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Do some lenders have information advantages? Evidence from Japanese credit market data

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Abstract

Using detailed Japanese credit data, we test for the existence of a credit market hierarchy. Empirical tests indicate that firms with information problems are more likely to carry higher proportions of relationship loans from main banks than non-main banks, holding constant risk and control factors. We further examine credit specialization on the part of lenders by testing the relationship between client firms' information and risk characteristics and the concentration of loans obtained from depository institutions versus other financial institutions. However, no significant differences in information superiority between these two types of financial institutions are found. We conclude that our evidence supports the credit market hierarchy hypothesis for Japanese main banks in particular but not depository institutions in general.

JEL classification: G21; D82; G15
Keywords: Bank credit; Asymmetric information; Credit hierarchy; Japanese banking

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1. Introduction

Banks are believed to be special due to access to private or inside information about borrowing firms that is not available to other institutions or investors (e.g., see Fama, 1985). Most empirical tests of this bank uniqueness hypothesis have examined firms' stock market responses to bank loan announcements (e.g., see James, 1987; Lummer and McConnell, 1989; Preece and Mullineaux, 1994; Billet et al., 1995). Related work on Japanese bank–firm relationships and the bank uniqueness hypothesis have likewise employed event study methods (e.g., see Yamori and Murakami, 1999; Kang et al., 2000; Kang and Stulz, 2000). In general, these studies show that banks are delegated monitors that utilize inside information to make credit decisions.

A connection between firm information problems and choice of credit market has been proposed by numerous authors (e.g., Diamond, 1991; Carey et al., 1993; Rajan, 1992; Berglöf and Von Thadden, 1994; Houston and James, 1996; and others). Carey et al. (1993) have argued that differences in covenant requirements, monitoring capacity, and flexibility in renegotiation of contractual violations across credit market type (i.e., bank loans, private placement, and public debt) leads to credit market specialization by type of borrower. They proposed that borrowers with different degrees of information problems will seek lenders with the appropriate information monitoring capability, and vice versa. This *credit market hierarchy hypothesis* implies a match-up of borrowers and lenders according to their information sensitivity. In this scheme banks provide loans to the most information problematic companies, the private placement market (e.g., insurance companies) offers credit to less information sensitive firms, and the public debt market supplies credit to well-known companies.

Focusing on bank loans, Carey et al. (1998) empirically examined the relationship between specialization among financial institutions and borrowers' information problems. Employing firm-level information and risk variables, they tested whether significant differences existed between firms that borrowed from banks versus finance companies. Since no significant differences were found in information variables, they concluded that there is no apparent credit market hierarchy that differentiates banks and finance companies.

In this paper we test for the existence of a credit market hierarchy in Japan. Unlike most countries, information on exchange-listed firms' sources of institutional credit and amount outstanding with different financial institutions is made public in Japan. Here we use detailed credit records of individual Japanese firms for the period 1995–1997 obtained from the Nikkei database. Our main research question is: Do some lenders have information advantages relative to other lenders in the financial marketplace? In this regard, we test two research hypotheses concerning the position of lenders in collecting information on borrowers. The first hypothesis is that main banks have access to inside information that other lenders do not possess. Given this information advantage, information problematic firms will be more likely to seek credit from a main bank than from non-main banks. It is well-known that main banks have privileged access to firm information through management of

the settlement account, board membership, and major shareholdings (e.g., see Weinstein and Yafeh, 1998). As such, we can consider the main bank as a *relationship lender*, as opposed to an *arms-length lender*. In brief, our empirical results confirm that, after controlling for firm size, industry, and other factors that affect the risk structure of loans, firms with information problems are more likely to carry higher proportions of loans from main banks than non-main banks.

A second (and related) hypothesis is that depository institutions have information advantages relative to non-depository institutions. Holding a firm's deposit (or checking) account, especially a daily settlement account, gives banks more opportunities to comprehensively view the flow of customer cash flows over time. Black (1975) observed that banks have an informational advantage in lending to borrowers with deposit accounts. Fama (1985) extended the application of this inside information advantage to all borrowers who have deposit accounts with the bank. It is argued that other private institutions cannot acquire timely and complete information comparable to institutions holding deposit accounts of business firms (Nakamura, 1993). Based on loan data for small business borrowers at a Canadian bank, Mester et al. (2002) found that holding checking accounts for small companies provided banks with exclusive opportunities to access a continuous stream of borrower data. Consequently, they inferred that deposit-taking banks are special in their role as lenders compared to other types of financial institutions. However, consistent with Carey et al. (1998), who compared the information advantages of banks versus finance companies in the US, our empirical evidence does not suggest that deposit-taking envisages information advantages relative to other financial institutions. Based on these results and further robustness tests, we conclude that the credit market hierarchy hypothesis holds for Japanese main banks in particular but not depository institutions in general.

Section 2 overviews Japanese financial institutions, including the 1990s banking crisis. Sections 3 and 4 discuss our research methodology and empirical results, respectively. Section 5 gives our conclusions.

2. Japanese financial institutions [1]

Financial industry regulations and administrative guidelines have segmented Japanese financial institutions by their principal sources of funds as well as their asset composition. Despite deregulation in financial markets beginning in 1980, the functional nature of different financial institutions as well as banks has remained unchanged for the most part. Ordinary banks, including city banks, regional banks, and foreign banks, are the major suppliers of short-term private credit. City banks with nationwide branches mainly provide wholesale lending to large corporate customers, accept individual deposits, and offer some consumer loans. Regional banks

[1] See Hoshi and Kashyap (2002) for an excellent overview of the modern history of the Japanese financial system.

are much smaller in scale than city banks and limit their geographical scope of operations to the area surrounding their head offices. They primarily service small and regional firms as well as individuals. Reduced loan demand from corporate customers and easy access by traditional city bank clients to the capital market due to financial deregulation has motivated city banks to pursue small and medium sized firms, thereby encroaching on regional banks. On the deposit side, while most time deposits in city banks are from large corporations, the bulk of regional banks' time deposits are obtained from individuals and local firms. Due to relatively low margins on corporate lending, foreign banks in Japan focus on foreign currency transactions, trade finance, and investment banking. Their market share in loan markets has traditionally been small.

Long-term private credit is supplied by specialized financial institutions, which include trust banks, insurance companies, and, until 1999, long-term credit banks. [2] Their primary customers are large businesses firms seeking capital investment funds. Different from ordinary banks, long-term credit banks can issue long-term debentures up to a maximum of 30 times their own capital, while trust banks obtain most of their funds needed from trust accounts. [3]

In the Japanese banking system close monitoring of borrowing firms is performed by the main bank, which gathers detailed information on companies via holdings of settlement accounts, loans, and common stock. The main bank relationship is especially intimate between large, publicly listed firms and their main bank, which are normally large city banks. As the largest lender to the borrowing firm and manager of its payment settlement account, the main bank has access to substantial inside firm information. This special relationship with client firms enables the main bank to efficiently monitor credit risk (see Nakatani, 1984; Sheard, 1989; Hoshi et al., 1990; Aoki, 1994; Aoki et al., 1994; Kang et al., 2000).

Over the past decade Japanese financial institutions, particularly banks, experienced problems associated with a severe and prolonged economic downturn beginning in 1990. Relevant to the present study, Hoshi and Kashyap (1999) found that banks' performance in the 1990s was worse than would be predicted by macroeconomic conditions. In this regard, they argued that deregulation of the Japanese financial system led to changes that diminished the credit quality of commercial

[2] Previously, the long-term credit banks were Industrial Bank of Japan, Long-term Credit Bank of Japan, and Nippon Credit Bank. However, no long-term credit banks existed as of June, 2003. Industrial Bank of Japan (IBJ) was merged with Dai-ichi Kangyo Bank and Fuji Bank and named Mizuho Holdings Inc. in 1999. Long-term Credit Bank of Japan and Nippon Credit Bank failed in 1998 and were later merged out with other financial organizations. For more detailed information on the deposit-taking activities of long-term credit banks and trust banks, see Suzuki (1987) and Hoshi and Kashyap (2002).

[3] The Loan Trust Law of 1952 allowed trust banks to acquire funds through loan trusts, which are actually time deposits. Trust banks used funds from loan trusts to supply funds for capital investment (Hoshi and Kashyap, 2002). As an anonymous referee pointed out, security investment trusts, which engaged in similar trust services as US banks, are not allowed to provide long-term credit. The Financial System Reform Law of 1994, however, eased trust services restrictions by allowing securities houses and ordinary banks to engage in trust business through subsidiaries. This law was intended to make the businesses of the trust banks almost indistinguishable from those of ordinary banks.

banks. For example, 1980's deregulation of the Japanese bond market allowed large, high-quality firms to become much less dependent on bank credit than before. Coincidentally, lending to large firms declined in the 1990s, and bank lending to small firms increased. Horiuchi (1994) and Dinç (1999) also observed that deregulation of capital markets in Japan led to increased large bank lending to small and medium-size firms.

Differentiating between credit competition from the capital market versus other banks, Boot and Thakor (2000) have argued that the former tends to lead to a reduction in relationship lending (see also Hellmann et al., 1997, 2000; Rajan, 1998), while the latter leads to an increase in relationship lending (see also Boot, 2000). On other hand, theoretical work by Dinç (2000) has proposed that increased competition from bond markets force banks to reduce arms-length lending (transactional lending) and, consequently, increase relationship lending. Citing Japan as a case in point, Dinç inferred that banks would increase lending to borrowers with low credit quality under these circumstances.

Since our sample period is 1995–1997, our analyses of information advantages and lending among different Japanese financial institutions is affected by the banking crisis of the 1990s. Due to turmoil in credit markets, theory would suggest that the monitoring role of main banks in relationships with client firms would tend to be more important than otherwise. As such, borrowing firms with information problems would tend to become more dependent on main banks as well as other lending institutions with greater monitoring capability vis-à-vis other potential lenders. It should be noted that our tests do not explain why Japanese main banks have experienced difficulties with loan defaults despite their potentially greater monitoring ability (e.g., see Hanazaki and Horiuchi, 2000). Instead, our analyses focus on how firms make decisions about different sources of credit in financial markets.

3. Research methodology

3.1. Research hypotheses

According to the credit market hierarchy hypothesis, information problems in credit markets cause firms to selectively borrow from different financial institutions. We test two research hypotheses related to the existence of a credit market hierarchy. First, according to our *main bank hypothesis*, information problematic firms will be more likely to borrow from main banks than non-main banks in Japan. Second, according to our *depository institution hypothesis*, information problematic firms will be more likely to borrow from depository institutions than non-depository institutions. Here we test for whether deposit accounts are a valuable source of inside information.

3.2. Model specification

Following Carey, Post, and Sharpe, we employ a binary choice model to test whether borrowing firms' information and risk characteristics are associated with

their choice of loans from banks versus finance firms. Using Japanese credit market data for the sample period 1995–1997, we divide firms into two different response groups: (1) firms with high versus low proportions of main bank loans to total loans from all depository institutions (i.e., main bank hypothesis), and (2) firms with high versus low outstanding loans from depository institutions to total loans from all financial institutions (i.e., depository institutions hypothesis). The following logit model is utilized:

$$\begin{aligned}\mathrm{Log}(P_i/1-P_i) = {} & \beta_{1ik}\ (\text{information variables}_{ik}) + \beta_{2ij}\ (\text{risk variables}_{ij}) \\ & + \beta_{3il}\ (\text{control variables}_{il}),\end{aligned} \tag{1}$$

where P_i is the probability that the ith firm borrows primarily from a main bank (depository institution) compared to other banks (other financial institutions). The dependent variable is the log of firms' odds of high main bank (high depository institutions) borrowing group membership versus low main bank (low depository institutions) borrowing group membership. Assuming self-selection by client firms of financial institutions, the significance of the information variables, holding constant risk and control variables, would imply that main banks (depository institutions) have a unique ability to resolve information problems of client firms. The significance of risk variables would suggest that main banks (depository institutions) attract firms with higher default risk than at other banks (financial institutions).

Following Carey et al., our information variables are:

- sales growth rate over the past five years (GROWTH),
- market-to-book ratio (MVBV),
- R&D to sales ratio (RD),
- size (SIZE), and
- years in business (AGE).

All data are collected from DataStream. In general, it is believed that a firm with more growth options is exposed to greater information problems. Relative to other firms, high growth firms tend to have higher market-to-book ratios, higher R&D expenditures, smaller size, and fewer years in business. Because R&D data for OTC firms are not available on DataStream, this data was hand collected from the Japan Company Handbook (various years). Also, we should note that, due to discrepancies between the book and market values of assets in the cost accounting treatment of assets, we use sales revenues to measure firm size.

Regarding firm risk proxies, we again use variables similar to Carey et al., including measures of financial leverage, liquidity, cash flow, and profitability. Financial leverage (MKTLV) is calculated by dividing the book value of debt by the summation of book value of debt and market value of equity. The debt coverage ratio (COVERAGE) is defined as recurring profits (i.e., operating profits excluding such items as capital, exchange, or valuation gains/losses) divided by total interest expenses. To measure short-term liquidity (TRADE) the amount owed to trade cred-

itors (i.e., trade accounts and notes payable relating to the normal business activities of the firm, excluding payables to affiliated firms) is divided by the amount of trade receivables (i.e., the accounts and notes receivable). A high liquidity ratio indicates that the firm makes heavy use of short-term debt (rather than loans from financial institutions) to manage normal business operations. Firm cash holdings (CASH) are measured by the ratio of total cash and equivalents (i.e., cash in banks, securities, short-term loans and treasury stock) divided by current liabilities. Profitability (ROS) is measured as the summation of net income and the tax adjusted total interest payments divided by the average total sales.

Additionally, we seek to control for the possible influence of pre-existing lending relationships between firms and banks. First, to control for competitive conditions facing main banks, we calculated the ratio of loans from major banks ($n = 21$) divided by total loans from all private financial institutions (MAJOR). Second, general competitive conditions are proxied by the number of banks in a credit relationship with a firm (NUMBANK).

To control for the possible effect of a firm's access to funds other than loans from financial institutions, we include the ratio of total public debt to total liabilities (BOND). Furthermore, to take into consideration the potential influence of affiliation to a common industrial group (known as Keiretsu), we include a dummy variable set equal to 1 for Keiretsu firms and 0 for non-Keiretsu firms (KEIRETSU). [4]

Finally, we include control variables for the collateralization of debt as well as the industry membership of firms. Collateral is important in Japan because lending decisions are typically made on the basis of (for example) marketable securities held for short-term loans and real estate held for long-term loans, rather than on the basis of cash flow and credit risk analysis as in US banking practice. Collateral assets (COLL) are defined as the summation of net total tangible fixed assets, including assets such as buildings and structures, machinery and equipment, and financial fixed assets consisting of the firm's investments in affiliates and securities, long-term loans, etc.

Because overall leverage, the proportion of private debt in the overall debt structure, and the ratio of loans from the main bank to total loans from private financial institutions differ across industries, we control for industry effects in two ways. First, as discussed shortly, we match our low and high main bank samples (as well as low and high deposit samples) using the five-digit Nikkei Industry Code. Second, a Nikkei Industry Code dummy variable is included in the model, which divides the sample into five industry groups (i.e., manufacturing, construction, trade, service, and transportation and gas services). This dummy variable is coded so that the manufacturing industry is the control industry (i.e., a value of 0 is assigned to the industry dummy versus 1 for other industry groups).

[4] Keiretsu is a special business connection in Japan comprised of groups of firms in different industries but bound by ties of fractional ownership and centered around a large commercial bank as the major power center. Keiretsu serves to mitigate information problems through mutual monitoring and information exchange.

Table 1
Definitions of independent variables

Variables	Definitions	
Information	Market-to-book ratio (MVBV)	Market value of assets/book value of assets
	R&D (RD)	R&D spending/total sales
	Size (SIZE)	The natural log of sales
	Size (LNTA)	The natural log of total assets
	Age (AGE)	Years in business
	Growth rate (GROWTH)	Average growth rate of past five years before sample period
Risk	Market leverage (MKTLV)	Book value of debt/book value of debt plus market value of total equity
	Trade ratio (TRADE)	Amount owed to trade creditors/amount of trade receivables
	Coverage (COVERAGE)	Recurring profits/total interest expenses
	Profitability (ROS)	Net income plus tax-adjusted total interest payment/total sales
	Profitability (ROA)	Net income/total assets
	Cash holdings (CASH)	Cash equivalent assets/current assets
Control	Loans from major 21 banks (MAJOR)	Loans from major banks ($n = 21$)/total loans from all private financial institutions
	Number of banks (NUMBANK)	Total number of banks with which the firm has a borrowing relationship
	Public debt ratio (BOND)	Convertible debt plus bonds/total liabilities
	Keiretsu affiliation (KEIRETSU)	A dummy variable equal to 1 for Keiretsu firms and 0 for non-Keiretsu firms
	Collateral asset ratio (COLL)	Net total tangible fixed assets plus financial fixed assets/total assets
	CEO ownership (CEO)	A dummy variable equal to 1 for firms in which the CEO of the firm is the largest shareholder of the firm and 0 otherwise
	Main bank ownership (TOPFIVE)	A dummy variable equal to 1 if the main bank is one of the top five shareholders and 0 otherwise
	Main bank ownership (BANKTOP)	A dummy variable equal to 1 if the main bank is top shareholder among banks that hold stocks in the firm and 0 if not
	Main bank ownership (INTTOP)	A dummy variable equal to 1 if the main bank is top shareholder among financial institutions that hold stocks in the firm and 0 if not
	Change in main bank (CHANGE)	A dummy variable is assigned a value of 1 for firms that switched their main bank and 0 otherwise

Table 1 gives definitions of the independent variables. To conserve space descriptive statistics on the variables are available upon request from the authors.

3.3. Sample design

The initial sample encompassed all Japanese non-financial companies listed on the Tokyo Stock Exchange and Japanese OTC for the period April 1995 to March

1998. [5] The selection of the sample is restricted by the availability of parent-only financial data on DataStream. Though DataStream carries consolidated financial statements starting from 1984, it contains parent-only financial statements from fiscal year-end 1996. Furthermore, DataStream does not have parent-only financial data for firms listed on the local exchanges (which comprise less than 10 percent of all listed firms). Data for the period 1995–1997 were obtained from the Nikkei database on the borrowings of individual firms from each financial institution. It should be noted that this database contains only firms that have credit outstanding at various types of financial institutions. In all likelihood the omission of firms with no institutional debt does not cause any selection bias because the primary purpose of this study is to test for bank uniqueness via client firms' choices concerning different types of financial institutions. For the firms that have loans from financial institutions, [6] a restriction that the loan data exist through all three years of the sample period 1995–1997 is applied, such that newly listed or delisted firms during the sample period are dropped from the sample. This deletion is necessary to mitigate the potential effects of abnormal behavior of firms in financial distress or lack of information on newly listed firms. Because performance differences between matched groups are not being measured, it is unlikely that any survivorship bias is introduced. After these and other screens [7] a sample of 1225 firms was available.

Our use of parent-only financial statements [8] instead of the consolidated financial statements is justifiable in view of Japanese accounting practices. Consolidated financial statements in Japan have been published since fiscal year 1976. It is common to report the parent company-only statements with the investment in affiliated companies carried at cost on primary statements and treat the consolidated statements (based on the equity method with the 20–50 percent provisions similar to US practice) as supplementary to the parent-only statement. Notably, it is the parent-only statements that are required to meet commercial

[5] While there has been some degree of financial turmoil in Japan in the 1990s as discussed earlier, the Tankan survey (i.e., a short-term economic survey of Japanese firms) reported that the willingness of financial institutions to lend was quite strong during our sample period. By contrast, this favorable lending attitude among financial institutions diminished in late 1997 due to the failure of one of the large city banks, Hokkaido Takushoku bank. Thus, the sample period is generally representative of an active period in the credit markets.

[6] Loans outstanding were cross-checked in the Nikkei database with those of Kigyo Keiretsu Soran (various years).

[7] Additional sample screens included firms: with no loans from private financial institutions, with fiscal year end other than March (i.e., most Japanese listed firms use March), in finance, utilities, and transportation sectors, with more than 50 percent of their outstanding shares held by another firm, that report a negative book value of equity over the sample period 1995–1997 (i.e., distressed firms), listed on local exchanges (i.e., DataStream does not carry parent financial data for firms listed on these exchanges).

[8] During our testing period 1995–1997, there was discussion among policy makers to enforce stricter rules concerning consolidated financial statements as a way of improving accounting transparency of Japanese firms. A new standard on consolidated financial statements was issued in June 1997, which was based on a company's extent of control, rather than merely the percentage shareholding. All listed and unlisted companies in Japan should report their consolidated financial statements on the basis of this revised accounting standard beginning fiscal year ending March 31, 2000.

code requirements and compute income taxes (see Ballon and Tomita, 1988; Lowe, 1990).

Because the debt composition and other characteristics of firms are highly correlated with industry, as already mentioned, we implemented a matched-sample strategy. To do this we ranked all 1225 firms and sorted by the ratio of average outstanding loans from the main bank to the average total loans from all depository financial institutions [9] in the sample period 1995–1997. Firms in the top decile (i.e., high main bank borrowers) are then matched by the five-digit Nikkei industry code to firms in the bottom decile (i.e., low main bank borrowers) that have similar levels of total loans outstanding at all financial institutions. After dropping observations with outliers or missing data, 232 firms in total are identified in the main bank sample, with 116 respective firms in both the high main bank loan group and the low main bank loan group. Thus, our final sample represents about 20 percent of our initial sample of Japanese firms.

Concerning the main bank hypothesis, the most common method for identifying the main bank is to select the bank with the largest debt holding of the firm (e.g., see Aoki et al., 1994; Gibson, 1995; and others). After initially using this criterion, results were cross-checked with the Japan Company Handbook (various years), which contains financial data on all publicly listed Japanese companies. It usually lists the banks in the order of the largest balance of loans and designates the first bank in the reference list as the firm's main bank. If there is a conflict between these two main bank classification procedures, the reference books Kigyo Keiretsu Soran (various years) and *Keiretsu no Kenkyu* were used for clarification. If these references identified the same bank as shown in the Japan Company Handbook (various years) to be the main bank, this publication's designation of the main bank is used due to the fact that these references incorporate more information than debt alone to identify main banks. In the present sample of firms, the classification of main banks as defined by loan size differed in 42 out of 1225 firms from the main bank listed in the Japan Company Handbook (various years). [10]

With regard to the depository institutions hypothesis sample, the same sampling procedure as in the main bank sample was implemented, except that now firms are ranked and sorted by the ratio of loans from banks that take deposits divided by the total loans from all financial institutions, including government-affiliated financial institutions. Consequently, the final depository institution sample is comprised of 232 firms, with 116 respective firms in both the high deposit group and low deposit group.

[9] This definition of depository institutions includes city banks, long-term credit banks, trust banks, and regional banks. Though Shinkin Banks (i.e., credit cooperatives) and other special purpose or non-profit private banks take deposits, these banks are not included in deposit-taking institutions.

[10] In the sample of firms used for testing of the main bank hypothesis, three out of 232 firms had a different main bank identification according to the main bank classification by loan size versus by the main bank listed in the Japan Company Handbook (various years).

4. Empirical results

4.1. Main bank hypothesis results

Table 2 reports the empirical evidence on the main bank hypothesis. The dependent dummy variable equals either 1 or 0 (i.e., the firm belongs to the top versus bottom decile in the ranking of all eligible 1225 firms for the ratio of main bank loans to loans from all depository institutions). Estimated coefficient values (and Z-values in parentheses) for the variables are reported. Alternative models labeled (1)–(7) are run to test the robustness of the results with respect to different independent variables.

Focusing on the results for model (1) in Table 2, the statistical significance (except GROWTH) and appropriate signs of the information variables strongly support the notion that main banks have an advantage in monitoring information sensitive firms. The SIZE [11] and the market-to-book ratio (MVBV) coefficients are consistently significant (at the 0.01 level) with the anticipated sign for all model specifications. As such, smaller and high growth-oriented firms depend more heavily on the main bank for credit than on other banks. Small firms with a large proportion of value determined by future growth prospects, as opposed to assets-in-place, are much more difficult to value for investors and lenders, all else the same. It is well known that these firms are more vulnerable to agency problems (e.g., see Myers, 1977). The positive and significant R&D variable indicates that firms with high information problems resulting from intensive research and development spending are more inclined to rely on the main bank for credit financing than otherwise. The information variable AGE is a proxy for the length of the firm's relationship with a lender (see Berger and Udell, 1995; Petersen and Rajan, 1994), especially with a main bank. As shown in Table 2, the AGE coefficient is positive and significant (at least at the 0.10 level) in all models, which means that older firms tend to rely more on main banks for credit than other banks. As suggested by an anonymous referee, this finding is counterintuitive in the sense that older firms with greater reputation may well be expected to be less reliant on a main bank for credit. However, it is likely that older firms have longer duration main bank relationships that have deepened over time and resulted in greater credit usage.

[11] As noted by an anonymous referee, the share of loans from the main bank may understate its true importance for a large firm. In the case of a large loan, the main bank may invite another bank to cofinance the loan to diversify its risks. The non-main bank would join the deal because it trusts the judgment and monitoring ability of the main bank. Also, there is an implicit understanding that the main bank will participate in a future cofinancing arrangement. For small firms a single bank would handle the entire loan balance. Relatedly, our analyses do not take into consideration cases in which a firm has two main banks (e.g., large, regional firms using both a city bank and a regional bank). These observations imply a downward bias on the SIZE coefficient to the extent that cofinancing of main bank loans and multiple main banks for large firms are not taken into account. In other words the effect of SIZE is likely less negative than estimated in our regression model. Because our data sources do not identify implicit cofinancing agreements and it is difficult to discern multiple main banks, our results are biased to some extent toward finding evidence in favor of the main bank hypothesis.

Table 2
Pooled logit results for the main bank hypothesis sample

	Model						
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	9.1745	8.0427	9.8414	10.0245	13.4131	9.3066	12.3256
	(2.79)***	(2.49)**	(2.91)***	(2.65)***	(3.61)***	(2.53)**	(3.46)***
Information variables							
AGE	1.4388	1.3648	1.4912	1.1765	1.2368	1.0937	1.3912
	(2.74)***	(2.62)***	(2.81)***	(2.08)**	(2.28)**	(1.87)*	(2.93)***
GROWTH	1.7245	1.3850	1.6579	1.9936	2.3737	1.2829	0.8593
	(1.23)	(1.01)	(1.18)	(1.37)	(1.65)*	(0.89)	(0.56)
RD	0.0663	0.0647	0.0645	0.0593	0.0498	0.7540	0.0498
	(1.72)*	(1.68)*	(1.68)*	(1.46)	(1.27)	(1.85)*	(1.23)
RD Dummy		0.0762	0.0636	0.1820	0.6404	0.0647	0.7230
		(1.29)	(1.07)	(2.71)***	(1.04)	(1.08)	(1.17)
SIZE	−0.5371		−0.5838	−0.5606	−0.7209	−0.5196	−0.6061
	(−2.98)***		(−3.09)***	(−2.72)***	(−3.61)***	(−2.73)***	(−3.18)***
LNTA		−0.4768					
		(−2.61)***					
MVBV	0.2530	0.2544	0.2494	0.3121	0.2190	0.2439	0.2564
	(2.97)***	(2.95)***	(2.96)***	(3.34)***	(2.54)**	(2.8)***	(2.89)***
Risk variables							
TRADE	−0.1180	−0.1336	−0.1184	−0.1455	−0.1206	−0.1189	−0.1338
	(−2.57)***	(−2.90)***	(−2.6)***	(−2.96)**	(−2.56)***	(−2.63)***	(−2.77)***
MKTLV	0.7150	0.8910	0.6527	1.7962	0.5834	0.8052	0.2557
	(0.74)	(0.37)	(0.67)	(1.72)*	(0.61)	(0.83)	(0.25)
COVERAGE	−0.0030	−0.0040	−0.0030	−0.0070	−0.0040	−0.0060	−0.0090
	(−0.41)	(−1.51)	(−0.30)	(−0.79)	(−0.48)	(−0.68)	(−1.08)
ROS	−2.4850		−2.7139	−2.8268	−2.4200	−0.7090	−3.9700
	(−0.96)		(−1.04)	(−1.05)	(−0.92)	(−0.26)	(−1.16)
ROA		−2.7422					
		(−0.85)					
CASH	0.904	1.031	0.8041	1.013	0.993	0.9726	0.846
	(2.49)**	(2.87)***	(2.13)**	(2.6)***	(2.67)***	(2.62)***	(2.19)**
Control variables							
COLL	1.9772	2.3690	1.8526	3.1790	2.3672	1.6185	0.6171
	(1.96)**	(2.34)**	(1.81)*	(2.89)***	(2.28)**	(1.53)	(0.55)
CEO					−1.1398		
					(−2.84)***		
KEIRETSU				0.9099			
				(2.47)**			
BOND			1.1180				
			(0.89)				
CHANGE							−2.9175
							(−5.32)***
TOPFIVE						0.2819	
						(0.74)	
BANKTOP						1.4746	
						(2.81)***	
INTTOP						−0.1207	
						(−0.28)	

Table 2 (*continued*)

	Model						
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MAJOR	−2.2000	−1.9100	−2.0275	−2.0499	−2.3655	−2.2817	−2.0110
	(3.34)***	(−2.86)***	(−3.02)***	(−2.83)**	(−3.04)***	(−3.09)***	(−2.94)***
NUMBANK	−0.7300	−0.8190	−0.8285	−0.9483	−0.8571	−0.8403	−0.8200
	(−11.4)***	(−10.8)***	(−10.97)***	(−10.5)***	(−10.2)***	(−10.60)***	(−11.00)***
INDUM1	4.5641	4.5043	4.6139	4.7717	5.0446	4.4128	5.5641
	(4.58)***	(4.59)***	(4.61)***	(4.65)***	(4.19)***	(4.12)***	(5.33)***
INDUM2	1.4560	1.2996	1.4750	1.4137	1.7002	1.2596	1.7906
	(3.0)***	(2.73)***	(3.05)***	(2.76)***	(3.45)***	(2.60)***	(3.44)***
INDUM3	−0.8123	−0.9690	−0.7228	−1.3603	−1.0851	−0.8544	−0.3704
	(−1.36)	(−1.56)	(−1.19)	(−2.11)**	(−1.77)*	(−1.34)	(−0.58)
INDUM4	−0.4248	−0.4804	−0.4068	−0.6478	−0.5593	−0.3784	−0.5730
	(−0.80)	(−0.91)	(−0.78)	(−1.14)	(−1.06)	(0.69)	(−1.05)
LRχ^2	627.30	647.03	650.21	679.91	657.89	665.04	684.42
P(χ^2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
McFadden Pseudo R^2	0.6539	0.6710	0.6739	0.7047	0.6819	0.6893	0.7093

The dependent dummy variable equals 1 if the firm belongs to the top decile (in the rank order of all eligible 1225 firms by the size of the ratio of loans from a main bank to all other deposit-taking institutions) and is 0 if the firm belongs to the bottom decile (for the industry matched firms with low ratios of main bank loans). The table gives estimated coefficient values (and Z values in parentheses) of the variables. The information variables include log(age), sales growth, R&D, size, and market-to-book ratio. The risk variables include trade leverage, financial leverage, interest coverage, return on sales, and cash equivalent/current liabilities ratio. Industry dummies are employed to control industrial influence on the risk and information variables. The RD dummy variable is 1 for firms with R&D expenses and 0 for firms with missing data. If this variable is significant, the results for RD are influenced by missing data (see Himmelberg et al., 1999).

Asterisk indicates that the estimated coefficient is significantly different from zero at the following levels: * – 0.10, ** – 0.05, and *** – 0.01.

The results concerning the risk characteristics reveal that main banks tend to supply loans to information sensitive firms without exposing themselves to additional risk. Most of the risk variables (MKTLV, COVERAGE, and ROS) are statistically significant. The negative and significant (at the 0.01 level) TRADE coefficient indicates that the main bank offers less credit to firms that acquire funds via extension of credit liabilities to trading partners than to other firms. The positive and significant (at least at the 0.05 level) CASH coefficient across all models suggests that main banks impose higher cash balance requirements on information sensitive firms than other firms.

Some of the control variable results are worth discussion. Both NUMBANK and MAJOR have negative and significant (at the 0.01 level) coefficients in all models. These findings suggest that, if a firm has borrowing relationships with fewer banks or has fewer choices for the main bank, its reliance on the main bank for private credit is higher. These results also support the main bank hypothesis. The fewer the number of major banks (negative MAJOR), along with smaller number of banks

in borrowing relationships (negative NUMBANK), the more likely that the main bank has access to comprehensive information about the client firm's flow of funds.

We next summarize the results for models (2)–(7) in Table 2. Model (2) tests the effect of using sales revenue to measure size and profitability by substituting log total assets (LNTA) and return on assets (ROA) for log sales (SIZE) and return on sales (ROS), respectively. The introduction of LNTA and ROA does not change the results for the information and risk variables. Model (3) considers the effect of a firm's access to the public debt market on the results, but there is no apparent effect of bond issuance in terms of the information and risk variables.

Model (4) takes into account the effect of Keiretsu on the results. The positive and significant (at the 0.05 level) Keiretsu variable coefficient in model (4) suggests that Keiretsu affiliated firms have a higher probability of being in the high main bank dependent group than otherwise. This result is consistent with the general belief that the main bank, as a delegated monitor in the Keiretsu group as well as among financial institutions, has a special responsibility for monitoring firms affiliated with Keiretsu and usually holds the largest credit exposure among different financial institutions.

Model (5) tests for the effect of the CEO variable on our results. Managers' equity ownership reduces moral hazard problems by aligning managerial and shareholder interests. Consequently, manager–owner firms are subject to lower agency costs of debt and are less inclined to benefit from monitoring services on the part of banks. Following this line of reasoning, firms operated by shareholder managers may decrease their usage of bank loans relative to market debt. The negative and significant (at the 0.01 level) CEO coefficient in model (5) reveals that firms in which the CEO of the firm has the largest share ownership of the firm tend to rely less on the main bank to supply credit, which implies that these firms require less rigorous monitoring by the main bank.

Model (6) reports the results after adding variables related to ownership concentration. The main bank is usually a major shareholder and the largest supplier of private credit to client firms (e.g., see Morck and Nakamura, 1999; Kang and Shivdasani, 1999). Relevant to the present study, main bank equity ownership of the client firm can alter the main bank's attitude toward the client firm's risk taking. As Stiglitz (1985) has observed, bank ownership of equity in firms with credit outstanding from the same bank tends to mitigate conservative lending attitudes. If this is true, the finding of a high association between risky firms and main bank credit usage can be attributed to the main bank's shareholding to the client firm. A variety of dummy variables are added in model (6) to capture this potential main bank shareholder effect, including the relative size of main bank shareholding to outstanding shares (TOPFIVE [12]), relative size of shareholding among banks (BANKTOP [13]), and relative size of share-

[12] The dummy variable is set to 1 if the main bank is one of the top five shareholders and 0 otherwise.

[13] A dummy variable is set to 1 if the main bank is top shareholder among banks that hold stocks in the firm and 0 if not.

holding among all financial institutions (INTTOP [14]). Of these variables only BANKTOP is significant (at the 0.01 level). Thus, contrary to expectations, main bank ownership of client firms' shares does not appear to be a factor in predicting firms' dependence on loans from the main bank.

Model (7) in Table 2 controls for the strength of the main bank relationship with client firms over time. In Japan it is unusual to observe a change in the main bank by a firm, especially among exchange-listed firms. Generally speaking, firms that change the main bank are usually small and rapidly growing firms. To control for the possible effect of frequent changes in the main bank, all firms that switch their main bank in the previous six years are identified. A dummy variable is assigned a value of 1 for firms that switched their main bank and 0 otherwise. The variable coefficient is negative and statistically significant (at the 0.01 level), which indicates that the strength of the relationship is a factor in predicting firms' dependence on loans from the main bank.

Overall, the information and risk variables are consistently significant with the anticipated sign even after taking into account a number of factors, such as Keiretsu affiliation and the main bank stock ownership, that could influence borrowers' banking preferences. Supporting the main bank hypothesis, the empirical evidence indicates that information sensitive firms tend to seek a relationship with a main bank. Under the assumption that all lenders are not the same due to specialization within the private market, the finding of information sensitive firms' association with monitored debt (i.e., loans from the main bank) is consistent with the credit market hierarchy hypothesis.

4.2. Deposit-taking hypothesis results

Table 3 reports the pooled logit regression results for the depository institution hypothesis. Again, the dependent dummy variable equals 1 (0) if the firm belongs to the top (bottom) decile among all eligible firms ranked by the size of the ratio of loans from deposit-taking institutions to loans from all financial institutions. Estimated coefficient values (and Z-values in parentheses) for the variables are shown. As before, alternative models are run to check the robustness of the results.

In general, based on the results reported for models (1)–(3), the information variables are not significant, with the exception of the size variable, which is negative and significant (at the 0.01 level) for all models. By contrast, many of the risk variables are statistically significant. The trade leverage (TRADE) coefficient is positive and significant (at the 0.01 level) for all models, which implies that firms with higher short-term liquidity needs are more likely to have higher proportions of loans from the deposit-taking institutions. The positive and significant (at the 0.01 level) coefficient for the ratio of cash or cash equivalent assets to current assets (CASH) further

[14] A dummy variable is set to 1 if the main bank is top shareholder among financial institutions that hold stocks in the firm and 0 if not.

Table 3
Pooled logit results for the depository institution hypothesis sample

	Model						
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept	12.0126	11.1568	8.3893	11.5726	10.9314	14.4733	15.8227
	(4.33)***	(4.01)***	(3.07)***	(3.88)***	(3.92)***	(4.93)***	(4.92)***
Information variables							
AGE	0.5441	0.5441	0.5543	0.5424	0.6144	0.0280	0.0173
	(1.46)	(1.46)	(1.52)	(1.46)	(1.62)	(0.07)	(0.04)
GROWTH	0.5131	0.4953	0.5436	0.4968	0.4577	0.7304	0.7741
	(1.23)	(1.20)	(1.33)	(1.19)	(1.10)	(1.68)*	(1.74)*
RD	−4.5913	−4.5341	−4.3434	−4.6859	−4.2757	−4.5528	−3.9315
	(−0.96)	(−0.95)	(−0.92)	(−0.98)	(−0.89)	(−0.89)	(−0.78)
RD dummy	0.6767	0.6706	0.6221	0.6633	0.6972	0.5662	0.5866
	(2.67)***	(2.65)***	(2.48)**	(2.61)***	(2. 74)***	(2.19)**	(2.23)**
SIZE	−0.7115	−0.6798		−0.7004	−0.6730	−0.7500	−0.7869
	(−5.51)***	(−5.34)***		(−5.07)***	(−5. 27)***	(−5.76)***	(−5.49)***
LNTA			−0.5442				
			(−4.16)***				
MVBV	−0.0180	−0.0190	−0.0132	−0.0206	−0.0125	−0.0345	−0.0145
	(−0.31)	(−0.33)	(−0.23)	(−0.36)	(−0.22)	(−0.55)	(−0.24)
Risk variables							
TRADE	0.6314	0.6052	0.5790	0.6113	0.6003	0.6612	0.6940
	(3.16)***	(3.06)***	(2.89)***	(3.09)***	(2.99)***	(3.31)***	(3.27)***
BKLV	−0.2846						
	(−0.42)						
MKTLV		0.2741	0.5056	0.1707	0.2387	0.6678	0.6063
		(0.39)	(0.72)	(0.23)	(0.34)	(0.92)	(0.77)
COVERAGE	0.0001	0.0004	0.0007	0.0006	0.0008	0.0010	0.0028
	(0.02)	(0.15)	(0.24)	(0.21)	(0.27)	(0.35)	(0.93)
ROS	−7.9791	−7.5214		−7.5558	−7.4300	−7.6609	−7.6033
	(−3.01)***	(−2.86)***		(−2.88)***	(−2.81)***	(−2.81)***	(−2.66)***
ROA			−7.6310				
			(−2.68)***				
CASH	0.6503	0.7209	0.8184	0.6790	0.6655	0.8659	0.7060
	(2.75)***	(3.11)***	(3.56)***	(2.66)***	(2.85)***	(3.64)***	(2.66)***
Control variables							
COLL	−3.1873	−2.9777	−2.2906	−3.0902	−3.1056	−2.7528	−3.0276
	(−4.06)***	(−3.9)***	(−3.21)***	(−3.8)***	(−4.01)***	(−3.57)***	(−3.53)***
CEO						−1.2990	−1.8807
						(−4.55)***	(−5.64)***
KEIRETSU					−0.2889		−0.7481
					(−1.28)		(−2.77)***
BOND				0.3090			0.3596
				(0.39)			(0.43)
AFFL							−0.5224
							(−1.82)*
NUMINT	−0.1100	−0.1123	−0.1110	−0.1107	−0.1100	−0.1187	−1.1142
	(−3.99)***	(−4.05)***	(−4.03)***	(−3.96)***	(−3.96)***	(−4.08)***	(−3.79)***

Table 3 (*continued*)

	Model						
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TOTLOAN	−0.0001	−0.0001	−0.0001	−0.0001	−0.0001	−0.0001	−0.0001
	(−3.33)***	(−3.54)***	(−3.67)***	(−3.43)***	(−3.49)***	(−3.6)***	(−3.50)***
INDUM1	0.9072	0.9174	0.9213	0.9158	0.9329	0.7401	0.6909
	(2.32)**	(2.34)**	(2.36)**	(2.34)**	(2.38)**	(1.86)*	(1.70)*
INDUM2	0.0641	0.0852	−0.1659	0.0265	−0.0421	0.2282	0.1176
	(0.17)	(0.02)	(−0.45)	(0.07)	(−0.11)	(0.60)	(0.30)
	0.4380	0.4334	0.4124	0.4737	0.3982	0.2501	0.0419
	(0.58)	(0.58)	(0.56)	(0.62)	(0.52)	(0.35)	(0.057)
INDUM4	−0.3907	−0.3752	−0.3766	−0.3734	−0.3488	−0.5219	−0.5914
	(−1.07)	(−1.03)	(−1.03)	(−1.02)	(−0.96)	(−1.35)	(−1.50)
LRχ^2	366.29	366.27	354.16	366.42	367.91	387.80	403.06
P(χ^2)	0.000	0.000	0.000	0.000	0.000	0.000	0.000
McFadden Pseudo R^2	0.3796	0.3796	0.3671	0.3798	0.3813	0.4019	0.4177

The dependent variable equals 1 if the firm belong to the top decile (in the rank order of all eligible 1225 firms by the size of the ratio of loans from deposit-taking banks to total loans from financial institutions) and equals 0 if the firm belongs to the bottom decile (for the industry matched firms with low ratios of loans from deposit-taking banks). The table gives the estimated coefficient values (and Z values in parentheses) for the variables. The information variables include log(age), sales growth, R&D, size, and market-to-book ratio. The risk variables include trade leverage, financial leverage, interest coverage, return on sales, and cash equivalent/current liabilities ratio. Industry dummies are employed to control industrial influence on the risk and information variables. The RD dummy variable is 1 for firms with R&D expenses and 0 for firms with missing data. If this variable is significant, the results for RD are influenced by missing data (see Himmelberg et al., 1999).

Asterisk indicates that the estimated coefficient is significantly different from zero at the following levels: * – 0.10, ** – 0.05, and *** – 0.01.

supports higher short-term liquidity needs for firms seeking credit from depository institutions.

Reviewing the results for other risk variables, the negative and significant (at the 0.01 level) coefficients for the profit variables (i.e., ROS and ROA) indicate that firms with lower profitability have higher proportions of loans from depository institutions than otherwise. The higher credit risk preference of depository institutions is strengthened by the negative and significant (at the 0.01 level) coefficient for the ratio of collateralizable assets to total assets (COLL). Given that Japanese banks usually require collateral for lending, the negative relationship between the ratio of loans from depository institutions to total loans and the collateral ratio is strong evidence that these institutions take higher credit risks than others. The estimated coefficients for both the number of financial institutions in a borrowing relationship with the firm (NUMINT) and total loans from all financial institutions (TOTLOAN) are negative and significant (at the 0.01 level) in all models in Table 3, which means that as credit supply competition and the size of financial institutions' loans increase, firms increase their reliance on non-depository institutions, especially insurance companies.

Model (4) tests whether firms that have access to the public debt market (BOND) have any difference in their preference for credit services from depository institutions. The insignificance of BOND reveals that access to the public market is not important across deposit types.

Model (5) reports the regression results after controlling for the possible influence of Keiretsu affiliation on the firm's choice of credit supplier type. The negative but insignificant estimated coefficient for the Keiretsu variable indicates this factor did not influence whether firms obtained loans from depository versus non-depository institutions.

Model (6) reveals a negative and significant (at the 0.01 level) CEO ownership coefficient estimate, which supports the notion that owner–managers have a lower preference for credit from depository institutions than other institutions.

Model (7) gives the results after controlling for firms' access to the Keiretsu affiliation, public debt market, CEO ownership of firms, and corporate affiliation [15] of the firm. However, these factors do not change the signs or significance of the information and risk variables, with the exception that the Keiretsu dummy variable coefficient estimate is now significant and negative in sign.

To summarize, contrary to the depository institution hypothesis, the information variables (with the exception of size) are not significantly different between firms borrowing primarily from depository versus non-depository institutions. This finding is consistent with Carey, Post, and Sharpe, who found that the lending behavior of both banks and finance companies is similar with respect to the informational dimension of borrowing firms. Consistent negative and significant results for the number of depository institution relationships and total loans from depository institutions in the regression analyses suggest that, while large and less risky firms preferred non-depository credit, small and more risky firms preferred depository institutions for credit funds. It is likely that the association of relatively risky firms with depository institutions in Japan is due to a lack of financial institutions there that serve the lowest credit market hierarchy comparable to finance companies in the US. Thus, in bank-centered financial system such as Japan, relatively risky firms are forced to rely upon depository institutions for their credit needs. We should add the caveat that, since our sample contains only listed firms, the definition of risky firms in this context excludes small, unlisted firms. More generally, the scope of our empirical findings is limited to listed Japanese firms.

5. Conclusion

This paper provided a number of empirical tests on the existence of a credit market hierarchy in Japan. Unlike previous tests of this hypothesis, we use detailed

[15] If more than 20 percent but less than 50 percent of a firm's shares are held by another company, then this firm is an affiliated firm and assigned a value of 1 for the dummy variable and 0 otherwise. Firms with more than 50 percent of their shares held by another company are considered a subsidiary and were dropped from the initial sample of 1225 firms.

credit records of individual Japanese firms for the period 1995–1997. We test two information-based hypotheses: (1) the main bank hypothesis, and (2) the depository institution hypothesis. The main bank hypothesis examines the association between client firms' information and risk characteristics and the concentration of loans obtained from main banks versus non-main banks. The depository institution hypothesis broadens the empirical analysis to investigate the concentration of loans obtained from depository institutions versus non-depository financial institutions. In effect, these credit categories allow us to examine differences between relationship lending versus arms-length lending among different types of financial institutions. Consistent with a credit market hierarchy, we anticipated that firms with information problems would seek larger quantities of debt from institutions that can better monitor their credit quality and provide relationship loans than other financial institutions.

Our results with respect to the main bank hypothesis indicated that firms with information problems were more likely to carry higher proportions of loans from main banks than non-main banks during the sample period 1995–1997, holding constant risk and control factors. However, the results did not reveal any significant differences in risk characteristics between firms with high versus low amounts of credit outstanding with their respective main banks. These findings suggest that the main bank does inherently have an advantage in acquiring information about client firms and providing relationship loans relative to other banks. Turning to the depository institution hypothesis, the information variables (with the exception of size) are not significantly different between firms borrowing primarily from depository versus non-depository institutions. Furthermore, we found that small and high risk firms tended to prefer depository institutions for loans. We interpret these findings to imply that deposit-taking itself is not a sufficient condition to become a relationship lender to firms with information problems. These findings are consistent with Carey et al., who compared borrowers in finance companies versus banks. Robustness tests of these two research hypotheses tended to confirm our results. Thus, we conclude that our evidence supports the credit market hierarchy hypothesis for Japanese main banks in particular but not depository institutions in general.

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