博士論文（要約）

Essays on Small Business Finance and Relationship Lending

（中小企業金融とリレーションシップ貸出に関する研究）

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Chapter 1

Overview

1.1 Introduction

Small business activities have been receiving attention from many economists and policy makers. Many small firms create new technologies and new businesses; therefore, they play important roles in economic growth. However, small businesses face difficulty in financing investment opportunities even if the net present value is positive because the problems associated with asymmetric information between creditors and small businesses are serious. As Stiglitz and Weiss (1981) mention, it is difficult for creditors to acquire information about the types of borrowers, so creditors might reduce the credit supply to small businesses. Because of asymmetric information between creditors and borrowers, many previous papers (e.g., Storey, 1994; Berger and Udell, 1998) argue that financial markets do not work well for small businesses. [1]

Berger and Udell (2006) argue that several lending technologies used by private financial institutions mitigate the problem of information asymmetry, such as financial statement lending, small business credit scoring, asset-based lending, and relationship lending. One of the most effective lending techniques for small business loans is relationship lending.[2] Banks obtain information on small business borrowers through past transactions with the

[1] To enhance credit supply for SMEs, the government can establish public lending and credit guarantee schemes, which can improve social welfare (Mankiw, 1986). Therefore, public financial supports for SMEs can be justified from the perspective of economic theory. However, because of government failure, public financial support does not always improve social welfare.

[2] See Elyasiani and Goldberg (2004) for a detailed survey about relationship lending.

borrowers, and they mitigate the problem of information gaps by establishing long-term relationships. According to Petersen and Rajan (1994) and Berger and Udell (1995), banks obtain soft qualitative information through lending relationships. Berger and Udell (2006) argue that "This soft information may also include an assessment of the future prospects of the SME garnered from past communications with SME's suppliers, customers, or neighboring businesses" (p. 2951). As hard information (such as information from financial statements) about informationally opaque small businesses is less credible, soft information is important for assessment and monitoring of small business loans.

Using firm-level data of small businesses, previous studies show empirically that credit constraints caused by the information gap are mitigated by relationship lending. For example, Petersen and Rajan (1994) argue that small businesses that have been with their banks for a long time have greater access to bank loans using the National Survey of Small Business Finance (NSSBF), which provides survey data for small businesses in the US. Similarly, Berger and Udell (1995) insist that borrowers with longer lending relationships pay a lower interest rate and are less likely to pledge collateral.

Previous studies also argue the cost side of lending relationships, the problem of hold-up, the relationship between bank performance and borrowers' activity, and the relationship between macroeconomic shocks and borrower performance. First, as Rajan (1992) and Sharpe (1990) argue, the hold-up problem is serious for small businesses. They argue that if a bank acquires information about a small business through long-term relationships, the small business faces difficulty in borrowing from other uninformed banks because the problem of asymmetric information is severe. Furthermore, as Berger et al. (2005) argue, they acquire soft information about borrowers through the lending relationship, which is not transferable to other lenders. The small businesses are locked into lending relationships with informed banks; therefore, they face the hold-up problem. As a result, the informed banks can set a higher interest rate over the competitive level to extract monopoly rents. This problem induces the underinvestment problem among small business borrowers.

Many papers investigate empirically the effects of the hold-up problem. For example,

Angelini et al. (1998) and Degryse and Cayseele (2000) use small business data to show that borrowers with longer lending relationships pay a higher interest rate. Similarly, in D'Auria et al. (1999), a borrower with higher dependence on bank loans pays a higher interest rate. In addition to these studies, Houston and James (1996) examine the hold-up problem and the cost of lending relationships using a sample of publicly-listed firms. Weinstein and Yafeh (1998) focus on the Japanese main bank system, showing that banks extract monopoly rents from borrowers through main bank relationships by using data of publicly-listed firms. These studies conclude that the hold-up problem is serious for borrowers.

However, many previous studies point out that it is not easy for informed banks to acquire information rents. Borrowers often have relationships with multiple banks to avoid the extraction of rents by the banks. Therefore, the hold-up problem might not be serious. For example, Ongena and Smith (2000) and Farinha and Santos (2002) investigate the number of lending relationships using small business data for the EU and Argentina, respectively. They find that larger-sized small businesses and older businesses have multiple lending relationships. Using data from Italian firms, Detragiache et al. (2000) show that borrowers establish multiple relationships with banks to reduce the likelihood of early liquidation.[3] In Japan, the percentages of firms with a single lending relationship are 7.6% for firms with 20 employees or fewer and 2.9% for firms with 21–100 employees.[4] This implies that many small businesses have multiple lending relationships and do not lock-in lending relationships with one bank.

Second, the cost of lending relationships is related to the issues of bank distress or bank failure. If informed banks reduce credit supply for borrowers, borrowers face severe credit constraints because other uninformed banks cannot offer sufficient credit. As a result, the borrowers cannot finance profitable investment opportunities and experience lower performance. For example, Slovin et al. (1993) discuss how the performance of borrowers that depend upon bank loans deteriorates if informed banks having a relationship with the borrower go bankrupt. They argue that a firm cannot raise funds from other banks because the

[3]Rajan (1992) argues that if there are multiple informed banks, Bertrand competition with informed banks occurs and extracting rent is impossible.

[4]See Figure 2-3-26 in *2007 White Paper on Small and Medium Enterprises in Japan* (http://www.chusho.meti.go.jp/pamflet/hakusyo/h19/download/2007hakusho_eng.pdf).

problem of information asymmetry is serious, and consequentially the performance of borrowers worsens. Yamori and Murakami (1999) obtain similar results focusing on the failure of Hokkaido Takushoku Bank, which is one of the largest banks in Japan. Similarly, Houston and James (2001) and Gibson (1995) claim, based on data from stock-listed Japanese firms, that bank performance is linked to borrower performance. [5]

Third, the level of activity and performance of small businesses are low when macroeconomic shocks occur. During shock periods, many banks decrease credit supply, which induces a credit crunch. As Gilchrist and Gertler (1994) argue, bank-dependent small businesses suffer the negative effects of financial shocks because they have alternative ways of financing. This is the cost side of lending relationships, as argued by Berger and Udell (2002). Many studies argue that the Japanese experience during the late 1990s is evidence that small businesses were affected adversely by the financial shock. For example, Hoshi and Kashyap (2004) conclude that Japanese banking problems led to a credit crunch that depressed employment and investment, citing empirical work by Ogawa (2003) and Motonishi and Yoshikawa (1999) on small businesses in Japan. According to previous studies, this problem is known as "*kashishiburi*" (reluctance to lend), which has had a negative impact on the Japanese economy.

In addition, small businesses can use trade credit if bank loans are not available. For example, using the NSSBF, Petersen and Rajan (1997) argue that when credit from banks is unavailable, borrowers use more trade credit. McMillan and Woodruff (1999) show that a longer duration of supplier–customer relationships is associated with larger credit investigating in the case of Vietnam. Fisman and Love (2003) show that industries with higher dependence on trade credit exhibit a higher rate of growth in countries with weaker financial institutions.

Although many studies empirically investigate the costs and benefits of lending rela-

[5] Acquisition of monopoly rents by banks improves credit availability for young small businesses. As banks acquire monopoly rents by establishing lending relationships, many previous studies find that banks offer a lower interest rate and more credit to young firms. They acquire monopoly rents more easily if credit markets are more concentrated; therefore, banks in concentrated credit markets offer more loans to young firms. For example, Petersen and Rajan (1995) find that banks in concentrated markets offer a lower interest rate and more loans to young firms using NSSBF.

tionships, some issues still remain unresolved. First, the effects of termination of lending relationships are investigated by previous studies using data of listed firms in Japan (e.g. Houston and James, 2001; Yamori and Murakami, 1999; Gibson, 1995), but not using firm-level small business data, except for Hori (2005). In addition, the studies investigating the negative effects of bank distress focus on the lending relationship with a particular bank (generally, those with a main bank), but few studies focus on the effects of ending relationships with all banks.[6] After the 2000s in Japan, many small businesses ended their lending relationships with all banks, despite many previous studies finding that lending relationships are very important for small businesses. Therefore, it is important to examine empirically the factors and effects of ending relationships between small business borrowers and banks.

Second, many studies (e.g. Gilchrist and Gertler, 1994) assert that the negative effects of financial shocks are more severe for small businesses, but the evidence is insufficient in Japan. As we argued, Ogawa (2003) and Motonishi and Yoshikawa (1999) show that the negative effects on the activities of small business borrowers are significant using the data for the late 1990s. Although the negative shocks examined in these studies are very severe, they rely on the aggregate data of small businesses, but not the firm-level data of small businesses. Many firm-specific factors have some effects on the activities and performance of small businesses, but these factors are not controlled for using aggregate data. Therefore, firm-level data are suitable for investigating the negative effects of financial shocks.

Third, the leverage[7] of small businesses is higher than that of large firms because the small businesses are dependent on lending relationships with banks. However, it is not clear whether the costs of high leverage are severe or not for small businesses. On average, the leverage of small businesses that have lending relationships with banks is 0.872 in Japan[8], which is higher than for firms in other developed countries. As Myers (1977) argues, highly leveraged small businesses face the debt overhang problem. Therefore, they face severe credit constraints, which induces the underinvestment problem and low firm performance. Further-

[6]Using US firm data, Cole (2010) investigates whether the cost of not having a lending relationship with any bank is significant for borrowers

[7]Leverage is defined as the ratio of a firm's book value of total debts to the book value of total assets.

[8]See Table 7.3 in Chapter 7.

more, highly leveraged firms prefer high-risk investments; thus, banks reduce credit supply for these firms under information gaps between lenders and borrowers. To our knowledge, few studies investigate these issues using firm-level data of small businesses in Japan, although many small businesses are highly leveraged.

1.2 Organization

This dissertation is based upon the following works:

・ Chapter 2 is based on the paper "Tsuruta, D., 2016. No lending relationships and liquidity management of small businesses during a financial shock", published in *Journal of the Japanese and International Economies* 42, 31–46.

・ Chapter 3 is based on the paper "Tsuruta, D., 2016. Natural or unnatural selection? The end of lending relationships for small businesses", published in *Applied Economics* 48 (15), 1416–1428.

・ Chapter 4 is based on the paper "Tsuruta, D., 2014. Changing banking relationships and client-firm performance: Evidence from Japan for the 1990s", published in *Review of Financial Economics* 23 (3), 107–119.

・ Chapter 5 is based on the paper "Tsuruta, D., 2010. Do financial shocks have negative effects on small businesses? New evidence from Japan for the late 1990s", published in *The B.E. Journal of Economic Analysis & Policy* 10 (1), Topics, Article 87.

・ Chapter 6 is based on the paper "Tsuruta, D., 2015. Bank loan availability and trade credit for small businesses during the financial crisis", published in *The Quarterly Review of Economics and Finance* 55, 40–52.

・ Chapter 7 is based on the paper "Tsuruta, D., 2015. Leverage and firm performance of small businesses: Evidence from Japan", published in *Small Business Economics* 44 (2), 385–410.

・ Chapter 8 is based on the paper "Tsuruta, D., 2016. Variance of firm performance and leverage of small businesses", forthcoming in *Journal of Small Business Management*.

To investigate the remaining issues argued in Subsection 1.1, this thesis presents the following results. Chapters 2, 3, and 4 investigate why borrowers and banks terminate lending relationships and the effects of the ending of lending relationships on borrowers. As argued in Subsection 1.1, small businesses were more likely to end lending relationships with banks after the 2000s in Japan. According to previous studies, lending relationships with banks are valuable for small business borrowers; therefore, the termination of lending relationships is costly for them. Furthermore, if banks terminate lending relationships with borrowers because bank loan supply decreases (e.g., accumulation of nonperforming loans and bank failures), the ending of lending relationships is observed in not only risky borrowers, but also nonrisky borrowers. However, borrowers are locked into a relationship with a main bank; therefore, they cannot change their lending relationships with their current main bank when that bank is distressed.

Chapter 2 shows that small businesses end their lending relationships with all banks when their working capital requirements and firm growth are low. Firms with low working capital requirements and nongrowing firms have low credit demand, so the end of lending relationships are caused by demand-side effects. In addition, during the global financial shock in 2008, firms without lending relationships reduced their cash holdings to finance credit demand, while those with lending relationships increased their bank loans. This implies that firms without lending relationships borrow less from banks if they faced credit demand during the shock. However, the difference in the performance between firms with lending relationships and those without relationships is insignificant; therefore, the cost of no lending relationships is not supported.

Focusing on the borrowing firms that had lending relationships over five or 10 consecutive years, Chapter 3 examine why the lending relationships between banks and borrowing firms terminate. The estimation results show that the relationships end if borrowing firms are unprofitable firms, highly leveraged firms, those with high cash flow volatility, or slow-growing firms. This result is similar for the global financial shock in 2008. These estimation results imply that risky firms end relationships with banks; therefore, the termination of lending

relationships is determined efficiently.

Chapter 4 uses the firm-level data of listed firms during the 1990s to examine whether firms change their main bank relationships if the main bank is distressed. The estimation results show that firms change their main bank if the nonperforming loans of that bank are high. This is because firms are more likely to face liquidity shortages if they continue to borrow from their main bank. Therefore, firms do not prefer to continue their main bank relationship if that bank is distressed. This implies that firms can change their main bank relationship and are not locked into their current main bank relationship. In addition, firm performance (in terms of Tobin's Q) does not deteriorate after a change in a main bank relationship. In contrast, postfirm performance after a change in the relationship was enhanced just before the financial shock after 1997.

Chapters 5 and 6 investigate the financial activity and firm performance of small businesses during the financial shock. Chapter 5 investigates whether the financial shock had negative effects on small businesses. As we argued, lending relationships with a bank enhance the credit availability of small businesses borrowers. In contrast, because small business borrowers are locked into lending relationships, they could not borrow sufficient funds when informed banks decreased credit supply during the financial shock (Gilchrist and Gertler, 1994). Many previous studies assert that the financial shock in late 1997 in Japan induced a credit crunch for small businesses, which deteriorated the performance of small businesses. However, previous studies used aggregate data, not the firm-level data of small businesses; therefore, they do investigate adequately whether the negative effects of the credit crunch were significant on small businesses.

Using firm-level data of small businesses, this chapter shows that firms decreased their borrowing if the amount of borrowing was high during the financial shock. Furthermore, if the financial shock was severe for small businesses, bank-dependent small businesses underperformed compared with nondependent small businesses. However, the differences are insignificant, implying that the negative effects of the financial shock are not supported.

Chapter 6 investigates the trade credit of small businesses during the financial shock.

Previous studies argue that the cost of trade credit is higher than that of bank loans; therefore, firms use trade credit (or trade debt) when bank loans are unavailable. Thus, many studies use the amount of trade credit as a proxy of the extent of financial constraints (e.g., Petersen and Rajan, 1994). Many previous studies show that firms depended more on trade credit during the financial shock because the availability of bank loans was limited. However, as Miwa and Ramseyer (2008) argue, the cost of trade credit is not always higher than the cost of bank loans. Thus, the estimation of relationships between bank loans and trade credit are affected by the endogeneity problem. This chapter focuses on the emergency public credit guarantee program after 2009 as an exogenous event that enhanced the credit availability of bank loans, which mitigates the simultaneity problem between bank loans and trade credit. If firms used trade credit when the credit constraints on bank loans were severe during the shock, they decreased trade credit after credit availability improved. However, the estimation results in this chapter shows that trade credit increased (not decreased) after an increase in the availability of bank loans.

Chapters 7 and 8 investigate the effects of high leverage of small businesses of their financial activities and performance. As relationship lending is important for small businesses, many small businesses depend on bank loans. Furthermore, they face difficulty in issuing new equity in capital markets; therefore, the leverage of small businesses is higher than that of large firms on average. In contrast, as Myers (1977) argues, highly leveraged firms cannot borrow sufficient funds to finance profitable investment opportunities; therefore, the cost of high leverage might be significant. Chapters 7 and 8 show that the cost of high leverage is severe for small businesses.

Chapter 7 shows that highly leveraged small businesses increase bank borrowings and trade payables less compared with low leveraged firms when they face profitable investment opportunities. In contrast, they increase the use of discounting note receivables to finance profitable investment opportunities. These results imply that highly leveraged small businesses face credit constraints, but they have financial resources to mitigate the constraint. Chapter 7 also shows the relationships between the level of leverage and firm performance

(in terms of profitability and firm growth). If highly leveraged small businesses face significant credit constraints, their performance is lower than that of nonhighly leveraged small businesses. However, the estimated results show that the performance of highly leveraged small businesses is higher (not lower) than that of nonhighly leveraged small businesses. This result implies that the effects of credit constraints on firm performance are insignificant.

Chapter 7 investigates the relationship between average firm performance and leverage of small businesses. However, economic theory (e.g. Freixas and Rochet, 2008) suggests that highly leveraged small businesses prefer high-risk high-return investment under information asymmetry; therefore, the variance of firm performance is higher if small businesses are highly leveraged. Chapter 8 focuses on the relationship between the variance of firm performance (in terms of profitability and firm growth) and leverage. The estimation results show that the variance of firm performance is higher if small businesses are highly leveraged, after controlling for the other determinants of firm performance. This relationship is stronger if the cash flow of small businesses is negative because they incur no loss from defaulting on debt. In contrast, if small businesses have many collateral assets, the relationship between the variance of firm performance and leverage is weak. This implies that collateral assets prevent investment in high-risk high-return projects.

Chapter 2

No Lending Relationships and Liquidity Management of Small Businesses During a Financial Shock

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Abstract

We investigate the determinants of the end of lending relationships with banks using small business data. We also investigate how small businesses without lending relationships financed credit demand during the global financial shock. First, we find that firms with lower growth, low working capital, and high internal cash were more likely to end lending relationships with banks. Supply-side effects on the determinants of the end of relationships are insignificant. Second, when firms experienced credit demand during the financial shock, those with lending relationships increased bank borrowings while those without lending relationships reduced internal cash. Third, firm performance (in terms of profitability) was neither lower nor higher for firms that did not have lending relationships with banks during the shock period.
JEL classification: G21; G32

Keywords: lending relationship; financial shock; liquidity management; small businesses.

Chapter 3

Natural or Unnatural Selection? The End of Lending Relationships for Small Businesses

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Abstract

We investigate the situation where small business borrowers and banks end their lending relationships. If credit allocation is efficient, banks terminate their relationships with risky borrowers. Alternatively, small business borrowers are more likely to end their relationships when they have poor investment opportunities and do not require borrowed funds. However, if the soft budget constraints of banks or credit crunches are a significant problem, banks are likely to continue their relationships with risky firms or end their relationships with nonrisky firms, which is representative of an unnatural credit allocation. Using Japanese firm-level data, we show empirically that these relationships end naturally, with natural credit allocation supported even during the recent global financial crisis.

Keyword: Lending relationships; financial shocks; bank loans; small businesses

JEL classification:G21; G32; G33

Chapter 4

Changing Banking Relationships and Client-Firm Performance: Evidence from Japan for the 1990s

This study was published in *Review of Financial Economics*, Volume 23(3) (Tsuruta, 2014). The final form is available at http://dx.doi.org/10.1016/j.rfe.2013.12.002. This research was supported by a Grant-in-Aid for Scientific Research from the Japan Society for the Promotion of Science. The author would like to thank the Editor (Tarun K. Mukherjee) and two anonymous referees for their many useful comments and suggestions.

Abstract

The extant literature generally suggests that the performance of client firms deteriorates if their distressed main bank reduces the supply of credit. However, this insight is only consistent with the notion that main banks have an information advantage over other banks to the extent that a client firm has trouble getting access to credit if the firm changes its main bank. We show that Japanese firms did change their main banking relationship when their main banks become distressed in a period with financial shocks. Surprisingly, these firms did not suffer from loss of access to credit and actually their performance significantly improved after their change of main banks. JEL classification: G20; G21; G32
Keywords: Bank–firm relationships; Bank distress; Private information.

4.1 Introduction

Banking theory suggests that any deterioration in bank health has a potential negative impact on the performance of client firms. To investigate this, many empirical studies focus on the negative shock of the bursting of the asset price bubble in Japan during the late 1980s. During this period, the performance of banks began to deteriorate following the substantial increase in nonperforming loans during the bubble economy. These conditions created an ensuing weakness in the banking sector during the 1990s. In focusing on this shock, these studies argue that bank health entails negative impacts on client-firm performance during the subsequent deep recession.

For example, using Japanese firm-level data, Gibson (1995) shows that client-firm investment is sensitive to the financial health of the main bank. Similarly, Kang and Stulz (2000) conclude that firms whose debt in 1989 included a higher proportion of bank loans performed relatively worse after the bursting of the bubble economy. In other work, Yamori and Murakami (1999) infer the negative effect of bank failure on client-firm stock returns using the case of the Hokkaido Takushoku Bank.[1] Using firm-level data outside Japan, several other studies (see, for example, Agarwal and Elston, 2001; Ongena et al., 2003; Fok et al., 2004) also find that the performance of client firms is adversely affected by bank weakness. Most recently, Sohn (2010) has argued that the positive abnormal returns of client firms are significantly associated with the forced market exit of failed banks and the transfer of their loans to healthy banks.

For the most part, these studies assume that main banks have an information advantage over other banks gained through their lending relationships. The asymmetric information between banks and client firms then induces the problems of adverse selection and moral hazard. To mitigate these problems, the client firm and the bank establish long-term relationships, so-called relationship lending. As Petersen and Rajan (1994) have argued, relationship lending enhances credit availability for client firms, representing the main benefit of banking relationships. However, banking relationships can also have a dark side, as argued by Rajan (1992).

[1] That said, Hori (2005) suggests, using unlisted firm data, that the magnitude of the negative effects of bank failure depends on both client characteristics and the liquidation procedure used by the bank.

For example, client firms can face severe financial constraints if they switch from an existing banking relationship because other banks may not have sufficient information on the firm. As a result, Rajan (1992) argues that client firms exiting an existing banking relationship face a holdup problem in the availability of credit.

If informed main banks are then obliged to decrease lending for whatever reason, other banks cannot offer sufficient credit to these client firms because of the prevailing information problem. During financial shocks, as Udell (2009) has pointed out, distressed banks decrease loans to maintain an adequate capital ratio. Therefore, existing client firms face financial shortfalls and thus experience poorer performance. In Japan, as Hoshi et al. (1991) and Wu and Yao (2012) argue, the relationship between main banks and their client firms is very close. These close relationships help mitigate the information problem. On this basis, the banking literature suggests that poor bank performance and the changing of main banks together account for the low level of activity and poor performance of Japanese client firms.

Contrary to existing findings, if the information problems between client firms and non-main banks are not severe, client firms have an incentive to shift their main banking relationship from a distressed bank to another bank. Because distressed banks cannot offer sufficient funding to maintain an adequate capital ratio, client firms then benefit by changing their relationships with distressed banks. In addition, the performance of client firms can improve after they change their main bank if they are able to obtain benefits in changing their bank. Importantly, if client firms can switch their main bank easily, we observe that firms will move from a distressed bank. Some studies (for example, Gibson, 1995; Kang and Stulz, 2000) use data from the financial shock of the 1990s to show that the performance of Japanese client firms deteriorates if they have a main bank relationship with a distressed bank. However, they do not provide any evidence about whether the change in the main bank relationship improves the performance of the client firms. In addition, Wu et al. (2009) and Wu and Au Yeung (2012) show that (especially high-growth) firms are often able to employ equity issuance as an alternative source of firm financing. Therefore, equity can mitigate rent extraction by banks. That is, firms do not lock in a relationship with their incumbent main

bank, and so they can switch between main banks more easily.

We use Japanese firm-level data from the 1990s to investigate whether client firms shift their main banking relationship away from a distressed bank. We also investigate whether the ex post firm performance of client firms changes afterwards. As many banks suffered problems with nonperforming loans, and commensurately reduced loans for firms following the postbubble financial shock, these data are very appropriate for our analysis. Moreover, in addition to the relationship between bank health and firm performance, we investigate whether client firms lock in main banking relationships with distressed banks. This is a question not adequately addressed in existing work.

We find that client firms switch their main bank relationship if their main bank has relatively more nonperforming loans and goes bankrupt. However, by applying a propensity score matching method, we show that credit availability (in terms of the amount and annual change in bank borrowing) does not deteriorate following a change in main bank. Further, the interest payments for firms changing main bank generally fall in relative terms. In addition, we find that in 1997 (the pre-financial-shock year), the change in ex post firm performance (in terms of Tobin's q and ROA) is higher for firms switching their main bank relationship compared with firms that did not switch their main bank. However, during the period 1993–96, the change in ex post firm performance is neither higher nor lower following the change in main bank. In theory, for client firms locked into a main bank, those that switch their main bank tend to face severe financial constraints and lower firm performance. Our results do not support this prediction.

Instead, we show that Japanese firms do not lock into main bank relationships, and thus switch their banking relationship if their main bank is likely to go bankrupt. Further, in the pre-financial-crisis period, the change in performance for firms changing their main bank is significantly high. As we argue, firms are likely to change their main bank relationship if they have an existing relationship with a distressed bank. Given that during the financial crisis, distressed banks were unable to offer sufficient credit to their client firms, those with distressed main banks could face a financial shortage. Therefore, the changing of the main

bank away from a distressed bank before the financial crisis should enhance firm value.

Unlike many previous studies, our findings imply that the main banking relationship in Japan is endogenously determined. This endogeneity could account for bias in the estimated effects of the main bank. Further, selection bias can be serious with a sample comprising only the client firms of distressed banks because these firms generally change their main bank relationships from distressed banks to healthy banks.

The remainder of the paper is organized as follows. Section 4.2 describes the hypothesis and our data set. Section 4.3 provides the estimation results concerning the determinants of the change in the main bank. In Section 4.4, we examine the performance of firms after changing their main bank by applying the propensity score method and discuss the implications from our results. Section 4.5 concludes.

4.2 Hypothesis and Data

4.2.1 Hypothesis

If, as the banking literature asserts, incumbent main banks have an information advantage over other banks, client firms face severe financial constraints when they change their main banking relationship. The information advantage of the main bank causes a lock-in problem for client firms, in that these firms are unlikely to change their relationship with their existing main bank, even if the bank becomes distressed, because their access to credit will deteriorate. This is the so-called dark side of the main banking relationship.[2] Conversely, if the incumbent main bank does not specialize in accumulating credit information on its client firms, firms benefit from a change in their main banking relationship. This implies that the lock-in problem for client firms is not severe. In this case, we would also observe that client firms change their main banking relationship if their main bank becomes distressed.[3]

Further, if the main bank has an information advantage over other banks, firms that change their main banks face financial constraints because their cost of external finance in-

[2]See Kang and Stulz (2000) for details.

[3]Some listed firms can choose to issue bonds or stock to finance credit demand. To focus on the banking relationship, we only investigate bank loans.

creases with the difficulty of getting access to new loans. As a result, client-firm performance deteriorates after shifting the main banking relationship from the distressed bank to another bank. In contrast, if the information advantage for the main bank is insignificant, the availability of loans and loan rates for the client firms either improve or do not change after changing the main bank. In addition, if client firms benefit from changing their main bank, their performance improves after changing their main banking relationship because of the concomitant improvement in credit availability.

We employ a probit model to estimate the determinants of a change in the main bank relationship. To compare the availability of credit and the performance of firms after changing or maintaining their main bank relationship, we employ a propensity scoring matching method to mitigate any potential sample selection bias.

4.2.2 Data

Many Japanese financial institutions faced severe difficulties with large amounts of nonperforming loans following the bursting of the bubble economy in the late 1980s. During the late 1990s, many of these financial institutions later went bankrupt. We therefore employ Japanese listed-firm data from 1993 to 1997. We sample 1,745 nonfinancial Japanese firms, the data for which we obtained from the Nikkei Financial Quest database. We identify a firm's main bank as the private bank that lent it the most each year.[4] We omit from our database firms with more than one main bank.

We proxy the health of the main bank with the ratio of nonperforming to total loans, which is obtained from the *Financial Statements of All Banks* issued by the Japanese Bankers Association. Each bank's nonperforming loans ratio is defined as the ratio of "Loans to borrowers in legal bankruptcy" (*hatansaki saiken*) plus "Past due loans" (*entai saiken*) plus "Restructured loans" (*kinri genmen saiken*) to total loans (hereafter NPL3). As some data for regional banks before 1995 are unavailable, we also use several alternative definitions of the nonperforming loans ratio. These are the ratio of "Loans to borrowers in legal bankruptcy" plus "Past due loans" to total loans (hereafter NPL2) and the ratio of "Loans to borrowers

[4]This definition is the same as that used by Kang and Stulz (2000).

in legal bankruptcy" to total loans (hereafter NPL1).

4.3 Determinants of a Change in the Main Bank Relationship

4.3.1 Estimation

To investigate the choice of main bank relationship, we estimate the following regression:

$$\begin{aligned} C^*_{i,t+1} &= \gamma_1 Nonperforming\ Loans_{i,t} + \gamma_2 Failed\ Bank\ Dummy_{i,t} + \mathbf{y}_{i,t}\eta + u_{i,t} \quad (4.1) \\ & C_{i,t+1} = 1\ if\ C^*_{i,t+1} > 0 \\ & C_{i,t+1} = 0\ otherwise, \end{aligned}$$

where $u_{i,t} \sim N(0, \sigma^2)$. The proxies for main bank health are $Nonperforming\ Loans_{i,t}$ and $Failed\ Bank\ Dummy_{i,t}$. $Nonperforming\ Loans_{i,t}$ is the ratio of nonperforming loans to total loans of a main bank for firm i in year t (defined as NPL1, NPL2, or NPL3). We also use a dummy variable that takes a value of one if the main bank for firm i in year t is an ex post failed bank ($Failed\ Bank\ Dummy_{i,t}$).[5] The dummy variable $C_{i,t+1}$ takes a value of one if the name of the main bank for firm i in year t differed from that in year t+1 (Changing the Main Bank Dummy), and zero otherwise.[6] $C^*_{i,t+1}$ is a latent variable indicating the change in the main bank, which is the net benefit from changing the main banking relationship. If $C^*_{i,t+1}$ is greater than zero, firms change their main banking relationship. If client firms that have a main banking relationship with a distressed bank have an incentive to change their bank relationship, the estimated coefficients for $Nonperforming\ Loans_{i,t}$ (NPL1, NPL2, and NPL3) and $Failed\ Bank\ Dummy_{i,t}$ (γ_1, γ_2) will be positive in the estimates of Equation

[5]The ex post failed banks (month and year of failure) in our sample are Hokkaido Takushoku Bank (Nov. 1997), the Long-Term Credit Bank of Japan (Oct. 1998), Nippon Credit Bank (Dec. 1998), Hanwa Bank (Mar. 1996), Hyogo Bank (Aug. 1995), Fukutoku Bank (May 1999), Naniwa Bank (Oct. 1998), Koufuku Bank (May 1999), and Tokyo Sowa Bank (Jun. 1999), all of which failed between 1995 and 1999.

[6]During our sample period, there was a single main bank merger with the merger of Mitsubishi Bank and Tokyo Bank in April 1996 to form the Tokyo–Mitsubishi Bank. For this reason, the main bank dummy has a value of zero if firms change their main bank from Tokyo Bank to Mitsubishi Bank or to Tokyo–Mitsubishi Bank in either 1996 or 1995. The main bank dummy also has a value of zero if firms change their main bank from Hyogo Bank to Midori Bank because Midori Bank, established after the collapse of Hyogo Bank in August 1995, assumed any outstanding loans.

(4.1).

Following Ongena and Smith (2001), we specify firm scale, leverage, profitability, Tobin's q and the natural log of the number of lending relationships with banks in year t as control variables ($\mathbf{y}_{i,t}$) in Equation (4.1). In addition, we include liquidity, main bank dependence, the natural log of total loans from the main bank in year t, and year and industry dummies as control variables. Our justification is as follows. First, larger firms are generally more informationally transparent, so they may find it easier to change their main bank relationship. We predict that the effect of firm size is positive for the change in main bank. We specify the natural log of a firm's total assets in year t as a proxy for firm size.

Second, we define leverage as the book value of firm debts divided by the book value of firm assets. In general, highly leveraged firms are more dependent on banks, so they are more likely to lock in their existing main bank. Consequently, the estimated coefficient for leverage should be negative given a change in the main bank dummy variable. Conversely, highly leveraged firms are risky for banks, so main banks will decrease the supply of credit to these firms. If this second effect is stronger, leveraged firms are more likely to be obliged to change their main bank. Therefore, the coefficient for leverage should be negative given a change in the main bank dummy variable. We thus predict that leverage has either positive or negative effects on the dummy variable indicating the change in the main bank.[7]

Third, profitable firms can also change their main bank relationship more easily, so we expect profitability has a positive effect on the dummy variable indicating the change in main bank. We define profitability as the ratio of a firm's operating incomes to total assets in year t. In addition, we use Tobin's q to control for firm values as these determine the relative bargaining position of the borrowing firms. We define Tobin's q as the ratio of each firm's market value of debt and equity to its book value.

Fourth, firms with higher liquidity are less likely to default, so they may also find it easier to change their main bank relationship. We use the ratio of a firm's cash holdings to total assets in year t as a proxy for liquidity.

[7]Ongena and Smith (2001) provide evidence that highly leveraged firms are more likely to change their primary bank.

Fifth, firms with a larger number of lending relationships do not typically face a lock-in problem with their main bank. As these firms can easily change their main bank relationship, we predict that the number of relationships has a positive effect on the change in main bank. Conversely, as Ongena and Smith (2001) have argued, multiple banking relationships also have negative effects because firms with a large number of separate banking relationships do not face a holdup problem. Since those firms do not face holdup problem, they can continue with a stable main bank relationship. Therefore, the probability of a change in the main bank is lower for firms with a large number of banking relationships. To proxy for this effect, we specify ln(Number of Lending Relationships) being the natural log of the number of banks that offer loans for a sample firm in year t.

Sixth, firms that depend more on their main bank are also less likely to switch main bank, so the effects of bank dependence should be negative. We define main bank dependence as the ratio of loans obtained from the main bank to total loans in year t.

Finally, firms that borrow large sums from their main bank cannot easily change their main banking relationship as only a few (especially large) banks can offer large loans to substitute for the role of the main bank. Therefore, the size of loans from the main bank implies negative effects on the dummy variable indicating a change in the main banking relationship. For this, we specify the natural log of total loans from the main bank as a proxy.

Table 4.1 provides summary statistics for the variables. The median and means of all the explanatory variables are similar. This suggests that the problem of outliers is not serious in our estimation. In addition, the mean of changing the main bank is 0.070. We infer from this that the number of observations involving the changing of the main bank is sufficient for estimating a probit model.

In Table 4.2, we include a correlation matrix for the independent variables. Table 4.2 shows that the correlation between ln(Amount of Loans from Main Bank) and Main Bank Dependence exceeds -0.7. Similarly, the correlation between ln(Amount of Loans from Main Bank) and ln(Number of Loans from Main Bank) exceeds 0.6, suggesting that the multi-

Table 4.1: Summary Statistics

Variable	N	mean	sd	min	p25	p50	p75	max
Changing the Main Bank	7,183	0.070	0.255	0.000	0.000	0.000	0.000	1.000
NPL1	7,183	0.007	0.004	0.001	0.005	0.006	0.008	0.087
NPL2	6,668	0.033	0.016	0.002	0.023	0.031	0.038	0.241
NPL3	3,154	0.043	0.030	0.004	0.027	0.039	0.053	0.253
Failed Bank Dummy	7,183	0.045	0.207	0.000	0.000	0.000	0.000	1.000
Firm Scale	7,183	10.803	1.296	6.611	9.894	10.699	11.544	15.272
Leverage	7,183	0.634	0.192	0.089	0.499	0.641	0.773	2.984
Profitability	7,183	0.028	0.038	-0.431	0.012	0.028	0.046	0.221
Liquidity	7,183	0.106	0.081	0.000	0.049	0.087	0.140	0.688
Tobin's q	7,183	1.331	0.448	0.524	1.087	1.240	1.459	8.933
Main Bank Dependence	7,183	0.355	0.165	0.046	0.242	0.315	0.424	1.000
ln(Number of Lending Relationships)	7,183	2.225	0.685	0.000	1.792	2.197	2.639	4.605
ln(Amount of Loans from Main Bank)	7,183	7.708	1.416	2.708	6.802	7.649	8.556	12.548

Note: This table provides summary statistics of the variables used in the probit model.

collinearity problem can be serious. However, the results of the probit estimation (in Table 4.4 in Subsection 4.3.2) show that the coefficients of all variables are similar and stable across all of the columns. Therefore, we infer that multicollinearity is not too serious.

Table 4.2: Correlation Matrix of Independent Variables

	NPL1	NPL2	NPL3	Failed Bank Dummy	Firm Scale	Leverage	Profitability	Liquidity	Tobin's q	Main Bank Dependence	ln(Number of from Main Bank)
NPL2	-0.0883	1									
NPL3	0.0317	0.4875	1								
Failed Bank Dummy	0.1756	-0.0715	-0.0019	1							
Firm Scale	-0.0397	0.1267	0.1076	-0.0022	1						
Leverage	0.0382	0.0123	0.0157	0.045	0.1552	1					
Profitability	0.0012	-0.025	-0.0599	0.0047	0.0458	-0.2914	1				
Liquidity	-0.0433	-0.0002	-0.0451	-0.0238	-0.119	-0.2925	0.1822	1			
Tobin's q	-0.0177	0.0147	0.0769	-0.0042	-0.1481	-0.0257	0.1791	0.0847	1		
Main Bank Dependence	-0.0399	-0.1048	-0.1191	0.007	-0.367	-0.2116	0.0179	0.1178	0.1223	1	
ln(Number of Lending Relationships)	-0.0105	0.0517	0.0559	0.0274	0.7074	0.5199	-0.1704	-0.3247	-0.1469	-0.2552	1
ln(Amount of Loans from Main Bank)	0.015	0.1018	0.1116	0.0129	0.5807	0.4162	-0.0767	-0.2105	-0.1609	-0.7194	0.6207

Note: This table provides the correlation matrix for the variables used in the probit model.

4.3.2 Results

Table 4.3 compares the independent variables for firms that experienced a change in main bank during the sample period with those that did not. To start with, 19.4% (338) of the sample firms changed their main bank during the sample period. This clearly illustrates that not all firms lock into a relationship with a specific main bank. The column headed "Change" includes the statistics for the subsample of firms that changed their main bank relationship, while the column headed "No Change" provides the statistics for those client firms that did not change their main bank relationship. In Table 4.3, we calculate the average for each variable within the firm and then average these across firms. If firms change their main bank, we group these firms as "Change (A)".

In Table 4.3, we also create a dummy variable, "Failed Bank", to take a value of one if a firm has a main bank relationship with a failed bank, zero otherwise. As shown, the means of NPL1, NPL2, NPL3, and "Failed Bank" in the "Change" group are large, suggesting that the main banks of firms that changed their main banking relationship had large amounts of nonperforming loans. The variables indicating firm scale, leverage, main bank dependence, number of lending relationships, and the amount of loans for the main bank are also smaller and statistically significant for firms that changed their main banking relationship. In contrast, the liquidity of firms that changed their main banking relationship is higher and statistically significant.

Table 4.3: Comparison of Firms Changing their Main Bank with Firms that did not Change

	Full Sample			Change (A)			No Change (B)			Difference	
Variable	N	mean	sd	N	mean	sd	N	mean	sd	(A – B)	
Number of Firm	1,745	0.194	0.395	338	1.000	0.000	1,407	0.000	0.000		
NPL1	1,745	0.007	0.003	338	0.008	0.004	1,407	0.007	0.003	0.001	***
NPL2	1,731	0.032	0.015	335	0.036	0.017	1,396	0.031	0.015	0.005	***
NPL3	1,661	0.044	0.028	305	0.051	0.037	1,356	0.042	0.025	0.009	***
Failed Bank Dummy	1,745	0.056	0.229	338	0.151	0.358	1,407	0.033	0.178	0.118	***
Firm Scale	1,745	10.693	1.276	338	10.555	1.183	1,407	10.726	1.295	-0.172	**
Leverage	1,745	0.620	0.196	338	0.596	0.184	1,407	0.626	0.199	-0.029	***
Profitability	1,745	0.032	0.037	338	0.034	0.039	1,407	0.032	0.036	0.002	
Liquidity	1,745	0.110	0.080	338	0.121	0.088	1,407	0.108	0.078	0.013	***
Tobin's q	1,745	1.341	0.430	338	1.332	0.396	1,407	1.344	0.438	-0.012	
Main Bank Dependence	1,745	0.369	0.169	338	0.326	0.154	1,407	0.379	0.171	-0.054	***
ln(Number of Lending Relationships)	1,745	2.146	0.691	338	2.060	0.659	1,407	2.166	0.697	-0.106	**
ln(Amount of Loans from Main Bank)	1,745	7.561	1.408	338	7.149	1.333	1,407	7.660	1.407	-0.512	***

Note: This table provides summary statistics of the variables averaged by firm and across firms. We calculate the average for each firm and then average across firms. If firms changed their main bank during the sample period, we include the firm in "Change (A)". We specify "Failed Bank" to equal one if the firm has a main bank relationship with a failed bank during the sample period. ** indicates significance at the 5% level, *** at the 1% level.

Table 4.4 includes the estimation results for Equation (4.1). As shown, the estimated coefficients for NPL1, NPL2, and NPL3 in columns (1)–(3) are all positive and statistically significant at the 1% level. These results suggest that client firms are more likely to change their main banking relationship if their main bank has a large amount of nonperforming loans. In addition, the estimated coefficients for the failed bank dummy are positive and statistically significant at the 1% level. In sum, our results suggest that client firms are more likely to change their main banking relationship if their main bank is distressed.

The signs on the estimated coefficients for the control variables are consistent with our predictions. As shown in columns (1) and (2), the effects of leverage are positive and statistically significant at the 1% level, suggesting that highly leveraged firms are more likely to change their main bank relationship. As we predicted, the estimated coefficients for profitability and liquidity are positive, apart from the result for profitability in column (3), but are not statistically significant. The estimated coefficients for Tobin's q are negative, but are statistically insignificant. The estimated coefficients for the number of lending relationships are negative, implying that firms with many banking relationships are unlikely to change their main bank relationship. In other results, the effect of the amount of loans from the main bank is negative and statistically significant at the 1% level.

4.3.3 Robustness Check

To confirm the robustness of the results for the effect of main bank health on the changing main bank dummy, we control for bank mergers, size, and lending capacity following Ongena and Smith (2001). First, we control for the effect of bank merger given that two banks, Mitsubishi Bank and Tokyo Bank, merged to form the Tokyo–Mitsubishi Bank during April 1996. Firms that have a main bank relationship with a merged bank could face a financial shortage because the main bank may cut its loan supply while asset restructuring. Therefore, these firms are likely to change main bank. To control for this effect, we add a dummy variable that takes a value of one if the main bank is Mitsubishi Bank, Tokyo Bank, or Tokyo–Mitsubishi Bank to Equation (4.1). The result is shown in column (1) of Table 4.5. As

Table 4.4: Estimation Results of the Probit Model for Changing the Main Bank

	(1)	(2)	(3)	(4)
Dependent Variable	Changing the Main Bank			
NPL1	31.7294***			31.8429***
	(5.182)			(4.889)
NPL2		8.8228***		
		(1.385)		
NPL3			5.6898***	
			(1.055)	
Failed Bank Dummy	0.5636***	0.5380***	0.7454***	0.5669***
	(0.096)	(0.100)	(0.146)	(0.094)
Firm Scale	0.0831***	0.0861***	0.0827*	0.1020***
	(0.030)	(0.032)	(0.045)	(0.030)
Leverage	0.4048**	0.4235**	0.2027	0.4315***
	(0.172)	(0.179)	(0.259)	(0.163)
Profitability	0.5493	0.3512	-0.1131	-0.0348
	(0.708)	(0.752)	(1.070)	(0.670)
Liquidity	0.2044	0.4426	0.7466	0.1398
	(0.304)	(0.327)	(0.484)	(0.300)
Tobin's q	-0.0915	-0.1003	-0.0442	
	(0.061)	(0.064)	(0.082)	
Main Bank Dependence	-3.2019***	-3.0863***	-3.3785***	
	(0.275)	(0.288)	(0.429)	
ln(Number of	-0.7559***	-0.7683***	-0.7889***	-0.0326
Lending Relationships)	(0.078)	(0.082)	(0.120)	(0.049)
ln(Amount of Loans	-0.1599***	-0.1497***	-0.1213***	-0.2641***
from Main Bank)	(0.032)	(0.033)	(0.047)	(0.030)
Industry Dummy	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	No
Observations	7,183	6,668	3,154	7,025
Log Likelihood	-1589	-1439	-702.1	-1,619

Note: This table provides the estimates of a maximum-likelihood probit model with the changing the main bank dummy as the dependent variable. *Changing the Main Bank* is a dummy variable that takes a value of one if firms change their main bank between year t and t+1. *NPL1*, *NPL2*, and *NPL3* are proxies for nonperforming loans in the main bank for the sample firms. *NPL1* is the ratio of "Loans to borrowers in legal bankruptcy" to total loans. *NPL2* is the ratio of "Loans to borrowers in legal bankruptcy" plus "Past due loans" to total loans. *NPL3* is the ratio of "Loans to borrowers in legal bankruptcy" (*hatansaki saiken*) plus "Past due loans" (*entai saiken*) plus "Restructured loans" (*kinri genmen saiken*) to total loans. *Failed Bank Dummy* is a dummy variable that equals one if the main bank for firm i in year t is an ex post failed bank between 1996 and 1999, otherwise zero. *Firm Scale* is the natural log of a firm's total assets in year t. *Leverage* is the book value of debt divided by the book value of assets in year t. *Profitability* is the ratio of a firm's operating incomes to total assets in year t. *Liquidity* is the ratio of a firm's cash holdings to total assets in year t. *Tobin's q* is the ratio of each firm's market value of debt and equity to its book value in year t. *ln(Number of Lending Relationships)* is the natural log of the number of banks that offer loans for a sample firm in year t. *Main Bank Dependence* is the ratio of loans obtained from the main bank to total loans in year t. *ln(Amount of Loans from Main Bank)* is the natural log of total loans from the main bank in year t. Standard errors in parentheses; * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level, respectively.

expected, the estimated coefficient for bank merger is positive, but not statistically significant.

Second, bank size may also have an effect on the decision to change main bank. In general, firms that have relationships with large banks are not likely to change their main bank, as larger banks are typically more creditworthy with strong competitive advantages. To capture the effect of bank size, we include a large bank dummy variable by identifying if a firm's main bank is a "toshi ginko" (city bank)[8]. The estimated result for the equation including the large bank dummy variable is in column (2) of Table 4.5. As shown, the estimated coefficient is negative and statistically significant at the 1% level, confirming that firms with a main bank relationship with a large bank are less likely to change their main bank.

Third, we also control for the lending capacity of the main bank. Unfortunately, we do not have a direct measure of the lending capacity of the main bank as in Ongena and Smith (2001). Instead, we use the capital ratio gap, defined as the main bank's capital ratio less 8% if the capital ratio gap is positive and zero otherwise. To satisfy capital adequacy requirements under Basel I, the capital ratio of banks with an international presence should be at least 8%. Therefore, banks with a capital ratio close to 8% may reduce their level of risk-weighted assets, including loans to nonfinancial firms. As this entails a diminished lending capacity, firms with a relationship with such a bank may be more likely to change their main bank relationship. In column (3) of Table 4.5, we can see the estimated coefficient for the capital ratio gap is positive, which is contrary to our expectation.

In addition, we also control for the seriousness of the lock-in relationship with the main bank. Wu and Wang (2005) generalize the Myers and Majluf (1984) model and show that asymmetric information concerning firm value produced by growth (not assets in place) can facilitate firm equity issuance. Moreover, Wu et al. (2009) show that rent extraction by the main bank is not severe for high-growth firms because they can draw upon other financial resources, including new equity. To reflect this effect, we estimate equation (4.1) using only those observations for middle- and low-growth firms (that is, excluding high-growth firms). Following Wu et al. (2009), we use Tobin's q as a proxy for firm growth. We classify firms with

[8]Comprising Daiichi-Kangyou Bank, Fuji Bank, Sakura Bank, Tokyo–Mitsubishi (formerly Mitsubishi Bank), Asahi Bank, Sanwa Bank, Sumitomo Bank, Daiwa Bank, Tokai Bank, Hokkaido Takushoku Bank, and Tokyo Bank.

Table 4.5: Estimation Results of the Probit Model for Changing Main Bank (Robustness Check)

	(1)	(2)	(3)	(4)
Dependent Variable	Changing Main Bank			
NPL1	32.1935***	29.9793***	29.0833***	32.2508***
	(5.211)	(5.083)	(5.546)	(6.213)
Failed Bank Dummy	0.5682***	0.4983***	0.6385***	0.4880***
	(0.096)	(0.096)	(0.100)	(0.118)
Firm Scale	0.0820***	0.1014***	0.0944***	0.0716*
	(0.030)	(0.031)	(0.031)	(0.040)
Leverage	0.4050**	0.4300**	0.3426**	0.6323***
	(0.172)	(0.171)	(0.172)	(0.229)
Profitability	0.5579	0.4799	0.5445	0.2982
	(0.709)	(0.713)	(0.719)	(1.075)
Liquidity	0.2037	0.1618	0.1748	0.2934
	(0.304)	(0.304)	(0.308)	(0.378)
Tobin's q	-0.0914	-0.0900	-0.0782	-0.4947**
	(0.061)	(0.061)	(0.061)	(0.225)
ln(Number of	-3.2089***	-3.2176***	-3.1798***	-3.4639***
Lending Relationships)	(0.275)	(0.274)	(0.277)	(0.344)
Main Bank Dependence	-0.7562***	-0.7620***	-0.7588***	-0.8106***
	(0.078)	(0.079)	(0.079)	(0.094)
ln(Amount of Loans	-0.1596***	-0.1712***	-0.1583***	-0.1418***
from Main Bank)	(0.032)	(0.032)	(0.032)	(0.040)
Bank Merger	0.0799			
	(0.088)			
Large Bank Dummy		-0.2477***		
		(0.053)		
Capital Ratio Gap			18.3787***	
			(4.499)	
Industry Dummy	Yes	Yes	Yes	Yes
Year Dummy	Yes	Yes	Yes	Yes
Observations	7,183	7,183	7,142	4,777
Log Likelihood	-1588	-1578	-1551	-1092

Note: This table provides the estimates of a maximum-likelihood probit model with changing the main bank dummy as the dependent variable. *Changing Main Bank* is a dummy variable that takes a value of one if firms change their main bank between years t and t+1. The definitions of *NPL1*, *Firm Scale*, *Leverage*, *Profitability*, *Liquidity*, *ln(Number of Lending Relationships)*, *Main Bank Dependence*, and *ln(Amount of Loans from Main Bank)* are in the notes accompanying Table 4.4. *Bank Merger* is a dummy variable that takes a value of one if the main bank is the Mitsubishi Bank, Tokyo Bank, or Tokyo–Mitsubishi Bank. *Large Bank Dummy* takes a value of one if the firm's main bank is a "toshi ginko" (city bank). *Capital Ratio Gap* is the main bank's capital ratio minus 8% if the capital ratio gap is positive, and zero otherwise. Standard errors in parentheses; * significant at the 10% level; ** significant at the 5% level; *** significant at the 1% level, respectively.

a Tobin's q in the top tertile as high-growth firms, which are firms that we do not consider typically locked into a main bank. We provide the estimated results excluding high-growth firms in column (4) in Table 4.5. As shown, the effects of bank health are positive and the estimated coefficient for Tobin's q is negative and statistically significant. Together, these checks confirm that the results concerning the positive effects of main bank health are robust.

The negative coefficient of Tobin's q in column (4) in Table 4.5 implies that firms with a lower Tobin's q may have relationships with a troubled main bank, so they are more likely to change their main bank. We include NPL1 and failed bank dummy as proxies for bank health. However, according to Gibson (1995), the credit rating of the main bank can also be a proxy for bank health. Gibson (1995) shows that main bank credit ratings have negative effects on borrower firm performance. Therefore, we can interpret from this result that a lower Tobin's q indicates a relationship with a main bank that has a lower credit rating

4.4 Consequences of Changing the Main Bank

4.4.1 Propensity Score Matching

We found that firms that have a main bank relationship with a distressed bank are more likely to switch to a new main bank. This means that firms prefer not to have relationships with distressed main banks. However, we can also interpret this as meaning that firms change their main bank relationship because the main bank ceases offering credit to the firm. In this case, firm performance deteriorates after changing their main bank relationship. To investigate firm performance and other behavior, we apply propensity score matching methods. If the dummy variable for changing main bank ($C_{i,t+1}$) is a random variable, the coefficient in a simple regression model specifying firm performance as the dependent variable and the changing main bank dummy as an independent variable will show the effect of changing the main bank on client-firm performance. However, as shown in Table 4.4, client firms that have a main banking relationship with a distressed bank are also likely to change their main bank. In support, as shown in Table 4.3, the characteristics of firms with and without a change in the main bank are not very similar. Therefore, the dummy variable indicating the change in

main bank is a nonrandom variable.

To mitigate these problems, we employ the propensity score matching method, first introduced by Rosenbaum and Rubin (1983). This is because we need to compare firms changing and not changing their main bank with similar characteristics. Propensity score matching methods allow us to compare firms changing their main bank and those that do not, as these will have similar characteristics based on the propensity score. We can thus mitigate the selection bias problem.

Propensity score matching methods require a conditional independence assumption (CIA):

$$Y_0, Y_1 \perp C \mid \mathbf{w}, \mathbf{z}, \tag{4.2}$$

where Y_0 is an outcome variable without treatment (not changing main bank), Y_1 is an outcome variable under treatment (changing main bank), C is a bilateral variable indicating treatment, and $\mathbf{w}, \mathbf{z}$ is a set of observed firm characteristics. This assumption means that the outcome variables are independent of whether the participants receive treatment or not. In addition, the assumption of common support needs to be satisfied. As the number of observations (more than 7,000 in our data set) is sufficient, our data satisfy this assumption.

The propensity score is the probability of receiving treatment, which in our paper is the probability of changing the main bank. To calculate the propensity score $p(\mathbf{w}_{i,t}, \mathbf{z}_{i,t})$, we estimate the probability of changing the main bank using the following probit model:

$$\begin{aligned} p(\mathbf{w}_{i,t}, \mathbf{z}_{i,t}) &\equiv P(C_{i,t+1} = 1 \mid \mathbf{w}_{i,t}, \mathbf{z}_{i,t}) \\ &= \Phi(\mathbf{z}_{i,t}\gamma + \mathbf{w}_{i,t}\eta), \end{aligned} \tag{4.3}$$

where $\mathbf{w}_{i,t} = (\text{Leverage}_{i,t}, \text{Profitability}_{i,t}, \text{Liquidity}_{i,t}, \ln(\text{Number of Lending Relationships}_{i,t}), \ln(\text{Amount of Loans from Main Bank}_{i,t}), \text{Industrial Dummies})$ and $\mathbf{z}_{i,t} = (\text{Nonperforming Loans}_{i,t}, \text{Failed Bank Dummy}_{i,t})$. We use NPL1 as a proxy for nonperforming loans. To

satisfy the balancing property, we omit the bank dependence and year dummies. As we now employ Tobin's q as an outcome variable ($Y_i \; for \; i = 0, 1$), we exclude it from the matching estimation. We limit the observations to those where Tobin's q in t+1 and t+2 are both available. Φ is the cumulative distribution function of the standard normal distribution. The propensity score satisfies the common support condition, which is $0 < p(\mathbf{w}_{i,t}, \mathbf{z}_{i,t}) < 1$. If the CIA described in Equation (4.2) holds, the following condition also holds.

$$Y_0, Y_1 \perp C \mid p(\mathbf{w}_{i,t}, \mathbf{z}_{i,t}) \tag{4.4}$$

The estimation result for Equation (4.3) is shown in column (4) of Table 4.4. Using the estimated coefficients ($\hat{\gamma}$, $\hat{\eta}$) in column (4) of Table 4.4, we calculate the estimated propensity score ($\hat{p}(\mathbf{w}_{i,t}, \mathbf{z}_{i,t})$) for each observation, and match the observations based on the estimated propensity score. We employ a k-nearest neighbor-matching algorithm to match the treatment and control observations where k indicates the number of control observations matched with each treatment observation. We estimate the propensity score by matching each treatment observation using its five nearest neighbors.

We checked the balancing test as follows. First, we test that the mean of each variable differs between the treated and matched firms using a t-test. The mean of each of the variables specified in Equation (4.3) indicating the treated and control observations is shown in Table 4.6. The column headed "Treated" provides the means for the treated observations (firms changing their main bank). The column headed "Unmatched" details the means for the control observations (firms that do not change their main bank) before matching. We test that the difference of mean between control and treated observations is zero. Table 4.6 shows that the null hypothesis that the difference of treated and control samples is zero is rejected for all variables at the 1% or 5% level before matching. This suggests that the characteristics of those firms changing and not changing their main bank are not similar for the variables listed in Table 4.6. Similarly, the table provides the means for the control observations after matching, shown in the column headed "Matched." The difference between the treated and matched control observations is not statistically significant, so we fail to reject

Table 4.6: Difference Between the Treated and Control Samples Before and After Matching

		Unmatched			Matched	
	Treated	Control	t statistics		Control	t statistics
NPL1	0.009	0.007	9.63	***	0.008	0.75
Failed Bank Dummy	0.116	0.038	8.11	***	0.109	0.33
Firm Scale	10.493	10.831	-5.54	***	10.488	0.07
Leverage	0.603	0.637	-3.83	***	0.594	0.73
Profitability	0.031	0.028	1.90	**	0.033	-0.76
Liquidity	0.120	0.105	3.90	***	0.124	-0.71
ln(Number of Lending Relationships)	2.066	2.250	-5.79	***	2.048	0.41
ln(Amount of Loans from Main Bank)	7.077	7.779	-10.73	***	7.051	0.29

Note: This table details the means of the independent variables used in the probit estimation. The column headed "Treated" contains the means for the firms changing their main bank (treated firms). The column headed "Unmatched" contains the means for firms not changing their main bank (control firms). The column headed "matched" contains the means for the matched observations of firms not changing their main bank. * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level, respectively.

the null hypothesis that the difference in the means between the treated and matched control observations is zero. This suggests that after matching, the difference in characteristics between the treated and control observations is small.

Second, we estimate Equation (4.3) using only the treated and matched control observations, and test that all of the estimated coefficients for each variable are jointly zero. Before matching, the pseudo R^2 value for the estimate of Equation (4.3) is 0.080. The LR χ^2 value is 281.18, which rejects the null hypothesis that all estimated coefficients for variables in Equation (4.3) are equal to zero at the 1% level. After matching, the pseudo R^2 value for Equation (4.3) decreases to 0.009, which is lower than that in the model using all observations. The LR χ^2 value is 5.15, which fails to reject the null hypothesis that all coefficients are jointly equal to zero. These results suggest that the difference between the treated and matched observations is not significantly large.

4.4.2 Outcome Variables

We use Tobin's q, ROA, the total borrowing to total assets ratio, the annual growth rate of total borrowing, the interest rate, and the cash-holdings ratio as outcome variables. Our hypothesis is as follows. If firms lock into a relationship with the incumbent main bank and are obliged to reduce their loan supply for any reason, firms that change their main bank do

not obtain sufficient funds from the new main bank. In this case, the availability of credit for firms that change their main bank worsens, so the total borrowing to total assets ratio and the annual growth rate of total borrowings for firms changing their main bank are lower than that for matching firms. We define the total borrowing to total assets ratio as the ratio of a firm's total borrowing to its total assets. The growth rate of total borrowing is defined as the annual growth rate of a firm's total borrowings [(total borrowings$_t$ – total borrowings$_{t-1}$) / total assets$_{t-1}$].

In addition, if firms changing their main bank need to compensate for this financial shortfall by drawing on more expensive sources of financing, their average interest rate will be higher than that for matching firms. We define each firm's interest rate as the ratio of firm interest expenses to the sum of total borrowings. Conversely, if the credit availability for firms changing main banks improves, the annual growth rate of total borrowings and the total borrowing to total assets ratio will be higher and the interest rates lower for these firms.

As Opler et al. (1999) have argued, when financial shortfalls for firms are severe, they draw on internal cash holdings. We predict that cash holdings for firms changing their main bank are lower than those for matching firms if the financial shortfall is severe. In contrast, if the problem of a locked-in relationship with the main bank does not matter, the differences in these variables between firms that change their main bank and the matching firms will not be statistically significant. We define the cash-holdings ratio as the ratio of a firm's cash holdings to total assets.

We also check whether firm performance deteriorates after changing the main bank using Tobin's q and ROA. Following Morck et al. (2000), we use the average Tobin's q as a proxy for firm performance. As Wu and Xu (2005) have argued, information on market valuation in Japan became more meaningful following financial deregulation up until the late 1990s, so Tobin's q is a suitable measure of firm performance. If firms face an underinvestment problem because of financial constraints, Tobin's q and the ROA for firms changing their main bank should be lower than for matching firms.

In contrast, if financial constraints do not matter, the differences between these firms and

the matched firms should not be statistically significant. In addition, the change in the main bank can enhance each firm's behavior, such that both Tobin's q and ROA can improve after the firm changes its main bank. We define Tobin's q as the ratio of each firm's market value of debt and equity to its book value. We define ROA as the ratio of each firm's operating income to total assets. We compare the change in the outcome variables for the treatment and control groups from year t to year t+1 or year t+2. We evaluate the treatment effects by highlighting the difference in differences of the outcome variables.

4.4.3 Results

Tables 4.7 and 4.8 provide the means of the outcome variables for the treated and control firms and the difference in differences of the means. We apply the difference in differences of the mean in each outcome variable for evaluating the treatment effects. We take the difference of the outcome variables between t and t+1 or t+2, which are the years before and after changing the main bank. To compare the outcome variables in t and t+1 or t+2, we limit the observations to those available in t+1 and t+2. Panels A, B, and C in Table 4.7 provide the results for the total borrowing to total assets ratio, the annual growth rate of total borrowing, and the interest rate, respectively. The column headed "Matched" shows the results for the observations of matching firms using the propensity score. In addition, we provide the results using all firm observations for firms not changing main bank as controls in the column headed "Unmatched". "Treated" are the results using only those observations for firms changing their main bank.

We provide the difference in differences of the mean using all the sample years and for each year. The financial crisis hit the Japanese economy late in 1997, so 1997 is immediately before the financial crisis. The difference in differences of the means for the total borrowing to total assets ratio is not statistically significant in all years apart from 1995 for a year (t+1), suggesting that firms changing their main bank did not decrease their bank loans. In 1995, the total borrowing ratio decreased more for firms changing their main bank, but the negative effects are insignificant for two years (t+2). As shown in the column headed "Unmatched",

Table 4.7: Estimation Results for Treatment Effects on Credit Availability

Panel A: Total borrowing to total assets ratio

			Matched				Unmatched			
		Treated	Controls	Diff. in Diff.	Std. Err.		Controls	Diff. in Diff.	Std. Err.	
t=1993	t	0.3027	0.3112				0.3407			
	t+1	0.3132	0.3178	0.0039	0.0065		0.3501	0.0012	0.0052	
	t+2	0.3129	0.3183	0.0031	0.0100		0.3479	0.0030	0.0079	
t=1994	t	0.3236	0.3032				0.3482			
	t+1	0.3218	0.3013	0.0001	0.0069		0.3462	0.0002	0.0059	
	t+2	0.3100	0.3015	-0.0119	0.0103		0.3396	-0.0049	0.0090	
t=1995	t	0.3499	0.2981				0.3426			
	t+1	0.3283	0.2981	-0.0217	0.0095	**	0.3377	-0.0168	0.0061	***
	t+2	0.3373	0.2903	-0.0048	0.0137		0.3361	-0.0061	0.0100	
t=1996	t	0.3075	0.3090				0.3327			
	t+1	0.3104	0.3079	0.0040	0.0093		0.3304	0.0052	0.0063	
	t+2	0.3112	0.3195	-0.0069	0.0106		0.3376	-0.0013	0.0091	
t=1997	t	0.3152	0.2821				0.3256			
	t+1	0.3196	0.2878	-0.0013	0.0072		0.3339	-0.0040	0.0053	
	t+2	0.3348	0.2975	0.0041	0.0103		0.3505	-0.0053	0.0086	
All	t	0.3192	0.2946				0.3375			
	t+1	0.3186	0.2941	0.0000	0.0046		0.3393	-0.0024	0.0026	
	t+2	0.3223	0.2965	0.0013	0.0056		0.3424	-0.0017	0.0040	

Panel B: Growth rate of total borrowing

			Matched				Unmatched			
		Treated	Controls	Diff. in Diff.	Std. Err.		Controls	Diff. in Diff.	Std. Err.	
t=1993	t	0.0611	0.1398				0.1118			
	t+1	0.0901	0.0856	0.0831	0.1003		0.0559	0.0850	0.1111	
	t+2	0.0898	0.0262	0.1422	0.1104		0.0144	0.1261	0.1097	
t=1994	t	0.2386	0.0547				0.0580			
	t+1	0.0849	0.0377	-0.1366	0.1862		0.0141	-0.1096	0.0674	*
	t+2	0.0273	0.0069	-0.1634	0.1894		0.0012	-0.1544	0.0644	***
t=1995	t	-0.0127	0.0762				0.0349			
	t+1	0.0114	0.0390	0.0613	0.0721		0.0162	0.0427	0.0495	
	t+2	0.0923	-0.0112	0.1923	0.0635	***	0.0021	0.1377	0.0523	***
t=1996	t	-0.0080	-0.0007				0.0266			
	t+1	0.1069	-0.0009	0.1152	0.0692	*	0.0110	0.1305	0.0452	***
	t+2	0.0219	0.0555	-0.0262	0.1012		0.0274	0.0292	0.0544	
t=1997	t	0.0647	0.0309				0.0236			
	t+1	0.1511	0.1156	0.0017	0.1529		0.0550	0.0550	0.0556	
	t+2	0.0907	0.0432	0.0138	0.0808		0.0692	-0.0195	0.1111	
All	t	0.0665	0.0372				0.0503			
	t+1	0.0923	0.0422	0.0209	0.0600		0.0310	0.0451	0.0313	
	t+2	0.0684	0.0697	-0.0305	0.0947		0.0240	0.0281	0.0391	

[continued to the next page]

Panel C: Interest rate

			Matched				Unmatched			
		Treated	Controls	Diff. in Diff.	Std. Err.		Controls	Diff. in Diff.	Std. Err.	
t=1993	t	0.0815	0.0639				0.0602			
	t+1	0.0604	0.0507	-0.0079	0.0077		0.0495	-0.0104	0.0030	***
	t+2	0.0487	0.0452	-0.0140	0.0113		0.0443	-0.0170	0.0037	***
t=1994	t	0.0539	0.0557				0.0502			
	t+1	0.0454	0.0481	-0.0010	0.0029		0.0446	-0.0030	0.0019	*
	t+2	0.0352	0.0384	-0.0014	0.0041		0.0363	-0.0048	0.0039	
t=1995	t	0.0465	0.0452				0.0447			
	t+1	0.0350	0.0370	-0.0033	0.0050		0.0362	-0.0031	0.0033	
	t+2	0.0251	0.0314	-0.0075	0.0034	**	0.0302	-0.0070	0.0036	*
t=1996	t	0.0393	0.0352				0.0349			
	t+1	0.0283	0.0291	-0.0048	0.0026	*	0.0289	-0.0049	0.0019	***
	t+2	0.0275	0.0253	-0.0018	0.0039		0.0258	-0.0027	0.0019	
t=1997	t	0.0273	0.0298				0.0287			
	t+1	0.0239	0.0280	-0.0015	0.0021		0.0256	-0.0003	0.0012	
	t+2	0.0233	0.0314	-0.0056	0.0049		0.0248	0.0000	0.0030	
All	t	0.0486	0.0441				0.0432			
	t+1	0.0378	0.0380	-0.0047	0.0018	**	0.0365	-0.0042	0.0011	***
	t+2	0.0316	0.0332	-0.0062	0.0028	**	0.0320	-0.0058	0.0015	***

Panel D: Cash-holdings ratio

			Matched				Unmatched			
		Treated	Controls	Diff. in Diff.	Std. Err.		Controls	Diff. in Diff.	Std. Err.	
t=1993	t	0.1305	0.1228				0.1135			
	t+1	0.1268	0.1199	-0.0008	0.0068		0.1111	-0.0013	0.0046	
	t+2	0.1275	0.1144	0.0054	0.0089		0.1059	0.0047	0.0055	
t=1994	t	0.1244	0.1279				0.1118			
	t+1	0.1233	0.1229	0.0041	0.0055		0.1069	0.0040	0.0046	
	t+2	0.1132	0.1081	0.0088	0.0081		0.0971	0.0037	0.0057	
t=1995	t	0.1264	0.1298				0.1077			
	t+1	0.1139	0.1132	0.0040	0.0069		0.0980	-0.0029	0.0043	
	t+2	0.1120	0.1045	0.0109	0.0084		0.0903	0.0030	0.0049	
t=1996	t	0.1230	0.1268				0.1004			
	t+1	0.1164	0.1126	0.0077	0.0075		0.0920	0.0019	0.0041	
	t+2	0.1028	0.1069	-0.0003	0.0070		0.0895	-0.0093	0.0050	*
t=1997	t	0.1017	0.1040				0.0938			
	t+1	0.0910	0.1008	-0.0076	0.0059		0.0912	-0.0081	0.0035	***
	t+2	0.0987	0.1100	-0.0090	0.0056		0.0991	-0.0083	0.0047	*
All	t	0.1197	0.1239				0.1049			
	t+1	0.1124	0.1162	0.0004	0.0026		0.0993	-0.0017	0.0019	
	t+2	0.1100	0.1114	0.0027	0.0033		0.0962	-0.0010	0.0023	

Note: This table provides the treatment effects on the *Total borrowing to total assets ratio*, *Growth rate of total borrowing*, *Interest rate*, and *Cash-holdings ratio* for treated and matched firms before and after changing their main bank; t denotes year immediately before changing main bank and t+1 denotes year after changing main bank. *Total borrowing to total assets ratio* is the ratio of a firm's total borrowing to its total assets in year t. *Growth rate of total borrowing* is the growth rate of a firm's total borrowings [(total borrowings$_t$ – total borrowings$_{t-1}$) / total assets$_{t-1}$]. *Interest Rate* is the ratio of a firm's interest expenses to the sum of its total borrowings for in year t. *Cash-holdings ratio* is the ratio of a firm's cash holdings to total assets in year t. The column denoted as "Diff. in Diff." shows the difference in differences between year t and t+1/t+2 and the treated and matched firms. Standard errors for the difference in differences in the column headed "Std. Err.". Standard errors obtained from bootstrapping based on 50 replications. * represents significance at the 10% level, ** at the 5% level and *** at the 1% level, respectively.

Table 4.8: Estimation Results for Treatment Effects on Firm Performance

Panel A: Tobin's q

			Matched				Unmatched			
		Treated	Controls	Diff. in Diff.	Std. Err.		Controls	Diff. in Diff.	Std. Err.	
t=1993	t	1.3281	1.3567				1.3226			
	t+1	1.3976	1.4411	-0.0149	0.0329		1.3964	-0.0044	0.0213	
	t+2	1.2558	1.2989	-0.0145	0.0404		1.2800	-0.0298	0.0273	
t=1994	t	1.3902	1.4399				1.4161			
	t+1	1.2516	1.2941	0.0072	0.0385		1.2884	-0.0109	0.0284	
	t+2	1.3725	1.3973	0.0249	0.0357		1.4087	-0.0102	0.0398	
t=1995	t	1.3127	1.3083				1.2823			
	t+1	1.4486	1.4038	0.0404	0.0343		1.4001	0.0181	0.0318	
	t+2	1.2364	1.1919	0.0401	0.0382		1.1910	0.0150	0.0313	
t=1996	t	1.4079	1.4566				1.4272			
	t+1	1.1978	1.2051	0.0415	0.0309		1.2025	0.0147	0.0294	
	t+2	1.0266	1.0395	0.0358	0.0417		1.0615	-0.0155	0.0382	
t=1997	t	1.2094	1.2068				1.2099			
	t+1	1.0791	1.0312	0.0453	0.0282		1.0582	0.0213	0.0185	
	t+2	1.1554	1.0270	0.1259	0.0515	**	1.0709	0.0850	0.0368	**
All	t	1.3193	1.3590				1.3307			
	t+1	1.2615	1.2549	0.0463	0.0179	**	1.2609	0.0120	0.0131	
	t+2	1.2012	1.1743	0.0666	0.0228	***	1.1942	0.0184	0.0169	

Panel B: ROA

			Matched				Unmatched			
		Treated	Controls	Diff. in Diff.	Std. Err.		Controls	Diff. in Diff.	Std. Err.	
t=1993	t	0.0310	0.0331				0.0285			
	t+1	0.0226	0.0247	-0.0001	0.0038		0.0214	-0.0013	0.0024	
	t+2	0.0236	0.0256	0.0001	0.0034		0.0240	-0.0029	0.0032	
t=1994	t	0.0271	0.0252				0.0223			
	t+1	0.0281	0.0263	-0.0001	0.0041		0.0242	-0.0009	0.0028	
	t+2	0.0248	0.0263	-0.0034	0.0061		0.0251	-0.0051	0.0040	
t=1995	t	0.0318	0.0269				0.0244			
	t+1	0.0313	0.0270	-0.0006	0.0034		0.0247	-0.0008	0.0026	
	t+2	0.0339	0.0299	-0.0009	0.0036		0.0275	-0.0010	0.0033	
t=1996	t	0.0322	0.0360				0.0297			
	t+1	0.0340	0.0366	0.0012	0.0026		0.0316	-0.0002	0.0026	
	t+2	0.0268	0.0313	-0.0008	0.0038		0.0268	-0.0026	0.0035	
t=1997	t	0.0327	0.0405				0.0331			
	t+1	0.0295	0.0323	0.0050	0.0027	*	0.0273	0.0026	0.0022	
	t+2	0.0296	0.0228	0.0146	0.0043	***	0.0208	0.0091	0.0033	***
All	t	0.0312	0.0331				0.0278			
	t+1	0.0291	0.0305	0.0005	0.0015		0.0261	-0.0004	0.0011	
	t+2	0.0279	0.0283	0.0015	0.0021		0.0248	-0.0003	0.0016	

Note: This table provides the treatment effects on *Tobin's q* and *ROA* for treated and matched firms before and after changing their main bank; t denotes the year just before changing main bank and t+1 denotes the year after changing main bank. *Tobin's q* is the ratio of the firm's market value of debt and equity to its book value of debt and equity. *ROA* is the ratio of a firm's operating income to total assets. The rows denoted "Difference" contain the difference in each variable in year t and t+1 for the matched and treated firms. The column denoted as "Diff. in Diff." shows the difference in differences between years t and t+1 and the treated and matched firms. Standard errors for the difference in differences in the column headed "Std. Err.". Standard errors obtained from bootstrapping based on 50 replications. * represents significance at the 10% level, ** at the 5% level and *** at the 1% level, respectively.

these results are similar to those if we used all observations.

As shown in Panel B, the differences in differences of the means of the growth rate of total borrowing are both positive and negative. If we use unmatched observations, the differences in differences are statistically significant in 1994, in 1995 for two years (t+2), and in 1996 for one year (t+1). After matching, the difference in differences is statistically significant only in 1995 for two years (t+2) and in 1996 for a year (t+1), but the effects in the remaining years are statistically insignificant. Together, the results in Panels A and B of Table 4.7 imply that credit availability in firms changing their main bank did not worsen compared with those firms not changing their main bank.

In Panel C, we show the results using the interest rate. Using all observations, the difference in differences of the means of the interest rate is negative and statistically significant at the 5% level. This suggests that firms reduce their interest payments more after changing their main bank, when compared with firms not changing their main bank. If we sample by year, the differences in differences of the means are all negative and statistically significant in 1995 for two years (t+2) and in 1996 for a year (t+1) if we use matching observations for controls.

We also check the change in the liquidity of firms using the cash-holdings ratio in Panel D of Table 4.7. In both 1996 and 1997, the differences in differences are negative and statistically significant if we use unmatched observations for controls. However, using matched observations as controls, the difference in differences of the mean for cash holdings is statistically insignificant in all years. This suggests that firms do not reduce their internal cash holdings more after changing their main bank, when compared with firms that do not change their main bank.

Table 4.8 provides the results concerning the performance of the treated and control firms. Panel A details the means of Tobin's q for firms changing their main bank and the matching firms and the differences in differences of the means in each year. If we use observations from the full sample period, the differences in differences for Tobin's q between t and t+1 or t+2 are positive and statistically significant at the 1% or 5% level if we use matched

observations for controls. The level of Tobin's q for both groups decreases from t to t+1 or t+2 because our sample period includes the postbubble recessionary period. Dividing the sample by year, we can see that before 1996 the differences in differences for Tobin's q are statistically insignificant. In contrast, the change in Tobin's q for firms changing their main bank is higher than those for matching firms and statistically significant at the 5% level in 1997 for two years (t+2). This implies that in 1997 (the pre-financial-shock year), the change in Tobin's q was relatively large in firms that changed their main bank. These results suggest that the impact of changing the main bank persists for two years after 1997.

Panel B provides the results using ROA as the outcome variable. As with the results in Panel B, the differences in differences for one and two years are positive and statistically significant at the 1% or 10% level (only using matched observations) in 1997, but insignificant in the other years. These results also suggest that although the level of ROA decreased, the change in client-firm ROA was larger after a change in the main banking relationship, especially in 1997, the pre-crisis year.

As shown in Table 4.4, we find that firms that have a main bank relationship with a distressed bank are more likely to switch to a new main bank. This suggests that firms do not prefer to have relationships with distressed main banks. Interestingly, the change in performance (in terms of Tobin's q and ROA) of client firms that switched their main bank relationship immediately before the financial shock (in 1997) is greater than that for firms that did not switch main bank. As argued, many large banks (e.g., Hokkaido Takushoku Bank, the Long-Term Credit Bank of Japan, Nippon Credit Bank, etc.) went bankrupt after November 1997. The reason for the relatively higher firm performance is that firms changed relationships to nondistressed banks during the financial shock period, which led to more stable sources of finance.

The discounted sum of expected cash flows to firms determines firm value (such as Tobin's q). If the main bank relationship moves from a distressed bank, we expect credit availability in the future to improve. The improvement in future credit availability prevents the loss of profitable investment opportunities. Therefore, firm value improves because changing the

main bank increases the probability of achieving future profitable investment opportunities. Table 4.7 supports the argument that interest rates fall for firms changing their main bank. Thus, credit availability improves after firms change main bank, and this leads to relatively larger changes in ROA and Tobin's q for firms switching main bank.

To investigate the reason for the higher ROA in the treatment group, we detail the average total assets and operating income growth rates for the control and treatment groups for one and two years in Table 4.9.[9] In 1997, the growth rates of total assets for the treatment group are positive and larger than for the control group. As the change in the cash-holdings ratios for the treatment group is lower after changing the main bank relationship (Table 4.7), firms that change their main bank increase their inventory and/or capital investment by reducing their cash holdings. The two-year growth rates of operating income for the treatment group are also positive, while those for control group are negative in 1997. These findings indicate that firms that change their main bank increase their operating incomes with increasing investment. As a result, the changes in ROA for the treatment group are larger than those for the control group. However, the change in total assets is also large, so the changes in ROA for the treatment group are negative for one and two years.[10]

Possible reasons for the increasing investment and operating incomes are as follows. First, as new main banks can monitor client firms more efficiently, these firms increase the level of investments with positive net present value. Second, as client firms do not need to prepare for future financial shortages given the failure of the main bank, they do not require additional precautionary cash holdings. They can then invest more in capital and inventories. As a result, the operating incomes for firms changing their main bank increase.

These results imply that firms changing main bank can retain their existing level, which is inconsistent with our prediction that the new main bank cannot offer sufficient credit because

[9]Total assets growth in year t+1 is defined as [(Total assets in year t+1 – Total assets in year t)/Total assets in year t]. Total assets growth in year t+2 is defined as [(Total assets in year t+2 – Total assets in year t)/Total assets in year t]. Operating income growth rate in year t+1 is defined as [(Operating incomes in year t+1 – Operating incomes in year t)/Total assets in year t]. Operating income growth rate in year t+2 is defined as [(Operating incomes in year t+2 – Operating incomes in year t)/Total assets in year t]. We normalized operating income growth using total assets because the operating incomes for some firms are negative.

[10]The differences between the treated and control firms are not statistically significant if we use matched firms as the control group. Therefore, there is insufficient evidence of a reduction in cash holdings.

Table 4.9: Average ROA, Total Assets Growth, and Operating Income Growth

		ROA			Total Assets Growth		Operating Income Growth	
		Treated	Controls	Diff. in Diff.	Treated	Controls	Treated	Controls
t=1997	t	0.0327	0.0405					
	t+1	0.0295	0.0323	0.0050	0.0041	-0.0030	-0.0009	-0.0069
	t+2	0.0296	0.0228	0.0146	0.0481	-0.0082	0.0042	-0.0150
All	t	0.0312	0.0331					
	t+1	0.0291	0.0305	0.0005	0.0065	0.0108	0.0000	-0.0007
	t+2	0.0279	0.0283	0.0015	0.0477	0.0263	0.0008	-0.0017

Note: This table provides average ROA, total assets growth, and operating income growth for the treatment and control firms. Total assets growth in year t+1 is [(Total assets in year t+1 – Total assets in year t)/Total assets in year t]. Total assets growth in year t+2 is defined as [(Total assets in year t+2 – Total assets in year t)/Total assets in year t]. Operating income growth rate in year t+1 is [(Operating incomes in year t+1 – Operating incomes in year t)/Total assets in year t]. Operating income growth rate in year t+2 is [(Operating incomes in year t+2 – Operating incomes in year t)/Total assets in year t].

the incumbent main bank has an information advantage. The results from the propensity score matching also suggest that the new main bank can offer sufficient credit to its new client firms because its information problems are not severe.

4.4.4 Robustness Check

By applying the propensity matching method, we showed that the change in the performance of client firms switching their main bank was relatively higher during the pre-financial-crisis period. However, we also made some rather strict assumptions, including that of CIA and common support. To support the robustness of our results, we estimate a treatment effects model as follows:

$$\begin{aligned} Ex\ Post\ Firm\ Performance_{i,t+s} &= \alpha_1 Nonperforming\ Loans_{i,t} + \alpha_2 Failed\ Bank\ Dummy_{i,t} \\ &+ \mathbf{x}_{i,t}\beta + \delta C_{i,t+1} + u_{i,t} \end{aligned} \tag{4.5}$$

$$\begin{aligned} C^*_{i,t+1} &= \beta_1 Nonperforming\ Loans_{i,t} + \beta_2 Failed\ Bank\ Dummy_{i,t} \\ &+ \mathbf{y}_{i,t+1}\eta + v_{i,t} \\ & C_{i,t+1} = 1\ if\ C^*_{i,t+1} > 0 \end{aligned} \tag{4.6}$$

$$C_{i,t+1} = 0 \; otherwise,$$

where $u_{i,t} \sim N(0, \sigma^2), v_{i,t} \sim N(0, \sigma^2)$ and $Cov(u_{i,t}, v_{i,t}) = \rho \neq 0$.

We use Tobin's q and ROA as a proxy for $Ex\ Post\ Firm\ Performance_{i,t+s}$, where s equals 1 or 2. The proxies for main bank health are $Nonperforming\ Loans_{i,t}$ and $Failed\ Bank\ Dummy_{i,t}$. $Nonperforming\ Loans_{i,t}$ is the ratio of nonperforming loans to total loans of a main bank for firm i in year t (defined as NPL1). We also use a dummy variable that equals one if the main bank for firm i in year t is an ex post failed bank ($Failed\ Bank\ Dummy_{i,t}$). As in the previous section, the dummy variable $C_{i,t+1}$ takes a value of one if the name of the main bank for firm i in year t differed from that in year t+1 (Changing the Main Bank Dummy), and zero otherwise. $C^*_{i,t+1}$ is a latent variable for the change in the main bank. If the performance of the client firms improves after they change their main banking relationship, the estimated coefficient for $C_{i,t+1}$ (δ) in Equation (4.5) will be positive and statistically significant. We use a treatment effects model to mitigate any endogeneity bias. As argued, the dummy variable indicating the change in main bank is a nonrandom variable. We estimate the parameter vectors using a maximum likelihood method.

We also specify several control variables ($\mathbf{x}_{i,t}$) in the estimation of firm performance in Equation (4.5), including assets, leverage, profitability, liquidity, main bank dependence, and the number of lending relationships, along with the year and industry dummies for each year t. To start with, we employ the natural log of each firm's total assets as a proxy for firm scale (size). We measure profitability using the ratio of each firm's operating incomes to total assets. As a rule, profitable firms are better performing firms and so each firm's Tobin's q will be higher. Profitability is also used in Wu and Xu (2005) in their analysis of the determinants of firm value in Japanese firms. We predict that a firm's profitability has a positive effect on firm performance. We do not include profitability as a control variable when ROA is the dependent variable. As Kang and Stulz (2000) argue, firms with more liquidity should also have better performance because they do not suffer liquidity constraints. We predict that liquidity has a positive effect on firm performance, with liquidity defined as the ratio of cash

to total assets.

We include leverage to control for the effects of capital structure, defined as the ratio of a firm's total debts to total assets, as used in Wu and Xu (2005) to control for firm value. From a theoretical point of view, firm performance and capital structure are irrelevant. However, some studies suggest that capital structure can have either positive or negative effects on firm performance. For example, Fama and French (1998) investigate the effects of taxes on leverage and argue that debt has a positive effect on firm value. However, they also discuss the lack of empirical support for this argument. In addition, higher leverage increases bankruptcy costs, which lowers firm value. Wu and Xu (2005) summarize the effects of leverage by focusing on agency costs and asymmetric information, which have either positive or negative effects on firm values. In particular relation to the Japanese financial system, Wu and Xu (2005) argue that the effects of leverage can be positive given monitoring by the main bank and negative in the presence of rent extraction by the main bank. To reflect these effects, we include leverage in our estimation of firm performance.

The number of lending relationships with banks is the number of banks that offer loans for firm i in year t. According to Detragiache et al. (2000), as firms with a large number of lending relationships are less likely to face liquidity problems, the number of lending relationships has a positive effect on firm performance. Main bank dependence is the ratio of loans obtained from the main bank to total loans. According to Rajan (1992), a close main bank relationship causes the holdup problem. As a result, the performance of client firms that depend more on their main bank is lower. Conversely, a close main bank relationship can enhance credit availability for these client firms. Overall, bank dependence should then have some impact on firm performance, but the predicted sign is ambiguous. We also include proxies for nonperforming loans and a failed bank dummy in Equation (4.5). As Gibson (1995) finds that the deterioration of main bank health has a negative effect on client-firm performance, we predict that the performance effects of nonperforming loans and the failed bank dummy will be negative. The control variables specified in Equation (4.6) are the same as in Equation (4.1).

We use the natural log of total loans from the main bank as an instrumental variable. Firms that borrow large sums from their main bank cannot change their main banking relationship easily. This is because only a few (especially large) banks can offer large loans to substitute for the role of the main bank. Therefore, the size of loans from the main bank negatively correlates with the dummy for changing the main banking relationship. This variable is mainly determined by firm size, so it is not considered to be correlated with firm performance and $u_{i,t}$.

Table 4.10 provides the estimation results for Equations (4.5) and (4.6). We simultaneously estimate columns (1) and (2) using the treatment effects model. We omit the results of Equation (4.6) in columns (3)–(5) as they are similar to the results in column (1). Column (1) details the results of Equation (4.6). As shown, the estimated coefficients for NPL1 in column (1) are positive and statistically significant at the 1% level. These suggest that client firms are likely to change their main banking relationship if their main bank has a large amount of nonperforming loans. In addition, the estimated coefficient for the failed bank dummy is positive and statistically significant at the 1% level. In sum, our results suggest that client firms are more likely to change their main banking relationship if their main bank is distressed, which is a similar result to that provided earlier in Table 4.4.

We provide the estimation results for Equation (4.5) in columns (2)–(5). We use Tobin's q in columns (2) and (3) and ROA in columns (4) and (5) as proxies for firm performance. In columns (2) and (4), we use the dependent variables in t+1 and those in t+2 in columns (3) and (5). As shown, the estimated coefficients for changing the main bank are all positive and statistically significant at the 1% level. This suggests that a client-firm's performance (in terms of Tobin's q and ROA) improves after it changes its main banking relationship.[11]

[11] We also estimate a treatment regression using only those observations from 1997. However, the estimated ρ is not statistically significant from zero, which is inconsistent with the assumption in Equations (4.5) and (4.6) that $Cov(u_{i,t}, v_{i,t}) = \rho \neq 0$. If we estimate Equation (4.5) using simple least-squares regression using the same observations, the estimated coefficient for the changing main bank dummy is positive and statistically significant.

Table 4.10: Estimation Results of the Treatment Effects Model

	(1)	(2)	(3)	(4)	(5)
	Changing the Main Bank	Firm Performance (Tobin's q)		Firm Performance (ROA)	
Year of Dependent Variable		t+1	t+2	t+1	t+2
Changing the Main Bank		0.5933***	0.5659***	0.0546***	0.0460***
		(0.020)	(0.025)	(0.002)	(0.002)
NPL1	28.0233***	-4.6382***	-6.6301***	-0.3978***	-0.5525***
	(4.605)	(1.337)	(1.438)	(0.117)	(0.120)
Failed Bank Dummy	0.4457***	-0.0878***	-0.0960***	-0.0039*	-0.0019
	(0.091)	(0.025)	(0.027)	(0.002)	(0.002)
Firm Scale	0.0797***	-0.0102**	-0.0028	0.0029***	0.0023***
	(0.027)	(0.005)	(0.005)	(0.000)	(0.000)
Leverage	0.2909*	0.4113***	0.4448***	-0.0409***	-0.0338***
	(0.153)	(0.032)	(0.034)	(0.003)	(0.003)
Profitability	-0.1108	1.7403***	1.4222***		
	(0.653)	(0.144)	(0.153)		
Liquidity	0.5289**	0.0571	0.0303	0.0458***	0.0388***
	(0.268)	(0.067)	(0.071)	(0.006)	(0.006)
ln(Number of	-0.5259***	-0.0185	-0.0064	0.0033***	0.0023*
Lending Relationships)	(0.069)	(0.014)	(0.014)	(0.001)	(0.001)
Main Bank Dependence	-2.5400***	0.2847***	0.2960***	0.0147***	0.0126***
	(0.236)	(0.046)	(0.049)	(0.004)	(0.004)
ln(Amount of Loans	-0.1308***				
from Main Bank)	(0.025)				
Year Dummy	Yes	Yes	Yes	Yes	Yes
Industry Dummy	Yes	Yes	Yes	Yes	Yes
Observations	7,183	7,183	7,025	7,183	7,041
Log Likelihood	-5120	-5,120	-5,374	12,492	12,090
Estimated ρ		-0.7488***	-0.6631***	-0.7949***	-0.6338***

Note: This table provides the estimates of the treatment effects model with the changing main bank dummy and firm performance (Tobin's q) or ROA as dependent variables. Definitions of all variables are in notes accompanying Tables 4.4 and 4.8. * represents significance at the 10% level, ** at the 5% level and *** at the 1% level.

4.5 Conclusion

In this paper, we investigate the empirical relationship between the change in main banking relationship and client-firm performance (in terms of Tobin's q and ROA) using Japanese firm-level data from the 1990s. Our findings are as follows. First, we find that client firms were likely to change their main banking relationship if their main bank suffered from non-performing loans or even went bankrupt during the 1990s. Second, our data do not support the argument that credit availability (in terms of loans) for client firms decreased after they changed their main bank. Third, we find that the change in client-firm performance for firms switching their main banking relationship is better than that for firms not switching during the pre-financial-crisis period. For the most part, the extant literature suggests that credit availability for client firms worsens when their main bank becomes distressed because they are locked into a particular main bank relationship. As one result, the performance of these firms decreases. However, our results show that client firms can change their relationship with a distressed main bank to enhance their performance. In addition, our findings suggest that client firms are not actually locked into a main banking relationship with distressed banks.

Chapter 5

Do Financial Shocks Have Negative Effects on Small Business?:New Evidence from Japan for the Late 1990s

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Abstract

The banking literature suggests that the low performance of the banking sector can spread to real economic activities, especially small businesses. Many previous studies insist that the Japanese experience of the 1990s supports this argument. However, many studies of small businesses are often insufficient since they depend on aggregate data, even though small businesses are likely to face difficult constraints in their activities when financial problems are severe. In this study, we use firm-level data on small businesses and investigate whether bank-dependent small businesses face severe constraints on their activities, which lowers performance. Our results differ from the findings of previous work in this area. First, we show that per the widely used TANKAN statistics, the focus of many existing studies, is misleading and that a majority of respondents in this survey (at least 71%) report no worsening in the lending attitude of financial institutions in the so-called credit crunch period of 1998-1999 (or even in the 2000-2001 period). Second, using detailed firm level panel data from CRD, we find no significant reductions in the loans for the majority of small businesses. Third, while we do find evidence that bank-dependent firms increased reliance on internal funds during the period of the credit crunch (1998-2001), we find no evidence that this negatively impacted firm performance (as reflected in firm growth and profitability measures).

JEL classification: G20; G21; G32

Keywords: credit crunch, financial shock, small business.

5.1 Introduction

Despite the Modigliani-Miller Theorem supporting irrelevance, the banking literature suggests that the negative effects of banking shocks can spread to real economic activity. In this literature, banks can mitigate the information gap between lenders and borrowers using their monitoring abilities. For instance, James (1987) argues that banks provide special services unavailable from other creditors, while Petersen and Rajan (1994) show that lending relationships with banks are valuable for borrowers wishing to mitigate problems with the information gap. Small firms in particular can have trouble accessing capital markets because of the problem of information asymmetry between borrowers and creditors. Therefore, numerous studies argue that loans from financial intermediaries are important sources of financing for small firms.[1] Thus, if banks stop lending because of a large macro shock, small firms cannot borrow enough and may therefore face severe financial constraints. The banking literature suggests that small firms cannot finance investment opportunities and thereby may lose potential profits.[2]

This literature also suggests that the recent U.S. banking crisis has had negative effects for the real economy, especially the small business sector. In the aftermath of the 2007 subprime crisis, many banks suffered large losses in the real estate market. To maintain an adequate capital ratio, as Udell (2009) argues, they needed to cut loans by raising credit standards, making very few new loans, and renewing fewer existing loans. Consequently, small businesses may have been significantly damaged by the financial crisis, mainly because the sources of external finance for small businesses are relatively limited. Some studies, (for example, Tong and Wei, 2008) have since investigated whether the subprime crisis had serious effects on the real economy. As Udell (2009) also argued, however, it is not clear whether the negative effects for small businesses are serious.[3]

Research on the Japanese experience of the 1990s may be helpful in investigating whether

[1] However, bank loans are not the only sources of finance for small firms, as they can also employ trade credit, factoring, existing cash holdings, etc.

[2] Rajan (1992) and Kang and Stulz (2000) also discuss the adverse effects of information production by banks.

[3] For example, Udell (2009) argues "How bad will this credit crunch be? Right now, it is too hard to tell" (p. 124).

the current U.S. banking shock has negative effects on small businesses, because many studies argue that the Japanese banking crisis of the 1990s is similar to current circumstances in the U.S. For example, Reinhart and Rogoff (2008) dispute whether the current financial crisis is a special case by comparing it with five of the largest global crises in the past, including that of Japan in the 1990s. They argue that "[W]hile each financial crisis no doubt is distinct, they also share striking similarities in the run-up of asset prices, in debt accumulation, in growth patterns, and in current account deficits" (p. 342). Moreover, Udell (2009) and Hoshi and Kashyap (2008) argue that the current U.S. crisis and the 1990s Japanese experience parallel each other as both shocks arose from the bursting of real estate market bubbles. In this paper, we use late 1990s Japanese small business data to investigate whether a negative banking shock is a serious problem for the small business sector.

The conventional view is that the 1990s Japanese experience supports the banking literature, especially the late 1990s when banking problems posed severe implications for the real economy. For instance, in November 1997, the Hokkaido Takushoku Bank and Yamaichi Securities, two of the largest financial institutions in Japan, went bankrupt.[4] In Japan, the bankruptcies of such large financial institutions were somewhat surprising events, as it was widely believed that large financial institutions would be preserved by the Ministry of Finance (MOF). In addition, many financial institutions faced difficulties with large amounts of nonperforming loans as their assets deteriorated when the bubble economy burst. During this period, the main concern for small business was the credit crunch, which involved a significant reduction in credit supply from banks to both viable and nonviable borrowers. Policymakers and journalists referred to this as *kashishiburi* and argued anecdotally that it was especially serious for small businesses. Moreover, many nonfinancial firms struggled with the economic downturn, and the number of firms declaring bankruptcy increased after 1998. More generally, the real growth rate of GDP in Japan fell to around –2.0 percent in 1998 and –0.1 percent in 1999, the lowest growth rates since World War II. Accordingly, during the 1990s a banking crisis and a severe recession simultaneously took place in Japan.

[4]Several middle-sized financial institutions, including Sanyo Securities and Tokuyo City Bank, also went bankrupt.

Many studies support the observation that credit supplies from banks were squeezed and the financial system collapsed, suggesting that *kashishiburi* was a serious problem during this period. They also argue that the financial shocks were the main cause of the severe recession known in Japan as the "the lost decade." For example, Hoshi and Kashyap (2004) conclude that Japanese banking problems led to a credit crunch that depressed employment and investment, citing recent empirical work by Ogawa (2003) and Motonishi and Yoshikawa (1999) on small business in Japan. Similarly, Diamond and Rajan (2001) use the Japanese recession to substantiate their models, insisting that "[U]ndercapitalized banks squeeze their borrowers and do not make new loans. Some viable borrowers are forced to restructure and some banks are being closed" (p. 66). Using aggregated data, Bayoumi (2001) also shows that the disruption of financial intermediation throughout the 1990s was the main cause of the Japanese economic slump, while Kuttner and Posen (2001) and Watanabe (2007) argue that a credit crunch also took place after late 1997.[5]

Unfortunately, most of the existing work in this area focuses on listed firms or aggregate data, and the use of firm-level small business data is relatively uncommon.[6] According to Bernanke (1983), credit crunches potentially lead to more serious harm for small businesses than for listed firms, as the former usually have fewer alternatives to bank financing.[7] If the banking problem was serious, small businesses in the late 1990s could not borrow enough money from banks. As a result, they could not invest an adequate amount and would thereby suffer lower performance. Accordingly, financial shocks are relatively more likely to harm bank-dependent small businesses.

[5]Several other studies focus on the early 1990s, because the performance of banks began to deteriorate with the increase in nonperforming loans made during the bubble economy. Using listed firm data, Gibson (1995) shows that firm investment was sensitive to the financial health of its main bank. Similarly, Kang and Stulz (2000) conclude that firms whose debt in 1989 included a higher proportion of bank loans performed relatively worse from 1990 to 1993.

[6]The effects of financial shocks in the real economy are investigated using data from various countries. For example, Borensztein and Lee (2002) and Bae et al. (2002) investigate, using data on Korean listed firms, how bank-dependent firms are damaged by credit crunches. Likewise, using aggregate data in the U.S., Bernanke and Lown (1991) and Hancock and Wilcox (1998) examine the real effects of a credit crunch. Finally, Ongena et al. (2003) conclude that bank-dependent firms did not experience lower performance during the 1990s banking crises. However, studies of the negative effects on small business using firm-level data are less common.

[7]Also, Gilchrist and Gertler (1994) investigate effects of a tightening of monetary policy for large and small manufacturing firms. Small manufacturing firms, who are more limited access to credit market, cut back on their inventories more during a tightening of monetary policy.

Using firm-level data on small business, we investigate whether small businesses in Japan struggled because of these critical banking problems. We first employ simple observations on short- and long-term borrowing by small businesses in Japan. Based on these observations, we do find that banks did not decrease loans for many small businesses during this period, with a median growth rate of short- and long-term borrowing of zero. Next, we apply the difference-in-differences (DID) approach, similarly to previous work in other countries (for example, Kroszner et al., 2007 and Love et al., 2007). If negative shocks to financial institutions harmed economic activities during this period, bank-dependent small firms faced serious negative shocks. In contrast, bank-independent firms were not as seriously damaged because they used less bank credit. If our data support differences in firm performance between bank-dependent and bank-independent firms, we can conclude that banks squeezed credit supplies during the shock. If not, the decline in firm performance was merely the result of business cycles, not of financial shocks.

Our findings from the econometric analysis are as follows. First, we find that tangible fixed assets and cash holdings of bank-dependent firms are lower during the shock period if they depend on banks. These results imply that they may face constraints on their activities because of the financial shock. Second, the negative effects of financial shocks on the performance (measured as firm sales growth or profitability) for bank-dependent (or small bank-dependent) firms are insignificant. If the financial shock is severe, these negative effects should only appear in bank-dependent small businesses. However, we do not find negative effects on the performance of bank-dependent firms. In fact, they performed better than bank-independent firms.

As in Hoshi and Kashyap (2004), most existing studies in Japan conclude there is strong evidence that a weakened financial system lowers economic performance. Unfortunately, because firm-level data on small business is generally unavailable, many of these studies have depended on the aggregate diffusion index of financial institution lending attitudes (hereafter called "financial DI") from the Bank of Japan's *TANKAN* survey (Short-term Economic Survey of Enterprises) as evidence of a credit crunch for small business. Therefore,

the results in this analysis differ from previous work in this area. The *TANKAN* survey questions firms about their business conditions, with one question that concerns the lending attitude of financial institutions. Financial DI represents the "accommodative" minus the "severe" percentage points regarding the present lending attitude of financial institutions. The financial DI was negative in the last quarter of 1997 and dropped from –1 to –19 in the first quarter of 1998. Ogawa (2003) uses this to argue that lending attitudes became more severe in the last quarter of 1997, Motonishi and Yoshikawa (1999) estimate the investment function and show an inverse relationship between financial DI and the level of investment, and Kuttner and Posen (2001) and Watanabe (2007) use the financial DI as evidence of a credit crunch.

However, some of the evidence from the *TANKAN* survey is open to question. First, the main shortcoming is that previous work ignores the ratio of firms responding "not so severe." For instance, more than 60 percent of firms responded "not so severe" about the lending attitude of financial institutions and only 16 percent of firms regarded the lending attitude of financial institutions as "severe," even during the height of the financial shock. Once the most frequent response is incorporated, the financial DI hardly supports the contention that banking problems led to a credit crunch. Second, the survey does not investigate the reasons for a "severe" response, so we cannot appreciate whether the more severe lending attitude resulted from firms' worsening credit risk or from a decline in the available credit supply from banks. Importantly, if firm credit risk worsened the already severe lending attitude, we can argue that the credit squeeze in Japan did not take place until after 1998.

The remainder of the paper is organized as follows. Section 5.2 uses macro and small business data to show Japan in the late 1990s. This section also describes our data set and provides some simple summary statistics. We discuss the empirical results in Section 5.3. Section 5.4 concludes.

5.2 An Overview of the Financial Shock

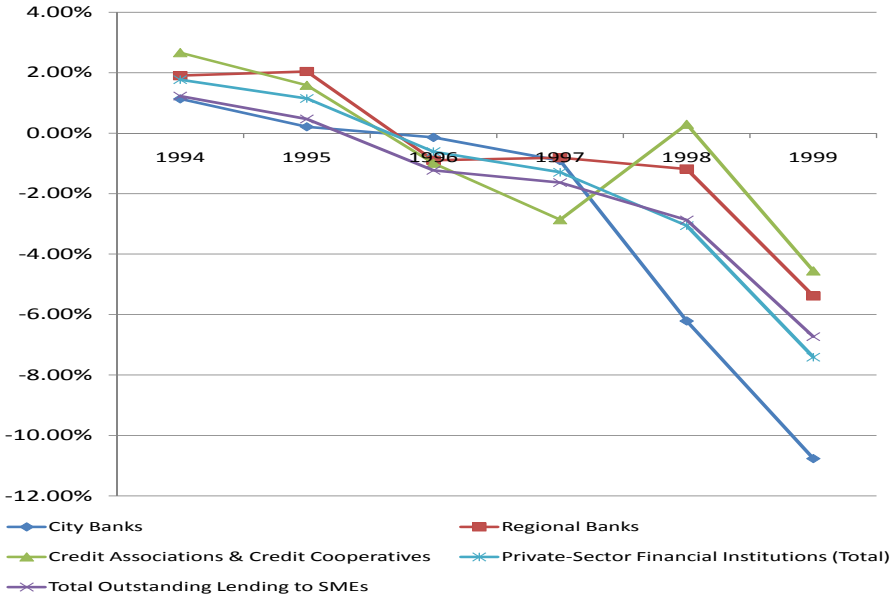
5.2.1 Aggregate Data Evidence

In Section 5.2.1, we provide the aggregate data used in many of the previous studies that support evidence of a credit crunch in Japan. Figure 5.1 depicts the growth rate of loans for small businesses from 1994 to 1999. The growth rate of bank loans for small businesses was 1.77 percent in 1994 and 1.15 percent in 1995, suggesting that banks increased lending for small businesses during 1994 and 1995. The growth rate of loans became negative starting in 1996: –0.61 percent in 1996 and –1.29 percent in 1997. After 1998, outstanding loans for small businesses fell dramatically, with growth rates of –3.06 percent in 1998 and –7.41 percent in 1999. The decrease in loans from city banks was especially severe. However, despite negative loan growth after 1996, we cannot specifically identify whether supply or demand effects were the main cause of the decline in loans. For instance, the decline may have resulted from a lower demand for bank loans as firms had fewer opportunities for investment during the recession. To overcome these problems, many studies rely on the *TANKAN* survey with regard to the diffusion index for financial institution lending attitude.

The *TANKAN* survey investigates firm business conditions in Japan, and it is conducted quarterly in March, June, September, and December.[8] The Bank of Japan sends the *TANKAN* questionnaires to firms with 50 or more workers. The target firms are randomly sampled using data from the Establishment and Enterprise Census conducted by the Ministry of Internal Affairs and Communications. In 1999, the number of target firms was 9,433 with a 93.9 percent response rate. The survey questions follow this format: "Please choose one of the three alternatives that best describes the current (from three months earlier) and forecasted[9] survey, excluding seasonal factors." One survey item also concerns the lending attitudes of financial institutions, with respondents selecting one option from these three: 1) accommodative; 2) not so severe; or 3) severe.[10] The diffusion index is defined as the percentage of firms selecting "accommodative" less the percentage of firms selecting

[8] See http://www.boj.or.jp/en/type/exp/stat/tk/extk.htm for details.
[9] The survey included forecasted changes until September 2007.
[10] A sample form is available at http://www.boj.or.jp/en/type/exp/stat/tk/extk01.htm.

Figure 5.1: Growth Rate of Bank Loans for Small and Medium Enterprises (as at end of December)



Source: Small and Medium Enterprise Agency, *White Paper on Small and Medium Enterprises in Japan* ; Bank of Japan, *Financial and Economic Statistics Monthly.*
Note: According to the website of Japanese Bankers Association, city banks are "large in size, with headquarters in major cities and branches in Tokyo, Osaka, other major cities, and their immediate suburbs." Regional banks are "usually based in the principal city of a prefecture and they conduct the majority of their operations within that prefecture and have strong ties with local enterprises and local governments." See http://www.zenginkyo.or.jp/en/banks/principal/index.html for details.

"severe."

As argued, we cannot readily identify whether the decline in bank loans is on the supply side or the demand side. Nonetheless, most previous studies use the financial DI as a proxy for the supply of bank loans. Figure 5.2 plots the financial DI for the period 1994 to 2003. On this basis, Ogawa (2003) argues that "[I]t is clear that the lending attitude becomes very severe in the last quarter of 1997."[11] This is because the proportion of "severe" respondents exceeded that of "accommodative" respondents starting in the first quarter of 1998. IMF (1998), Kuttner and Posen (2001), Fukao (2003), and Watanabe (2007) also use the diffusion index as their primary evidence for a credit crunch.[12] Many studies, however, focus only on the difference in the ratio of "accommodative" and "severe" responses, thereby effectively

[11] As Miwa (2008) counters, the financial DI has fallen several times since it began, so the decline in the financial DI after 1997 is not necessarily out of the ordinary.
[12] Gibson (1997) uses the diffusion index to study the Japanese financial shocks of the early 1990s.

Figure 5.2: Lending Attitude of Financial Institutions, Diffusion Index

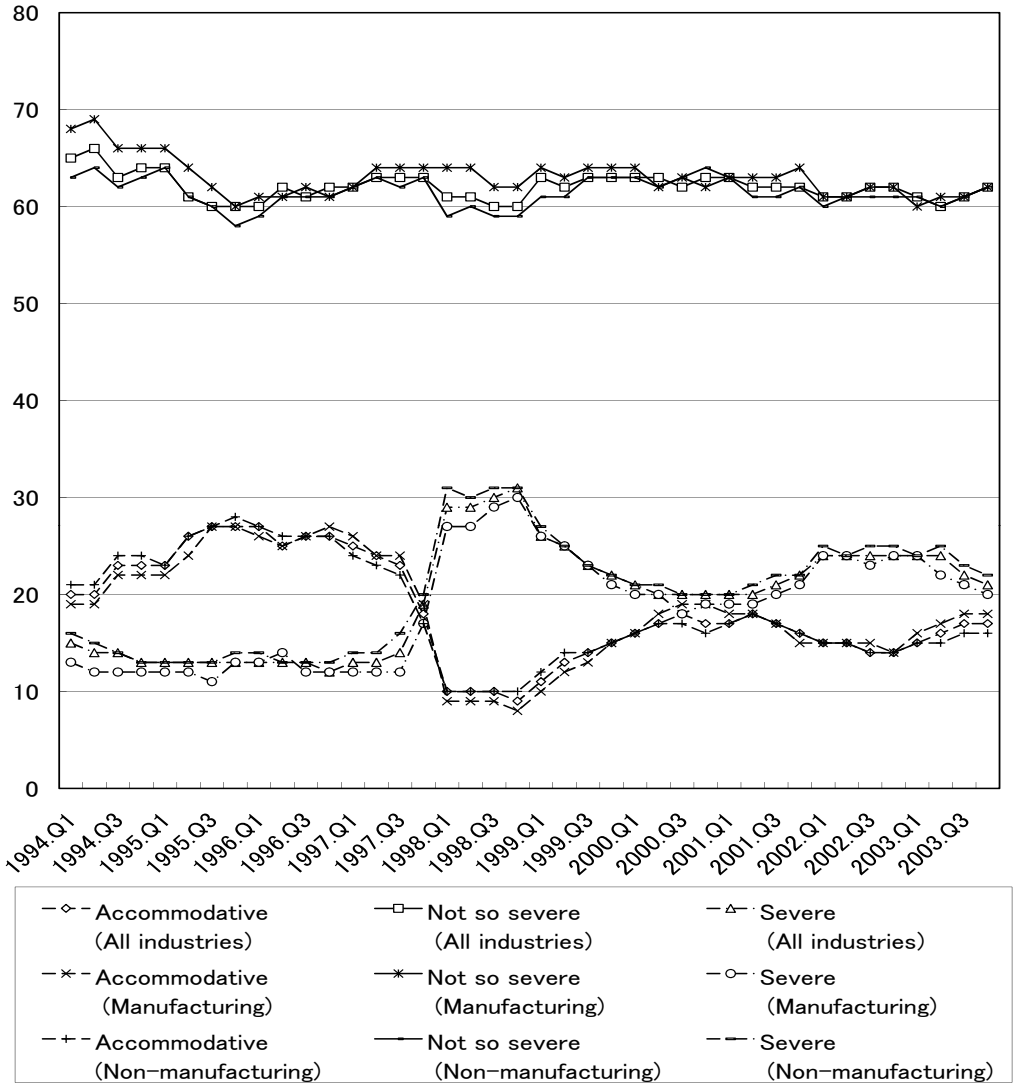
Source: Bank of Japan, Short-term Economic Survey of Principal Enterprises (*TANKAN)*
Note: Diffusion Index: Percentage of firms responding "accommodative" minus percentage of firms responding "severe". The data frequency is quarterly.

ignoring the "not so severe" responses. The exclusion of this large portion of the responses is potentially misleading as some observers have misinterpreted the financial DI as indicating that more than half of the responses were "severe."[13]

In Figure 5.3, we show the percentages of responses for each item. At more than 60 percent, the percentage of "not so severe" responses is highest for all years. In the first quarter of 1998, 71 percent of small firms responded "not so severe" or "accommodative," suggesting that many firms did not face tight financial conditions, even during the credit crunch. Therefore, the *TANKAN* survey does not imply that lending attitudes toward many small businesses became severe after 1998. Indeed, the survey evidences only 29 percent of lending attitudes toward small business as being severe in the first quarter of 1998, with 71

[13]For example, *Nihon Keizai Shinbun (Nikkei)*, a leading economic newspaper in Japan, reports that more than 50 percent of small firms in the last quarter of 1997 responded that the lending attitude of financial institutions was "severe" (p. 3 in the morning issue of 15 December, 1997). This suggests that the response of "not so severe" is effectively ignored and that the financial DI is even misinterpreted by the leading economic media in Japan.

Figure 5.3: The Percentage of Accommodative, Not so Severe, and Severe



Source: Bank of Japan, Short-term Economic Survey of Principal Enterprises (*TANKAN)*
Note: The data frequency is quarterly.

percent not severe. In addition, in the first quarter of 1997, 87 percent of small businesses responded that lending attitudes were "accommodative" or "not so severe," with only 13 percent responding as "severe." Thus, only an additional 16 percent of small businesses believed that the lending attitude of financial institutions was more severe in the first quarter of 1998 than in the first quarter of 1997 if the small firms responding "severe" in the first quarter of 1997 did not respond as "not so severe" or "accommodative" in the first quarter of 1998. Lending attitudes towards 84 percent of small businesses were unchanged in 1998.

Moreover, we cannot construe from Figure 5.3 that the loan supply for 16 percent of small firms fell in 1998.[14] The *TANKAN* statistics may be biased for the following reasons. First, the financial DI largely depends on the subjective viewpoints of small business owners. As the *TANKAN* survey does not request information about the level of borrowings or interest rates, it cannot check whether or not the small business owners responding "severe" actually faced severe lending attitudes. Second, the media, governments, and politicians may influence the survey results. As we have argued, in November 1997, Yamaichi Shouken, one of the largest securities trading firms in Japan, and the Hokkaido Takushoku Bank, one of Japan's largest banks, went bankrupt. Furthermore, many nonfinancial firms struggled with the economic downturn and the number of firms declaring bankruptcy increased. During this period, many policymakers and politicians also expressed concern that credit supplies had fallen because of financial institution bankruptcies. They also suggested that the severe financial conditions had had a negative effect on small business activity, without providing any evidence of a decreasing bank credit supply. In turn, this information may have influenced the choices made by respondents in the *TANKAN* survey.

Finally, we do not have any information about the reasons for a "severe" response. It is well known that financial institutions reduce loan supplies as the credit risk of borrowers worsens. Further, as firms struggle with a deepening recession and the number of bankruptcies increases, the credit risks for many small businesses worsen. Importantly, according to Bernanke and Lown (1991), a credit crunch is a leftward shift in the supply curve, holding

[14]We do not have firm-level data from the *TANKAN* survey, so we cannot provide the actual number of responses that were unchanged in 1997-1998.

constant the quality of borrowers. If the worsening credit risks caused more severe lending attitudes, then the data on lending attitudes may reflect a demand shift rather than a true credit supply crunch.

5.2.2 Firm-level Data on Small Business: The Credit Risk Database

As discussed, the empirical evidence drawn from the aggregate data is insufficient to support the presence of a credit crunch in Japan. To check in more detail whether or not the credit crunch took place, we use micro data on small businesses in Japan from 1996 to 2001. The data are from the Credit Risk Database for Small and Medium Enterprises (CRD).

The data set used in this study includes only corporations that existed for more than two consecutive past years in the CRD, from 1996 to 2001.[15] To compare the pre- and postshock period, we limit our sample to firms whose financial data in 1996 and 1997 is available. We omit financial and small farm businesses. Data is collected on 143,108 firms including their balance sheets and profit and loss statements.[16] The first quartile of employees is 3, the median is 7, and the third quartile is 16. The distribution of employees suggests that CRD data includes many micro firms; these are typically more informationally opaque and vulnerable to credit crunches. The 99 percentile of employees is 214, so our sample also includes some larger small businesses. The numbers of firms in each year of the sample are 74,986 in 1996; 143,108 in 1997; 134,092 in 1998; 124,757 in 1999; 115,759 in 2000; and 105,930 in 2001. Given that the number of firms from 1995 in the CRD is low, we begin our sample with the 74,986 firms in 1996.

As the CRD is a database of bank clients, we are somewhat concerned that it includes only satisfactorily performing firms, because poorly performing firms usually cannot borrow from banks and therefore are excluded. To check whether the CRD is sample biased, in Table 5.1 we compare the ratio of operating income to total assets and the ratio of total borrowings to total assets in the CRD,[17] to the statistics on the financial statement of corporations by

[15] This is because we employ lagged variables and growth rates in the descriptive and econometric analysis.

[16] According to Sakai et al. (2010), CRD covers about 60 percent of small incorporated firms in Japan in 2001. As we limit to firms whose financial data in 1996 and 1997 is available, the number of sample in our paper is smaller than the number of full sample collected in CRD.

[17] To compare the CRD and MOF data in Table 5.1 we define the ratio of operating income to total assets as

Table 5.1: Comparison of CRD with Financial Statements Statistics of Corporations by Industry

Operating Income/Total Assets

	Total		< 10M		10M–50M		50M–100M		> 100M	
	MOF	CRD	MOF	CRD	MOF	CRD	MOF	CRD	MOF	CRD
1996	0.026	0.027	0.010	0.009	0.024	0.021	0.023	0.025	0.031	0.032
1997	0.026	0.027	0.009	0.009	0.019	0.021	0.026	0.025	0.032	0.032
1998	0.025	0.022	0.007	0.002	0.019	0.016	0.022	0.020	0.031	0.027
1999	0.019	0.019	–0.007	–0.004	0.012	0.013	0.018	0.018	0.026	0.026
2000	0.023	0.024	–0.012	0.002	0.014	0.016	0.024	0.021	0.030	0.029

Total Borrowings/Total Assets

	Total		-10M		10M–50M		50M–100M		100M-	
	MOF	CRD	MOF	CRD	MOF	CRD	MOF	CRD	MOF	CRD
1996	0.477	0.544	0.637	0.831	0.528	0.599	0.523	0.574	0.416	0.478
1997	0.470	0.543	0.629	0.837	0.545	0.597	0.509	0.574	0.408	0.473
1998	0.473	0.554	0.617	0.845	0.558	0.610	0.493	0.581	0.412	0.482
1999	0.484	0.563	0.655	0.864	0.593	0.628	0.463	0.591	0.412	0.483
2000	0.449	0.556	0.637	0.869	0.506	0.625	0.548	0.588	0.390	0.479

Source: Ministry of Finance, Financial Statements Statistics of Corporations by Industry (Houjin Kigyou Toukei Nenpou).
Note: We divide the sample into four groups by the level of capital: less than 10 million yen ("<10M"), 10 to 50 million yen ("10M–50M"), 50 to 100 million yen ("50M–100M"), and more than 100 million yen (">100M").

industry conducted by the MOF. This Table shows that the operating income ratios in both data sets are similar. For example, the 1996 operating income ratio in the CRD is 0.026, and is 0.027 in the MOF data. The difference in the operating income ratio between the CRD and MOF data is not large in any one year, suggesting that the firms in the CRD sample do not systematically perform better than the firms in the MOF data sample. However, the total borrowings to total assets ratio is larger in the CRD than in the MOF data. As discussed, banks provide data to the CRD, so that firms that do not borrow from banks are underrepresented in the sample.

5.2.3 Simple Observations from Firm-level Data

Short- and Long-term Borrowings

In Section 5.2.3, we provide some simple summary statistics using firm-level data. If banks reduced their supply of loans from the end of 1997, the growth rates of short- and long-term

$\Sigma_{i=1}^{n} Operating\ Income_i / \Sigma_{i=1}^{n} Total\ Assets_i$. Similarly, we define the ratio of total borrowings to total assets as $\Sigma_{i=1}^{n} Total\ Borrowings_i / \Sigma_{i=1}^{n} Total\ Assets_i$, where n is the sample number.

borrowings[18] in 1998 should have dramatically fallen in many small firms. We define the short-term borrowings growth as (Short-term Borrowings$_t$ – Short-term Borrowings$_{t-1}$)/Total Assets$_{t-1}$, where t indicates the years from 1996 to 2001.[19] Table 5.2 includes the quartiles of the short-term borrowing growth rates after 1996. For each year, the median growth rate of short-term borrowing is 0.00 percent.[20] We also provide the quartiles of the growth rates after dividing the sample into three groups by the level of employees in 1997: 5 or fewer employees (very small firms), 6–20 employees (small firms), and more than 20 employees (middle-sized and large firms). These results are unchanged when we divide the sample by firm size, implying that firms can generally roll over their short-term debt, even during the period of the financial shock. The firm-level data thus suggests that loans for the average small business were not cut back following the credit-crunch period in 1998.

If we focus on short-term borrowing growth for the first quartiles, we see that the growth rates in 1998 (–2.46 percent) and in 1999 (–3.32 percent) were smaller than in 1997 (–2.08 percent). Similarly, short-term borrowing growth in the third quartiles for 1998 and 1999 were smaller than in 1997. The data suggests, then, that at least some firms reduced their short-term 1998–1999 borrowings, and that this finding is invariant to firm size. We also focus on the interquartile range (IQR): If some firms suffered from the credit crunch and greatly reduced the level of their borrowings after 1998, the difference between firms should become larger. However, according to Table 5.2, the IQR is smaller after 1997.[21]

[18]Short-term borrowings are loans that a firm needs to repay within a year. Long-term borrowings are loans that a firm needs to repay over more than a year.

[19]The growth rate is not normalized by the level of borrowings in t-1 because the level of borrowings in some firms is sometimes zero.

[20]In comparison, trade payables for manufacturing firms fell in 1998 and 1999. The median trade payables growth rates in manufacturing are –0.71 percent in 1998 and –0.40 percent in 1999. The first quartiles of the growth rates are also smaller in 1998 and 1999. These results imply an obvious contraction in trade payables, unlike short- and long-term borrowings.

[21]If our sample is divided by industry and year, the median growth rate of short-term borrowings is 0.00 percent across all industries.

Table 5.2: Growth Rate of Short-term Borrowings, 1996–2001

	All Samples				Very Small Firms				Small Firms				Large and Middle Firms			
	p25	Med	p75	IQR	p25	Med	p75	IQR	p25	Med	p75	IQR	p25	Med	p75	IQR
1996	–2.67	0.00	3.84	6.51	–3.59	0.00	4.00	7.59	–2.78	0.00	3.83	6.61	–1.72	0.00	3.69	5.41
1997	–2.08	0.00	3.70	5.78	–2.67	0.00	3.88	6.56	–2.28	0.00	3.78	6.06	–1.49	0.00	3.51	5.00
1998	–2.46	0.00	3.15	5.61	–2.66	0.00	3.43	6.08	–2.67	0.00	3.28	5.95	–2.09	0.00	2.81	4.90
1999	–3.32	0.00	2.20	5.52	–3.18	0.00	2.89	6.07	–3.67	0.00	2.20	5.88	–3.06	0.00	1.58	4.64
2000	–1.96	0.00	3.00	4.96	–1.98	0.00	3.37	5.35	–2.06	0.00	3.15	5.21	–1.83	0.00	2.43	4.26
2001	–2.08	0.00	2.70	4.77	–2.19	0.00	2.87	5.06	–2.14	0.00	2.76	4.90	–1.88	0.00	2.40	4.28

Note: We define the growth rate as (Short-term Borrowings$_t$ – Short-term Borrowings$_{t-1}$)/Total Assets$_{t-1}$. Growth rates are percentages.

Table 5.3: Growth Rate of Long-term Borrowings, 1996–2001

	All Samples				Very Small Firms				Small Firms				Large and Middle Firms			
	p25	Med	p75	IQR	p25	Med	p75	IQR	p25	Med	p75	IQR	p25	Med	p75	IQR
1996	–4.69	0.00	4.20	8.89	–5.31	0.00	4.64	9.94	–4.68	0.00	4.63	9.30	–4.05	-0.46	3.23	7.28
1997	–4.83	–0.23	3.59	8.42	–5.45	0.00	4.51	9.96	–4.89	0.00	4.00	8.89	–4.27	–0.91	2.54	6.81
1998	–4.54	0.00	4.81	9.35	–5.14	0.00	5.93	11.07	–4.55	0.00	5.50	10.04	–3.90	–0.48	3.24	7.13
1999	–3.11	0.30	10.65	13.76	–3.89	0.00	13.48	17.36	–2.64	1.68	12.24	14.89	–2.79	0.00	5.87	8.66
2000	–6.11	–0.99	3.81	9.92	–7.02	–0.64	5.10	12.13	–6.21	–1.02	4.05	10.27	–4.78	–1.21	2.17	6.95
2001	–6.06	–0.85	4.03	10.08	–7.25	–0.91	4.73	11.98	–5.98	–0.83	4.20	10.18	–4.40	–0.81	2.98	7.38

Note: We define the growth rate as (Long-term Borrowings$_t$ – Long-term Borrowings$_{t-1}$)/Total Assets$_{t-1}$. Growth rates are percentages.

In Table 5.3, we focus on the long-term borrowing growth rate. We define the long-term borrowings growth as (Long-term Borrowings$_t$ – Long-term Borrowings$_{t-1}$)/Total Assets$_{t-1}$, where t indicates the years from 1996 to 2001. Similar to our findings for short-term borrowings, our observations do not support the contention that banks cut lending and that small firms reduced their borrowings. The median growth rate of long-term borrowings in 1998 is 0.00 percent. The data suggests, then, that long-term loans for small firms were not generally cut back, despite the 1997 median growth rate being negative.[22] In addition, the results of the first and third quartiles of long-term borrowing growth rates do not support the notion that small firms reduced their borrowings after 1998.[23]

On the contrary, firms tended to reduce their long-term borrowings only after 2000. The median growth rates of long-term borrowings are –0.99 percent in 2000 and –0.85 percent in 2001. The IQR range of long-term borrowing growth rates is large in 1999, primarily because the third quartile is extremely large in 1999, due to the Special Credit Guarantee Program for Financial Stability commencing in October 1998.[24] In this program, government and credit guarantee corporations provided credit guarantees of 20 trillion yen. Financial institutions could then expand their loans without credit risk because they could offer loans to small businesses with public credit guarantees. Similarly to Table 5.2, we also divide the sample into three groups by the level of employees. When we focus on very small and small firms, we see that the median long-term growth rates are 0.00 before 1998. In contrast, median long-term borrowings growth for large and middle-sized firms is negative, apart from 1999. This suggests that large and middle-sized firms tended to reduce their long-term borrowings more in the late 1990s.

Table 5.4 provides the ratios of firms with decreasing short- or long-term borrowings as compared with the previous year. If the credit crunch was serious after 1997, these ratios should increase after 1998. However, our data is inconsistent with this hypothesis. The

[22]If we divide the sample into six industries, the results are broadly similar. Apart from the real estate industry, the median growth rates of long-term borrowings after 1998 are not smaller than in 1997.

[23]Miwa (2008), using firm-level quarterly financial data from the Hojin Kigyo Tokei Kiho (Corporate Enterprise Quarterly Statistics), finds no clear evidence of a credit crunch. Similar to our findings, they conclude that the average level of short- and long-term borrowings did not decline during the period of the credit crunch.

[24]See Uesugi et al. (2010) for details.

Table 5.4: Fraction of Firms with Decreasing Short-term Borrowings, Long-term Borrowings, or Trade Payables, 1996–2001

	All Samples			Very Small Firms		
	Short-term Borrowings	Long-term Borrowings	Trade Payables	Short-term Borrowings	Long-term Borrowings	Trade Payables
1996	0.376	0.482	0.405	0.377	0.460	0.375
1997	0.346	0.490	0.409	0.335	0.452	0.366
1998	0.356	0.460	0.496	0.333	0.436	0.431
1999	0.385	0.360	0.462	0.342	0.356	0.406
2000	0.329	0.505	0.390	0.304	0.477	0.353
2001	0.328	0.491	0.405	0.305	0.474	0.360

	Small Firms			Middle and Large Firms		
	Short-term Borrowings	Long-term Borrowings	Trade Payables	Short-term Borrowings	Long-term Borrowings	Trade Payables
1996	0.381	0.474	0.419	0.367	0.529	0.430
1997	0.350	0.482	0.425	0.354	0.548	0.445
1998	0.360	0.452	0.514	0.383	0.509	0.568
1999	0.394	0.333	0.483	0.442	0.409	0.524
2000	0.335	0.509	0.411	0.369	0.551	0.426
2001	0.336	0.495	0.431	0.365	0.518	0.455

Note: We define the ratio of firms with decreasing short- (long-)term borrowings as [Number of firms whose (Short- (Long-)term Borrowings$_t$ – Short-term Borrowings$_{t-1}$) is negative]/[Total number of firms] in each year. Similarly, the ratio of firms with decreasing trade payables is the [Number of firms whose (Trade Payables$_t$ – Trade Payables$_{t-1}$) is negative]/[Total number of firms].

ratio of firms with decreasing short-term borrowings to all firms in 1997 is 0.346. While this ratio increased in 1998 to 0.356, the difference is not great. If we compared the ratio of decreasing short-term borrowings in 1998 with the ratio of decreasing short-term borrowings in 1996, the ratio in 1998 is lower. This suggests that the period after 1998 is not special. For comparison, we also provide, in Table 5.4, the ratio of firms with decreasing trade payables. These are higher than the ratio with decreasing short-term borrowings, suggesting that more firms decreased their trade payables than their short-term borrowings. The ratios of firms with decreasing long-term borrowings are lowest in 1999 and second lowest in 1998: this also implies that many firms did not decrease their long-term borrowings during the shock period.

In Table 5.4, we divide the subsample by firm size. For the group of very small and small firms, the ratios for decreasing short- or long-term borrowings do not increase after 1998. However, the ratios for decreasing short-term borrowings for large and middle-sized firms increased during the shock period in 1998 and 1999. On the other hand, the ratio of

decreasing long-term borrowings is lowest in 1998 and 1999 for large and middle-sized firms.[25]

Consistency Between the Aggregate Data and the CRD

We have shown that short- and long-term borrowings of many small firms did not decrease during the shock period. However, this finding is inconsistent with the trends in the aggregate data shown in Figure 5.1. To explain the gap between CRD and aggregate data, in Table 5.5 we calculate the growth rate of total borrowings. We divide the sample into four groups according to the total borrowings outstanding in the previous year: 0.1 billion yen or less, between 0.1 and 0.5 billion yen, between 0.5 and 1 billion yen, and more than 1 billion yen. We show the percentage of the total samples for each group and year in parentheses. This ratio is higher for the group of smallest total borrowings outstanding, accounting for just over half the sample. According to this Table, firms with large total outstanding borrowings reduced their borrowings more after 1998. For example, the median growth rates of total borrowings for the group of firms with borrowings in excess of 1 billion yen are –1.32 percent in 1997, –1.66 percent in 1998, and –2.43 percent in 1999. In contrast, the rates for the group of firms with borrowings of 0.1 billion yen or less are positive until 1999. The trends in the first and third quartiles are similar to those found at the median. Together, these suggest that while many firms did not reduce their borrowings, even during the shock period, other firms with larger total outstanding borrowings reduced their borrowings relatively more after the shock period.

[25] We calculate the ratio of firms with decreasing short-term borrowings by industry. In 1998, these are 0.369 in construction and 0.366 in manufacturing, representing less than half the number of firms in the sample. In addition, the ratios in other industries are between 0.32 and 0.35, suggesting that the number of firms with decreasing short-term borrowings is not large. Apart from the real estate industry, the ratios for decreasing long-term borrowings are also similar during the shock period.

Table 5.5: Growth Rate of Total Borrowings by Total Outstanding Borrowings in Previous Year

	< 0.1 Billion				0.1 – 0.5 Billion				0.5 – 1 Billion				> 1 Billion			
	p25	Med	p75		p25	Med	p75		p25	Med	p75		p25	Med	p75	
1996	–13.80	0.00	21.98	(59.13)	–8.65	–1.29	8.64	(27.33)	–7.58	–1.31	7.10	(6.25)	–7.04	–1.36	5.39	(7.29)
1997	–13.40	0.00	21.43	(55.71)	–9.09	–1.89	8.09	(27.59)	–7.90	–1.41	7.18	(7.55)	–6.87	–1.32	5.84	(9.15)
1998	–12.73	0.27	21.66	(54.85)	–9.28	–1.77	8.13	(28.02)	–8.24	–1.89	5.80	(7.74)	–7.22	–1.66	4.82	(9.39)
1999	–8.33	6.66	32.61	(54.01)	–7.62	0.26	10.81	(28.67)	–8.04	–1.66	5.11	(7.76)	–7.78	–2.43	3.06	(9.56)
2000	–14.53	–2.37	13.03	(52.43)	–10.71	–3.40	4.57	(30.18)	–9.43	–3.11	3.48	(7.99)	–8.05	–2.84	2.55	(9.40)
2001	–14.88	–2.99	11.21	(52.53)	–10.19	–3.17	4.94	(30.32)	–8.77	–2.79	4.10	(7.94)	–7.55	–2.41	3.46	(9.22)

Note: We define the growth rate as (Total Borrowings$_t$ – Total Borrowings$_{t-1}$)/Total Borrowings$_{t-1}$. We normalized the growth rate with total borrowings in the previous year to assist comparison with the trend in Figure 5.4. Growth rates are expressed as percentages. The percentage of firms for each group and year is in parentheses.

As small firms with large total outstanding borrowings reduced their borrowings from banks, the average level of total borrowings in the data decreased after 1999. The average amount of firm borrowings in our sample is 519.30 million yen in 1997, 519.93 million yen in 1998, 505.98 million yen in 1999, and 483.75 million yen in 2000. In Figure 5.4, we compare the growth rate of aggregate bank loans for small businesses (the same data depicted in Figure 5.1) and the growth rate of average total borrowings in the CRD. In general, the accounting period for most Japanese firms ends in March, so we plot the growth rate of total borrowings in the CRD data for March and the aggregate data for December. As shown in Figure 5.4, the trends in the growth rates in the CRD and aggregate bank loan data correspond. However, as our data includes fewer larger-sized small businesses, the growth rate of average total borrowings is higher than the growth rate for the aggregate data.

Interest Payments

If the supplies of bank loans shrunk and the credit crunch was serious after 1997, the interest payments of small business must have increased in 1998.[26] In our database, all quartiles of interest rates decline.[27] For example, the median interest rate across all samples in 1997 is 2.865 percent and 2.667 percent in 1998. As the prime rate did not change for 1997–1998, these changes were not the result of monetary relaxation.[28] Using other aggregated data, the MOF's Financial Statements Statistics of Corporations by Industry (one of the most reliable aggregate firm databases in Japan), also shows that interest rates decreased in all industries except real estate.[29] Moreover, the interest rate trend in the MOF data is similar to the trend in the CRD. These results again suggest that the supply of bank loans did not contract in 1998.

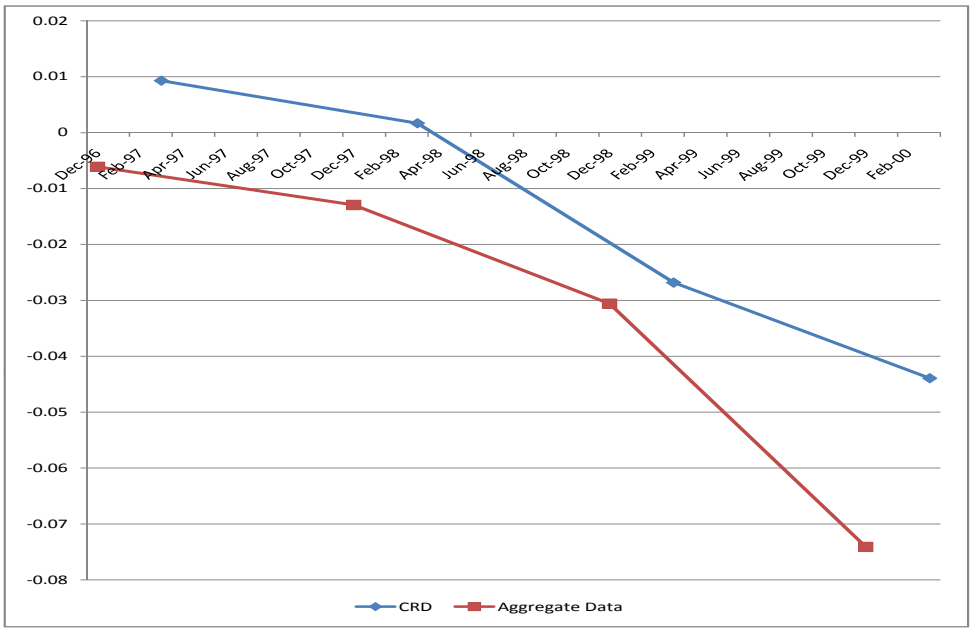
[26]Domac and Ferri (1998) examine the real impact of financial shocks in Korea and show that the interest spread is larger for small- and medium-sized enterprises.

[27]We define the interest rate as the ratio of a firm's interest expenses to the sum of its short- and long-term debt and discounted notes receivable.

[28]According to the Bank of Japan's Financial and Economic Statistics Monthly, the prime rate at the end of March was 1.625 percent for the period 1996-1998, 1.500 percent in 1999 and 2001, and 1.375 percent in 2000.

[29]For example, the level of interest rates in the manufacturing sector is 3.0 percent in 1997, 2.7 percent in 1998, and 2.5 percent in 1999.

Figure 5.4: Growth Rate of Average Total Borrowings in the CRD and Aggregate Bank Loans for Small and Medium Enterprises



Note: To facilitate comparison of the CRD and aggregate data, we use the aggregate bank loan data for small and medium enterprises at the end of December. As the accounting period for many Japanese firms ends in March, we plot the growth rate of total borrowings in the CRD data.
Source: Small and Medium Enterprise Agency, *White Paper on Small and Medium Enterprises in Japan* ; Bank of Japan, *Financial and Economic Statistics Monthly.*

5.3 Econometric Analysis

5.3.1 Hypothesis

In Section 5.2, using simple summary statistics, we show that loans for many firms were not cut back. These results generally imply that small businesses were not seriously harmed after late 1997. Using econometric methods, Section 5.3 investigates whether the performance of bank-dependent firms suffered after 1997. As argued in previous studies (for example Dell'Ariccia et al., 2008), the decline in output and the contraction in credit took place simultaneously. This potential endogeneity problem is serious when considering whether the banking shock has real effects on small business. To mitigate this problem, we use the DID approach of Kroszner et al. (2007), Love et al. (2007), and Dell'Ariccia et al. (2008) when investigating the real effects of financial shock. For example, using firm-level data, Love

et al. (2007) investigate the effects of precrisis indicators of a firm's vulnerability to financial shocks. On this basis, they conclude that firms with more vulnerable financial positions were damaged relatively more by large financial shocks.

Following previous studies (for example, Kang and Stulz, 2000), we use the ratio of bank dependence in the preshock period as a proxy for a firm's vulnerability to the financial shock. Samples of bank-dependent firms in the preshock period are treatment groups. As argued by Petersen and Rajan (1994), some small firms have long-term relationships with banks, so they cannot switch banks easily. As a result, small firms that depend on banks do not have access to sufficient financing when banks reduce their credit supplies. If bank credit supplies fell in late 1997, only bank-dependent firms would then suffer from the credit contraction. For example, firms may halt plans for capital investment because of severe financial constraints. In addition, firms can draw on other financial sources when there is a decline in credit. One of these is the reduction of cash holdings. According to Opler et al. (1999), firms use their cash holdings to finance activities and investment if other financial sources are not available. To alleviate the financial shortage, firms may have reduced their cash holdings to compensate for the credit decline. Moreover, if the decline in bank lending caused output to fall, bank-dependent firms would suffer large losses. As an alternative, if the credit decline after 1998 did not matter for firm performance, the difference between bank-dependent and bank-independent firms would be statistically insignificant.

To check whether or not the credit supply of bank loans declined, we test several hypotheses. First, if banks reduced their credit supplies, bank-dependent small firms would be unable to increase their capital investment. As a result, tangible fixed assets for bank-dependent firms should decrease more during the shock period, and the ratio of tangible fixed assets to total assets should be statistically smaller for bank-dependent firms. Second, small firms can employ various financial sources, including internal finance.[30] To compensate for the reduction of bank loans, bank-dependent small firms may use up their cash holdings. As a result, the ratio of cash holdings should be statistically smaller for bank-dependent small businesses.

[30]Small businesses can also use trade credit. To compensate for the reduction in bank loans, they can increase trade payables or cut back on trade receivables (Tsuruta, 2008).

Finally, if the activities of bank-dependent small firms were limited because of the reduction in bank loans, they would lose growth opportunities and their profits would then decrease. We predict that the performance of bank-dependent small businesses is statistically lower if financial shocks have negative effects for the real sector.

5.3.2 Effects on Short- and Long-term Borrowings

Before estimating the effects on firm activities and performance, we investigate the effects of the financial shock on the short- and long-term borrowings of firms. We regress the following equation.

$$\begin{aligned} Firm\ Borrowings_{i,t} &= \alpha_1 Bank\ Dependence_i * Shock\ Period\ Dummy_t \\ &+ \alpha_2 Bank\ Dependence_i * Post\ Shock\ Period\ Dummy_t \\ &+ \alpha_3 Year\ Dummy_t + \alpha_4 X_{i,t} + \mu_i + \nu_{i,t} \end{aligned} \tag{5.1}$$

where $\mathbf{X}_{i,t}$ is a matrix of control variables, μ_i is the time-invariant effects of each sample, and $\nu_{i,t}$ is the error term of firm i in year t from 1996 to 2001. It is argued that the credit crunch began after this period, as the Hokkaido Takushoku Bank and Yamaichi Securities went bankrupt in November 1997. As this shock took place in late 1997, the negative effects of the credit crunch appeared in firm financial statements after 1998. However, some previous studies have argued that the credit crunch problem corrected itself after 2000. Thus, the period 1998–1999 is defined as the shock period. We define the $Shock\ Period\ Dummy_t$ as one if the year is 1998 or 1999; zero otherwise and the $Post\ Shock\ Period\ Dummy_t$ as one if the year is 2000 or 2001; zero otherwise. The proxy for bank dependence is the ratio of the firm's total borrowings to total assets in the preshock year 1996. Given that $Bank\ Dependence_i$ in the preshock year is not a time-varying variable, the level of $Bank\ Dependence_i$ is subsumed into the fixed effect (μ_i). Thus, we include only the interactions of $Bank\ Dependence_i$ and the shock and postshock period dummies for each year.[31]

[31] Love et al. (2007) also include only interaction variables with the crisis dummy.

We specify the ratios of short- and long-term borrowing to total assets and the growth rates of short- and long-term borrowings as dependent variables. The control variables are the natural log of (1+firm age) in year t-1; the natural log of (1+firm sales) in year t-1; the annual growth rate of firm sales (Sales Growth); the ratio of a firm's earnings before interest, taxes, depreciation, and amortization to total assets in year t-1 (EBITDA); and the ratio of current-assets to total assets in year t-1 (Current-Assets Ratio). We also estimate the effect of the crisis on firms' average interest rates. In the interest rate regression, we also include firm leverage, the ratio of cash holdings to total assets (Cash Holdings Ratio), and the ratio of short-term borrowings to total borrowings (Short–Long-term Borrowings Ratio) as control variables. The definitions of each variable are given in the notes for each Table. As we do not have all of the information that determines firm borrowings, the problem of unobserved effects may be serious. Accordingly, because we employ panel data, we estimate a fixed effects model to eliminate any time-invariant unobserved effects.

Table 5.6: Summary Statistics

Variable	N	mean	sd	min	p1	p50	p99	max
Operating Income Ratio	698,632	–0.0025	0.1095	–0.9235	–0.4541	0.0137	0.2414	0.4213
Ordinary Income Ratio	697,544	–0.0015	0.1032	–0.8893	–0.4247	0.0070	0.2424	0.4498
Sales Growth	695,437	0.0004	0.2714	–1.0000	–0.5967	–0.0214	1.0195	2.7609
Short-term Borrowings Ratio	694,297	0.2121	0.2615	0.0000	0.0000	0.1248	1.2055	1.7674
Long-term Borrowings Ratio	694,961	0.4032	0.3251	0.0000	0.0000	0.3565	1.4621	2.1265
Short-term Borrowings Growth	693,593	0.0045	0.1202	–0.6947	–0.3746	0.0000	0.4416	0.9297
Long-term Borrowings Growth	693,941	0.0186	0.1597	–0.5794	–0.3056	–0.0006	0.6952	1.4356
Interest Rate	687,262	1.2725	1.5285	–1.6250	–1.6250	1.1207	7.1204	13.9392
Tangible Fixed Assets Ratio	698,632	0.3525	0.2540	0.0000	0.0018	0.3084	0.9551	1.0000
Bank Dependence	698,632	0.5902	0.3737	0.0000	0.0000	0.5606	1.9114	4.4303
Log (1+Firm Age)	698,632	3.1086	0.7748	0.0000	0.0000	3.2581	4.2627	4.9127
Log (1+Sales)	698,632	12.3389	1.6217	0.0000	9.0313	12.2061	16.2579	18.4015
Current-Assets Ratio	698,632	0.5569	0.2532	0.0000	0.0250	0.5787	0.9807	1.0000
Net Working Capital	698,625	–0.1091	0.3698	–5.2405	–1.4269	–0.0623	0.5921	2.6586
EBITDA	695,130	0.0322	0.1126	–0.8380	–0.3899	0.0369	0.3137	0.4852
Short–Long-term Borrowings Ratio	698,632	0.3551	0.3398	0.0000	0.0000	0.2642	1.0000	1.0000
Leverage	698,632	0.9200	0.4104	0.0000	0.2187	0.8837	2.6433	5.3929
Cash Holdings	695,657	0.1673	0.1409	0.0000	0.0023	0.1309	0.6364	1.0000

Note: Bank Dependence is the ratio of a firm's total loans to total assets in 1996. *Cash Holdings Ratio* is the ratio of a firm's cash holdings to total assets. *Current-Assets Ratio* is the ratio of a firm's current assets to total assets. *EBITDA* is the ratio of a firm's earnings before interest, taxes, depreciation, and amortization to total assets. *Interest Rate* is the ratio of a firm's interest expenses to the sum of its short-term debt, long-term debt, and discounted notes receivable. *Leverage* is the ratio of a firm's book value of total debts to book value of total assets. *Log(1+Firm Age)* is natural log of (1+firm age). *Log(1+Sales)* is n atural log of (1+firm sales). *Long-term Borrowings Growth* is the annual growth rate of a firm's long-term borrowings [(long-term borrowings$_t$ – long-term borrowings$_{t-1}$)/total assets$_{t-1}$]. *Long-term Borrowings Ratio* is the ratio of a firm's long-term borrowings to total assets.*Net Working Capital* is the ratio of a firm's net working capital (current assets minus current liabilities minus cash) to total assets. *Operating Income Ratio* is the ratio of a firm's operating income to total assets.*Ordinary Income Ratio* is the ratio of a firm's ordinary income to total assets.*Sales Growth* is the annual growth rate of a firm's sales [(sales$_t$ – sales$_{t-1}$)/sales$_{t-1}$]. *Short-term Borrowings Growth* is the annual growth rate of a firm's short-term borrowings [(short-term borrowings$_t$ – short-term borrowings$_{t-1}$)/total assets$_{t-1}$]. *Short-term Borrowings Ratio* is the ratio of a firm's short-term borrowings to total assets.*Short–Long-term Borrowings Ratio* is the ratio of a firm's short-term borrowings to total borrowings. *Tangible Fixed Assets Ratio* is the ratio of a firm's tangible fixed assets (the sum of the book value of buildings and land) to total assets.

Table 5.6 provides the summary statistics. As shown, the wide distribution of bank dependence indicates that our data includes sufficient observations to compare bank-dependent and bank-independent firms. Table 5.7 reports the median of each variable before and after the shock period, divided by bank dependence. We define "bank-dependent" groups as firms with above-median bank dependence in the preshock year of 1997, and "bank-independent" groups otherwise. These simple comparisons show that differences in bank dependence are not correlated with firm performance. For example, the operating incomes for both groups are approximately equal. The sales growth of bank-dependent firms is lower than bank-independent firms, but the differences are small. However, ordinary incomes for bank-dependent firms are lower than for bank-independent firms because this measure of income is lower when interest payments are higher. Therefore, the differences in ordinary income between both groups of firms do not reflect differences in firm performance. Table 5.7 also shows that the short- and long-term borrowings ratio, the interest rate, the tangible fixed assets ratio, and leverage are higher in the bank-dependent group. Conversely, long-term borrowings growth, sales, the current-asset ratio, net working capital, EBITDA, and cash holdings are lower in the bank-dependent group.

Table 5.8 includes the estimated results of Equation (5.1). The coefficients of bank dependence*shock period dummy are statistically negative for the short-term borrowings ratio and growth, suggesting that short-term borrowings for bank-dependent firms decreased during the shock period (columns 1 and 3). However, we do not observe any negative effect for long-term borrowings. The coefficients of bank dependence*shock period dummy for the long-term borrowings ratio and growth are statistically insignificant. This means that bank-dependent firms did not reduce their long-term borrowings during the shock period (columns 2 and 4). Together, these findings suggest that the negative effect of the financial shock for bank-dependent firms only holds for short-term borrowings. The effect of the current-assets ratio is statistically negative for both the short- and long-term borrowings ratios, suggesting that firms with more liquidity borrow less from banks. Similarly, sales growth has a negative effect on the short- and long-term borrowing ratios and growth, because firms that are

Table 5.7: Median Firm Performance, Activities, and Characteristics by Bank Dependence

	Bank-dependent Group		Bank-independent Group	
Variable	Before Shock	After Shock	Before Shock	After Shock
Operating Income Ratio	0.0170	0.0133	0.0187	0.0108
Ordinary Income Ratio	0.0047	0.0037	0.0168	0.0090
Sales Growth	0.0000	–0.0399	0.0196	–0.0347
Short-term Borrowings Ratio	0.2026	0.1719	0.0893	0.0906
Long-term Borrowings Ratio	0.5216	0.5540	0.1913	0.2483
Short-term Borrowings Growth	0.0000	0.0000	0.0000	0.0000
Long-term Borrowings Growth	–0.0084	–0.0092	0.0000	0.0000
Interest Rate	1.4196	1.1198	1.2625	0.9503
Tangible Fixed Assets Ratio	0.3737	0.4060	0.2298	0.2522
Bank Dependence	0.7686	0.7664	0.3498	0.3518
Log (1+Firm Age)	3.0445	3.2581	3.2581	3.2581
Log (1+Sales)	11.9447	11.8776	12.5532	12.5062
Current-Assets Ratio	0.5040	0.4733	0.6723	0.6442
Net Working Capital	–0.0917	–0.0786	–0.0587	–0.0399
EBITDA	0.0366	0.0354	0.0477	0.0344
Short–Long-term Borrowings Ratio	0.2803	0.2412	0.2956	0.2695
Leverage	0.9606	0.9576	0.7710	0.7743
Cash Holdings	0.1072	0.0982	0.1673	0.1613

Note: We define the "bank-dependent" group as firms with above-median bank dependence in the preshock year 1997; otherwise, "bank-independent" group. "Before Shock" years are 1996 and 1997, and "After Shock" years are 1998-2001. The definitions of each variable are given in the note of Table 5.6.

growing and firms with more cash flow have more internal cash and therefore need fewer bank loans. The coefficients of EBITDA for the growth rate are negative in columns 1 and 2. However, the coefficients of EBITDA for the growth rate are positive in columns 3 and 4, because profitable firms may have better growth opportunities and require additional funds for this purpose.

Column 5 in Table 5.8 shows the effect of the shock on firm interest rates. The results of the year dummies are that all coefficients are negative and statistically significant at the 1 percent level. The coefficient for the interactive variable of bank dependence and shock period dummy is positive and statistically significant, suggesting that bank-dependent firms pay higher interest costs during the shock period. However, the magnitude of the coefficient is not large. For example, while firms with 100 percent bank dependence pay 0.1141 percent more in terms of interest rates during the shock period, average interest rates decreased by

Table 5.8: Bank Dependence, Firm Borrowings, and Interest Rates

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	Short-term Ratio	Long-term Ratio	Short-term Growth	Long-term Growth	Interest Rate
Bank Dependence	–0.0273***	–0.0018	–0.0038***	0.0017	0.1141***
*Shock Period	(0.0010)	(0.0012)	(0.0010)	(0.0013)	(0.0082)
Bank Dependence	–0.0444***	–0.0114***	0.0055***	–0.0120***	0.0942***
*Postshock Period	(0.0011)	(0.0013)	(0.0011)	(0.0014)	(0.0090)
Log(1+Firm Age)	0.0003	0.0132***	–0.0023***	–0.0043***	–0.0028
	(0.0007)	(0.0008)	(0.0007)	(0.0009)	(0.0059)
Log (1+Sales)	–0.0273***	–0.0345***	–0.0050***	–0.0108***	0.1846***
	(0.0005)	(0.0006)	(0.0006)	(0.0007)	(0.0045)
Sales Growth	–0.0220***	–0.0377***	–0.0177***	–0.0067***	0.0641***
	(0.0007)	(0.0008)	(0.0007)	(0.0009)	(0.0056)
EBITDA	–0.1216***	–0.1668***	0.0045**	0.0378***	
	(0.0018)	(0.0022)	(0.0019)	(0.0024)	
Current-Assets Ratio	–0.0052**	–0.1028***	–0.0479***	0.1266***	
	(0.0021)	(0.0025)	(0.0022)	(0.0029)	
Short–Long-term					-0.1507***
Borrowings Ratio					(0.0084)
Leverage					0.0101
					(0.0081)
Cash Holdings Ratio					–0.5141***
					(0.0208)
Year Dummy (1997)	0.0023***	0.0082***	0.0009	–0.0048***	–0.3477***
	(0.0006)	(0.0007)	(0.0006)	(0.0008)	(0.0049)
Year Dummy (1998)	0.0197***	0.0233***	–0.0038***	–0.0020*	–0.5941***
	(0.0009)	(0.0010)	(0.0009)	(0.0011)	(0.0072)
Year Dummy (1999)	0.0086***	0.0597***	–0.0128***	0.0307***	–0.5986***
	(0.0009)	(0.0010)	(0.0009)	(0.0011)	(0.0073)
Year Dummy (2000)	0.0211***	0.0666***	–0.0090***	–0.0118***	–0.5334***
	(0.0009)	(0.0011)	(0.0009)	(0.0012)	(0.0076)
Year Dummy (2001)	0.0240***	0.0663***	–0.0112***	–0.0142***	–0.7416***
	(0.0009)	(0.0011)	(0.0009)	(0.0012)	(0.0078)
Observations	691,176	691,722	691,186	691,458	685,096
Adjusted R^2	0.02	0.08	0.00	0.02	0.04

Note: This Table presents estimates of fixed effects regressions with *Short-term Borrowing Ratio* (Column 1), *Long-term Borrowing Ratio* (Column 2), *Short-term Borrowing Growth* (Column 3), *Long-term Borrowing Growth* (Column 4), and *Interest Rate* (Column 5) as dependent variables. *Short- (Long-)term Borrowing Ratio* is the ratio of a firm's short- (long-)term borrowings to total assets in year t. *Short- (Long-)term Borrowing Growth* is the annual growth rate of a firm's short- (long-)term borrowings [(short- (long-)term borrowings$_t$ – short- (long-)term borrowings$_{t-1}$)/total assets$_{t-1}$]. *Interest rate* is the ratio of a firm's interest expenses to the sum of its short-term debt, long-term debt, and discounted notes receivable for each year in year t. *Firm Age* is the natural log of firm age in year t-1. *Log(1+Sales)* is the natural log of (1+firm sales) in year t-1. *Sales Growth* is the annual growth rate of a firm's sales [(sales$_t$ – sales$_{t-1}$)/sales$_{t-1}$]. *EBITDA* is the ratio of a firm's earnings before interest, taxes, depreciation, and amortization to total assets in year t-1. *Current-Assets Ratio* is the ratio of a firm's current assets to total assets in year t-1. *Short–Long-term Borrowings Ratio* is the ratio of a firm's short-term borrowings to total borrowings in year t-1. *Leverage* is the ratio of a firm's book value of total debts to book value of total assets in year t-1. *Cash Holdings Ratio* is the ratio of a firm's cash holdings to total assets in year t-1. *Shock Period* is a dummy variable equal to one if the year is 1998 or 1999; zero otherwise. *Postshock Period* is a dummy variable equal to one if the year is 2000 or 2001; zero otherwise. *Year Dummy(t)* is a dummy variable that is equal to one if the year is t; zero otherwise. The reference year is 1996. Robust standard errors are in parentheses; * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

0.5941 percent in 1998. In sum, interest rates for both bank-dependent and independent firms decreased during the shock period. The effect on the short–long-term borrowings ratio is negative. In general, the interest rate for short-term loans is relatively lower, so firms with debt of a shorter maturity pay less interest. Firms with a higher cash holdings ratio also pay less interest, as these firms are more creditworthy with more collateral assets. The effect of sales growth is positive, suggesting that firms facing a decrease in sales may delay paying interest, because they have inadequate income.[32]

5.3.3 Effects on Firm Activity

Estimation Strategy

We investigate whether firm activities were limited during the shock period. To check this hypothesis, we estimate the following regression.

$$\begin{aligned} Firm\ Activity_{i,t} &= \beta_1 Bank\ Dependence_i * Shock\ Period\ Dummy_t \\ &+ \beta_2 Bank\ Dependence_i * Post\ Shock\ Period\ Dummy_t \\ &+ \beta_3 Year\ Dummy_t + \beta_4 Y_{i,t} + \delta_i + \epsilon_{i,t} \end{aligned} \tag{5.2}$$

where $\mathbf{Y}_{i,t}$ is a matrix of control variables, δ_i is the time-invariant effects of each sample, and $\epsilon_{i,t}$ is the error term of firm i in year t from 1996 to 2001. The definitions of $Bank\ Dependence_i$, $Shock\ Period\ Dummy_t$, and the $Post\ Shock\ Period\ Dummy_t$ are identical to those described in Section 5.3.2. If banks reduce their credit supplies and firms encounter severe financial constraints, bank-dependent firms face relatively more severe constraints on their activities because of the shock. We predict that β_1 will be statistically negative if banks reduce their credit supplies. We employ two proxies of firm activity: the ratios of tangible fixed assets and cash holdings to total assets.

[32]Our data does not include contractual interest rates, so the average interest rate is lower if the firm does not pay interest.

Tangible Fixed Assets

Table 5.9 shows the result using the tangible fixed assets ratio (tangible fixed assets$_t$/total assets$_t$) as the dependent variable. We predict that β_1 is negative if tangible fixed assets for bank-dependent firms are lower during the shock period. We also include several control variables: leverage, sales growth, the natural logarithm of sales, the natural logarithm of firm age, and EBITDA normalized by total assets in year t-1. In general, more highly leveraged firms can draw on larger amounts of external funds and invest more in tangible fixed assets. Therefore, we predict that the effects of leverage are positive. Firms with higher sales growth and EBITDA earn more cash flow and have more current assets. As a result, the ratio of tangible fixed assets to total assets is lower. We predict that the effects of sales growth and EBITDA are negative. We again estimate using a fixed effects model to eliminate any time-invariant unobserved effects.

In column 1 of Table 5.9, we estimate Equation (2) using the full sample. The effects of the interactions of bank dependence and the shock period dummy are negative and statistically significant, suggesting that bank-dependent firms reduce their tangible fixed assets more during the shock period. Moreover, the negative effects of these interactions are statistically significant in the postshock period. The results in column 1 suggest, then, that bank-dependent firms faced constraints on their activities during the shock period. We also estimate heterogeneous effects by firm size. In columns 2-4 of Table 5.9, we divide the sample into three groups by the level of employees in 1997, comprising very small, small, and middle-sized and large firms. According to the results in this table, the impact of bank dependence is heterogeneous with respect to firm size. In column 2, we specify the subsample of very small firms. As shown, the interaction between bank dependence and the shock period dummy has a negative effect on the tangible fixed assets ratio. These imply that bank-dependent firms reduced their tangible fixed assets more during the shock period. When we focus on the estimated results for the sample of small, middle and large firms, we see that negative effects of the interaction of bank dependence and the shock period dummy are also found. These negative effects are statistically significant in the postshock period. In addition, the

Table 5.9: Bank Dependence and Tangible Fixed Assets

	(1)	(2)	(3)	(4)
Dependent Variable	Tangible Fixed Asset Ratio			
Firm Size	All	Very Small	Small	Middle and Large
Bank Dependence	–0.0061***	–0.0051***	–0.0079***	–0.0074***
*Shock Period	(0.0006)	(0.0009)	(0.0010)	(0.0012)
Bank Dependence	–0.0061***	–0.0063***	–0.0071***	–0.0085***
*Postshock Period	(0.0006)	(0.0010)	(0.0011)	(0.0013)
Log(1+Firm Age)	–0.0004	–0.0009	–0.0007	0.0002
	(0.0004)	(0.0007)	(0.0007)	(0.0007)
Log (1+Sales)	–0.0152***	–0.0106***	–0.0224***	–0.0177***
	(0.0003)	(0.0005)	(0.0006)	(0.0006)
Leverage	0.0160***	0.0117***	0.0172***	0.0397***
	(0.0006)	(0.0009)	(0.0011)	(0.0017)
Sales Growth	–0.0139***	–0.0115***	–0.0141***	–0.0209***
	(0.0004)	(0.0006)	(0.0007)	(0.0008)
EBITDA	–0.0309***	–0.0276***	–0.0309***	–0.0467***
	(0.0011)	(0.0017)	(0.0018)	(0.0029)
Year Dummy (1997)	0.0050***	0.0057***	0.0046***	0.0045***
	(0.0003)	(0.0006)	(0.0005)	(0.0005)
Year Dummy (1998)	0.0160***	0.0169***	0.0161***	0.0151***
	(0.0005)	(0.0009)	(0.0008)	(0.0008)
Year Dummy (1999)	0.0161***	0.0176***	0.0150***	0.0157***
	(0.0005)	(0.0009)	(0.0008)	(0.0008)
Year Dummy (2000)	0.0188***	0.0218***	0.0181***	0.0174***
	(0.0005)	(0.0010)	(0.0009)	(0.0009)
Year Dummy (2001)	0.0222***	0.0258***	0.0216***	0.0201***
	(0.0005)	(0.0010)	(0.0009)	(0.0009)
Observations	695,265	232,024	260,502	197,417
Adjusted R^2	0.03	0.02	0.03	0.04

Note: This Table presents estimates of fixed effects regressions with *Tangible Fixed Asset Ratio* as the dependent variable. *Tangible Fixed Assets Ratio* is the ratio of a firm's tangible fixed assets (the sum of the book value of buildings and land) to total assets in year t. *Bank Dependence* is the ratio of a firm's total loans to total assets in 1996. *Firm Age* is the natural log of firm age in year t-1. *Log(1+Sales)* is the natural log of (1+firm sales) in year t-1. *Leverage* is the ratio of a firm's book value of total debts to book value of total assets in year t-1. *Sales Growth* is the annual growth rate of a firm's sales $[(\text{sales}_t - \text{sales}_{t-1})/\text{sales}_{t-1}]$. *EBITDA* is the ratio of a firm's earnings before interest, taxes, depreciation, and amortization to total assets in year t-1. *Shock Period* is a dummy variable equal to one if the year is 1998 or 1999; zero otherwise. *Postshock Period* is a dummy variable equal to one if the year is 2000 or 2001; zero otherwise. *Year Dummy(t)* is a dummy variable equal to one if the year is t; zero otherwise. The reference year is 1996. *Very Small Firm* is defined as a firm with 5 or fewer workers in 1997. *Small Firm* is defined as a firm with 6–20 workers in 1997. *Middle and Large Firms* are defined as firms with 21 or more workers in 1997. As the number of workers in some firms is unavailable, these observations are removed from the sample. Robust standard errors are in parentheses; * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

magnitudes of the coefficients of the interaction variables with the shock-period dummy are smaller for the subsample of very small firms. This indicates that firms with greater bank dependence reduced their tangible fixed assets more, both during and after the shock period, and that these negative impacts are less if the firm size is very small. The results for the control variables are consistent with our hypotheses. As predicted, the effects of sales growth and EBITDA on the tangible fixed assets ratio are statistically negative, while those of leverage are positive.

Cash Holdings

In Table 5.10, we specify the cash holding ratio (cash holdings$_t$/total assets$_t$) as the dependent variable. Following Opler et al. (1999), we also include EBITDA, net working capital (both normalized by total assets), and leverage. The cost of additional funds for more highly leveraged firms is greater, and they use more internal cash. We predict that the effect of leverage is negative for the cash-holding ratio. EBITDA is a proxy of cash flow, which has a positive effect on the cash-holding ratio. The ratio of net working capital to total assets is a proxy for liquid asset substitutes. Firms with higher liquid assets can use these assets in the presence of a financial shortage, so they then need fewer cash holdings. We predict that net working capital has negative effects for the cash-holding ratio. We control for the effects of the characteristics of firm size and age.

As shown in Table 5.10, the effects of the interactive variables for bank dependence and the shock period dummies are negative and statistically significant if we include the full sample (column 1). We find similar results if the sample is limited to small firms or small businesses of middle and large sizes (columns 3 and 4). However, the interactive variables of the shock period dummy and bank dependence are statistically insignificant for very small firms (column 2). These results imply that cash holdings for bank-dependent firms, excluding very small firms, are lower during the shock period. The estimated results for the control variables are consistent with our predictions. The coefficients for leverage and net working capital are statistically negative while those for EBITDA are statistically positive.

Table 5.10: Bank Dependence and Cash Holding

	(1)	(2)	(3)	(4)
Dependent Variable	Cash Holding Ratio			
Firm Size	All	Very Small	Small	Middle and Large
Bank Dependence	–0.0027***	–0.0004	–0.0023**	–0.0118***
*Shock Period	(0.0005)	(0.0009)	(0.0010)	(0.0010)
Bank Dependence	–0.0076***	–0.0025**	–0.0070***	–0.0217***
*Postshock Period	(0.0006)	(0.0010)	(0.0010)	(0.0011)
Log(1+Firm Age)	0.0005	0.0019***	–0.0000	0.0002
	(0.0004)	(0.0007)	(0.0006)	(0.0006)
Log (1+Sales)	0.0084***	0.0060***	0.0143***	0.0072***
	(0.0002)	(0.0004)	(0.0005)	(0.0004)
Leverage	–0.0252***	–0.0162***	–0.0314***	–0.0509***
	(0.0007)	(0.0010)	(0.0012)	(0.0016)
EBITDA	0.0317***	0.0278***	0.0350***	0.0373***
	(0.0010)	(0.0016)	(0.0017)	(0.0024)
Net Working Capital	–0.0195***	–0.0125***	–0.0230***	–0.0374***
	(0.0006)	(0.0010)	(0.0010)	(0.0013)
Year Dummy (1997)	–0.0055***	–0.0058***	–0.0049***	–0.0061***
	(0.0003)	(0.0006)	(0.0005)	(0.0005)
Year Dummy (1998)	–0.0050***	–0.0068***	–0.0037***	–0.0019***
	(0.0005)	(0.0009)	(0.0008)	(0.0007)
Year Dummy (1999)	–0.0021***	–0.0042***	–0.0003	0.0010
	(0.0005)	(0.0009)	(0.0008)	(0.0007)
Year Dummy (2000)	–0.0048***	–0.0101***	–0.0044***	0.0040***
	(0.0005)	(0.0010)	(0.0008)	(0.0008)
Year Dummy (2001)	–0.0058***	–0.0114***	–0.0058***	0.0038***
	(0.0005)	(0.0010)	(0.0008)	(0.0008)
Observations	695,414	232,752	260,014	197,326
Adjusted R^2	0.01	0.01	0.02	0.02

Note: This Table presents estimates of fixed effects regressions with *Cash Holding Ratio* as the dependent variable. *Cash Holdings Ratio* is the ratio of a firm's cash holdings [(cash holdings$_t$)/total assets$_t$]. *Bank Dependence* is the ratio of a firm's total loans to total assets in 1996. *Log(1+Firm Age)* is the natural log of (1+firm age) in year t. *Log(1+Sales)* is the natural log of (1+firm sales) in year t. *Leverage* is the ratio of a firm's book value of total debts to book value of total assets in year t-1. *Net Working Capital* is the ratio of a firm's net working capital (current assets minus current liabilities minus cash) to total assets in year t-1. *EBITDA* is the ratio of a firm's earnings before interest, taxes, depreciation, and amortization to total assets in year t-1. *Year Dummy(t)* is a dummy variable equal to one if the year is t; zero otherwise. The reference year is 1996. *Shock Period* is a dummy variable equal to one if the year is 1998 or 1999; zero otherwise. *Postshock Period* is a dummy variable equal to one if the year is 2000 or 2001; zero otherwise. *Very Small Firm* is defined as a firm with 5 or fewer workers in 1997. *Small Firm* is defined as a firm with 6–20 workers in 1997. *Middle and Large Firms* are defined as firms with 21 or more workers in 1997. As the number of workers in some firms is unavailable, these observations are removed from the sample. Robust standard errors are in parentheses; * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Implications of the Observations

According to the econometric analysis of firm activities, our results indicate that small businesses face constraints on their activities during the shock period, with bank-dependent firms reducing their level of short-term borrowings and tangible fixed assets relatively more during the financial shock period. Importantly, if the constraints arising from financial shock are severe for borrowers, they may attempt to use other sources of finance, such as cash holdings. Our results show that bank-dependent (especially larger-sized) small businesses reduced their cash holdings during the financial shock period. Nevertheless, it is possible to interpret these results in several ways. For example, many firms in the 1990s struggled with the burden of debt from overinvestment during the bubble economy of the late 1980s. In these circumstances, bank-dependent firms may well have used internal cash to pay off bank loans to lessen their inherited debt burden. Likewise, small businesses may have needed to engage in asset restructuring, so they reduced their level of tangible fixed assets during the shock period. Unfortunately, our results do not permit us to identify whether bank-dependent firms needed to reduce their short-term borrowings, tangible fixed assets, or cash holdings. If they needed to reduce their assets and debts, the performance of bank-dependent firms would be enhanced during the shock period. Conversely, if bank-dependent firms are forced to reduce their debt and assets below the optimal level, their performance worsens during the shock period. Therefore, in the next section, we rerun our regressions using proxies for firm performance.

5.3.4 Effects on Firm Performance

Estimation Strategy

In this section, we investigate whether the performance of bank-dependent firms is lower during the shock period. We employ the following regression.

$$Firm\ Performance_{i,t} \quad = \quad \gamma_1 Bank\ Dependence_i * Shock\ Period\ Dummy_t$$

$$+ \quad \gamma_2 Bank\ Dependence_i * Post\ Shock\ Period\ Dummy_t$$

$$+ \quad \gamma_3 Year\ Dummy_t + \gamma_4 Z_{i,t} + \eta_i + \zeta_{i,t} \tag{5.3}$$

where $\mathbf{Z}_{i,t}$ is a matrix of control variables, $\zeta_{i,t}$ is the error term of firm i in year t from 1996 to 2001, and η_i are the unobserved time-invariant effects for firm i. If banks reduced their credit supplies and firms encountered severe constraints, bank-dependent firms experienced lower performance because of the shock. Therefore, we predict that γ_1 is statistically negative if banks reduce their credit supplies. The definitions of $Bank\ Dependence_i$, $Shock\ Period\ Dummy_t$, and the $Post\ Shock\ Period\ Dummy_t$ are identical to the variables specified in Equations (5.1) and (5.2).

Our sample is comprised of data on unlisted small businesses, so we cannot obtain stock price data. Consequently, performance data using stock returns or Tobin's q are unavailable.[33] Instead, we use accounting profit as a proxy for firm performance. We employ two proxies for firm performance: the ratio of operating income to total assets and the ratio of ordinary income to total assets. Ordinary income includes net financial income and expenses, so this measure of income is naturally lower when interest payments are large. We also use the growth rate of annual sales as a proxy for firm performance. From a textbook viewpoint, the purpose of firms is to maximize profits, so an increase in sales is not always consistent with profit maximization. However, many previous studies (for example Kroszner et al., 2007) use real growth in total sales as a proxy for firm performance. To confirm robustness, we employ the sales growth rate normalized by total sales for the previous year ([sales_t – sales_{t-1}]/sales_{t-1}) as a proxy for firm performance. We also specify firm scale, firm age, leverage, and the current assets to total assets ratio in year t-1 as control variables. We include firm scale and firm age to control for firm characteristics, and we use leverage as a proxy for capital structure. We use the ratio of current assets to total assets as our proxy for liquidity.

As with the estimation for firm activity and borrowing, we lack all of the information that

[33]For example, Kang and Stulz (2000) and Ongena et al. (2003) specify stock returns as a proxy for firm performance as they concern listed firms.

Table 5.11: Ratio of Truncated Firms in 1998 and 2000
by Level of Operating Income Ratio and Bank Dependence

Panel A: The Ratio of Truncated Firms in 1998

Level of	Quantiles of Operating Income Ratio in Preshock Year 1997				
Bank Dependence	Very Low	Low	High	Very High	Total
0.25 or less	8.52	6.45	5.64	6.70	6.43
Over 0.25 to 0.5	7.43	5.32	5.74	5.33	5.65
Over 0.50 to 0.75	7.94	5.91	5.54	5.62	5.98
Over 0.75 to 1.00	8.57	6.58	6.05	6.53	6.54
Over 1.00	13.80	9.10	8.71	9.36	8.71
Total	8.86	6.07	5.87	6.33	6.30

Panel B: The Ratio of Truncated Firms in 2000

Level of	Quantiles of Operating Income Ratio in Preshock Year 1997				
Bank Dependence	Very Low	Low	High	Very High	Total
0.25 or less	23.53	19.66	18.65	19.48	19.96
Over 0.25 to 0.5	20.43	16.66	16.77	16.64	17.31
Over 0.50 to 0.75	22.42	17.77	17.42	16.69	18.29
Over 0.75 to 1.00	23.08	19.32	18.01	18.41	19.38
Over 1.00	32.39	25.47	23.68	23.92	25.49
Total	23.66	18.33	17.83	18.32	19.11

Note: We define the ratio of truncated firms in year t as 1 – (Number of Existing Firms in year t/Number of Firms in 1997). Ratios are expressed as percentages.

affects the determinants of firm performance, some of which are important determinants, such as, the owner's characteristics and abilities. As owner abilities can be correlated with bank dependence, we need to counter the potential problem of omitted variables. As we employ panel data, we can estimate firm performance using a fixed-effects model to eliminate the time-invariant unobserved effects.

Truncated Samples

Before we estimate the econometric models, we need to check what types of firms are truncated during and after the shock period. This is because if poorly performing and highly bank-dependent firms are truncated before the shock period, the results of the DID estima-

tion using the simple fixed effects model are biased. Table 5.11 shows the ratio of truncated firms in 1998 (Panel A) and 2000 (Panel B).[34] Panel A shows that the ratio of truncated firms in the total sample is 6.30 percent in 1998, suggesting that the problem of truncated samples is not serious. However, the ratio of truncated firms in firm groups with very low operating income and with measures of bank dependence exceeding 1.00 is 13.80 percent. This means that firms with very low operating income and high levels of bank dependence are more likely to be truncated, and this may cause biased results. These firms are also financially and economically distressed, so banks are also more likely to cease transactions with them. Excluding the groups of firms with measures of bank dependence over 1.00, firms with "Between 0.75 and 1.00" and "0.25 or less" bank dependence are more truncated in the groups of firms with very low operating income. This implies that, excluding financially distressed firms, firms with higher bank dependence and lower operating income are not more truncated and the problem of truncated samples is not so serious. When we focus on other groups for operating income, we get similar observations.

As shown in Panel B, poorly performing and highly bank-dependent firms are not more truncated after excluding financially distressed firms. However, 19.11 percent of firms are truncated in 2000, which suggests that more firms are truncated after the financial shock. As we see from the observations in Table 5.11, the attrition bias may then be serious in estimating Equation (5.3). Therefore, we estimate Equation (5.3) using the fixed effects model and employ the Heckman selection model as a means of mitigating the attrition bias.

Fixed-Effects Model

Table 5.12 provides the results obtained using the full sample. In column 1, the proxy for firm performance is the ratio of operating income to total assets. The coefficient for bank dependence*shock period is positive and statistically significant at the 1 percent level. The results are similar if we specify ordinary income to total assets ratio as the proxy for firm performance and sales growth, suggesting that bank-dependent firms increased their sales

[34]We define the ratio of truncated firms in year t as 1 – (number of existing firms in year t/number of firms in 1997).

Table 5.12: Bank Dependence and Firm Performance (All Firms)

Dependent Variable	Operating Income Ratio	Ordinary Income Ratio	Sales Growth
Bank Dependence	0.0126***	0.0158***	0.0207***
*Shock Period	(0.0007)	(0.0007)	(0.0020)
Bank Dependence	0.0099***	0.0164***	0.0194***
*Postshock Period	(0.0008)	(0.0008)	(0.0022)
Log(1+Firm Age)	–0.0022***	–0.0025***	–0.0177***
	(0.0005)	(0.0005)	(0.0014)
Log (1+Sales)	0.0483***	0.0441***	0.3327***
	(0.0003)	(0.0003)	(0.0010)
Leverage	0.1176***	0.1230***	0.1971***
	(0.0007)	(0.0007)	(0.0021)
Current-Assets Ratio	–0.0403***	–0.0355***	–0.1877***
	(0.0015)	(0.0015)	(0.0043)
Year Dummy (1997)	–0.0004	0.0006	–0.0115***
	(0.0004)	(0.0004)	(0.0012)
Year Dummy (1998)	–0.0203***	–0.0203***	–0.0861***
	(0.0006)	(0.0006)	(0.0017)
Year Dummy (1999)	–0.0295***	–0.0294***	–0.0837***
	(0.0006)	(0.0006)	(0.0017)
Year Dummy (2000)	–0.0214***	–0.0227***	–0.0247***
	(0.0006)	(0.0006)	(0.0018)
Year Dummy (2001)	–0.0175***	–0.0197***	–0.0231***
	(0.0007)	(0.0006)	(0.0019)
Observations	698,632	697,544	695,437
Adjusted R^2	0.09	0.09	0.2

Note: This Table presents estimates of fixed effects regressions with *Operating Income Ratio*, *Ordinary Income Ratio*, and *Sales Growth* as dependent variables. *Operating Income Ratio* is the ratio of a firm's operating income to total assets in year t. *Ordinary Income Ratio* is the ratio of a firm's ordinary income to total assets in year t. *Sales Growth* is the annual growth rate of a firm's sales [(sales$_t$ – sales$_{t-1}$)/sales$_{t-1}$]. *Bank Dependence* is the ratio of a firm's total loans to total assets in 1996. *Firm Age* is the natural log of firm age in year t-1. *Log(1+Sales)* is the natural log of (1+firm sales) in year t-1. *Leverage* is the ratio of a firm's book value of total debts to book value of total assets in year t-1. *Current-Assets Ratio* is the ratio of a firm's current assets to total assets in year t-1. *Year Dummy(t)* is a dummy variable equal to one if the year is t; zero otherwise. *Shock Period* is a dummy variable equal to one if the year is 1998 or 1999; zero otherwise. *Postshock Period* is a dummy variable equal to one if the year is 2000 or 2001; zero otherwise. Robust standard errors are in parentheses; * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

and enjoyed higher incomes during the shock period. In addition, the performance of bank-dependent firms is higher after the shock period. The coefficients of bank dependence* postshock period dummy are positive and statistically significant at the 1 percent level for all proxies of firm performance. These results imply that bank-dependent firms are better performing after the shock period.

The coefficients of ln(1+firm age) are negative, suggesting that older firms performed relatively worse than younger firms. The effects of ln(1+sales) are positive, evidencing that larger firms performed better than smaller firms. Leverage has a positive effect on firm performance. From a textbook viewpoint, firm performance and capital structure are irrelevant, so this observation of a positive relationship remains a puzzle. However, some studies suggest that capital structure could have either positive or negative effects on firm performance.[35] The effects of current assets are negative, suggesting that firms with lower current assets performed better. Some studies, for example Kang and Stulz (2000), show that firms with higher liquidity have better performance because they do not face liquidity constraints. Our results suggest that the positive relationship between firm performance and liquidity is not supported for small businesses. The estimated coefficients for the year dummies are negative after 1998, and this fits with trends in the business cycle at the time.

In Table 5.13, we rerun the specification for the subsample of very small, small, and firms of middle and large sizes. After controlling for firm characteristics, leverage, current assets, and time-invariant firm heterogeneity, the interactions of bank dependence with the shock period dummy are positive and statistically significant at the 1 percent level for the operating income ratio (columns 1-3). In addition, the positive relationship between bank dependence and firm performance is statistically significant if we change the performance proxy to the ordinary income ratio (columns 4-6) or sales growth (columns 7-9). This also suggests that bank-dependent firms did not experience lower performance during the credit crunch period. On the contrary, bank-dependent firms performed better after the financial shock. When we focus on the magnitude of the interaction variables with the shock period dummy, we see that the coefficients for operating and ordinary income ratios are larger for firms of middle

[35]See Myers (2001) for a discussion of the impact of capital structure.

Table 5.13: Bank Dependence and Firm Performance, Divided by Firm Size

	(1)	(2)	(3)
Dependent Variable	Operating Income Ratio		
Samples	Very Small	Small	Middle and Large
Bank Dependence	0.0153***	0.0147***	0.0171***
*Shock Period	(0.0013)	(0.0012)	(0.0011)
Bank Dependence	0.0112***	0.0127***	0.0202***
*Post-shock Period	(0.0014)	(0.0013)	(0.0011)
Number of Observations	234,340	261,197	197,710
Adjusted R^2	0.10	0.10	0.06

	(4)	(5)	(6)
Dependent Variable	Ordinary Income Ratio		
Samples	Very Small	Small	Middle and Large
Bank Dependence	0.0184***	0.0178***	0.0202***
*Shock Period	(0.0012)	(0.0012)	(0.0010)
Bank Dependence	0.0174***	0.0199***	0.0262***
*Post-shock Period	(0.0014)	(0.0013)	(0.0011)
Number of Observations	233,728	260,833	197,608
Adjusted R^2	0.09	0.10	0.06

	(7)	(8)	(9)
Dependent Variable	Sales Growth		
Samples	Very Small	Small	Middle and Large
Bank Dependence	0.0189***	0.0227***	0.0183***
*Shock Period	(0.0035)	(0.0033)	(0.0036)
Bank Dependence	0.0198***	0.0300***	0.0036
*Post-shock Period	(0.0038)	(0.0035)	(0.0039)
Number of Observations	232,101	260,561	197,436
Adjusted R^2	0.19	0.23	0.18

Note: This Table presents estimates of fixed effects regressions with *Operating Income Ratio*, *Ordinary Income Ratio*, and *Sales Growth* as dependent variables. *Operating Income Ratio* is the ratio of a firm's operating income to total assets in year t. *Ordinary Income Ratio* is the ratio of a firm's ordinary income to total assets in year t. *Sales Growth* is the annual growth rate of a firm's sales $[(\text{sales}_t - \text{sales}_{t-1}))/\text{total assets}_{t-1}]$. *Bank Dependence* is the ratio of a firm's total loans to total assets in 1996. *Shock Period* is a dummy variable equal to one if the year is 1998 or 1999; zero otherwise. *Postshock Period* is a dummy variable equal to one if the year is 2000 or 2001; zero otherwise. Similar to the regression in Table 5.12, all regressions include *Firm Age*, *Log(1+Sales)*, *Leverage*, *Current-Assets Ratio*, and *Year Dummy(t)*. We do not present the estimated coefficients of these variables. *Very Small Firm* is a firm with 5 or fewer workers in 1997. *Small Firm* is a firm with 6–20 workers in 1997. *Middle and Large Firms* are firms with 21 or more workers in 1997. As the number of workers in some firms is unavailable, these observations are removed from the sample. Robust standard errors are in parentheses; * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

and large sizes, which implies that these firms enjoyed better performance than did smaller firms.

Sample-Selection Model

Our small business data comprises the client data of banks, so we have to consider attrition bias. The CRD data includes only firms with transactions with banks. As we showed, poorly performing firms are more likely to drop from the CRD data, because they are more likely to default and banks will not offer them further credit. Furthermore, as profitable firms have sufficient internal cash, they do not need to borrow money and thus are also more likely to be dropped from the database.[36] To correct for the attrition bias, we estimate the Heckman selection model following Wooldridge (2010).

$$\begin{aligned} \Delta FirmPerformance_{i,t} &= \gamma_1 \Delta BankDependence_i * ShockPeriodDummy_t \\ &+ \gamma_2 \Delta BankDependence_i * PostShockPeriodDummy_t \\ &+ \gamma_3 \Delta YearDummy_t + \Delta Z_{i,t}\gamma_4 + \Delta\zeta_{i,t} \qquad (5.4) \\ s_{i,t} &= 1[\omega_{i,t}\theta + v_{i,t}] \qquad (5.5) \end{aligned}$$

where $\mathbf{Z}_{i,t}$ is a matrix of control variables and $\zeta_{i,t}$ is the error term of firm i in year t from 1996 to 2000. $s_{i,t}$ is the selection indicator for each year t, where $s_{i,t} = 1$ if the dependent and independent variables in t are observed. To remove the unobserved time-invariant individual effects, we first difference all variables in Equation (5.4). We assume that $Cov(\Delta\zeta_{i,t}, v_{i,t}) = \rho$, where ρ is not equal to zero. $w_{i,t}$ includes all undifferenced independent variables in t-1, the level of average interest rates, the short–long-term borrowings ratio, and seven industry dummies.[37]

[36] Love et al. (2007) mitigate the attrition bias using balanced panel data. If we estimate using balanced panel data, we obtain similar results.

[37] Ongena and Smith (2001) estimate the duration of banking relationships with firms. They show that sales, age, profitability, Tobin's Q, and leverage affect the duration of bank–firm relationships. To estimate the selection variable, we include these variables, except for Tobin's q as it is unavailable. The seven industries are construction, transportation and communication, wholesale trade, retail trade, restaurant, real estate, and service. We use a manufacturing industry as a benchmark.

Column 1 in Table 5.14 provides the estimates of Equation (5.5). Firm age and sales have positive effects on the selection indicator, while leverage, the current-assets ratio, interest rates, and the short–long-term borrowings ratio have negative effects. This means that highly leveraged firms are more likely to be dropped from the database, which suggests that banks cease transactions with these firms because they are more likely to be financially distressed. Firms with large current assets also have enough internal cash, so credit demand for these firms is considered to be low. As a result, these firms are more likely to be truncated. Firms with higher interest rates are more likely to be dropped, because they have an incentive to pay off bank loans to save on the high interest costs. The short–long-term borrowings ratio is the proxy for maturity. Firms with a higher short-term borrowing ratio have a shorter maturity period, and so are more likely to pay off the loans. Thus, we suggest that the results of the selection model are reasonable. After controlling for these variables, the interaction beteween bank dependence and the shock period dummy is positive for the selection indicator. This suggests that bank-dependent firms are less truncated during the shock period. The estimated ρ is statistically significant at the 1 percent level, so the assumption of a selection model is also supported.

Columns 2–4 in Table 5.14 provide the results of Equation (5.4). The definition of the dependent variables in each column is the same as in Table 5.12. The coefficients for bank dependence*shock period are positive and statistically significant at the 1 percent level, irrespective of the specification of the dependent variable. On the other hand, the coefficients for bank dependence*postshock period are statistically insignificant after correcting for attrition bias, if we specify the operating income ratio as the proxy of firm performance. According to these results, bank-dependent firms are better performing, even in the banking shock period and after correcting for the attrition bias.

Discussion

We interpret these estimation results as meaning that highly bank-dependent firms enjoyed better performance during the shock period and that the negative effects of the financial shock

Table 5.14: Bank Dependence and Firm Performance
(Heckman Selection Model)

	(1)	(2)	(3)	(4)
Dependent Variable	Selection	Operating Income	Ordinary Income	Sales Growth
Bank Dependence	0.0631***	0.0068***	0.0083***	0.0292***
*Shock Period	(0.0057)	(0.0014)	(0.0014)	(0.0033)
Bank Dependence	0.0926***	0.0009	0.0046**	0.0371***
*Postshock Period	(0.0058)	(0.0020)	(0.0020)	(0.0045)
Log(1+Firm Age)	0.0835***	0.0009	0.0006	–0.0027
	(0.0011)	(0.0007)	(0.0007)	(0.0020)
Log(1+Sales)	0.0325***	0.0582***	0.0543***	0.6599***
	(0.0006)	(0.0015)	(0.0014)	(0.0151)
Leverage	–0.0821***	0.2615***	0.2940***	0.2997***
	(0.0028)	(0.0034)	(0.0036)	(0.0064)
Current-Assets Ratio	–0.0132***	–0.0745***	–0.0760***	–0.2671***
	(0.0041)	(0.0029)	(0.0029)	(0.0091)
Interest Rate	–0.0712***			
	(0.0030)			
Short–Long-term	–0.0150***			
Borrowings Ratio	(0.0032)			
Year Dummy (1997)	0.0125***	0.0049***	0.0066***	–0.0222***
	(0.0044)	(0.0004)	(0.0004)	(0.0014)
Year Dummy (1998)	–0.0359***	–0.0081***	–0.0063***	–0.0854***
	(0.0044)	(0.0007)	(0.0007)	(0.0017)
Year Dummy (1999)	–0.0662***	–0.0152***	–0.0134***	–0.0605***
	(0.0044)	(0.0007)	(0.0007)	(0.0017)
Year Dummy (2000)	–0.1534***	–0.0050***	–0.0041***	–0.0030***
	(0.0045)	(0.0004)	(0.0004)	(0.0010)
Estimated ρ		–0.02	–0.01	0.16
Observations	582,468	582,468	581,699	579,669
Log Likelihood		279,994.2	287,962.0	287,962.0

Note: This table presents estimates of Heckman selection regressions with *Operating Income Ratio*, *Ordinary Income Ratio*, and *Sales Growth* as the dependent variables. All variables in columns (2), (3), and (4) are first differences. Column (1) shows the results of the selection equation for the estimation in column (2). *Short–Long-term Borrowings Ratio* is the ratio of a firm's short-term borrowings to total borrowings in year t-1. *Interest rate* is the ratio of a firm's interest expenses to the sum of its short-term debt, long-term debt, and discounted notes receivable for each year in year t-1. Other definitions of each variable are given in the note of Table 5.12. Robust standard errors are in parentheses; * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

on small business were insignificant. However, if the differences in firm performance between bank-dependent and bank-independent firms in the preshock period are large, the treatment and control groups in our analysis cannot be identical. This will cause biased results, even if we correct for attrition bias. For example, as potentially good firms can borrow more, they perform better than firms that cannot borrow much. Therefore, the difference in performance between highly bank-dependent and bank-independent firms can be even larger in a recession than in a boom. However, these better performing firms in the shock period are not better performing in the preshock period, as shown in Table 5.7. Given the median operating income of bank-dependent and bank-independent firms is 0.0170 and 0.0187 in the preshock year of 1997, suggesting that the differences in firm performance are small.

Another possibility is the "zombie lending" hypothesis.[38] Under this hypothesis, highly bank-dependent firms can borrow more in the crisis period, possibly because banks do not let them go bankrupt. This may result in the better performance of bank-dependent firms in the shock period. As Table 5.11 shows, however, highly bank-dependent firms with low operating income are more likely to be truncated. These firms are economically and financially distressed, so banks are more likely to cease transactions with risky and indebted firms. Thus, our database does not support the presence of zombie lending for Japanese small businesses.[39] From these observations, highly bank-dependent and bank-independent firms should be identical in every aspect of firm performance in the preshock period.

5.4 Conclusion

We investigated whether or not the Japanese financial shocks of the late 1990s had negative effects on small and bank-dependent businesses using firm-level data. We report three broad findings. (i) Short and long-term loans were not cut back for the typical small business, despite the financial DI worsening during the shock period. (ii) The DID estimations indicate that bank-dependent firms saw relative declines in short term borrowing ratio, proportion of tangible fixed assets, and cash holdings to assets ratio (and an increase in interest rate). These

[38] See Caballero et al. (2008) for detailed information about zombie lending.
[39] Using a CRD sample, Sakai et al. (2010) also reject the zombie lending hypothesis.

findings imply that the bank dependent establishments faced some worsening of their external credit situation, and had to rely more on internal resources. (iii) But, most importantly, we do not find any worsening of firm performance (measured as firm sales growth or profitability) for bank-dependent (or small bankdependent) firms; on the contrary, we find evidence that they performed better relative to other firms. Thus, we conclude the credit crunch of 1998-2001 did not impose severe financial constraints on most firms.

Chapter 6

Bank Loan Availability and Trade Credit for Small Businesses during the Financial Crisis

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Abstract

Using small business data, we investigate the relationship between bank loan availability and trade credit in Japan during the recent global financial crisis. Previous studies argue that the relationship between trade payables and bank loan availability is negative because trade credit is an inferior financial resource for firms. In addition, firms with better credit availability offer more trade credit to their customers. Specifying the credit guarantee program for small businesses introduced in Japan after October 2008 as an exogenous shock that enhanced credit availability, we find that small businesses increase trade credit (both payables and receivables) if bank loan availability improves. This implies that the relationship between trade payables and bank loans for small businesses is complementary. Furthermore, small businesses with enhanced credit availability offer more trade credit to their customers.

JEL classification: G21; G23; G33

Keywords: Trade credit; Bank credit; Financial crisis; Small business

6.1 Introduction

In this paper, we investigate the effects of the availability of bank loans on trade credit for small businesses. Trade credit is one of several financial resources available to small businesses. This is because when firms purchase goods and services from their suppliers and sell goods and services to their customers, they generally delay payment to their suppliers, while their customers delay payment to the firm. Examination of firm balance sheets shows that trade payables appear with the former, and trade receivables arise with the latter.

Trade credit serves both financial and transaction motives. The transaction motive for trade credit is to avoid the transaction costs of paying cash (Ferris, 1981) and those associated with inventory holding (Emery, 1987; Bougheas et al., 2009; Daripa and Nilsen, 2011). For example, Ferris (1981) argues that if buyers are to pay bills every time goods are delivered, they must have sufficient liquidity. To reduce these transaction costs, buyers and sellers use trade credit. This implies that firms with more frequent transactions tend to use larger amounts of trade credit. Elsewhere, Emery (1987) suggests that if there are strong seasonalities in demand for a firm's products, firms need to maintain larger inventories as a means of smoothing production cycles. To save this inventory cost, firms offer trade credit and sell the product to reduce the amount of inventories. This implies that the amount of trade credit is larger in firms that sell or purchase products with strong seasonal components. In addition, Daripa and Nilsen (2011) maintain that an upstream firm offers trade credit to a downstream firm to reduce inventory holding costs, which in turn help mitigate the lost sales of the upstream firm. Furthermore, Bougheas et al. (2009) conclude that firms facing uncertain demand for their products have an incentive to extend trade credit in order to promote sales, and thereby mitigate the cost of maintaining inventories of finished goods.

For the most part, the literature on financial motives focuses on the relationship between bank loans and trade credit, with many studies arguing that firms receive trade credit if they face difficulty in obtaining bank loans (Petersen and Rajan, 1994, 1997; Danielson and Scott, 2004; Demiroglu et al., 2012). For example, Petersen and Rajan (1994, 1997) show that small businesses with short-lived banking relationships receive more trade credit, as

banks do not typically offer them sufficient credit because of the presence of information asymmetry.[1] Other studies focus on the relationship between bank credit and the behavior of trade creditors during financial shocks. For example, Nilsen (2002), Atanasova and Wilson (2004), Choi and Kim (2005), and Mateut et al. (2006) find that small firms increase their trade credit when it is received as a substitute form of credit during monetary contractions.[2]

In examining the recent subprime shock, several studies (Yang, 2011a; Carbó-Valverde et al., 2016) support the substitute hypothesis concerning the relationship between trade credit received and bank loans.[3] These studies assert that because the cost of trade credit can be very high, sometimes involving annual interest rates in excess of 40%, firms use trade credit to compensate for the reduced availability of bank loans (Smith, 1987; Petersen and Rajan, 1994). Focusing on the offering of trade credit, Garcia-Appendini and Montoriol-Garriga (2013) argue that suppliers with access to readily available inexpensive bank loans or those with sufficient liquidity can offer more trade credit at higher interest rates to their customers.

We argue that while many existing studies have empirically investigated the relationship between bank loans and trade credit, these have significant shortcomings because the empirical relationships between bank loan availability and trade credit involve problems with endogeneity and spurious correlations. This assumption concerning the exogeneity of bank loan availability is based on the pecking order theory described by Petersen and Rajan (1994), which argues that firms first use relatively inexpensive bank loans and then expensive trade credit after bank loans become unavailable. Because of the high cost of trade credit, previous

[1] In addition, Demiroglu et al. (2012) show that firms without lines of credit receive more trade credit when bank lending standards are tight. Danielson and Scott (2004) find that small businesses that have applications for bank loans rejected receive trade credit. Some studies also argue that firms in countries with poorly developed financial institutions receive more trade credit because they cannot borrow sufficiently from financial institutions when they require external finance (Ge and Qiu, 2007; Fisman and Love, 2003).

[2] In addition, Love et al. (2007) find that firms with high levels of short-term debt, which are vulnerable to financial crises, reduce the provision of trade credit during periods of contraction in bank credit. In contrast, however, using Italian data, Marotta (1997) shows that small firms did not receive trade credit sufficient to compensate for the decline in bank loans during a monetary squeeze. As a result, as Yang (2011b) has argued, the relationships between trade credit and bank loans can be either complementary or substitutionary.

[3] Yang (2011a) shows that accounts payable and bank credit for small firms are negatively associated, whereas accounts receivable and bank credit are positively related. Using Spanish data, Carbó-Valverde et al. (2016) show that credit-constrained small businesses increased trade credit received as a substitute for bank loans during the financial crisis after 2007.

studies have also argued that firms receive trade credit as a last resort during a liquidity shock or during periods of financial distress (Wilner, 2000; Cunat, 2007).

However, some studies (Marotta, 2005; Miwa and Ramseyer, 2008; Uesugi et al., 2009) show that the cost of trade credit is not necessarily higher than that of bank loans. The results of these studies thus suggest that the assumption of the exogeneity of bank loan availability may be invalid. In addition, as some studies (for example, Biais and Gollier, 1997; Jain, 2001; Aktas et al., 2012) assert, suppliers may have an information advantage over banks, such that the lending attitude of banks can be determined by the availability of trade credit. Empirically, Atanasova (2012) finds that trade credit has positive effects for bank loans for firms with high agency costs, which supports the signaling role of trade credit provision.[4]

To overcome the endogeneity problem, some studies (for example, Garcia-Appendini and Montoriol-Garriga, 2013; Love et al., 2007) treat declines in the availability of bank loans during a financial shock period as an exogenous shock. In this paper, we use an alternative identification strategy; namely, the exogenous change in the availability of bank loans resulting from the emergency credit guarantee (ECG) program established in Japan on October 31, 2008.[5] Under the public credit guarantee program, local government-affiliated credit guarantee corporations offered credit guarantee services to credit-constrained small businesses in exchange for an annual credit guarantee fee of about 0.45% to 1.90%. The credit guarantee corporations then ensured the repayment of any defaulting guaranteed loans. Japanese banks were then in the position of being able to offer risk-free loans to small businesses in the presence of a guarantee from a credit guarantee corporation. Consequently, banks did not ration credit to notionally informationally opaque small businesses.

At the end of October 2008, the public credit guarantee corporations commenced the ECG program, which would eventually provide new guarantees of 9.181 trillion yen in to-

[4]Some studies investigating bank loans and trade credit (For example, Petersen and Rajan, 1997; Danielson and Scott, 2004; Yang, 2011a) use proxies for the availability of bank loans (for example, the amount of bank loans, the duration of banking relationships, and dummy variables indicating the denial of credit at the last loan request) as independent variables and trade credit as the dependent variable. However, causality can operate in the opposite direction. That is, the proxies for trade credit can also be independent variables, while the proxies for bank loan availability may also be dependent variables.

[5]The ECG program concluded at the end of March 2011. See *The 2009 White Paper on Small and Medium Enterprises in Japan* for details of the ECG program.

tal by March 2009. Small businesses that satisfied the requirements for the ECG program could obtain new guaranteed loans. Therefore, for small businesses that satisfied the ECG program requirements, credit availability improved after October 2008. This policy change in the public credit guarantee system is then an exogenous change that enhanced bank loan availability for small businesses. Identifying this policy change as an exogenous shock, we thus check whether the availability of bank loans exerted negative effects on trade payables and positive effects on trade receivables using the difference-in-differences (DID) approach. As small businesses were more vulnerable to the evolving financial crisis and faced severe credit constraints, we use firm-level data on small businesses instead of that for listed firms.

If (relatively expensive) trade payables are substitutes for bank loans, small businesses satisfying the ECG program requirements would have decreased their trade payables because they could obtain new guaranteed inexpensive bank loans instead. However, we find that these small businesses did not decrease their trade payables at this time. Instead, they increased the amount of trade payables following the establishment of the ECG program, which suggests that trade credit and bank loans are complementary rather than substitutes. This result implies that trade credit is not inferior to bank loans and that trade credit then does not serve as a substitute when there is less availability of bank loans. We also estimate the relationship between trade payables and bank loans using a dummy variable (which has a value of one if the firm satisfies the requirements of the ECG program) as an instrumental variable. We find that the bank loans to total assets ratio has positive effects on the trade payables to total assets ratio. These results are similar if we alternatively specify the growth rate of trade payables and bank loans. These additional results also support our finding that trade payables and banks loans are complementary.

Although many studies assert that trade credit received is a substitute for bank loans, these sources of credit can be complementary. As previous studies (for example, Wilner, 2000) argue, suppliers are unsecured lenders, whereas banks are secured lenders, so suppliers suffer large losses when customers do not repay trade credit. If bank loan availability for firms increases, the probability of the postponement of the repayment for trade debts falls.

Therefore, the ECG program improved the level of credit risk associated with small businesses, and this contributed to an increase in the supply of trade credit. Furthermore, as Miwa and Ramseyer (2008) have argued, given that suppliers know the industry well, they have an information advantage over banks. As these suppliers offer credit more quickly, borrowers use trade credit when they face short-term unexpected exigencies. If trade credit is not a costly financial source, as in the situation of increasing bank loan availability, firms then decide to receive additional trade credit because they can acquire it relatively quickly. As a result, we observe a positive relationship between bank loan availability and trade payables, which implies that they are complementary.

We also investigate the relationship between bank loan availability and trade receivables. We predict that small businesses with enhanced bank loan availability increase their trade receivables if bank loan availability has a positive effect on the supply of trade credit. Our results also support the positive relationship between bank loan availability and trade receivables using instrumental variables regression. These results for trade receivables are consistent with earlier studies in this area.

The remainder of the paper is organized as follows. In Section 6.2, we outline the credit guarantee system in Japan and the ECG program established in 2008. Section 6.3 explains our hypotheses, and Section 6.4 describes the data set. We introduce our empirical strategy and discuss the estimation results in Sections 6.5 and 6.6, respectively. Section 6.7 concludes the paper.

6.2 The Credit Guarantee System in Japan

6.2.1 General Credit Guarantee Program

Because the information gaps between banks and small businesses are large, small businesses often find it difficult to borrow sufficient funds from banks, even if they have low credit risk. To mitigate the resultant credit rationing for small businesses, 52 government-affiliated credit guarantee corporations (hereafter, CGCs) in Japan offered credit guarantees for bank loans to credit-constrained small businesses. In the credit guarantee system, banks offer guaranteed

loans to small businesses, and small businesses pay a guarantee fee to the CGCs. If these guaranteed loans default, the CGCs repay the loan to the banks (referred to as subrogation). Therefore, banks can offer guaranteed loans to risky small businesses with relatively low risk. When CGCs make subrogated payments against default by small businesses, they collect the debts from the defaulting small business. In this system, the ceilings on the credit guarantees for small businesses were 80 million yen in the guarantee program without collateral and 200 million yen in the general guarantee program. The small businesses pay guarantee fees of 0.45% to 1.90%, with the exact amount determined by the firm's credit risk.

The credit guarantee system operating in Japan differs from that in other countries in the following respects. First, the coverage rates in Japan were 100% until October 2007, which then fell to 80% after October 2007. However, the coverage rates returned to 100% in the ECG program, established in October 2008. Thus, the large amount of guaranteed loans offered 100% cover for the defaulting loans. According to Uesugi et al. (2010), full coverage in the credit guarantee systems was adopted only in Japan and Korea. Second, the Japan Finance Corporation, which is a public corporation wholly owned by the Japanese government, offers credit insurance for all CGCs. Coverage rates for this insurance ranged from 70% to 80%, so the CGCs suffered few losses as a result of subrogation.

6.2.2 Emergency Credit Guarantee Program from October 2008

Following the bankruptcy of Lehman Brothers in 2008, the rapid rise in oil prices and the resulting financial shocks, the profitability of many Japanese small businesses deteriorated rapidly. *The 2009 White Paper on Small and Medium Enterprises in Japan* argues that many small businesses were confronted with liquidity shortages, which resulted from the worsening credit constraints and the restricted supply of bank loans. To mitigate these problems, the Small and Medium Enterprise Agency and the CGCs established the ECG program and increased the ceiling on the amount of credit guarantees for small businesses. The ECG program ceilings for each small business were 80 million yen in the case of a guarantee without collateral, and 200 million yen in the case of a guarantee with collateral; these amounts were

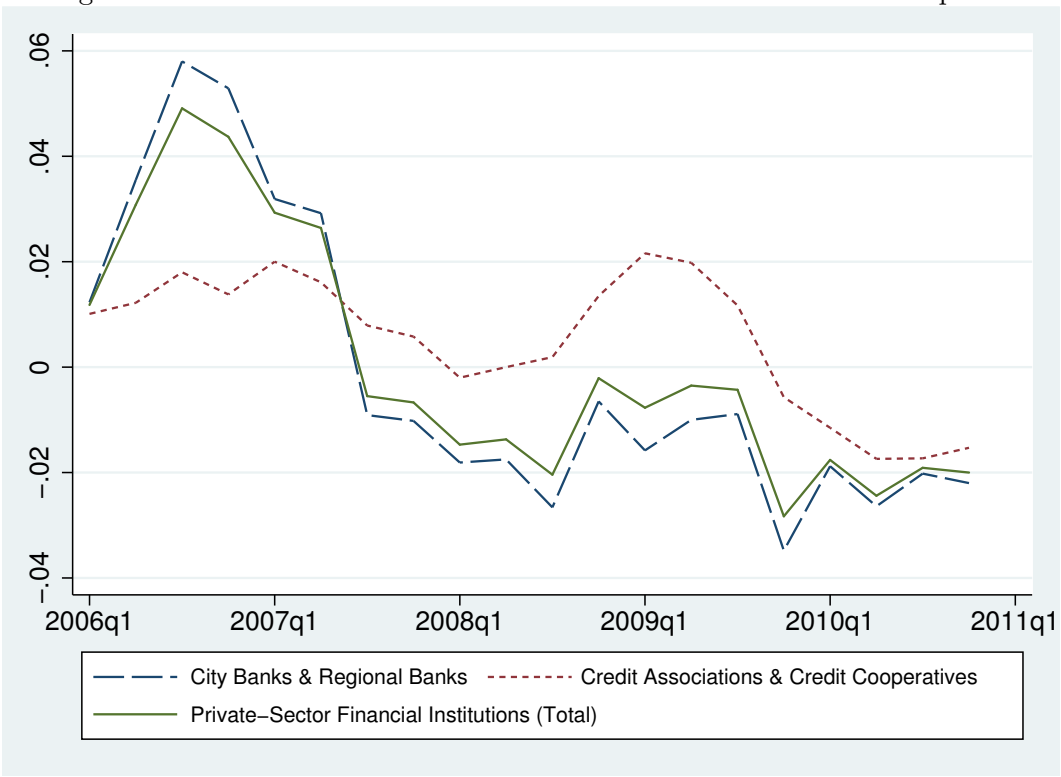
in addition to the ceilings on the general public guarantee program.[6]

The total budget for the ECG program was 20 trillion yen, targeted at some 2.6 million small businesses. As the coverage rate represented 100% of the defaulting guaranteed loans, financial institutions were able to offer risk-free loans for small businesses by using the ECG program. The guarantee rate was 0.8%, which was lower than the rate in the general guarantee program. To access the ECG program, small businesses needed to satisfy at least one of the following three requirements: 1) average sales in the most recent three-month period were 3% or more lower than the same period in the previous year; 2) product costs had increased by more than 20%, and more than 20% of this increase consisted of the increased cost of oil that the small business was unable to pass on in the sale price; and 3) the ratios of average net profit or operating incomes to total sales in the most recent three-month period were 3% lower than the same period in the previous year. In addition to these requirements, small businesses had to operate in one of 760 designated industries in February 2009. The ECG program was a temporary guarantee program that ran from the end of October 2008 to the end of March 2011. Under the ECG program, the total amounts of guaranteed liabilities were 9.181 trillion yen, with the acceptance of 435 million guaranteed loans (by the end of March 2009). Although we are unable to obtain data on the acceptance rate, we assume that small businesses that satisfied the requirements were rarely rejected for assistance because acceptance rates exceeded 90% in the general guarantee program.

To illustrate the impact of the ECG program for aggregate small business lending, we plot the annual growth rate of bank lending for small businesses during the period 2006–10 using seasonal aggregate data in Figure 6.1. As shown, the growth rates of bank lending for small businesses declined from 2007Q2 to 2008Q3. After 2008Q4, corresponding to the commencement of the ECG program, these growth rates returned to their precrisis levels. In particular, the growth rates of bank lending by credit associations and credit cooperatives increased to more than 1% after 2008Q4. Borrowers from these financial institutions are mainly smaller (not middle-sized) firms, which are mainly targeted in our database. This

[6]That is, the total ceilings are 160 million yen in the case of a guarantee without collateral, and 400 million yen in the case of a guarantee with collateral.

Figure 6.1: Growth Rate of Bank Loans for Small and Medium Enterprises



Source: Small and Medium Enterprise Agency, *White Paper on Small and Medium Enterprises in Japan* ; Bank of Japan, *Financial and Economic Statistics Monthly.*
Note: The growth rate of bank loans is defined as (bank loans in year t – bank loans in year t-1)/bank loans in year t-1 for each quarter. According to the Web site of the Japanese Bankers Association, city banks are "large in size, with headquarters in major cities and branches in Tokyo, Osaka, other major cities, and their immediate suburbs." Regional banks are "usually based in the principal city of a prefecture and they conduct the majority of their operations within that prefecture and have strong ties with local enterprises and local governments." See http://www.zenginkyo.or.jp/en/banks/principal/index.html for details.

graph implies that general credit availability for small businesses in Japan improved with the ECG program (2008Q4).

Moreover, Ono et al. (2013) show that the ECG program enhanced credit availability using micro data for small businesses. This is because after the ECG program began, the financial constraints of many small businesses in Japan lessened because they were able to obtain guaranteed loans more easily. However, the increase in guaranteed loans substituted for some nonguaranteed loans. For instance, Ono et al. (2013) show that by using the ECG program, main banks were able to reduce their nonguaranteed loans and level of credit risk by extending ECG-guaranteed loans to borrowers.

6.3 Hypotheses

In this analysis, we investigate whether bank loans and trade credit exhibited a negative or positive relationship during the recent financial crisis. In general, because of the presence of substantial information asymmetry in the credit market, small businesses cannot readily issue bonds or equity. Therefore, their creditors are principally limited to banks and trade suppliers. Smith (1987) argues that trade credit is more expensive than bank loans. If this is accurate, at least from the perspective of pecking order theory, small businesses would seek trade credit only when the availability of bank loans declines (Petersen and Rajan, 1994). Therefore, many previous studies argue that during the financial crisis, small businesses sought trade credit to compensate for the decline in bank loans because the availability of bank loans was limited. As a result, these studies generally imply that bank loans and trade credit received are substitutes.

However, the availability of bank loans can be endogenously determined by trade credit because the cost of trade credit is not always relatively high (Marotta, 2005; Miwa and Ramseyer, 2008; Uesugi et al., 2009). To mitigate this problem, we use the exogenous improvement in bank loan availability for small businesses that occurred with the establishment of Japan's ECG program in 2008. As we have argued, with the establishment of the ECG program, banks were less likely to deny credit applications from small businesses that met the requirements of the program. If bank loans are superior to trade credit received in terms of the cost of financing, and if trade credit received and bank loans are substitutes, small businesses would have switched from trade credit to bank loans during the period of the financial shock.

Conversely, the relationship between trade payables and bank loans can be positive. As Wilner (2000) argue, suppliers are generally unsecured lenders. Therefore, they can increase the supply of trade credit given enhanced bank loan availability. This is because firms that meet the requirements of the ECG program can borrow from banks more easily, and this enhances their ability to repay trade payables. Also, as Miwa and Ramseyer (2008) assert, suppliers possess an advantage over banks in monitoring firm activity. Therefore, suppliers can quickly offer credit to firms when borrowers face short-term unexpected exigencies. Dur-

ing the financial shock, firms and creditors faced uncertainty, so trade credit was preferred to bank loans, even with the enhancements in the availability of the latter. Demand for trade credit then increases if trade credit is not a costly financial source. If this account holds—that is, if bank loans and trade credit are complements—small businesses would receive more trade credit with the improved availability of bank loans following the establishment of the ECG program.

In addition to trade credit received, the availability of bank loans has positive effects on trade receivables, which is a proxy for the provision of credit to customers. As Meltzer (1960) and Petersen and Rajan (1997) argue, firms with better access to bank loans redistribute credit to credit-constrained firms via trade credit. If better access to bank loans increases the provision of trade credit to customers, the trade receivables of firms meeting the ECG program requirements would also increase because bank loan availability for these firms exogenously increased through the ECG program.

6.4 Data

In this study, we use firm-level data on small businesses in Japan from 2006 to 2009. We selected the sampling period to include the two years before and after the bankruptcy of Lehman Brothers. The data are from the Credit Risk Database for Small and Medium Enterprises (CRD) established by several financial institutions and the CGCs under the guidance of the Small and Medium Enterprise Agency in Japan. The data set used in this study includes only corporations in the manufacturing industry that were present in the CRD for more than the past three consecutive years. We omit financial and small farm businesses. Furthermore, some variables[7] include outliers in only the upper values, so we truncate the sample at the 99 percentile to exclude these outliers. When variables[8] include outliers in both the upper and lower values, we truncate at both the 0.5 and 99.5 percentiles of the sample. The data collected on the 80,625 firms from 2006 to 2009 include 91 items from their balance

[7]The variables are Trade Payables, Bank Loans, Trade Receivables Growth, Leverage, Sales Growth, Collateralizable Assets, and Interest Rate.

[8]The variables are Trade Payables Growth, Bank Loans Growth, and ROA (Return on assets).

sheets and profit and loss statements. The total number of firm-year observations is 278,611.

Focusing on the distribution of the number of employees, we can see that the value for the first quartile is 4, the value for the second quartile (median) is 10, and the value for the third quartile is 26. This suggests that the CRD data include many micro firms. The 99th percentile of employees is 248, so the sample share of larger small businesses is small. Overall, although the CRD includes some bias, it also provides a huge firm-level panel data set for a very large number of Japanese small businesses around the time of the global financial crisis, which comprises a great empirical advantage for our analysis. Therefore, the CRD is suitable for investigating the choice of financing in small businesses.

6.5 Trade Payables and Bank Loan Availability

6.5.1 Effects of the ECG Program on Firms' Borrowings

We first determine the effects of the ECG program on firms' bank loans. If the firms' bank loan availability improves following the establishment of the ECG program, the number of bank loans by firms satisfying the ECG program requirements should increase. We estimate the following equation:

$$Bank\ Loans_{i,t} = \alpha_1 Guarantee_i \times YearDummy_t^{2009} + \alpha_2 X_{i,t} + \epsilon_i + \zeta_{i.t}. \tag{6.1}$$

$Bank\ Loans_{i,t}$ is the ratio of a firm's total loans to total assets in year t (total borrowings in year t/total assets in year t). The ratio of total loans increases when the total assets in year t decrease, even if the amounts of bank loans are constant. Therefore, there could be bias in the estimates if we were to use the ratio of bank loans normalized by total assets. To address this problem, we also specify the growth rate of bank loans, which is defined as [(total borrowings in year t – total borrowings in year t-1)/total assets in year t-1] as a proxy for $Bank\ Loans_{i,t}$. $Guarantee_i$ is a dummy variable that takes a value of one if a firm satisfies the requirements for inclusion in the ECG program. $\zeta_{i,t}$ is the error term for firm i in year t

from 2006 to 2009. ϵ_i is firm i's fixed effects. We regard the observations for firms where the guarantee dummy is equal to one as the treatment group.

To identify firms that satisfy the requirements of the ECG program (as described in Subsection 6.2.2), we require monthly financial data on small businesses. However, only yearly financial data are available from the CRD.[9] In addition, data on the purchase cost of oil are unavailable, so we identify these requirements using data on the cost of goods sold. Using the yearly financial data, we identify firms that satisfy any of the following requirements of the ECG program: 1) small businesses whose sales in 2008 fell by more 3% from 2007; 2) small businesses whose cost of goods sold increased by more 20%; and 3) small businesses whose average net profit or operating income to total sales in 2008 declined by 3% compared with 2007. The ECG program commenced at the end of October 2008, so its policy effects should appear in firm financial statements after 2009 because the accounting year-end for many firms in Japan is March 31. Therefore, as a variable for the policy change, we use a year dummy that takes a value of one if the year is 2009 ($YearDummy_t^{2009}$). If those firms satisfying the ECG program requirements increase their total loans after the program commences, the estimated coefficient for $Guarantee_i \times YearDummy_t^{2009}$ will be positive.

$X_{i,t}$ is a vector of seven control variables (Firm Scale, Firm Age, Sales Growth, Current Assets Ratio, Return on assets (ROA), Collateralizable Assets, Interest Rate, Year Dummy). Firm scale is the natural logarithm of total assets in year t–1. Sales growth and ROA are proxies for firm performance, where sales growth is the annual growth rate of a firm's sales [(sales in year t – sales in year t-1)/total assets in year t-1]. We define ROA as the ratio of the sum of a firm's operating income, interest receivables, and dividends to total assets in year t–1. The current assets ratio is a proxy for the demand for short-term credit. The current assets ratio is the ratio of a firm's current assets, excluding cash, to total assets in year t–1. Collateralizable assets are a proxy for collateral, which we define as the ratio of tangible fixed assets to total debts in year t–1. We define the interest rate as the ratio of a firm's interest expenses to the sum of its short- and long-term debt and discounted notes

[9]In general, small businesses prepare financial statements once a year, so monthly data are generally unavailable in any database.

receivable in year t–1.

Table 6.1 provides some summary statistics. As shown, the medians and means of all the explanatory variables are similar, which suggests that outliers are not a significant problem in our estimation. Table 6.2 details the means of the dependent and independent variables by year. In 2009, trade payables and receivables largely fall as a result of the decline in transactions with both suppliers and customers. This is consistent with the data that the mean of sales growth is negative in 2009. In contrast, bank loans increase substantially in 2009, which is after the commencement of the ECG program. The trend in ROA is consistent with the business cycle. We can see that the remaining variables do not change greatly over the sample period.

Table 6.1: Summary Statistics

	N	Mean	Std. Dev.	Min	p1	Median	p99	Max
Trade Payables	278,611	0.113	0.116	0.000	0.000	0.076	0.505	0.617
Trade Payables Growth	276,654	-0.005	0.061	-0.298	-0.199	-0.001	0.200	0.419
Trade Receivables	275,880	0.160	0.095	0.000	0.000	0.142	0.453	0.547
Trade Receivables Growth	276,755	-0.011	0.092	-0.989	-0.305	-0.005	0.261	0.403
Bank Loans	276,255	0.659	0.418	0.000	0.014	0.617	2.326	3.340
Bank Loans Growth	276,571	0.030	0.168	-0.473	-0.287	-0.002	0.717	1.306
Guarantee	278,611	0.642	0.479	0.000	0.000	1.000	1.000	1.000
Guarantee $\times$ Year Dummy^{2009}	278,611	0.163	0.369	0.000	0.000	0.000	1.000	1.000
Firm Age	278,611	3.380	0.649	0.000	0.000	3.434	4.263	4.949
Firm Scale	278,611	12.109	1.626	5.704	8.772	12.026	16.025	19.407
Leverage	276,916	0.877	0.416	0.000	0.175	0.844	2.640	4.031
ROA	278,611	0.015	0.103	-0.806	-0.380	0.021	0.267	0.402
Sales Growth	278,611	-0.015	0.222	-1.000	-0.576	-0.016	0.701	1.393
Collateralizable Assets	278,611	0.376	0.223	0.000	0.007	0.361	0.883	1.000
Current Assets Ratio	278,611	0.373	0.192	0.000	0.043	0.350	0.867	0.999
Interest Rate	278,611	0.022	0.012	0.000	0.000	0.020	0.062	0.109

Note: This table shows summary statistics of variables used in the econometric analysis. *Trade Payables* is the ratio of a firm's trade payables to total assets in year t. *Trade Payables Growth* is (a firm's trade payables in year t - trade payables in year t-1)/total assets in year t-1. *Trade Receivables* is the ratio of a firm's trade receivables to total sales in year t. *Trade Receivables Growth* is (a firm's trade receivables in year t - trade receivables in year t-1)/total assets in year t-1. *Bank Loans* is the ratio of a firm's total loans to total assets in year t *Bank Loans Growth* is defined as (a firm's total borrowings in year t - total borrowings in year t-1)/total assets in year t-1. *Guarantee* is a dummy variable that has a value of one if a firm satisfies the requirements of the ECG program. *Firm Scale* is the natural log of (total assets) in year t–1. *Firm Age* is the natural log of (1+ firm age) in year t. *Leverage* is the book value of debt divided by the book value of assets in year t–1. *ROA* is the ratio of the sum of a firm's operating income, interest receivables, and dividends to total assets. *Sales Growth* is (a firm's sales in year t - sales in year t-1)/sales in year t-1. *Collateralizable Assets* is the ratio of tangible fixed assets to total debts in year t–1. The *Current Asset Ratio* is the ratio of current assets, excluding cash, to total assets in year t–1. *Interest Rate* is the ratio of a firm's interest expenses to the sum of its short-term debt, long-term debt, and discounted bills receivable for each year in year t–1.

Table 6.2: Means of Dependent and Independent Variables, by Year

Year	2006	2007	2008	2009
Trade Payables	0.122	0.120	0.116	0.093
Trade Payables Growth	0.005	0.003	-0.002	-0.026
Trade Receivables	0.169	0.165	0.161	0.148
Trade Receivable Growth	0.007	0.003	-0.007	-0.044
Bank Loans	0.625	0.637	0.650	0.721
Bank Loans Growth	0.028	0.024	0.017	0.052
Guarantee	0.642	0.641	0.642	0.644
Guarantee × Year Dummy^{2009}	0.000	0.000	0.000	0.644
Firm Age	3.336	3.362	3.383	3.432
Firm Scale	12.138	12.096	12.093	12.116
Leverage	0.869	0.875	0.879	0.884
ROA	0.023	0.019	0.015	0.006
Sales Growth	0.042	0.034	0.003	-0.133
Collateralizable Assets	0.379	0.375	0.373	0.376
Current Assets Ratio	0.372	0.374	0.375	0.372
Interest Rate	0.022	0.021	0.022	0.023

Note: This table provides the means of the dependent and independent variables by year. The definitions of the variables are given in the notes accompanying Table 6.1.

Table 6.3 provides the estimated results for equation (6.1). As shown in column (1), we include only Guarantee × Year Dummy^{2009} in the regression equation. The estimated coefficient for Guarantee × Year Dummy^{2009} is positive and statistically significant at the 1% level, which suggests that the bank loan to assets ratio for firms satisfying the requirements of the ECG program increased by 0.02602 after the program began. This result is consistent with the view that credit availability was enhanced by the ECG program (Ono et al., 2013). We also estimate interactive variables with the natural logarithm of the amount of bank loans in year t–1 (column 2) and the ratio of bank loans to total assets in year t–1 (column 3). The estimated coefficients for the interactive variables for Guarantee × Year Dummy^{2009} and ln(the amount of bank loans), and those for the bank loans ratio in year t–1 are positive and statistically significant at the 1% level. The ceiling on the credit guarantee program could represent a restriction for firms with a large amount of loans. This result suggests that these firms increased their bank loans following the start of the ECG program.

The effect of firm scale is negative and statistically significant. This implies that smaller

Table 6.3: Estimation Results for Effect of Emergency Guarantee on Bank Loans

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Bank Loans (Ratio)	Bank Loans (Ratio)	Bank Loans (Ratio)	Bank Loans (Growth)	Bank Loans (Growth)	Bank Loans (Growth)
Guarantee × Year Dummy^{2009}	0.02602***	-0.11368***	-0.08127***	0.00150	-0.01460***	-0.01286***
	(0.00129)	(0.00206)	(0.00176)	(0.00132)	(0.00236)	(0.00205)
Guarantee × Year Dummy^{2009} × ln(Amount of Bank Loans)		0.28962***			0.03262***	
		(0.00338)			(0.00442)	
Guarantee × Year Dummy^{2009} × Bank Loans in year t–1			0.16227***			0.02107***
			(0.00186)			(0.00262)
Firm Scale	-0.04244***	-0.03231***	-0.02997***	0.02178***	0.02505***	0.02535***
	(0.00184)	(0.00181)	(0.00181)	(0.00253)	(0.00253)	(0.00253)
Firm Age	0.00891***	0.00845***	0.00851***	0.01109***	0.01101***	0.01101***
	(0.00145)	(0.00142)	(0.00142)	(0.00142)	(0.00142)	(0.00142)
Sales Growth	-0.18014***	-0.18343***	-0.18337***	-0.05183***	-0.05103***	-0.05105***
	(0.00151)	(0.00147)	(0.00147)	(0.00148)	(0.00147)	(0.00147)
Current Assets Ratio	0.02070***	0.01709***	0.01775***	0.02377***	0.02290***	0.02292***
	(0.00534)	(0.00523)	(0.00522)	(0.00623)	(0.00622)	(0.00622)
Collateralizable Assets	0.09226***	0.07833***	0.07993***	0.10092***	0.10050***	0.10053***
	(0.00572)	(0.00560)	(0.00560)	(0.00656)	(0.00656)	(0.00656)
ROA	-0.35005***	-0.34234***	-0.34136***	-0.05504***	-0.05028***	-0.05003***
	(0.00409)	(0.00402)	(0.00402)	(0.00518)	(0.00514)	(0.00514)
Interest Rate	-1.04020***	-0.91801***	-0.92720***	0.43632***	0.45653***	0.45742***
	(0.04540)	(0.04445)	(0.04442)	(0.04707)	(0.04713)	(0.04713)
Year = 2007	0.00288***	0.00284***	0.00278***	-0.00443***	-0.00445***	-0.00445***
	(0.00078)	(0.00076)	(0.00076)	(0.00098)	(0.00098)	(0.00098)
Year = 2008	0.01476***	0.01429***	0.01419***	-0.01170***	-0.01185***	-0.01184***
	(0.00079)	(0.00077)	(0.00077)	(0.00093)	(0.00092)	(0.00092)
Year = 2009	0.04966***	0.04816***	0.04799***	0.01804***	0.01793***	0.01791***
	(0.00118)	(0.00116)	(0.00116)	(0.00125)	(0.00125)	(0.00125)
Observations	276,255	276,056	276,056	248,541	247,236	247,236
Adjusted R-squared	0.90	0.90	0.90	0.02	0.02	0.02

Note: This table presents the estimates of the fixed-effects (in columns 1–3) and OLS regressions (in columns 4–6) with *Bank Loans* and *Bank Loans Growth* as dependent variables. *Bank Loans* is the ratio of a firm's total loans to total assets in year t [total borrowings in year t/total assets in year t]. *Bank Loans Growth* is (a firm's total borrowings in year t - total borrowings in year t-1)/total assets in year t-1. *Guarantee* is a dummy variable that has a value of one if a firm satisfies the requirements of the ECG program. *Interest Rate* is the ratio of a firm's interest expenses to the sum of its short- and long-term debt, and discounted bills receivable for each year in year t–1. *ln(Bank Loan)* is the natural log of total loans in year t–1. *Firm Scale* is the natural log of (total assets) in year t–1. *Firm Age* is the natural log of (1+ firm age) in year t. *Sales Growth* is (a firm's sales in year t - sales in year t-1)/sales in year t-1. The *Current Asset Ratio* is the ratio of current assets, excluding cash, to total assets in year t–1. *Collateralizable Assets* is the ratio of tangible fixed assets to total debts in year t–1. *ROA* is the ratio of the sum of a firm's operating income, interest receivables, and dividends to total assets. In columns (4)–(6), we use the annual lag of independent variables, apart from *Guarantee* × *Year Dummy*^{2009} and the interaction variables with *Guarantee* × *Year Dummy*^{2009}. We include year dummies from 2007 to 2009. The reference year is 2006. * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level.

firms depend more on bank loans because these firms are relatively informationally opaque. Firm age has a positive effect on bank loans, which implies that older firms are more creditworthy and transparent. The effect of sales growth is negative, which suggests that the assets of firms are growing faster than their total borrowings. Firms with more current assets need more working capital, so the estimated coefficient for the ratio of current assets to bank loans is positive and statistically significant. The collateralizable assets have positive effects on bank loans because collateral mitigates the information problem. Firms with higher cash flow do not need to borrow as much; therefore, the coefficient for ROA is negative and statistically significant. Finally, the estimated coefficient for the interest rate is negative and statistically significant at the 1% level.

As we have argued, the increase in the ratio of bank loans to total assets can result from a decline in total assets, not just from an increase in bank loans, so we reestimate the regression using the annual growth rate of bank loans. The F-test that all $\epsilon_i = 0$ is accepted, so we estimate using OLS regression. We specify the annual differences in $\mathbf{X}_{i,t}$ as control variables. The estimated results for the growth rates of bank loans are shown in columns (4)–(6) of Table 6.3. As shown, the estimated coefficient for Guarantee × Year Dummy^{2009} is not statistically significant (column 4). However, the estimated coefficients for the interactions between Guarantee × Year Dummy^{2009} and ln(the amount of bank loans) and the bank loans ratio in year t–1 are positive and statistically significant at the 1% level, which indicates similar results to when we specified the ratio of bank loans as the dependent variable.

6.5.2 Effects of the ECG Program on Trade Payables

In this subsection, we investigate the relationship between trade payables and bank loan availability. To investigate the hypothesis described in Section 6.3, we estimate the following equation:

$$Trade\ Payables_{i,t} = \beta_1 Guarantee_i \times YearDummy_t^{2009} + \mathbf{X}_{i,t}\beta_2 + \eta_i + \theta_{i,t}. \qquad (6.2)$$

$\mathbf{X}_{i,t}$ is a vector of control variables (Firm Scale, Firm Age, Sales Growth, Current Assets Ratio, ROA, Collateralizable Assets, Interest Rate, Year Dummy). $\theta_{i,t}$ is the error term of firm i in year t from 2006 to 2009. η_i is the firm i's fixed effects. Following Petersen and Rajan (1997), we use the ratio of a firm's trade payables to total assets in year t as a proxy for $Trade\ Payables_{i,t}$. To investigate the effects of the ECG program on trade credit, we use the DID approach. We focus on the interactive variable $Guarantee_i \times YearDummy_t^{2009}$. If firms experiencing improving availability of bank loans receive less trade credit, the estimated coefficient for $Guarantee_i \times YearDummy_t^{2009}$ should be negative. The effect of $Guarantee_i$ is subsumed into the firm's fixed effects η_i, so we omit $Guarantee_i$ from equation (6.2).

Enhanced credit availability could have effects on both the level and change in trade payables, so we estimate the level of trade payables and the difference in the ratio of trade payables to total assets from year t–1 to t. In addition, we use the growth rate of trade payables [defined as (trade payables in year t – trade payables in year t-1)/total assets in year t-1] because this ratio changes when total assets decrease, even if trade payables are constant. In the equations using the difference or growth of trade payables as a dependent variables, we also use the difference in the control variables $\mathbf{X}_{i,t}$ and omit the firm fixed effects, η_i. Given that an F-test indicates that all $\eta_i = 0$ is accepted, we estimate the equation using OLS regression when the growth rate or the difference in trade payables is specified as a dependent variable.

We control for the effects of trade payables by adding several variables in each year; namely, firm scale, firm age, sales growth, the current assets ratio, ROA, collateralizable assets, and interest rates in year t–1. According to Petersen and Rajan (1997), firm demand for short-term credit in general and trade credit in particular determine trade payables. Firm scale, sales growth, the current assets ratio, and ROA are proxies for the demand for short-term credit. To control for the effect of firm size, we use the natural logarithm of total assets in year t–1. Firms whose sales are expanding quickly need working capital and therefore increase their trade payables. The effects of sales growth are positive for trade payables. Firms with higher current assets require short-term financing to match the maturity of their

assets with those of their liabilities, which implies that the current assets ratio has positive effects on trade payables. The current assets ratio also controls for the effect of inventories on trade payables, as argued by Emery (1987) and Daripa and Nilsen (2011). Firms that make more profit receive less trade credit because they have greater cash flow, so we predict that ROA has a negative effect on trade payables. Conversely, firms with lower ROA are poorly performing firms, so ROA can also have positive effects on trade payables.

Firm demand for trade credit is particularly affected by the availability of bank loans. We specify collateralizable assets and interest rates as proxies for the availability of bank loans. As Frank and Maksimovic (2005) argue, suppliers have an advantage in salvaging value from existing assets, which means that they can offer credit to firms with relatively few collateralizable assets. Thus, firms that possess fewer collateralizable assets receive more trade credit because they cannot borrow sufficiently from banks. Furthermore, we predict that firms with a higher interest rate use more trade credit. We use ln(1+age) as a proxy for firm age.

Unfortunately, we do not have information about all of the factors that affect trade payables. Because we employ panel data, we can use the fixed-effects model to eliminate time-invariant unobserved effects (η_i). As argued in Section 6.1, the literature on transaction motives asserts that seasonalities in demand for a firm's product have positive effects on trade payables. The strength of these seasonalities then depends on the type of product, so these effects are controlled for by the firm fixed effects (η_i). Also, the frequency of transaction (argued by Ferris, 1981) is not often changed during the sample period. Therefore, we control this effect by the firm fixed effects (η_i).

Table 6.4 shows the estimated effects of the ECG program on trade payables. If the substitutes hypothesis holds, the estimated coefficients for Guarantee $\times$ Year Dummy^{2009} should be negative. However, the estimated coefficients are positive and statistically significant at the 1% level. These results suggest that firms satisfying the requirements of the ECG program increased trade payables following the start of the program. This implies that firms experiencing enhanced credit availability increased their trade payables, and that bank

Table 6.4: Estimation Results for the Effect on Trade Payables

	(1)	(2)	(3)
Dependent Variable	Trade Payables (Ratio)	Trade Payables (Difference)	Trade Payables (Growth)
Guarantee × Year Dummy^{2009}	0.00243***	0.00365***	0.00344***
	(0.00040)	(0.00047)	(0.00049)
Firm Scale	-0.01789***	-0.02389***	-0.01612***
	(0.00057)	(0.00086)	(0.00081)
Firm Age	-0.00045	-0.00041	0.00052
	(0.00046)	(0.00045)	(0.00050)
Sales Growth	0.04921***	0.04113***	0.05179***
	(0.00047)	(0.00057)	(0.00059)
Current Assets Ratio	0.00485***	-0.04507***	-0.04221***
	(0.00167)	(0.00214)	(0.00213)
Collateralizable Assets	-0.00355**	0.00859***	0.01856***
	(0.00179)	(0.00187)	(0.00189)
ROA	0.01890***	0.03368***	0.04334***
	(0.00125)	(0.00149)	(0.00152)
Interest Rate	0.13011***	-0.06696***	0.00668
	(0.01428)	(0.01657)	(0.01677)
Year = 2007	-0.00040*	-0.00020	-0.00123***
	(0.00024)	(0.00030)	(0.00034)
Year = 2008	-0.00223***	-0.00161***	-0.00551***
	(0.00025)	(0.00029)	(0.00032)
Year = 2009	-0.02189***	-0.02112***	-0.02660***
	(0.00037)	(0.00043)	(0.00046)
Observations	278,611	249,460	248,582
Adjusted R-squared	0.90	0.09	0.11

Note: This table presents estimates of the fixed-effects (in column 1) and OLS regressions (in columns 2 and 3) with *Trade Payables* and *Trade Payables Growth* as dependent variables. *Trade Payables* is the ratio of a firm's trade payables to total assets in year t. *Trade Payables Growth* is (a firm's trade payables in year t - trade payables in year t-1)/total assets in year t-1. The definitions of the independent variables are the same as those in the notes accompanying Table 6.3. In column (2), we specify the annual lags of the dependent and independent variables, apart from *Guarantee* × *Year Dummy*^{2009}. In column (3), we specify the annual lags of all the independent variables, except for *Guarantee* × *Year Dummy*^{2009}. Standard errors in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level.

loans and trade payables are complementary, which is our main result. As we predicted, the estimated coefficients for sales growth, the current asset ratio, and the interest rate are all positive while that for collateralizable assets is negative, as shown in column (1).

In column (2), we estimate equation (6.2) using the annual differences in the ratio of trade payables to total assets and $\mathbf{X}_{i,t}$. In addition, we estimate the regression using the annual growth rate in trade payables and the annual differences in $\mathbf{X}_{i,t}$ in column (3). In columns (2) and (3), we estimate using OLS regression. As shown, the estimated coefficient for Guarantee $\times$ Year Dummy^{2009} is also positive and statistically significant at the 1% level, which suggests that firms increase trade payables with the commencement of the ECG program.

6.5.3 IV Regression

To investigate the relationship between bank loans and trade credit more directly, we estimate the following equation:

$$Trade\ Payables_{i,t} = \gamma_1 BankLoans_{i,t} + \mathbf{X}_{i,t}\gamma_2 + \iota_i + \kappa_{i.t}. \tag{6.3}$$

$\mathbf{X}_{i,t}$ is a vector of control variables defined in Subsection 6.5.2. $\kappa_{i,t}$ is the error term for firm i in year t from 2006 to 2009. ι_i is firm i's fixed effects. If trade payables are substitutes for bank loans, the estimated coefficient for bank loans should be negative. In contrast, if trade payables are complementary to bank loans, the estimated coefficient for bank loans should be positive. Equation (6.2) therefore contains simultaneous relations between bank loans and trade payables, so we estimate using a two-stage least squares fixed-effects model using instrumental variables.

We specify several instrumental variables. One instrumental variable is Guarantee $\times$ Year Dummy^{2009}, as defined in Subsection 6.5.1. The basis for including this variable is that firms satisfying the requirements of the ECG program increased the amount of bank loans after the start of the program. Therefore, the correlation between bank loans and Guarantee $\times$ Year Dummy^{2009} is considered to be positive. As discussed in Subsection 6.5.2, positive effects of

Guarantee × Year Dummy^{2009} on trade payables are the result of the increasing availability of bank loans, which do not directly affect trade payables. Therefore, the effects of Guarantee × Year Dummy^{2009} on trade payables that do not occur via increasing bank loan availability are considered to be insignificant, so Guarantee × Year Dummy^{2009} is a suitable instrumental variable for bank loans.

To test for overidentifying restrictions, we specify several other instrumental variables. As noted in Subsection 6.2.1, the ceiling on the credit guarantee program for the general guarantee program is 80 million yen (without collateral) and 200 million yen (with collateral). Firms with higher amounts of bank loans are then likely to meet the ceiling on the credit guarantee, which represents a severe credit constraint for these firms. Increases in the credit guarantee ceiling relax the credit constraints and enhance credit availability for firms with higher amounts of bank loans. Therefore, the interaction variables of Guarantee × Year Dummy^{2009} and the amount of bank loans in year t–1 are positively correlated with the ratio of bank loans to total assets in year t. Meanwhile, trade credit for firms with large amounts of bank loans changes only through the enhanced bank loan availability resulting from establishment of the ECG program. Therefore, we consider the interaction between Guarantee × Year Dummy^{2009} and the amount of bank loans in year t–1 as a suitable instrumental variable. We use the natural log of total loans in year t–1 as a proxy of the amount of bank loans. To check for robustness, we also use the bank loans to total assets ratio in year t–1 (Bank Loans in year t–1) as a proxy of the amount of bank loans.

The results for equation (6.3) are shown in Table 6.5. The instrumental variables are Guarantee × Year Dummy^{2009} in column (1), Guarantee × Year Dummy^{2009} and Guarantee × Year Dummy^{2009} × ln(Amount of Bank Loans in year t–1) in column (2), and Guarantee × Year Dummy^{2009} and Guarantee × Year Dummy^{2009} × Bank Loans in year t–1 in column (3). The results of the first-stage regression are shown in Table 6.3. The signs of the instrumental variables are consistent with our predictions. The coefficients of all instrumental variables are statistically significant at the 1% level, which suggests that we can reject the weak instruments. In addition, the p-values of the instrumental variables are 0.600 in column

Table 6.5: Estimation Results for Effect of Bank Loans on Trade Payables (IV Regression)

	(1)	(2)	(3)	(4)
Dependent Variable	Trade Payables (Ratio)	Trade Payables (Ratio)	Trade Payables (Ratio)	Trade Payables (Growth)
Bank Loans	0.09409***	0.10160***	0.09557***	1.03388***
	(0.01706)	(0.00404)	(0.00395)	(0.19974)
Firm Scale	-0.01369***	-0.01340***	-0.01367***	-0.04369***
	(0.00098)	(0.00067)	(0.00066)	(0.00590)
Firm Age	-0.00127**	-0.00134***	-0.00129**	-0.01082***
	(0.00052)	(0.00051)	(0.00050)	(0.00266)
Sales Growth	0.06649***	0.06790***	0.06681***	0.10500***
	(0.00313)	(0.00090)	(0.00088)	(0.01028)
Current Assets Ratio	0.00234	0.00253	0.00264	-0.06715***
	(0.00187)	(0.00186)	(0.00185)	(0.00819)
Collateralizable Assets	-0.01215***	-0.01280***	-0.01223***	-0.08429***
	(0.00255)	(0.00203)	(0.00201)	(0.02116)
ROA	0.05240***	0.05531***	0.05312***	0.09813***
	(0.00634)	(0.00204)	(0.00201)	(0.01191)
Interest Rate	0.23101***	0.24043***	0.23403***	-0.44803***
	(0.02383)	(0.01640)	(0.01625)	(0.10077)
Year = 2007	-0.00070**	-0.00072***	-0.00070***	0.00340**
	(0.00027)	(0.00027)	(0.00027)	(0.00138)
Year = 2008	-0.00370***	-0.00383***	-0.00374***	0.00682***
	(0.00037)	(0.00028)	(0.00028)	(0.00257)
Year = 2009	-0.02668***	-0.02719***	-0.02679***	-0.04355***
	(0.00116)	(0.00040)	(0.00040)	(0.00372)
Observations	276,255	276,056	276,056	245,735
J-statistics	-	0.276	0.011	2.345
P-value of J-statistics	-	0.600	0.918	0.126

Note: This table presents estimates of the two-stage least squares fixed-effects regression (columns 1–3) and the two-stage least squares regression (column 4) with *Trade Payables* and *Trade Payables Growth* as dependent variables. *Trade Payables* is the ratio of a firm's trade payables to total assets in year t. *Trade Payables Growth* is (a firm's trade payables in year t - trade payables in year t-1)/total assets in year t-1. The instrumental variables are *Guarantee* × *Year Dummy*^{2009} in column (1), *Guarantee* × *Year Dummy*^{2009} and *Guarantee* × *Year Dummy*^{2009} × *ln(Amount of Bank Loans)* in column (2), *Guarantee* × *Year Dummy*^{2009} and *Guarantee* × *Year Dummy*^{2009} × *Bank Loans* in year t–1 in column (3), and *Guarantee* × *Year Dummy*^{2009} × *ln(Amount of Bank Loans)* and *Guarantee* × *Year Dummy*^{2009} × *Cash Holdings* in column (4). The definitions of the independent variables and instrument variables are the same as those in the notes accompanying Tables 6.1 and 6.3. In column (4), we use the annual lag of independent variables, apart from *Bank Loan Growth*. *ln(Amount of Bank Loans)* is the natural log of total loans in year t–1. *Cash Holdings* is the ratio of cash holdings to total assets in year t–1. Standard errors in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level.

(2) and 0.918 in column (3), so the requirements for the instrumental variables are satisfied. In all specifications, the estimated coefficients for bank loans are positive and statistically significant at the 1% level. These results thus reject the substitution hypothesis between trade payables and bank loans. The results of the control variables are similar to those estimated by the fixed-effects model shown in column (1) of Table 6.4.

To check robustness, we use the growth rate of trade payables growth as a dependent variable and the growth rate of bank loans growth as an independent variable in column (4) of Table 6.5. Given that the F-test indicates that the hypothesis that all $\iota_i = 0$ is accepted, we estimate the equation using two-stage least squares regression. We find that the J-test of instruments rejects exogeneity if we employ the same instrumental variables used in columns (2) and (3). Therefore, we use Guarantee $\times$ Year Dummy^{2009} $\times$ ln(Amount of Bank Loans in year t–1) and Guarantee $\times$ Year Dummy^{2009} $\times$ Cash Holdings (defined as the ratio of cash holdings to total assets in year t–1). We omit the Guarantee $\times$ Year Dummy^{2009} from the list of instrumental variables because this variable does not have a significant effect on the growth rate of bank loans (see Table 6.3). In addition, firms with higher cash holdings do not have an incentive to increase borrowings, so we use the interactive variable with cash holdings. The J-statistics show that the requirement for instrumental variables is satisfied in column (4). The results of the IV regression show that the estimated coefficient for the growth rate of bank loans is positive and statistically significant at the 1% level. This also implies that the relationship between trade payables and bank loans is complementary.

6.5.4 Discussion

Sufficient Amount of Funds?

We interpret the results in this section as being consistent with the complementary hypothesis, but our results can also be consistent with the substitution hypothesis as follows. After commencing the ECG program, firms can increase loans from financial institutions, but these may not be sufficient. Therefore, they increase trade payables to compensate for any financial shortfall. This implies that the positive relationship between trade payables and bank loans

is consistent with the substitution hypothesis. To investigate which hypothesis is suitable, we need to establish whether small businesses meeting the requirements of the ECG program face severe financial constraints. If they can borrow a sufficient amount of funds, we interpret this as inferring support for the complementary hypothesis.

As we argued in Section 6.2, the ECG program ceilings for each small business were 80 million yen in the case of a guarantee without collateral, and 200 million yen in the case of a guarantee with collateral, these amounts being in addition to the ceilings on the general public guarantee program. That is, the total ceilings are 160 million yen in the case of a guarantee without collateral, and 400 million yen in the case of a guarantee with collateral.

According to Chusho Kigyo Jittai Chosa (Basic Survey of Small and Medium Enterprises) by the Small and Medium Enterprise Agency, the total average borrowings of a small business are 85.6 million yen (in fiscal year 2009), so this ceiling is a sufficient amount for small businesses to relax their credit constraints. Therefore, after the start of the ECG program, banks increased their credit supply for small businesses because they offered loans without any credit risk. We can interpret this as meaning that small businesses that satisfied the requirement of the ECG program were less credit rationed after the commencement of the program.

In addition, interest rates are not very high for firms with guarantee requirements. The average interest rates for these firms are 2.16% in 2007, 2.30% in 2008, and 2.14% in 2009. These values suggest that the average interest rates returned to their precrisis level in 2009. This implies that firms did not suffer under a higher cost of bank loans after the start of the ECG program. Based on this discussion, firms meeting the requirements of the ECG program should be able to borrow a sufficient amount of bank loans and therefore we interpret this positive relationship between bank loans and trade payables as supporting the complementary hypothesis.

Supply-side Effects on Trade Credit

We argue that the one reason for the positive relationship between trade payables and bank loan availability is the increase in the supply of trade credit by sellers. However, if this effect is significant, positive effects could be consistent with the substitution hypothesis. When the increase in the supply effects of trade credit offset the decrease in the demand effects through enhanced loan availability, we observe positive relationships under the substitute relationship. To address this, we estimate equations (6.2) and (6.3) for only those firms with a constant supply of trade credit by including firms with an already high level of ability to repay trade payables before the commencement of the ECG program. As these firms are already creditworthy, the supply effects on trade credit resulting from the ECG program should be insignificant.

We use liquidity (defined as the ratio of cash holdings to total assets) in year t-1 as a proxy for the ability to repay. We limit ourselves to firms with liquidity in the top tertile, as these have a high ability to repay. Columns (1)–(3) in Table 6.6 provide the estimation results obtained using OLS and fixed-effects regressions, and Columns (4)–(7) detail those obtained using IV regression. As shown, apart from the estimates in columns (1) and (4), the coefficients for Guarantee $\times$ Year Dummy^{2009} and Bank Loans are positive and statistically significant. These results suggest that we continue to support the complementary hypothesis when we control for the supply effects of trade credit. However, the magnitudes of the coefficients are smaller than when we included all firms in the sample. For example, column (1) of Table 6.6 shows that the coefficient for Guarantee $\times$ Year Dummy^{2009} on the trade payables ratio is 0.00086, which is not statistically significant. In contrast, in column (1) of Table 6.4, the same coefficient is 0.00243, which is larger than when we restricted our sample to firms with high liquidity. This suggests that the positive relationships found are not robust for firms with high liquidity. A possible reason is that the supply effects caused by enhancing credit availability are weak for firms with high liquidity. However, we do not find support for the substitution hypothesis, even if we control for the supply effects of trade credit.

Table 6.6: Estimation Results for Effect of Bank Loans on Trade Payables (Firms with High Liquidity)

	(1)	(2)	(3)
Dependent Variable	Trade Payables (Ratio)	Trade Payables (Difference)	Trade Payables (Growth)
Guarantee × Year Dummy^{2009}	0.00086	0.00236***	0.00198***
	(0.00078)	(0.00083)	(0.00087)
Observations	92,870	82,274	81,888
Adjusted R-squared	0.86	0.09	0.11

	(4)	(5)	(6)	(7)
Dependent Variable	Trade Payables (Ratio)	Trade Payables (Ratio)	Trade Payables (Ratio)	Trade Payables (Growth)
Bank Loans	0.03112	0.06084***	0.06054***	0.41128***
	(0.02869)	(0.00622)	(0.00604)	(0.07999)
Observations	92,269	92,212	92,212	87,082
J-statistics	-	1.942	1.901	0.562
P-value of J-statistics	-	0.1634	0.168	0.454

Note: This table presents estimates of the fixed-effects regression (in column 1), OLS regressions (in columns 2 and 3), the two-stage least squares fixed-effects regression (columns 4–6) and the two-stage least squares regression (column 7) with *Trade Payables* and *Trade Payables Growth* as dependent variables using observations with liquidity in the top tertile. Liquidity is defined as the ratio of cash holdings to total assets. The definitions of the independent and dependent variables are the same as those in the notes accompanying Tables 6.4 and 6.5. We omit the results of control variables from this table. The instrumental variables are *Guarantee* × *Year Dummy*^{2009} in column (4), *Guarantee* × *Year Dummy*^{2009} and *Guarantee* × *Year Dummy*^{2009} × *ln(Amount of Bank Loans)* in columns (5) and (7), and *Guarantee* × *Year Dummy*^{2009} and *Guarantee* × *Year Dummy*^{2009} × *Bank Loans* in year t–1 in column (6). In columns (2), (3), and (7), we use the annual lag of independent variables, apart from *Guarantee* × *Year Dummy*^{2009} and *Bank Loan Growth*. In column (2), we use the annual lag of *Trade Payables* as a dependent variable. Standard errors in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level.

6.6 Trade Receivables and Bank Loan Availability

6.6.1 Estimation Strategy

In this section, we investigate the relationship between trade receivables and bank loan availability. To investigate whether bank loan availability has positive effects on trade receivables, we estimate the following regression equation:

$$Trade\ Receivables_{i,t} = \delta_1 Guarantee_i \times YearDummy_t^{2009} + \mathbf{Y}_{i,t}\delta_2 + \lambda_i + \mu_{i.t}. \qquad (6.4)$$

$\mathbf{Y}_{i,t}$ is a vector of control variables (Firm Scale, Firm Age, Sales Growth, ROA, Leverage, Interest Rate, Year Dummy). $\mu_{i,t}$ is the error term for firm i in year t from 2006 to 2009. λ_i is firm i's fixed effects. Following Petersen and Rajan (1997), we use the ratio of a firm's trade receivables to total sales in year t as a proxy for $Trade\ Receivables_{i,t}$. We regress the annual difference in the ratio of trade receivables to total sales because $Guarantee_i$ can have some effects on both the level and the change in $Trade\ Receivables_{i,t}$. We also estimate the regression using the growth rate of trade receivables [defined as (trade receivables in year t – trade receivables in year t-1)/total assets in year t-1] because this ratio changes when total sales decrease, even if trade receivables are constant. $Guarantee_i$ is a dummy variable that takes a value of one if a firm satisfies the requirements of the ECG program. $YearDummy_t^{2009}$ is a dummy variable with a value of one if the year is 2009, being the year of the policy change. If firms experiencing higher bank loan availability offer trade credit to their customers, the coefficient of $Guarantee_i \times YearDummy_t^{2009}$ is positive.

The provision of trade credit to customers is costly for suppliers because it means that they finance all trade receivables until maturity. Accordingly, if the borrowing constraint for customers is binding, the suppliers must reduce their level of inventory investment. In addition, they carry default risk and so must frequently monitor the creditworthiness of their customers, which also suggests that the suppliers of trade credit bear monitoring costs. Therefore, as Petersen and Rajan (1997) and Molina and Preve (2009) conclude, creditworthy

firms offer more trade credit, whereas firms experiencing financial distress reduce their offers of trade credit. In addition, if firms face a reduced supply of bank credit (for example, when banks charge higher interest rates), they have every incentive to reduce trade credit to their own customers.

We employ the interest rate and leverage as proxies for firm creditworthiness. We define interest rates as the ratio of a firm's interest expenses to the sum of its short- and long-term debt and discounted notes receivable in year t–1. Leverage is the ratio of liabilities to total assets in year t–1. We predict that leverage and interest rates exert negative effects on trade receivables.

Following Petersen and Rajan (1997), we also specify firm scale, firm age, sales growth, and ROA (as a proxy for profitability), as control variables. To control for firm size, we specify the natural logarithm of the firm's assets. We predict that profitable and growing firms offer more credit, so we expect the estimated coefficients for ROA and sales growth to be positive. Alternatively, as Petersen and Rajan (1997) argue, the estimated coefficients for ROA and sales growth can be negative because firms that reduce their sales and profits offer more trade credit to maintain customer relationships. We define ROA as the ratio of the sum of a firm's operating income, interest receivables, and dividends to total assets in year t–1. Sales growth is defined as the annual growth rate of a firm's sales [(sales in year t – sales in year t-1)/total assets in year t-1]. In justification, Long et al. (1993) demonstrate that younger firms offer more credit to allow customers to evaluate the quality of their product prior to payment. Following these results, we expect the estimated coefficient for firm age to have a negative effect on trade credit. For this, we use the natural logarithm of one plus firm age. Seasonalities and the sales uncertainty of a firm's product depend on the type of product. Therefore, we control for these effects on trade receivables using firm individual effects ($\mu_{i,t}$). Firm individual effects ($\mu_{i,t}$) also control for the frequency of transactions, (as argued by Ferris, 1981).

6.6.2 Effects of the ECG Program on Trade Receivables

The estimation results are shown in Table 6.7. We estimate equation (6.4) using the fixed-effects model in column (1) and OLS in columns (2) and (3) because the null hypothesis that all $\lambda_i = 0$ is accepted. We show the result using ratios in column (1), the result using the annual difference in the ratio of trade receivables to total sales from year t–1 to t in column (2), and the result using the growth rate of trade receivables in column (3). The estimated coefficients for Guarantee × Year Dummy^{2009} are positive and statistically significant at the 1% or 5% level in columns (1) and (2). These results suggest that firms meeting the ECG program requirements offer more trade credit, which implies that bank loan availability has a positive effect on trade receivables. However, if we use the growth rate of trade receivables (in column 3), the coefficient of Guarantee × Year Dummy^{2009} becomes negative and statistically significant at the 1% level, which suggests that the relationship between bank availability and trade receivables is not robust.

As shown in columns (1)–(3), the effects of firm age are negative, but not statistically significant in columns (1) and (2). The coefficients of sales growth and ROA are negative and statistically significant at the 1% or 10% level in columns (1) and (2). The interest rate and leverage have negative effects on trade receivables apart from the result for the interest rate in column (3), supporting the argument that creditworthy firms offer more trade credit.

6.6.3 IV Regression

Similar to Subsection 6.5.3, we estimate the following regression:

$$Trade\ Receivables_{i,t} = \pi_1 Bank\ Loans_{i,t} + \mathbf{Y}_{i,t}\pi_2 + \nu_i + \xi_{i.t}. \tag{6.5}$$

$\xi_{i,t}$ is the error term of firm i in year t from 2006 to 2009. ν_i is firm i's fixed effects. If firms that experience enhanced credit availability offer more trade credit to their customers, the estimated coefficient for $Bank\ Loans_{i,t}$ will be positive. We assume that $BankLoans_{i,t}$ is an endogenous variable. We use Guarantee × Year Dummy^{2009} as an instrumental variable. To test for overidentifying restrictions, we also use Guarantee × Year Dummy^{2009} × ln(Amount

Table 6.7: Estimation Results for the Effect on Trade Receivables

	(1)	(2)	(3)
Dependent Variable	Trade Receivables (Ratio)	Trade Receivables (Difference)	Trade Receivables (Growth)
Guarantee × Year Dummy^{2009}	0.00157***	0.00129**	-0.00359***
	(0.00044)	(0.00050)	(0.00071)
Firm Scale	-0.01743***	-0.04316***	-0.01621***
	(0.00063)	(0.00088)	(0.00133)
Firm Age	-0.00034	-0.00035	-0.00151**
	(0.00050)	(0.00056)	(0.00074)
Sales Growth	-0.00144***	-0.01180***	0.08992***
	(0.00052)	(0.00063)	(0.00089)
ROA	-0.00278*	-0.01210***	0.03457***
	(0.00143)	(0.00152)	(0.00271)
Interest Rate	-0.10738***	-0.08994***	0.10935***
	(0.01554)	(0.01551)	(0.02550)
Leverage	-0.00527***	-0.00869***	-0.00496**
	(0.00101)	(0.00138)	(0.00219)
Year = 2007	-0.00123***	-0.00174***	-0.00332***
	(0.00026)	(0.00034)	(0.00049)
Year = 2008	-0.00501***	-0.00490***	-0.01175***
	(0.00027)	(0.00032)	(0.00047)
Year = 2009	-0.01881***	-0.01660***	-0.03764***
	(0.00040)	(0.00045)	(0.00065)
Observations	274,219	245,538	247,331
Adjusted R-squared	0.77	0.03	0.13

Note: This table presents estimates of the fixed-effects (in column 1) and OLS regressions (in columns 2 and 3) with *Trade Receivables* and *Trade Receivables Growth* as dependent variables. *Trade Receivables* is the ratio of a firm's trade receivables to total sales in year t. *Trade Receivables Growth* is defined as (a firm's trade receivables in year t - trade receivables in year t-1)/total assets in year t-1. *Leverage* is the book value of debt divided by the book value of assets in year t–1. The definitions of the other independent variables are the same as those in the notes accompanying Tables 6.1 and 6.3. In column (2), we use the annual lag of dependent and independent variables, apart from *Guarantee* × *Year Dummy*^{2009}. In column (3), we use the annual lag of independent variables, apart from *Guarantee* × *Year Dummy*^{2009}. Standard errors in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level.

Table 6.8: Estimation Results for Effect of Bank Loans on Trade Receivables (IV Regression)

	(1)	(2)	(3)	(4)
Dependent Variable	Trade Receivables (Ratio)	Trade Receivables (Ratio)	Trade Receivables (Ratio)	Trade Receivables (Growth)
Bank Loans	0.06239***	0.06672***	0.06121***	0.38256**
	(0.01803)	(0.00600)	(0.00603)	(0.15315)
Firm Scale	-0.01707***	-0.01703***	-0.01709***	-0.02746***
	(0.00068)	(0.00065)	(0.00065)	(0.00469)
Firm Age	-0.00074	-0.00078	-0.00073	-0.00530***
	(0.00053)	(0.00051)	(0.00051)	(0.00174)
Sales Growth	0.01028***	0.01111***	0.01005***	0.11082***
	(0.00351)	(0.00127)	(0.00128)	(0.00833)
ROA	0.01103**	0.01216***	0.01090***	0.05615***
	(0.00439)	(0.00201)	(0.00201)	(0.00860)
Interest Rate	-0.06589***	-0.06269***	-0.06635***	-0.07359
	(0.01996)	(0.01650)	(0.01645)	(0.07864)
Leverage	-0.02644***	-0.02812***	-0.02604***	-0.01909***
	(0.00682)	(0.00252)	(0.00253)	(0.00650)
Year = 2007	-0.00133***	-0.00134***	-0.00133***	-0.00162*
	(0.00028)	(0.00027)	(0.00027)	(0.00084)
Year = 2008	-0.00565***	-0.00570***	-0.00563***	-0.00712***
	(0.00035)	(0.00029)	(0.00028)	(0.00188)
Year = 2009	-0.02143***	-0.02169***	-0.02136***	-0.04701***
	(0.00112)	(0.00047)	(0.00047)	(0.00294)
Observations	273,233	273,160	273,160	245,692
J-statistics	-	0.077	0.011	0.001
P-value of J-statistics	-	0.782	0.915	0.976

Note: This table presents estimates of the two-stage least squares fixed-effects regression (columns 1–3) and the two-stage least squares regression (column 4) with *Trade Receivables* and *Trade Receivables Growth* as dependent variables. *Trade Receivables* is the ratio of a firm's trade receivables to total sales in year t. *Trade Receivables Growth* defined as (a firm's trade receivables in year t - trade receivables in year t-1)/total assets in year t-1. The instrumental variables are *Guarantee* × *Year Dummy*^{2009} in column (1), *Guarantee* × *Year Dummy*^{2009} and *Guarantee* × *Year Dummy*^{2009} × *ln(Amount of Bank Loans)* in year t–1 in column (2), *Guarantee* × *Year Dummy*^{2009} and *Guarantee* × *Year Dummy*^{2009} × *Bank Loans* in year t–1 in column (3), and *Guarantee* × *Year Dummy*^{2009} × *ln(Amount of Bank Loans)* in year t–1 and *Guarantee* × *Year Dummy*^{2009} × *Cash Holdings* in year t–1 in column (4). The definitions of the independent variables and instrumental variables are the same as those in the notes accompanying Tables 6.3 and 6.7. In column (4), we use the annual lag of the independent variables, apart from *Bank Loan Growth*. Standard errors in parentheses. * denotes significance at the 10% level, ** denotes significance at the 5% level, and *** denotes significance at the 1% level.

of Bank Loans) and Guarantee × Year Dummy^{2009} × Bank Loans in year t–1 as instrumental variables. The estimation results are shown in columns (1)–(3) of Table 6.8. We employ the two-stage least squares fixed-effects model. In columns (2) and (3), the p-values of the J-statistics are 0.782 and 0.915, respectively, which confirm the null hypothesis that the instruments are uncorrelated with the error term. Therefore, the instrumental variables used in columns (2) and (3) are valid. In all specifications, the estimated coefficients for bank loans are positive and statistically significant at the 1% level, which implies that bank loan availability has positive effects on the provision of trade credit. In contrast to the results in Table 6.7, the coefficients of sales growth turn out to be positive, which suggests that better-performing firms offer more trade credit to their customers. The estimated results for leverage and the interest rate are similar to those obtained by the simple model in Table 6.7.

In addition, we use the annual growth rate of trade receivables and bank loans as dependent and independent variables to confirm robustness in column (4) of Table 6.8. We use Guarantee × Year Dummy^{2009} × ln(Amount of Bank Loans) and Guarantee × Year Dummy^{2009} × Cash Holdings, which are the same instrumental variables used in Table 6.5. We estimate the two-stage least squares model because the null hypothesis that all $\nu_i = 0$ is accepted. The p-value of the J-statistic is 0.976, so the requirement for the instruments is satisfied. As shown, the estimated coefficient for bank loans is positive and statistically significant, which suggests that bank loan availability has a positive effect on trade receivables.[10]

6.7 Conclusion

In this paper, we investigate the relationship between bank loan availability and trade credit during the global financial crisis using small business data. By adopting a unique identification strategy, we find that the substitution hypothesis between bank loan availability and trade payables is not supported. Instead, we show that the relationship between these sources

[10] In the regressions for equations (6.4) and (6.5), we specify trade receivables growth normalized by total sales. The results are similar with those using trade receivables growth normalized by total assets. However, with those normalized by total sales, the p-values of the J-statistics are less than the 1% level, which shows that the correlations between the error terms and the instruments are significant.

of finance is complementary. Similar to many previous studies, the relationship between bank loan availability and trade receivables is positive, which implies that creditworthy firms offer more trade credit to their customers.

Our findings have some implications for the ongoing debate about whether trade credit is inferior to bank loans. As we argued, existing studies (for example, Smith, 1987; Petersen and Rajan, 1994) argue that the cost of trade credit is extremely high, so the substitution relationship between trade credit and bank loans is supported. However, we find that firms with high levels of bank loan availability also use trade credit, which suggests that bank loans and trade payables are instead complementary. This implies that trade credit is not inferior to bank loans.

Chapter 7

Leverage and Firm Performance of Small Businesses: Evidence from Japan

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Abstract

Highly leveraged small businesses cannot obtain enough credit because of the debt overhang problem. Therefore, highly leveraged firms may lose potential profits from profitable investment opportunities in which they are unable to invest. On the other hand, highly leveraged small businesses can enhance their performance because banks and trade creditors monitor their activity and prevent inefficient management. Using small-business data for Japan, we empirically investigate the relationship between firm performance and leverage. We find, first, that highly leveraged small businesses increase their trade payables less even if they have investment opportunities. Second, highly leveraged small businesses convert more bills receivables into cash by selling them to finance companies to finance their growth opportunities. Third, highly leveraged firms enjoy stronger performance (measured as firm sales growth or profitability) compared with low-leveraged firms. These results highlight the benefits of high leverage for small businesses.

Keywords: leverage; trade credit; bank credit; firm performance; small business

JEL classification: G32; G33

7.1 Introduction

We investigate how highly leveraged small businesses finance their profitable investment opportunities, and the relationship between leverage and firm performance for small businesses. We also focus on the effects of extremely high leverage, which has been regarded as financial distress in previous studies (for example, Opler and Titman, 1994). Previous studies showed that the cost of high leverage can lead to a negative relationship between leverage and firm performance. First, as Myers (1977) argued, debt overhang problems create underinvestment problems and cause poor firm performance. Even if firms with high leverage have new investment projects that generate positive net present values (NPV), they cannot issue new junior debt. Because the earnings generated by new investment projects are used to pay off debts to existing debt holders, new junior debtors do not obtain adequate payments from the earnings of new projects. Therefore, banks and other creditors do not offer credit for new projects with positive NPVs. As highly leveraged firms cannot obtain enough credit, they can lose potential profits from profitable investment opportunities of which they are unable to take advantage.

Second, highly leveraged firms have a high probability of bankruptcy on average (Altman, 1984). For creditors, it is difficult to judge whether highly leveraged firms have good investment opportunities because the information asymmetry between borrowers and creditors is significant. As a result, highly leveraged firms with positive NPVs cannot find new creditors, and they lose potential earnings from new projects. In the case of small businesses, the asymmetric information is more severe (Berger and Udell, 1998). Third, some papers (for example, Cole et al., 2004) argued that large banks mitigate the information asymmetry for small businesses by using hard information, such as information from firms' financial statements.[1] However, banks might deny loan applications from highly leveraged (generally, financially weak) small businesses, even if they face profitable investment opportunities.

The corporate finance literature for large and listed firms mainly focuses on the cost of high leverage. In contrast, especially for small businesses, the benefits of high leverage have

[1] Caneghem and Campenhout (2012) showed that the quality of financial statements increases borrower's leverage.

been established. First, according to Storey (1994), "small business owners do not have to concern themselves with reporting their actions to external shareholders, and so 'performance monitoring' effectively does not exist" (p. 11). If small businesses use high levels of debt (i.e., bank loans or trade credit), banks and trade partners monitor the activity of small businesses and prevent inefficient management.

Second, as Jensen (1986) argued, the threat of defaulting on debt payments makes firms more efficient.[2] As highly leveraged firms that have large amounts of debt have to pay off debts and make interest payments, they have an incentive to earn more cash from efficient investments and to enhance their performance. Furthermore, because of the threat of default on debt payments, they do not increase their debts and finance profitable investment opportunities without using debt. In the case of small businesses, owners lose personal assets when their firms default because these assets generally are pledged as collateral. Therefore, the incentive for efficient management is strong in highly leveraged small businesses.

Third, as highly leveraged firms have greater access to credit than low-leveraged firms, they enjoy greater competitiveness (Campello, 2006). The information asymmetry between small businesses and creditors is significant, which leads to credit rationing for small businesses. More highly leveraged small businesses and their creditors might mitigate the information problem using some form of lending technology (argued in Berger and Udell, 2006), so that these firms can improve their performance.

Many studies investigated the cost of high leverage for borrowers using data on listed firms. Opler and Titman (1994) is a leading empirical study about high leverage. They showed that highly leveraged firms, which are more likely to be financially distressed, lose their sales and operating incomes in industry downturns. As a result, they lose some of their substantial market shares to their more conservatively financed competitors. Similarly, Lang et al. (1996), Aivazian et al. (2005), Ahn et al. (2006), and Cai and Zhang (2011) found negative relationships between leverage and firm performance. Using small-business data, Weill (2008) investigated the relationships between leverage and firm performance and found

[2] As Berger and Udell (1998) argued, the agency problem between shareholders and managers and the free cash flow problem discussed by Jensen (1986) is not significant in the case of small businesses because ownership and control generally are not separated.

that these relationships are either positive or negative using data of EU countries. Agostino and Trivieri (2010) also argued that the performance of firms with higher bank debts is lower and that the negative effects are weakened by the high competition between banks in Italy.

In this paper, we investigate the relationship between leverage and firm performance, focusing on small businesses. As we argued, the relationship between leverage and firm performance can be either positive or negative for small businesses, but few studies have investigated this relationship empirically using small-business data. Furthermore, previous empirical studies have mainly focused on the cost of high leverage. To overcome the limitations of previous studies, we use firm-level data from about 90,000 small businesses located in Japan after 1998 to investigate the relationship between leverage and firm performance.

Small-business data from Japan are suitable for investigating the relationship between leverage and firm performance. According to Demirguc-Künt and Levine (1999) (in Table 1), the ratio of bank assets to GDP in Japan is the third highest among the 63 countries considered in the study.[3] Therefore, the Japanese credit market is regarded as a bank-based financial system. Access to bank loans in Japan for small businesses is considered to be easier than in other developed countries. As a result, the leverage of small businesses is higher. In fact, the average leverage rate in our data is 0.90 (see Table 7.3), which is higher than the leverage of small businesses in the EU (shown in Joeveer, 2013). Japanese data include a large number of very highly leveraged small businesses, which is the main difference between our database and that of previous studies. Therefore, we can investigate more accurately whether the costs and benefits of high leverage are significant for small businesses using Japanese data.

The main findings of this paper are as follows. First, we investigate whether highly leveraged firms can acquire enough credit from banks or trade partners when they face profitable investment opportunities. Previous studies have argued that highly leveraged firms cannot acquire enough credit compared with low-leveraged firms if the debt overhang problem is serious. Our results show that short-term borrowings from banks and trade payables for highly leveraged small businesses do not increase even if the small businesses have profitable invest-

[3]Switzerland has the highest ratio, while Hong Kong has the second highest.

ment opportunities. Second, we investigate whether highly leveraged small businesses can obtain alternative financing to bank loans and trade payables. Small businesses can choose ways of financing profitable investment opportunities, such as discounting bills receivables and factoring. If highly leveraged firms face some constraint on using bank loans and trade payables, they can use alternative ways of financing their profitable investment opportunities to mitigate this credit constraint. Our results show that highly leveraged firms with significant investment opportunities are most likely to convert bills receivables into cash by selling them to finance companies.

Third, we estimate the ex post firm performance of highly leveraged small businesses. If the cost of high leverage creates significant problems for small businesses, highly leveraged firms lose potential profits and sales. As a result, their ex post performance should be lower than that of low-leveraged firms, after controlling for the effects of firm characteristics and unobserved time-invariant fixed effects. On the other hand, if highly leveraged firms reduce their level of debt to avoid the cost of bankruptcy, their ex post performance will not be lower. In addition, if the benefit of leverage for firm efficiency is significant, firm ex post performance can be higher. We find that the performance (measured as industry-adjusted firm sales growth or profitability) of highly leveraged firms is higher than that of low-leveraged firms in Japan during the late 1990s and early 2000s. This result implies that the benefit of high leverage is significant for small businesses because the high leverage makes the management of small businesses more efficient. The results also imply that highly leveraged small businesses decrease their amount of debt to avoid the cost of bankruptcy because they can finance investment opportunities without using bank loans and trade payables. Many previous studies have shown that the negative relationship between leverage and firm performance is supported using data on listed firms. We show that for small businesses, a positive relationship between leverage and firm performance is supported, even if small businesses are extremely leveraged and regarded as financially distressed. This finding is our contribution to the literature.

Our paper has implications for studies investigating what types of small businesses face

credit constraints. Petersen and Rajan (1994) and Berger and Udell (1995) argued that small businesses with shorter relationships with banks are credit rationed or use higher-cost sources of finance. Furthermore, Canton et al. (2013) argued that the smallest and youngest small businesses perceive themselves as having low accessibility to bank loans. Bottazzi et al. (2014) investigated the relationship between credit constraints and firm performance of small businesses, and found that financial constraints in small businesses lower their sales growth. However, to our knowledge, few studies have investigated the seriousness of financial constraints caused by high leverage focusing on small businesses.

Our paper also has some implications for studies examining the relationship between trade credit and bank loans using firm-level data on small businesses. Many previous studies have claimed that small firms use trade credit when bank loans are not available because the cost of trade credit is extremely high. For example, Petersen and Rajan (1994, 1997) showed that small firms with short relationships with banks use trade credit more because credit from banks is unavailable. However, few studies have investigated how small businesses finance their investment opportunities if bank loans and trade credit are unavailable.

The remainder of the paper is organized as follows. Section 7.2 describes our data set and the characteristics of highly leveraged firms. We discuss the hypothesis and empirical strategy in Section 7.3 and present our empirical results in Section 7.4. In Section 7.5, we discuss the robustness of our results. Section 7.6 concludes the paper.

7.2 Data

7.2.1 Database of Small Businesses

In this study, we use firm-level data on small businesses in Japan from 1996 to 2006. The data are from the Credit Risk Database for Small and Medium Enterprises (CRD), which was established by several financial institutions and credit guarantee corporations under the guidance of the Small and Medium Enterprise Agency in Japan and is managed by the CRD Association.

The first quartile of employees is five, the median is 12, and the third quartile is 32. The

distribution of employees suggests that the CRD data include many micro firms: these are typically more informationally opaque. The 99th percentile of employees is 285; therefore, our sample also includes some larger small businesses. The detailed distribution of the number of observations by sector, sales, total assets, and number of employees is shown in Table 7.1.

7.2.2 Definition of Leverage

Following Opler and Titman (1994), we define leverage as the book value of debts divided by the book value of assets in year t-2. We use book values rather than market values because the market values of debt and assets for small businesses are unavailable. Lower-performing firms are likely to make large losses and to increase short-term borrowing to cover the losses, so the current leverage and firm performance can be negatively correlated. Therefore, similar to Opler and Titman (1994), we use ex ante leverage in year t-2 to avoid the endogeneity problem and spurious correlation. Furthermore, following Opler and Titman (1994) and Molina and Preve (2012), we use dummy variables to indicate whether a firm's leverage is in the top two deciles of its industry in a particular year as a proxy of leverage (hereafter, we refer to the variable as the *High-leverage Dummy*).

7.2.3 Performance of Highly Leveraged Firms

In Table 7.2, we show quartiles of the ratio of industry-adjusted operating income to total assets (hereafter, the industry-adjusted operating income ratio), the industry-adjusted sales growth rate, and the industry-adjusted operating income growth rate for both highly leveraged and non-highly leveraged groups, divided by the high-leverage dummy.[4] Panel A shows that the industry-adjusted operating income ratios of the highly leveraged group have a wide range. For example, the third quartile of the industry-adjusted operating income ratio for the

[4]The industry-adjusted operating income ratio is defined as the ratio of operating income to total assets, calculated by subtracting the mean value in the medium category in the industrial classification averaged for two years from year t to t+1. Industry-adjusted sales growth is defined as the growth rate of sales for two years from t-1 to t+1 ([sales_{t+1} – sales_{t-1}]/assets_{t-1}), calculated by subtracting the mean value in the medium category in the industrial classification. The industry-adjusted operating incomes growth is defined as the growth rate of operating incomes for two years from t-1 to t+1 ([operating incomes_{t+1} – operating incomes_{t-1}]/assets_{t-1}), calculated by subtracting the mean value in the medium category in the industrial classification.

Table 7.1: Distribution of Observations by Sectors, Sales, Total Assets, and Number of Employees

Panel A: Sectors

	Freq.	Percent	Cum.
Food	40,168	11.01	11.01
Textile Mill Products	27,879	7.64	18.65
Lumber and Wood Products - except Furniture	17,422	4.77	23.42
Furniture and Fixtures	6,638	1.82	25.24
Pulp - Paper and Paper Products	9,147	2.51	27.75
Printing and Allied Industries	26,618	7.29	35.04
Chemical and Allied Products	7,539	2.07	37.11
Petroleum and Coal Products	464	0.13	37.23
Plastic Products- except Otherwise Classified	9,148	2.51	39.74
Rubber Products	2,141	0.59	40.33
Leather Tanning - Leather Products and Fur Skins	1,225	0.34	40.66
Ceramic - Stone and Clay Products	15,919	4.36	45.03
Iron, Steel, and Metal	72,188	19.78	64.81
General Machinery and Precision Instruments	54,453	14.92	79.73
Electrical Machinery - Equipment and Supplies	23,957	6.56	86.29
Transportation Equipment	17,687	4.85	91.14
Others	32,332	8.86	100

Panel B: Sales

(million yen)	Freq.	Percent	Cum.
-100	121,295	33.24	33.24
100-500	137,694	37.73	70.97
500-1000	42,390	11.62	82.59
1000-	63,546	17.41	100

Panel C: Number of Employees

	Freq.	Percent	Cum.
-5	94,942	26.02	26.02
6-20	140,627	38.54	64.55
21-100	104,124	28.53	93.09
101-	25,232	6.91	100

Panel D: Total Assets

(million yen)	Freq.	Percent	Cum.
-100	136,758	37.48	37.48
100-500	127,039	34.81	72.29
500-1000	39,946	10.95	83.23
1000-	61,182	16.77	100

Note: This table shows the frequency and percentage distribution for the number of observations divided by sector, sales, total assets and number of employees.

Table 7.2: Distribution of Performance of Highly Leveraged and Non-highly Leveraged Firms

Panel A: Industry-adjusted Operating Income Ratio

	p25	Median		p75	IQR
Non-highly Leveraged	-1.82	0.88		3.33	5.15
Highly Leveraged	-5.68	0.54	***	4.97	10.65
Total	-2.30	0.85		3.55	5.84

Panel B: Industry-adjusted Sales Growth

	p25	Median		p75	IQR
Non-highly Leveraged	-17.52	-1.66		14.44	31.97
Highly Leveraged	-26.68	-5.57	***	14.72	41.40
Total	-19.00	-2.26		14.49	33.49

Pane C: Industry-adjusted Operating Income Growth

	p25	Median		p75	IQR
Non-highly Leveraged	-3.68	-0.45		2.94	6.61
Highly Leveraged	-7.15	-0.37	**	7.01	14.16
Total	-4.10	-0.44		3.44	7.54

Note: This table shows the quartiles of the industry-adjusted operating income ratio, sales growth, and operating income growth. The industry-adjusted operating income ratio is defined as the ratio of operating income to total assets, calculated by subtracting the mean value in the medium category in the industrial classification averaged for two years from year t to t+1. The industry-adjusted sales growth is defined as the growth rate of sales for two years from t-1 to t+1 ($[\text{sales}_{t+1} - \text{sales}_{t-1}]/\text{assets}_{t-1}$), calculated by subtracting the mean value in the medium category in the industrial classification. The industry-adjusted operating incomes growth is defined as the growth rate of operating incomes for two years from t-1 to t+1 ($[\text{operating incomes}_{t+1} - \text{operating incomes}_{t-1}]/\text{assets}_{t-1}$), calculated by subtracting the mean value in the medium category in the industrial classification. The numbers are expressed in percentage terms. We test the null hypothesis that the median of each variable is equal between observations for highly and non-highly leveraged firms using the Wilcoxon–Mann–Whitney test. The symbol ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

highly leveraged group is 4.97, which is higher than that for firms in the non-highly leveraged group. The first quartile of the operating income ratio for firms in the highly leveraged group is -5.68, which is lower than that for firms in the non-highly leveraged group. The interquartile range (IQR) is higher for the highly leveraged group, implying that highly leveraged firms are more likely to be either strong or weak performers. We also show the quartiles of industry-adjusted sales growth (in panel B) and industry-adjusted operating income growth (in panel C). Both panels show that the trend in the distribution of sales and operating income growth is similar to that in panel A, also suggesting that highly leveraged firms are more likely to be either strong or weak performers.

7.3 Empirical Strategy

In this section, we use econometric methods to investigate whether financial institutions and trade partners offer less credit to highly leveraged firms with greater investment opportunities. Furthermore, we investigate the ex post performance of highly leveraged firms.

7.3.1 Hypothesis

The debt overhang problem can mean that highly leveraged firms are unable to obtain enough credit from banks and suppliers, even if they have new projects with positive NPVs (Myers, 1977). As new creditors obtain only small payments from the earnings of new projects, they do not offer new credit for highly leveraged firms that have projects with positive NPVs. In addition, Altman (1984) argued that highly leveraged firms face difficulties in obtaining credit to finance new opportunities because, on average, there is a high possibility of bankruptcy of highly leveraged firms. In the case of small-business finance, the asymmetric information between lender and borrowers is more severe (Berger and Udell, 1998), so the leveraged small businesses face strict financial constraints. Furthermore, banks (especially large banks) will reduce the number of loans to small businesses if they screen small-business borrowers based on hard information, such as financial statements (Cole et al., 2004).

On the other hand, highly leveraged firms have an incentive to reduce their level of debt because they have to avoid the cost of bankruptcy. We predict that highly leveraged firms with good investment opportunities have less reliance on bank loans and trade payables. Furthermore, if these firms do not increase credit available to them from financial institutions and trade partners to finance new opportunities, we predict that highly leveraged firms with better investment opportunities obtain credit instead of using bank loans and trade payables.

To discover whether the cost of high leverage is significant for small businesses, we investigate whether the performance of highly leveraged firms is lower than that of low-leveraged firms. Because of information asymmetry in the credit market, small businesses generally cannot issue bonds or equity. As a result, their creditors are limited to banks and suppliers (Petersen and Rajan, 1994). Therefore, if banks and suppliers reduce credit for highly lever-

aged small businesses and alternative ways of financing are unavailable, firm performance is likely to deteriorate. If the cost of high leverage (i.e., the debt overhang problem and the high cost of borrowing) is a significant problem for small businesses, the effects of leverage should be negative. In contrast, in the case of small businesses, the monitoring activities of shareholders are weak because small businesses are unlisted firms, and the owners and shareholders generally are not separated (Storey, 1994). Additionally, banks and trade creditors monitor indebted small businesses efficiently using lending technologies, as argued by Berger and Udell (2006). Furthermore, many small businesses pledge the owners' assets as collateral, so owners have an incentive to avoid default. As a result, highly leveraged firms are more efficient in earning sufficient cash flow. If the high level of debt makes small businesses more efficient, the effects of leverage should be positive in small businesses.

7.3.2 Alternative Ways of Financing for Highly Leveraged Firms

In addition to using bank loans and trade payables, small businesses have two other means of obtaining finance; namely, discounting bills receivables and factoring. Factoring and selling bills receivables are easier methods of financing for highly leveraged firms. [5] In Japan, factoring is not popular for small businesses because they can discount (liquidate) bills receivables more easily, which is called "*Tegata Waribiki*" in Japanese.[6] Both the banks and finance companies involved in discounting bills receivable (called "*Tegata Waribiki Gyousha*" in Japanese) underwrite the bills receivable. Bills receivables are sold to banks with recourse, so underwriting is based on the risk of the bills receivables themselves and the firm that holds the bills. Banks do not accept the risk of default of the bills, so discounting rates are not high in banks. According to reports from the Ministry of Economy, Trade, and Industry (METI)[7], banks underwrite bills using low discount rates of about 1 to 3 percent. However, highly leveraged firms cannot sell bills to banks because they and their bills have a high credit

[5] According to Klapper (2006), factoring is "a type of supplier financing in which firms sell their creditworthy accounts receivable at a discount (generally equal to interest plus service fees) and receive immediate cash." (pp. 3111–3112). See Klapper (2006) for a detailed discussion about factoring.

[6] See Matsumura and Ryser (1995) for details about bill discounting in Japan.

[7] See pp. 79–80 in "*Hacchu hoshikitou torihikijyouken kaizenchousa jigyouhoukokusho 2011* (Study to improve trading conditions such as ordering systems)", downloaded from http://www.meti.go.jp/meti_lib/report/2012fy/E002152.pdf (last accessed: April 2014)

risk.

In contrast, finance companies underwrite the bills with nonrecourse clauses, in exchange for high discounting rates. Underwriting is based on the risk of the bills receivables themselves rather than the risk of the firm holding the bills, so highly leveraged firms can sell bills to finance companies. When firms with high credit risk have bills receivables, they can acquire money easily by selling these receivables at a high discount rate. For example, according to *Turnaround PARTNERS GUIDE 2012*, 72 percent of customers in one large finance company were uncreditworthy firms (firms offered debt payment rescheduling by banks or civil rehabilitation firms)[8]; however, these firms sell bills to finance companies at high annual discount rates, from 6 to 15 percent. As Table 7.3 shows, the median interest rate in each small business is 2.39 percent. Therefore, discounting bills receivables to finance companies is a high-cost financing method for small businesses. We predict that highly leveraged firms sell more bills receivables at a high discount than creditworthy firms.

7.3.3 Financial Sources

Equation

To investigate which financial sources are used by highly leveraged firms with greater investment opportunities, we estimate the following regression.

$$\begin{aligned} y_{i,t-1\to t+1} &= \beta_1 Leverage_{i,t-2} + \beta_2 Investment\ Opportunities_{i,t-1\to t+1} \\ &+ \beta_3 Leverage_{i,t-2} \times Investment\ Opportunities_{i,t-1\to t+1} + \mathbf{Z}_{i,t-1}\beta_4 \\ &+ \eta_i + \epsilon_{i,t} \end{aligned} \tag{7.1}$$

where $y_{i,t-1\to t+1}$ is a dependent variable for firm i from year t-1 to t+1.[9] We use short-term borrowings growth, trade payables growth, trade receivables growth, and the bills discount

[8] See the article "*Tegata waribiki ni tokka shite shikin choutatsu wo shien*" (Support for bills discounting in business finance), pp. 66–67, *Turnaround PARTNERS GUIDE 2012*.

[9] Following previous studies, we use the independent variables from t-1 to t+1. The results are similar if we use the independent variables from t to t+1.

as dependent variables. To focus on the additional funds available after the distress period, we use the growth rate of each variable from year t-1 to year t+1 as dependent variables. Each growth rate is normalized by total assets in year t-1. The bills discount is defined as the ratio of a firm's discounting bills receivables to total trade receivables, averaged using those in years t and t+1. $\mathbf{Z}_{i,t-1}$ is a set of control variables in year t-1. We also control for unobserved firm heterogeneity through an individual effect η_i. $\epsilon_{i,t}$ is the error term of firm i in year t. We estimate standard errors based on clustering across firms.

In this paper, we focus on short-term credit to finance inventory investment and working capital. As firms with greater investment opportunities need more external funds to finance working capital or inventory investment, they increase their short-term credit. The coefficients of $Investment\ Opportunities_{i,t-1\to t+1}$ should be positive if banks or trade creditors offer credit to firms with greater investment opportunities. As we argued, lenders do not offer sufficient credit if highly leveraged firms have greater investment opportunities. If highly leveraged firms with greater investment opportunities do not use bank loans and trade payables, whereas low-leveraged firms with greater investment opportunities do use them, the coefficients of $Leverage_{i,t-2} \times Investment\ Opportunities_{i,t-1\to t+1}$ for short-term borrowings and trade payables growth should be negative. The negative coefficients of the interaction variables mean that the positive effects of $Investment\ Opportunities_{i,t-1\to t+1}$ are weakened if firms are highly leveraged. The coefficients of $Leverage_{i,t-2}$ are assumed to be negative because creditors do not offer debt facilities for uncreditworthy borrowers, and highly leveraged firms have an incentive to decrease their amount of debt.[10]

Furthermore, if highly leveraged firms with greater investment opportunities use other financing sources, including reducing their trade receivables and discounting bills receivables, they decrease the amount of trade receivables on their balance sheets. As a result, the coefficients of $Leverage_{i,t-2} \times Investment\ Opportunities_{i,t-1\to t+1}$ should be negative for trade receivables growth. If firms sell bills receivables to increase their cash hold-

[10]If creditors acknowledge the positive NPV of projects (not the burden of debts), they offer credit for highly leveraged firms with greater investment opportunities. If this effect is strong, the coefficients of $Leverage_{i,t-2} \times Investment\ Opportunities_{i,t-1\to t+1}$ should be positive. The reason is that the negative effects of $Leverage_{i,t-2}$ are weakened when firms have greater investment opportunities.

ings, the amount of discounted bills receivables is larger. As a result, the coefficients of $Leverage_{i,t-2} \times Investment\ opportunities_{i,t-1 \to t+1}$ should be positive for bill discounts. The coefficient of $Investment\ opportunities_{i,t-1 \to t+1}$ for trade receivables growth rates is expected to be positive because firms that are expanding their businesses increase trade receivables for their customers.

Proxies of Investment Opportunities

As Petersen and Rajan (1994) argued, investment opportunities for small businesses depend on the industry of the firm. We use the performance of the industries that the firms operate in as proxies of investment opportunities. Firms in strongly performing industries face greater investment opportunities because they need inventory investment to expand their business. We use the diffusion index of business conditions (hereafter called the "business DI") from the Bank of Japan's TANKAN survey (Short-term Economic Survey of Enterprises)[11] as a proxy for the level of investment opportunities.[12] According to the web site of the Bank of Japan[13], the TANKAN survey is "conducted to provide an accurate picture of the business trends of enterprises in Japan". It is conducted quarterly in March, June, September, and December. The Bank of Japan sends the TANKAN questionnaires to firms with 50 or more workers. The target firms are randomly sampled using data from the Establishment and Enterprise Census conducted by the Ministry of Internal Affairs and Communications. The survey questions use the following format. "Please choose one of the three alternatives that best describes the current (from three months earlier) and forecasted survey, excluding seasonal factors." One survey item relates to the business conditions of respondents, who are asked to select one option from the following three alternatives: 1) "favorable"; 2) "not so favorable"; or 3) "unfavorable". The diffusion index is defined as the percentage of firms selecting "favorable" less the percentage of firms selecting "unfavorable." We use the business DI for small and

[11]The business DI is available on the web site of the Bank of Japan (last accessed: April 2014) (http://www.boj.or.jp/en/statistics/tk/gaiyo/2001/index.htm/).

[12]In previous studies using data on listed firms, the level of investment opportunities is measured by the market-to-book ratio or Tobin's Q. In our studies using data on nonlisted firms, the market-to-book ratio and Tobin's Q are unavailable.

[13]http://www.boj.or.jp/en/statistics/outline/exp/tk/extk.htm/#01 (last accessed: April 2014)

medium enterprises defined under the Small and Medium Enterprise Basic Law. Industries with a higher business DI face better business conditions, so firms in these industries have better investment opportunities. As CRD data are annual and TANKAN data are seasonal, the TANKAN data are averaged for the two fiscal years to match the CRD data. The business DI for the medium category in the Japan Standardized Industrial Classification is available.

Control Variables

The control variables are the natural log of (1+sales) in year t-1, the ratio of operating income to total assets in year t-1 (the Operating Income Ratio), the growth rate of sales from t-1 to t+1 (Sales Growth) , the ratio of current assets to total assets in year t-1 (the Current Assets Ratio), the ratio of cash holdings to current liabilities in year t-1 (the Cash–Current Liabilities Ratio), the ratio of tangible fixed assets to total liabilities in year t-1 (the Tangible Fixed Assets Ratio), a firm's average interest rate in year t-1 (the Interest Rate), and the Annual Change in the Interest Rate from year t-1 to year t. A firm's average interest rate is defined as the ratio of that firm's interest expenses to the sum of its short- and long-term debt and discounted bills receivables. The definition of each variable is also given in the notes for each table.

Our hypothesis for the control variables is as follows. We use the operating income ratios as indicators of firm performance. High-performing firms generally have sufficient cash flow; therefore, they do not need more short-term credit. In contrast, poorly performing firms are more likely to default; therefore, creditors reduce the credit supply to these firms. In sum, the ratios of operating and ordinary incomes have some effect on trade payables and short-term borrowings, although the signs of the coefficients are ambiguous. Growing firms that have to finance increasing amounts of working capital need trade credit and/or short-term bank credit. Therefore, we hypothesize that the coefficient on sales growth is positive. Because firms with a higher current assets ratio finance their working capital needs until maturity, they must increase trade credit and/or short-term bank credit. Thus, we hypothesize that the coefficient on the current assets ratio is positive.

The cash–current liabilities ratio measures the liquidity of firms given that firms with a lower level of liquidity are less likely to pay off their credit by the due date. Therefore, the credit risk of these firms is higher, and creditors are more likely to reduce credit to these firms. We hypothesize that the coefficient on the cash–current liabilities ratio is positive for trade payables and short-term borrowings growth. The tangible fixed assets ratio is a proxy for collateral assets. Banks in Japan generally are secured lenders, whereas trade partners are unsecured lenders. As a result, firms that have more tangible fixed assets use bank loans more; therefore, the coefficient on the tangible fixed assets ratio should be positive for short-term borrowings. Furthermore, firms with less tangible fixed assets use trade payables more; therefore, the coefficient on the tangible fixed assets ratio should be negative for trade payables. We can also calculate the average interest rate on bank credit using a firm's balance sheets and profit and loss statements. The interest rate on bank credit has a negative effect on short-term borrowings and a positive effect on trade payables. We hypothesize that the coefficients for the levels and changes in interest rates are negative for short-term borrowings and positive for trade payables. We include the natural logarithm of 1+sales[14] and year dummies. As industry effects are subsumed into firm fixed effects (η_i), we do not use industry dummies as control variables.

7.3.4 Firm Performance

Equation

To investigate whether the cost of high leverage is significant for small businesses, we estimate the following regression:

$$Firm\ Performance_{i,t-1\to t+1} = \alpha_1 Leverage_{i,t-2} + \mathbf{X}_{i,t-1}\alpha_2 + \eta_i + \epsilon_{i,t} \qquad (7.2)$$

where $\mathbf{X}_{i,t}$ is a matrix of control variables, $\epsilon_{i,t}$ is the error term of firm i in year t from 1998 to 2005, and η_i are the unobserved time-invariant effects for firm i. We estimate standard errors based on clustering across firms. If highly leveraged firms encounter severe constraints, these

[14]When the sales of firms are zero, we set the value of this variable equal to 1.

firms will experience poorer performance because they lose potential profits and investment opportunities. Therefore, we predict that α_1 is statistically negative if these firms lose potential profits and the costs of high leverage are significant. We use the ratio of book values of debts to assets and the high-leverage dummy (which equals one if a firm's leverage is in the top two deciles of its industry in a particular year) in year t-2 as proxies of $Leverage_{i,t-2}$.

Our sample comprises data on unlisted small businesses; therefore, performance data using stock returns or Tobin's Q are unavailable.[15] Instead, we use accounting profit as a proxy for firm performance. We employ several other proxies for firm performance. First, we use the ratio of operating income to total assets, calculated by subtracting the mean value in the medium category in the industrial classification (the industry-adjusted operating income ratio) averaged for two years from year t to t+1. Similar to Opler and Titman (1994) and Molina and Preve (2012), we also use the growth rate of sales for the two years from t-1 to t+1 ([sales$_{t+1}$ – sales$_{t-1}$]/assets$_{t-1}$), calculated by subtracting the mean value in the medium category in the industrial classification (industry-adjusted sales growth) and that of operating incomes for two years from t-1 to t+1 ([operating incomes$_{t+1}$ – operating incomes$_{t-1}$]/assets$_{t-1}$), calculated by subtracting the mean value in the medium category in the industrial classification (the industry-adjusted operating income growth) as a proxy for firm performance.[16]

Control Variables

We specify firm scale, firm age, and the current assets to total assets ratio in year t-1 as control variables. Furthermore, following Opler and Titman (1994), we use the industry-adjusted operating incomes to assets ratio in year t-1, industry-adjusted tangible fixed assets growth from year t-2 to t-1, and industry-adjusted total assets growth from year t-2 to t-1[17] as control variables. We include firm scale and firm age to control for firm characteristics.

[15] For example, Kang and Stulz (2000) specified stock returns as a proxy for firm performance in considering listed firms.

[16] From a textbook point of view, the objective of firms is to maximize profits. However, an increase in sales is not always consistent with profit maximization. Despite this, many previous studies (for example, Opler and Titman, 1994; Molina and Preve, 2012) have used real growth in total sales as a proxy for firm performance.

[17] Industry-adjusted (tangible fixed) assets growth is calculated as (tangible fixed) assets growth calculated by subtracting the mean value in the medium category in the industrial classification.

We use the ratio of current assets to total assets as our proxy for liquidity. We control for the effects of capital and inventory investment in prior years by adding tangible fixed assets and total assets growth rates in the estimation equations. We include year dummies for all years except the first year. To control the effects of industry-specific business cycles, we also include the proxy of investment opportunities defined in Subsection 7.3.3.

We lack complete information about the determinants of firm performance, although certain information, such as the owner's abilities and the legal type of firms, is likely to be important. In particular, the firms that are managed by owners with lower abilities are likely to suffer large losses and a large debt burden to compensate for the loss. If we estimate equation (7.2) using simple OLS, the effects of owner's abilities are omitted, and the error terms include these effects. As owner abilities can be correlated with the level of leverage, we need to counter the potential problem of omitted variables. As we employ panel data, we can estimate firm performance using a fixed-effects model to eliminate the time-invariant unobserved effects.

Summary statistics of the dependent and independent variables are shown in Table 7.3. In Table 7.4, we show the median value of the dependent and independent variables, divided by the high-leverage dummy. The medians of ln(1+sales), ln(1+firm age), cash–current liabilities ratio, and tangible assets ratio in the highly leveraged group are smaller and statistically significant, suggesting that firms in the highly leveraged group are smaller and younger. Furthermore, they have less collateralizable assets.

Table 7.3: Summary Statistics

Variable	N	mean	sd	min	p1	p50	p99	max
Industry-adjusted Operating Income Ratio	364,925	0.000	0.079	-0.570	-0.295	0.008	0.191	0.322
Industry-adjusted Sales Growth	364,925	0.000	0.443	-2.058	-1.161	-0.023	1.568	3.963
Industry-adjusted Operating Income Growth	364,094	0.000	0.114	-0.589	-0.330	-0.004	0.397	0.810
Short-term Borrowings Growth Rate	364,925	-0.002	0.134	-0.784	-0.437	0.000	0.458	0.916
Trade Payables Growth Rate	364,925	-0.001	0.079	-0.339	-0.217	0.000	0.292	0.601
Trade Receivables Growth Rate	364,925	0.006	0.107	-0.387	-0.258	-0.002	0.388	0.796
Note Discounts Rate	359,639	0.175	0.221	0.000	0.000	0.045	0.761	1.000
High-leverage Dummy	364,925	0.183	0.387	0.000	0.000	0.000	1.000	1.000
Leverage	364,925	0.904	0.380	0.000	0.245	0.872	2.459	4.479
Business DI	364,925	-25.120	21.468	-66.000	-58.708	-25.750	24.542	24.542
ln(1+Sales)	364,925	12.323	1.531	0.000	9.333	12.176	16.053	18.363
ln(1+Firm Age)	364,925	3.299	0.669	0.000	0.000	3.434	4.263	4.949
Current Assets Ratio	364,925	0.523	0.216	0.000	0.080	0.520	0.959	1.000
Industry-adjusted Tangible Assets Growth	361,745	0.003	0.082	-0.221	-0.134	-0.007	0.383	0.825
Industry-adjusted Total Assets Growth	362,770	0.014	0.176	-0.483	-0.327	-0.011	0.713	1.435
Short–Long-term Borrowings Ratio	364,925	0.304	0.304	0.000	0.000	0.219	1.000	1.000
Current Assets Ratio	364,925	0.369	0.190	0.000	0.042	0.346	0.860	1.000
Cash–Current Liabilities Ratio	364,925	0.617	0.930	0.000	0.006	0.339	4.912	10.764
Tangible Assets Ratio	364,925	0.793	0.843	0.000	0.019	0.639	4.411	11.743
Interest Rate	364,925	2.469	1.204	0.000	0.000	2.392	6.519	11.795
Annual Change in Interest Rate	364,925	-0.083	0.896	-11.353	-2.900	-0.060	2.568	11.111

Note: This table shows summary statistics of variables used in the econometric analysis.

Table 7.4: Median of Each Variable, Divided by High-leverage Dummy

Variable	Highly Leveraged(A)	Non-highly Leveraged(B)	Difference(A-B)	
Industry-adjusted Operating Income Ratio	0.005	0.009	-0.003	***
Industry-adjusted Sales Growth	-0.056	-0.017	-0.039	***
Industry-adjusted Operating Income Growth	-0.004	-0.005	0.001	**
Short-term Borrowings Growth Rate	0.000	0.000	0.000	***
Trade Payables Growth Rate	0.000	-0.001	0.001	***
Trade Receivables Growth Rate	-0.005	-0.001	-0.003	***
Note Discounts Rate	0.043	0.045	-0.002	***
Leverage	1.272	0.825	0.447	***
Business DI	-25.750	-25.750	0.000	
ln(1+Sales)	11.194	12.421	-1.227	***
ln(1+Firm Age)	3.258	3.434	-0.176	***
Current Assets Ratio	0.488	0.526	-0.038	***
Industry-adjusted Tangible Assets Growth	-0.005	-0.008	0.002	***
Industry-adjusted Total Assets Growth	-0.022	-0.009	-0.012	***
Short–Long-term Borrowings Ratio	0.220	0.219	0.001	***
Current Assets Ratio	0.350	0.345	0.005	***
Cash–Current Liabilities Ratio	0.155	0.386	-0.231	***
Tangible Assets Ratio	0.372	0.711	-0.339	***
Interest Rate	2.416	2.388	0.029	***
Annual Change in Interest Rate	-0.053	-0.062	0.009	***

Note: This table shows the median values of variables used in the econometric analysis, divided by the high-leverage dummy. We test the null hypothesis that the median of each variable is equal between observations for the highly and non-highly leveraged firms using the Wilcoxon–Mann–Whitney test. The symbol * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

7.4 Results

7.4.1 Short-term Borrowings and Trade Payables

Columns (1) and (2) in Table 7.5 present the results of equation (7.1) using short-term borrowings growth rates [(short-term borrowings$_{t+1}$ – short-term borrowings$_{t-1}$)/total assets$_{t-1}$] as the dependent variable. The coefficients of leverage and the high-leverage dummy are negative and statistically significant at the 1 percent level, which implies that highly leveraged firms use bank loans less often than low-leveraged firms. The coefficient of leverage × investment opportunities is negative but not statistically significant. On the other hand, the coefficient of the high-leverage dummy × investment opportunities is negative and statistically significant at the 1 percent level. The effects of investment opportunities for short-term borrowings are not statistically significant. In sum, the result in column (2) suggests that firms with greater investment opportunities in the highly leveraged group use short-term borrowings less than firms in the non-highly leveraged group. Furthermore, from the results for investment opportunities, firms with good investment opportunities do not increase their bank loans. As we predicted, the coefficients of the current assets ratio, the cash–current liabilities ratio, and the tangible fixed assets ratio are positive, and the coefficients of the annual change in interest rates are negative. These coefficients are all statistically significant at the 1 percent level. However, the coefficients of sales growth are negative and statistically significant at the 1 percent level, implying that growing firms do not use bank loans. The coefficients of the level of interest rates are positive and statistically significant.

In columns (3) and (4) in Table 7.5, we present the estimation results using the trade payables growth rates [(trade payables$_{t+1}$ – trade payables$_{t-1}$)/total assets$_{t-1}$] as the dependent variable. In column (3), we show the results for leverage. The coefficient of leverage is negative for trade payables growth and statistically significant at the 1 percent level, suggesting that trade creditors decrease payables for highly leveraged firms. The coefficient of the proxy of investment opportunities is positive and statistically significant at the 1 percent level, suggesting that firms with greater investment opportunities have larger trade payables, not bank loans. In contrast, the coefficient of leverage × investment opportunities is statis-

Table 7.5: Regression Results for the Effects on Short-term Borrowings and Trade Payables for Financially Distressed and Nondistressed Firms

	(1)	(2)	(3)	(4)
Dependent Variable	Short-term Borrowings		Trade Payables	
Leverage	-0.06354***		-0.01853***	
	(0.00405)		(0.00154)	
Leverage	-0.00002		-0.00006**	
× Investment Opportunities	(0.00006)		(0.00002)	
High Leverage Dummy		-0.02702***		-0.00824***
		(0.00226)		(0.00109)
High Leverage Dummy		-0.00020***		-0.00013***
× Investment Opportunities		(0.00005)		(0.00002)
Investment Opportunities	-0.00003	-0.00001	0.00016***	0.00013***
	(0.00006)	(0.00003)	(0.00003)	(0.00002)
Sales Growth	-0.00655***	-0.00674***	0.06793***	0.06787***
	(0.00103)	(0.00104)	(0.00084)	(0.00083)
Operating Income Ratio	0.02709***	0.00759	0.04731***	0.04167***
	(0.00496)	(0.00484)	(0.00251)	(0.00242)
Current Asset Ratio	0.05272***	0.05504***	-0.11674***	-0.11605***
	(0.00536)	(0.00535)	(0.00311)	(0.00311)
Cash-C.Liability Ratio	0.03019***	0.03109***	0.00516***	0.00541***
	(0.00064)	(0.00064)	(0.00023)	(0.00023)
Tangible Asset Ratio	0.01746***	0.01935***	-0.00660***	-0.00606***
	(0.00063)	(0.00064)	(0.00036)	(0.00036)
Interest Rate	0.00420***	0.00397***	-0.00091***	-0.00098***
	(0.00060)	(0.00060)	(0.00033)	(0.00033)
Annual Change	-0.00799***	-0.00806***	-0.00169***	-0.00171***
in Interest Rate	(0.00040)	(0.00040)	(0.00024)	(0.00024)
ln(1+sales)	-0.00204	0.00113	-0.01133***	-0.01044***
	(0.00159)	(0.00163)	(0.00119)	(0.00117)
Year Dummy	Yes	Yes	Yes	Yes
Number of Observations	364,925	364,925	364,925	364,925
R-squared	0.03	0.03	0.16	0.16

Note: This table presents estimates of fixed-effects regressions with *Short-term Borrowings Growth* and *Trade Payables Growth* as dependent variables. *Short-term Borrowings Growth* is the growth rate of a firm's short-term borrowings [(short-term borrowings$_{t+1}$–short-term borrowings$_{t-1}$)/total assets$_{t-1}$]. *Trade Payables Growth* is the growth rate of a firm's trade payables [(trade payables$_{t+1}$–trade payables$_{t-1}$)/total assets$_{t-1}$]. *Leverage* is defined as the ratio of a firm's total liabilities to its total assets in year t-2. *High-leverage Dummy* takes a value of one if a firm's leverage in year t-2 is in the top two deciles of its industry in a particular year. *Investment Opportunities* denotes the business DI, averaged over year t to year t+1. *Operating Income Ratio* is the ratio of a firm's operating income to total assets in year t-1. *Sales Growth* is the growth rate of a firm's sales [(sales$_t$ + 1-sales$_{t-1}$)/sales$_{t-1}$]. The *Current Assets Ratio* is the ratio of current assets, excluding cash, to total assets in year t-1. The *Cash–Current Liabilities Ratio* is the ratio of a firm's cash holdings to current liabilities in year t-1. The *Tangible Fixed Assets Ratio* is the ratio of a firm's tangible fixed assets (the sum of the book value of buildings and land) to total debts in year t-1. The *Interest Rate* is the ratio of a firm's interest expenses to the sum of its short-term debt, long-term debt, and discounted bills receivables for each year in year t-1. *Annual Change in Interest Rate* is the *Interest Rate* in year t minus the *Interest Rate* in year t-1. *lm(1+Sales)* is the natural log of (1+firm sales) in year t-1. We include nine year dummies from 1999 to 2005. The reference year is 1998. Estimated standard errors in parentheses are based on clustering across firms. The symbol * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

tically negative at the 5 percent level. Although firms with greater investment opportunities have larger trade payables, this is not the case for highly leveraged firms. These results imply that highly leveraged firms with greater investment opportunities have difficulty in increasing trade payables. Column (4) shows the results using the high-leverage dummy. Similar to the results in column (3), the coefficient of the high-leverage dummy is negative and statistically significant at the 1 percent level. In addition, the coefficient of the high-leverage dummy $\times$ investment opportunities is negative and statistically significant at the 1 percent level. These results imply that highly leveraged firms with greater investment opportunities have lower trade payables than low-leveraged firms.

In contrast to our expectations, the effects of the current assets ratio and interest rate are negative and statistically significant at the 1 percent level. As we argued, the current assets ratio is a proxy of a firm's short-term credit demand. Firms with higher short-term credit demand have more short-term borrowings, and therefore these firms might decrease their trade payables. The other control variables are consistent with our predictions.

Our results in Table 7.5 imply that firms with good investment opportunities have larger trade payables. In contrast, highly leveraged firms with good investment opportunities do not have larger trade payables than low-leveraged firms. These results imply that the costs of high leverage (in terms of the difficulty in obtaining credit to finance investment opportunities) are supported by our firm-level data.

7.4.2 Alternative Ways of Financing

If small businesses need more funds to finance their investment opportunities, they use alternative and expensive ways of financing to mitigate financial shortages. To investigate the use of alternative financial sources, we estimate equation (7.1) using trade receivables growth [defined as (trade receivables$_{t+1}$ – trade receivables$_{t-1}$)/total assets$_{t-1}$] and the bills discount rate [defined as a firm's discounted bills receivables/(trade receivables + discounted bills receivables), averaged over two years from t to t+1] as dependent variables. If highly leveraged firms with investment opportunities sell bills receivables or use factoring services,

the amount of trade receivables in firms' balance sheets decreases. As a result, the coefficients of $Leverage_{i,t-2} \times Investment\ Opportunities_{i,t-1 \to t+1}$ for trade receivables growth are negative. Highly leveraged firms with good investment opportunities can sell bills receivables at a significant discount rate in exchange for immediate money to finance their investment opportunities. The more bills receivables they sell at a discount, the more likely it is that the coefficients of $Leverage_{i,t-2} \times Investment\ Opportunities_{i,t-1 \to t+1}$ for the discounted bills rate are positive.

In columns (1) and (2) of Table 7.6, we show the results for the trade receivables growth rate. The coefficients of the proxies of investment opportunities are positive and statistically significant at the 1 percent level, which suggests that firms in the industries with greater investment opportunities have more trade receivables. The coefficient of leverage $\times$ investment opportunities is negative and statistically significant at the 10 percent level, suggesting that highly leveraged firms with good investment opportunities have less trade receivables than low-leveraged firms. However, the coefficient of the high-leverage dummy $\times$ investment opportunities is not statistically significant.

As we argued, the amount of trade receivables is increasing when firms' sales are expanding, which is consistent with the estimated positive coefficients of sales growth. As Petersen and Rajan (1997) argued, creditworthy firms offer trade credit to customers and have a large amount of trade receivables. Our results show that the coefficients of the cash–current liabilities ratio and the tangible fixed assets ratio are positive, whereas those of the annual change of interest rates are negative for trade receivables growth. Firms that have larger cash holdings and tangible fixed assets are more creditworthy because they have more collateral assets. Our results for trade receivables imply that creditworthy firms offer more trade credit to customers, which is consistent with previous studies.

In columns (3) and (4) of Table 7.6, we show the results for the bill discounting rate. We estimate equation (7.1) using a Tobit model because the bill discounting rate of many firms is zero, as shown in Table 7.3. The coefficients of the level of leverage and the high-leverage dummy are positive and statistically significant at the 1 percent level. Generally,

Table 7.6: Regression Results of the Effects on Trade Receivables and Bill Discounts for Financially Distressed and Nondistressed Firms

	(1)	(2)	(3)	(4)
Dependent Variable	Trade receivables		Bill Discounts Rate	
Leverage	0.01380***		0.07660***	
	(0.00214)		(0.00419)	
Leverage	-0.00007*		0.00065***	
× Investment Opportunities	(0.00003)		(0.00011)	
High Leverage Dummy		0.00589***		0.04388***
		(0.00138)		(0.00392)
High Leverage Dummy		0.00000		0.00069***
× Investment Opportunities		(0.00003)		(0.00010)
Investment Opportunities	0.00025***	0.00019***	-0.00044***	0.00003
	(0.00004)	(0.00002)	(0.00013)	(0.00008)
Sales Growth	0.10456***	0.10460***	0.00171	0.00116
	(0.00100)	(0.00100)	(0.00188)	(0.00188)
Operating Income Ratio	-0.03713***	-0.03276***	-0.03631***	-0.03575***
	(0.00344)	(0.00335)	(0.00963)	(0.00966)
Current Asset Ratio	-0.46024***	-0.46078***	-0.12901***	-0.13601***
	(0.00469)	(0.00469)	(0.00730)	(0.00731)
Cash-C.Liability Ratio	0.00355***	0.00336***	-0.02989***	-0.03464***
	(0.00037)	(0.00036)	(0.00154)	(0.00154)
Tangible Asset Ratio	0.00307***	0.00265***	-0.03638***	-0.04358***
	(0.00046)	(0.00046)	(0.00178)	(0.00177)
Interest Rate	0.00275***	0.00279***	0.03362***	0.03406***
	(0.00042)	(0.00042)	(0.00111)	(0.00111)
Annual Change	-0.00420***	-0.00419***	0.00776***	0.00769***
in Interest Rate	(0.00030)	(0.00030)	(0.00080)	(0.00080)
ln(1+sales)	0.01460***	0.01388***	0.03292***	0.03101***
	(0.00120)	(0.00118)	(0.00095)	(0.00096)
Year Dummy	Yes	Yes	Yes	Yes
Number of Observations	364,925	364,925	359,639	359,639
R-squared	0.28	0.28		

Note: Columns (1) and (2) in this table present estimates of fixed-effects regressions with *Trade Receivables Growth* as a dependent variable. *Trade Receivables Growth* is the growth rate of a firm's trade receivables [(trade receivables$_{t+1}$–trade receivables$_{t-1}$)/total assets$_{t-1}$]. Columns (3) and (4) in this table present estimates of Tobit regressions with the *Bills Discount Rate* as a dependent variable. The *Bills Discount Rate* is the amount of a firm's discounted bills normalized by trade receivables plus discounted bills (that is, it equals Discounted Bills Receivables)/(Trade Receivables + Discounted Bills Receivables), averaged in year t and year t+1. Other definitions of each variable are given in the note for Table 7.5. We include year dummies from 1999 to 2005. The reference year is 1998. Estimated standard errors in parentheses are based on clustering across firms. The symbol * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

highly leveraged firms are uncreditworthy firms. Therefore, they use more bill discounting because they can convert bills receivables to cash. The coefficients of leverage × investment opportunities are positive and statistically significant at the 1 percent level. Highly leveraged firms discount more bills receivables to finance their investment opportunities. This result is similar if we use the high-leverage dummy × investment opportunities. The coefficients of the cash–current assets ratio and the tangible fixed assets ratio are negative and statistically significant at the 1 percent level. The coefficients of the level and annual change in interest rates are positive and statistically significant. As we argued, firms with lower cash and tangible fixed assets ratios and higher interest rates are uncreditworthy. Therefore, these firms sell more bills receivables at a discount. The coefficients of investment opportunities are negative or statistically insignificant. Firms in industries with the business DI increase trade payables, so they do not sell more bills receivables.

7.4.3 Firm Performance

We present the estimation results of equation (7.2) in Table 7.7. In column (1), the proxy for firm performance is the industry-adjusted operating income ratio. The coefficient of leverage is positive and statistically significant at the 1 percent level. This suggests that highly leveraged firms enjoyed better performance after controlling for firm-invariant fixed effects.[18] The results are similar if we specify industry-adjusted sales growth and operating income growth as the proxies for firm performance and sales growth (columns 2 and 3), suggesting that highly leveraged firms increased their sales and enjoyed higher operating incomes during the period examined.

The coefficients of ln(1+firm age) are not statistically significant in columns (1) and (2). The effects of ln(1+sales) are negative, indicating that smaller firms perform better than larger firms. The effects of current assets on the industry-adjusted operating income ratio and growth are negative, suggesting that firms with less current assets have larger profits.

[18]The results are similar if we specify the industry-adjusted ordinary income ratio as the proxy for firm performance (results are not shown in the table). Ordinary income includes net financial income and expenses. Therefore, this measure of income is naturally lower when interest payments are large. However, our results do not indicate that highly leveraged firms make large interest payments.

Table 7.7: Regression Results of the Effects of Leverage on Firm Performance

	(1)	(2)	(3)
Dependent Variable	Industry-adjusted Operating Income Ratio (t, t+1)	Industry-adjusted Sales Growth (t-1 → t+1)	Industry-adjusted Operating Income Growth (t-1 → t+1)
Leverage	0.14804***	0.05070***	0.11208***
	(0.00297)	(0.01216)	(0.00292)
Log (1+Sales)	-0.00822***	-0.63280***	-0.00869***
	(0.00087)	(0.02662)	(0.00100)
Log(1+Firm Age)	-0.00033	0.00130	-0.00171**
	(0.00061)	(0.00368)	(0.00073)
Industry-adjusted	-0.11370***	-0.58101***	-1.12058***
Operating Income Ratio (t-1)	(0.00329)	(0.02611)	(0.00397)
Current Assets Ratio	-0.03213***	0.01133	-0.02313***
	(0.00307)	(0.02280)	(0.00351)
Industry-adjusted	-0.01597***	-0.06869***	0.00691**
Tangible Assets Growth	(0.00205)	(0.01349)	(0.00273)
Industry-adjusted	0.00695***	0.06081***	-0.00904***
Total Assets Growth	(0.00116)	(0.00802)	(0.00162)
Investment Opportunities	0.00067***	0.00533***	0.00063***
	(0.00002)	(0.00010)	(0.00002)
Year Dummy (1999)	0.00059	0.06412***	0.01731***
	(0.00040)	(0.00265)	(0.00063)
Year Dummy (2000)	-0.00543***	0.02130***	0.00645***
	(0.00052)	(0.00447)	(0.00067)
Year Dummy (2001)	-0.00770***	-0.06254***	-0.00514***
	(0.00054)	(0.00456)	(0.00066)
Year Dummy (2002)	-0.00320***	-0.03132***	0.01335***
	(0.00055)	(0.00450)	(0.00067)
Year Dummy (2003)	-0.00346***	-0.03393***	0.01292***
	(0.00061)	(0.00614)	(0.00075)
Year Dummy (2004)	-0.01233***	-0.09899***	-0.00046
	(0.00077)	(0.00719)	(0.00091)
Year Dummy (2005)	-0.02030***	-0.14590***	-0.00738***
	(0.00090)	(0.00732)	(0.00104)
Number of Observations	360,686	360,686	359,890
R-squared	0.13	0.24	0.57

Note: This table presents estimates of fixed-effects regressions with the *Industry-adjusted Operating Income Ratio*, *Industry-adjusted Sales Growth*, and *Industry-adjusted Operating Income Growth* as dependent variables. The *Industry-adjusted Operating Income Ratio* is defined as the ratio of operating income to total assets averaged for two years from year t to t+1, calculated by subtracting the mean value in the medium category in the industrial classification. *Industry-adjusted Sales Growth* is defined as the growth rate of sales for two years from t-1 to t+1 ($[\text{sales}_{t+1} - \text{sales}_{t-1}]/\text{assets}_{t-1}$), calculated by subtracting the mean value in the medium category in the industrial classification. *Industry-adjusted Operating Incomes Growth* is defined as the growth rate of operating incomes for two years from t-1 to t+1 ([operating incomes_{t+1} – operating $\text{incomes}_{t-1}]/\text{assets}_{t-1}$), calculated by subtracting the mean value in the medium category in the industrial classification. *Leverage* is defined as the ratio of a firm's total liabilities to its total assets in year t-2. *ln(1+Firm Age)* is the natural log of firm age in year t-1. *ln(1+Sales)* is the natural log of (1+firm sales) in year t-1. *Tangible Fixed Assets Growth* is the annual growth rate of a firm's tangible fixed assets in year t-1 [(tangible fixed assets_{t-1}-tangible fixed assets_{t-2})/total assets_{t-2}], calculated by subtracting the mean value in the medium category in the industrial classification. *Total Assets Growth* is the annual growth rate of a firm's total assets in year t-1 [(total assets_{t-1}-total assets_{t-2})/total assets_{t-2}], calculated by subtracting the mean value in the medium category in the industrial classification. *Investment Opportunities* denotes the business DI, averaged over year t to year t+1. Year Dummy(t) is a dummy variable equal to one if the year is t and zero otherwise. Estimated standard errors in parentheses are based on clustering across firms. The symbol * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

Table 7.8: Regression Results of the Effects of Leverage on Firm Performance

	(1)	(2)	(3)
Dependent Variable	Industry-adjusted Operating Income Ratio (t, t+1)	Industry-adjusted Sales Growth (t-1 → t+1)	Industry-adjusted Operating Income Growth (t-1 → t+1)
High Leverage Dummy	0.04802***	0.03234***	0.03550***
	(0.00103)	(0.00552)	(0.00116)
Number of Observations	360,686	360,686	359,890
R-squared	0.07	0.24	0.56

Note: This table presents estimates of fixed-effects regressions with the *Industry-adjusted Operating Income Ratio*, *Industry-adjusted Sales Growth*, and *Industry-adjusted Operating Income Growth* as dependent variables. The *High-leverage Dummy* takes a value of one if a firm's leverage in year t-2 is in the top two deciles of its industry in a particular year. Definitions of the other variables are given in the note for Table 7.7. The same variables as in Table 7.7 are used, apart from leverage. The results of the control variables are omitted, as they are similar to those in 7.7. Estimated standard errors in parentheses are based on clustering across firms. The symbol * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

The effects of industry-adjusted tangible fixed assets growth are negative and statistically significant at the 1 percent level in columns (1) and (2). Many firms are struggling with the burden of a large amount of fixed debt because of overinvestment during the bubble. Therefore, many need to engage in asset restructuring. As a result, the performance of firms that reduced their holdings of tangible fixed assets is better than the performance of firms that did not. In contrast, the industry-adjusted total asset growth rates have positive effects on firm performance in columns (1) and (2). However, the coefficient of industry-adjusted tangible fixed assets is positive and that of industry-adjusted total assets growth is negative on industry-adjusted operating income growth in column (3), which is inconsistent with the results in columns (1) and (2). The estimated coefficients of investment opportunities are positive, which fits with trends in the industry-specific business cycles.

In Table 7.8, we show the estimated effects of the high-leverage dummy on firm performance. The dependent variables are the same as those in Table 7.7. The coefficients of the high-leverage dummy for the industry-adjusted operating income ratio and operating income growth are positive and statistically significant at the 1 percent level. These results also imply that highly leveraged firms enjoy higher profitability. In addition, the coefficient of the high-leverage dummy on industry-adjusted sales growth is positive and statistically signifi-

cant at the 1 percent level, suggesting that firms with high leverage increase their sales. The control variables are the same as those in Table 7.7. The results (not shown in the table) are similar to Table 7.7.

7.5 Robustness Check

7.5.1 Firm Size

To investigate the effect of differences in firm size, we divide the sample into two subsamples, small and medium. Under the Small and Medium Enterprise Basic Law in Japan, "Small enterprises" are defined as enterprises with 20 or fewer employees. Therefore, firms with 20 or fewer employees are categorized as small-sized firms and firms with 21 or more employees as medium-sized firms. We regress equations (7.1) and (7.2) using the fixed-effects model.

Table 7.9 shows the estimation results of equations (7.1). We show the results using observations of small firms in panel A and those of medium firms in panel B. In each panel, we do not show the results of the control variables. We show the results for short-term borrowings in columns (1) and (2), and those for trade payables in columns (3) and (4). Panel A shows that the coefficients of leverage $\times$ investment opportunities are not statistically significant. The coefficients of the high-leverage dummy $\times$ investment opportunities are negative and statistically significant. In panel B, the coefficients of the interactive variables with investment opportunities are negative and statistically significant for the short-term borrowings (columns 1 and 2), but those coefficients become positive and statistically significant for the trade payables (columns 3 and 4). These imply that the credit constraint of small firms in the highly leveraged group is more severe than that of medium firms.

In columns (5)–(8) of each panel, we show the results of trade receivables and the bill discount rate. The results of small firms in panel A are similar to the results using all firms in Table 7.6, suggesting that highly leveraged small firms with investment opportunities use alternative ways of financing, especially bill discounting. On the other hand, if we focus on the results using medium firms (in panel B), we see that the coefficients of leverage (or high-leverage dummy) and investment opportunities for trade receivables change to positive

Table 7.9: Regression Results for Short-term Borrowings, Trade Payables, Trade Receivables, and Bill Discounts, Divided by Firm Size

Pane A: Small Firms

	(1)	(2)	(3)	(4)
Dependent Variable	Short-term Borrowings		Trade Payables	
Leverage	-0.06048***		-0.01330***	
	(0.00448)		(0.00165)	
Leverage	0.00001		-0.00001	
× Investment Opportunities	(0.00007)		(0.00003)	
High Leverage Dummy		-0.02657***		-0.00634***
		(0.00260)		(0.00121)
High Leverage Dummy		-0.00020***		-0.00007**
× Investment Opportunities		(0.00006)		(0.00003)
Investment Opportunities	-0.00010	-0.00005	0.00006*	0.00006**
	(0.00008)	(0.00005)	(0.00003)	(0.00002)
Year Dummy	Yes	Yes	Yes	Yes
Number of Observations	235,569	235,569	235,569	235,569
R-squared	0.03	0.03	0.13	0.13

	(5)	(6)	(7)	(8)
Dependent Variable	Trade Receivables		Bill Discounts Rate	
Leverage	0.01583***		0.06550***	
	(0.00236)		(0.00467)	
Leverage	-0.00006		0.00042***	
× Investment Opportunities	(0.00004)		(0.00012)	
High Leverage Dummy		0.00737***		0.05232***
		(0.00160)		(0.00448)
High Leverage Dummy		0.00002		0.00044***
× Investment Opportunities		(0.00004)		(0.00012)
Investment Opportunities	0.00025***	0.00019***	-0.00030*	-0.00000
	(0.00005)	(0.00003)	(0.00016)	(0.00012)
Year Dummy	Yes	Yes	Yes	Yes
Number of Observations	235,569	235,569	231,047	231,047
R-squared	0.27	0.27		

[continued to the next page]

Panel B: Medium Firms

	(1)	(2)	(3)	(4)
Dependent Variable	Short-term Borrowings		Trade Payables	
Leverage	-0.08913***		-0.02138***	
	(0.00859)		(0.00492)	
Leverage	-0.00018*		0.00019***	
× Investment Opportunities	(0.00011)		(0.00007)	
High Leverage Dummy		-0.02415***		0.00142
		(0.00457)		(0.00280)
High Leverage Dummy		-0.00020*		0.00015**
× Investment Opportunities		(0.00012)		(0.00007)
Investment Opportunities	0.00012	-0.00000	0.00004	0.00018***
	(0.00009)	(0.00004)	(0.00005)	(0.00003)
Year Dummy	Yes	Yes	Yes	Yes
Number of Observations	129,356	129,356	129,356	129,356
R-squared	0.04	0.04	0.24	0.24

	(5)	(6)	(7)	(8)
Dependent Variable	Trade Receivables		Bill Discounts Rate	
Leverage	0.02437***		0.24048***	
	(0.00579)		(0.01279)	
Leverage	0.00015*		0.00095***	
× Investment Opportunities	(0.00008)		(0.00032)	
High Leverage Dummy		0.00937***		0.03344***
		(0.00315)		(0.00866)
High Leverage Dummy		0.00017**		0.00024
× Investment Opportunities		(0.00007)		(0.00024)
Investment Opportunities	0.00005	0.00015***	-0.00083***	-0.00010
	(0.00006)	(0.00003)	(0.00028)	(0.00011)
Year Dummy	Yes	Yes	Yes	Yes
Number of Observations	129,356	129,356	128,592	128,592
R-squared	0.31	0.31		

Note: This table presents estimates of fixed-effects and Tobit regressions with the *Short-term Borrowings Growth*, *Trade Payables Growth*, *Trade Receivables Growth*, and *Bills Discount Rate* as dependent variables, where the sample is divided by firm size. Firms with 20 or fewer employees are categorized as "Small", and firms with 21 or more employees as "Medium". The results for small firms are shown in Panel A, and those for medium firms are shown in Panel B. The dependent and independent variables are shown in Tables 7.5 and 7.6. We omit the results of some control variables from this table. Definitions of the variables are given in the notes for Tables 7.5 and 7.6. Estimated standard errors in parentheses are based on clustering across firms. We estimate Tobit regressions if we use *Bills Discount Rate* as the independent variable. The symbol * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

Table 7.10: Regression Results of the Effects of Leverage on Firm Performance, Divided by Firm Size

Panel A: Small

	(1)	(2)	(3)
Dependent Variable	Industry-adjusted Operating Income Ratio (t, t+1)	Industry-adjusted Sales Growth (t-1 → t+1)	Industry-adjusted Operating Income Growth (t-1 → t+1)
Leverage	0.15381***	0.07758***	0.11385***
	(0.00334)	(0.01408)	(0.00327)
Number of Observations	232,281	232,281	231,542
R-squared	0.15	0.25	0.58

	(4)	(5)	(6)
High Leverage Dummy	0.05354***	0.04534***	0.03890***
	(0.00121)	(0.00658)	(0.00137)
Number of Observations	232,281	232,281	231,542
R-squared	0.08	0.25	0.57

Panel B: Medium

	(1)	(2)	(3)
Dependent Variable	Industry-adjusted Operating Income Ratio (t, t+1)	Industry-adjusted Sales Growth (t-1 → t+1)	Industry-adjusted Operating Income Growth (t-1 → t+1)
Leverage	0.11810***	-0.01887	0.09910***
	(0.00623)	(0.02849)	(0.00648)
Number of Observations	128,405	128,405	128,348
R-squared	0.07	0.27	0.51

	(4)	(5)	(6)
High Leverage Dummy	0.02437***	-0.00641	0.01868***
	(0.00165)	(0.01013)	(0.00194)
Number of Observations	128,405	128,405	128,348
R-squared	0.04	0.27	0.51

Note: This table presents estimates of fixed-effects regressions with the *Industry-adjusted Operating Income Ratio*, *Industry-adjusted Sales Growth*, and *Industry-adjusted Operating Income Growth* as dependent variables, where the sample is divided by firm size. Firms with 20 or fewer employees are categorized as "Small", and firms with 21 or more employees as "Medium". The results for small firms are shown in Panel A, and those for medium firms are shown in Panel B. The dependent and independent variables are presented in Table 7.7. We omit the results of some control variables from this table. Definitions of the variables are given in the notes for Table 7.7. Estimated standard errors in parentheses are based on clustering across firms. The symbol * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

and statistically significant (columns 5 and 6). Furthermore, those for bill discount rates are positive but not statistically significant in column (8). These results suggest that highly leveraged medium firms with investment opportunities use fewer alternative ways of financing, which is consistent with the interpretation that credit constraints for highly leveraged medium firms are less severe.

Table 7.10 shows the estimation results of equation (7.2) after dividing the sample by firm size. Panel A shows the estimation results using data of small firms and panel B shows that for medium firms. The coefficients of leverage are positive and statistically significant at the 1 percent level, apart from the result in columns (2) and (5) of panel B. This suggests that the high performance of highly leveraged firms is supported. Focusing on the magnitude of the coefficients, we see that the coefficients of leverage for small firms are larger than those for medium firms. This suggests that the positive effects of leverage are larger in small firms.

7.5.2 Instrumental Variable Regression

Following Opler and Titman (1994), we assume the exogeneity of leverage in year t-2. However, as Aivazian et al. (2005) argued, the simultaneity between firm performance and leverage could be serious. To address this potential problem, we estimate an instrumental variable regression, assuming that leverage is an endogenous variable. We use two instrumental variables, which are collateralizable assets and average interest rate in year t-3.[19] Firms with higher collateralizable assets can use external finance because the information problem is not severe. As a result, availability of bank loans is enhanced, and leverage is higher for firms with collateralizable assets. On the other hand, the effects of collateralizable assets on firm performance, other than via increasing leverage, are considered to be insignificant, so collateralizable assets are suitable instrumental variables for firm performance. We use the ratio of a firm's tangible fixed assets to total assets in year t-3 (the Tangible Fixed Assets–TA ratio) and the ratio of the book value of a firm's land and buildings to total assets in year t-3 (the Land and Building–TA ratio) as proxies of collateralizable assets.

[19] Aivazian et al. (2005) also used the ratio of tangible assets to total assets as an instrumental variable for leverage. Our idea of using collateralizable assets as an instrument variable is similar to Aivazian et al. (2005).

Furthermore, we use the average interest rate in year t-3 as an instrumental variable: firms with higher interest rates have smaller bank loans, which causes lower leverage. Therefore, the correlation between interest rates and leverage is considered to be negative. On the other hand, the effects of interest rates on firm performance are indirect, which is through changes in loan size. Therefore, the effects of interest rates on firm performance other than via increasing leverage are considered to be insignificant. Similar to the collateralizable assets, interest rates are also suitable instruments. A firm's average interest rate is defined as the ratio of a firm's interest expenses to the sum of its short- and long-term debt and discounted bills receivable in year t-3 (the Interest Rate).

The estimated results are shown in Table 7.11. We use the tangible fixed assets–TA ratio in column (1) and the land and building–TA ratio in columns (2) and (3) as a proxy of the collateralizable assets. In all columns, the coefficient of interest rates for leverage are negative, and those of tangible fixed assets–TA ratio and land and building–TA ratio are positive. F-test that all coefficents of excluded instruments equal zero is rejected at the 1 percent level. These results suggest that the weak instruments are not a problem. As shown at the bottom of Table 7.11, the p-values for the J-statistics are 0.886, 0.430, and 0.706, respectively. These suggest that the correlations between the error terms and instrumental variables are statistically insignificant. In columns (1) and (3) of Table 7.11, the coefficients of leverage are positive and statistically significant, suggesting that the positive effects of leverage on operating incomes are supported if we mitigate the problem of endogeneity. However, the effect on sales growth is positive, but not statistically significant (column 2).

7.5.3 Sample Selection Problem

Our small-business data consist of the client data of banks. Poorly performing and highly leveraged firms might be more likely to be removed from the CRD data because they are more likely to default, and banks will not continue relationships with them. According to our data, the ratios of the truncated observations are 18.91 percent for firms in the highly leveraged

Table 7.11: Regression Results of the Effects of Financial Distress on Firm Performance (IV Estimation)

	(1)	(2)	(3)
Dependent Variable	Industry-adjusted Operating Income Ratio (t, t+1)	Industry-adjusted Sales Growth (t-1 → t+1)	Industry-adjusted Operating Income Growth (t-1 → t+1)
Leverage	0.28676***	0.79005	0.29017***
	(0.04387)	(0.50984)	(0.10817)
Log (1+Sales)	0.00185	-0.64334***	0.00677
	(0.00391)	(0.05937)	(0.00914)
Log(1+Firm Age)	-0.00105	-0.00441	-0.00169
	(0.00080)	(0.00482)	(0.00110)
Industry-adjusted	-0.21552***	-0.95253***	-1.23159***
Operating Income Ratio (t-1)	(0.02285)	(0.26291)	(0.05583)
Current Assets Ratio	-0.02226***	0.09653	-0.00319
	(0.00835)	(0.09422)	(0.01897)
Industry-adjusted	-0.00679	0.05171	0.02486*
Tangible Assets Growth	(0.00574)	(0.06598)	(0.01371)
Industry-adjusted	0.00519**	0.00223	-0.01601***
Total Assets Growth	(0.00224)	(0.02160)	(0.00453)
Investment Opportunities	0.00066***	0.00530***	0.00065***
	(0.00002)	(0.00015)	(0.00003)
Year Dummy (2001)	0.01436***	0.17253***	0.01440***
	(0.00100)	(0.00719)	(0.00120)
Year Dummy (2002)	0.01096***	0.08461***	0.00127
	(0.00118)	(0.00948)	(0.00181)
Year Dummy (2003)	0.01522***	0.11284***	0.01985***
	(0.00134)	(0.01093)	(0.00204)
Year Dummy (2004)	0.01408***	0.10028***	0.01767***
	(0.00094)	(0.00728)	(0.00148)
Year Dummy (2005)	0.00661***	0.03874***	0.00587***
	(0.00045)	(0.00360)	(0.00080)
Number of Observations	199,848	196,261	195,931
P-value of J-statistics	0.886	0.430	0.706
First Stage Coefficients of Excluded Instruments on Leverage			
Interest Rate	-0.00299***	-0.00302***	-0.00300***
	(0.00048)	(0.00049)	(0.00049)
Tangible Fixed Assets–TA ratio	0.06631***		
	(0.00795)		
Land and Building–TA ratio		0.00268	0.00345
		(0.00780)	(0.00778)
F-statistic of excluded instruments	54.85***	19.07***	19.07***

Note: This table presents estimates of the two-stage least squares fixed-effects regression with the *Industry-adjusted Operating Income Ratio*, *Industry-adjusted Sales Growth*, and *Industry-adjusted Operating Income Growth* as dependent variables. We use collateralizable assets and average interest rates in year t-3 as instrument variables. A firm's average interest rate is defined as the ratio of a firm's interest expenses to the sum of its short- and long-term debt and discounted bills receivables in year t-3. The proxy of collateralizable assets is the ratio of a firm's tangible fixed assets to total assets in year t-3 (the Tangible fixed assets–TA ratio) or the ratio of the book value of a firm's land and building to total assets in year t-3 (the Land and building–TA ratio). The definition of independent variables is same as those used in Table 7.7. Estimated standard errors in parentheses are based on clustering across firms. The symbol * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

group and 11.52 percent for those in the non-highly leveraged group.[20] This suggests that the highly leveraged firms are more truncated in our database.

Truncated highly leveraged firms experience larger reductions in short-term borrowings and/or trade payables because they stop transacting with banks. Therefore, if our database included these firms, the coefficients of leverage × investment opportunities would also be negative and the magnitude would be larger. As the estimated magnitude of leverage in equation (7.1) is considered to be biased downward, additional tests are not required. However, if poorly performing and highly leveraged firms are more likely to be truncated, we need additional tests for the results of equation (7.2). The reason is that the performance of highly leveraged firms would be lower if our database included truncated highly leveraged firms. As a result, we are concerned that the coefficients of leverage on firm performance would be negative in data including truncated observations.

To correct for the attrition bias, we estimate the Heckman selection model following Wooldridge (2010):

$$\Delta Firm\ Performance_{i,t-1\to t+1} = \gamma_1 \Delta Leverage_{i,t-2} + \Delta X_{i,t-1}\gamma_2 + \Delta\epsilon_{i,t} \quad (7.3)$$

$$s_{i,t} = 1[\omega_{i,t}\theta + v_{i,t}] \quad (7.4)$$

where $\mathbf{X}_{i,t}$ is a matrix of control variables and $\Delta\epsilon_{i,t}$ is the error term of firm i in year t from 1998 to 2004. $s_{i,t}$ is the selection indicator for each year t, where $s_{i,t} = 1$ if the dependent and independent variables in t+1 are observed. To remove the unobserved time-invariant individual effects, we first difference all variables in equation (7.3). We assume that $Cov(\Delta\epsilon_{i,t}, v_{i,t}) = \rho$, where ρ is not equal to zero. $w_{i,t}$ includes all undifferenced independent variables in t-1, the average interest rates in t-1, the short- to long-term borrowings ratio in t-1, and the 16 industry dummies listed in panel A of Table 7.1.[21] Our data are constructed from the client data of banks, so truncated samples shorten the duration of the bank relationships

[20] We define the ratio of truncated firms in year t as 1 — (number of existing firms in year t/number of existing firms in year t-1). The ratio of the truncated samples is 12.87 percent across all samples.

[21] We use the food industry as a benchmark.

that can be examined. Therefore, we include the control variables used in Ongena and Smith (2001), which can be used to estimate over the full duration of the banks' relationships with firms. [22]

Column (1) in Table 7.12 presents the estimates of equation (7.4) using industry-adjusted operating income as a proxy of firm performance. Firm age, sales, industry-adjusted operating income ratio, and investment opportunities have positive effects on the selection indicator, whereas leverage, the current assets ratio, the interest rate, and the short- to long-term borrowings ratio have negative effects. Firms with a large amount of current assets also have adequate internal cash. Therefore, credit demand for these firms is low. As a result, these firms are more likely to be truncated. The short- to long-term borrowings ratio is the proxy for maturity. Firms with a higher short-term borrowings ratio have a shorter maturity period and therefore are more likely to pay off their loans. Firms that pay higher interest rates are more likely to be truncated because they have an incentive to stop their transactions with banks to reduce the burden of interest expenses. Thus, we suggest that the results of the selection model are reasonable. After controlling for these variables, the effect of leverage is negative for the selection indicator. This means that highly leveraged firms are more likely to be dropped from the database, which suggests that banks cease transactions with these firms because they have higher default risks. The estimated ρ is statistically significant at the 1 or 5 percent level.

Columns (2)–(4) in Table 7.12 provide the results of equation (7.3). The definitions of the dependent variables in each column are the same as in Table 7.7. The effects of leverage for the industry-adjusted operating incomes ratio and growth are positive and statistically significant at the 1 percent level. These results imply that highly leveraged firms enjoy higher firm performance in terms of profitability after correcting for attrition bias. The coefficient of leverage on industry-adjusted sales growth is positive and statistically significant, suggesting that highly leveraged firms increase their sales. The results of the control variables are similar to the results using a simple fixed-effects model in Table 7.7.

[22] Ongena and Smith (2001) showed that sales, age, profitability, Tobin's Q, and leverage affect the duration of bank–firm relationships. To estimate the selection variable, we include these variables, except for Tobin's Q, as it is unavailable.

Table 7.12: Regression Results of the Effects of Financial Distress on Firm Performance (Heckman Selection Model)

	(1)	(2)	(3)	(4)
Dependent Variable	Selection	Industry-adjusted Operating Income Ratio (t, t+1)	Industry-adjusted Sales Growth (t-1 → t+1)	Industry-adjusted Operating Income Growth (t-1 → t+1)
Leverage	-0.22393***	0.15213***	0.05783***	0.04032***
	(0.00795)	(0.00290)	(0.01452)	(0.00348)
Log (1+Sales)	0.08338***	-0.01189***	-0.87163***	-0.01008***
	(0.00254)	(0.00084)	(0.04534)	(0.00122)
Log(1+Firm Age)	0.09188***	-0.00030	-0.00519*	-0.00175**
	(0.00451)	(0.00041)	(0.00311)	(0.00088)
Industry-adjusted	0.49980***	-0.28275***	-0.57557***	-1.05988***
Operating Income Ratio (t-1)	(0.04654)	(0.00233)	(0.03941)	(0.00463)
Current Assets Ratio	-0.38461***	-0.05207***	-0.20216***	-0.03451***
	(0.01491)	(0.00251)	(0.03220)	(0.00468)
Industry-adjusted	0.03523	-0.02444***	-0.05459***	0.00429
Tangible Assets Growth	(0.04449)	(0.00144)	(0.01384)	(0.00311)
Industry-adjusted	-0.00099	0.01207***	-0.05385***	-0.00854***
Total Assets Growth	(0.02240)	(0.00079)	(0.00712)	(0.00181)
Investment Opportunities	0.00337***	0.00051***	0.00385***	0.00022***
	(0.00041)	(0.00001)	(0.00011)	(0.00002)
Interest Rate	-0.01305***			
	(0.00267)			
Short-Long Term	-0.09847***			
Borrowings Ratio	(0.01020)			
Year Dummy (1999)	-0.00455	-0.01582***	-0.00118	-0.03803***
	(0.01392)	(0.00157)	(0.01917)	(0.00302)
Year Dummy (2000)	-0.06549***	-0.01428***	0.05387***	-0.01940***
	(0.01384)	(0.00130)	(0.01543)	(0.00251)
Year Dummy (2001)	-0.06892***	-0.01667***	0.02967***	-0.01750***
	(0.01307)	(0.00108)	(0.01118)	(0.00207)
Year Dummy (2002)	0.00853	-0.01298***	-0.03794***	-0.02662***
	(0.01265)	(0.00082)	(0.00860)	(0.00159)
Year Dummy (2003)	-0.01705	-0.00423***	0.00320	-0.00770***
	(0.01338)	(0.00059)	(0.00660)	(0.00117)
Year Dummy (2004)	-0.35154***	-0.00091***	0.01528***	0.00237***
	(0.01712)	(0.00031)	(0.00287)	(0.00074)
Number of Observations	299,719	299,719	299,719	299,752
ρ		0.03477***	-0.03646***	0.00655**
Log Likelihood		306423.1	-214241.8	128862.5

Note: This table presents estimates of Heckman selection regressions with the *Industry-adjusted Operating Income Ratio*, *Industry-adjusted Sales Growth*, and *Industry-adjusted Operating Income Growth* as dependent variables. All variables in columns (2), (3), and (4) are first differences. Column (1) shows the results of the selection equation for the estimation in column (2). The *Short- to Long-term Borrowings Ratio* is the ratio of a firm's short-term borrowings to total borrowings in year t-1. The *Interest rate* is the ratio of a firm's interest expenses to the sum of its short-term debt, long-term debt, and discounted bills receivables for each year in year t-1. Definitions of the other variables are given in the notes for Table 7.7. Estimated standard errors in parentheses are based on clustering across firms. The symbol * denotes significance at the 10 percent level, ** denotes significance at the 5 percent level, and *** denotes significance at the 1 percent level.

7.6 Conclusion

We investigated whether the cost or benefit of high leverage is significant for small businesses using firm-level data in Japan. We report three broad findings. First, we find that the performance (measured as firm sales growth or profitability) of highly leveraged firms is higher than that of low-leveraged firms after controlling for time-invariant firm effects and selectivity bias. These results imply that the cost of high leverage is not a significant problem for small businesses. Second, although the performance of highly leveraged firms is not poorer, they increase short-term borrowings and trade payables less when they have profitable investment opportunities. This suggests that highly leveraged small businesses reduce the burden of debts and avoid the cost of bankruptcy. Third, highly leveraged firms use alternative ways of financing: selling bills receivables without increasing debt. Thus, we conclude that the costs of high leverage are not binding for small businesses because they have alternative ways of financing to increasing debt.

Our results have some policy implications for small-business lending. According to the "Inspection manual for deposit-taking institutions" by the Financial Services Agency of Japan,[23] banks should classify firms with negative net worth (which are very highly leveraged firms) as "borrowers in danger of bankruptcy (*Hatan Kenen Saiken*)" or "borrowers in de facto bankruptcy (*Jissitsu Hatan Saiken*)" in their self-assessment of assets if the profitability of these borrowers is not expected to be enhanced. Therefore, when banks judge that the profitability of these firms with negative net worth will not improve, they are likely to classify the loans of very highly leveraged firms as "borrowers in danger of bankruptcy" or "borrowers in de facto bankruptcy". The banks' loans to "borrowers in danger of bankruptcy" and "borrowers in de facto bankruptcy" are classified as nonperforming loans, so banks reduce the credit supply for these firms. This is consistent with the results in Table 7.5, suggesting that highly leveraged firms take fewer loans even if they have good investment opportunities. However, our results show that ex post performance (in terms of profitability and sales growth) is higher, so these firms have the ability to repay. This implies that banks need to

[23] See http://www.fsa.go.jp/manual/manualj/yokin.pdf (in Japanese) (last accessed: April 2014) for more detail.

evaluate the credit risk of very highly leveraged small businesses more carefully.

Our results also have implications for understanding the difference between large listed firms and small firms. For listed firms, high leverage (especially, the situation in which total debts exceed total assets) is a very serious situation because the risk of delisting is increased. For example, the criteria for delisting on the Tokyo Stock Exchange include the situation where "Liabilities exceed assets and this state remains unchanged for 1 year."[24] On the other hand, as we showed in Table 7.4, the median degree of leverage in firms with a high-leverage dummy equal to one is 1.282, suggesting that debts exceed assets in many firms in our small-business data set. This implies that unlike the large listed firms, the high leverage (especially the case of debt exceeding assets) is not serious for (unlisted) small firms.

[24]See the website of Tokyo Stock Exchange: http://www.tse.or.jp/english/rules/delisting/summary/index.html. (last accessed: April 2014)

Chapter 8

Variance of Firm Performance and Leverage of Small Businesses

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Abstract

We investigate the relationship between leverage and firm performance using small business data from Japan by estimating the effects of leverage on both average firm performance and the variance of firm performance. We find that leverage has a negative effect on average firm performance and a positive effect on the variance of firm performance. This suggests that the problem of moral hazard is severe for highly leveraged firms. However, when highly leveraged firms have sufficient collateral assets, the effects of leverage are positive for average performance, but negative for the variance of performance. This implies that when small firms have sufficient collateral assets, highly leveraged businesses are better performers.

Keywords: leverage; firm performance; small business

JEL classification: G32; G33

Chapter 9

Concluding Remarks and Future Work

9.1 Concluding remarks

The conclusions of the thesis are summarized as follows. First, although many studies support the value of lending relationships for mitigating asymmetric information between borrowers and banks, the inefficiency associated with ending the relationships is not severe.[1] Borrowers and banks end their relationships because the credit demand of borrowers is low, the credit risk of borrowers is high, and bank health is deteriorated. These imply that inefficient credit allocation through lending relationships is not a serious issue. In addition, firms without bank relationships used cash holdings to finance credit demand during the financial shock period. This means that borrowers with no relationships had alternative financial sources to mitigate the liquidity shortage during the shock.

Second, dependence on bank loans is beneficial rather than harmful for small businesses. Highly leveraged firms enjoy higher firm performance, in terms of sales growth and profitability. Furthermore, during the shock period, firm performance of bank-dependent firms, which are considered to be vulnerable to a large financial shock, was higher than that of independent firms. This implies that inefficiency caused by dependence on bank loans is not significant in

[1]The results in this thesis do not show whether the value of lending relationships is significant or not.

the loan market for small businesses. This result is consistent with recent work that supports the benefits of relationship lending during the shock period (for example, Jiangli et al., 2008; Cotugno et al., 2013; Dewally and Shao, 2014; Gobbi and Sette, 2014).

Third, the main reason for using trade credit by small businesses is not the unavailability of bank loans, which implies that trade credit is not a last resort. They used trade credit even if the availability of bank loans was enhanced during the financial shock, which does not suggest that trade credit and bank loans are substitutes.

9.2 Future research

These findings have not been adequately argued in the literature, and some important issues remain for future research.

Definition of no lending relationship Berger and Udell (2006) argue that "[U]nder relationship lending, the financial institution relies primarily on soft information gathered through contact over time with the SME, its owner and the local community to address the opacity problem" (p. 2951). Chapters 2 and 3 define firms ending lending relationships as those for which short-term and long-term borrowings from financial institutions in a particular year are zero or observations are dropped from the database. Under these definitions, firms with no borrowings are identified as those without contact over time with banks. However, under the definitions of lending relationships applied in this thesis, the firms that have lending relationships according to the literature are identified as those with "no relationships." First, a credit line is ignored by the definition of lending relationship in this thesis. If firms have an available credit line, the lending relationships (or contact over time between banks and borrowers) continue even if the amount of borrowings in a firm's financial statement is zero. Indeed, some studies (for example, Campello et al., 2011, 2012) show that during the financial shock, firms financed financial shortages using credit lines. This implies that firms continued lending relationships with banks using credit line contracts during the nonshock period to cope with the negative effects of unexpected shocks. Because of the limitations of the data, we

cannot identify whether firms use credit lines or have credit line contracts. However, we need to define nonborrowing firms with credit line contracts as those with lending relationships.

Second, we define termination of lending relationships using borrowing data in one or two consecutive years. This definition also has some shortcomings for investigating ending relationships. If banks accumulate enough soft information, the effects of lending relationships remain over several years even though a lending transaction does not take place. We need to investigate when the value of lending relationships ceases after the final transaction. Recently, Drexler and Schoar (2014) show that unexpected loan officer turnover reduces the credit supply for firms, suggesting that the accumulation of soft information disappears after the turnover. The negative effects of ending relationships might be significant when the loan officer changes.

Third, we only focus on the relationships with banks through lending transactions. Because banks can continue relationships through deposit transactions, banks and firms can continue relationships even if firms stop borrowing. These problems are caused by using data for "lending" and not data for "lending relationships" as defined in the literature.

Alternative financial sources and lending relationships Chapters 2 and 3 investigate the determinants of the end of lending relationships between banks and small business borrowers. To investigate this issue, we focus on all types of small businesses. However, start-up firms and those that are growing rapidly do not need close relationships with banks because venture capital offers equity to finance their growth opportunities. In addition, subsidiaries can borrow sufficient funds from parent firms, so they also do not need close relationships with banks. To estimate the inefficiency of lending relationships more accurately, we limited our analysis to small businesses that need lending relationships with banks.

Credit demand for bank loans and trade credit Chapter 6 investigates the relationship between bank loans and trade credit, showing that the estimated relationships are positive. This implies that the relationships between bank loans and trade credit are complements, rather than substitutes. However, Chapter 6 does not show adequately why the relationships

are complements. In Subsection 6.5.4, we check simply whether the supply or demand effects of trade credit are significant. However, we do not show the drivers of demand for trade credit and bank loans. To understand the reason why they are complements, we need to show why small businesses have credit demand for bank loans and trade credit. For example, Cunat (2007) shows that suppliers offer trade credit for customers to maintain supplier–customer relationships when customers have credit demand in situations of liquidity shortage. Wilner (2000) considers these relationships focusing on credit demand for financially distressed firms, which supports the negative relationships between bank loans and trade credit. This implies that if we focus on the credit demand of distressed firms and those experiencing liquidity shocks, the relationship between bank loans and trade credit might be negative. Other studies (for example, Mateut et al., 2006; Love et al., 2007) investigate the relationship focusing on the credit demand for severely credit-constrained firms during the financial crisis. If we limit the credit demand during the financial crisis, then bank loans and trade credit are substitutes, empirically. This implies that the relationships depend on the types of credit demand, so we need to investigate the relationships in greater detail.

Buyer–supplier network Chapter 6 investigates the empirical relationship between trade credit and bank loans using the data from financial statements. These data have some shortcomings because information about the networks of supplier–customer relationships is not available. As some studies (for example, Kiyotaki and Moore, 1997, 2002) argue, suppliers offer credit to firms, while firms offer credit to their customers. As firms construct buyer–supplier networks through trade credit, the determinants of the trade credit of firms are affected by the characteristics of suppliers and the suppliers' suppliers as well as customers and the customers' customers. For example, if suppliers of firms' suppliers are large and creditworthy firms, the effects of the credit constraints of their suppliers are mitigated. In this case, the relationships between bank loans and trade credit can be negative because their suppliers can offer sufficient credit by using credit obtained from the buyer–supplier network. Furthermore, the characteristics of a firm's suppliers or customers are not controlled in our estimations. Because limitations in terms of data availability meant that we could only

focus on particular relationships between suppliers and customers, the insights available from buyer–supplier networks are not included.

Identification problem for ending relationships Chapters 2 and 3 do not adequately identify whether firms or banks end lending relationships. Some studies (for example, Jiménez et al., 2012) argue that loan demand is observed through loan applications. Therefore, if data availability is limited to only those firms with loan applications, the end of lending relationships is caused by low credit supply from banks. Using data from the Basic Survey of Small and Medium Enterprises, we found that many nonborrowing firms do not apply for loans; however, we cannot limit our econometric analysis to only those firms with loan applications. Therefore, the identification problem was a major issue in our estimation. In future research, we should use a two-stage regression that estimates whether firms apply for loans in the first equation and whether banks offer loans to the applicants in the second equation. In addition, we should consider discouraged borrowers, which are firms that did not apply for a bank loan because they felt they would be rejected (as argued by Kon and Storey, 2003).

To identify whether banks or borrowers end the lending relationships, structural estimation is also appropriate. Not all chapters in the thesis apply this approach, so it would be valuable to apply structural estimation to investigate the relationships between banks and borrowers or those between firms and suppliers to reveal the causality.

Unnatural selection caused by public credit guarantees To consider the issue of natural and unnatural selection of relationship lending, the inefficiency caused by the public credit guarantee program should be also discussed.[2] The aim of public credit guarantee programs is to increase the supply of bank loans for small businesses that do not borrow sufficiently to finance profitable investment opportunities. However, banks have an incentive to offer credit-guaranteed loans to firms that do not face profitable investment opportunities, which should end the lending relationships. The reason for the continuation of relationships with these firms is that banks do not incur losses when borrowers do not repay credit-

[2]Saito and Tsuruta (2014) investigate the inefficiency of the credit guarantee program in Japan, caused by information asymmetry between banks and credit guarantee corporations.

guaranteed loans, which creates a moral hazard problem. The main cause of this issue is the information advantage of banks over credit guarantee corporations. Some studies (for example, Ono et al., 2013) show that relationship lenders offer more public credit-guaranteed loans to risky firms, implying that the credit guarantee may cause an unnatural selection of lending relationships. To investigate this issue, we should examine to what extent inefficiency caused by public credit guarantees is serious.

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