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The impact of capital market competition on relationship banking: Evidence from the Japanese experience

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ABSTRACT

Disagreement exists about the potential effects of changes in competition on relationship lending. Boot and Thakor (2000) predict that an increase in capital market competition should lead to a reduction in relationship lending; however, Dinç (2000) predicts that greater capital market competition should increase relationship lending. Thus far, data limitations have precluded empirical tests of these competing hypotheses. In this study, we use a unique data set drawn from the deregulation of the Japanese financial system. Our findings show that increased capital market competition is associated with reduced relationship lending. However, the effect differs according to the maturity of the loans; increased capital market competition is associated with reduced long-term, but greater short-term, relationship lending.

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1. Introduction

Relationship banking is frequently the focus of recent literature on financial intermediation (Boot, 2000). This literature often discusses how banks can develop close relationships with their borrowers to overcome the fundamental problem of asymmetric information in the credit market. In recent years, however, the role of banks in the credit process has diminished due to the reduction in the marginal cost of information and in the ratio of private to public information. At the same time, dramatic increases in competition from the capital market have altered the relationship between banks and their borrowers.

These changes raise a number of important questions about financial intermediation. This paper focuses on two primary questions: (i) do the bank's commitments to relationship lending diminish when competition from the capital market intensifies? and (ii) does the maturity of relationship lending (*short-term* versus *long-term*) matter? These two questions become increasingly important since significant changes have occurred in capital market competition (Boot and Thakor, 2000). Moreover, existing literature offers conflicting predictions on the effects of this increased competition.

Boot and Thakor (2000) predict that increases in capital market competition for bank loans will lead to a reduction in relationship lending. Their underlying premises are: (i) commercial banks will engage in both relationship and transaction lending; and (ii) these banks will substitute one for the other based upon a variety of factors including technology, competition,

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regulation, and relative profitability. While relationship lending is more valuable to the borrower than transaction lending, it is more expensive for the bank, since the bank must develop the sector-specialized expertise that is necessary to become a relationship lender. Following this argument, commercial banks may be expected to reduce their fund allocation to relationship lending and shift to transaction lending as they face increased competition from the capital market. Boot and Thakor (2000) also suggest that an increase in interbank competition will diminish the profitability of transaction lending more than relationship lending, thereby inducing banks to shift from transaction to relationship lending.

In contrast, Dinç (2000) argues that a bank's commitment to relationship lending depends upon how such lending affects its reputation. Increased competition from the capital market will strengthen the bank's incentive to maintain a good reputation, thus leading to an increase in relationship lending. But Dinç agrees with Boot and Thakor (2000) in that increased interbank competition will not lead to a decline in relationship lending because it reduces the profitability of transaction lending more than that of relationship lending.

Several studies also focus on the link between the degree of competition and the importance of relationship lending. For example, Yafeh and Yosha (2001) argue that an increase in competition leads to more relationship loans for multi-product banks. Dell'Ariccia and Marquez (2003) argue that banks may substitute relationship loans for transaction loans as a response to more interbank competition. Degryse and Ongena (2005) use Belgian data to examine the effects of greater interbank competition on relationship loans, even though the effects of capital market competition is not the focus their study. While our paper focuses primarily on the effects of changes in capital market competition, we also consider the effects of change in interbank competition.

The deregulation of the Japanese financial system provides an excellent laboratory to test the competing predictions of Boot and Thakor (2000) and Dinç (2000); both predictions focus on the effects of increased capital market competition on relationship lending. During the 25-year time frame of our analysis, the extent of the capital market competition has increased dramatically. These changes allow us to measure the impact of increased competition on relationship lending and provide empirical data by which we can reasonably isolate the differential effects of increased capital market competition from the effects of increased interbank competition.

Our 25-year study period is divided into four subperiods based upon the degree of capital market competition. These subperiods are primarily based upon the evolving deregulation of the Japanese financial markets. Period 1 (1978–1984) signifies a period of bank domination; Period 2 (1985–1990) is characterized by expanding capital market financing; Period 3 (1991–1997) represents a period of a more openly competitive financial system that has restrictions; and Period 4 (1998–2002) characterizes an almost complete abolishment of the barriers to the capital market. Our findings show that increased capital market competition is associated with reduced relationship lending. However, the effect differs according to the maturity of the loans. In general, increased capital market competition is associated with reduced long-term, but greater short-term, relationship lending. This suggests that commercial banks tend to switch from long- to short-term lending in response to greater competition from the capital market. This finding is not surprising given that the deregulation of the Japanese financial sector provides corporate borrowers with increased access to bond market financing. We also find that increases in interbank competition, following intensifying capital market competition, are generally associated with increases in short-term relationship lending.

The remainder of this study is organized in the following manner. Section 2 discusses relationship banking in greater detail. Section 3 describes how the Japanese financial system evolved over the four subperiods and introduces our hypothesis. This section also details the empirical model, the sample selection, and other variables of interest. Section 4 reports our empirical findings and the results of robustness checks. Section 5 concludes the paper.

2. Relationship banking and the main bank

2.1. Relationship banking

Boot (2000) defines relationship banking as "the provisions of financial services by a financial intermediary that: (i) invests in obtaining customer specific information, often proprietary in nature; and (ii) evaluates the profitability of these investments through multiple interactions with the same customer over time and/or across products." In contrast to the key dimensions of proprietary information and the multiple interactions of relationship banking, transaction banking involves either a single transaction (generally a loan) between a lender and a borrower or a series of identical transactions.[1]

Relationship lending involves several aspects: (i) flexibility and discretion that facilitate implicit long-term contracting; (ii) extensive covenants that mitigate potential conflicts of interest; (iii) facilitating the monitoring of collateral by the lender; and (iv) funding short-term unprofitable loans that may be profitable in the long-term (e.g., Boot, 2000). While these functions (specialization, monitoring, screening, and certification) are associated with lending relationships and produce numerous benefits to both borrowers and lenders, relationship banking also has potential costs.

In particular, relationship banking has two important potential costs. The first is the lender's unwillingness to enforce the loan contract terms due to the long-term relationship between the borrower and the lender; this is known as the soft-budget constraint problem. Peek and Rosengren (2005) document evidence that, with implicit permission from the regulatory

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[1] According to Dewenter and Hess (2003), in former English colonies, transactional banks could be distinguished from relationship banks by their short-term loans, limited involvement in borrowers' management, and reluctance to re-negotiate problem loans.

authorities, Japanese banks had incentives to evergreen their loans to weak clients to hide their deteriorating balance sheet during the 1994–1998 period. They argue that providing life support to client firms with poor financial conditions further weakens the viability of Japanese banks, and results in excessive risk taking by the borrower; they further argue that this behavior subsequently leads to an excessive credit risk for the lender. Dewenter and Hess (2003) differentiate relationship banking from transactional banking by examining write-off behavior; they find that relationship banks have lower ratios of provisions and write-offs of non-performing loans. They conclude that transactional and relationship banks have different loan loss provision and write-off practices. They also conclude that this difference is driven by the equity held by relationship banks in their borrowers, not because these banks have superior information on their borrowers.

The second potential problem is generally referred to as the "hold-up problem." When evaluating relationship lending, concentrated lending by a single lender is usually an indication of a strong bank-firm relationship. The wider scope of the business and the higher level of mutual commitment that is driven by strong relationships also allow the lending bank to possess monopolistic information on the borrowers. This informational monopoly may reduce the willingness of borrowers, especially growth-oriented firms, to seek multiple bank relationships or to access the public debt market as a means of mitigating the potential hold-up problem (e.g., Deng et al., 2011; Detragiache et al., 2000; Houston and James, 1996; Rajan, 1992; and Sharpe, 1990). Gambini and Zazzaro (2010) report that relationship lending hampers the efforts of small firms to increase their size, while it mitigates the negative growth of troubled, medium–large enterprises.

Extensive prior research provides empirical evidence on various aspects of relationship banking. One major focus of this literature relates to the link between the benefits of relationship banking (in terms of loan price and credit availability) and the strength of the banking relationship (represented by the duration of relationship and the number of banks) (Berger and Udell, 1995; and Petersen and Rajan, 1994). While Petersen and Rajan (1994) do not document a significant influence of bank-borrower relationships on loan pricing for small firms in the U.S. Small Business Administration survey database, Berger and Udell (1995) find that the price of credit is negatively related to the length of a firm's relationship with its lender. Nevertheless, they all agree that the availability of credit for small firms is based upon the duration of the relationship. As continuous and repeated activities of ex-ante information gathering and ex-post monitoring on the borrower mitigate informational asymmetries over time, banks become more confident in evaluating loan applications and in monitoring borrowers; this results in a positive link between credit availability and the length of a banking relationship. Thus, these authors concur that the strength of the relationship, as proxied by the length of the lending relationship, plays a critical role in the availability of credit; however, it does not play such a role in the price of credit.

Most theoretical and empirical literature dealing with relationship banking assumes the homogeneity of the banking relationship (Boot, 2000). However, in their studies of relationship banking in Germany, Elsas and Krahnen (2001), Machauer and Weber (1998), and Allen and Gale (1995), differentiate hausbank relationships from normal (transaction) bank relationships. They observe long-term commitment-based lending behavior from the credit policies of hausbanks. Effectively, these hausbanks provide their borrowers with liquidity insurance in the event of deteriorations in borrower ratings. Even in the environment of multiple banking relationships, hausbanks co-exist with normal banks that provide corporate borrowers with transaction banking needs. Specifically, to examine the effects of lending relationships on borrower's costs and collateral requirements, Harhoff and Körting (1998) contend that hausbanks can be considered to be relationship banks since they offer information dominance, a duration of relationship, credit concentration, and insurance against financial distress.

2.2. The main bank as a relationship bank

The Japanese credit market provides client-bank relationships that are similar to those in Germany. As with the German hausbanks, the main banks in Japan are considered to be relationship banks.[2] Accordingly, we will consider any loan exposure to the main bank to be relationship loans, and we will consider all loans from other financial institutions to be transaction loans. Elsas (2005) confirms that the main bank can also be the relationship bank. To determine the characteristics of relationship banks, Elsas (2005) examines hausbanks and demonstrates that several factors determine whether a bank offers relationship banking. He reports that the most important factor in determining whether a bank qualifies for hausbank status is the bank's share of the borrower's total debt financing. He also identifies the hausbanks' information dominance and its influence on borrower management as critical ingredients, but he fails to document the banking duration as a factor for relationship banks. Thus, we expect that the main banks will be the dominant information collector and monitor in *de facto* lending syndications (information monopoly). In fact, the main banks have access to privileged information: (i) by maintaining settlement accounts of the borrowing firms as the largest lender for client firms; and (ii) by placing their officers on the boards of these client firms as major shareholders. Other financial institutions, who have limited amounts of information, will generally delegate these monitoring functions to the main bank (implicit insurance) (e.g., Aoki, 1994; Aoki et al., 1994; Burgstaller and Scharler, 2010; Campbell and Hamao, 1994; Gibson, 1995; and Sheard, 1989).

Another critical aspect of the Japanese main bank relationship is the risk-sharing between the main banks and client firms. When a client firm is in financial or managerial distress, the main bank will step in and make a decision on whether to offer financial assistance; this type of assistance is generally a characteristic of relationship lenders. Thus, by defining the main bank's

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[2] In this paper, the "main bank" is the major creditor of a firm that maintains a special relationship with the client firm and performs functions as the main monitor. This approach to identifying the main bank is consistent with Campbell and Hamao (1994); Aoki et al. (1994); Peek and Rosengren (2005); Sheard (1989); and Gibson (1995).

loans as relationship loans, compared to transactional loans, we are considering the two characteristics of relationship lending: information monopoly and implicit insurance.

3. Development of the Japanese financial system and testable hypotheses

3.1. Regulatory changes over capital market access by Japanese firms

To test the conflicting predictions by Boot and Thakor (2000) and Dinç (2000), we will partition the Japanese data into four time periods. These time periods are based upon the regulatory changes over the access to the capital market by Japanese firms.[3] Table 1 presents a chronological development of these regulatory changes. In the first part of our analysis, from 1978 to 1984, Japanese commercial banks faced virtually no competition from the capital market and very limited competition from other commercial banks, either domestic or foreign. The financial system was highly regulated, so savers had little choice but to channel their funds into commercial banks. The deposit interest rates were strictly controlled, thereby limiting interbank deposit competition, and bank lending was segmented into different maturities. Bank lenders also faced little competition from the capital markets due to legal restrictions on the ability of potential borrowers to access the public debt market for capital.

Until 1979, Japanese companies could not issue unsecured debt, and severe restrictions controlled their issuance of secured debt (e.g., Anderson and Makhija, 1999; Frankel and Morgan, 1992; Suzuki, 1987; and Weinstein and Yafeh, 1998). We characterize the first period, fiscal year 1978–1984, as a bank-dominated financial system.

However, beginning in the mid-1980s, Japanese capital markets were substantially deregulated. This deregulation significantly expanded the ability of Japanese firms to access the corporate bond market; thus, it increased competition for bank loans. Two of the most important developments were the deregulation of interest rates and the change in corporate financing patterns. The deregulation of short-term interest rates created an important impetus for the rapid growth of the short-term money market based on gensaki REPOs and commercial paper. Non-financial Japanese corporations were first allowed to issue commercial papers in 1987. Moreover, beginning in the mid-1980s, Japanese firms were allowed to issue unsecured straight corporate bonds on domestic and international markets. As large corporations became less dependent on banks for their financing, Japanese banks faced growing interbank competition as well as capital market competition. City banks began to compete with regional banks, since they wanted to develop business relationships with small- and medium-sized corporations (Frankel and Morgan, 1992). For the first time, Japanese firms had flexibility in their financing decisions. It is not possible to create a precise time table explaining the deregulation trends in the Japanese financial markets. However, the period from 1985 to 1990 served as a transition period from a bank-dominated financial system to a more open and competitive financial system. Although restrictions on firm financing and interbank competition were relaxed during this period, Japanese firms still faced stringent regulatory criteria for issuing secured convertible and straight bonds.

In the third period of our analysis, from 1991 to 1997, corporate borrowers had even more financing alternatives, encompassing both corporate debt and equity markets. In November 1990, the accounting criteria for bond issuance were reduced, even though firms were still subject to credit rating restrictions. To issue unsecured convertible bonds domestically, a firm had to carry at least a rating of investment grade. This self-registration of bond issuance was allowed in 1995. However, the issuing criteria for corporate bonds were abolished in 1996; this allowed even non-investment grade companies to issue bonds domestically. Moreover, deposit rate ceilings were deregulated to encourage more intense interbank deposit competition among commercial banks.

During this period, Japanese firms had noticeably greater access to the corporate bond market, which served as a source of debt financing and replaced long-term loans from financial institutions. Hoshi and Kashyap (1999) consider this development to be a consequence of the Japanese banking crisis, and predict that Japanese firms' borrowing patterns are moving toward the United States' model. Furthermore, turbulent financial markets and weak macroeconomic conditions increased the uncertainty level in the credit markets, which may have further enhanced the importance of relationship lending.

In 1996, Japan announced the "Big-Bang" financial market deregulation, which represents the final step in the deregulation that started earlier in the 1970s. With this final reform, Japan's financial system became similar to that of the United States. Under this deregulated framework, banks are allowed to participate in fee-generating businesses including loan commitments. In addition, banks, insurance companies, and securities dealers are able to directly compete against each other; and barriers that had previously kept investment banking and commercial banking separate were abolished. In November 1996, the government completely removed all bond issuance restrictions, which had been the primary barrier to free access to the bond market for firms below a certain quality level. This leads us to the fourth period, from 1998 to 2002, which is an open financial system.

To confirm the reasonableness of dividing the study period into four different time periods, we have applied a switching regression approach. First, we perform a likelihood ratio test to identify switches during our study period, then we validate the four periods using the correlation coefficients that are generated by switching regressions. Although not reported in the paper, the

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[3] Due to the long testing period (twenty-five years), asymmetric relationship banking practices across time periods could influence reliable examination of a link between competition and relationship loan exposures. Perceptually, the deregulation of financial markets (including both the money market and the bond market) could have hurt relationship banking, while the long recession after collapse of the "bubble" and subsequent increased credit risk could enforce relationship banking. Nam (2004) cites various survey reports regarding the main bank relationship, presents evidence that shows no apparent significant change in main bank relationships between 1980–1998 in terms of exposure to main bank loans, shareholding by main banks, representation to client firms' board, and other business such as debenture issuance.

Table 1
Deregulation of money and corporate bond markets.

Year	Regulatory changes
1977	A formal corporate rating system was introduced
1979	Unsecured straight bonds and unsecured convertible bonds were permitted
1980	Amendment of the Foreign Exchange and Trade Control Act
1981	Warrant bonds were introduced
1983	Eligibility standards for issuing unsecured convertible bonds relaxed
1985	First unsecured straight corporate bonds were issued; Bond futures market was introduced; Introduction of money market certificates; Introduction of Yen-dominated bankers' acceptance
1988	Domestic issue of commercial papers was authorized for Japanese corporations
1989	Rating criteria for bond issuance were added
1990	Accounting criteria for bond issuance removed
1992	Bond issuance restrictions eased; A firm with a BB rating or higher can issue bonds in several cases: (i) if a dividend per share is greater than 5 yen, and (ii) if the earnings per share is greater than 7 yen
1996	All bond issuance restrictions have been removed; Big-Bang deregulation announced
1997	Introduction of medium term notes; Deregulation of unlisted and unregistered equity market
1998	Introduction of new corporate bond products; Elimination of business restriction on securities companies; Relaxation of rules governing asset securitization via special purpose companies; Full liberalization of securities derivatives
2000	Banks are allowed to sell insurance products

null hypothesis of a single regime (no switch) is overwhelmingly rejected (at a .01 significance level) in favor of a two- (one-switch point), three-, or four-regime (three-switch points) specification. We then run switching regression models between firm characteristics (selection variables) and four-period regimes (periods 1 vs. 2, 1 vs. 3, 1 vs. 4, etc.). Our selection variables are identical to those introduced by Anderson and Makhija (1999) and Hoshi et al. (1993).

The switching regressions indicate that our decision to divide the study period into four-period regimes is justified; the firm characteristics do not play any significant role after the implementation of the credit rating systems for the public market access, which marks the beginning of period 3.

Once the four-period regimes are identified, we are able to test our hypothesis. The tests provide evidence demonstrating the effects of changes in capital market competition on relationship banking.

Hypothesis. An increase in capital market competition leads banks to reduce the amount of their relationship lending.

3.2. Sample

Our sample is limited to Tokyo Stock Exchange (TSE)-listed firms during the period, 1978–2002. Two major sources of data include: (i) the Pacific-Basin Capital Markets (PACAP) Databases for Japan, which supplies financial statement data[4]; and (ii) the Nikkei NEED database, which supplies individual firm borrowings from financial institutions.[5]

Since our primary purpose is to demonstrate how the capital market impacts relationship lending, we have excluded all firms that have loans solely from government-affiliated financial institutions, such as Japanese development banks.[6] Thus, only a total of 1545 firms survives the initial screening in our sample. Our study period, 1978–2002, is also dictated by the availability of the two databases previously mentioned. The PACAP databases go back to 1975, but the Nikkei Loan Database only includes reports beginning in 1978. Thus, only 549 firms remain in our sample. Once we have excluded firms with negative book values, our final sample consists of 491 firms that represent a diverse set of 34 industries (classified by two-digit Nikkei Industry Classification).[7]

3.3. The model

Once we interpret the loan exposure of the main bank to relationship loans, we can examine how relationship banking responds to changes in the competitive banking environment. We can examine this response by applying a fixed-effect model that estimates unbiased coefficients with the existence of fixed omitted variables. As noted by Himmelberg et al. (1999), the fixed-effect model has an advantage since it can control for unmeasured firm characteristics that influence the relationship loan variable and remain constant over the firm specific intercept term.

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[4] The PACAP-Japan databases have been compiled in cooperation with the Daiwa Institute of Research and the Toyo Keizai Inc.

[5] The Nikkei NEED database reports loan data for firms from both private and government-affiliated financial institutions.

[6] We exclude firms from the sample if they do not carry any loans from a private financial institution, but firms are included in the sample if they have loans from both private financial institutions and government affiliated institutions.

[7] This requirement causes a survivorship bias in our results; hence, we apply our regression models to another sample set that has been created with a less stringent requirement. This sample selection procedure requires that the data must be available during at least two consecutive periods. Replication of the regressions with this set of data produce results that do not differ meaningfully from those reported in this paper.

Specifically, we examine the potential effects of increasing capital market competition by adding period dummy variables to the fixed-effects model. The estimated coefficients of these dummy variables indicate how relationship banking will respond to increasing capital market competition. A negative coefficient for the dummy variable is consistent with Boot and Thakor's (2000) prediction that capital market competition leads to a decline in the importance of relationship lending, but it is inconsistent with Dinç's (2000) prediction that increased capital market competition leads to an increase in relationship lending. To assess the effects of changing competition from the capital market, we simply focus on the signs of the interaction variable between the period dummy variables and the competition variables.

3.4. Variable selection

For this study, we have collected data on a large number of variables. The principal dependent variables include the total loans, the short-term loans, and the long-term loans from the main bank, and are expressed as a fraction of the total loans from all private financial institutions. These variables are denoted by TOTLOAN, STLOAN, and LTLOAN, respectively. We employ these dependent variables on the assumption that loan exposure to the main bank closely reflects the characteristics of relationship loans as described by prior studies. Although neither Boot and Thakor (2000) nor Dinç (2000) consider the maturity of relationship loans, it is quite possible that the effects of changing capital market competition could differ between short- and long-term loans. With long-term debt financing options available from the corporate bond market, long-term loans could be more sensitive to the changing environment of the financial system. Therefore, we have decomposed the total borrowing from the main banks into both short- and long-term loans.

We also introduce two additional dependent variables for the purpose of robustness tests: STCL and LTLL. These variables represent the short- and long-term loans from all financial institutions, and are expressed as a fraction of current liabilities and long-term liabilities, respectively. Existing theories define relationship lending as loans from financial institutions, and they define transactional lending as funds from the capital market that are provided at arm's length by a financial provider. With this traditional definition of relationship lending and transaction lending, we can change the denominator from total loans from private financial institutions to current liabilities and long-term liabilities, depending on the maturity of liabilities. This allows us to capture a firm's exposure to relationship lending, to loans from all financial institutions, to other sources of short-term capital (trade credit or commercial papers), and to long-term capital (bonds and stocks). Thus, the principal dependent variables that are standardized by loans from all private financial institutions measure relationship lending exposure to inter-institution competition. On the other hand, the dependent variables that are standardized by current liabilities and long-term liabilities capture the cross-sectional behavior of relationship loan exposure to all sources of financing available to a firm.

Our principal explanatory variables are the period dummy variables included in the fixed-effect model. The sign of the period dummy variables may indicate the change in relationship loans to increasing capital market competition.

We recognize that the effects of changing capital market competition on relationship lending will in turn be influenced by any changes in the extent of interbank competition. Hence, we control for the degree of interbank competition by the use of the Herfindahl index (HI) which is created both for short- and long-term loans and for total loans. TOTHI is the ratio of the total loans from all lenders to the borrower as a fraction of its total liabilities.[8] Following the convention of computing HI, we square the market share of each lender and then add the results. TOTHI (LTHI and STHI) will increase as the number of banks in a credit relationship with the firm decreases and as the disparity in size between those loans rises.

The fixed-effect model mitigates problems associated with endogenous explanatory variables by controlling for individual firm effects. To address any possible endogeneity problem between the dependent variable and the HI, we introduce a lagged value of HI following Hsiao and Tahmiscioglu (1997): TOTHI, LTHI, and STHI.[9] We then conduct a Hausman-like test of fixed-effects model vs. 2SLS (in the context of Generalized Method of Moment estimation) to test if the coefficients estimated in both 2SLS and fixed-effects models are the same. The Hausman test fails to reject the null hypothesis of no systematic difference in coefficients between two models. TOTHI2, LTHI2, and STHI2 are the squared values of TOTHI, LTHI, and STHI, respectively, and are introduced to capture the possible non-linearity in the relationship between TOTHI (LTHI and STHI) and relationship lending.

We also introduce the number of banks that have a credit relationship with the borrower and designate this number as another control for the interbank competition variable (BNUM). The number of bank relationships is often used as an indicator of the value of relationship banking. The rationale is that the number of bank relationships reflects the degree of direct competition between banks in the relationship and the quality of information accessed by banks. These are important credentials for banks to determine the economic benefits at the initial stage of relationship banking (Petersen and Rajan, 1994; Houston and James, 1996; Ongena and Smith, 2001; and Elsas, 2005).[10]

Firm attributes are controlled by several variables: (i) GROWTH: the sales growth of the borrower; (ii) MVBV: the log of market-to-book-value; (iii) FASSET: the fixed assets/total assets; (iv) UNEXPEPS: the unexpected future earning deflated by share price; (v) SIZE: the log of total sales; (vi) ROS: profitability as measured by after-tax profit/net sales; (vii) COVERAGE: debt

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[8] TOTHI is calculated as follows: $TOTHI_j = \sum_{i=1}^{n} p_i^2 = \sum_{i=1}^{n} \frac{\chi_i^2}{\nu^2}$ where χ_i is the total loans supplied by the i-th bank by the rank of total loans to the firm j and ν is the total liability of firm j.

[9] In a robustness test, by using the lagged TOTHI as an instrument variable for TOTHI, we generate a within estimator by a two-stage least-square generalization (2SLS). The results (though not reported) with 2SLS procedure are mostly consistent with the fixed-effect model.

[10] The correlation between TOTHI and BNUM is −0.1865.

Table 2
Definition of variables.

Variable	Nature of variable	Definitions
TOTLOAN	Dependent variable	Total loans from the main bank/total loans from all private financial institutions (FIs)
STLOAN	Dependent variable	Short-term loans from the main bank/total loans from all private FIs
LTLOAN	Dependent variable	Long-term loans from the main bank/total loans from all private FIs
STCL	Dependent variable	Total short-term loans from all FIs/current liabilities
LTLL	Dependent variable	Total long-term loans from all FIs/long-term liabilities
TOTHI	Control variable for interbank competition	One year lagged Herfindahl Index defined as total loans from all FIs in a credit relationship to total liabilities
LTHI	Control variable for interbank competition	One year lagged Herfindahl Index defined as long-term loans granted by all FIs in a credit relationship to sum of long-term loan and note payable
STHI	Control variable for interbank competition	One year lagged Herfindahl Index defined as short-term loans granted by all FIs in a credit relationship to sum of total short-term loan payable including current portion of long-term loan payable and bonds
TOTHI2 LTHI2 STHI2	Control variable for interbank competition	Square of TOTHI, LTHI, and STHI
BNUM	Control variable for interbank competition	Number of all banks that have lending relationships with the firm
GROWTH	Control variable	Average growth rate of total sales measured over past 3 years
MVBV	Control variable	Ln (MVBV), where MVBV is the ratio of market to book value
FASSET	Control variable	Fixed assets/total assets
UNEXPEPS	Control variable	Unexpected future earnings; the value in year t is defined as the actual earnings per share in year $t+1$ minus the forecasted earnings per share for year $t+1$ divided by the year t share price
SIZE	Control variable	Ln (net sales)
ROS	Control variable	After-tax profit/net sales
COVERAGE	Control variable	Income from operation/total interest expenses
STDSTOCK	Control variable	Standard deviation of previous twelve months of stock returns with dividend reinvested

coverage, which is defined as income from the operation/total interest expenses; (viii) STDSTOCK: the standard deviation of the previous 12 months of stock returns. Each of these variables is defined in Table 2.

4. Empirical results

4.1. Descriptive statistics

Table 3 provides descriptive statistics for the variables. The statistics are based upon pooled time-series and cross-sectional data, and are divided into the four periods. The main bank provides an average of 25% of the total corporate loans from all private financial institutions. The borrower's dependence on the main bank increases significantly (at the .01 level) between period 1 and periods 2, 3, and 4, even though the role of capital market financing has increased. A breakdown of the total loans from the main bank by maturity shows that most of these loans are short-term; in fact, short-term loans account for approximately two-thirds of the total loans. Firms did increase their short-term borrowing from the main bank in period 2 and continue to have an increased level of dependence on short-term financing with the main bank for the following two periods. Conversely, they reduce their reliance on long-term loans in period 2, but gradually increase their reliance during the other two periods.[11] The variables representing short- and long-term loans from all financial institutions are a fraction of current liabilities (STCL) and long-term liabilities (LTLL), respectively, and show a similar pattern as LTLOAN and STLOAN.

Turning to the independent variables, corporate borrowers have consistently reduced the number of banks in their credit relationships. The number of banks range from 18.13 banks on average in period 1 to 16.51 banks, 15.56 banks, and 12.62 banks in periods 2, 3 and 4, respectively. The variables for lender concentration (TOTHI, LTHI, and STHI) fluctuate over the sample periods without a statistically significant difference across the sample periods. The degree of total loan concentration (TOTHI) is relatively high when banks are the dominant supplier of funds (period 1) or when there is a large degree of uncertainty in the financial market during economic turmoil (period 3). Borrowing firms exhibit a consistently decreasing trend in their annual sales growth (GROWTH). On the other hand, firms in our sample show an increasing trend in sales size and debt coverage ratio.

We also observe that the ratio for fixed assets (FASSET) increases over time, especially during periods 3 and 4, which are considered to be the periods of economic recession. This observation raises a question about the investment behavior of Japanese firms as they took advantage of large amounts of free cash flow (Jensen, 1986, 1989). Since *keiretsu* group firms engaged in such investment activities much more than independent firms, we later control for the *keiretsu* group membership in the fixed-effect model. Reflecting the economic downturn in periods 3 and 4, the profitability of firms as measured by the ratio of after-tax profits to net sales (ROS) shows a significant deterioration.

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[11] The increase in long-term relationship loans for the last period reflects increased mega-bank merger activities during the sample periods of 1998–2002.

Table 3
Summary statistics of key variables.

Variables	Whole period (1978–2002)	(1) Period 1 (1978–1984)	(2) Period 2 (1985–1990)	(3) Period 3 (1991–1997)	(4) Period 4 (1997–2002)	Mean difference test between subperiods		
						(1)–(2)	(1)–(3)	(1)–(4)
TOTLOAN	.2540	.2439	.2527	.2500	.2756	−.0088 (−3.07)***	−.0061 (−2.24)***	−.0317 (−10.0)***
STLOAN	.1588	.1359	.1709	.1632	.1699	−.0350 (−11.2)***	−.0273 (−9.28)***	−.0340 (−9.90)***
LTLOAN	.0953	.1080	.0817	.0868	.1056	.0262 (9.85)***	.0211 (8.30)***	.0024 (0.80)
STCL	.2767	.2594	.2940	.2733	.2850	−.0346 (−9.26)***	−.0139 (−3.82)***	−.0256 (−6.15)***
LTLL	.5153	.6454	.4745	.4444	.4808	.1709 (15.92)***	.2010 (18.95)***	.1646 (13.83)***
BNUM	15.92	18.13	16.51	15.56	12.62	1.6165 (5.82)***	2.57 (9.64)***	5.51 (19.63)***
TOTHI	.0215	.0213	.0211	.0221	.0212	.0001 (0.17)	−.0009 (−1.41)	.0000 (0.04)
LTHI	.3690	.3753	.3661	.3679	.3652	.0092 (1.11)	.0074 (0.93)	.0101 (1.16)
STHI	.0180	.0179	.0179	.0184	.0177	.0000 (0.01)	−.0005 (−0.83)	.0002 (0.31)
GROWTH	.0371	.0804	.0420	.0232	−.0152	.0421 (22.49)***	.0609 (34.57)***	.0993 (52.12)***
MVBV	6.08	5.76	6.66	6.37	5.42	−.8995 (−28.4)***	−.6095 (−22.5)***	.3463 (9.56)***
FASSET	.2850	.2551	.2698	.3003	.3237	−.0148 (−3.52)***	−.0453 (−10.9)***	−.0686 (−14.9)***
UNEXPEPS	2.98 e−06	3.944 e−08	5.91 e−09	1.22 e−08	9.60 e−08	4.54e−08 (1.95)*	2.72e−08 (1.25)	−5.66e−08 (−0.42)
SIZE	11.28	11.00	11.28	11.48	11.39	−.2813 (−7.82)***	−.4781 (−13.8)***	−.3896 (−10.2)***
ROS	.0124	.0176	.0209	.0128	−.0053	−.0033 (−4.79)***	.0050 (6.40)***	.0228 (19.65)***
COVERAGE	4.24	2.59	3.48	3.74	8.15	−.8928 (−5.55)***	−1.15 (−6.18)***	−5.5622 (−7.71)**
STDSTOCK	5.92	9.15	7.49	4.58	1.57	1.66 (1.11)	4.56 (3.55)***	7.58 (5.84)***

4.2. Multivariate analyses

4.2.1. Regression results for the basic model

Table 4 presents the results of our regression model.[12] Column 1 summarizes the results for total relationship lending from the main bank as the dependent variables; column 2 summarizes the results for long-term relationship lending as the dependent variables; and column 3 summarizes the results for short-term relationship lending. The independent variables in each of the three columns are the same; we used three dummy variables to signify periods 2, 3, and 4. We also include a measure of competition as proxied by the concentration index and the number of banks in the credit relationship. Included also are interaction variables between competition variables and period dummy variables.

The overall results provide interesting evidence depending on the maturity of loans; increased capital market competition leads banks to reduce the amount of their long-term relationship lending. Indeed, the estimated coefficients for periods 2, 3, and 4 dummy variables in column 2 are consistently negative and significant. In contrast, we find consistently positive and significant coefficients for the dummy variables signifying periods 2, 3, and 4 in column 3; this result suggests that increases in capital market competition lead to increases in short-term relationship loans. Thus, our regression results indicate that increased capital market competition leads to a substitution of short- for long-term relationship loans. Therefore, a negative relationship between capital market competition and relationship banking as predicted by Boot and Thakor (2000) is supported for long-term relationship lending. A positive relation between the two, as predicted by Dinç (2000), is valid only for short-term relationship lending.

The coefficients for the number of banks in the credit relationship (BNUM) are negative and significant, though the t-value is noticeably weaker for long-term relationship loans than for total as well as short-term relationship loans. Thus, competition among banks as measured by the number of banks in the credit relationship appears to lead to reduced relationship lending. On the other hand, the estimated coefficients of the loan share concentration variable (TOTHI, LTHI, and STHI) are all negative; however, they are insignificant in all regressions. This implies that interbank concentration is not statistically associated with the

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[12] As a robustness test, we generate the fixed-effect models after controlling for firm attributes, although the results are not reported for space conservation. The results with controlled firm specific attributes are largely consistent with those in Table 4.

Table 4
Relationship loan exposure and capital market competitions.

Independent variables	Total loan exposure from the main bank to loans from all private financial institutions	Long-term loan exposure from the main bank to loans from all private financial institutions	Short-term loan exposure from the main bank to loans from all private financial institutions
	1	2	3
DUMPR2 (85–90)	−.0001	−.0297	.0273
	(−0.04)	(−11.15)***	(12.04)***
DUMPR3 (91–97)	−.0084	−.0252	.0155
	(−4.38)***	(−9.74)***	(6.99)***
DUMPR4 (98–02)	−.0012	−.0090	.0070
	(−.53)	(−3.04)***	(2.70)***
DUMPR2*TOTHI	.0774		
	(1.30)		
DUMPR3*TOTHI	.1404		
	(2.53)**		
DUMPR4*TOTHI	.3884		
	(6.25)***		
DUMPR2*LTHI		.0056	
		(1.04)	
DUMPR3*LTHI		.0048	
		(.92)	
DUMPR4*LTHI		.0049	
		(.86)	
DUMPR2*STHI			.1150
			(1.62)
DUMPR3*STHI			.1514
			(2.20)**
DUMPR4*STHI			.4153
			(5.17)***
BNUM	−.0045	−.0009	−.0036
	(−35.47)***	(−5.88)***	(−23.05)***
TOTHI	−.0122		
	(−.21)		
TOTHI2	−.6084		
	(−2.63)***		
LTHI		−.0024	
		(−.22)	
LTHI2		−.0022	
		(−.24)	
STHI			−.0958
			(−1.32)
STHI2			−.1970
			(−.88)
Number of observations	11,780	11,119	11,505
Number of firms	491	491	491
F-statistics	191.03***	40.62***	114.28***

Note: The sample includes 12,275 firm-year observations from 1978 to 2002. Regressions with total loan exposure to the main bank as the dependent variable are reported in column 1; regressions with long- and short-term loan exposure to the main bank as the dependent variables are reported in columns 2 and columns 3, respectively. The independent variables are as follows: competition measures as proxied by one-year lagged loan share concentration (TOTHI, LTHI, and STHI); the number of all banks that have lending relationships with the firm (BNUM); three period dummy variables (DUMPR1, DUMPR2, and DUMPR3) signifying three periods, 1985–1990, 1991–1997, and 1998–2002, respectively; and the interaction variables between the loan share concentration and the period dummies. TOTHI2 (LTHI2, STHI2) are introduced to capture the non-linearity in the relationship between loan share concentration variables and relationship lending exposure. Statistical significance is indicated by *, **, and *** for the 10%, 5%, and 1% level, respectively.

change in relationship loans. We interpret these results as indication that fewer banks competing for loans contribute to more relationship lending.

The coefficient on a given interaction term measures how the relationship between interbank competition and changes in competition from the capital market vary over the four periods. Notably, the interaction terms between the period dummy variables and the competition variable in columns 1 and 3, which use total and short-term relationship loans as the dependent variable, change sign and are statistically positive and significant (except DUMPR2). For long-term relationship loans, the interaction terms between the period dummy variables and the competition variable change signs, but they are insignificant. This finding is consistent with the deregulation in the Japanese capital market during periods 2, 3, and 4. As deregulation occurs, banks face increasing competition from the long-term credit market; thus, they appear to be reluctant to grant long-term relationship loans, even though they seem to be more aggressive in providing short-term relationship loans to firms with a concentrated loan structure.

The evidence summarized in Table 4 partially supports the hypothesis that increased capital market competition leads to reduced relationship lending. However, this hypothesis only applies to long-term loans. The results in Table 4 show that banks appear to increase short-term relationship loans as competition from the capital market increases. Thus, increased capital market competition appears to result in the substitution of short-term relationship loans for long-term relationship loans.

This finding is not surprising given that the deregulation of the Japanese capital markets provided corporate borrowers with access to long-term low-cost funding through bond markets.[13] Failure to document any supporting results for short-term loans can be explained by the link between the banks' rent extraction and its information dominance. To generate profits from lending, banks must possess dominant private information on borrowers' business activities. This information enables the banks to exert market power over the borrower's financing activities. As firms are able to access more alternative financing sources due to the increasing number of competing banks, they can potentially diversify their funding sources across other banks. Thus, the main bank could lose its informational monopoly. Consistent with this view, Petersen and Rajan (1995) argue that banks evaluate their exposure to relationship loans by estimating the probability of sharing future benefits from firms; thus, they require a degree of certainty in future surpluses by requiring less competition in terms of the number of banks in their credit relationship.

4.2.2. Regressions with public debt access, Keiretsu affiliation, and firm credit quality controlled

Table 5 presents the results of the fixed-effect model, controlling for three critical firm attributes: (i) the quality of borrowers; (ii) public debt access; and (iii) *keiretsu* affiliation.

The benefits of relationship banking are often attributed to its informational advantage over transactional banking. A bank with better information is able to construct higher quality loan portfolios. On the other hand, transactional lenders often make lending decisions on the basis of noisy information; thus, they may fail to identify qualified borrowers and end up with more non-performing loans (Dewenter and Hess, 2003). Dinç's (2000) conjecture is consistent with Dewenter and Hess's argument, but he has a different reason. He argues that banks only offer their relationship loans to high quality borrowers so they can cover the high commitment costs involved with relationship loans. This policy can generate the necessary returns and justify their commitment costs. Thus, relationship lenders are expected to have a higher loan exposure, but they are also expected to have higher quality borrowers. In contrast, Boot and Thakor (2000) claim that banks can attain added value only from low- and medium-quality firms. Since relationship lenders are better informed, they may have to face poor quality loan portfolios.

Columns 1 and 4 of Table 5 introduce a dummy variable to capture the quality of the borrower. The quality of a borrowing firm is measured by its ability to meet the issuance criteria for either a secured convertible bond or a secured straight bond issuance.[14] This dummy variable is assigned a value of 1 if the firm meets the regulatory requirements for issuing bonds and 0 otherwise. The regression results show that higher quality firms, in general, have reduced the quantities of long-term relationship loans as evidenced by negative and significant coefficients as summarized in column 1. The coefficients of the interaction terms between the period dummies and the quality dummy variable are mostly insignificant except for the short-term loans in period 4, which are negative and significant at the .01 level. This indicates that high quality borrowers with improved accessibility to the capital/money markets decrease their short-term relationship loans in period 4. Relationship banks, which have access to better information on the borrowing firms' credit quality, appear to decrease their resource allocation for long-term loans to quality borrowers to maximize relationship rent. This is consistent with the prediction made by Boot and Thakor (2000).[15]

Bank financing may be less expensive than issuing bonds since it benefits from cost savings in monitoring and agency costs (Diamond, 1984); however, concentrating on loans with a single lender or several lenders can make borrowers "informationally captive" to their relationship lenders. Empirical and theoretical research on "hold-up costs" suggests that firms that are subject to high information costs may use public debt to mitigate this problem, or they may obtain loans from multiple banks (e.g., Anderson and Makhija, 1999; Houston and James, 1996; Rajan, 1992; and Sharpe, 1990). Boot and Thakor (2000) contend that firms who issue bonds would rely less on relationship lending. In contrast, Dinç (2000) argues that banks will increase relationship lending as capital market competition grows because bonds are considered to be a substitute for transaction loans.

In columns 2 and 5 of Table 5, a dummy variable is used to represent the credit quality of the borrower; in addition, a dummy variable signifies whether a firm has outstanding bonds. The dummy variable for public debt access equals 1 if the firm has public debt (including convertible debt) in its capital structure, and 0 otherwise. Regressions with short- and long-term loan exposure to the main bank as the dependent variables are summarized in columns 2 and 5, respectively. A greater access to public debt, in general, does not seem to change the reliance on relationship loans for borrowers as indicated by negative but insignificant BOND variable coefficients across both columns.

Interestingly, increased competition from the capital (bond) market does affect relationship loans for firms across maturity. As the competition from the capital market intensifies, firms with access to the bond market appear to increase their exposure to short-term relationship loans in periods 2 and 3. This is indicated by the positive coefficient on the interaction term between the BOND dummy and period dummies in column 5. In period 4, firms with public debt financing choose to reduce their short-term relationship loan financing as shown by a negative and significant coefficient on the interaction term, while firms without public debt continue to use short-term relationship loans as indicated by a positive and significant interaction term.

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[13] See Anderson and Makhija (1999) and Hoshi and Kashyap (1999) for the change in the debt structure of Japanese firms.

[14] To restrict firms' access to the public debt market, Japanese regulators employ regulatory criteria for issuing public debt. For example, to issue secured straight bonds, a firm must meet the DPS of at least 5 yen per share for the past 3 years for the firm with a book equity of 3–6 billion yen; at least 4 yen per share for the past 3 years or 5 yen in the previous year for the firm with book equity of 6–10 billion yen; at least 3 yen per share for the past 3 years or 4 yen in the previous year for the firm with book equity greater than 10 billion yen, respectively. In addition to the DPS requirement, firms should meet at least three of the four other criteria by book equity/paid in capital, book equity/total assets, operational profit/total assets, and interest coverage. We sort the sample firms into two groups: (i) high quality firms; and (ii) poor quality firms, depending on whether or not they meet either of the issuing criteria for straight bonds and for convertible bonds.

[15] On the contrary, Dewenter and Hess (2003) found that, compared with transactional banks, relationship banks carry greater amounts of non-performing loans, but have smaller amounts of provisions and write-off. They attribute this seemingly contradictory finding to the relationship banks' ownership of shares of borrowing firms (equity-as-option incentive) and evergreening behavior by the relationship banks.

For long-term relationship loans, the estimated coefficients on the interaction terms between the BOND dummy and the period dummies in column 2 remain negative and significant (except for the insignificant DUMPR2). Thus, firms that choose to access the bond market curtail their dependence on long-term relationship loans. Competition from the bond market and subsequent access to public debt reduces information costs for firms that use (mainly) internal debt (relationship loans), which results in a reduced importance of relationship lenders. If increased competition from the capital market affects arm's length financing more than relationship lending, as suggested by Dinç (2000), banks would allocate more resources to relationship loans so they could avoid the competition associated with transactional loans. On the contrary, Boot and Thakor (2000) predict that increases in capital market competition for bank loans lead to a shrinkage in relationship lending. Our finding that firms with access to public debt curtail their long-term relationship loans is consistent with the prediction by Boot and Thakor (2000). In addition, firms that are subject to higher information asymmetry costs (with a negative MVBV and a negative FASSET) reduce long-term relationship loans, which support the hold-up theory.

We also document the results for interaction terms between the quality dummy and the BOND variable, which represents the sample firms' access to the bond market during our study periods. The purpose of this interaction term is to assess whether the documented effect of the public debt market access is limited to firms who are qualified to issue bonds by the issuance criteria. The main effect, QLTDUM, is positive, but it is insignificant for long-term relationship loans; however, it is negative and significant for short-term relationship loans. The coefficients of the interaction terms between the quality dummy and the bond market access variable change their sign and become significant with the opposite sign across loan maturities; they are negative and significant for long-term relationship loans and positive and significant for short-term relationship loans. Though quality firms, in general, tend to increase long-term relationship loans and decrease short-term relationship loans, quality firms who access the bond market choose to decrease the long-term relationship loans but increase the short-term relationship loans.

Columns 3 and 6 present the results when a dummy variable is introduced to signify that a firm is a member of a Keirstsu group.[16] For large firms in Japan, the main bank relationship plays a critical role in sustaining the *keiretsu* affiliation. Hoshi et al. (1990) report that *keiretsu* member firms are less likely to be liquidity-constrained in their investment expenditures than independent firms due to their close relationships with the main banks. Hoshi et al. (1990) conclude that close banking relationships help *keiretsu* member firms overcome any informational friction in the credit market. These firms can acquire more funds than independent firms even when the level of information uncertainty is higher.[17]

Since the *keiretsu* group affiliation is time-invariant, the main effect of the variable is not considered. Nevertheless, the effects on the period dummies and their interaction with the *keiretsu* variable are considered. The results are reported in columns 3 and 6. The negative but insignificant first two coefficients and positive and significant last coefficient estimated for the interaction terms of column 3 suggest that long-term relationship loans do not appear to be affected by the *keiretsu* relation initially, but they do appear to increase long-term relationship lending as the competition from the capital market deepens. The first two positive and significant coefficients estimated for the interaction terms in column 6 suggest that increased capital market competition seems to be associated with more short-term relationship lending for *keiretsu* industrial group members.

To document the link between *keiretsu* affiliation and the main bank status, we introduce a dummy variable (SAMEKE), which equals 1 if the firm's main bank belongs to the same *keiretsu* as the borrowing firm, and 0 otherwise. Borrowers who belong to the same *keiretsu* group with the main bank exhibit an increasing reliance on long-term relationship loans. We observe, however, that borrowing firms who belong to the same *keiretsu* group as the main bank display a very different association with short-term relationship loans; they actually reduce borrowing through short-term relationship loans. Weinstein and Yafeh (1998) observe that *keiretsu* main banks "pressure" client firms to maintain high levels of bank debt at high interest rates by way of extracting rents from client firms. Perhaps what we observe from the short-term relationship loans is consistent with their observation.

As part of the overall results, we perform a joint test of the hypotheses about the sign of capital market competition on lending across time and total loan (TOTLOAN), long-term loan (LTLOAN), and short-term loan (STLOAN), respectively. The null of no effects is rejected at the 1% level of statistical significance.

4.3. Robustness checks

4.3.1. Lending attitude of financial institutions

While our results are robust to various specifications of the basic model, we provide further evidence through a series of additional robustness tests. During the entire study period, 1978–2002, there were major macroeconomic events and financial market disturbances. An observed link between relationship loans and the change in capital market/interbank competition can be attributed to shifts in the supply of bank loans or changes in the firms' demand for bank loans triggered by these macroeconomic shocks or financial market disturbances. Specifically, in the third period, firms may switch from long- to short-term loans and from transactional loans to relationship loans because of the economic uncertainty suffered by Japan during a banking crisis as the value of assets deteriorated. We explore the potential significance of these complications using the Tankan survey. The Tankan survey is a short-term economic survey of approximately 220,000 Japanese firms with at least twenty million yen in capital. In this survey, companies are asked questions about current trends and conditions in their businesses and their respective

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[16] We employ the *keiretsu* classification in *Industrial Grouping in Japan* published by Dodwell Marketing Consultant. We do not distinguish between vertical and horizontal *keiretsu* affiliations.

[17] On the contrary, several other studies contend that Japanese firms with *keiretsu* affiliation are less profitable due to rent extraction by the main banks in the form of higher interest on the basis of its informational monopoly (Nakatani, 1984 and Weinstein and Yafeh, 1998).

Table 5
The impact of public debt access, quality of borrowers, and *Keiretsu* affiliation.

Independent variables	Panel A: long-term loans			Panel B: short-term loans		
	1	2	3	4	5	6
	QLTDUM	Bond	Keiretsu	QLTDUM	Bond	Keiretsu
QLTDUM	−.0069 (−1.93)*	.0073 (1.50)		.0041 (1.07)	−.0143 (−2.72)***	
BOND		−.0003 (−.07)			−.0004 (−.10)	
BOND*QLTDUM		−.0113 (−2.18)**			.0160 (2.84)***	
SAMEKE			.0168 (3.27)***			−.0301 (−5.42)***
DUMPR2 (85–90)	−.0122 (−4.35)***	−.0085 (−2.66)***	−.0092 (−2.82)***	.0200 (6.60)***	.0117 (3.39)***	.0170 (4.81)***
DUMPR3 (91–97)	−.0123 (−4.11)***	−.0053 (−1.54)	−.0080 (−2.37)**	.01687 (5.21)***	.0113 (3.01)***	.0111 (3.04)***
DUMPR4 (98–02)	−.0031 (−.96)	.0008 (.22)	−.0079 (−2.10)**	.0244 (6.91)***	.0258 (6.58)***	.0222 (5.44)***
DUMPR2*QLTDUM	.0014 (.33)			.0036 (.74)		
DUMPR3*QLTDUM	.0049 (1.14)			−.0018 (−.40)		
DUMPR4*QLTDUM	−.0026 (−.53)			−.0207 (−3.9)***		
DUMPR2*BOND		−.0062 (−1.55)			.0160 (3.70)***	
DUMPR3*BOND		−.0082 (−1.99)**			.0075 (1.67)*	
DUMPR4*BOND		−.0091 (−2.03)**			−.0153 (−3.16)***	
DUMPR2*KEIRETSU			−.0040 (−1.04)			.0096 (2.30)**
DUMPR3*KEIRETSU			−.0038 (−1.02)			.0122 (3.01)***
DUMPR4*KEIRETSU			.0069 (1.65)*			−.0059 (−1.30)
LTHI	.0047 (.43)	.0043 (.40)	.0037 (.34)			
LTHI2	−.0041 (−.32)	−.0028 (−.28)	−.0024 (−.24)			
STHI				.1261 (2.01)**	.1250 (2.00)**	.1231 (1.97)**
STHI2				−.4578 (−1.99)**	−.4489 (−1.96)**	−.4292 (−1.87)*
BNUM	−.0009 (−5.45)***	−.0009 (−5.57)***	−.0009 (−5.39)***	−.0035 (−20.17)***	−.0035 (−20.32)***	−.0035 (−20.12)***
GROWTH	.0151 (1.37)	.0134 (1.21)	.0165 (1.50)	.0209 (1.74)*	.0220 (1.83)*	.0246 (2.05)**
LMVBV	−.0076 (−4.77)***	−.0072 (−4.51)***	−.0077 (−4.91)***	.0047 (2.74)***	.0050 (2.89)***	.0041 (2.39)**
FASSET	.0414 (3.36)***	.0411 (3.34)***	.0402 (3.27)***	−.0244 (−1.83)*	−.0273 (−2.05)**	−.0289 (−2.18)**
UNEXPEPS	318.85 (1.31)	318.62 (1.31)	336.92 (1.38)	−588.21 (−2.23)**	−591.26 (−2.25)**	−592.89 (−2.25)**
SIZE	−.0058 (−1.72)*	−.0042 (−1.09)	−.0076 (−2.29)**	−.0131 (−3.61)***	−.0150 (−4.12)***	−.0156 (−4.34)***
ROS	−.0209 (−1.04)	−.0218 (−1.09)	−.0214 (−1.07)	.0132 (.61)	.0092 (.43)	.0079 (.36)
COVERAGE	−.0001 (−3.54)***	−.0001 (−3.64)***	−.0001 (−3.07)***	.0002 (6.03)***	.0002 (5.93)***	.0002 (6.10)***
STDSTOCK	.00003 (1.65)*	.00003 (1.58)	.00003 (1.60)	−.00004 (−2.09)**	−.00004 (−1.97)**	−.00004 (−2.02)**
Number of observations	9721	9721	9721	10,081	10,081	10,081
Number of firms	490	490	490	491	491	491
F-statistics	15.53***	14.87***	15.96***	44.04***	31.76***	45.68***

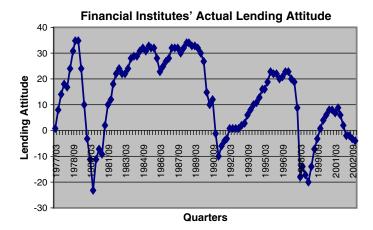**Financial Institutes' Actual Lending Attitude**

Fig. 1. The financial institutes' lending attitude by the Tankan survey. The line in the figure is drawn by the diffusion index (DI) of the Tankan survey, which can be read as a percentage share of the enterprises responding for Choice 1 minus the percentage share of the enterprises responding for Choice 3. The respondent to a survey item "lending attitude of financial institutions" should choose one of following as their choice: 1) Accommodative, 2) Not so severe, or 3) Severe. A positive number indicates an easy availability of funds from financial institutions.

industries, as well as their expected business activities for the next quarter and the next year. These firms are also asked about their financial institutions' attitudes toward lending. As Fig. 1 indicates, while there are significant macroeconomic disturbances during the third period of our analysis, the Tankan survey reports that the financial institutions still had a strong willingness to lend.[18] This favorable lending attitude among financial institutions was reduced in late 1997 when one of the large city banks (the Hokkaido Takushoku Bank) failed, but the curve still shows a rapid recovery of the financial institutions' lending attitude during period 4. Thus, period 4 appears to represent a normal period in the credit markets; it is similar to period 1 when the second oil crisis caused an economic recession in 1979.

Our control variables for interbank competition, the concentration index, and the number of banks in a credit relationship can be influenced by the attributes of the borrowing firms. To evaluate this potential contaminant, we have tested a fixed-effect model that includes the variables that control for the various attributes of borrowing firms. Though we have not reported the results due to limitations in space, we did observe that the results are largely consistent with the results listed in Table 4, even after we control for firm specific factors. The results show that increased capital market competition leads to reduced long-term relationship lending. We also find that banks generally avoid granting long-term relationship loans to firms who exhibit a high information problem (a negative and significant MVBV), but they will grant short-term relationship loans to those firms. The banks provide long (short)-term relationship loans on the basis of collateralizable fixed assets (the ability for debt service) over the ability for debt service (collateralizable fixed assets).

To further check for robustness, we use short- and long-term loans from all financial institutions in our definition of relationship loans, instead of only using loans from the main bank. We also standardize our version of relationship loans by matching the maturity of the firm's funding sources to that of relationship loans (current and long-term liabilities).

The results are shown in columns 1 and 2 of Table 6, and they are largely consistent with the results shown in our prior tables. Increased capital market competition leads to less long-term relationship lending, but it also leads to more short-term relationship lending. A competition variable, BNUM, in columns 1 and 2 changes its sign and become positive and significant; this implies that firms with more banks in their credit relationships are more likely to borrow from financial institutions, instead of borrowing from the money market or the capital market. This finding is not unexpected considering that current definition of relationship loans includes loans from all financial institutions.

Notes to Table 5:

Note: The fixed-effect model is used to control for firm attributes and three critical aspects: (i) quality of corporate borrowers; (ii) public debt access; and (iii) *keiretsu* affiliation to investigate their interactions with period dummy variables and competition variables. Regressions with long- and short-term loan exposure to the main bank as the dependent variables are reported. We introduce a dummy for the public debt market access (BOND); a dummy for *keiretsu affiliation* (KEIRETSU); and a dummy for the quality of the borrower by the ability to meet issuance criteria for either secured convertible bond or secured straight bond issuance (QLTDUM). We also introduced a dummy variable (SAMEKE) that equals 1 if the firm's main bank belongs to the same *keiretsu* group as the borrowing firm, and 0 otherwise. The firm characteristics include three years of average sales growth (GROWTH), the log of market-to-book ratio (LMVBV), fixed assets (FASSET), book leverage (BOOKLVG), unexpected future earnings (UNEXPEPS), firm size (SIZE), after-tax profit/total sales (ROS), debt coverage (COVERAGE), and the standard deviation of stock return (STKSTD). T-values are reported in parentheses. Statistical significance is indicated by *, **, and *** for the 10%, 5%, and 1% level, respectively.

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[18] The line in the figure is drawn by the diffusion index (DI), which can be read as percentage share of enterprises responding for Choice 1 minus the percentage share of enterprises responding for Choice 3. The survey item that reads, "lending attitude of financial institutions" is described as follows by the Bank of Japan: Judgment of financial institutions' attitude towards lending as perceived by the responding enterprise. The respondent should choose one of following as choice: (i) accommodative; (ii) not so severe; and (iii) severe. Thus, a positive number indicates an easy availability of funds from financial institutions.

Table 6
Robustness test of relationship lending defined as loans from financial institutions.

Independent variables	1	2	3	4
	Long-term	Short-term	Long-term	Short-term
	LTLL	STCL	LTLL	STCL
LTHI	−.0169		−.0116	
	(−.32)		(−.25)	
LTHI2	.0075		.0105	
	(.17)		(.25)	
STHI		−.5983		−.1451
		(−6.04)***		(−1.86)*
STHI2		.2098		.5910
		(.75)		(2.07)**
BNUM	.0112	.0050	.0118	.0040
	(15.00)***	(23.38)***	(17.58)***	(19.54)***
DUMPR2 (85–90)	−.0779	.0618		
	(−5.09)***	(18.85)***		
DUMPR3 (91–97)	−.0903	.0628		
	(−5.79)***	(18.05)***		
DUMPR4 (98–02)	−.0833	.0478		
	(−4.81)***	(12.85)***		
DUMPR2 * LTHI	.0249			
	(.92)			
DUMPR3 * LTHI	.0050			
	(.19)			
DUMPR4* LTHI	.0086			
	(.29)			
DUMPR2 * STHI		.6040		
		(6.34)***		
DUMPR3 * STHI		.7379		
		(7.85)***		
DUMPR4* STHI		.5796		
		(5.10)***		
BOND			.0342	−.0254
			(.63)	(−1.52)
BOND*MVBV			−.0475	.0034
			(−5.59)***	(1.28)
GROWTH	−.0959	−.0569	.0334	−.2030
	(−1.90)*	(−3.92)***	(.78)	(−15.32)***
LMVBV	−.0498	−.0142	−.0224	.0001
	(−6.89)***	(−6.90)***	(−3.35)***	(.07)
FASSET	−.1792	.0242	−.2591	.1110
	(−3.19)***	(1.51)	(−5.04)***	(6.97)***
UNEXPEPS	−334.39	−762.49	−373.81	−819.23
	(−.30)	(−2.40)**	(−.35)	(−2.50)**
SIZE	−.0918	−.1271	−.0756	−.0799
	(−6.05)***	(−28.94)***	(−6.41)***	(−21.86)***
ROS	−.4674	−.1424	−.4631	−.1985
	(−5.10)***	(−5.44)***	(−5.32)***	(−7.38)***
COVERAGE	−.0004	−.0003	−.0006	−.0003
	(−2.50)**	(−5.54)***	(−3.98)***	(−5.65)***
STDSTOCK	.0001	.0000	.0001	.0000
	(1.72)*	(1.44)	(1.91)*	(.82)
Number of observations	9815	10100	9815	10100
Number of firms	490	491	490	491
F-statistics	52.33***	131.31***	149.49***	115.28***

Note: The fixed-effect model is used for regressions with loans from all financial institutions as our definition of relationship loans rather than loans from the main bank as the dependent variables. The ratio of the long-term loans from all financial institutions to long-term liabilities is the dependent variable in regressions reported in columns 1 and 3; and short-term loans from all financial institutions to current liabilities is the dependent variables in regressions reported in columns 2 and 4. The independent variables are as follows: competition measures as proxied by one-year lagged loan share concentration (TOTHI, LTHI, and STHI); the number of banks that have lending relationships with the firm (BNUM); three period dummy variables (DUMPR1, DUMPR2, and DUMPR3) signifying three periods, 1985–1990, 1991–1997, and 1998–2002, respectively; and interaction variables between loan share concentration and period dummies. TOTHI2 (LTHI2, STHI2) are introduced to capture the non-linearity in the relationship between loan share concentration variables and relationship lending exposure. The firm characteristics include three years of average sales growth (GROWTH), the log of market-to-book ratio (LMVBV), fixed assets (FASSET), book leverage (BOOKLVG), unexpected future earnings (UNEXPEPS), firm size (SIZE), after-tax profit/total sales (ROS), debt coverage (COVERAGE), and the standard deviation of stock return (STKSTD). T-values are reported in parentheses. Statistical significance is indicated by *, **, and *** for the 10%, 5%, and 1% level, respectively.

Both lagged loan concentration indexes (LTHI and STHI) are negative, but only STHI is statistically significant. This indicates that firms with a less concentrated loan structure (more competition) obtain a higher proportion of their short-term liabilities from financial institutions. In addition, firm attributes change their sign, which shows that firms who are subject to higher

information problems obtain a lower proportion of their short-term and long-term liabilities from financial institutions. These include smaller (SIZE), growing firms (GROWTH) with higher growth opportunity (MVBV) and a higher default risk (by COVERAGE and ROS). Long-term relationship loans show a clear alienation from liabilities supplied by financial institutions by information (MVBV, FASSET, and SIZE) and observable risk characteristics (UNEXPEPS, COVERAGE, and STDSTOCK) of borrowing firms. We interpret these findings to indicate that informationally captured firms have an aversion to borrowing from informationally dominant lenders and financial institutions.

Following the examples set by Houston and James (1996) and Anderson and Makhija (1999), we add an indicator variable to measure public debt access and its interaction with MVBV to assess the behavior of growth-oriented firms who access the public debt market. A dummy variable for public debt access equals 1 if the firm has public debt (including convertible debt), and 0 otherwise. As shown in columns 3 of Table 6 (which has a negative and significant coefficient for the interaction between MVBV and BOND), having an equal, high growth-orientation reduces the exposure to long-term relationship loans of firms with public debt access more than that it reduces the exposure to long-term relationship loans for firms without public debt access.[19] The fact that there are no noticeable changes in observable risk variables suggests that firms avoid relationship loans due to the informational hold-up effects, not due to the greater risk of relational loan dependent borrowers. Our evidence on hold-up costs is consistent with Houston and James' (1996) hypothesis that firms with an informationally dominant lender are susceptible to a hold-up cost.

Previous studies show conflicting results between the duration of a banking relationship and lending rates (Berger and Udell, 1995; and Petersen and Rajan, 1994). However, the duration of the banking relationship may not capture the intensity of the relationship (Cole, 1998; and Elsas and Krahnen, 1998). Elsas (2005) examines the duration of the relationship between banks and borrowing firms. He concludes that the duration of the bank-borrower relationship is not a significant factor in identifying a hausbank. As a result, we include an indicator variable, CHANGE, that measures the incidence of switching main banks. This variable equals 1 if the firm switches its main banks during our sample periods, and 0 otherwise. We exclude any firms that switch financial institutions within the same *keiretsu* (i.e., a switch to an ordinary bank from a trust bank).

Though we did not include the results to conserve space, for competition variables, the results from a model that includes the variables designed to control for the substitution of the main bank are almost identical to the results in Table 4. Since CHANGE is time-invariant, the main effect of the variable is not considered, but the interactions of the CHANGE variable with period dummies (and competition variables) are considered. We found that firms who switch their main bank over the sample period shrink long-term relationship loans while they increase their short-term relationship loans as the capital market competition increases. The interaction between CHANGE and STHI is statistically positively significant at the .05 level. Firms with higher short-term loan concentration, who have changed their main bank during the sample period, actually increase their short-term relationship loans.

4.3.2. Impact of inverted yield curves and the zero interest rate policy

During the study period, Japan's economy experienced two unusual monetary policy developments: (i) an inverted yield curve whereby short-term interest rates are greater than long-term interest rates between July 18989 and September 1991; and (ii) the BOJ anti-deflationary zero interest rate policy adopted since February 1999. We confirm that the increase of short-term lending is not driven by a steepening of the yield curve and/or the increased macroeconomic uncertainty.[20] We run the same regressions in Table 4 with the observations suppressed during two subperiods with the inverted yield curve and the zero interest rate policy. Even though the results are not reported for brevity of the paper, we ascertain that no meaningful deviations are observed from the Table 4 results when the combined effect as well as the separate effects of two monetary policy changes.[21]

We ran a fixed-effect model regression with the Huber/White sandwich estimator of variance, which is adjusted for heteroskedasticity. These results are entirely consistent with those discussed earlier. Increased capital market competition leads to less long-term relationship banking, but it also leads to more short-term relationship banking.

The fixed-effect models are less efficient; however, they are still consistent when the idiosyncratic errors in the fixed-effect model, ε_{it}, are cross-sectionally heteroskedastic and are serially correlated. A feasible generalized least square model is designed to account for the presence of an AR(1) autocorrelation within a panel and cross-sectional heteroskedasticity across panels; when we use this model with our data, it confirms our earlier findings.

5. Conclusions and implications

The predictions made by Boot and Thakor (2000) and Dinç (2000) on the effects of greater capital market competition on relationship lending have not been thoroughly investigated in the past because of data limitations and the lack of an appropriate empirical setting. However, the deregulation of the Japanese capital market in the 1980s and 1990s provides a unique empirical setting to test these predictions. Furthermore, the information dominance of and implicit insurance rendered by the main banks

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[19] To increase comparability of our results with those of Houston and James' (1996) and of Anderson and Makhija (1999), we also run the model with standardization of private debt by total liabilities. We observe no switch of the sign change in any variables, though a few variables either lose or enhance their significance.

[20] Shirakawa (2010) illustrate the changes in monetary policy in 1985–2008 against the economic shocks during the periods.

[21] We express our special thanks to an anonymous referee who forced us to investigate the decrease [increase] in short-term [long-term] loans are driven by the inverted yield curve and BOJ's anti-deflationary zero-interest rate policy.

in Japan matches the profile of relationship lending as documented by previous studies; this allows us to relatively easily identify the loan exposure associated with relationship lending.

Consistent with the prediction by Boot and Thakor (2000), but contrary to Dinç (2000), we have observed that increased capital market competition is associated with reduced relationship lending. However, the effect varies depending on the loan maturities. Increased capital market competition is, in general, associated with reduced long-term relationship loans but greater short-term relationship lending. These results suggest that commercial banks tend to switch from long- to short-term lending in response to greater competition from the capital market. This finding is not surprising given that the deregulation of the Japanese financial sector provides corporate borrowers with increased access to bond market financing.

We also find that increases in *interbank* competition following intensifying capital market competition lead to an increase in short-term relationship lending. We attribute this result to the nature of relationship lending and to the difficulty in detecting sector specialization, which is the critical link between relationship lending and interbank competition. We suspect that even though the main banks possess proprietary client firm information and enjoy the benefits of other business-related banking arrangements, they still require a certain level of monitoring activities to deter the possible opportunistic behavior of the client firms.

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