Grant-in-Aid Scientific Research (S)
HIT-REFINED Working Paper Series No. 76

When Japanese Banks Become Pure Creditors: The effects of declining shareholding by banks on bank lending and firms' risk-taking

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March, 2018

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[†] This study was conducted as part of the "Study on Corporate Finance and Firm Dynamics" undertaken by the Research Institute of Economy, Trade and Industry (RIETI). The authors thank Jess Diamond, Masaharu Hanazaki, Masazumi Hattori, Kaoru Hosono, Masaru Konishi (discussant), Hideaki Miyajima (discussant), Masayuki Morikawa, Hisashi Nakamura, Eiji Ogawa, Yoshiaki Ogura, Hiroshi Ohashi, Elizabeta Pana (discussant), Xu Peng, Etsuro Shioji, Hiroshi Tsubouchi, Daisuke Tsuruta, Hirofumi Uchida (discussant), Kenichi Ueda, Noriyoshi Yanase, Makoto Yano, Yukihiro Yasuda, seminar participants at Hitotsubashi University, RIETI, the 10th Regional Finance Conference, Darla Moore School of Business–Hitotsubashi University 2nd International Conference on Corporate Finance, 2017 Japanese Economic Association Autumn Meeting, and 2018 Midwest Finance Association Annual Meeting for valuable comments. The authors gratefully acknowledge financial support from the JSPS Grant-in-Aid for Scientific Research Nos. 25220502, 15H06619, and 17K03812.
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Abstract

Utilizing the regulatory change relating to banks' shareholding in Japan as an instrument, this study examines the causal effects of declining shareholding by banks on bank lending and firms' risk-taking. Banks may hold equity claims over client firms for either of the following two reasons: (i) gaining a competitive advantage by exploiting complementarity between shareholding and lending activities, and (ii) mitigating shareholder–creditor conflict. Exogenous reduction in a bank's shareholding would then impair the competitiveness of the bank's lending activities and aggravate the risk-taking behavior of client firms. Using a firm–bank matched dataset for Japan's listed firms during the period 2001–2006, we empirically test these two hypotheses and obtain the following findings. First, after a bank's removal from the list of major shareholders of a client firm, the bank's share of the firm's loans decreases. Second, volatility of a firm's return on assets increases after the top shareholding bank is removed from the list of the firm's major shareholders. Third, the negative impact of a bank's removal from the list of major shareholders on bank lending mainly applies to non-main banks, while the positive impact of the top shareholding bank's removal from the list of major shareholders on firms' risk-taking mainly applies to main banks.

JEL classifications: G21, G32, G34

Keywords: Bank shareholding, cross-selling, conflict of interest

1. Introduction

Shareholding in non-financial firms by banks has been the subject of considerable debate among economists and policy-makers around the world. In the United States, laws prohibit banks from having direct equity claims, while bank-affiliated firms can invest in non-financial firms to some extent, especially since the passage of the Gramm–Leach–Bliley Financial Services Modernization Act of 1999. In Japan and many European countries, banks are able to hold equity claims over non-financial firms on their own account up to a specified limit, and many empirical studies have investigated Japanese and European banks' involvement in equity investment. In particular, those studies have examined whether banks' shareholding reduces credit friction between lenders and borrowers and improves firm performance (see, for instance, Flath (1993), Hiraki et al. (2003), Lichtenberg and Pushner (1994), Miyajima and Kuroki (2007), Morck et al. (2000), Prowse (1992), and Weinstein and Yafeh (1998) for Japanese banks, Barucci and Mattesini (2008) for Italian banks, and Chirinko and Elson (2006) and Gorton and Schmid (2000) for German banks). Recently, the simultaneous holding of equity in and issuing of loans to non-financial firms by financial institutions has been the focus of renewed research interest and several studies have examined the interaction between equity investment and loan origination by focusing on (i) equity investments by bank-affiliated private equity funds and venture capital firms in the United States (Fang et al. 2013 and Hellman et al. 2008), (ii) equity investments by banks through their trust businesses and asset management services (Ferreira and Matos 2012, Santos and Rumble 2006, and Santos and Wilson 2017), and (iii) the increasing participation in syndicated

loans by institutional equity investors (Jiang et al. 2010). Against this background, this study revisits this issue by examining the causal effect of the *unwinding* of Japanese banks' shareholding caused by the regulatory change that was introduced in the early 2000s.

Shareholding in listed firms by banks declined substantially in the late 1990s and the early 2000s in Japan. One of the reasons for this was the introduction of regulatory limits on banks' shareholding in 2001, specifically the "Act on Limitation on Shareholding by Banks and Other Financial Institutions" (Bank Shareholding Limitation Act hereafter).[1] For each bank, the Bank Shareholding Limitation Act set an upper limit on the aggregate amount of listed firms' shares that a bank could hold that was equal to the amount of Tier 1 regulatory capital of the bank, and banks had to ensure that their shareholding was below this upper limit by the end of September 2006. Hence, a bank that held shares valued at more than its Tier 1 regulatory capital before the introduction of the Bank Shareholding Limitation Act was forced to sell client firms' shares. Using the introduction of the Bank Shareholding Limitation Act as a quasi-natural experiment and the ratio of banks' shareholding relative to their Tier 1 regulatory capital as an instrument for the banks' unwinding of their shareholding, this study extracts the causal effect of declining shareholding by banks on bank lending and firms' risk-taking.

Theoretically, banks may hold equity claims over client firms for two reasons. First, banks may gain competitive advantages by exploiting complementarity between shareholding and lending

[1] Before the introduction of the Bank Shareholding Limitation Act, banks' shareholdings in an individual non-financial firm were restricted to no more than 5% of the firm's total equity issued, but there were no restrictions on banks' aggregate shareholdings.

activities and opportunities for cross-selling (the "competitive advantage hypothesis"). Second, shareholding by banks may mitigate conflicts of interest between shareholders and creditors, thus mitigating risk-taking behavior by firms and financial friction between lenders and borrowers (the "incentive alignment hypothesis"). According to these two hypotheses, exogenous reduction of a bank's shareholding would impair the competitiveness of its lending activities (competitive advantage hypothesis) and increase the risk-taking behavior of its client firms (incentive alignment hypothesis). Using a firm–bank matched dataset for Japan's listed firms during the period 2001–2006, we test these hypotheses by focusing on the reduction in banks' shareholding caused by the introduction of the Bank Shareholding Limitation Act in 2001.

To be more precise, we employ a treatment regression approach wherein the change in a bank's shareholding in its client firms is determined endogenously. To measure the reduction in shareholding by a bank, we construct a dummy variable that takes a value of 1 if the shareholding bank is removed from the top 30 shareholders ("major shareholders" hereinafter) in the firm, which results in the bank becoming (almost) a pure creditor. In the first stage of the treatment regression, we treat this dummy variable as a dependent variable and use the banks' ratio of shareholding relative to their Tier 1 regulatory capital before the introduction of the Bank Shareholding Limitation Act as an instrumental variable. In the second stage of the treatment regression, we examine whether the exogenous change in a bank's shareholding, which we extract from the first-stage regression, reduces the bank's competitiveness in terms of lending activities and increases the risk-taking behavior of client firms.

By way of a preview, we obtain the following empirical results. First, when a shareholding bank reduces its equity claims on a client firm and is removed from the firm's list of major shareholders, the bank's share of loans to the same firm decreases. This result is consistent with the competitive advantage hypothesis. Second, when the bank that has the largest equity claim among banks is removed from a firm's major shareholders, the risk-taking behavior of the firm as measured by the volatility of its return on assets (ROA) increases. This result is consistent with the incentive alignment hypothesis. To further investigate whether increased risk-taking by firms would increase financial friction between creditors and borrowing firms, we also examine the change in "other" debts provided by bond investors and banks other than the top shareholding bank, as well as the change in the interest payments of the firm. Under the incentive alignment hypothesis, we expect that the declining shareholding by the bank will intensify credit friction and decrease other debts and/or increase the interest payments of the firm. However, we do not find such evidence. Third, to examine the heterogeneity of the effect of declining shareholding by banks, we split our entire sample into subsamples based on the strength of the firm–bank relationship and rerun our treatment regressions. As a proxy for the strength of firm–bank relationships, we define the *main bank* of a firm as the one that has the largest share of the firm's outstanding loans and whose equity holding in the firm exceeds at least 3% of the firm's total equity. We find that the negative effect of banks' declining shareholding on their share of loans is significant for the subsample of non-main banks, while the positive effect of banks' declining shareholding on the volatility of client firms' ROA is significant for the subsample of main banks. These findings suggest

that the competitive advantage hypothesis mainly applies to non-main banks, which have less intimate relationships with their client firms, while the incentive alignment hypothesis mainly applies to main banks.

The contributions of this study are twofold. First, this study contributes to the literature on the Japanese main-bank system by examining the effects of unwinding of shareholding by banks. Previous studies on Japanese main banks (Flath 1993, Hiraki et al. 2003, Lichtenberg and Pushner 1994, Morck et al. 2000, Prowse 1992, Weinstein and Yafeh 1998) have mainly focused on the determinants and effects of shareholding by banks, and few studies have investigated the unwinding of shareholding by Japanese banks that took place in the late 1990s and early 2000s. One notable exception is Miyajima and Kuroki (2007), who examine the determinants of the unwinding of bank–firm cross-shareholding in Japan during 1985–2001. They also examine the effect of cross-shareholding on firm performance by employing a fixed-effect model to find that shareholding by banks negatively affects firm performance. The second and more important contribution of this study is that we extract the causal effects of declining shareholding by a bank on its competitiveness in the loan market and the performance of firms in which the bank reduces its equity claims. Previous studies have produced mixed results in relation to how shareholding by Japanese banks affects firm performance (see, for instance, Litchenberg and Pushner (1994) for the positive view, Weinstein and Yafeh (1998) and Miyajima and Kuroki (2007) for the negative view, and Morck et al. (2000) for the more nuanced view) and more generally on how dual holding of equity and debt claims by financial institutions affect loan contract

terms and firm performance (see Jiang et al. (2010) for the positive view and Fang et al. (2013) for the negative view). We revisit this unresolved issue by making use of a proper instrument, i.e., the reduction in shareholding induced by the Bank Shareholding Limitation Act.

The remainder of the paper is organized as follows. Section 2 briefly explains the Bank Shareholding Limitation Act of 2001 and the change in banks' shareholding in the early 2000s. Section 3 presents our empirical hypotheses and reviews the related literature. Section 4 explains our data and sample selection, the empirical strategy, and the variables, while Section 5 presents the empirical results. Section 6 concludes.

2. Institutional background

To provide some background for our analysis, this section briefly discusses changes in the shareholding structure of Japan's listed firms before and after the introduction of the Bank Shareholding Limitation Act.

Figure 1 shows changes in shareholding distribution for listed companies in Japan by investor category. Business corporations and banks used to hold substantial proportions of shares in Japan's listed firms and, as has been documented in many studies, cross-shareholding between firms (e.g., between suppliers and customers) and between firms and banks was prevalent until the early 1990s. However, cross-shareholdings between firms and banks started to unwind from the late 1990s onwards

for the following reasons.[2] First, declining share prices after the burst of the asset price bubble prompted banks to sell off their shares to reduce the market risk associated with shareholding. Second, the introduction of market value accounting for financial instruments, which became effective in April 2000, might have reinforced banks' incentives to reduce the market risk associated with shareholding because a decline in the price of shares that a bank holds directly reduces its accounting profits under the market value accounting approach. Third, banks might also have anticipated that the risk weight of shares would increase under the Basel II Capital Accord, which was under discussion in the late 1990s, compared with that under the Basel I Capital Accord. As a result, the proportion of shareholding by commercial banks in listed Japanese companies declined from 14.8% in 1997 to 10.1% in 2000 (see Figure 1).

Although the banks voluntarily unwound their shareholding in listed firms in the late 1990s, they were forced to do so in response to the policy set by the Japanese government in the early 2000s. Until then, the Banking Act allowed banks to hold up to 5% of a non-financial firm's total equity issued on their own account. In addition to this regulation, in April 2001, the Japanese government proposed an upper limit on the aggregate amount of shares that a bank could hold in its "Emergency Economic Measures (*Kinkyu-keizai-taisaku*)," which was aimed at resolving the banking crisis. Based on the government's proposal, the Financial System Council discussed whether it was beneficial to set an upper limit on banks' shareholding. While there was initially a divergence of views among the council

[2] Miyajima and Kuroki (2007) empirically examine the determinants of the unwinding of cross-shareholdings during the period 1995–2001.

members as to whether such a limit on banks' shareholding was desirable,[3] they eventually reached agreement. The Financial System Council formulated the details of the regulation in June, and the National Diet introduced the Bank Shareholding Limitation Act in November 2001. Because the Bank Shareholding Limitation Act forced banks to sell considerable amounts of listed firms' shares, which was also expected to prompt the unwinding of cross-shareholdings by non-financial firms, the Japanese government established the Banks' Shareholdings Purchase Corporation (*Ginkou-tou Hoyuu Kabushiki Shutoku Kikou*) to mitigate the downward pressure on share prices. The Banks' Shareholdings Purchase Corporation purchases eligible shares outside the stock exchanges, where eligible shares are defined as shares in listed companies that banks hold and bank shares that non-financial corporations hold.

As noted in the Introduction, the upper limit stipulated by the Bank Shareholding Limitation Act is equal to the amount of Tier 1 regulatory capital of each bank, and banks were required to reduce their shareholding to below this upper limit by the end of September 2006.[4] In principle, the shareholding is evaluated based on current market price, but if a bank's aggregate shareholding based on market prices exceeds that based on book value, the latter valuation is used for the purposes of the regulation. Shares in bank subsidiaries and bank-affiliated companies, trust properties, and unlisted firms, and shares obtained through debt–equity swaps are exempt from the regulation.

In response to the Bank Shareholding Limitation Act, banks continued to decrease their

[3] For instance, the Nikkei Financial News (16 April 2001) summarized the opinions expressed by seven members of the Financial System Council at the first meeting. Two members were in favor, while five members were opposed.

[4] Initially, the deadline was the end of September 2004. In 2003, the National Diet extended the deadline to the end of September 2006.

shareholding in listed firms. As a result, the proportion of shareholding in listed Japanese companies by commercial banks decreased from 10.1% in 2000 to 4.6% in 2006 (see Figure 1). Note, however, that the effect of the Bank Shareholding Limitation Act was heterogeneous among banks because it was predetermined by each bank's shareholding relative to their Tier 1 regulatory capital before the Bank Shareholding Limitation Act was implemented. Note also that the proportion of shareholding in listed Japanese companies by commercial banks has been fairly stable since 2006, which suggests that the Bank Shareholding Limitation Act has had a significant impact on banks' shareholding.

3. Empirical hypotheses

This section sets out our empirical hypotheses and reviews the related literature examining the effect of banks' shareholding on their lending activities and firm performance.

3.1. The effect of decreasing shareholding by banks on bank lending: competitive advantage hypothesis

Banks may gain a competitive advantage in their lending activities when they hold both equity and debt claims over the same firm. Such advantages naturally arise if there is an economy of scope and/or information synergies between equity investment and loan origination. Several studies have highlighted the existence of an economy of scope and/or information synergies between lending activities and securities underwriting (see, for instance, Bharath et al. (2007), Drucker and Puri (2005), and Yasuda (2005)). Likewise, banks may use either private information on client firms generated through their

lending activities to make an equity investment or information obtained through their equity investments to originate loans. Alternatively, banks may make equity investments in firms to cross-sell their core banking services, including business loans. For instance, Hellmann (2002) constructs a theory of strategic venture capital (VC) whereby strategic VC investments increase the value of the investors' other core businesses. Because of the complementarity between the VC investments and other businesses, the required rate of return from a strategic VC investment is lower than that from an independent VC investment that seeks purely financial gains. Bank-affiliated VC investments are likely to be strategic if there is complementarity between the bank's equity investment and its lending activities. We propose the following hypothesis regarding the effect of decreasing shareholding by banks on bank lending.

Hypothesis 1 (competitive advantage hypothesis): reduction in a bank's shareholding in a firm impairs the competitiveness of its lending activities and reduces the bank's share of the firm's loans.

A number of empirical studies on Japanese main banks have found that close firm–bank ties increase the availability of credit for firms (e.g., Weinstein and Yafeh 1998). However, many studies do not state whether this effect is the result of the simultaneous holding of both equity and debt or of other characteristics of the close relationship with the bank (e.g., the presence of representatives of the bank on the firm's board). Using data from German banks, Chirinko and Elson (2006) report that

shareholding by banks does not have a significant effect on the value of long-term loans provided. Using data on bank-affiliated private equity (PE) or VC firms in the United States, Hellmann et al. (2008) and Fang et al. (2013) find that banks are more likely to cross-sell their financial products, including loans, if bank-affiliated PE/VC firms have previously invested in those firms. Jiang et al. (2010) analyze data on syndicated loans by non-commercial banking institutions in the United States and find that these institutions tend to participate in syndicated loans more often if they simultaneously hold both equity and debt positions.

3.2. The effect of decreasing shareholding by banks on firms' risk-taking behavior and borrowing terms: incentive alignment hypothesis

Shareholding by banks may mitigate conflicts of interest between shareholders and creditors, thus reducing both risk-taking behavior by firms and financial friction between lenders and borrowers. The seminal work of Jensen and Meckling (1976) and Myers (1977) shows that the divergence of objectives between shareholders and creditors may result in a conflict of interest whereby managers, whose objective it is to maximize shareholder value, may undertake actions exploiting the wealth of creditors (the asset substitution problem). A typical example of the asset substitution problem occurs when a manager pursues a risky albeit potentially profitable project because if the project fails, the limited liability status of shareholders sets a limit on their potential losses. The asset substitution problem may be resolved, at least partially, if creditors internalize the conflict of interest between shareholders and

creditors by simultaneously holding equity and debt (Dewatripont and Tirole 1994, John et al. 1994). Alternatively, Mahrt-Smith (2006) theoretically shows that the hold-up problem in a lending relationship may be mitigated if the lender holds equity in the borrowing firm because the lender's incentive to extract rents from the borrower is reduced by its equity stake. We put forward the following hypothesis regarding the effect of decreasing shareholding by banks on firms' risk-taking behavior and borrowing terms.

Hypothesis 2 (incentive alignment hypothesis): reduction in a bank's shareholding in a firm aggravates conflicts of interest between shareholders and creditors, thereby increasing risk-taking behavior by firms and worsening their borrowing terms.

Most previous studies using Japanese data have examined how shareholding by banks affects firm value, and have produced mixed findings. Litchenberg and Pushner (1994) report that bank shareholding has a positive impact on firm productivity, while Miyajima and Kuroki (2007) report a negative impact on firm profitability (as measured by ROA) and Tobin's q, and argue that bank shareholding may be detrimental to firm value by encouraging the entrenchment of firms' managers. Morck et al. (2000) report that the effect of bank shareholding on firm performance is nonlinear, i.e., it is negative for low levels of shareholding, but positive for higher levels. Using German data, Gorton and Schmid (2000) find evidence that bank shareholding is positively related to firm performance (as

measured by the market-to-book ratio), while Chrinko and Elson (2006) find that bank shareholding is negatively related to firm performance (as measured by ROA).

Turning to borrowing terms, Morck et al. (2000) find that the interest costs of Japanese firms increase with the level of bank shareholding, which is inconsistent with the incentive alignment hypothesis, and they raise the possibility of rent extraction by bank shareholders (hold-up problem). In contrast, Jiang et al. (2010) find that the credit spreads of syndicated loans are lower if non-commercial banking institutions in the United States hold equity claims over borrowing firms, which is consistent with the incentive alignment hypothesis. Using cross-country data on syndicated loans, Ferreira and Matos (2012) find that the availability of credit is greater if financial institutions make equity investments in borrowing firms.

3.3. The effect of decreasing shareholding by main banks and non-main banks

The effect of banks' unwinding of shareholding on their lending activities and client firms' risk-taking behavior may differ depending on the strength of the firm–bank relationship. In Japan, a bank that has the closest ties with a firm is called the firm's main bank and is often characterized by the following attributes: the largest share of loans, providing bond issuance-related services such as trustee administration and underwriting, substantial stockholding, providing payment settlement accounts, and supplying information services and management resources (Aoki and Patrick 1994).

Regarding bank lending, the negative effect of a bank's decreasing shareholding may not

emerge if the bank has strong ties with the firm (i.e., it is the firm's main bank) and can obtain information synergies through business relationships other than equity investments. Conversely, if a bank has weak ties with the firm (i.e., it is a non-main bank), a decrease in shareholding may be detrimental to its lending activities. Regarding firms' risk-taking behavior, a main bank that has substantial ownership of a client firm is expected to mitigate the asset substitution problem by making use of its dual role as a creditor and a shareholder, while such a role may be limited for a non-main bank, whose value of loans outstanding and shareholding are smaller than those of the main bank. We put forward the following hypothesis regarding the differentiated effect of decreasing shareholding by main banks and non-main banks.

Hypothesis 3: the competitive advantage hypothesis (Hypothesis 1) mainly applies to non-main banks, while the incentive alignment hypothesis (Hypothesis 2) mainly applies to main banks.

There are few studies that examine the difference between main and non-main banks in terms of the impact of their shareholding. One notable exception that we are aware of is Hiraki et al. (2003), who argue that the effect of bank shareholding on firm performance depends on whether the shareholding between a bank and a firm is one-way or two-way (cross-shareholding) and on whether the shareholding bank is the firm's main bank, where a main bank is defined as the bank that has the largest outstanding loan value and whose loan share is at least 5% of the firm's total outstanding loans.

They find that cross-shareholding between a main bank and its client firms has a negative effect on firm value, while one-way shareholding by non-main banks has a positive effect. Note, however, that they do not use a proper instrument to extract a causal relationship between bank shareholding and firm performance.

4. Data, empirical strategy, and variables

4.1. Data and sample selection

To construct our firm–bank matched dataset for shareholding relationships between listed firms and banks in Japan, we use the Nikkei Financial Quest database. This contains detailed information on Japan's listed firms including their financial statements, equity ownership, and the amount of loans outstanding with each bank with which they undertake transactions. Regarding equity ownership, the Nikkei Financial Quest database identifies the 30 major shareholders based on the number of shares held. In addition to the Nikkei Financial Quest database, we use the banks' financial statements collected by the Japanese Bankers Association to obtain bank-level data.

The period we examine using the firm–bank matched dataset is from 2001 to 2006, that is, the year in which the Bank Shareholding Limitation Act was established and the year by which banks had to comply with the upper limit for total shareholding stipulated in the Bank Shareholding Limitation Act. We restrict our sample to listed firms and banks for which accounting information for 2001 is available, where the closing month for 2001 is between January 2001 and December 2001 for firms and

March 2001 for banks. Regarding banks, we restrict our sample to commercial banks; i.e., city banks, regional banks, and second-tier regional banks. We exclude trust banks because their shareholding is mainly in relation to fiduciary services for which the trust banks act as trustees. All city banks and some regional banks in our sample experienced mergers and acquisitions during the period 2001–2006. Thus, we constructed hypothetical merged banks, i.e., if bank A and bank B existed in 2001 but merged in 2003 to become bank C, we assumed that bank C existed in 2001.[5] Thus, if bank A was a major shareholder in a particular firm in 2001, we treat bank C as a major shareholder in the firm.

We additionally restrict our sample to firm–bank pairs where a bank was one of the major shareholders in a firm and the bank has positive loans outstanding in 2001 to examine the evolution of their shareholding relationship, as well as changes in loans outstanding in 2006. After deleting some banks from the sample (see Section 4.3 for an explanation), we ended up with 3,281 firm–bank pairs (involving 1,315 firms and 84 banks) for our analysis.

4.2. Empirical strategy

To examine the impact of decreasing shareholding in firm *i* by bank *j* on changes in loans outstanding and firm performance, we need to separate a treatment effect from a possible selection effect. For instance, if we observe that the value of a bank's loans to a firm decreases after the bank reduces its

[5] To be more precise, we constructed hypothetical banks in 2001 for the following banks: Mizuho (formerly Daiichi-Kangyo, Fuji, and Industrial Bank of Japan; merged in April 2002), BTMU (formerly Bank of Tokyo-Mitsubishi and UFJ; merged in January 2006. UFJ was formerly Sanwa and Tokai; merged in January 2002), SMBC (formerly Sakura, Sumitomo, and Wakashio; merged in March 2003), Nishinihon-City (formerly Nishinihon and Fukuoka-City; merged in October 2004), Shinwa (formerly Shinwa and Kyusyu; merged in April 2003), and Momiji (formerly Hiroshima-Sogo and Setouchi; merged in May 2004).

shareholding in the firm, it is difficult to establish whether the decreased shareholding causes a decrease in the value of loans provided (treatment effect) or whether the bank reduces its stockholding in a firm for which the bank expects a decrease in loan demand (selection effect). We use a treatment regression approach to deal with this problem.

Regarding changes in firm *i*'s loans outstanding from bank *j* to examine Hypotheses 1 and 3, we apply a treatment regression approach in the following manner:

$$\Delta LOAN_{ij,2006-2001} = \alpha_0 \text{Stock decrease\_ex}_{\iota j,2006-2001} + \mathbf{X_{2001}}\boldsymbol{\alpha} + \varepsilon_{ij}, \quad (1)$$

$$\left.\begin{aligned} \text{Stock decrease\_ex}^*_{ij,2006-2001} &= \lambda_0 \text{IV}_{j,2001} + \mathbf{X_{2001}}\boldsymbol{\lambda} + \upsilon_{ij}, \\ \text{Stock decrease\_ex}_{ij,2006-2001} &= 1 \text{ if Stock decrease\_ex}^*_{ij,2006-2001} > 0; \\ &= 0 \text{ if otherwise.} \end{aligned}\right\} \quad (2)$$

In equation (1), $\Delta LOAN_{ij,2006-2001}$ is the variable that represents changes in the loan amount between firm *i* and bank *j* during the period 2001–2006.[6] We are interested in the coefficients of the dummy variable $\text{Stock decrease\_ex}_{ij,2006-2001}$, α_0, which indicates how bank *j* being deleted from the list of major shareholders (extensive margin) in firm *i* between 2001 and 2006 affected $\Delta LOAN_{ij,2006-2001}$. To allow for the possibility that $\text{Stock decrease\_ex}_{ij,2006-2001}$ is determined endogenously, as shown by equation (2), and that the correlations between the disturbance terms in equations (1) and (2) are not zero, we resort to the treatment regression that jointly estimates equations (1) and (2) using the maximum likelihood estimator. We also use an instrumental variable, $\text{IV}_{j,2001}$, that is correlated with

[6] To be more precise, we take the average of 2005 and 2006 for 2006 and the average of 2000 and 2001 for 2001 to take into account the possibility that the figures at the end of the fiscal year may be quite different from the average balance throughout the year. We apply the same procedure to all of the dependent variables that measure a difference (Δ).

Stock decrease_ex$^{*}_{ij,2006-2001}$ but not correlated with ε_{ij} to extract exogenous changes in Stock decrease_ex$^{*}_{ij,2006-2001}$. Finally, $\mathbf{X_{2001}}$ is a vector of covariates including the characteristics of firms and firm–bank relationships in 2001.

Using changes in firm *i*'s risk-taking behavior and borrowing terms to examine Hypotheses 2 and 3, we estimate the following equations:

$$\Delta RISK_{i,2006-2001} = \beta_0 \text{Stock decrease\_ex}\widehat{\ }_{ij(TOP),2006-2001} + \mathbf{X_{2001}}\boldsymbol{\beta} + \eta_i, \quad (3)$$

$$\Delta BORROWING_{i,2006-2001} = \gamma_0 \text{Stock decrease\_ex}\widehat{\ }_{ij(TOP),2006-2001} + \mathbf{X_{2001}}\boldsymbol{\gamma} + \omega_i, \quad (4)$$

$$\left.\begin{aligned} \text{Stock decrease\_ex}^{*}_{ij(TOP),2006-2001} &= \mu_0 \text{IV}_{j(TOP),2001} + \mathbf{X_{2001}}\boldsymbol{\mu} + \upsilon_{ij(TOP)}, \\ \text{Stock decrease\_ex}_{ij(TOP),2006-2001} &= 1 \text{ if Stock decrease\_ex}^{*}_{ij(TOP),2006-2001} \\ &> 0; \ = 0 \text{ if otherwise.} \end{aligned}\right\} \quad (5)$$

In equations (3) and (4), the dependent variables $\Delta RISK_{i,2006-2001}$ and $\Delta BORROWING_{i,2006-2001}$ represent changes in the risk-taking behavior and borrowing terms, respectively, of firm *i* during the period 2001–2006, while the independent variable Stock decrease_ex$_{ij(TOP),2006-2001}$ represents whether the top shareholding bank, which is defined as the bank that held a greater value of shares than other banks in firm *i* in 2001, was deleted from the list of major shareholders between 2001 and 2006. Unlike equation (1), which uses the firm–bank-level dependent variable $\Delta LOAN_{ij}$, the dependent variables in equations (3) and (4) are at the firm level. To measure the effect of banks' declining shareholding at the firm level, we assume that the *top* shareholder bank is the most influential among bank shareholders in relation to the firm's behavior. Thus, for variables that represent the characteristics of shareholding banks in equations (3) and (4), including an instrumental variable, we use those of the

top shareholding banks.

As noted above, the treatment regressions assume that Stock decrease_ex$_{ij}$ and Stock decrease_ex$_{ij(TOP)}$ are endogenous and that the correlation between the disturbance terms in equations (1) and (2) and those in equations (3), (4), and (5) is not zero. To check the endogeneity of these two variables, we implement the Wald test to test the null hypothesis that the correlation between disturbance terms is zero (Stock decrease_ex$_{ij}$ and Stock decrease_ex$_{ij(TOP)}$ are exogenous). In cases in which we fail to reject the null hypothesis, we also estimate ordinary least squares (OLS) regressions for equations (1), (3), and (4).

Finally, to examine whether the effect of declining shareholding by banks is affected by the strength of firm–bank ties, we conduct subsample analyses in Section 5.2. We divide our sample into two subsamples based on whether or not a shareholder bank is the firm's main bank and redo our estimations (equations (1)–(5)). We define main banks as those that have the largest value of loans outstanding and whose equity holding exceeded at least 3% of a firm's total equity in 2001, that is, before the introduction of the Bank Shareholding Limitation Act.

4.3. Variables

The definitions of dependent variables and independent variables used to estimate equations (1)–(5) are presented in Table 1, while Table 2 shows summary statistics. To deal with outliers, most variables are winsorized at the 1st and 99th percentiles (see Table 1 for details).

Regarding the instrumental variable in equations (2) and (5), we use $\text{BK\_stock} - \text{cap ratio}_j$, which is defined as each bank's shareholding in listed firms relative to the amount of the bank's core capital as at March 2001. The mean of $\text{BK\_stock} - \text{cap ratio}_j$ is 1.147, so banks in our sample had to reduce the value of shares they held by about 15% on average to comply with the regulatory limit, although there are considerable cross-bank variations, as indicated by the first and third quartiles of $\text{BK\_stock} - \text{cap ratio}_j$, which are 0.551 and 1.423, respectively (see Table 2). The mean of $\text{BK\_stock} - \text{cap ratio}_{j(TOP)}$, which is the same ratio for each firm's *top* shareholding bank and is a subset of $\text{BK\_stock} - \text{cap ratio}_j$, is 1.268.

To calculate the $\text{BK\_stock} - \text{cap ratio}_j$ from the Nikkei Financial Quest database, we took the following steps. First, for each firm–bank pair *ij*, we calculated the value of shares that bank *j*, as one of the top 30 shareholders, held in firm *i* by multiplying the number of firm *i*'s shares that bank *j* held by the average stock price of firm *i* in the closing month of accounting year 2001 (Stock_{ij}). Second, for each bank *j*, we totaled the value of each firm's stock that the bank held: $\text{BK\_stock}_j = \sum_i \text{Stock}_{ij}$. Finally, we divided BK_stock_j by bank *j*'s core capital, which was a proxy for the bank's Tier 1 regulatory capital and was taken from the bank's balance sheet, to calculate the $\text{BK\_stock} - \text{cap ratio}_j$.

We could have calculated the ratio by simply using the value of shares shown in the bank's balance sheet, but we decided not to do so for the following reasons. First, by definition, shares listed in a bank's balance sheet include not only shares in listed firms but also shares in unlisted firms and affiliated companies that are exempt from the Bank Shareholding Limitation Act. Second, shares listed

in a bank's balance sheet may also include shares the bank holds in listed firms despite not being among the top 30 shareholders in those firms, and our key variable, $\text{Stock decrease\_ex}_{ij}$, does not capture changes in shares that a bank holds if it is not one of the major shareholders in a firm. To be consistent with the definitions of the two main variables, we used the Nikkei Financial Quest database to calculate the $\text{BK\_stock} - \text{cap ratio}_j$. There is, however, a caveat in relation to the $\text{BK\_stock} - \text{cap ratio}_j$ in that it may underestimate the value of listed firms' shares that a bank holds if the bank has a significant shareholding but is a non-major shareholder (i.e., not among the top 30) of a client firm. To deal with this problem, we deleted banks for which the difference between the $\text{BK\_stock} - \text{cap ratio}_j$ constructed from the Nikkei Financial Quest database and the Stock-Tier 1 ratio constructed from the bank's balance sheet was significant.[7] In addition, we deleted Ashikaga Bank and banks belonging to the Resona Group, which received capital injections from the Japanese government between 2001 and 2006. These banks significantly reduced their shareholding during this period because this was one of the conditions they were required to meet to receive capital injections from the government. As a result, the total number of banks in our sample was 84.

The key variable of interest in this study is the dummy variable $\text{Stock decrease\_ex}_{ij}$, which takes a value of 1 if bank j, which was one of the major shareholders in 2001, disappeared from the list of major shareholders in 2006. The mean of $\text{Stock decrease\_ex}_{ij}$ is 0.220, thus less than one-quarter

[7] To be more precise, we calculated the ratio between the value of shares listed in a bank's balance sheet and the value of listed firms' shares that the bank held as one of the major shareholders, BK_mainstock, and deleted the bank from the sample if the ratio was greater than 22, which is the 99th percentile of the entire sample.

of firm–bank shareholding relationships diminished between 2001 and 2006 (see Table 2). The mean of Stock decrease_ex$_{ij(TOP)}$, the dummy variable for the top shareholder among banks in 2001, is 0.131. This indicates that the firm–bank shareholding relationships of a top shareholding bank were less likely to be diminished than those of other shareholding banks.

Turning to dependent variables, to examine whether a reduction in a bank's shareholding impaired the competitiveness of its lending activities ($\Delta LOAN_{ij}$ in equation (1)), we used ΔLoan share$_{ij}$, which represents the ratio between loans provided by bank *j* and the total value of all loans taken out by firm *i* in 2006 less the same ratio in 2001. From Hypothesis 1 in Section 3, we expect the coefficient of Stock decrease_ex$_{ij}$ in equation (1) to be negative. In examining the change in risk-taking behavior by firms between 2001 and 2006 ($\Delta RISK_i$ in equation (3)), we use ΔROA volatility, which represents the change in the standard deviation of ROA. If reduced shareholding by banks increases the risk-taking behavior of client firms, as predicted by Hypothesis 2 in Section 3, we expect the coefficient of Stock decrease_ex$_{ij}$ in equation (3) to be positive. Finally, to examine whether the firms' borrowing terms ($\Delta BORROWING_i$ in equation (4)) worsen because of intensified conflicts of interest between borrowing firms and creditors, we use ΔOther debt ratio and ΔInterest expense ratio. ΔOther debt ratio represents the change in a firm's outstanding debts other than loans from the shareholding bank relative to the firm's total assets, and we expect the coefficient of Stock decrease_ex$_{ij}$ to take a negative value. ΔInterest expense ratio represents the change in a firm's interest expenses relative to its assets, and we expect the coefficient of

Stock decrease_ex$_{ij}$ to take a positive value.

Regarding the control variables $\mathbf{X_{2001}}$, we use the following firm characteristic variables for 2001: the logarithm of total sales as a proxy for firm size (ln(Sales)), ROA as a proxy for profitability (ROA), standard deviation of ROA (ROA volatility) and the leverage ratio (Leverage ratio) as proxies for riskiness, ratio of cash relative to total assets as a proxy for liquidity (Cash ratio), sales growth as a proxy for firm growth and loan demand (Sales growth), ratio of tangible assets to total assets as a proxy for tangibility (Tangible asset ratio), and 32 industry dummy variables. We also include a dummy variable representing whether the shareholding bank is the firm's main bank (Main bank dummy), where the main bank is defined as the bank with the largest value of loans outstanding and owning 3% or more of the firm's equity as at 2001.[8]

5. Results

In this section, we present the estimation results. Section 5.1 presents the main results to test Hypotheses 1 and 2, while Section 5.2 presents the estimation results for the subsamples of main banks and non-main banks to test Hypothesis 3.

5.1. Main results

[8] In addition to firm and firm–bank characteristics, we could have included bank characteristic variables as covariates, but we decided not to do so because of concerns about multicollinearity with our instrumental variable BK_stock − cap ratio. For instance, the correlation coefficient for bank asset size and BK_stock − cap ratio is 0.88.

We first examine the determinants of banks' withdrawal from being major shareholders in firms to confirm whether the instrumental variable we use has the expected effects. Column (1) of Table 3 corresponds to the empirical specifications in equation (2) in Section 4.2, with the rows showing the estimated coefficients and heteroskedasticity-robust standard errors in parentheses. We find that the coefficient of the BK stock − cap ratio is positive and significant, implying that a bank that held a larger value of shares than its Tier-1 capital in 2001 (i.e., before the Bank Shareholding Limitation Act was introduced) was more likely to be deleted from client firms' lists of major shareholders by 2006. Based on the estimated coefficients in Table 3, a bank that had to reduce its shareholding by an average of 14.7%, which corresponds to the mean BK stock − cap ratio at the bank–firm level in our sample, has a 3.8-percentage-point (0.147*0.259*100)-higher probability of being deleted from the lists of major shareholders. In terms of firm characteristics, we find that banks are more likely to be removed from the list of major shareholders in larger firms (ln(Sales)), riskier firms (ROA volatility), and firms with more tangible assets (Tangible asset ratio). In terms of firm–bank relationships, we find that a bank is less likely to be deleted from a firm's list of major shareholders if it is the firm's main bank.

Next, we examine the effect of a bank's removal from a firm's list of major shareholders on the competitiveness of its lending activity. In Column (2) of Table 3, the coefficient of Stock decrease_ex is significantly negative, indicating that the exogenous reduction in bank shareholding has a significant negative impact on ΔLoan share. The Wald test on the exogeneity of Stock decrease_ex (rho=0) is rejected at the 1% level, which lends support for the use of a treatment

regression estimation. For the sake of comparison, we also report the conventional OLS estimation result in column (3) and the OLS estimation with a firm fixed-effect result in column (4) in which we measure the effect of Stock decrease_ex on ΔLoan share within a firm. Both the coefficients of Stock decrease_ex are significantly negative, although the point estimates in columns (3) and (4), −0.018 and −0.017, respectively, are smaller than that obtained in column (2), i.e., −0.079. Based on the estimation result in column (2), when a bank is deleted from a firm's list of major shareholders, its share of loans to that firm decreases by 7.9 percentage points. Compared with the mean of ΔLoan share shown in Table 2, i.e., −1.7%, the effect is economically significant. Taking into account the estimation result in column (1), for a bank that had to reduce its average shareholding by 14.7% under the Bank Shareholding Limitation Act, the expected value of the decrease in the bank's share of loans to that firm is 0.3 percentage points (0.147*0.259*0.079*100). Thus the effect of the Bank Shareholding Limitation Act on an average bank in our sample is of modest but not negligible economic significance. In summary, the results suggest that a decrease in banks' shareholding impairs the competitiveness of their lending activities.

Table 4 shows the effect of the top shareholding bank's withdrawal from a client firm's list of major shareholders on the firm's risk-taking behavior and borrowing terms. Column (2) in Table 4 shows that the coefficient of Stock decrease_ex is significantly positive. This suggests that firms increase their risk-taking in relation to their business activities when the top shareholding banks are deleted from their list of major shareholders. Turning to whether the reduction in bank shareholding

worsens firms' borrowing terms, we find that the effects of Stock decrease_ex on ΔOther debt ratio in an OLS estimation (column (6) in Table 4) and on ΔInterest expense ratio in an OLS estimation (column (9) in Table 4) are both insignificant. Note that we employ OLS estimation results because we fail to reject the null hypothesis that Stock decrease_ex is exogenous (rho=0).

Overall, we find evidence that the exogenous reduction in a bank's shareholding caused by the Bank Shareholding Limitation Act decreased its share of loans to client firms, which is consistent with the competitive advantage hypothesis. We also find evidence of an increase in firms' risk-taking behavior, which is consistent with the incentive alignment hypothesis, but do not find evidence of a deterioration in firms' borrowing terms.

5.2. Results for main-bank and non-main-bank subsamples

In this subsection, we examine whether the effect of declining shareholding by banks differs in terms of their relationships with client firms. As noted in Section 4.2, we report the estimation results after dividing our overall sample into main-bank and non-main-bank subsamples, where the main bank is defined as the bank that has the largest value of loans outstanding and whose equity holding exceeds at least 3% of a firm's total equity.

Columns (1)–(3) in Table 5 show the estimation results for ΔLoan share using the main-bank subsample, while columns (4)–(6) in Table 5 show those using the non-main-bank subsample. We

find that the coefficient of Stock decrease_ex is insignificant for the main bank subsample in column (2). Although we should interpret this result with caution because we fail to reject the null hypothesis that Stock decrease_ex is exogenous (rho=0), we find that the OLS estimate of Stock decrease_ex in column (3) is also insignificant, confirming that the effect of Stock decrease_ex on ΔLoan share is statistically insignificant for the main-bank subsample. In contrast, the treatment-effect estimate of Stock decrease_ex is significant for the non-main-bank subsample in column (5). Taken together, these results are consistent with the first part of Hypothesis 3, which states that the competitive advantage hypothesis mainly applies to non-main banks that have weak ties with client firms and whose decrease in shareholding may be detrimental to their lending activities.

Table 6 shows estimation results for ΔROA volatility in columns (1)–(6), ΔOther debt ratio in columns (7)–(12), and ΔInterest expense ratio in columns (13)–(18) in a similar manner. Regarding ΔROA volatility, we find that the coefficient of Stock decrease_ex is only significant in treatment regressions for the main-bank subsample (column (2)). For the non-main-bank subsample, because we fail to reject the null hypothesis that Stock decrease_ex is exogenous (rho=0) in column (4), we resort to the OLS estimate of Stock decrease_ex in column (6), which is also statistically significant. However, the absolute value of the point estimate for the main-bank subsample in column (2) is 0.035, while that for the non-main-bank subsample in column (6) is 0.009. Taken together, these results are consistent with the second part of Hypothesis 3, which states that the incentive alignment hypothesis mainly applies to main banks that are most expected to alleviate the

asset substitution problem because of their dual role as creditors and shareholders. Turning to estimation results for ΔOther debt ratio and ΔInterest expense ratio, we find that Stock decrease_ex is insignificant in all cases, except for the treatment regression for ΔOther debt ratio using the non-main-bank subsample in column (11). However, the sign of Stock decrease_ex in column (11) is negative, which is inconsistent with the incentive alignment hypothesis. One possible interpretation is that firms may be able to escape from rent extraction by non-main top shareholding banks when those banks reduce their shareholding.

6. Conclusion

Employing the regulatory changes relating to banks' shareholding in Japan as an instrument, this study investigated the effects of declining shareholding by banks on bank lending and firms' risk-taking. Our empirical analysis yielded the following results. First, exogenous reduction in a bank's shareholding decreases the bank's share of loans to the client firm. This finding is consistent with the view that banks hold equity in client firms to gain a competitive advantage in relation to lending activities (competitive advantage hypothesis). Second, exogenous reduction in a bank's shareholding increases the volatility of a client firm's ROA, which is consistent with the view that bank shareholding is useful in mitigating shareholder–creditor conflict (incentive alignment hypothesis). Third, the negative impact of a reduction in a bank's shareholding on its share of loans to the firm is significant for the subsample of non-main banks, while the positive impact of a reduction in a bank's shareholding on the volatility of

client firms' ROA is significant for the subsample of main banks. These findings suggest that the competitive advantage hypothesis mainly applies to non-main banks, while the incentive alignment hypothesis mainly applies to main banks.

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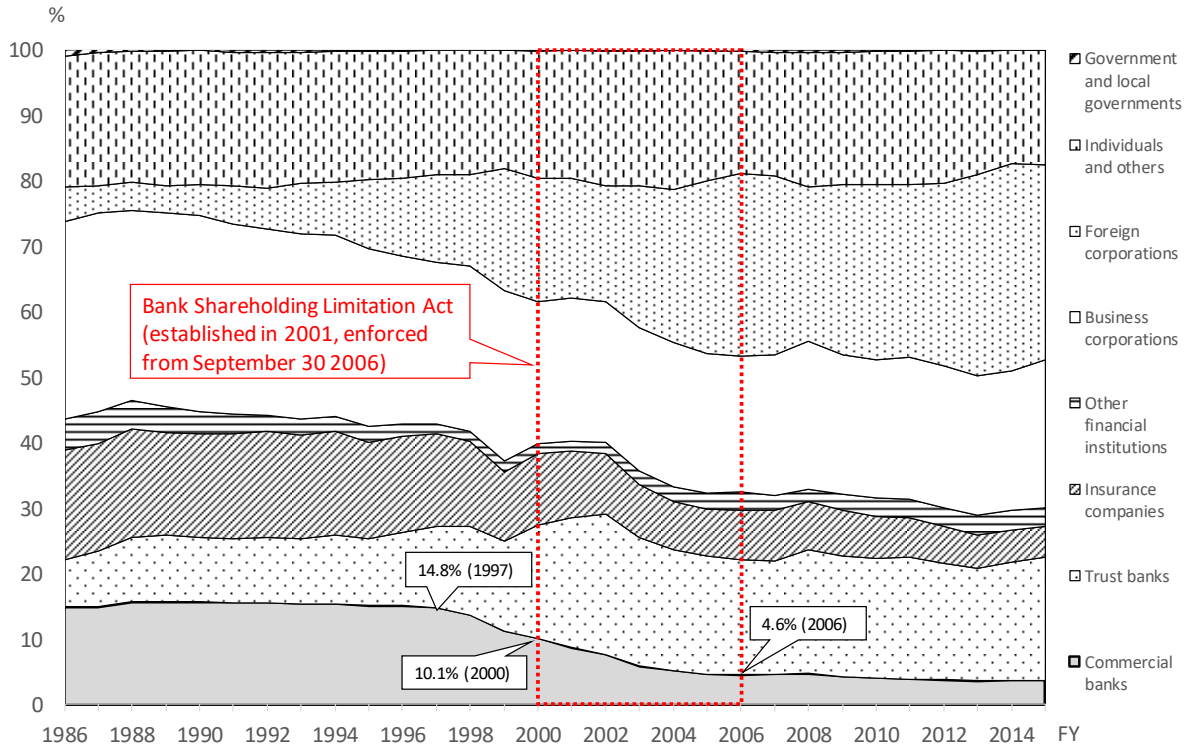
Figure 1: Changes in the shareholding distribution (in terms of market value) for domestic listed companies by investor category



Note: The term 'commercial banks' refers to city banks, regional banks, and long-term credit banks. From FY2004, companies listed on the JASDAQ are included. The term 'other financial institutions' includes securities companies, credit cooperatives, investment trusts, and annuity trusts. The term 'foreign corporations' includes non-Japanese individuals.

Source: Tokyo Stock Exchange

Table 1: Definitions of variables.

Variables	Definition	Winsor*
Dependent variables		
Stock_decrease_ex	Dummy for bank *j*'s termination of the relationship with firm *i* as a major shareholders. 1 if the bank *j* which is listed as one of the top 30 shareholders in 2001 disappears from the top 30 list in 2006 and 0 if the bank *j* remains in the list. In case we only use the top shareholder bank among the banks included in top 30 list in 2001, we denote the variable with lower subscript "j(TOP)," $\text{Stock\_decrease\_ex}_{ij(TOP)}$	No
ΔLoan share	A change in the average share of loans extended to firm *i* by bank *j* between 2000-2001 and 2005-2006. The share of loans is the ratio of loans extended by bank *j* to the total amount of loans for firm *i*.	No
ΔROA volatility	A change in the average volatility of a firm's ROA between 2000-2001 and 2005-2006. On the one hand, volatility of ROA in 2000 and 2001 is respectively the standard deviation of ROA in 1995-1999 and 1996-2000, and we take the average of the two for the ROA volatility of a firm's ROA for years 2000-2001. On the other hand, volatility of ROA in 2005 and 2006 is respectively the standard deviation of ROA in 2006-2010 and 2007-2011, and we take the average of the two for the ROA volatility of a firm's ROA for 2005-2006.	Yes
ΔOther debt ratio	A change in the average debt ratio provided by other institutions than the main shareholder bank between 2000-2001 and 2005-2006. The debt ratio is defined as the ratio of interest-bearing liabilities (=loans and bonds) issued by other institutions than the main shareholder bank to the amount of total assets for a firm.	Yes
ΔInterest expense ratio	A change in the average interest expense ratio for a firm between 2000-2001 and 2005-2006. The interest expense ratio is the amount of interest payment plus discount expense divided by a firm's interest bearing liabilities amount.	Yes
Independent variables		
BK stock − cap ratio	Sum of bank *j*'s shareholding of listed firms (as one of the top 30 shareholders for each firm) divided by the bank's own core capital amount in 2001. Core capital is the sum of common stock, new stock subscription, and capital surplus reserve. In case we only use the top shareholder bank among the banks included in top 30 list in 2001, we denote the variable with lower subscript "j(TOP)," $\text{BK stock} - \text{cap ratio}_{ij(TOP)}$	Yes
ln(Sales)	Log of a firm's sales in 2001	No
ROA	The ratio of a firm's current profit to its total asset in 2001	Yes
ROA volatility	Standard deviation of a firm's ROA for the preceding five years in 2001	Yes
Cash ratio	The ratio of a firm's cash and short-term security holdings to its total asset in 2001	Yes
Sales growth	A firm's sales growth between year 2000 and 2001	Yes
Tangible asset ratio	The ratio of a firm's tangible asset to its total asset in 2001	Yes
Leverage ratio	The ratio of a firm's interest bearing liabilities to its total asset in 2001	Yes
Mainbank dummy	Dummy for the main bank of a firm. 1 if the bank has the largest outstanding loan value and holds at least 3 percent of the equity in the firm in 2001, and 0 otherwise.	No
Industry dummy	Dummies for 33 industries (excluding financial industry) based on the Nikkei Industry Classification Code in 2001	No

* Winsorization at upper and lower 1 percentile of the sample

Table 2: Summary statistics. Definitions of variables are provided in Table 1.

Bank-firm level

Variables	N	Mean	sd	Min	p25	p50	p75	Max
Dependent variable (1st stage)								
Stock_decrease_ex	3,281	0.220	0.414	0.000	0.000	0.000	0.000	1.000
Dependent variable (2nd stage)								
ΔLoan share	3,281	-0.017	0.052	-0.137	-0.039	0.000	0.005	0.128
Independent variables								
BK stock-cap ratio	3,281	1.147	0.605	0.014	0.551	1.165	1.423	1.923
ln(Sales)	3,281	10.607	1.367	5.613	9.647	10.440	11.399	16.300
ROA	3,281	0.039	0.043	-0.466	0.015	0.033	0.056	0.243
ROA volatility	3,281	0.019	0.016	0.002	0.009	0.015	0.024	0.237
Cash ratio	3,281	0.127	0.084	0.011	0.068	0.109	0.164	0.745
Sales growth	3,281	0.071	0.201	-0.390	-0.017	0.040	0.113	3.955
Tangible asset ratio	3,281	0.326	0.169	0.002	0.198	0.315	0.430	0.824
Leverage ratio	3,281	0.346	0.195	0.005	0.190	0.328	0.477	0.932
Main bank dummy	3,281	0.217	0.412	0.000	0.000	0.000	0.000	1.000

Firm level

Variables	N	Mean	sd	Min	p25	p50	p75	Max
Dependent variable (1st stage)								
Stock_decrease_ex	1,296	0.131	0.338	0.000	0.000	0.000	0.000	1.000
Dependent variables (2nd stage)								
ΔROA volatility	1,270	0.009	0.026	-0.043	-0.004	0.004	0.015	0.161
ΔOther debt ratio	1,296	-0.057	0.124	-0.383	-0.132	-0.055	0.010	0.316
ΔInterest expense ratio	1,296	-0.003	0.014	-0.048	-0.009	-0.003	0.001	0.068
Independent variables								
BK stock-cap ratio	1,296	1.268	0.560	0.028	1.165	1.165	1.923	1.923
ln(Sales)	1,296	10.505	1.397	5.613	9.522	10.333	11.302	16.300
ROA	1,296	0.040	0.047	-0.466	0.015	0.035	0.059	0.243
ROA volatility	1,296	0.020	0.017	0.002	0.009	0.016	0.026	0.237
Cash ratio	1,296	0.131	0.090	0.011	0.068	0.110	0.167	0.745
Sales growth	1,296	0.077	0.240	-0.390	-0.017	0.042	0.117	3.955
Tangible asset ratio	1,296	0.325	0.169	0.002	0.198	0.314	0.430	0.824
Leverage ratio	1,296	0.338	0.196	0.005	0.181	0.320	0.476	0.932
Main bank dummy	1,296	0.465	0.499	0.000	0.000	0.000	1.000	1.000

Table 3: Estimation results for ΔLoan share. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively. Robust standard errors are shown in parentheses.

Dependent variable:	ΔLoan share (1st stage: Stock decrease_ex)			
Estimation method:	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS	Fixed effects
	(1)	(2)	(3)	(4)
Stock_decrease_ex		-0.079***	-0.018***	-0.017***
		(0.006)	(0.002)	(0.003)
BK stock-cap ratio	0.259***			
	(0.038)			
ln(Sales)	0.038*	-0.001	-0.002***	
	(0.022)	(0.001)	(0.001)	
ROA	-0.164	0.043	0.050*	
	(0.628)	(0.026)	(0.028)	
ROA volatility	5.037***	-0.102	-0.200***	
	(1.650)	(0.071)	(0.073)	
Cash ratio	0.274	-0.010	-0.019	
	(0.362)	(0.014)	(0.014)	
Sales growth	-0.116	-0.004	-0.002	
	(0.147)	(0.005)	(0.004)	
Tangible asset ratio	0.520**	-0.007	-0.018**	
	(0.206)	(0.008)	(0.008)	
Leverage ratio	0.196	0.036***	0.035***	
	(0.156)	(0.006)	(0.006)	
Main bank dummy	-0.870***	-0.023***	-0.011***	-0.016***
	(0.077)	(0.003)	(0.002)	(0.002)
Constant	-1.905***	0.006	0.017	-0.010***
	(0.319)	(0.012)	(0.010)	(0.001)
Industry dummies	yes	yes	yes	yes
Observations	3,281	3,281	3,281	3,281
Number of groups				1,315
R-squared			0.052	
Log likelihood	3568.1888			
Wald chi2	259.37			
Coef of rho	0.639978			
Wald test of indep. eqns. (rho=0)	87.95***			
F-stat				37.02***

Table 4: Estimation results for firms' risk-taking behavior and borrowing terms. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively. Robust standard errors are in parentheses.

Dependent variables:	ΔROA volatility (1st stage: Stock decrease_ex)			Δ Other debt ratio (1st stage: Stock decrease_ex)			Δ Interest expense ratio (1st stage: Stock decrease_ex)		
Estimation method:	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stock_decrease_ex		0.021***	0.005**		-0.043	0.003		-0.000	0.001
		(0.007)	(0.003)		(0.030)	(0.010)		(0.003)	(0.001)
BK stock-cap ratio	0.220**			0.290***			0.273***		
	(0.093)			(0.091)			(0.093)		
ln(Sales)	-0.014	-0.001	-0.001	-0.009	-0.013***	-0.013***	-0.010	-0.001*	-0.001*
	(0.040)	(0.001)	(0.001)	(0.040)	(0.003)	(0.003)	(0.040)	(0.000)	(0.000)
ROA	-0.070	-0.035**	-0.034	0.663	-0.231***	-0.233***	0.581	-0.030***	-0.030***
	(1.109)	(0.018)	(0.035)	(1.058)	(0.073)	(0.082)	(1.050)	(0.009)	(0.011)
ROA volatility	8.224***	-0.245***	-0.211**	8.879***	0.897***	0.802***	8.676***	-0.139***	-0.142***
	(2.898)	(0.051)	(0.094)	(2.852)	(0.211)	(0.245)	(2.845)	(0.025)	(0.031)
Cash ratio	0.350	0.006	0.008	0.241	-0.200***	-0.206***	0.213	0.006	0.006
	(0.628)	(0.010)	(0.011)	(0.625)	(0.042)	(0.044)	(0.623)	(0.005)	(0.006)
Sales growth	-0.465	0.001	0.000	-0.676**	0.005	0.008	-0.566*	0.002	0.002
	(0.284)	(0.003)	(0.003)	(0.310)	(0.013)	(0.023)	(0.300)	(0.002)	(0.002)
Tangible asset ratio	0.150	-0.011*	-0.010	0.189	0.001	-0.002	0.192	-0.008***	-0.009***
	(0.372)	(0.006)	(0.008)	(0.376)	(0.025)	(0.028)	(0.375)	(0.003)	(0.003)
Leverage ratio	-0.035	0.012***	0.012**	-0.108	-0.275***	-0.274***	-0.105	0.010***	0.010***
	(0.288)	(0.005)	(0.005)	(0.287)	(0.019)	(0.020)	(0.287)	(0.002)	(0.003)
Main bank dummy	-0.608***	0.000	-0.001	-0.590***	-0.022***	-0.017***	-0.587***	0.000	0.000
	(0.104)	(0.002)	(0.001)	(0.104)	(0.007)	(0.006)	(0.104)	(0.001)	(0.001)
Constant	-1.696***	0.020**	0.020*	-1.864***	0.202***	0.201***	-1.841***	0.004	0.004
	(0.600)	(0.009)	(0.011)	(0.593)	(0.037)	(0.038)	(0.596)	(0.004)	(0.004)
Industry dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Observations	1,270	1,270	1,270	1,296	1,296	1,296	1,296	1,296	1,296
R-squared			0.108			0.257			0.091
Log likelihood	2444.2363			612.35235			3354.4718		
Wald chi2	150.59			442.60			128.52		
Coef of rho	-0.34701			0.2317214			0.06007		
Wald test of indep. eqns. (rho=0)	4.86**			2.48			0.27		

Table 5: Subsample estimation results for ΔLoan share: main bank vs. non-main banks. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively. Robust standard errors are in parentheses.

Dependent variable:	ΔLoan share (1st stage: Stock decrease_ex)					
Subsample of firms with:	Main bank dummy = 1			Main bank dummy =0		
Estimation method:	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Stock_decrease_ex		0.002	-0.014		-0.081***	-0.019***
		(0.021)	(0.009)		(0.007)	(0.002)
BK stock-cap ratio	0.317*			0.265***		
	(0.180)			(0.039)		
ln(Sales)	-0.007	-0.004***	-0.004***	0.060**	0.000	-0.002**
	(0.065)	(0.002)	(0.002)	(0.024)	(0.001)	(0.001)
ROA	-0.052	0.077	0.078	-0.275	0.040	0.048
	(2.688)	(0.060)	(0.065)	(0.663)	(0.029)	(0.031)
ROA volatility	1.623	0.019	0.018	5.485***	-0.098	-0.223***
	(7.160)	(0.173)	(0.163)	(1.732)	(0.078)	(0.082)
Cash ratio	-2.220	0.010	0.006	0.563	-0.008	-0.022
	(1.356)	(0.032)	(0.034)	(0.382)	(0.016)	(0.015)
Sales growth	-0.366	-0.001	-0.002	-0.098	-0.003	-0.002
	(0.608)	(0.009)	(0.007)	(0.160)	(0.006)	(0.005)
Tangible asset ratio	-0.534	-0.031*	-0.032*	0.740***	-0.000	-0.016*
	(0.692)	(0.017)	(0.017)	(0.222)	(0.010)	(0.009)
Leverage ratio	-0.200	0.045***	0.044***	0.212	0.034***	0.032***
	(0.538)	(0.012)	(0.012)	(0.168)	(0.007)	(0.007)
Constant	-1.440	0.031	0.033	-2.356***	-0.015	0.005
	(0.971)	(0.023)	(0.022)	(0.346)	(0.014)	(0.012)
Industry dummies	yes	yes	yes	yes	yes	yes
Observations	711	711	711	2,570	2,570	2,570
R-squared			0.083			0.055
Log likelihood	967.41566			2645.4902		
Wald chi2	61.22			216.05		
Coef of rho	-0.157052			0.6605648		
Wald test of indep. eqns. (rho=0)	0.63			81.04***		

Table 6: Subsample estimation results for firms' risk-taking behavior and borrowing terms: main bank vs. non-main banks. ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively. Robust standard errors are in parentheses.

Dependent variable:	Δ ROA volatility (1st stage: Stock decrease_ex)					
Subsample of firms with:	Main bank dummy = 1			Main bank dummy =0		
Estimation method:	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS
	(1)	(2)	(3)	(4)	(5)	(6)
Stock_decrease_ex		0.035***	-0.004		0.009	0.009**
		(0.002)	(0.003)		(0.007)	(0.003)
BK stock-cap ratio	0.225*			0.203*		
	(0.131)			(0.113)		
ln(Sales)	0.095*	-0.001	-0.001	-0.014	-0.001	-0.001
	(0.051)	(0.001)	(0.001)	(0.053)	(0.001)	(0.001)
ROA	-4.766**	0.081***	0.078***	0.889	-0.073***	-0.073*
	(2.116)	(0.031)	(0.029)	(1.202)	(0.022)	(0.042)
ROA volatility	-10.118*	-0.413***	-0.419***	9.910***	-0.182***	-0.180*
	(5.673)	(0.091)	(0.117)	(3.323)	(0.063)	(0.104)
Cash ratio	0.581	0.004	-0.009	0.943	0.011	0.011
	(1.113)	(0.017)	(0.020)	(0.728)	(0.013)	(0.014)
Sales growth	0.187	-0.003	-0.003	-0.511	0.003	0.003
	(0.385)	(0.004)	(0.003)	(0.343)	(0.004)	(0.005)
Tangible asset ratio	0.223	-0.008	-0.012	0.465	-0.004	-0.004
	(0.532)	(0.009)	(0.009)	(0.464)	(0.008)	(0.012)
Leverage ratio	-1.004**	0.014**	0.012*	0.077	0.012**	0.012*
	(0.474)	(0.007)	(0.007)	(0.357)	(0.006)	(0.007)
Constant	-1.990***	0.020	0.027	-2.430***	0.015	0.015
	(0.738)	(0.012)	(0.017)	(0.838)	(0.013)	(0.015)
Industry dummies	yes	yes	yes	yes	yes	yes
Observations	593	593	593	677	677	677
R-squared			0.110			0.187
Log likelihood	1340.8117			1218.3806		
Wald chi2	274.13			146.89		
Coef of rho	-0.971502			-0.020306		
Wald test of indep. eqns. (rho=0)	139.74***			0.02		

Table 6 (continued)

Dependent variable:	Δ Other debt ratio (1st stage: Stock decrease_ex)					
Subsample of firms with:	Main bank dummy = 1			Main bank dummy =0		
Estimation method:	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS
	(7)	(8)	(9)	(10)	(11)	(12)
Stock_decrease_ex		0.021	0.011		-0.107**	-0.001
		(0.071)	(0.018)		(0.042)	(0.012)
BK stock-cap ratio	0.388**			0.269***		
	(0.188)			(0.103)		
ln(Sales)	0.009	-0.011***	-0.011***	-0.004	-0.013***	-0.013***
	(0.071)	(0.003)	(0.004)	(0.051)	(0.004)	(0.004)
ROA	-1.012	-0.320***	-0.321**	0.803	-0.222**	-0.232**
	(2.812)	(0.119)	(0.159)	(1.198)	(0.099)	(0.107)
ROA volatility	2.371	1.035***	1.035**	10.387***	0.999***	0.709**
	(7.714)	(0.360)	(0.452)	(3.317)	(0.293)	(0.333)
Cash ratio	-2.456*	-0.293***	-0.296***	1.175	-0.115**	-0.150***
	(1.477)	(0.069)	(0.070)	(0.734)	(0.059)	(0.056)
Sales growth	-0.522	0.004	0.003	-0.893**	-0.002	0.008
	(0.718)	(0.018)	(0.015)	(0.369)	(0.021)	(0.041)
Tangible asset ratio	-0.363	0.009	0.008	0.431	0.016	-0.001
	(0.739)	(0.035)	(0.039)	(0.456)	(0.037)	(0.039)
Leverage ratio	-0.755	-0.327***	-0.328***	0.001	-0.240***	-0.238***
	(0.616)	(0.026)	(0.027)	(0.347)	(0.028)	(0.029)
Constant	-1.416	0.178***	0.178***	-2.575***	0.189***	0.201***
	(1.014)	(0.048)	(0.051)	(0.810)	(0.058)	(0.059)
Industry dummies	yes	yes	yes	yes	yes	yes
Observations	603	603	603	693	693	693
R-squared			0.348			0.220
Log likelihood	427.60764			235.1019		
Wald chi2	320.69			180.59		
Coef of rho	-0.05111			0.511183		
Wald test of indep. eqns. (rho=0)	0.02			5.96**		

Table 6 (continued)

Dependent variable:	Δ Interest expense ratio (1st stage: Stock decrease_ex)					
Subsample of firms with:	Main bank dummy = 1			Main bank dummy =0		
Estimation method:	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS	Treatment Regression (1st stage)	Treatment Regression (2nd stage)	OLS
	(13)	(14)	(15)	(16)	(17)	(18)
Stock_decrease_ex		0.004	0.003		-0.002	-0.001
		(0.005)	(0.003)		(0.004)	(0.001)
BK stock-cap ratio	0.391**			0.221**		
	(0.187)			(0.111)		
ln(Sales)	0.008	-0.000	-0.000	-0.012	-0.001*	-0.001*
	(0.071)	(0.000)	(0.001)	(0.052)	(0.000)	(0.000)
ROA	-1.035	-0.058***	-0.058***	0.792	-0.018*	-0.018
	(2.848)	(0.016)	(0.018)	(1.187)	(0.010)	(0.013)
ROA volatility	2.142	-0.099**	-0.099*	9.909***	-0.136***	-0.139***
	(7.840)	(0.048)	(0.058)	(3.250)	(0.030)	(0.035)
Cash ratio	-2.404	0.022**	0.022**	0.961	0.001	0.001
	(1.502)	(0.009)	(0.010)	(0.722)	(0.006)	(0.008)
Sales growth	-0.504	0.006**	0.006	-0.542	-0.001	-0.001
	(0.716)	(0.002)	(0.004)	(0.342)	(0.002)	(0.002)
Tangible asset ratio	-0.360	-0.016***	-0.016***	0.525	-0.004	-0.005
	(0.743)	(0.005)	(0.004)	(0.457)	(0.004)	(0.004)
Leverage ratio	-0.765	0.012***	0.011***	-0.019	0.009***	0.009**
	(0.615)	(0.003)	(0.004)	(0.350)	(0.003)	(0.004)
Constant	-1.409	0.002	0.002	-2.495***	0.005	0.005
	(1.013)	(0.006)	(0.006)	(0.829)	(0.006)	(0.006)
Industry dummies	yes	yes	yes	yes	yes	yes
Observations	603	603	603	693	693	693
R-squared			0.151			0.102
Log likelihood	1638.0987			1764.466		
Wald chi2	105.14			78.88		
Coef of rho	-0.02986			0.05293		
Wald test of indep. eqns. (rho=0)	0.03			0.12		