability of firms decreased. There is also a remarkable reduction in debt-to-assets and liquid-to-total assets ratio. The Japanese corporate bond market was not fully developed in the 1980s, but it is in the 1990s. Up to 1990 corporate bonds could be considered to be loan-like assets. Main banks were also the underwriters of corporate bonds. After 1990 the corporate bond market became a real financing alternative to loans. So it could be expected that the borrowing decisions by firms will be affected stronger by the corporate bond market indicator in the 1990s than in the 1980s. The Japanese economy invested more in R&D in the 1980s (although this is hard to measure precisely, since Japanese firms tend to report lower expenditure on R&D than actually purchased). The strong impetus to growth by investing in R&D seriously changed in the 1990s, so we might expect to see some differences between the borrowing decisions in the 1980s and 1990s due to R&D expenditure shifts.

4 Explaining Japanese multiple bank relationships

We model the number of bank relations from the perspective of the firm. So we argue that the number of bank contacts is demand driven. One could bring to the fore that supply arguments might interfere: banks might also refuse loan supply. With our dataset we are not able to identify these supply arguments, because we do not have bank-specific information. We argue that banks will probably want to sell their products, especially in the last decade, and be certainly interested in supplying services to the large listed

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insurance companies as well as private banking companies. The equities held by individual and institutions through trust banks are classified as individual holdings.

companies. Of course banks can control the terms of the contracts, but this will not affect the number of contracts to a large extent.

We model a demand for banking contacts model. Decomposing the total observed variance into inter-firm and temporal variance and leads to the conclusion that we reject the hypothesis that either cross-section or time variance dominates the nature of the observations (results available upon request). So we proceed by explaining firm-year observations instead of using a dynamic panel. We do so in three steps. First we estimate the decision to have a single bank contact versus multiple loans using a simple logit model. Next, we model the decision to opt for multiple loans in more detail by estimating a multinomial logit model. Finally we present evidence on the Herfindahl index of loan concentration using a tobit model. Given the time-series nature of our data for long-term loans, and the macroeconomic bubble-pattern, we use various sub-samples in our estimation:

1. 1982-1999;
2. 1982-1989 (the 'bubble' period);
3. 1990-1999 (the post-'bubble' period).

We use the following variables to explain loan concentration:

- A variable that indicates the size of the firm: total real sales (*SAL*);
- A variable that indicates profitability (*ROA*). Here we note that in all our results Tobin's Q did not play a significant role (results available upon request);
- A variable that indicates solvability (debt-to-assets ratio, *DAR*);
- A variables that indicates liquidity (liquid-to-total assets, *LAR*);
- Variables that indicate alternative financing forms. We use the corporate bonds to debt ratio (*CBR*) and the short-term loan to debt ratio (*SLR*);
- A variable that indicates the R&D activity of the firm: R&D expense to total sales. Moreover, we include industry dummies (not reported in the tables) and year dummies (not reported in the tables).
- A variable that indicates a relation between top-*x* loan and top-*y* equity ownership (MBD_i, i=1,…7). We use the 7 indicators as explained above.

First we present a logit-model of the decision to have either a single loan, represented by Y=1, or to have multiple loans (Y=0). The results are presented in Table 4. In Table 4 we give three panels (A, B, and C) that describe the two sub-samples as well as the whole sample period. The rows in each panel give the results for each type of main bank dummy variables, say MBD_i (i=1,…,7) as listed above. The columns give the various estimated parameters of the determinants (see also above). In the last column we give the pseudo-R-squared and the Correct Prediction Rate (*CPR*). The numbers of observations used in each sub-sample are denoted at the top of each panel. At the bottom of each panel we also provide the marginal derivatives of the determinants x on the probability of a single relation P: dP/dx. We shade the significant estimated parameters at the 5% confidence level (asymptotic t-values between the brackets below the estimated parameters).

Insert Table 4 about here

Table 4 shows that a higher debt-to-assets ratio (*DAR*) decreases the probability of a single loan relation in all cases. This is a natural effect: more debt in the Japanese case implies a higher loan demand, which increases the probability of multiple loans. It is also clear that a higher liquid asset ratio (*LAR*) increases the probability of a single bank relation. Firms with relatively more liquid assets do not need liquidity insurance and rely on a single bank. Table 4 also shows that variables that represent the size of the firm (*SAL*) and profitability (*ROA*) do not have a systematic impact on the loan decisions. Of the alternative financing forms (short-term loans *SLR* and the corporate bond to total debt ratio *CBR*) only the corporate bond to debt ratio has a significant impact on the single versus multiple loan relation decision. A higher value of *CBR* indicates two things in this respect: more bonds relative to loans will increase the probability of a single loan by itself. But secondly, as explained above, corporate bonds also signal quality in the Japanese case. A better bond rating reduces the need for multiple banking contacts.

All the main bank dummies MBD_i have a significant negative impact on the probability of a single bank relation. As such this is a counterintuitive result: one would expect that a main bank dominates the firm's loan market and will use its market dominance. On the

other hand, the firm might use a main bank relation as a signal of quality in attracting other debt suppliers' attention. It might be in the interest of the main bank as an equity holder to e.g. have some liquidity insurance. If we compare the results among the MBD_i-lines one should note that for the cases where the bank is the largest equity holder, the probability of single borrowing relations decreases with a more modest position of the bank as a top-debt supplier. The other way round, if the bank is the largest supplier of debt, the probability of a single relation increases if the bank becomes a more important equity holder. So there are two effects: a main bank relation leads to a larger probability of multiple banking contacts, but equity concentration leads to a relatively higher probability of a single loan.

Comparing the bubble and post-bubble periods one can observe that there are no real big differences in terms of marginal derivatives. A 1% increase of the debt-to-assets ratio decreases the probability of a single relation in the bubble period by 0.5% and by 0.3% in the post-bubble period. The other derivatives are comparable across sub-periods. The most striking difference is the impact of R&D-expenses. In the bubble period more R&D expenses decrease the probability of a single relation: this supports the Bhattacharya-Chiesa hypothesis (see Section 2). In the post-bubble period this impact of R&D expenses vanishes. The R-squared is around 0.1, but the correct prediction rate is around 90 percent for all models. In general, we can conceive the relatively stable relationship between the several determinants and the single-multiple decision irrespective of the choice of MBD_i's.

Next we analyze the decision of multiple loan contacts a little further (see for a similar approach Detragiache *et al*., 2000). That is to say, once firms decided to have multiple loans, how many relations do they have? We model five classes:

1. 2-4 relationships (Y=0);
2. 5-7 relationships (Y=1);
3. 8-10 relationships (Y=2);
4. 11-15 relationships (Y=3);
5. 16 and more relationships (Y=4).

Table 5 contains the results of the estimated multinomial logit model. We again use the same structure as presented in Table 4. For each panel we present the estimated parameters and the dP/dx values. In estimating the model, the parameters for Y=0 (the smallest number of relations, 2-4 relations) are normalized to zero. So, all parameters should be interpreted as changes from the base case Y=0. We include only the results for one of the main bank relation variables MBD_3 (the other results are available upon request).

Insert Table 5 about here

Table 5 shows that in most cases there is a split between less than and more than 8 banking contacts. Take for example the impact of the debt-to-assets ratio (*DAR*). A lower solvability (higher *DAR*) decreases the probability of having less than 8 contacts, and increases the probabilities of the large contact classes. For the liquid assets ratio (*LAR*) the reverse holds. Liquidity-rich firms have higher probabilities of having up to 8 bank contacts. For the main-bank dummy variable MBD_3 we find that the probability of multiple banking contacts (more than 5) increases. Apart from these main three determinants, we now also observe that size (*SAL*), profitability (*ROA*), and the financing alternatives matter in some respect. For size we find that larger firms want more bank relations, especially for the large numbers of banking contacts (more than 11). There is also some evidence that in the pos-bubble period profitability matters. More profitable firms want more bank relations, which implies that most of the loss-making firms will tend to have fewer bank relations. Alternative financing forms (corporate bonds, *CBR*, and short-term loans *SLR*) tend to make firms opt for a moderate (up to 8 loan contacts) or extensive number of banking relations. For the first group there could be substitution of financing means, while for the latter group the signaling function might be relevant. R&D-intensive firms tend to have a larger probability of having multiple relations (more than 16). We do not find striking differences between the bubble and post-bubble period in this model.

The previous results relate to the discrete lending choice. Next we use a continuous variable as a dependent variable: the Herfindahl-index. This variable is limited in range

(by definition in the interval [0,1]). Prior to estimating the model we transformed the original index by taking the logarithm and multiplying it by -1. By this transformation the dependent variable lost its upper bound. After this transformation we apply an ordinary Tobit model with a lower truncation at zero. Table 6 gives the estimation results. It should be noted that a larger value of the dependent variable implies a lower concentration (multiple loan contacts). A plus sign in the table therefore indicates that an increase of the determining variable will lead to more banking relations. Table 6 includes the same panels and determinants as before. We give the results for all our main bank relation variables MBD_i (i=1,…7).

Insert Table 6 about here

The results in Table 6 confirm the results shown in Tables 4 and 5. Table 6 shows that an increase in sales (*SAL*, representing size) leads to a lower concentration of loans in the post-bubble period only. Higher profitability (*ROA*) also implies more banking contacts, especially after 1990. Both the impact of size and profitability did not come to the fore that prominently in the discrete choice models. As in Tables 4 and 5, a higher debt-to-assets (*DAR*) and a lower liquidity (*LAR*) lead to more banking relations. With respect to the alternative financing forms we now find some differences between the bubble and post-bubble periods. It seems that both corporate bonds (*CBR*) and short-term loans (*SLR*) developed from complementary assets into true substitutes after 1990. For the corporate bond market this result coincides with the institutional observation that corporate bonds developed from loan-like assets into alternative market financing forms after 1990. As before having a main-bank relation leads to a lower concentration of loans. Especially, in the post-bubble period a relatively more important equity-holding bank relation leads to fewer banking contacts. Finally more R&D-intensive firms tend to have a lower loan concentration.

5 Summary and conclusions

In this paper we analyze the number of long-term bank relations that Japanese listed firms hold. Japanese firms have about 6 long-term bank relations (median value). Compared to other countries this is about the average value observed. We present an overview of the rather extensive literature in the field of the optimal number of creditors. From this literature we retrieve a set of likely candidate variables that might have an impact on the number of bank relations. We focus on long-term loans, since these loans play a crucial role in the functioning of the Japanese economy. We estimate discrete choice models of the decision for single versus multiple relations, the decision to have a number of bank relations in certain classes (in a multinomial logit model) and a model with a continuous measurement of the loan concentration (as measured by the Herfindahl index).

Our general conclusions are as follows. Size, profitability, solvability, liquidity, and alternative financing forms determine the number of banking contacts. These variables are standard determinants of the number of bank relations in the literature. Our results support especially the liquidity insurance argument to have multiple relations, as well as the impact of solvability. We show that size and profitability matter in explaining the Herfindahl-index of loan concentration. We pay special attention to the impact of Japanese corporate governance by including indicators of the types of relations Japanese firms tend to have with their banks. We find on average that firms having a so-called main bank relation tend to have a preference for multiple loan contacts (which seems to be counterintuitive). If the bank is a relatively important equity owner there is a relative decrease of the desire to have multiple relations. These effects tend to hold for the bubble (1981-1989) ad post-bubble (19990-1999) sub-samples. R&D-intensive firms tended to want more bank relations.

The Japanese banking system has shown some drastic changes in the last few years. Bank concentration increased, so-called bad loans are transferred to special-purpose banks, and some bank managers have been replaced. Our paper shows that Japanese firms tend to have important links with multiple banks, which makes Japanese corporate behavior to be

dependent on the developments in the banking sector. Especially for instance in R&D intensive sectors the role of banks is big. As Ongena and Smith (2000a) argue, the stability of the banking sector interacts with the bank-firm networking systems. Banks being central to Japanese development therefore have a leading role in establishing conditions for a recovery of the Japanese economy.

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Table 1 - Overview of empirical results on single-bank relationships

Class of explanation/variable	DGG	FS	OS	DO	HJ
1 Cost minimalization					
Firm size	+	-		-	-
Firm age	0	+		-	0
Share of defaulted loans recovered	+				
Nonperforming loans	0				
2/3 Competition on the banking market and Hold-up problems					
Average size of lending banks	+	+			
Group membership	0				
4 Liquidity risk					
Liquidity shocks	+				
Profitability	+			-	-
Coverage ratio					+
5 Coordination problems/Soft-budget					
Firm leverage	+	-			-
Share of first owner	0				
6 Type of business activity					
Patents	0				
R&D	0				
Product innovation	0				
Process innovation	0				
Industry comovement	0				
Variability of asset returns					0
Home sales			-		
Worldwide sales			+		

DGG = Detriagiache, Garella, Guiso (2000)
FS = Farinha, Santos (2000)
OS = Ongena, Smith (2000a)
DO = Degrijse, Ongena (2001)
HJ = Houston, James (2001)

\+ = significant determinant in explaining a choice for a single banking relation;

0 = insignificant determinant;

\- = significant determinant in explaining a choice for multiple banking

Table 2. Number of bank relations with respect to long-term loans (*NBL*) by year

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	total
0	158	200	235	258	283	315	355	391	406	404	409	404	416	446	479	502	516	508	6685
1	49	59	59	66	70	82	86	90	96	93	69	62	69	65	69	94	103	89	1370
$2 \leq NBL \leq 4$	142	140	154	158	155	149	149	172	187	191	192	207	189	213	220	260	254	244	3376
$5 \leq NBL \leq 7$	162	176	159	160	188	179	184	184	189	202	204	187	207	222	230	236	272	286	3627
$8 \leq NBL \leq 10$	117	126	148	144	138	140	126	146	153	159	156	165	140	157	170	168	187	195	2735
$11 \leq NBL \leq 15$	104	90	87	106	89	96	88	85	94	103	111	126	142	143	134	126	138	157	2019
$16 \leq NBL$	47	49	48	43	48	44	42	35	42	51	50	57	54	56	54	49	84	75	928
total	779	840	890	935	971	1005	1030	1103	1167	1203	1191	1208	1217	1302	1356	1435	1554	1554	20740
with long-term loans	621	640	655	677	688	690	675	712	761	799	782	804	801	856	877	933	1038	1046	14055
(percentage)	(79,7)	(76,2)	(73,6)	(72,4)	(70,9)	(68,7)	(65,5)	(64,6)	(65,2)	(66,4)	(65,7)	(66,6)	(65,8)	(65,7)	(64,7)	(65,0)	(66,8)	(67,3)	(67,8)
percentage single relation	7,9	9,2	9,0	9,7	10,2	11,9	12,7	12,6	12,6	11,6	8,8	7,7	8,6	7,6	7,9	10,1	9,9	8,5	9,7

Table 3 The relationship between stockholders and debt suppliers

	(1) top1 share holder = top1 long-term debt holder	(2) top1 share holder resorts under top3 long-term debt holder	(3) top1 share holder resorts under top10 long-term debt holder	(4) top1 long-term debt holder resorts under top3 share holder	(5) top1 long-term debt holder resorts under top10 share holder	(6) One of the top3 share holder resorts under top3 long-term debt holder	(7) one of the top10 share holder resorts under top10 long-term debt holder	(8) total
1982	4.83	8.86	14.33	23.99	56.36	40.74	83.90	100.00
1983	4.22	8.28	12.81	25.16	57.03	42.34	84.22	100.00
1984	5.19	10.08	14.05	25.95	59.24	43.97	85.34	100.00
1985	4.73	10.19	13.59	26.29	59.97	43.87	84.93	100.00
1986	4.65	8.72	12.21	26.45	61.63	44.77	85.61	100.00
1987	4.78	9.28	12.61	28.41	63.77	45.36	87.25	100.00
1988	4.59	8.74	12.30	25.93	63.41	42.96	86.52	100.00
1989	5.06	9.13	13.20	30.76	66.57	46.63	87.36	100.00
1990	4.99	10.38	14.45	31.27	64.78	46.78	87.78	100.00
1991	4.88	10.01	14.02	31.79	63.70	46.56	87.23	100.00
1992	3.58	10.23	14.58	31.84	64.45	49.10	88.87	100.00
1993	5.22	12.19	16.67	34.95	68.28	51.99	90.17	100.00
1994	4.49	10.99	15.61	35.21	69.91	50.81	90.76	100.00
1995	5.84	11.68	16.71	32.71	68.69	48.95	90.42	100.00
1996	5.02	11.63	15.28	33.30	72.63	48.69	89.85	100.00
1997	5.47	10.83	14.68	34.30	72.45	49.30	88.96	100.00
1998	5.78	10.50	14.35	35.45	72.93	47.69	89.88	100.00
1999	5.83	11.09	14.91	36.81	72.75	49.14	89.39	100.00
total	5.01	10.27	14.35	31.16	66.23	46.99	87.96	100.00

Table 4 Estimation results for the binary logit model
for single (Y=1) and multiple relations (Y=0)

Panel A. Whole period: 1982-99

	SAL	*ROA*	*DAR*	*LAR*	*CBR*	*SLR*	*R&D*	*MBD*	R^2/*CPR*
(1) *MBD*1	0.00019	-0.0086	-0.0412	0.0371	0.0159	-0.0007	-0.0973	-0.6442	0.0655
	(0.85)	(0.96)	(19.6)	(15.4)	(7.81)	(0.30)	(4.26)	(3.67)	0.9030
(2) *MBD*2	0.00033	-0.0081	-0.0406	0.0366	0.0165	-0.0003	-0.0915	-1.4830	0.0727
	(1.49)	(0.92)	(19.2)	(15.2)	(8.10)	(0.13)	(4.02)	(8.62)	0.9031
(3) *MBD*3	0.00047	-0.0076	-0.0401	0.0360	0.0174	-0.0005	-0.0795	-1.9466	0.0810
	(2.19)	(0.86)	(19.0)	(15.0)	(8.52)	(0.20)	(3.46)	(11.3)	0.9035
(4) *MBD*4	0.00010	-0.0106	-0.0396	0.0367	0.0153	-0.0013	-0.0927	-0.8158	0.0737
	(0.45)	(1.22)	(18.8)	(15.2)	(7.48)	(0.55)	(4.07)	(10.6)	0.9039
(5) *MBD*5	-0.00015	-0.0087	-0.0373	0.0361	0.0142	-0.0013	-0.1058	-1.0356	0.0853
	(0.59)	(0.98)	(17.5)	(14.8)	(6.84)	(0.56)	(4.52)	(16.7)	0.9029
(6) *MBD*6	0.00021	-0.0133	-0.0378	0.0357	0.0154	-0.0007	-0.0924	-1.5811	0.1041
	(0.92)	(1.61)	(17.9)	(14.7)	(7.41)	(0.31)	(4.07)	(20.6)	0.9031
(7) *MBD*7	-0.00028	-0.0142	-0.0295	0.0343	0.0136	0.0009	-0.1155	-2.8237	0.1891
	(0.95)	(1.61)	(12.7)	(12.9)	(5.89)	(0.36)	(4.44)	(39.6)	0.9163

(1) *MBD*1	0.0155	-0.0020	-0.0038	0.0025	0.0012	-0.0001	-0.0084	-0.0516
(2) *MBD*2	0.0265	-0.0019	-0.0038	0.0025	0.0012	-0.0001	-0.0079	-0.1215
(3) *MBD*3	0.0383	-0.0018	-0.0037	0.0024	0.0013	-0.0001	-0.0069	-0.1589
(4) *MBD*4	0.0085	-0.0020	-0.0037	0.0025	0.0011	-0.0001	-0.0080	-0.0668
(5) *MBD*5	-0.0127	-0.0018	-0.0034	0.0024	0.0010	-0.0001	-0.0089	-0.0842
(6) *MBD*6	0.0159	-0.0020	-0.0034	0.0023	0.0011	-0.0001	-0.0077	-0.1246
(7) *MBD*7	-0.0179	-0.0013	-0.0021	0.0020	0.0008	0.0000	-0.0075	-0.1830

Panel B. Bubble period: 1982-89

(1) *MBD*1	0.00059	-0.0001	-0.0501	0.0374	0.0087	-0.0045	-0.1776	-0.8325	0.0901
	(2.02)	(0.01)	(13.9)	(9.03)	(2.22)	(1.20)	(4.59)	(2.81)	0.8960
(2) *MBD*2	0.00065	0.0001	-0.0499	0.0372	0.0094	-0.0040	-0.1733	-1.6331	0.0980
	(2.20)	(0.00)	(13.9)	(9.01)	(2.38)	(1.08)	(4.46)	(5.61)	0.8964
(3) *MBD*3	0.00075	-0.0001	-0.0499	0.0371	0.0105	-0.0044	-0.1603	-2.1410	0.1080
	(2.47)	(0.00)	(13.8)	(8.94)	(2.67)	(1.18)	(4.06)	(7.38)	0.8964
(4) *MBD*4	0.00049	-0.0015	-0.0490	0.0367	0.0080	-0.0052	-0.1733	-0.9426	0.0996
	(1.66)	(0.10)	(13.6)	(8.86)	(2.02)	(1.37)	(4.48)	(7.02)	0.8954
(5) *MBD*5	0.00030	0.0029	-0.0449	0.0356	0.0071	-0.0047	-0.1974	-1.1117	0.1124
	(0.99)	(0.20)	(12.3)	(8.51)	(1.78)	(1.26)	(4.98)	(10.9)	0.8988
(6) *MBD*6	0.00048	-0.0100	-0.0480	0.0351	0.0090	-0.0041	-0.1646	-1.7969	0.1367
	(1.63)	(0.67)	(13.0)	(8.41)	(2.24)	(1.09)	(4.19)	(13.5)	0.8951
(7) *MBD*7	0.00030	-0.0111	-0.0354	0.0317	0.0050	-0.0033	-0.1884	-3.0019	0.2350
	(0.81)	(0.71)	(8.59)	(6.74)	(1.09)	(0.84)	(4.11)	(25.3)	0.9181

(1) *MBD*1	0.0156	-0.0007	-0.0034	0.0030	0.0013	-0.0001	-0.0079	-0.0526
(2) *MBD*2	0.0267	-0.0007	-0.0033	0.0030	0.0013	0.0000	-0.0074	-0.1201
(3) *MBD*3	0.0376	-0.0006	-0.0032	0.0029	0.0014	0.0000	-0.0064	-0.1562
(4) *MBD*4	0.0001	-0.0009	-0.0032	0.0030	0.0012	-0.0001	-0.0075	-0.0658
(5) *MBD*5	-0.0119	-0.0007	-0.0030	0.0029	0.0011	-0.0001	-0.0084	-0.0820
(6) *MBD*6	0.0160	-0.0010	-0.0029	0.0028	0.0012	-0.0001	-0.0072	-0.1227
(7) *MBD*7	-0.0182	-0.0009	-0.0019	0.0022	0.0009	0.0001	-0.0074	-0.1813

Table 4 (continued) Estimation results for the binary logit-model
for single (Y=1) and multiple relations (Y=0)

Panel C. Post-Bubbles period: 1990-99

	SAL	*ROA*	*DAR*	*LAR*	*CBR*	*SLR*	*R&D*	*MBD*	R^2/*CPR*
(1) MBD_1	-0.00026	-0.0160	-0.0363	0.0385	0.0182	0.0014	-0.0485	-0.5111	0.0556
	(0.73)	(1.53)	(13.7)	(13.0)	(7.56)	(0.46)	(1.73)	(2.34)	0.9066
(2) MBD_2	-0.00008	-0.0153	-0.0353	0.0377	0.0188	0.0017	-0.0417	-1.3819	0.0622
	(0.24)	(1.47)	(13.4)	(12.7)	(7.75)	(0.56)	(1.50)	(6.47)	0.9069
(3) MBD_3	0.00010	-0.0143	-0.0346	0.0369	0.0195	0.0017	-0.0300	-1.8316	0.0696
	(0.31)	(1.38)	(13.1)	(12.5)	(8.06)	(0.56)	(1.07)	(8.57)	0.9066
(4) MBD_4	-0.00035	-0.0178	-0.0346	0.0383	0.0179	0.0009	-0.0445	-0.7707	0.0635
	(0.99)	(1.78)	(13.1)	(12.8)	(7.38)	(0.29)	(1.60)	(8.08)	0.9064
(5) MBD_5	-0.00068	-0.0172	-0.0333	0.0380	0.0168	0.0008	-0.0509	-1.0050	0.0740
	(1.75)	(1.66)	(12.5)	(12.6)	(6.85)	(0.26)	(1.80)	(12.7)	0.9071
(6) MBD_6	-0.00019	-0.0174	-0.0328	0.0373	0.0178	0.0015	-0.0495	-1.4747	0.0897
	(0.55)	(1.83)	(12.5)	(12.5)	(7.26)	(0.50)	(1.80)	(15.4)	0.9077
(7) MBD_7	-0.00104	-0.0179	-0.0268	0.0366	0.0168	0.0033	-0.0721	-2.7701	0.1675
	(2.20)	(1.71)	(9.30)	(11.2)	(6.23)	(1.04)	(2.30)	(30.2)	0.9149

(1) *MBD*1	-0.0203	-0.0013	-0.0029	0.0031	0.0014	0.0001	-0.0038	-0.0405
(2) *MBD*2	-0.0064	-0.0012	-0.0028	0.0030	0.0015	0.0001	-0.0033	-0.1088
(3) *MBD*3	0.0081	-0.0011	-0.0027	0.0029	0.0015	0.0001	-0.0023	-0.1431
(4) *MBD*4	-0.0278	-0.0014	-0.0027	0.0030	0.0014	0.0001	-0.0035	-0.0605
(5) *MBD*5	-0.0523	-0.0013	-0.0026	0.0029	0.0013	0.0001	-0.0039	-0.0775
(6) *MBD*6	-0.0143	-0.0013	-0.0025	0.0028	0.0014	0.0001	-0.0038	-0.1119
(7) *MBD*7	-0.0661	-0.0011	-0.0017	0.0023	0.0011	0.0002	-0.0046	-0.1765

CBR = corporate bonds to total debt;

DAR = debt-to-assets ratio;

LAR = liquid assets to total assets ratio;

MBD_i = main-bank dummy variable = 1 if a main bank loan supplies are also a main equity holders (subscript *i* indicates the relative importance both in loan and equity holding, see Section 3);

NBL = number of long-term bank loans;

ROA = return on assets (profits after tax / the average of the total asset at the beginning and the end of period);

R&D = R&D expenditure to total sales;

SAL = total sales, corresponding probability dP/dx is in terms of 10^3;

SLR = short-term loans to total debt.

Table 5 Estimation results multinomial logit-model for number of bank relations

Panel A. Whole period: 1982-1999, R^2=0.2423

	SAL	*ROA*	*DAR*	*LAR*	*CBR*	*SLR*	*R&D*	MBD_3
(2) 5-7	-0.00090	-0.0108	0.0217	-0.0180	-0.0065	0.0002	-0.0277	0.6715
	(2.40)	(1.57)	(12.3)	(9.29)	(3.36)	(0.11)	(1.56)	(8.12)
(3) 8-10	0.00045	0.0177	0.0469	-0.0364	-0.0088	-0.0077	0.0057	0.9979
	(1.30)	(2.29)	(23.2)	(17.1)	(4.08)	(3.60)	(0.30)	(11.6)
(4) 11-15	0.00231	0.0100	0.0580	-0.0386	-0.0062	-0.0107	-0.0006	1.3116
	(7.28)	(1.17)	(25.1)	(16.5)	(2.57)	(4.41)	(0.03)	(14.6)
(5) 16-	0.00304	0.0214	0.0817	-0.0584	0.0014	-0.0049	0.1223	1.6701
	(9.18)	(1.92)	(24.2)	(19.7)	(0.44)	(1.51)	(4.66)	(15.1)
(1) 2-4	-0.0593	-0.0006	-0.0069	0.0052	0.0011	0.0008	0.0006	-0.1654
(2) 5-7	-0.3494	-0.0040	-0.0022	0.0012	-0.0005	0.0010	-0.0077	-0.0082
(3) 8-10	-0.0001	0.0028	0.0029	-0.0025	-0.0009	-0.0008	0.0007	0.0476
(4) 11-15	0.2647	0.0007	0.0034	-0.0019	-0.0002	-0.0010	-0.0011	0.0749
(5) 16-	0.1494	0.0010	0.0028	-0.0020	0.0004	0.0000	0.0075	0.0510

Panel B. Bubble period: 1982-1989, R^2=0.2804

(2) 5-7	-0.00146	-0.0355	0.0277	-0.0191	0.0030	-0.0015	0.0180	0.9220
	(2.27)	(2.62)	(8.45)	(5.26)	(0.69)	(0.46)	(0.59)	(6.32)
(3) 8-10	0.00020	-0.0086	0.0557	-0.0411	0.0122	-0.0016	0.0112	1.3036
	(0.35)	(0.63)	(15.0)	(10.4)	(2.57)	(0.47)	(0.32)	(8.67)
(4) 11-15	0.00182	-0.0165	0.0711	-0.0439	0.0053	-0.0173	0.0226	1.5435
	(3.33)	(1.03)	(16.2)	(10.1)	(0.94)	(4.15)	(0.58)	(9.61)
(5) 16-	0.00221	0.0116	0.0973	-0.0714	0.0340	0.0033	0.1938	1.7377
	(3.91)	(0.59)	(15.8)	(13.4)	(4.95)	(0.62)	(4.26)	(8.69)
(1) 2-4	0.0275	0.0035	-0.0079	0.0055	-0.0013	0.0007	-0.0046	-0.1971
(2) 5-7	-0.4092	-0.0060	-0.0025	0.0018	-0.0009	0.0005	-0.0010	0.0089
(3) 8-10	0.0210	0.0013	0.0032	-0.0028	0.0011	0.0004	-0.0035	0.0715
(4) 11-15	0.2415	-0.0004	0.0040	-0.0020	-0.0005	-0.0021	-0.0014	0.0758
(5) 16-	0.1192	0.0016	0.0032	-0.0025	0.0016	0.0005	0.0105	0.0409

Panel C. Post-Bubble period: 1990-1999, R^2=0.2424

(2) 5-7	-0.00059	0.0027	0.0198	-0.0196	-0.0087	0.0008	-0.0519	0.5509
	(1.25)	(0.35)	(9.28)	(8.51)	(3.98)	(0.33)	(2.32)	(5.43)
(3) 8-10	0.00058	0.0331	0.0442	-0.0351	-0.0144	-0.0101	0.0092	0.8443
	(1.31)	(3.45)	(18.02)	(13.85)	(5.80)	(3.69)	(0.39)	(8.00)
(4) 11-15	0.00261	0.0267	0.0529	-0.0378	-0.0082	-0.0069	-0.0089	1.2121
	(6.49)	(2.58)	(19.05)	(13.58)	(3.04)	(2.27)	(0.35)	(11.1)
(5) 16-	0.00351	0.0288	0.0764	-0.0526	-0.0070	-0.0084	0.0829	1.6235
	(8.39)	(2.15)	(18.55)	(14.71)	(1.84)	(2.01)	(2.50)	(12.1)
(1) 2-4	-0.1115	-0.0031	-0.0065	0.0053	0.0018	0.0008	0.0031	-0.1481
(2) 5-7	-0.3133	-0.0030	-0.0021	0.0006	-0.0004	0.0012	-0.0117	-0.0164
(3) 8-10	-0.0199	0.0037	0.0029	-0.0023	-0.0014	-0.0013	0.0036	0.0348
(4) 11-15	0.2817	0.0016	0.0031	-0.0019	-0.0001	-0.0004	-0.0006	0.0760
(5) 16-	0.1629	0.0007	0.0026	-0.0016	0.0001	-0.0002	0.0056	0.0536

Symbols: See legend Table 4.

Table 6 Estimation results: Tobit-model for the Herfindahl index

Panel A. Whole period: 1982-99

	SAL	*ROA*	*DAR*	*LAR*	*CBR*	*SLR*	*R&D*	*MBD*	*LH/σ*
(1) MBD_1	0.00033	0.0068	0.0122	-0.0102	-0.0024	-0.0003	0.0168	0.1414	-14859.0
	(7.28)	(4.58)	(30.7)	(23.7)	(5.36)	(0.71)	(4.02)	(5.29)	0.6831
(2) MBD_2	0.00029	0.0066	0.0121	-0.0102	-0.0026	-0.0005	0.0149	0.2373	-14797.7
	(6.37)	(4.51)	(30.5)	(23.8)	(5.74)	(1.03)	(3.58)	(12.3)	0.6802
(3) MBD_3	0.00024	0.0066	0.0119	-0.0101	-0.0029	-0.0004	0.0121	0.3194	-14694.9
	(5.24)	(4.53)	(30.4)	(23.8)	(6.54)	(0.96)	(2.93)	(19.0)	0.6751
(4) MBD_4	0.00036	0.0068	0.0120	-0.0102	-0.0023	-0.0003	0.0164	0.1355	-14815.8
	(7.77)	(4.64)	(30.2)	(23.7)	(5.17)	(0.58)	(3.94)	(10.7)	0.6812
(5) MBD_5	0.00040	0.0065	0.0116	-0.0101	-0.0021	-0.0002	0.0181	0.2325	-14702.7
	(8.86)	(4.44)	(29.4)	(23.7)	(4.66)	(0.52)	(4.37)	(18.5)	0.6762
(6) MBD_6	0.00031	0.0069	0.0116	-0.0100	-0.0025	-0.0005	0.0165	0.2823	-14581.4
	(6.94)	(4.77)	(29.7)	(23.7)	(5.53)	(1.06)	(4.01)	(24.3)	0.6705
(7) MBD_7	0.00038	0.0055	0.0096	-0.0090	-0.0017	-0.0006	0.0166	0.9495	-13488.7
	(9.08)	(4.03)	(26.1)	(22.7)	(4.11)	(1.54)	(4.31)	(53.5)	0.6260

Panel B. Bubble period: 1982-89

(1) MBD_1	0.00004	0.0062	0.0154	-0.0119	0.0020	0.0014	0.0273	0.1807	-5533.0
	(0.49)	(2.29)	(21.9)	(15.6)	(2.11)	(1.97)	(3.87)	(4.18)	0.6664
(2) MBD_2	0.00001	0.0062	0.0154	-0.0119	0.0019	0.0013	0.0257	0.2347	-5515.1
	(0.09)	(2.28)	(21.9)	(15.7)	(2.01)	(1.80)	(3.66)	(7.31)	0.6643
(3) MBD_3	-0.00005	0.0062	0.0153	-0.0120	0.0015	0.0014	0.0238	0.3163	-5476.3
	(0.58)	(2.29)	(22.0)	(15.8)	(1.54)	(1.91)	(3.41)	(11.5)	0.6595
(4) MBD_4	0.00006	0.0062	0.0152	-0.0118	0.0020	0.0015	0.0275	0.1190	-5525.5
	(0.81)	(2.29)	(21.6)	(15.5)	(2.15)	(2.08)	(3.90)	(5.70)	0.6658
(5) MBD_5	0.00010	0.0054	0.0145	-0.0117	0.0020	0.0014	0.0308	0.2115	-5482.7
	(1.34)	(1.98)	(20.7)	(15.4)	(2.15)	(1.98)	(4.41)	(10.9)	0.6609
(6) MBD_6	0.00003	0.0070	0.0148	-0.0116	0.0017	0.0013	0.0257	0.2604	-5443.6
	(0.40)	(2.62)	(21.4)	(15.4)	(1.86)	(1.78)	(3.70)	(14.1)	0.6564
(7) MBD_7	0.00008	0.0049	0.0119	-0.0102	0.0024	0.0009	0.0224	0.8790	-5004.1
	(1.09)	(1.94)	(18.1)	(14.5)	(2.78)	(1.36)	(3.45)	(33.3)	0.6109

Panel C. Post-Bubble period: 1990-99

(1) MBD_1	0.00048	0.0075	0.0108	-0.0098	-0.0036	-0.0011	0.0125	0.1192	-9252.7
	(8.51)	(4.25)	(22.2)	(18.7)	(6.94)	(1.99)	(2.40)	(3.52)	0.6875
(2) MBD_2	0.00043	0.0073	0.0106	-0.0097	-0.0038	-0.0013	0.0104	0.2384	-9210.1
	(7.67)	(4.15)	(22.0)	(18.6)	(7.32)	(2.24)	(2.01)	(9.90)	0.6841
(3) MBD_3	0.00038	0.0072	0.0105	-0.0096	-0.0041	-0.0013	0.0073	0.3207	-9145.4
	(6.76)	(4.15)	(21.8)	(18.6)	(7.99)	(2.23)	(1.43)	(15.1)	0.6789
(4) MBD_4	0.00050	0.0076	0.0106	-0.0097	-0.0035	-0.0011	0.0119	0.1415	-9219.1
	(8.88)	(4.31)	(21.8)	(18.6)	(6.76)	(1.90)	(2.31)	(8.93)	0.6850
(5) MBD_5	0.00055	0.0074	0.0104	-0.0097	-0.0032	-0.0010	0.0126	0.2410	-9151.6
	(9.83)	(4.26)	(21.6)	(18.7)	(6.19)	(1.75)	(2.45)	(14.7)	0.6801
(6) MBD_6	0.00045	0.0073	0.0103	-0.0096	-0.0036	-0.0013	0.0131	0.2919	-9069.4
	(8.15)	(4.24)	(21.5)	(18.7)	(7.04)	(2.33)	(2.58)	(19.6)	0.6737
(7) MBD_7	0.00053	0.0062	0.0088	-0.0086	-0.0028	-0.0014	0.0147	0.9950	-8415.9
	(10.2)	(3.84)	(19.5)	(17.9)	(5.89)	(2.68)	(3.07)	(41.7)	0.6302

Symbols: see legend Table 4.

Table A - Number of sample firms by SNA industry classification and year

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	total
(1) Agriculture, forestry and fishery												1	1	1	1	1	2	3	10
(2) Mining	1	2	1	2	2	3	1	2	4	4	5	5	5	4	4	4	3	3	55
(3) Manufacturing	576	595	626	657	672	678	703	736	761	785	783	782	792	834	846	893	967	958	13644
1 Food and beverages	52	56	52	53	55	62	61	66	66	70	70	69	68	75	77	79	83	82	1196
2 Textiles	23	25	35	42	41	45	42	44	45	50	52	54	53	55	58	52	56	56	828
3 Pulp, paper and paper products	11	13	12	14	15	16	15	18	19	21	20	17	16	15	16	17	22	22	299
4 Chemicals	66	67	69	78	83	78	85	86	98	92	91	96	94	97	96	106	123	120	1625
5 Petroleum and coal products	2	3	2	2	2	1	1	3	1	1		1	2	4	2	3	9	6	45
6 Non-metallic mineral products	33	30	34	35	35	32	35	37	39	40	39	38	40	43	43	44	45	47	689
7 Basic metal	41	38	38	42	44	39	41	52	48	49	49	47	52	55	51	56	58	60	860
8 Fabricated metal products	39	38	44	44	49	44	42	47	50	46	47	47	46	48	55	63	65	65	879
9 Machinery	97	99	96	105	105	116	114	118	127	131	132	137	143	149	144	147	157	153	2270
10 Elec. Machinery	85	89	95	97	98	96	102	110	107	116	115	109	112	113	110	114	123	128	1919
11 Transport equipment	63	65	72	69	74	73	77	74	73	76	71	72	64	71	76	82	90	84	1326
12 Precision instrument	18	22	21	23	20	22	23	22	23	22	24	26	27	27	30	29	28	28	435
13 Others	46	50	56	53	51	54	65	59	65	71	73	69	75	82	88	101	108	107	1273
(4) Construction	67	71	80	76	80	85	72	88	93	95	88	89	86	93	105	107	76	82	1533
(5) Electricity, gas and water supply	6	4	4	3	4	4	3	4	5	4	5	6	4	5	6	4	7	8	86
(6) Wholesale and retail trade	55	82	97	109	125	138	151	167	180	192	191	199	200	226	240	260	308	303	3223
(8) Real estate	8	8	7	7	8	7	6	10	13	11	12	11	10	11	14	17	19	20	199
(9) Trans. And communication	46	43	41	46	45	47	48	47	56	52	48	50	49	52	56	54	63	63	906
(10) Services	20	35	34	35	35	43	46	49	55	60	59	65	70	76	84	95	109	114	1084
Total	779	840	890	935	971	1005	1030	1103	1167	1203	1191	1208	1217	1302	1356	1435	1554	1554	20740

Table B - Number of bank relations with respect to long-term loans by year

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	total
0	158	200	235	258	283	315	355	391	406	404	409	404	416	446	479	502	516	508	6685
1	49	59	59	66	70	82	86	90	96	93	69	62	69	65	69	94	103	89	1370
2	48	39	50	50	41	48	55	54	73	72	65	68	65	68	82	95	76	85	1134
3	41	51	54	49	54	47	37	60	57	65	60	67	55	67	60	79	89	75	1067
4	53	50	50	59	60	54	57	58	57	54	67	72	69	78	78	86	89	84	1175
5	50	61	63	60	76	65	71	78	70	76	72	66	70	75	75	84	97	95	1304
6	59	59	53	56	59	65	58	55	51	60	66	60	77	82	83	83	96	98	1220
7	53	56	43	44	53	49	55	51	68	66	66	61	60	65	72	69	79	93	1103
8	59	50	53	58	49	52	57	53	55	60	49	57	55	61	70	67	66	67	1038
9	26	40	57	56	58	53	43	59	63	59	66	61	52	53	57	58	68	72	1001
10	32	36	38	30	31	35	26	34	35	40	41	47	33	43	43	43	53	56	696
11	22	29	30	35	23	22	20	21	22	30	35	36	47	43	44	45	40	44	588
12	27	24	23	24	23	28	26	24	27	24	28	31	30	36	30	26	44	50	525
13	20	17	9	15	17	23	22	21	18	19	16	19	23	23	27	27	23	20	359
14	18	8	15	18	13	15	11	10	14	18	23	22	26	23	19	16	21	23	313
15	17	12	10	14	13	8	9	9	13	12	9	18	16	18	14	12	10	20	234
16	14	13	12	14	13	12	11	8	8	10	18	17	19	20	16	11	23	16	255
17	9	7	11	3	7	9	11	8	13	10	8	10	8	5	8	11	15	11	164
18	6	8	2	3	5	7	6	3	6	5	6	8	4	7	5	10	9	10	110
19	3	5	9	10	6	3	2	4	2	5	5	7	5	9	10	5	9	11	110
20	1	2	1	1	2	2	2	2	2	6	4	1	5	2	1	4	7	8	53
21	4	4	3	1	4	2	1		2	2	1	5	5	3	4	3	4	4	52
22	2	2	3	3	3	4	3	2	1	5	2	4	1	1	1		4	3	44
23		2	2	3		1	2	2	4	2	2		3	5	5	3	5	3	44
24		2	1		3	1	2			2	2			1	1		3	4	22
25	1	1	1					2	1		1				1		2		10
26			3	2		1	1	1	1			1			2	1		1	14
27				1	2	1		1				1	1	1					8
28					1			1					1						3
29	1			1						1		1				1			5
30								1										1	2
31		2							1	1							1		5
32	1													1				1	3
34					1							1							2
35	2									1									3
36		1		1							1	1	1						5
37					1	1							1	1					4
39							1										1	1	3
40	1																		1
44																		1	1
45																	1		1
46									1										1
52	1									1									2
55	1																		1
total	779	840	890	935	971	1005	1030	1103	1167	1203	1191	1208	1217	1302	1356	1435	1554	1554	20740

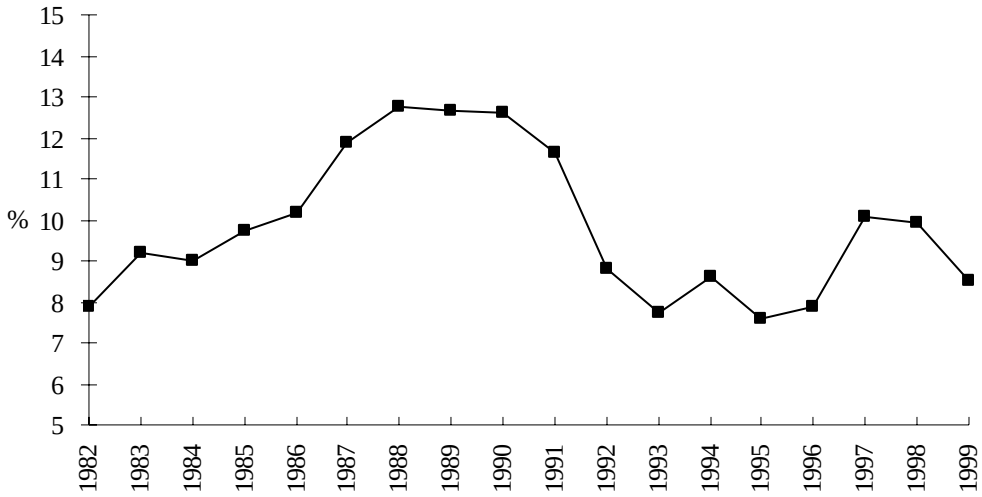

Figure 1. Percentage of firms with a single long-term loan relation

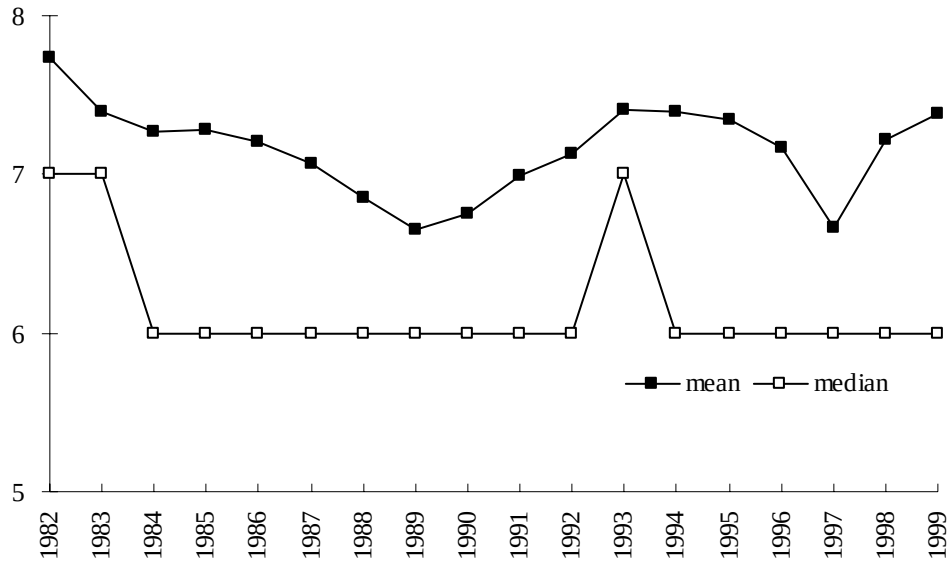

Figure 2. Number of bank relations with respect to long-term loan

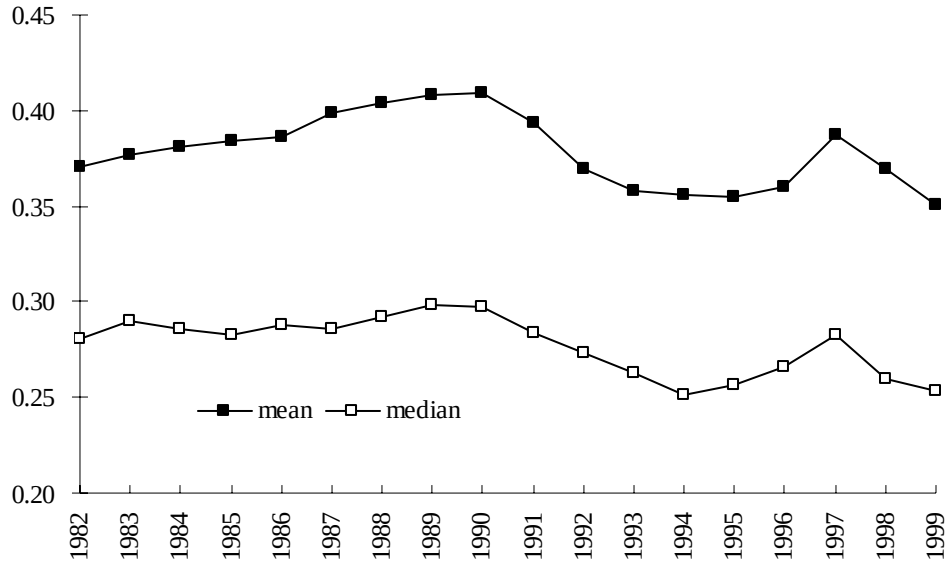

Figure3. Herfindahl index for long-term loans

Discussion Paper

No.	Author	Title		Date
2001・1	Takashi Hatakeda Nobuyuki Isagawa	Stock Price Behavior Surrounding Repurchase Announcements: Evidence from Japan		1／2001
2001・2	Michiyasu Nakajima Takeshi Mizuguchi Katsuhiko Kokubu Yasushi Onishi	Material Flow Cost Accounting of IMU (October 2000)	(in Japanese)	1／2001
2001・3	Koji Okubayashi	Japanese Manufacturers Without Factories: Cases of Sony, Matsushita, Misumi, People		1／2001
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Discussion Paper

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