2016 Doctor’s Thesis

Essays on Banking and New Business Bankruptcy

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Acknowledgements

Accomplishment of this doctoral dissertation has been possible with the support from many people who have encouraged and inspired me. I would like to express my sincere gratitude to all of them.

First, I would like to express my immeasurable gratitude to my supervisor, Jiro Nemoto. No words can do justice to my appreciation for his continued guidance in enhancing my “Applicable Ability” and “Research Ability.” Without his devoted support, I would not have been able to complete this paper with this quality. Getting closer to him as a researcher and as an educator is one of my future goals. To repay his kindness, I faithfully promise that I will bring out my best in my future career.

In addition, I would like to express my gratitude to Eiji Mangyo and Hidenori Takahashi, who are members of the dissertation advisory committee. Their rigorous but polite comments at two seminars have helped me to immensely improve the overall quality of my paper, and their excellent discernment provided me a broader perspective.

Moreover, I owe special thanks to Nobuyoshi Yamori, my ex-supervisor before Jiro Nemoto. He has offered me several opportunities for growth. For example, he invited me to his study group at the Research Institute of Economy, Trade and Industry (RIETI) as a member. Because I am the only graduate student among the regular members in the group, initially, I felt out of place or alienated. However, today, I feel fortunate to have joined the group because I grew a lot through discussions with the members.

Furthermore, I am extremely obliged to Hirofumi Uchida, who is a leading researcher in the field of banking in Japan. He always overwhelms me with his outstanding academic knowledge and insight, which simultaneously gives me a strong motivation to improve myself. He is, as it were, my supervisor outside the university. I am also indebted to him for accepting me as a Japan Society for the Promotion of

Science (JSPS) researcher in Kobe University after the completion of my doctoral program.

I must acknowledge a number of helpful comments from the discussants and participants at more than 30 academic conferences and seminars in which I participated as a presenter. Although I cannot include all of their names due to space constraints, I definitely appreciate their warm support and cooperation.

I am also grateful to Leo Iijima, who is a Designated Assistant Professor at Nagoya University, Graduate Program for Real-World Data Circulation Leaders, which is one of Nagoya University's Leading Graduate School Programs, and the Tokyo Shoko Research, Ltd. for data provision. I acknowledge the financial support from the Research Fellowships for Young Scientists of the JSPS through a Grant-in-Aid for JSPS Fellows 15J00987. All remaining errors are my own responsibility.

November 2016

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Contents

Chapter 1: Introduction

1.1. Background

The aim of this paper is to examine the effects of firm–bank relationships on the bankruptcy of new firms and to draw implications for supporting the survival of such firms. In general, firms' financial constraints and their demand for external funds are negatively associated with the size of enterprises and the number of years of their establishment. In spite of this, small and medium-sized enterprises (SMEs), particularly young and unlisted SMEs, which find it difficult to raise funds through direct financing, are faced with the most severe financial constraints among all firms. Therefore, facilitating financing for these vulnerable SMEs has become the central issue of economic policy in many countries.

In addition, the decline in entrepreneurial activity is a problem to be resolved in Japan. For example, the Total early-stage Entrepreneurial Activity (TEA), which is the main indicator in Global Entrepreneurship Monitor (GEM), reports that Japan has the lowest level of entrepreneurial activity among OECD countries. Thus, to realize regional revitalization, which is one of the important policies of the government, it is essential for Japan to improve the business environment and to grow out of being an underdeveloped country with regard to entrepreneurial activity. Scientific knowledge obtained from previous banking literature is indeed a useful tool to meet such social requests. However, in order to apply the theory to the real-world policy, we have to conduct empirical verification of its realistic validity.

Hence, this paper conducts empirical research using a sample of new firms incorporated in Japan.[1] More specifically, we mainly employ the data of the first settlement of accounts of these firms. The hypotheses in this paper are mainly based on the literature on relationship lending, which is a business model of lending based on

[1] In this paper, we define new firms as young and unlisted SMEs. For more detailed definition, see each chapter.

subjective information on the client firms such as the ability of managers, the firms' future prospects, and their potential power. Since Petersen and Rajan (1994), who are renowned as the first to focus on lending relationships between firms and their creditors, relationship lending has been a core research topic in banking until today.[2]

Most of the existing studies after Petersen and Rajan (1994) have investigated the effects of firm–bank relationships on lending terms and conditions. However, one of the greatest concerns of young SMEs is how to avoid bankruptcy during the early stages of the entrepreneurial process. For example, the 2006 White Paper on Small and Medium Enterprises in Japan reports that the first five- and ten-year survival rates of startup companies are 41.8% and 26.1%, respectively. This result suggests that the need for finding academic approaches to support the survival of young SMEs has increased.

Since Altman (1968), who may be the first to investigate the impact of financial intermediation on firm bankruptcy, a number of studies have been conducted on this issue, which has become one of the important research topics in recent banking studies. In spite of this, the impact of firm–bank relationships on the bankruptcy of young SMEs has long been an open question. In particular, to the best of our knowledge, no study has empirically investigated this impact.

Against this background, this paper is the first to empirically examine the effects of firm–bank relationships on the bankruptcy of new firms.

[2] Although the concept of relationship lending stems from Petersen and Rajan (1994), their empirical study is based on the theories presented by Leland and Pyle (1977), Campbell and Kracaw (1980), Diamond (1984), Fama (1985), and Diamond (1991), who argue that financial institutions play important roles in information production.

1.2. Abstracts of each chapter

The remainder of the paper is organized as follows.

1.2.1. Chapter 2: Competition among Financial Institutions and Startup Company Exit

Chapter 2 examines the effects of competition among financial institutions on the probability of small company exit using aggregate panel data on prefectures in Japan. We conduct the following two analyses. First, we use data on startup companies and examine the effect of such competition on the probability of startup company exit. Second, we employ data on all SMEs in Japan and investigate the effect of this competition on the probability of SME bankruptcy. We find that competition among financial institutions increases the probability of startup company exit, but reduces the probability of all SMEs' bankruptcies. This result suggests that the effects of such competition on SME exit change with firm age.

1.2.2. Chapter 3: Banking Relationship Numbers and New Business Bankruptcies

Chapter 3 examines the effect of the number of correspondent financial institutions for SMEs at the first settlement of accounts on subsequent firm bankruptcy risk using survival models. We use a unique firm-level data set of 2,667 unlisted SMEs incorporated in Japan between April 2003 and December 2009. Moreover, because of the nature of the analysis, we focus on firms that transact with at least one financial institution and disclose information about profit at the first settlement. We find that a larger number of correspondent financial institutions for SMEs at the first settlement increases the risk of subsequent firm bankruptcy. Furthermore, we check the robustness of this result with the method of instrumental variables (IV methods) and obtain similar results; in other words, the risk of firm bankruptcy increases with the

number of correspondent financial institutions.

1.2.3. Chapter 4: The Number of Bank Relationships and Bank Lending to New Firms: Evidence from Firm-level Data in Japan

Chapter 4 examines how the number of bank relationships affects bank lending to new firms using a unique firm-level data set of new firms incorporated in Japan between June 2003 and March 2010. We employ a two-stage least squares (2SLS) estimator, which is one of the instrumental variables estimators, to deal with possible bias caused by omitted variables and/or reverse causality. We find that an increase in the number of bank relationships increases total lending to new firms. We also find that the increase in total lending to new firms seems to be through the increase in long-term lending. We show that the above results are unlikely to be driven by omitted variables, outliers, or reverse causality.

1.2.4. Chapter 5: Effects of Main Bank Switch on Small Business Bankruptcy

Chapter 5 examines the effects of main bank switching on the probability of small business bankruptcy employing a propensity score matching estimation approach. We use a unique firm-level panel data set of more than 1,000 SMEs incorporated in Japan; the firms are young and unlisted SMEs just after incorporation. We find that main bank switching increases the probability of firm bankruptcy. In addition, the result suggests that switching increases the probability of bankruptcy when firms switch to banks with which they have not transacted before the switching. This result may be because such switching worsens the financial conditions of client firms. We also find that the result holds only when the ex-post main banks are not descendants of their ex-ante main banks.

1.2.5. Chapter 6: Conclusion

Chapter 6 concludes the paper, and discusses remaining issues and possible extensions.

Chapter 2: Competition among Financial Institutions and Startup Company Exit

2.1. Introduction

For new firms, it is difficult to continue their businesses for a long time. As mentioned in Chapter 1, the first five- and ten-year survival rates of startup companies in Japan are 41.8% and 26.1%, respectively. According to the Annual Report of Bankrupt Enterprises (published by the Organization for Small & Medium Enterprises and Regional Innovation, Japan), financial distress is one of the causes of new company bankruptcy. Banking literature argues that support from financial institutions can help firms to avoid bankruptcy and may improve their business performance. For example, Mayer (1988) shows that banks play important roles in avoiding bankruptcy of client firms. In addition, Hoshi et al. (1990), Grunert and Weber (2009), and Shimizu (2012) indicate that a close relationship between firm and bank might improve the firm performance or avoid firm bankruptcy. In a broader context, banking studies often focus on how competition among financial institutions affects lending terms and conditions (e.g., Petersen and Rajan 1995).[1] However, to the best of our knowledge, no study has empirically examined how such competition affects the survival rate of startup companies.

Against this background, this chapter is the first to examine how competition among financial institutions affects the probability of small company exit. As discussed below, existing studies examine the effects of such competition on lending terms and conditions using a sample of new firms. However, a more important concern for firms is not lending terms and conditions, but business performance and bankruptcy. Thus, it is

[1] Boot (2000) emphasizes the importance of revealing the effects of competition among financial institutions on relationship lending.

important for business managers to reveal the effects of the competition on firm bankruptcy.

Our main findings are summarized as follows. We find that competition among financial institutions is positively correlated with the probability of startup companies' exit. This result suggests that excessive competition increases such exit. We also find a negative correlation between such competition and exit when we employ a sample of all SMEs in Japan. This result implies that the effect of competition among financial institutions on the probability of small company exit changes with firm age. Specifically, the competition reduces such exit with an increase in firm age.

The remainder of the chapter is organized as follows. Section 2.2 reviews previous literature. Section 2.3 explains the data and the variables used in this chapter. Section 2.4 presents the results of the regression analyses. Section 2.5 concludes the chapter.

2.2. Literature review

This chapter is closely related to the literature on competition among financial institutions. Since Petersen and Rajan (1995), who may be the first to investigate the impact of the competition on relationship lending, a number of studies have been conducted on this topic. For instance, Boot and Thakor (2000), Yafeh and Yosha (2001), and Black and Strahan (2002) find evidence suggesting that such competition increases relationship lending. These studies are based on the theory that each financial institution selects relationship lending to differentiate itself from other financial institutions.

In contrast, Beck et al. (2004) and Hauswald and Marquez (2006) show that this competition reduces relationship lending. These studies are based on the theory that financial institutions are reluctant to build relationships with their client companies because the competition makes it difficult for financial institutions to lock-in the companies for a long time.

Studies on how competition among financial institutions affects relationship lending have also been conducted in Japan. For example, Ogura and Yamori (2010) investigate the effect of lending competition on the consulting services by the institutions. In addition, Ogura (2012) examines the effect of this competition on the credit availability for new firms. These studies argue that such competition negatively affects the lending relationship.

2.3. Data

This section explains the data and the variables. In this chapter, we employ two types of small company exit; specifically, we use the exit within the first five and ten years of their incorporation. In addition, we focus on unlisted companies incorporated in Japan. Hence, in this chapter, we employ young and unlisted SMEs that are not older than five or ten years. It should also be noted that these data are from either 2007 to 2010 or 2002 to 2010.[2] Moreover, we employ the data on all SMEs to investigate whether the impact of competition among financial institutions on the probability of the exit of firms changes with firm age.

2.3.1. Probability of startup company exit

As previously mentioned, in this chapter, we target only the small companies that are within five or ten years of their incorporation date because such companies are vulnerable, and thus the bankruptcies of these companies largely depend on support from financial institutions. The procedure to extract companies that meet this condition is as follows. First, we use Orbis, which is provided by Bureau van Dijk, and limit the sample to the

[2] We use the data for the period from 2007 to 2010 to examine the probability of the exit of startup companies that are within their first five years of incorporation. On the other hand, we employ the data for the period from 2002 to 2010 for companies within their first ten years of incorporation.

unlisted small Japanese companies incorporated between 2002 and 2010.[3] We then divide these companies into two categories. The first category is "active companies," which are classified as active in the beginning of March 2012 in Orbis. The second category is "inactive companies," which are classified as inactive in the beginning of March 2012 in Orbis.[4]

Details of the data in this chapter are as follows. Table 2.1 shows the number of small startup companies that are incorporated in Japan between 2002 and 2011, and their exit rate until March 2012. As Table 2.1 shows, although the number of startup and active companies fluctuates in this period, the total transition is relatively stable. In contrast, the number of inactive companies has clearly decreased since 2008 due to the definition of inactive companies. In Orbis, whether a company is active is judged by whether the company is active in March 2012. Thus, the exit rate of relatively new companies is low.[5] In particular, the rate of the companies incorporated in 2011 is extremely low. Hence, we exclude 2011 data and target only companies that are incorporated between 2002 and 2010 to eliminate the bias associated with the extraction of data.[6]

2.3.2. Probability of all SMEs' bankruptcies

We examine whether the same effect is observed when we use all the SMEs as a sample. Petersen and Rajan (1995) argue that the effects of competition among financial institutions on loan terms change with firm age.[7] Hence, we also investigate the impact of

[3] Orbis defines small companies as those that have any of the following:
A) Operating revenue of less than US$1.3 million
B) Total assets less than US$2.6 million
C) Less than 15 employees

[4] The "inactive" category in Orbis includes bankrupt, dissolved, and liquidated companies, among others. Thus, the term "inactive" differs from "bankrupt," and in this chapter, we refer to companies classified as "inactive" in Orbis as inactive and not bankrupt.

[5] Note that Orbis does not include detailed information on the year in which a company went out of business or the duration for which it was active.

[6] Based on Begley et al. (1996) and Headd (2003), we exclude the data of 2011 to deal with a bias caused by right censoring.

[7] Specifically, Petersen and Rajan (1995) argue that competition works against startup companies; however, the trend is reversed as their age increases, that is, competition works in favor of mature companies.

Table 2.1 Number of startup companies and exit rate

Startup year	Number of startup companies	Number of active companies	Number of inactive companies until March 2012	Exit rate (%)
2002	67,588	56,543	11,045	16.3
2003	73,953	59,956	13,997	18.9
2004	81,912	66,837	15,075	18.4
2005	88,207	73,091	15,116	17.1
2006	99,483	81,911	17,572	17.7
2007	93,441	78,955	14,486	15.5
2008	98,759	83,311	15,448	15.6
2009	94,476	83,641	10,835	11.5
2010	98,719	92,213	6,506	6.6
2011	83,180	83,143	37	0.0
Total	879,718	759,601	120,117	13.7

the competition on company exit employing the data on the bankruptcy rate for all the SMEs in Japan.[8] Table 2.2 shows the number of SMEs in Japan between 2002 and 2011 and companies' bankruptcy rate. In order to calculate the bankruptcy rate, we use the Number of Prefectural Sorted Ordinary Corporation published by the National Tax Agency and the Annual Report of Bankrupt Enterprises published by the Organization for Small & Medium Enterprises and Regional Innovation, Japan. Note that the data in Table 2.2 are different from the data in Table 2.1 with respect to the definition of the exit and bankruptcy rates. The exit rate is calculated based on whether a company is inactive in March 2012. On the other hand, the bankruptcy rate is calculated based on whether a company is bankrupt for each year. Thus, the probability of a startup's exit exceeds the probability of all SMEs bankruptcies.

It should also be noted that two definitions exist for SMEs in Japan. One definition is classified by the number of employees and the other is classified by the amount of capital; in addition, the definition of SMEs varies depending on the industry. In this

[8] As we employ different data, we use two different concepts, that is, exit and bankruptcy.

Table 2.2 Number of all SMEs and bankruptcy rate

Year	Number of all SMEs	Number of bankrupt companies	Bankruptcy rate (%)
2002	2,709,517	14,889	0.550
2003	2,695,241	12,408	0.460
2004	2,713,908	10,922	0.402
2005	2,733,820	10,375	0.380
2006	2,754,743	10,708	0.389
2007	2,549,012	11,603	0.455
2008	2,525,674	13,107	0.519
2009	2,524,491	11,921	0.472
2010	2,505,096	10,524	0.420
2011	2,526,722	10,227	0.405
Total	26,238,224	116,684	0.445

chapter, we employ the definition of the amount of capital. In Japan, a capital of 50 million yen or less is a sufficient condition to be classified into SMEs. Therefore, a firm with capital of 50 million yen or less is always classified as an SME regardless of the business type.

2.3.3. Competitive degree of financial institutions

We use the Herfindahl index of the number of financial institutions as a proxy for the intensity of competition among financial institutions. This is a key variable of interest. This index shows the degree of such competition, and is employed in many studies (see Degryse and Ongena 2005, Ogura and Yamori 2010, Presbitero and Zazzaro 2011, Chong et al. 2013).[9]

We compute the Herfindahl index of the number of financial institutions using the *Nihon Kinyu Meikan* (the directory of Japanese financial institutions), which is

[9] It should be noted that empirical studies in the US, such as Petersen and Rajan (1995) and Dick and Lehnert (2010), employ the amount of deposits as a measure of the degree of competition among financial institutions.

published by *Nihon Kinyu Tsushin Sha*. In addition, we target only financial institutions that accept deposits and provide loans to firms. More specifically, we use city banks, regional banks, trust banks, second-tier regional banks, Shinkin banks, and credit cooperatives. We also target the following banks: Shinsei Bank, Aozora Bank, The Shoko Chukin Bank, ShinGinko Tokyo, Citibank Japan, Incubator Bank of Japan, and ÆON BANK.

2.3.4. Other explanatory variables

We use the following variables as other explanatory variables: the number of financial institutions, population, real gross prefectural product, the number of ordinary corporations, economic growth rate, and startup rate. These variables are primarily based on Headd (2003), Carter and Van Auken (2006), and Franco and Haase (2010).

In this subsection, we explain each explanatory variable in detail. The number of financial institutions is a variable to show the effect of a change in the number of financial institutions on the probability of startup company exit. For instance, there are two regions that have the same Herfindahl index, but varying number of financial institutions: the Herfindahl index for both regions is 0.20; however, one region comprises five groups with a financial institution in each group and the other region comprises five groups with 100 financial institutions in each group. In this case, the Herfindahl index is the same, but the concentration degree of financial institutions clearly differs. Thus, this variable makes it possible to grasp the effect of the increase in the number of financial institutions on the probability of such exit. The source of this variable is the *Nihon Kinyu Meikan*.

The population is a variable to show the effect of the magnitude of the potential demand in each prefecture on the probability of such exit. A populous prefecture has larger potential demand, and an increase in the number of people is likely to decrease the probability of such exit. Moreover, a prefecture with a large population tends to

attract a number of financial institutions, and thus we expect that population is positively associated with competition among the financial institutions. The information on population is taken from the Population Estimates published by the Bureau of Statistics of the Ministry of Internal Affairs and Communications.

The real gross prefectural product is a variable to represent the economic scale of each prefecture. This variable makes it possible to reveal the effect of the scale of the economy on the probability of such exit. The source of this variable is the Report on Prefectural Accounts produced by the Cabinet Office.

The number of ordinary corporations indicates the number of their competitors in each prefecture, and this variable is to elucidate the impact of a change in the number of potential rival companies for each company on the probability of such exit. An increase in the number of rivals may increase the exit rate in the prefecture. The information of the number of the corporations is obtained from the Number of Prefectural Sorted Ordinary Corporation published by the National Tax Agency.

The variable on economic growth rate variable is to consider the effect of the business cycle on the probability of such exit. Economic booms are likely to decrease the probability of such exit. We calculate the growth rate using the Report on Prefectural Accounts published by the Cabinet Office.

The startup rate may be associated with the probability of such exit. For example, according to the 2002 White Paper on Small and Medium Enterprises in Japan, startup rates in the previous period and earlier affect the (current) exit rate. Furthermore, the startup rate variable may be correlated with competition among financial institutions.[10] For this reason, we also employ the startup rate as an explanatory variable. The startup rate is defined as the percentage of the number of small and unlisted enterprises that are newly incorporated during the period to the number of ordinary companies that exist at the beginning of the period. We use Orbis and the Number of Prefectural Sorted Ordinary Corporation to compute the startup rate.

[10] Bonaccorsi di Patti and Dell'Ariccia (2006) argue that competition among banks reduces the startup rate.

2.4. Empirical Results

In this section, we examine the effect of competition among financial institutions on the probability of startup company exit. Specifically, we investigate the probability of such exit within the first five and ten years of their incorporation, and the probability of all SMEs' bankruptcies.

2.4.1. First five-year probability of startup company exit

We start from the analysis on the effect of competition among financial institutions on the first five-year probability of startup company exit. Table 2.3 shows the variable definitions and the descriptive statistics using the data from 2007 to 2010. In order to use a fixed effects model, we substitute prefectural data for firm-level data. Hence, the N in Table 2.3 indicates the total number of prefectures for four years. We estimate a fixed effects model of the form:

$$y_{it} = \beta_1 x_{it} + a_i + u_{it}, \tag{2.1}$$

where y_{it} is a logit transformation of the exit rate. More specifically, y_{it} is $\ln\frac{p}{1-p}$, where p is the exit rate in each prefecture.[11] In addition, x_{it} represents time-varying explanatory variables, and includes the Herfindahl index of the number of financial institutions, the number of financial institutions, population, real gross prefectural product, the number of ordinary corporations, the economic growth rate,

[11] In this chapter, we cannot use a yearly exit rate due to the data characteristics. However, according to the 2006 White Paper on Small and Medium Enterprises in Japan, 81.3% of the new companies that exited within five years of their incorporation exited within three years of incorporation. Hence, the regression analysis in this subsection is close to the regression analysis that employs the "within-three-year" exit rate.

Table 2.3 Definition and descriptive statistics of variables (for startup companies from 2007 to 2010)

(A) Definition

Variable name	Definition
Exit rate	Exit rate of startup companies in each prefecture
Herfindahl index of financial institutions	Herfindahl index of the number of financial institutions in each prefecture
Financial institutions	The number of financial institutions in each prefecture (unit: thousand)
Population	Population in each prefecture (unit: million)
GPP	Real gross prefectural product in each prefecture (unit: trillion yen)
Ordinary corporations	The number of ordinary corporations in each prefecture (unit: thousand)
Economic growth rate	Growth rate of the real gross prefectural product in each prefecture
Startup rate	Startup rate of small and unlisted enterprises in each prefecture

(B) Descriptive statistics

Variable name	N	Mean	Median	S.D.	Min.	Max.
Exit rate	188	13.532	10.529	11.715	0.287	64.839
Herfindahl index of financial institutions	188	0.165	0.172	0.068	0.039	0.325
Financial institutions	188	0.487	0.336	0.395	0.150	2.314
Population	188	2.725	1.717	2.638	0.589	13.159
GPP	188	11.326	6.006	15.587	1.979	102.042
Ordinary corporations	188	55.815	28.217	83.480	9.354	534.752
Economic growth rate	188	0.284	0.067	3.947	-9.367	9.087
Startup rate	188	2.946	2.802	0.784	1.063	5.860

and the startup rate. Moreover, a_i represents time-invariant explanatory variables such as startup capital, business type, regional characteristics, and information on managers (e.g., qualification, business career).

Table 2.4 reports the result of the regression using the data from 2007 to 2010. Columns 1 and 2 indicate the regression results whose standard errors are heteroskedasticity-robust standard errors. In column 1, the odds ratio of the Herfindahl index of the number of financial institutions is −32.146, which is statistically significant at the 1% level. This result indicates that a 0.1 percentage point increase in the Herfindahl index of the number of financial institutions makes the probability of startup company exit 4.0% of the original value. In other words, the probability of such exit increases with competition among financial institutions. Next, to examine whether a U-shaped correlation between the Herfindahl index and the probability of exit is observed, we add the square of the Herfindahl index of the number of financial

Table 2.4 Results of regression analysis on the probability of startup company exit from 2007 to 2010

	(1)	(2)	(3)	(4)	(5)	(6)
	Logit with RSE	Logit with RSE	Logit with s.e. clustered by year	Logit with s.e. clustered by year	Logit with RSE clustered by year	Logit with RSE clustered by year
Financial competition characteristics						
Herfindahl index of financial institutions	-32.146***	33.106	-5.565**	-20.043**	-5.565**	-20.043
	(11.427)	(47.119)	(2.526)	(9.962)	(1.486)	(8.533)
(Herfindahl index of financial institutions)^2		-157.381		34.546		34.546
		(134.481)		(22.997)		(19.108)
Other variables						
Financial institutions	-2.431	-0.576	0.817	0.088	0.817	0.088
	(13.343)	(13.328)	(1.059)	(1.161)	(0.503)	(0.167)
Population	6.255**	6.498**	-0.311***	-0.382***	-0.311**	-0.382**
	(2.743)	(2.719)	(0.113)	(0.122)	(0.060)	(0.098)
GPP	0.216*	0.211*	0.063	0.071	0.063*	0.071*
	(0.124)	(0.124)	(0.057)	(0.057)	(0.020)	(0.027)
Ordinary corporations	0.444**	0.471***	-0.010	-0.009	-0.010	-0.009
	(0.123)	(0.119)	(0.010)	(0.010)	(0.004)	(0.004)
Economic growth rate	-0.100***	-0.098***	-0.030	-0.023	-0.030	-0.023
	(0.015)	(0.014)	(0.037)	(0.037)	(0.030)	(0.031)
Startup rate	-0.221	-0.247	0.236*	0.242*	0.236**	0.242**
	(0.238)	(0.233)	(0.142)	(0.142)	(0.067)	(0.075)
Constant	-39.448**	-48.135***	-1.792***	-0.132	-1.792***	-0.132
	(14.587)	(14.587)	(0.674)	(1.293)	(0.295)	(0.777)
Adj R-squared	0.414	0.423	0.076	0.087	0.076	0.087
Number of observations	188	188	188	188	188	188

Note: The upper rows are odds ratios and the lower rows are standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

institutions to column 1.[12] The result is shown in column 2, and it indicates that both the Herfindahl index and the square of the index are statistically insignificant.

Columns 3 and 4 report the results using cluster-robust standard errors that are clustered by year. In column 3, the odds ratio of the Herfindahl index of the number of financial institutions is −5.565, which is significant at the 5% level. Thus, a 0.1 percentage point increase in the Herfindahl index of the number of financial institutions makes the probability of startup company exit 57.3% of the original value. Moreover, we obtain similar results in column 4, which reports the result of adding the square of the Herfindahl index to column 3.

Columns 5 and 6 report the results using the cluster-robust standard errors that are clustered by year or heteroskedasticity-robust standard errors as the standard errors, respectively. In column 5, the odds ratio of the Herfindahl index of the number of

[12] Elsas (2005) conducts an empirical study employing German data and finds evidence for an inverted U-shaped correlation between the concentration of banks and the likelihood of relationship lending. Thus, excessive competition and concentration of banks reduce relationship lending.

financial institutions is significantly negative at the 5% level as well as column 3. In contrast, in column 6, the Herfindahl index and its square are insignificant.

To summarize, the intensity of competition among financial institutions is positively correlated with the first five-year probability of startup company exit, but a U-shaped correlation is not observed between competition and the probability.

2.4.2. First ten-year probability of startup company exit

Next, we examine the effect of competition among financial institutions on the first ten-year probability of startup company exit employing data from 2002 to 2010. In the previous subsection, the results show that the competition among financial institutions increases the probability of such exit. However, in this analysis, we use only companies that are incorporated between 2007 and 2010. Thus, we cannot deny the possibility that the result is observed only in the first five-year probability of startup company exit. We also cannot deny the possibility that this result is observed only for the period between 2007 and 2010. For this reason, in this subsection, we conduct the same regression as the previous subsection using the sample from 2002 to 2010.

Table 2.5 presents the descriptive statistics using the data from 2002 to 2010. Table 2.6 reports the results of the regression analyses. The structure of Table 2.6 is same as that of Table 2.4; hence, columns 1–6 in Table 2.6 respectively correspond to columns 1–6 in Table 2.4. The results in Table 2.6 are similar to those in Table 2.4; in other words, competition among financial institutions increases the first ten-year probability

Table 2.5 Descriptive statistics of variables (for startup companies from 2002 to 2010)

Variable name	N	Mean	Median	S.D.	Min.	Max.
Exit rate	423	16.788	15.044	10.582	0.287	64.839
Herfindahl index of financial institutions	423	0.160	0.168	0.066	0.035	0.325
Financial institutions	423	0.500	0.354	0.405	0.150	2.667
Population	423	2.721	1.744	2.592	0.589	13.159
GPP	423	11.146	5.913	15.294	1.979	102.042
Ordinary corporations	423	58.118	28.669	87.174	9.354	587.825
Economic growth rate	423	0.887	0.963	3.054	-9.367	9.087
Startup rate	423	2.732	2.635	0.785	0.963	7.018

Table 2.6 Results of regression analysis on the probability of startup company exit from 2002 to 2010

	(1)	(2)	(3)	(4)	(5)	(6)
	Logit with RSE	Logit with RSE	Logit with s.e. clustered by year	Logit with s.e. clustered by year	Logit with RSE clustered by year	Logit with RSE clustered by year
Financial competition characteristics						
Herfindahl index of financial institutions	-12.423**	-8.836	-4.704***	-12.530**	-4.704***	-12.530**
	(5.267)	(21.294)	(1.289)	(5.299)	(0.880)	(4.158)
(Herfindahl index of financial institutions)^2		-8.287		19.556		19.556*
		(41.290)		(12.845)		(9.863)
Other variables						
Financial institutions	3.296	3.426	0.609	0.245	0.609**	0.245
	(1.989)	(2.077)	(0.513)	(0.565)	(0.249)	(0.209)
Population	4.459***	4.497***	-0.268***	-0.305***	-0.268***	-0.305***
	(1.586)	(1.602)	(0.054)	(0.059)	(0.024)	(0.039)
GPP	0.027	0.027	0.014	0.018	0.014	0.018
	(0.094)	(0.094)	(0.025)	(0.026)	(0.019)	(0.021)
Ordinary corporations	0.068***	0.069***	-0.001	-0.001	-0.001	-0.001
	(0.023)	(0.024)	(0.004)	(0.004)	(0.003)	(0.003)
Economic growth rate	-0.069***	-0.069***	-0.021	-0.019	-0.021	-0.019
	(0.012)	(0.012)	(0.020)	(0.020)	(0.012)	(0.012)
Startup rate	-0.211**	0.212**	0.221***	0.224***	0.221***	0.224***
	(0.099)	(0.099)	(0.068)	(0.068)	(0.043)	(0.043)
Constant	-17.306***	17.816***	-1.372***	-0.513	-1.372***	-0.513
	(5.326)	(6.203)	(0.348)	(0.663)	(0.145)	(0.410)
Adj R-squared	0.245	0.245	0.083	0.088	0.083	0.088
Number of observations	423	423	423	423	423	423

Note: The upper rows are odds ratios and the lower rows are standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

of startup company exit. Thus, we find that the effect of the competition on the probability is observed during a period other than a given period.

2.4.3. Probability of all SMEs' Bankruptcies

Finally, we investigate the effect of competition among financial institutions on the probability of all SMEs' bankruptcies. As previously mentioned, Petersen and Rajan (1995) argue that the relationship between such competition and lending terms and conditions changes with firm age, and thus the competition may well benefit older companies. In this subsection, to confirm whether the effect of the competition on the probability of exit changes with firm age, we substitute the bankruptcy rate of all SMEs in Japan for the probability of startup company exit. In this analysis, we use the data from 2002 to 2010.

Table 2.7 reports the descriptive statistics employing the data from 2002 to 2010. We conduct the same analysis as the previous subsections, and the results are shown in

Table 2.7 Descriptive statistics of variables (for all SMEs from 2002 to 2010)

Variable name	N	Mean	Median	S.D.	Min.	Max.
Bankruptcy rate	423	0.443	0.435	0.108	0.192	0.920
Herfindahl index of financial institutions	423	0.160	0.168	0.066	0.035	0.325
Financial institutions	423	0.500	0.354	0.405	0.150	2.667
Population	423	2.721	1.744	2.592	0.589	13.159
GPP	423	11.146	5.913	15.294	1.979	102.042
Ordinary corporations	423	58.118	28.669	87.174	9.354	587.825
Economic growth rate	423	0.887	0.963	3.054	-9.367	9.087
Startup rate	423	2.732	2.635	0.785	0.963	7.018

Table 2.8. As with the previous analyses, columns 1–6 in Table 2.8 respectively correspond to columns 1–6 in Tables 2.4 and 2.6.

The results in Table 2.8 are clearly different from the results in Tables 2.4 and 2.6. The most notable difference is the odds ratio of the Herfindahl index of the number of financial institutions. In the analyses in Tables 2.4 and 2.6, which use new firms as the sample, the odds ratio of the Herfindahl index is significantly negative. In other words, competition among financial institutions is positively correlated with the probability of startup company exit. However, Table 2.8 reports positive odds ratios of the Herfindahl

Table 2.8 Results of regression analysis on the probability of all SMEs bankruptcies from 2002 to 2010

	(1)	(2)	(3)	(4)	(5)	(6)
	Logit with RSE	Logit with RSE	Logit with s.e. clustered by year	Logit with s.e. clustered by year	Logit with RSE clustered by year	Logit with RSE clustered by year
Financial competition characteristics						
Herfindahl index of financial institutions	0.424 (0.751)	1.235 (2.274)	1.258*** (0.308)	1.223 (1.270)	1.258*** (0.202)	1.223 (0.707)
(Herfindahl index of financial institutions)^2		-1.874 (4.877)		0.089 (3.079)		0.089 (2.049)
Other variables						
Financial institutions	2.337*** (0.544)	2.367*** (0.565)	0.399*** (0.123)	0.398*** (0.135)	0.399** (0.122)	0.398*** (0.097)
Population	0.116 (0.240)	-0.108 (0.240)	0.006 (0.013)	0.006 (0.014)	0.006 (0.013)	0.006 (0.015)
GPP	0.048*** (0.018)	0.048*** (0.018)	-0.004 (0.006)	-0.004 (0.006)	-0.004 (0.005)	-0.004 (0.005)
Ordinary corporations	0.010** (0.004)	-0.010** (0.004)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
Economic growth rate	0.025*** (0.002)	-0.025*** (0.002)	-0.005 (0.005)	-0.005 (0.005)	-0.005 (0.004)	-0.005 (0.004)
Startup rate	0.043 (0.034)	-0.043 (0.034)	0.001 (0.016)	0.001 (0.016)	0.001 (0.013)	0.001 (0.014)
Constant	6.194*** (0.743)	-6.309*** (0.825)	-5.794*** (0.083)	-5.790*** (0.159)	-5.794*** (0.063)	-5.790*** (0.048)
Adj R-squared	0.219	0.219	0.061	0.061	0.061	0.061
Number of observations	423	423	423	423	423	423

Note: The upper rows are odds ratios and the lower rows are standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

index in columns 3 and 5, indicating that such competition is negatively correlated with the probability of all SMEs' bankruptcies. This result implies that the effect of the competition on the probability of exit changes with firm age. More specifically, such competition increases the exit of startup companies, but it seems to reduce the exit of mature firms. This result is consistent with Petersen and Rajan (1995).

2.5. Conclusion

Using two kinds of aggregate data on the prefectures in Japan, we examine the effect of competition among financial institutions on the probability of startup company exit. In addition, to investigate whether the impact of the competition on the probability of the exit of firms changes with firm age, we also examine the same analysis using a sample of all SMEs. As a result, we find that the competition increases the probability of startup company exit. This finding indicates that excessive competition increases the probability of exit, and this finding is robust to the definition of startup companies. We also find that the competition reduces such probability when we employ all SMEs as a sample. This result suggests that the effect of the competition on the exit changes with firm age. Specifically, the competition increases the exit of startup companies, but it seems to reduce the exit of older firms.

This study provides a possibility of minimizing the probability of SMEs' bankruptcy throughout their life spans. Specifically, this study implies that SMEs should start a business in a region with less intense financial competition and then transfer to a region with intense financial competition after achieving growth in order to avoid bankruptcy. However, this chapter addresses only the probability of exit, and thus there are a number of issues that remain to be addressed in future research. For example, we do not provide analysis of the comprehensive effect of competition among financial institutions on SMEs. Moreover, in this chapter, we do not reveal the path to

bankruptcy. Unfortunately, we cannot address these issues due to data limitations, and thus further research on this topic is needed.

Chapter 3: Banking Relationship Numbers and New Business Bankruptcies

3.1. Introduction

As indicated by Carter and Van Auken (2006) and Franco and Haase (2010), business continuity for SMEs largely depends on whether they receive sufficient support from their correspondent financial institutions. However, the strategies available to SMEs to receive such support are limited. For example, they cannot actively address the problems that hinder support from financial institutions, such as asymmetric information and incomplete contracts. In addition, it is difficult for SMEs to prove that they are promising enterprises and attract investment from financial institutions.

However, SMEs have several strategies for which they can proactively control, and choosing the number of correspondent financial institutions is one such strategy. In most cases, the right to decide this number rests not with financial institutions but with client firms. Numerous studies have examined the choice of the number of correspondent financial institutions as one of the important business strategies of SMEs and entrepreneurs.

Here, we review the literature on the subject of the number of correspondent financial institutions, including multiple bank relationships. First, we begin with how multiple bank relationships affect hold-up problems and credit availability for firms. A single bank relationship causes an information monopoly by a specific financial institution, and thus causes hold-up problems (Sharpe 1990, Rajan 1992). In addition, multiple bank relationships reduce firms' credit availability (Petersen and Rajan 1994, Ongena and Smith 2000). However, Ongena and Smith (2000) also show that multiple bank relationships can reduce hold-up problems. Moreover, Hernández-Cánovas and Martínez-Solano (2007) argue that SMEs that transact with fewer financial intermediaries have more financial restraints.

Next, we review the literature on the theoretical risks of firm bankruptcy. Multiple bank relationships make it difficult for creditors to coordinate with each other, particularly in the case of business restructuring, and thus increase the risk for customer firms (Dewatripont and Maskin 1995, Bolton and Scharfstein 1996, Foglia et al. 1998, Brunner and Krahnen 2008). In contrast, some studies have shown that multiple bank relationships reduce the theoretical firm bankruptcy risk. For example, Detragiache et al. (2000) show that multiple bank relationships can ensure a more stable supply of credit and reduce the probability of an early liquidation of a project. Furthermore, Guiso and Minetti (2010) find a negative correlation between borrowing differentiation and restructuring costs.

These studies examine the impact of multiple bank relationships on hold-up problems, firms' credit availability, and theoretical firm bankruptcy risk. In addition, some studies investigate the relationship between the number of correspondent financial institutions and business performance. For instance, Degryse and Ongena (2001) investigate the effects of multiple bank relationships on sales profitability employing a sample of listed firms, and find a negative correlation between the two. Furthermore, Castelli et al. (2012) examine how the number of bank relationships affects firm performance using a unique data set of Italian small firms, and indicate that an increase in the number of correspondent financial institutions reduces firms' financial performance, such as return on equity and return on assets.

However, to the best of our knowledge, no study has empirically examined the effect of the number of correspondent financial institutions on firm bankruptcy in spite of its importance. For this reason, this chapter empirically investigates the impact of the number of correspondent financial institutions on firms' subsequent bankruptcy risk.[1] We employ a sample of unlisted SMEs just after incorporation for the following

[1] Mayer (1988) argues that banks play important roles in avoiding the bankruptcy of client firms. Moreover, Hoshi et al. (1990), Grunert and Weber (2009), Shimizu (2012), Gambini and Zazzaro (2013), and Han et al. (2014) show the possibility that close firm–bank relationships improve business performance and prevent firms from going bankrupt.

reason: as shown in many studies, such as Mata (1994) and Song et al. (2008), firms are most likely to go bankrupt within a few years of incorporation; thus, clarifying the effect during this period is important in terms of providing a new implication for business managers and entrepreneurs to avoid bankruptcy during the early stages of the entrepreneurial process.

In sum, this chapter empirically examines the effect of the number of correspondent financial institutions at the incorporation of the firms on their subsequent bankruptcy risk. This chapter is the first to empirically investigate this effect, and thus it is clearly different from previous studies. We expect that a larger number of correspondent financial institutions increases subsequent firm bankruptcy risk because of the following two reasons.

First, previous studies such as Degryse and Ongena (2001) and Castelli et al. (2012) show that an increase in the number of correspondent financial institutions reduces firm performance. This result suggests that a larger number of correspondent financial institutions increases the risk of subsequent firm bankruptcy. Second, as new firms are very fragile, the case of using only new firms corresponds to the situation described in the theoretical model based on Olson (1965) and Osborne (2003).[2] This model predicts that an increase in the number of correspondent financial institutions increases the risk of firm bankruptcy, and it is not unrealistic to assume that new firms are frequently faced with situations with a high risk of bankruptcy as shown in the model.

As expected, we find that a larger number of correspondent financial institutions at the first settlement of accounts increases subsequent bankruptcy risk for SMEs. In addition, we obtain similar results when we substitute a multiple bank relationships dummy variable for the number of correspondent financial institutions; specifically, we find that multiple bank relationships also increase subsequent firm bankruptcy risk.

The remainder of the chapter is organized as follows. Section 3.2 introduces the data used in this chapter. Section 3.3 presents the results of the regression analyses.

[2] For further details, see the Appendix.

Section 3.4 checks the robustness of the results obtained in Section 3.3. Section 3.5 concludes the chapter.

3.2. Data

We use a unique firm-level data set collected by the Tokyo Shoko Research, Ltd. (TSR), one of the largest credit reporting agencies in Japan. This data set comprises the TSR Enterprise Information File, TSR Bankrupt Information File, and TSR Manager Information File. We target firms incorporated in Japan between April 2003 and December 2009 that are unlisted and have capital of less than 50 million yen.[3] Moreover, we use the data of the first settlement of accounts of these firms, and in keeping with the nature of the analysis, we focus on firms that transact with at least one financial institution and disclose information about profit at the first settlement. In this chapter, we define the number of financial institutions recorded in the list of bank names in the TSR Enterprise Information File as the number of correspondent financial institutions for the firms.

Here, we elaborate on this data set. First, we classify the firms as either continuing or bankrupt based on whether they go bankrupt within five years from the first settlement, and thus there are 2,541 continuing firms and 126 bankrupt firms. These 2,667 firms represent almost all of the firms that meet the above data extraction conditions in the TSR Enterprise Information File. Therefore, the bias associated with sample extraction is likely to be small. Moreover, these data are censored up to five years after the first settlement.

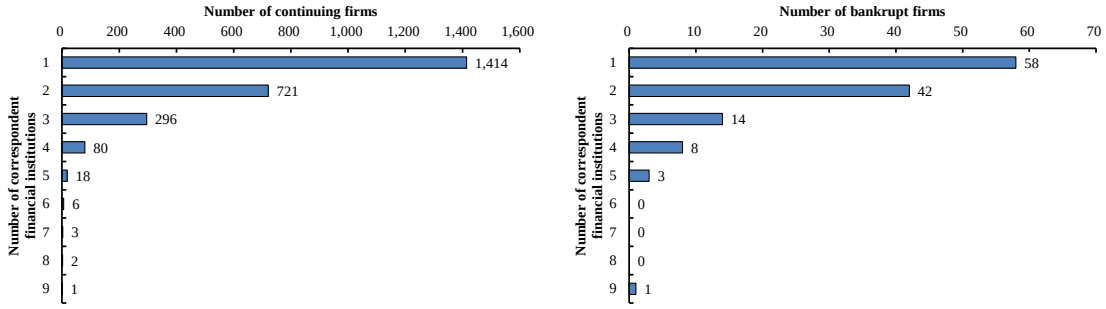
Table 3.1 shows the distribution of the sample firms, and Fig. 3.1 shows the distribution of the number of correspondent financial institutions. The firm age in Table 3.1 shows the age of each firm at the first settlement, and also represents the

[3] The date of establishment and incorporation do not necessarily concur. In this chapter, we exclude from the sample firms whose interval between establishment and incorporation exceeds 30 years to focus on relatively young firms.

Table 3.1 Distribution of sample firms

	Number of Firms	Number of correspondent financial institutions		Profit (in millions of yen)		Capital (in billions of yen)		Firm age (in years)	
		Mean	Median	Mean	Median	Mean	Median	Mean	Median
Continuing firms	2,541	1.667	1	0.733	0.200	0.007	0.004	5.402	0.990
Bankrupt firms	126	1.905	2	-5.317	0.203	0.008	0.005	4.689	1.990
Total	2,667	1.678	1	0.447	0.200	0.007	0.004	5.368	0.990

Fig. 3.1 Distribution of correspondent financial institutions



number of years from establishment to incorporation. Although not included in Table 3.1, we also obtain the following information. First, for both continuing and bankrupt firms, the minimum number of correspondent financial institutions is one, whereas the maximum is nine. In addition, the difference in the mean value of the number of correspondent financial institutions between the two groups is statistically significant at the 5% level. Moreover, as indicated in Fig. 3.1, the percentage of continuing firms that transact with multiple banks is 44.4%, whereas that of bankrupt firms that transact with multiple banks is 54.0%. The difference between the two is also statistically significant at the 5% level. Hence, the firms that go bankrupt within five years from the first settlement tend to have a larger number of correspondent financial institutions than firms that do not go bankrupt in that time. On the other hand, the differences in the mean value of profit and capital between the two groups are statistically significant at the 10% level, whereas the difference in the mean value of firm age is statistically insignificant. Thus, there is not much difference in the characteristics between the continuing and bankrupt firms, except for the number of correspondent financial

institutions.

Furthermore, we use the following aggregate data for each prefecture: *Nihon Kinyu Meikan* (the directory of Japanese financial institutions), published by *Nihon Kinyu Tsushin Sha*; the Population Estimates, published by the Bureau of Statistics of the Ministry of Internal Affairs and Communications; the Report on Prefectural Accounts, produced by the Cabinet Office; the Number of Prefectural Sorted Ordinary Corporation, published by the National Tax Agency; and Orbis, provided by Bureau van Dijk. These data represent information about the prefectures where the sample firms are located at the time of the first settlement.

3.3. Empirical results

In this section, we use survival models and examine the effect of the number of correspondent financial institutions for SMEs at the first settlement on the lifetime of the firms from their incorporation. From the perspective of robustness, we estimate the effect using both the Cox proportional hazards model and the Weibull proportional hazards model. Table 3.2 shows the definition and source of each variable, and Table 3.3 presents the descriptive statistics.[4] The close relationship industries, which we control for as a covariate, is a dummy variable that is equal to one if a firm is in an industry that has many opportunities to receive advice from its main bank.[5] In addition, the credit rating, which we also control for as a covariate, is an indicator by which TSR comprehensively evaluates the firms based on four criteria: qualifications of the

[4] The minimum "time to bankruptcy" is −0.91, but the firm that takes a negative value is only one out of 2,667, and we exclude this firm from the sample in the estimation. Moreover, the minimum "firm age" and "time to the first settlement" are also negative; however, the firms that take these values are very few, and thus these samples scarcely affect the results of the regression analyses.

[5] This dummy variable is based on Ogura (2007). Ogura (2007) uses a unique firm-level data set of unlisted companies collected from the Survey of the Financial Environment of Enterprises, conducted by the Small and Medium Enterprise Agency in October 2002, and classifies target companies into two groups according to their business type. While one group has many opportunities to receive advice from their main banks, the other group has few opportunities to do so. To clarify the difference in the strength of the relationships, Ogura (2007) calls the former close relationship industries, and includes this as a dummy variable. The close relationship industries include wholesale, real estate, accommodation, some service industries (e.g., food and beverage), manufacturing (other than wooden products), chemical products, and electric machinery and appliances.

Table 3.2 Definition and source of each variable

(A) Definition

Variable name	Definition
Time to bankruptcy	The number of years from the first settlement of accounts to bankruptcy
Bankruptcy	Dummy variable that is equal to 1 if the firm goes bankrupt within five years of the first settlement of accounts or 0 otherwise
Number of correspondent financial institutions	The number of correspondent financial institutions of each firm
Multiple bank relationships	Dummy variable that is equal to 1 if the firm opts for multiple bank relationships or 0 otherwise
City bank	Dummy variable that is equal to 1 if the main bank of each firm is city bank or 0 otherwise
Regional bank	Dummy variable that is equal to 1 if the main bank of each firm is regional bank or 0 otherwise
Shinkin bank	Dummy variable that is equal to 1 if the main bank of each firm is shinkin bank (Japanese small-scale bank) or 0 otherwise
Capital	Capital of each firm (unit: billion yen)
Firm age	The age of each firm
Close relationship industries	Dummy variable that is equal to 1 if the firm is classified into the business type that has many opportunities to receive advice from its main bank or 0 otherwise
Profit	Profit of each firm (unit: million yen)
Sales	Sales amount of each firm (unit: thousand yen)
Manager age	The age of the manager of each firm
Offices	The number of offices of each firm
Employees	The number of employees of each firm
Male	Dummy variable that is equal to 1 if the manager of the firm is male or 0 otherwise
Credit rating	Credit rating of each firm evaluated by Tokyo Shoko Research
Time to the first settlement	The length of time from the incorporation to the first settlement of accounts
Herfindahl index of financial institutions	Herfindahl index of the number of financial institutions in each prefecture
Financial institutions	The percentage of the number of financial institutions in each prefecture to the number of ordinary corporations
Population	Population in each prefecture (unit: million)
GPP	Real gross prefectural product in each prefecture (unit: trillion yen)
Ordinary corporations	The number of ordinary corporations in each prefecture (unit: million)
Economic growth rate	Growth rate of the real gross prefectural product in each prefecture
Startup rate	Startup rate of small and unlisted enterprises in each prefecture

(B) Source

Variable name	Source
Time to bankruptcy	TSR Enterprise Information File (Tokyo Shoko Research) TSR Bankrupt Information File (Tokyo Shoko Research) TSR Manager Information File (Tokyo Shoko Research)
Bankruptcy	
Number of correspondent financial institutions	
Multiple bank relationships	
City bank	
Regional bank	
Shinkin bank	
Capital	
Firm age	
Close relationship industries	
Profit	
Sales	
Manager age	
Offices	
Employees	
Male	
Credit rating	
Time to the first settlement	
Herfindahl index of financial institutions	Nihon Kinyu Meikan (Nihon Kinyu Tsushin Sya)
Financial institutions	Nihon Kinyu Meikan (Nihon Kinyu Tsushin Sya) and Number of Prefectural Sorted Ordinary Corporation (National Tax Agency)
Population	Population Estimates (Bureau of Statistics of the Ministry of Internal Affairs and Communications)
GPP	Report on Prefectural Accounts (Cabinet Office)
Ordinary corporations	Number of Prefectural Sorted Ordinary Corporation (National Tax Agency)
Economic growth rate	Report on Prefectural Accounts (Cabinet Office)
Startup rate	Orbis (Bureau van Dijk) and Number of Prefectural Sorted Ordinary Corporation (National Tax Agency)

manager, growth potential, stability, and openness. Higher ratings imply that the firm is a prime enterprise.[6] Industry and incorporation year dummy variables are also included in the regressions.

In the analyses in this chapter, odd columns show the results when we use standard errors clustered by prefecture and settlement year, while even columns represent the

[6] In the four criteria, stability occupies 45% of the total. Therefore, this variable mainly indicates the stability of each firm. In addition, stability is evaluated on owned capital, financial transactions, collateral margins, etc.

Table 3.3 Descriptive statistics

Variable name	N	Mean	Median	S.D.	Min.	Max.
Time to bankruptcy	2,667	5.554	5.980	0.863	-0.910	6.000
Bankruptcy	2,622	0.035	0	0.185	0	1
Number of correspondent financial institutions	2,667	1.678	1	0.946	1	9
Multiple bank relationships	2,667	0.448	0	0.497	0	1
City bank	2,667	0.221	0	0.415	0	1
Regional bank	2,667	0.530	1	0.499	0	1
Shinkin bank	2,667	0.216	0	0.411	0	1
Capital	2,667	0.007	0.004	0.007	0.000	0.050
Firm age	2,667	5.368	0.990	7.455	-0.010	30.000
Close relationship industries	2,667	0.333	0	0.471	0	1
Profit	2,667	0.447	0.200	16.632	-350.000	226.766
Sales	2,622	161.459	56.681	454.028	0	9,389.677
Manager age	2,622	46.836	46.978	10.489	18.038	85.967
Offices	2,622	0.477	0	1.447	0	23
Employees	2,622	8.319	4	19.899	1	490
Male	2,622	0.944	1	0.229	0	1
Credit rating	2,622	45.193	45	4.929	16	66
Time to the first settlement	2,622	0.749	0.980	0.455	-1.000	3.980
Herfindahl index of financial institutions	2,667	0.120	0.104	0.073	0.035	0.322
Financial institutions	2,667	0.935	0.957	0.359	0.388	1.901
Population	2,667	5.077	3.793	3.955	0.596	13.048
GPP	2,667	26.243	17.071	30.405	2.040	102.042
Ordinary corporations	2,667	142.968	76.220	172.939	9.416	587.825
Economic growth rate	2,667	1.338	1.482	2.461	-9.149	8.675
Startup rate	2,667	3.204	3.118	0.982	1.063	7.018

Note: The unit of sales is million yen.

results for the cases where we adopt standard errors clustered by firm, that is, heteroskedasticity-robust standard errors.

Table 3.4 reports the results of the regression analyses. Columns 1 and 2 show the regression results from using the Cox proportional hazards model, and columns 3 and 4 show those from the Weibull proportional hazards model. As shown in columns 1–4, a larger number of correspondent financial institutions for SMEs at the first settlement increases the subsequent firm bankruptcy risk at the 5% significance level when we use standard errors clustered by prefecture and settlement year (columns 1 and 3), whereas it is statistically significant at the 10% level when we employ standard errors clustered by firm (columns 2 and 4). Thus, a larger number of correspondent financial institutions does not work as insurance for firms to avoid bankruptcy as in Detragiache et al. (2000); on the contrary, it increases the risk of bankruptcy as in Dewatripont and

Table 3.4 Results of regression analyses with survival models (with number of correspondent financial institutions)

	(1) Cox with std. err. clustered by prefecture and year	(2) Cox with std. err. clustered by firm	(3) Weibull with std. err. clustered by prefecture and year	(4) Weibull with std. err. clustered by firm	(5) Cox with std. err. clustered by prefecture and year	(6) Cox with std. err. clustered by firm	(7) Weibull with std. err. clustered by prefecture and year	(8) Weibull with std. err. clustered by firm
Firm characteristics variables								
Ln (number of correspondent financial institutions)	1.452 **	1.452 *	1.463 **	1.463 *	1.827 ***	1.827 ***	1.843 ***	1.843 ***
	(0.238)	(0.283)	(0.243)	(0.288)	(0.340)	(0.402)	(0.347)	(0.408)
City bank	0.859	0.859	0.850	0.850	1.610	1.610	1.615	1.615
	(0.440)	(0.437)	(0.437)	(0.435)	(1.204)	(1.210)	(1.212)	(1.217)
Regional bank	0.730	0.730	0.727	0.727	1.277	1.277	1.281	1.281
	(0.326)	(0.361)	(0.327)	(0.362)	(0.969)	(0.959)	(0.975)	(0.964)
Shinkin bank	0.654	0.654	0.648	0.648	1.194	1.194	1.187	1.187
	(0.319)	(0.330)	(0.318)	(0.329)	(0.905)	(0.901)	(0.903)	(0.899)
Ln (capital)	1.221 *	1.221 *	1.227 *	1.227 *	1.103	1.103	1.111	1.111
	(0.137)	(0.134)	(0.138)	(0.136)	(0.132)	(0.134)	(0.131)	(0.134)
Ln (firm age + 1)	1.130	1.130	1.124	1.124	1.253 **	1.253 **	1.253 **	1.253 **
	(0.092)	(0.095)	(0.094)	(0.096)	(0.126)	(0.137)	(0.130)	(0.140)
Close relationship industries	0.725	0.725	0.723	0.723	0.987	0.987	0.993	0.993
	(0.164)	(0.163)	(0.165)	(0.164)	(0.260)	(0.272)	(0.267)	(0.278)
Profit	0.991 ***	0.991 ***	0.991 ***	0.991 ***	0.992 **	0.992 **	0.992 **	0.992 **
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Ln (sales + 1)					1.063	1.063	1.062	1.062
					(0.076)	(0.084)	(0.076)	(0.084)
Ln (manager age)					1.124	1.124	1.095	1.095
					(0.486)	(0.526)	(0.481)	(0.519)
Ln (offices + 1)					1.296	1.296	1.324	1.324
					(0.231)	(0.249)	(0.242)	(0.262)
Ln (employees)					1.130	1.130	1.133	1.133
					(0.162)	(0.160)	(0.163)	(0.161)
Male					1.079	1.079	1.071	1.071
					(0.524)	(0.555)	(0.525)	(0.553)
Ln (credit rating)					0.020 ***	0.020 ***	0.018 ***	0.018 ***
					(0.013)	(0.015)	(0.013)	(0.014)
Prefectural characteristics variables								
Herfindahl index of financial institutions	0.001	0.001	0.001	0.001	0.000 *	0.000 *	0.000 *	0.000 **
	(0.004)	(0.004)	(0.005)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)
Ln (financial institutions)	0.521	0.521	0.534	0.534	0.195	0.195	0.197	0.197
	(0.618)	(0.534)	(0.633)	(0.548)	(0.288)	(0.245)	(0.294)	(0.250)
Ln (population)	2.199	2.199	2.232	2.232	0.437	0.437	0.437	0.437
	(1.762)	(1.560)	(1.799)	(1.596)	(0.388)	(0.372)	(0.391)	(0.377)
Ln (GPP)	3.784	3.784	3.586	3.586	3.225	3.225	3.076	3.076
	(4.960)	(4.046)	(4.719)	(3.863)	(5.284)	(4.425)	(5.095)	(4.276)
Ln (ordinary corporations)	0.108	0.108 *	0.114	0.114 *	0.200	0.200	0.209	0.209
	(0.167)	(0.136)	(0.176)	(0.144)	(0.384)	(0.311)	(0.405)	(0.329)
Economic growth rate	0.905 *	0.905 ***	0.908 *	0.908 **	0.930	0.930	0.933	0.933
	(0.047)	(0.035)	(0.048)	(0.035)	(0.054)	(0.043)	(0.054)	(0.044)
Startup rate	0.903	0.903	0.899	0.899	0.782	0.782	0.775	0.775
	(0.181)	(0.143)	(0.179)	(0.143)	(0.184)	(0.161)	(0.183)	(0.160)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incorporation year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log pseudolikelihood	-942.409	-942.409	-597.525	-597.525	-673.821	-673.821	-445.549	-445.549
Number of observations	2,665	2,665	2,665	2,665	2,620	2,620	2,620	2,620

Note: The upper rows are hazard ratios and the lower rows are standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

Maskin (1995) and Bolton and Scharfstein (1996). As for the other covariates except for the number of correspondent financial institutions in columns 1–4, the profit and the economic growth rate are negatively associated with subsequent firm bankruptcy risk, while capital is positively associated with bankruptcy risk.

Columns 5–8 represent the results when firms' other information is added to

columns 1–4. Indeed, the sample size slightly decreases due to data limitations, but the bias associated with sample extraction is likely to be small. In columns 5–8, we also control for covariates that may affect firm bankruptcy, such as the number of offices and employees, and include the credit rating as a covariate that is a good predictor of the stability of firms. As these columns show, a larger number of correspondent financial institutions increases subsequent firm bankruptcy risk at the 1% significance level, regardless of the standard errors. In addition, although the capital and economic growth rate are statistically significant in columns 1–4, these covariates are not statistically significant in columns 5–8. In contrast, despite the firm age and the Herfindahl index of the number of financial institutions are not statistically significant in columns 1–4, these covariates are significant in columns 5–8. Furthermore, the credit rating is also statistically significant in columns 5–8. However, contrary to our expectations, it has positive signs in these columns.

In addition, Table 3.5 reports the results when we substitute a multiple bank relationships dummy variable for the number of correspondent financial institutions in Table 3.4. This table shows similar results to those in Table 3.4; specifically, multiple bank relationships at the first settlement also increase subsequent firm bankruptcy risk. This result indicates that the result in Table 3.4 is not driven by the outliers in the sample, and that the impact of a single bank relationship on bankruptcy risk is significantly different from that of multiple bank relationships on the risk.

In sum, a larger number of correspondent financial institutions for SMEs at the first settlement increases subsequent firm bankruptcy risk, and multiple bank relationships at the settlement also increase such risk.

3.4. Robustness checks

In the previous section, we obtained the result that a larger number of correspondent financial institutions for SMEs at the first settlement increases subsequent firm

Table 3.5 Results of regression analyses with survival models (with multiple bank relationships dummy variable)

	(1) Cox with std. err. clustered by prefecture and year	(2) Cox with std. err. clustered by firm	(3) Weibull with std. err. clustered by prefecture and year	(4) Weibull with std. err. clustered by firm	(5) Cox with std. err. clustered by prefecture and year	(6) Cox with std. err. clustered by firm	(7) Weibull with std. err. clustered by prefecture and year	(8) Weibull with std. err. clustered by firm
Firm characteristics variables								
Multiple bank relationships	1.403 **	1.403 *	1.409 **	1.409 *	1.776 ***	1.776 **	1.784 ***	1.784 **
	(0.233)	(0.269)	(0.235)	(0.272)	(0.388)	(0.415)	(0.390)	(0.418)
City bank	0.841	0.841	0.831	0.831	1.563	1.563	1.568	1.568
	(0.428)	(0.425)	(0.426)	(0.423)	(1.162)	(1.167)	(1.170)	(1.174)
Regional bank	0.719	0.719	0.717	0.717	1.256	1.256	1.261	1.261
	(0.321)	(0.354)	(0.322)	(0.355)	(0.946)	(0.935)	(0.954)	(0.942)
Shinkin bank	0.641	0.641	0.635	0.635	1.166	1.166	1.162	1.162
	(0.311)	(0.322)	(0.310)	(0.321)	(0.878)	(0.875)	(0.877)	(0.874)
Ln (capital)	1.235 *	1.235 *	1.241 *	1.241 *	1.114	1.114	1.122	1.122
	(0.138)	(0.137)	(0.138)	(0.138)	(0.135)	(0.137)	(0.134)	(0.137)
Ln (firm age + 1)	1.129	1.129	1.122	1.122	1.252 **	1.252 **	1.250 **	1.250 **
	(0.093)	(0.095)	(0.094)	(0.096)	(0.126)	(0.136)	(0.129)	(0.140)
Close relationship industries	0.732	0.732	0.730	0.730	0.995	0.995	1.002	1.002
	(0.168)	(0.166)	(0.170)	(0.167)	(0.265)	(0.276)	(0.272)	(0.283)
Profit	0.991 ***	0.991 ***	0.991 ***	0.991 ***	0.992 *	0.992 *	0.993 *	0.993 *
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)
Ln (sales + 1)					1.063	1.063	1.062	1.062
					(0.077)	(0.085)	(0.077)	(0.086)
Ln (manager age)					1.117	1.117	1.090	1.090
					(0.487)	(0.525)	(0.484)	(0.520)
Ln (offices + 1)					1.318	1.318	1.341	1.341
					(0.245)	(0.261)	(0.256)	(0.274)
Ln (employees)					1.157	1.157	1.160	1.160
					(0.165)	(0.162)	(0.166)	(0.164)
Male					1.057	1.057	1.051	1.051
					(0.516)	(0.545)	(0.517)	(0.544)
Ln (credit rating)					0.021 ***	0.021 ***	0.020 ***	0.020 ***
					(0.014)	(0.016)	(0.014)	(0.015)
Prefectural characteristics variables								
Herfindahl index of financial institutions	0.001	0.001	0.001	0.001	0.000 *	0.000 **	0.000 *	0.000 **
	(0.004)	(0.004)	(0.005)	(0.004)	(0.000)	(0.000)	(0.000)	(0.000)
Ln (financial institutions)	0.540	0.540	0.552	0.552	0.206	0.206	0.209	0.209
	(0.645)	(0.556)	(0.660)	(0.570)	(0.310)	(0.261)	(0.316)	(0.267)
Ln (population)	2.242	2.242	2.271	2.271	0.452	0.452	0.449	0.449
	(1.794)	(1.591)	(1.826)	(1.623)	(0.401)	(0.385)	(0.401)	(0.387)
Ln (GPP)	3.590	3.590	3.405	3.405	2.986	2.986	2.856	2.856
	(4.728)	(3.850)	(4.502)	(3.681)	(4.929)	(4.128)	(4.767)	(4.006)
Ln (ordinary corporations)	0.114	0.114 *	0.120	0.120 *	0.215	0.215	0.225	0.225
	(0.178)	(0.144)	(0.187)	(0.152)	(0.419)	(0.338)	(0.444)	(0.359)
Economic growth rate	0.904 *	0.904 ***	0.906 *	0.906 **	0.929	0.929	0.931	0.931
	(0.047)	(0.035)	(0.048)	(0.035)	(0.054)	(0.044)	(0.054)	(0.044)
Startup rate	0.898	0.898	0.894	0.894	0.778	0.778	0.771	0.771
	(0.180)	(0.142)	(0.179)	(0.142)	(0.182)	(0.159)	(0.181)	(0.158)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Incorporation year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Log pseudolikelihood	-942.712	-942.712	-597.857	-597.857	-674.178	-674.178	-445.961	-445.961
Number of observations	2,665	2,665	2,665	2,665	2,620	2,620	2,620	2,620

Note: The upper rows are hazard ratios and the lower rows are standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

bankruptcy risk. However, we cannot deny the possibility that the result is driven by reverse causality. In other words, firms that are likely to go bankrupt may tend to transact with many financial institutions. For example, at an individual level, a person on the edge of bankruptcy tends to borrow money from multiple lenders. Furthermore, several studies also show the possibility of reverse causality; for instance,

Peek and Rosengren (2005) argue that firms in poor financial condition are more likely to receive additional bank credit. In addition, Carletti et al. (2007) show that less profitable firms use multiple-bank lending more often than profitable ones. Hence, in this section, we verify whether the results obtained in Section 3.3 are driven by reverse causality. The possibility of reverse causality in this chapter may well result from the correlation between the number of correspondent financial institutions and firm weakness. Hence, if we deal with the endogeneity between these two, we can deny the causality that firms that are likely to go bankrupt tend to transact with a larger number of financial institutions. Hence, in this section, we consider the possibility of reverse causality as the problem of endogeneity, and identify the causality between the above two.

In addition, in Section 3.3, we only partially control for the financial stability of correspondent financial institutions with the credit rating, for which is one of the covariates that we control. Several studies have argued that the financial distress of banks reduces their client firms' investments (e.g., Gibson 1995, Minamihashi 2011). Thus, there is a possibility that the financial health of the correspondent financial institutions also affects firm bankruptcy.

Given these considerations, we use the IV methods to deal with these problems. However, the IV methods are usually not used in survival analysis; hence, we use instrumental variables probit (IV probit) models and a linear probability model (LPM) with the IV methods.[7] In other words, we employ these IV methods, and investigate the effect of the number of correspondent financial institutions for SMEs at the first settlement on the probability of firm bankruptcy within five years of the first settlement.

Here, we explain the instrumental variables used in this chapter. As previously mentioned, the number of correspondent financial institutions may be associated with

[7] The dependent variable in this case is a dummy variable that is equal to one if the firm goes bankrupt within five years of the first settlement.

weakness in firms and in their correspondent financial institutions. Hence, we use switching cost, time to the first settlement, the number of offices, and the number of employees as instrumental variables because they may not be associated with weakness in firms and their correspondent financial institutions, and may not directly affect firm bankruptcy.

Switching cost is the cost involved in the switching of firm–bank relationships, and it is likely to be associated with the number of correspondent financial institutions but not with weakness in firms and their correspondent financial institutions. In this study, we use the product of $-Ln$ (financial institutions) and the close relationship industries in Table 3.4 as the variable expressing the switching cost. The number of financial institutions per firm in each prefecture is negatively associated with the cost involved in the switching; however, as suggested by Sharpe (1990) and Rajan (1992), the cost differs depending on the strength of firm–bank relationships. Therefore, it is not unreasonable to use the product of these two variables as a proxy variable for the switching cost.[8]

In addition, the time to the first settlement is a continuous variable that shows time intervals between the incorporation and the first settlement of firms, and the unit of this variable is year. In the sample firms, even if the time of incorporation is the same, the time to the first settlement is not necessarily the same. For example, some of the firms' time interval between incorporation and the first settlement is one year, but it is half a year for others. The longer the interval, the more opportunities there are for firms to transact with many financial institutions; hence, this variable is likely to be positively associated with the number of correspondent financial institutions, but not with weakness in firms and their correspondent financial institutions.

Furthermore, the number of offices and the number of employees are also likely to

[8] This study is not trying to accurately measure switching costs, but is instead trying to find valid instrumental variables The product of $-Ln$ and close relationship industries satisfies the conditions of instrumental variables. Thus, even if the product of these two does not accurately represent the cost involved in the switching of firm–bank relationships, it does not mean that the product of these two is inappropriate as an instrumental variable.

satisfy the conditions of instrumental variables because of the following reasons: First, these variables are not widely distributed, and thus these variables are not likely to have a strong association with firm weakness, let alone weakness in their correspondent financial institutions. For the same reason, these variables may not directly affect firm bankruptcy. Finally, although the distributions of these variables are narrow, they seem to be positively associated with the number of correspondent financial institutions.

Hence, in this study, we adopt these four instrumental variables for the number of correspondent financial institutions, and examine the effect of this number on the probability of firm bankruptcy within five years of the first settlement.

Tables 3.6 and 3.7 report the results of the regression analyses with the IV probit models; specifically, Table 3.6 reports the results of using the maximum likelihood estimation, and Table 3.7 reports the results of using two-step estimation proposed by Newey (1987). In Table 3.6, column 1 shows the results when we use standard errors clustered by prefecture and settlement year, while column 2 represents the results when

Table 3.6 Results of regression analyses with IV probit models (maximum likelihood estimation)

	(1) Clustered by prefecture and year				(2) Clustered by firm			
	dy/dx	Delta-method Std. Err.	z	P>|z|	dy/dx	Delta-method Std. Err.	z	P>|z|
Firm characteristics variables								
Ln (number of correspondent financial institutions)	1.238 ***	0.442	2.800	0.005	1.238 ***	0.426	2.900	0.004
City bank	0.292	0.305	0.960	0.339	0.292	0.303	0.960	0.336
Regional bank	0.247	0.304	0.810	0.415	0.247	0.297	0.830	0.405
Shinkin bank	0.237	0.305	0.780	0.436	0.237	0.302	0.790	0.432
Ln (capital)	0.028	0.059	0.470	0.637	0.028	0.057	0.490	0.627
Ln (firm age + 1)	0.058	0.041	1.420	0.157	0.058	0.046	1.260	0.209
Close relationship industries	-0.152	0.116	-1.310	0.190	-0.152	0.121	-1.250	0.210
Profit	-0.007 ***	0.002	-2.980	0.003	-0.007 ***	0.002	-3.210	0.001
Ln (sales + 1)	0.008	0.027	0.280	0.783	0.008	0.029	0.260	0.796
Ln (manager age)	0.067	0.185	0.360	0.717	0.067	0.189	0.350	0.723
Male	0.017	0.203	0.080	0.933	0.017	0.214	0.080	0.937
Ln (credit rating)	-1.883 ***	0.310	-6.070	0.000	-1.883 ***	0.372	-5.060	0.000
Prefectural characteristics variables								
Herfindahl index of financial institutions	-5.170	3.232	-1.600	0.110	-5.170 *	2.993	-1.730	0.084
Ln (financial institutions)	-0.685	0.586	-1.170	0.243	-0.685	0.497	-1.380	0.168
Ln (population)	-0.209	0.353	-0.590	0.554	-0.209	0.334	-0.630	0.532
Ln (GPP)	0.420	0.645	0.650	0.515	0.420	0.543	0.770	0.439
Ln (ordinary corporations)	-0.633	0.753	-0.840	0.400	-0.633	0.611	-1.040	0.300
Economic growth rate	-0.043	0.026	-1.630	0.104	-0.043 **	0.020	-2.110	0.035
Startup rate	-0.141	0.091	-1.550	0.120	-0.141 *	0.081	-1.750	0.081
Industry dummies	Yes				Yes			
Incorporation year dummies	Yes				Yes			
Log pseudolikelihood	-1945.835				-1945.835			
Wald test of exogeneity	0.070				0.064			
Number of observations	2,621				2,621			

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Table 3.7 Results of regression analyses with IV probit models (two-step estimation)

	(1) First-stage regression Dependent variable: Ln (number of financial institutions)				(2) Two-step probit with endogenous regressors Dependent variable: Bankruptcy			
	Coef.	Std. Err.	t	P>|t|	dy/dx	Delta-method Std. Err.	z	P>|z|
Firm characteristics variables								
Ln (number of correspondent financial institutions)					1.363 **	0.581	2.350	0.019
Switching cost	0.052	0.045	1.150	0.249				
Time to the first settlement	-0.007	0.028	-0.240	0.809				
Ln (offices + 1)	0.070 ***	0.021	3.330	0.001				
Ln (employees)	0.079 ***	0.011	7.180	0.000				
City bank	-0.116 **	0.054	-2.160	0.031	0.322	0.339	0.950	0.342
Regional bank	-0.151 ***	0.050	-3.000	0.003	0.272	0.335	0.810	0.416
Shinkin bank	-0.147 ***	0.053	-2.790	0.005	0.262	0.343	0.760	0.446
Ln (capital)	0.027 ***	0.009	3.020	0.003	0.031	0.063	0.490	0.621
Ln (firm age + 1)	0.014	0.010	1.480	0.139	0.065	0.056	1.140	0.253
Close relationship industries	0.127 ***	0.023	5.420	0.000	-0.167	0.150	-1.110	0.265
Profit	0.001 **	0.001	2.420	0.016	-0.007 ***	0.002	-3.560	0.000
Ln (sales + 1)	0.013 ***	0.004	3.200	0.001	0.009	0.027	0.320	0.750
Ln (manager age)	-0.038	0.039	-0.970	0.331	0.074	0.223	0.330	0.741
Male	0.028	0.038	0.740	0.461	0.019	0.238	0.080	0.936
Ln (credit rating)	0.196 **	0.083	2.360	0.018	-2.080 ***	0.437	-4.760	0.000
Prefectural characteristics variables								
Herfindahl index of financial institutions	0.582	0.458	1.270	0.204	-5.710 *	2.916	-1.960	0.050
Ln (financial institutions)	0.216 **	0.092	2.360	0.018	-0.756	0.582	-1.300	0.194
Ln (population)	0.058	0.058	1.000	0.316	-0.231	0.346	-0.670	0.504
Ln (GPP)	-0.031	0.100	-0.310	0.754	0.465	0.594	0.780	0.434
Ln (ordinary corporations)	0.110	0.114	0.970	0.333	-0.699	0.701	-1.000	0.318
Economic growth rate	0.007	0.004	1.630	0.104	-0.047 **	0.023	-2.050	0.040
Startup rate	0.007	0.013	0.580	0.559	-0.155 *	0.081	-1.910	0.056
Constant	-0.820 *	0.451	-1.820	0.069				
Industry dummies				Yes				
Incorporation year dummies				Yes				
Adj R-squared				0.116				
Wald test of exogeneity				0.071				
Number of observations				2,621				

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

we use standard errors clustered by firm. As shown in these columns, a larger number of correspondent financial institutions at the first settlement increases the probability of firm bankruptcy during five years from the first settlement at the 1% significance level. Moreover, although the Wald tests of exogeneity are rejected at the 10% significance level, they are not rejected at the 5% significance level; hence, in this case, the number of correspondent financial institutions is unlikely to be endogenous.

In addition, in Table 3.7, we obtain similar results as in Table 3.6; specifically, a larger number of correspondent financial institutions at the first settlement increases the probability of firm bankruptcy within five years of the first settlement at the 5% significance level (see column 2), and the Wald test of exogeneity is not rejected at the 5% significance level. Moreover, column 1 indicates that the coefficient on the credit rating is positive and significant. This result indicates that the lower the risk, the more the firms transact with financial institutions. Thus, this result supports the causality that

a larger number of correspondent financial institutions increases subsequent firm bankruptcy risk.

Table 3.8 reports the results of using the LPM with the IV methods. Columns 1 and 2 show the results of using the 2SLS estimators, and columns 3 and 4 show the results of using the generalized method of moments (GMM) estimators. Table 3.8 also shows that a larger number of correspondent financial institutions increases the probability of firm bankruptcy, and the overidentifying restrictions tests are not rejected at the 10% significance level in columns 1–4; thus, also in this case, the number of correspondent financial institutions is unlikely to be endogenous.

On balance, in this section, which addresses the possibility of reverse causality and the problem of endogeneity, we obtain the result that an increase in the number of correspondent financial institutions increases the risk of firm bankruptcy, which is consistent with the results in the previous section. Therefore, the results in the previous section have a high level of robustness.

Table 3.8 Results of regression analyses using LPM with IV methods

	(1) 2SLS		(2) 2SLS		(3) GMM		(4) GMM	
	Coef.	Std. err. clustered by prefecture and year	Coef.	Std. err. clustered by firm	Coef.	Std. err. clustered by prefecture and year	Coef.	Std. err. clustered by firm
Firm characteristics variables								
Ln (number of correspondent financial institutions)	0.149 **	0.062	0.149 ***	0.056	0.146 **	0.061	0.141 **	0.055
City bank	0.040 *	0.023	0.040 *	0.023	0.037 *	0.022	0.038 *	0.022
Regional bank	0.031	0.022	0.031	0.021	0.027	0.020	0.028	0.020
Shinkin bank	0.029	0.022	0.029	0.022	0.027	0.022	0.026	0.022
Ln (capital)	-0.001	0.005	-0.001	0.004	-0.001	0.004	-0.001	0.004
Ln (firm age + 1)	0.005	0.003	0.005	0.004	0.005	0.003	0.005	0.004
Close relationship industries	-0.017	0.012	-0.017	0.012	-0.016	0.012	-0.015	0.011
Profit	-0.001 **	0.000	-0.001 **	0.000	-0.001 **	0.000	-0.001 **	0.000
Ln (sales + 1)	0.000	0.002	0.000	0.002	-0.000	0.002	-0.000	0.002
Ln (manager age)	0.006	0.016	0.006	0.017	0.005	0.016	0.005	0.016
Male	0.001	0.015	0.001	0.015	0.002	0.014	0.003	0.015
Ln (credit rating)	-0.186 ***	0.058	-0.186 ***	0.053	-0.178 ***	0.055	-0.185 ***	0.052
Prefectural characteristics variables								
Herfindahl index of financial institutions	-0.358	0.230	-0.358 *	0.213	-0.364	0.227	-0.358 *	0.209
Ln (financial institutions)	-0.042	0.042	-0.042	0.036	-0.045	0.041	-0.043	0.035
Ln (population)	-0.010	0.028	-0.010	0.026	-0.014	0.027	-0.010	0.026
Ln (GPP)	0.018	0.052	0.018	0.044	0.025	0.052	0.021	0.043
Ln (ordinary corporations)	-0.039	0.058	-0.039	0.047	-0.045	0.057	-0.043	0.046
Economic growth rate	-0.004 *	0.002	-0.004 **	0.002	-0.004 *	0.002	-0.004 **	0.002
Startup rate	-0.009	0.007	-0.009	0.006	-0.008	0.006	-0.009	0.006
Constant	0.816 ***	0.265	0.816 ***	0.244	0.811 ***	0.252	0.834 ***	0.236
Industry dummies	Yes		Yes		Yes		Yes	
Incorporation year dummies	Yes		Yes		Yes		Yes	
Overidentifying restrictions test	0.785		0.785		0.780		0.785	
Number of observations	2,621		2,621		2,621		2,621	

*Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

3.5. Conclusion

Employing a unique firm-level data set, we examine the effect of the number of correspondent financial institutions for SMEs at the first settlement of accounts on subsequent firm bankruptcy. We find that a larger number of correspondent financial institutions for SMEs at the first settlement increases the risk of subsequent firm bankruptcy. In addition, we confirm the causality between the two. The result in this chapter is consistent with the results in previous empirical studies such as Degryse and Ongena (2001) and Castelli et al. (2012), and the theoretical studies by Olson (1965) and Osborne (2003). This study presents a new management strategy to reduce the risk of firm bankruptcy during the early stages of the entrepreneurial process. The enterprise information at the first settlement of accounts is the very first piece of information about firms that we can obtain. Hence, the findings in this chapter indicate the possibility that the number of correspondent financial institutions at the first settlement functions as an indicator of the future of young SMEs, and this implication can also be useful to investors.

However, this chapter only examines the effect of the number of correspondent financial institutions for SMEs at the first settlement on the subsequent firm bankruptcy risk. Thus, this chapter does not show that having a larger number of correspondent financial institutions is always detrimental for SMEs. In fact, several studies have argued that the number of correspondent financial institutions is positively associated with firms' growth opportunities (e.g., Houston and James 1996, Farinha and Santos 2002). In addition, in this chapter, we target only those firms that transact with at least one financial institution and disclose information about profit at the first settlement. Moreover, we cannot examine the above effect considering the relationship between lending activities by financial institutions and business cycles.[9] Unfortunately, these are beyond the scope of this chapter; therefore, we need to deepen discussions on

[9] For example, Beck et al. (2014) argue that lending activities are associated with business cycles.

the issues using more detailed data over longer durations.

Appendix

This appendix describes the theoretical model to show that an increase in the number of correspondent financial institutions increases the risk of firm bankruptcy. Let us assume the following case. The number of correspondent financial institutions of a firm is n, and each financial institution has two strategies: *Support* and *Don't support*. Moreover, when the number of financial institutions that choose *Support* is w or greater, bankruptcy of the firm can be avoided, where $1 \leq w \leq n$. Furthermore, if bankruptcy of the firm is avoided, then all n correspondent financial institutions can obtain a benefit b.[10] However, financial institutions that choose *Support* have to pay cost c. Hence, the net profits of the financial institutions that choose *Support* are represented by $b - c$.[11] On the other hand, when the number of financial institutions that choose *Support* is less than w, the firm goes bankrupt. In other words, in this chapter, we assume a vulnerable firm whose bankruptcy largely depends on whether it can receive support from its correspondent financial institutions.

Next, we consider the Nash equilibrium in this model. In this case, a group of correspondent financial institutions is considered to be a temporary combination. Hence, in this case, it is appropriate to assume that the Nash equilibrium is a symmetric one.

The case of $w = 1$, that is, the state when a specific financial institution chooses *Support,* is not the Nash equilibrium because $b \geq b - c$. Hence, we consider the Nash equilibrium while including a mixed strategy, and assume the case where all correspondent financial institutions choose *Don't support* with the same probability p,

[10] In this case, b expresses the future margin of profits on lending that the financial institutions can earn by avoiding the firm's bankruptcy.

[11] Where $b - c > 0$. If we assume $b - c \leq 0$, the Nash equilibrium is the state when all correspondent financial institutions choose *Don't support*.

as in the Nash equilibrium. Because of the fundamental principle of the mixed strategy, the benefits in the case that a correspondent financial institution chooses *Support* with the probability of one have to equal the benefits in the case that it chooses *Don't support* with the probability of one. When it chooses *Support*, the benefit is $b-c$ because the bankruptcy of the firm can be avoided, irrespective of other correspondent financial institutions' actions.[12] If it chooses *Don't support* while at least one of the other correspondent financial institutions choose *Support*, then it can gain benefit b. However, if all other correspondent financial institutions also choose *Don't support*, the benefit is zero. In this case, the probability that all other correspondent financial institutions choose *Don't support* is p^{n-1}; hence, the probability that at least one of the other correspondent financial institutions chooses *Support* is $1-p^{n-1}$. Therefore, the condition for when all correspondent financial institutions choose *Don't support* with the probability of p is the Nash equilibrium, shown in equation (3.1) as follows:

$$b-c=\left(1-p^{n-1}\right)b. \tag{3.1}$$

Equation (3.2) solves this for p:

$$p=\left(\frac{c}{b}\right)^{\frac{1}{n-1}}. \tag{3.2}$$

To the contrary, when all correspondent financial institutions choose *Don't support* with this probability, the expected profit of each correspondent financial institution is $b-c$, which is equal to the expected profit in the case where a correspondent financial institution chooses *Support*. As mentioned above, there is no strategy available for any of the correspondent financial institutions other than *Support* or *Don't support*; hence,

[12] In this chapter, we use young and small firms as a sample. Therefore, the bankruptcy of the firms can be avoided if at least one of the correspondent financial institutions chooses *Support*, and thus it can gain the benefit $b-c$, regardless of the actions of other correspondent financial institutions.

the state where all correspondent financial institutions choose *Don't support* with the probability of $p = \left(\frac{c}{b}\right)^{\frac{1}{n-1}}$ is a unique symmetric Nash equilibrium. Moreover, the probability that each correspondent financial institution chooses *Don't support* increases with n because $\frac{c}{b} < 1$. Thus, the probability that each correspondent financial institution chooses *Don't support* increases with the number of correspondent financial institutions. Furthermore, the probability that all correspondent financial institutions choose *Don't support* is represented by equation (3.3) as follows:

$$p^n = \left(\frac{c}{b}\right)^{\frac{n}{n-1}}. \tag{3.3}$$

This probability also increases with n. Therefore, an increase in the number of correspondent financial institutions increases the free riders to other correspondent financial institutions, and thus firm bankruptcy is more likely to occur.

Chapter 4: The Number of Bank Relationships and Bank Lending to New Firms: Evidence from Firm-level Data in Japan

4.1. Introduction

Smooth funding for SMEs is one of the most important issues in banking. Although SMEs tend to have a strong desire for outside funds, it is difficult for them to obtain external financing due to information asymmetries existing between them and the financial institutions (Berger and Udell 1998). For this reason, banking literature has focused on finance to SMEs, and in this strand, numerous studies have examined the effect of the number of bank relationships on lending terms and conditions. For example, several previous studies examine how the number of bank relationships affects credit availability for SMEs (e.g., Petersen and Rajan 1994, Hernández-Cánovas and Martínez-Solano 2007).

However, there are few studies that employ actual bank lending as an indicator of credit availability for such firms because it is difficult to isolate loan supply from loan demand. Moreover, to the best of our knowledge, no study has empirically examined the impact of the number of bank relationships on the credit availability of new firms due to data limitations.

Against this background, this chapter represents the first attempt to examine how the number of bank relationships affects bank lending to new firms. This chapter is clearly distinguished from previous studies in terms of the following three points. First, we focus on new firms as a sample. Although new firms have the most critical need for outside funds during their life span, they are faced with the most severe funding constraints among all firms. To draw implications for solving this problem, it is essential to use new firms as a sample. Second, we employ actual bank lending as an indicator of the firms' credit availability. In particular, one of the key distinguishing

features of our analyses is to focus on lending activities by financial institutions. Finally, we divide bank loans into short-term and long-term lending. Despite the importance of distinguishing between these two types of lending, there are few studies that segregate loans into these two distinct categories.

Our main findings are summarized as follows. We find that an increase in the number of bank relationships increases total lending to new firms. We also find that this increase in total lending to such firms seems not to be through the increase in short-term lending, but through the increase in long-term lending.

The contribution of this study is to reveal the effect of the number of bank relationships on actual bank lending employing a sample of new firms. In addition, we focus on banks' lending activities by eliminating firms' demand for credit.

The remainder of the chapter is organized as follows. Section 4.2 reviews previous literature. Section 4.3 develops empirical hypotheses. Section 4.4 explains our data set and the empirical methodology. Section 4.5 presents the empirical results. Section 4.6 checks the robustness of the baseline estimation results obtained in Section 4.5. Section 4.7 concludes the chapter.

4.2. Literature review

Previous studies on the number of bank relationships (including the choice between a single bank relationship and multiple bank relationships) are broadly classified into four groups: theoretical risks of firm bankruptcy, empirical studies on firm performance and firm bankruptcy, hold-up problems, and credit availability for firms.

First, we review the literature on the theoretical risks of firm bankruptcy. Some studies argue that multiple bank relationships make it difficult for creditors to coordinate with each other, particularly in the case of business restructuring, and thus increase the risk for customer firms. For example, Dewatripont and Maskin (1995) and Bolton and Scharfstein (1996) show the possibility that multiple bank relationships lead to a lack

of coordination among creditors and it leads to the failure of debt restructuring. Foglia et al. (1998) argue that multiple banking relationships are positively associated with the riskiness of the borrowers. Brunner and Krahnen (2008) suggest that multiple bank relationships reduce the probability of workout success using a unique concept of "bank pools." In contrast, other studies argue that multiple bank relationships reduce theoretical firm bankruptcy risk. For instance, Detragiache et al. (2000) show that multiple bank relationships can ensure a more stable supply of credit and reduce the probability of an early liquidation of the project. In addition, Carletti et al. (2007) argue that multiple-bank lending reduces firm bankruptcy risk because it achieves higher monitoring. Furthermore, Guiso and Minetti (2010) find a negative correlation between borrowing differentiation and restructuring costs.

Second, we review empirical studies on firm performance and firm bankruptcy. Degryse and Ongena (2001) examine the effects of multiple bank relationships on sales profitability employing a sample of listed firms, and find a negative correlation between the two. Moreover, Castelli et al. (2012) investigate how the number of bank relationships affects firm performance using a unique data set of Italian small firms, and indicate that an increase in the number of bank relationships reduces firms' financial performance, such as the return on equity and return on assets. Furthermore, Ogane (2016) examines the effect of the number of bank relationships at the first settlement of accounts on subsequent firm bankruptcy risk employing a unique firm-level data set of unlisted young firms incorporated in Japan, and finds that an increase in the number of bank relationships at the first settlement increases subsequent firm bankruptcy risk.

Finally, we review existing literature on hold-up problems and credit availability. These studies are considerably related to this chapter, particularly the strands of literature on credit availability. However, there are few studies that have investigated how the number of bank relationships affects hold-up problems and credit availability. Some studies find that a single bank relationship causes an information monopoly by a specific financial institution, and thus causes hold-up problems (e.g., Sharpe 1990,

Rajan 1992). In addition, Petersen and Rajan (1994) and Hernández-Cánovas and Martínez-Solano (2007) investigate the effect of the number of bank relationships on the availability of credit. The former study employs two variables as measures of credit availability: one is the percentage of trade credit that is paid after the due date and the other is the percentage of discounts for early payment that are taken. They find that an increase in the number of bank relationships worsens the availability of credit. On the other hand, the latter study also uses two variables as proxies for credit availability: one is the ratio of trade creditors to purchases and the other is the ratio of bank debt to total assets. They argue that fewer bank relationships worsen credit availability.

4.3. Empirical hypotheses

A bank must assess a firm's riskiness before providing loans to the firm. As such, the number of bank relationships serves an important piece of information for a bank that attempts to provide finance to a financially opaque firm. This is because the number of bank relationships represents the number of times that a firm passes screening by different financial institutions. In other words, this number is proof of a firm's financial stability and future potential.

We expect that the effect of the number of bank relationships on bank lending to new firms differs by lending period. Main hypotheses in this chapter are summarized as follows:

Hypothesis 4.1: An increase in the number of bank relationships reduces short-term lending to new firms.

Hypothesis 4.2: An increase in the number of bank relationships increases long-term lending to new firms.

Hypothesis 4.3: The difference between a single bank relationship and multiple bank relationships is significant. In other words, multiple bank relationships affect lending to new firms.

Hypotheses 4.1–4.3 are based on the "substitution hypothesis," the theory of free-riding, and the winner's curse, respectively. To accurately grasp the grounds for these hypotheses, we here explain the difference between the characteristics of short-term and long-term borrowing. The former represents the borrowing that a firm has to repay within one year from the day following the date of the account closing day, and the latter represents longer-term borrowing. In general, it takes a long time for banks to provide finance to opaque firms, especially if borrowers are young and unlisted SMEs. Therefore, for banks, it does not pay to provide loans to financially opaque small new firms as it takes a long time to evaluate their financial stability. For this reason, banks tend to provide finance to the firms whose credit risks are evaluated by a third party.

As for firms, short-term borrowing is working capital and long-term borrowing is funds for equipment. In general, firms prefer long-term borrowing to short-term borrowing because of the following three reasons. First, short-term borrowing has the risk of being refused refinancing, which can be directly connected with bankruptcies. Second, the amount of repayment per time of short-term borrowing is generally larger than that of long-term borrowing because firms must repay all borrowing at once in the case of short-term borrowing. Third, in Japan, firms that cannot repay short-term borrowing until the term of repayment are subject to suspension of bank transactions, which substantially means bankruptcy even if the firms have black balance sheets. For these reasons, it is preferable for firms to obtain a long-term loan rather than a short-term one.

Turning to banks, they prefer to recover their loans as soon as possible, and thus they generally prefer short-term lending to long-term one. However, banks come to

provide longer-term loans as firms acquire good reputations in the lending market.[1] In addition, this increase in long-term lending may well lead to a reduction in short-term lending. In other words, short-term lending is likely to be substituted for long-term lending with an increase in the firm's creditworthiness. For this reason, we expect that an increase in the number of bank relationships reduces short-term lending to new firms (Hypothesis 4.1).

On the other hand, another mechanism acts at the start of lending, particularly long-term one. Based on the free riding theory, all banks have a large incentive to free ride on the efforts of other banks on loan application screening. To reduce the risk involved in lending to financially opaque firms, it is reasonable for all banks to look at other banks' actions and then decide whether provides loans to the firm. Although the same situation is true for short-term lending, default on a long-term loan does not lead to immediate firm bankruptcy, unlike in the case of short-term loan. Therefore, in the case of long-term lending, the number of bank relationships is more likely to serve as proof of financial stability and future potential of firms. For this reason, we expect that an increase in the number of bank relationships increases long-term lending to new firms (Hypothesis 4.2).

Furthermore, it is particularly risky for a bank to be the first lender because such bank may underestimate a firm's credit risk more than other banks. In other words, a bank can be the first lending bank simply because other banks have more negative information on the firm than the bank. This logic is based on the winner's curse, which predicts that a bank is less likely to provide finance to financially opaque firms until another bank does. For this reason, we expect that the difference between a single bank relationship and multiple bank relationships is significant (Hypothesis 4.3).

4.4. Data and methodology

[1] Diamond (1989) suggests such possibility.

4.4.1. Data

We construct a unique firm-level data set from the following sources. First, we employ the firm-level database provided by the TSR. This data set comprises two types of files: the TSR Enterprise Information File and TSR Stand-Alone Financial Information File. Our original sample contains firms incorporated in Japan between June 2003 and March 2010 as unlisted companies whose startup capital is less than 50 million yen.[2] Although the date of establishment and incorporation do not necessarily concur, this data set includes only information on the first settlement of accounts. Moreover, with respect to firms whose date of establishment and incorporation are different, all the firms basically incorporate within five years from their establishment.[3] Thus, all the observations in this chapter are very young firms (i.e., new firms).

The original sample of this data set comprises 712 observations. These firms represent almost all firms that meet the above data extraction conditions in the TSR database. Therefore, the bias associated with sample extraction is likely to be small.

In addition, we use the following aggregate data for each prefecture: *Nihon Kinyu Meikan* (Almanac of Financial Institutions in Japan) provided by *Nihon Kinyu Tsushin Sha*; the Report on Prefectural Accounts produced by the Cabinet Office; and the Number of Prefectural Sorted Ordinary Corporation published by the National Tax Agency.

4.4.2. Variables

Table 4.1 shows the variable definitions, and Table 4.2 presents the descriptive statistics. In this chapter, we employ three types of dependent variables:

[2] According to the Annual Report of Bankrupt Enterprises (published by the Organization for Small & Medium Enterprises and Regional Innovation, Japan), about 95% of bankrupt firms in Japan are firms with capital of less than 50 million yen.

[3] Farinha and Santos (2002) find that the estimated median duration for firms to initiate multiple bank relationships is five years. Hence, the firms around this age are in a period of transition from a single banking relationship to multiple banking relationships.

Table 4.1 Variable definitions

Variable	Definition
Dependent variables	
LnSHORT_BANKS	Log of (short-term borrowing / number of correspondent financial institutions)
LnLONG_BANKS	Log of (long-term borrowing / number of correspondent financial institutions)
LnTOTAL_BANKS	Log of (total borrowing / number of correspondent financial institutions), where total borrowing: = short-term borrowing + long-term borrowing
Number of bank relationships	
BANKS	Number of correspondent financial institutions
MULTIPLE_BANKS	1 if the firm transacts with multiple banks, 0 otherwise
Firm characteristics	
EMPLOYEES	Number of employees
HIGHRELATION	1 if the firm has a strong relationship with its main bank, 0 otherwise
MANAGER_AGE	Age of managers
MALE	1 if the manager of the firm is male, 0 otherwise
OFFICES	Number of offices
SCORE	Normalized credit score from Tokyo Shoko Research (0-100)
Firm financial information (unit: thousand yen)	
CASH	Cash and cash in bank (million yen)
ACCOUNTS_RECEIVABLE	Accounts receivable (million yen)
TOTAL_ASSETS	Total assets (million yen)
ACCOUNTS_PAYABLE	Accounts payable (million yen)
LnSHORT_BORROWING	Log of short-term borrowing
LnLONG_BORROWING	Log of long-term borrowing
TOTAL_LIABILITIES	Total liabilities (million yen)
CAPITAL_ADEQUACY_RATIO	Capital adequacy ratio: = (total assets - total liabilities) / total assets * 100 (%)
ROA	Return on assets: = current profit / total assets * 100
CAPITAL	Capital (million yen)
Prefecture characteristics	
HHI	Herfindahl index of the number of financial institutions
BANKS_RATIO	Ratio of the number of financial institutions to the number of ordinary corporations (%)
GPP	Real gross prefectural product (million yen)
FIRMS	Number of ordinary corporations
GROWTH_RATE	Growth rate of the real gross prefectural product
Instrumental variables	
MB_MERGER_TRANSFER	1 if the firm transfers its main banks because of the merger of the ex-ante main bank, 0 otherwise
MB_DISAPPEAR_TRANSFER	1 if the firm transfers its main banks because the ex-ante main bank (including only city bank) unilaterally ceases to provide loans to the firm, 0 otherwise

Note: The unit of short-term, long-term, and total borrowing are thousand yen.

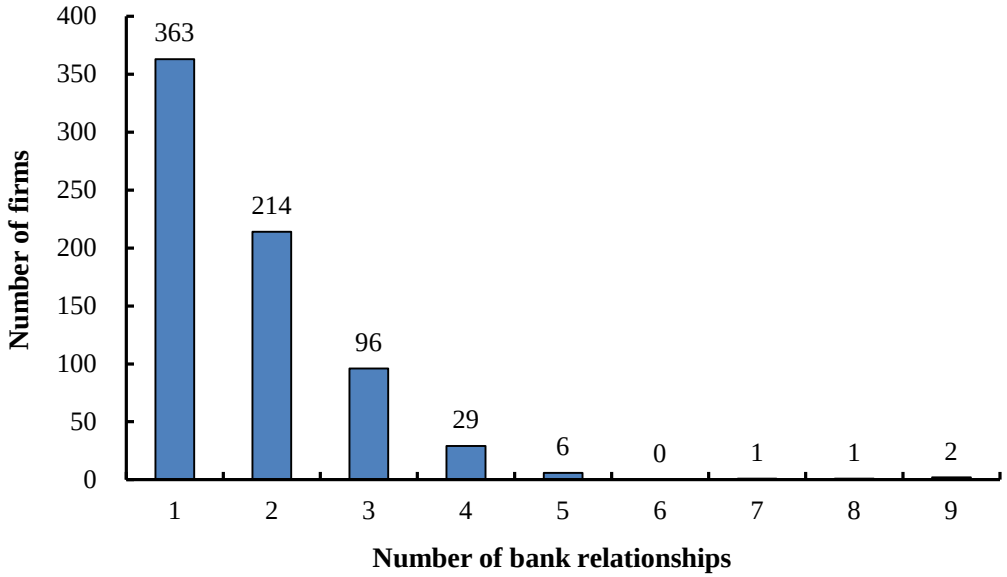
LnSHORT_BANKS, LnLONG_BANKS, and LnTOTAL_BANKS. These variables are borrowings per bank, specifically representing the log of short-term, long-term, and total borrowings per the number of bank relationships for a firm, respectively. BANKS is our key explanatory variable and shows the number of bank relationships for a firm, and Fig. 4.1 shows their distribution. In this chapter, we also construct a dummy variable, MULTIPLE_BANK, which equals one if a firm transacts with multiple banks.

Table 4.2 Descriptive statistics

Variable	N	Mean	Median	S.D.	Min.	Max.
Dependent variables						
LnSHORT_BANKS	712	-1.697	-9.210	8.910	-10.820	15.895
LnLONG_BANKS	712	-0.896	-9.210	9.244	-11.408	14.247
LnTOTAL_BANKS	712	3.445	7.954	8.466	-10.820	15.895
Number of bank relationships						
BANKS	712	1.767	1.000	1.027	1.000	9.000
MULTIPLE_BANKS	712	0.490	0.000	0.500	0.000	1.000
Firm characteristics						
EMPLOYEES	712	10.218	5.000	20.632	0.000	250.000
HIGHRELATION	712	0.383	0.000	0.487	0.000	1.000
MANAGER_AGE	712	46.407	46.048	10.653	21.950	79.058
MALE	712	0.942	1.000	0.233	0.000	1.000
OFFICES	710	0.530	0.000	1.442	0.000	21.000
SCORE	710	45.099	46.000	5.269	16.000	65.000
Firm financial information						
CASH	712	20.814	6.198	89.122	0.000	2,037.392
ACCOUNTS_RECEIVABLE	712	24.647	3.103	95.668	0.000	1,758.214
TOTAL_ASSETS	712	148.024	29.298	694.515	0.015	11,712.860
ACCOUNTS_PAYABLE	712	18.146	0.000	63.847	0.000	855.924
LnSHORT_BORROWING	712	-1.259	-9.210	8.913	-9.210	15.895
LnLONG_BORROWING	712	-0.457	-9.210	9.353	-9.210	15.356
TOTAL_LIABILITIES	712	131.403	23.251	613.270	0.002	8,817.754
CAPITAL_ADEQUACY_RATIO	712	-43.864	17.002	1,664.294	-44,366.670	99.980
ROA	712	-73.185	0.579	1,665.656	-44,426.670	57.826
CAPITAL	712	7.856	5.000	8.083	-18.912	51.000
Prefecture characteristics						
HHI	712	0.111	0.102	0.069	0.035	0.322
BANKS_RATIO	712	0.919	0.916	0.380	0.388	1.901
GPP	712	30,300,000.000	17,800,000.000	33,400,000.000	2,040,349.000	102,000,000.000
FIRMS	712	164,173.600	86,933.000	189,256.300	9,416.000	587,825.000
GROWTH_RATE	712	1.155	1.308	2.747	-9.149	8.675
Instrumental variables						
MB_MERGER_TRANSFER	712	0.001	0.000	0.037	0.000	1.000
MB_DISAPPEAR_TRANSFER	712	0.003	0.000	0.053	0.000	1.000

Other explanatory variables are as follows. First, we employ the following firm characteristics' variables: the number of employees (EMPLOYEES), a dummy indicating whether a firm has a strong relationship with its main bank (HIGHRELATION), the age of managers (MANAGER_AGE), a dummy indicating whether a manager of a firm is male (MALE), the number of offices (OFFICES), and the normalized credit score from TSR (SCORE). These variables are taken from the TSR Enterprise Information File. It should be noted that HIGHRELATION is based on Ogura (2007), and this variable is included to control for the strength of firm–main bank relationships. This variable takes a value of one if a firm is classified into a

Fig. 4.1 Distribution of bank relationships



business type that has many opportunities to receive advice from its main bank.[4]

Second, we also use the following firm financial information variables: the cash and cash in bank (CASH), the accounts receivable (ACCOUNTS_RECEIVABLE), the total assets (TOTAL_ASSETS), the accounts payable (ACCOUNTS_PAYABLE), the log of accrued expenses (LnACCRUED_EXPENSES), the log of short-term borrowing (LnSHORT_BORROWING), the log of long-term borrowing (LnLONG_BORROWING), the total liabilities (TOTAL_LIABILITIES), the capital adequacy ratio (CAPITAL_ADEQUACY_RATIO), the return on assets (ROA), and the capital (CAPITAL). These variables are from the TSR Stand-Alone Financial Information File. In this chapter, the variables that we take logarithm are replaced with 0.0001 if they are zero before taking the logarithm.

Finally, the following are aggregate data for each prefecture: the Herfindahl index of the number of financial institutions (HHI), the ratio of the number of financial institutions to the number of ordinary corporations (BANKS_RATIO), the real gross

[4] As aforementioned, this business type includes wholesale, real estate, accommodation, some service industries (e.g., food and beverage), manufacturing (other than wooden products), chemical products, and electric machinery and appliances. This variable is also a substitute for a dummy variable for industry.

prefectural product (GPP), the number of ordinary corporations (FIRMS), and the growth rate of the real gross prefectural product (GROWTH_RATE). HHI is taken from *Nihon Kinyu Meikan*. BANKS_RATIO is taken from *Nihon Kinyu Meikan* and the Number of Prefectural Sorted Ordinary Corporation. GPP and GROWTH_RATE are taken from the Report on Prefectural Accounts. FIRMS is taken from the Number of Prefectural Sorted Ordinary Corporation. Dummy variables for accounting year and the type of main bank are also included in the regressions.[5]

4.4.3. Empirical approaches

Using data set and variables just described, we examine the effect of the number of bank relationships on bank lending to new firms. In this chapter, we conduct an ordinary least squares (OLS) regression and the 2SLS regression of the form:

$$\begin{aligned} &\text{BORROWING}_i \\ &= \beta_0 + \beta_1 \text{BANKS}_i + \beta_2 FIRM_i + \beta_3 FIRM\_FINANCE_i \\ &\quad + \beta_4 PREFECTURE_i + \varepsilon_i \ , \end{aligned} \tag{4.1}$$

where BORROWING_i are dependent variables that represent borrowing per bank of firm i; specifically, LnSHORT_BANKS, LnLONG_BANKS, and LnTOTAL_BANKS fall under BORROWING_i. BANKS_i is the number of bank relationships for firm i. In the OLS regression, we regard this variable as endogenous. In contrast, in the 2SLS regression, we employ the variables MB_MERGER_TRANSFER and/or MB_DISAPPEAR_TRANSFER as instrumental variables for this endogenous variable. $FIRM_i$ and $FIRM\_FINANCE_i$ show the characteristics of firm i: the former includes basic information and the latter includes financial information on the firm. $PREFECTURE_i$ represents the characteristics of

[5] In this chapter, we regard the largest lending bank for firms as their main banks.

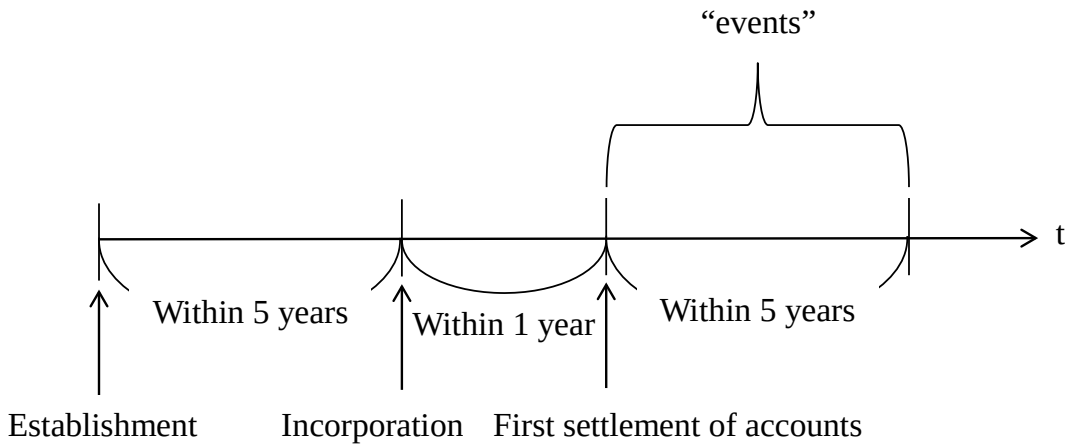
the prefecture in which firm i is located. ε_i is a mean zero error term that encompasses unobservable factors. In this regression, we use cluster-robust standard errors with respect to firms.

Here, we explain the instrumental variables. As aforementioned, the main reason behind existing studies not employing bank lending as a measure of the availability of credit is the identification problem. In other words, bank lending is simultaneously determined by credit supply and credit demand. We cannot grasp how the number of bank relationships affects lending activities by financial institutions without overcoming this identification problem. To deal with this problem, we employ two types of instrumental variables, that is, MB_MERGER_TRANSFER and MB_DISAPPEAR_TRANSFER.

MB_MERGER_TRANSFER is a dummy variable that equals one if a firm transfers its main bank within five years from the first settlement of accounts due to the merger of the ex-ante main bank. In this case, the ex-post main bank is one of the financial institutions with which a firm transacts at the first settlement of accounts. The merger of main banks in the future is an exogenous event for firms. Moreover, the transfer due to the merger of main banks is associated with firms' present number of bank relationships because many bank relationships make it easier for firms to transfer their main banks. Therefore, MB_MERGER_TRANSFER is likely to satisfy the conditions of instrumental variables, that is, instrument exogeneity and instrument relevance.

Next, we describe the other instrumental variable MB_DISAPPEAR_TRANSFER. This dummy variable equals one if a firm transfers its main bank within five years from the first settlement of accounts because the ex-ante main bank unilaterally ceases to provide loans to the firm. Unfortunately, we do not have information on whether a bank terminates financing for its own reasons. Hence, we assume that the ex-ante main bank unilaterally stops lending when it disappears from bank name list of the firm. In addition, we focus on the case where ex-ante main banks are city banks because city banks often unilaterally discontinue financing to small firms, but other financial

Fig. 4.2 Timeline of establishment, incorporation, first settlement of accounts, and "events"



institutions do not do so. In the context of city banks, the disappearance of the ex-ante main bank from the bank name list is usually an exogenous event for such firms.

Fig. 4.2 shows the timeline of establishment, incorporation, first settlement of accounts, and the events. The events fall under the variables MB_MB_MERGER_TRANSFER or MB_DISAPPEAR_TRANSFER.[6]

4.5. Baseline estimations

We start from the baseline estimation. Table 4.3 reports the results of the OLS regression whose dependent variables are BANKS (columns 1–3) and MULTIPLE_BANKS (columns 4–6). As for the variable of interest, the coefficients on BANKS and MULTIPLE_BANKS are statistically insignificant in columns 1 and 4. Thus, in this regression, we do not find supportive evidence that the number of bank relationships affects the log of short-term borrowing. This result is inconsistent with

[6] In order to avoid confusion on the timeline shown in Fig. 4.2 and simplify discussions, we do not include an explanatory variable indicating the time interval between establishment and first settlement of accounts. However, the results in this chapter are not driven by the variable indicating the time interval (not reported).

Hypothesis 4.1. In contrast, in columns 2 and 5, the coefficients on BANKS and MULTIPLE_BANKS are positive and significant, suggesting that an increase in the number of bank relationships increases the log of long-term borrowing; it also suggests that the start of multiple bank relationships sharply increases long-term lending. This is consistent with Hypotheses 4.2 and 4.3. Moreover, the coefficient on BANKS is positive and significant in column 3, implying that an increase in the number of bank relationships increases total borrowing. Furthermore, this result suggests that the increase in total borrowing is through an increase in long-term borrowing because total borrowing comprises short-term and long-term borrowing. In column 6, in contrast, the coefficient on MULTIPLE_BANKS is not statistically significant. This result implies that the number of bank relationships indeed increases the log of total borrowing, but the difference between a single bank relationship and multiple bank relationships is not important in total borrowing.

Among other variables, the coefficients on EMPLOYEES are positive and significant except for columns 1 and 4, suggesting that firms with a large number of employees obtain longer-term and higher total loans. The coefficients on SCORE are significantly negative in columns 1–6. This result seems to indicate that firms with high stability are less likely to rely on external funds, but it can also be interpreted that borrowing per bank is negatively associated with credit rating of firms only because firms with less borrowing get good evaluations. The coefficients on TOTAL_LIABILITIES are positive and significant other than in columns 2 and 5. However, this result may not mean that firms with more total liabilities can obtain more loans, but that total liabilities increase as a result of an increase in borrowing. CAPITAL_ADEQUACY_RATIO has significant negative coefficients in columns 1–6, suggesting that firms with less own capital are more likely to rely on bank loans; alternatively, this negative correlation may be owing to obtaining many loans. The coefficients on ROA are positive and significant in columns 1–6, indicating that firms with good business performance can receive more funds. This result is consistent with

Table 4.3 OLS regression

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables:	LnSHORT_ BANKS	LnLONG_ BANKS	LnTOTAL_ BANKS	LnSHORT_ BANKS	LnLONG_ BANKS	LnTOTAL_ BANKS
Number of bank relationships						
BANKS	0.024	1.438***	0.564**			
	(0.366)	(0.382)	(0.278)			
MULTIPLE_BANKS				-1.035	1.935***	0.441
				(0.693)	(0.687)	(0.631)
Firm characteristics						
EMPLOYEES	0.033	0.052***	0.049***	0.036	0.051***	0.050***
	(0.027)	(0.019)	(0.015)	(0.027)	(0.018)	(0.015)
HIGHRELATION	-0.281	-0.792	-0.455	-0.196	-0.749	-0.415
	(0.708)	(0.710)	(0.668)	(0.707)	(0.718)	(0.669)
MANAGER_AGE	0.044	0.006	0.045	0.044	0.011	0.047
	(0.033)	(0.034)	(0.030)	(0.033)	(0.034)	(0.030)
MALE	-0.625	-0.368	-1.053	-0.721	-0.625	-1.186
	(1.440)	(1.544)	(1.277)	(1.446)	(1.523)	(1.267)
OFFICES	-0.402	-0.261	-0.374	-0.384	-0.231	-0.358
	(0.268)	(0.293)	(0.259)	(0.269)	(0.303)	(0.263)
SCORE	-0.148**	-0.231***	-0.175***	-0.143*	-0.225***	-0.172***
	(0.074)	(0.067)	(0.063)	(0.073)	(0.068)	(0.063)
Firm financial information						
CASH	-0.000	-0.005	-0.001	-0.000	-0.006	-0.001
	(0.007)	(0.006)	(0.006)	(0.007)	(0.005)	(0.006)
ACCOUNTS_RECEIVABLE	-0.003	-0.013*	-0.005	-0.003	-0.015**	-0.006
	(0.007)	(0.008)	(0.006)	(0.007)	(0.007)	(0.006)
TOTAL_ASSETS	-0.005*	-0.002	-0.004	-0.005*	-0.002	-0.004
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)
ACCOUNTS_PAYABLE	-0.007	0.002	-0.013	-0.007	0.005	-0.012
	(0.009)	(0.008)	(0.009)	(0.009)	(0.008)	(0.009)
LnSHORT_BORROWING		-0.068*			-0.060	
		(0.039)			(0.039)	
LnLONG_BORROWING	-0.071*			-0.061		
	(0.039)			(0.039)		
TOTAL_LIABILITIES	0.009**	0.004	0.008**	0.009**	0.005	0.008**
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
CAPITAL_ADEQUACY_RATIO	-0.024*	-0.068***	-0.053***	-0.025*	-0.070***	-0.055***
	(0.013)	(0.015)	(0.016)	(0.013)	(0.015)	(0.016)
ROA	0.024*	0.068***	0.054***	0.025**	0.070***	0.055***
	(0.013)	(0.015)	(0.016)	(0.013)	(0.015)	(0.016)
CAPITAL	-0.092*	0.043	-0.043	-0.090*	0.051	-0.039
	(0.048)	(0.051)	(0.050)	(0.048)	(0.050)	(0.050)
Prefecture characteristics						
HHI	-0.303	6.796	-3.616	-0.471	4.924	-4.382
	(8.243)	(8.065)	(7.344)	(8.197)	(8.050)	(7.325)
BANKS_RATIO	-4.415***	-1.743	-3.507**	-4.465***	-1.732	-3.536**
	(1.540)	(1.545)	(1.510)	(1.545)	(1.553)	(1.512)
GPP	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FIRMS	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GROWTH_RATE	0.079	-0.133	0.005	0.082	-0.117	0.013
	(0.187)	(0.181)	(0.168)	(0.189)	(0.185)	(0.169)
Constant	0.464	21.206***	20.514***	1.398	24.089***	21.984***
	(5.358)	(5.070)	(4.349)	(5.238)	(4.925)	(4.319)
Accounting year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Dummies for main bank type	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.042	0.119	0.105	0.045	0.107	0.102
Number of observations	708	708	708	708	708	708

Note: The upper rows are coefficients and the lower rows are heteroscedasticity-robust standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

economic theory. BANKS_RATIO has significant negative coefficients other than in columns 2 and 5, which is consistent with previous studies on bank competition arguing that bank competition reduces bank lending (e.g., Petersen and Rajan 1995, Beck et al. 2004, Hauswald and Marquez 2006, Ogura 2012).

In sum, the results in this section are consistent with Hypothesis 4.2, while being inconsistent with Hypotheses 4.1 and 4.3.

4.6. Robustness checks

4.6.1. Single instrumental variable

To confirm the robustness of the baseline estimation results, we first conduct 2SLS estimation using only MB_MERGER_TRANSFER as an instrumental variable. This variable is almost exogenous for firms. In this regression, borrowing for firms is almost equivalent to lending to firms because MB_MERGER_TRANSFER is not driven by firms' demand for credit. Table 4.4 reports the results of the first-stage regression whose dependent variables are BANKS (columns 1–3) and MULTIPLE_BANKS (columns 4–6). The structure of explanatory variables in Table 4.4 is the same as in Table 4.3. As for the variable of interest, the coefficients on MB_MERGER_TRANSFER are positive and statistically significant at the 1% level in columns 1–6. This result means that MB_MERGER_TRANSFER satisfies instrument relevance in both cases where dependent variables are BANKS and MULTIPLE_BANKS.

Table 4.5 reports the results of the second-stage regression whose dependent variables are LnSHORT_BANKS (columns 1 and 4), LnLONG_BANKS (columns 2 and 5), and LnTOTAL_BANKS (columns 3 and 6). Columns 1–3 report the regression results whose key explanatory variable is BANKS, while columns 4–6 report the regression results whose key variable of interest is MULTIPLE_BANKS.

Table 4.4 2SLS regression (single IV, first-stage regression)

	Dependent variable: BANKS			Dependent variable: MULTIPLE_BANKS		
Instrumental variable: MB_MERGER_TRANSFER	(1)	(2)	(3)	(4)	(5)	(6)
Firm characteristics						
EMPLOYEES	0.003	0.005	0.005	0.003***	0.004***	0.004***
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
HIGHRELATION	0.144*	0.134	0.133	0.080**	0.076*	0.076*
	(0.082)	(0.084)	(0.084)	(0.040)	(0.040)	(0.040)
MANAGER_AGE	0.004	0.004	0.004	-0.000	-0.000	-0.000
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
MALE	-0.291	-0.309	-0.312	-0.087	-0.095	-0.095
	(0.201)	(0.198)	(0.199)	(0.082)	(0.080)	(0.080)
OFFICES	0.043	0.040	0.039	0.016	0.015	0.015
	(0.037)	(0.038)	(0.039)	(0.016)	(0.016)	(0.016)
SCORE	0.011	0.007	0.006	0.005	0.003	0.003
	(0.007)	(0.007)	(0.007)	(0.004)	(0.004)	(0.004)
Firm financial information						
CASH	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
ACCOUNTS_RECEIVABLE	-0.002	-0.002	-0.002	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
TOTAL_ASSETS	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
ACCOUNTS_PAYABLE	0.002	0.002	0.002	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
LnSHORT_BORROWING		0.004			-0.001	
		(0.005)			(0.002)	
LnLONG_BORROWING	0.022***			0.008***		
	(0.005)			(0.002)		
TOTAL_LIABILITIES	0.000	0.000	0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
CAPITAL_ADEQUACY_RATIO	-0.002*	-0.003***	-0.003***	-0.001*	-0.001***	-0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ROA	0.002*	0.003***	0.003***	0.001*	0.001***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CAPITAL	0.007	0.009*	0.008	0.002	0.003	0.003
	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Prefecture characteristics						
HHI	-1.464*	-1.350	-1.356	-0.098	-0.058	-0.057
	(0.873)	(0.887)	(0.886)	(0.442)	(0.450)	(0.450)
BANKS_RATIO	-0.086	-0.108	-0.127	-0.057	-0.077	-0.073
	(0.148)	(0.151)	(0.148)	(0.089)	(0.090)	(0.089)
GPP	-0.000*	-0.000*	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FIRMS	0.000*	0.000*	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GROWTH_RATE	0.016	0.012	0.013	0.002	0.001	0.001
	(0.023)	(0.023)	(0.023)	(0.010)	(0.010)	(0.010)
Instrumental variables						
MB_MERGER_TRANSFER	1.154***	1.400***	1.384***	0.527***	0.611***	0.615***
	(0.209)	(0.188)	(0.191)	(0.085)	(0.084)	(0.083)
Constant	2.851***	3.463***	3.463***	0.845***	1.078***	1.078***
	(0.589)	(0.564)	(0.563)	(0.289)	(0.279)	(0.279)
Accounting year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Dummies for main bank type	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.147	0.111	0.111	0.072	0.050	0.051
Number of observations	708	708	708	708	708	708

Note: The upper rows are coefficients and the lower rows are heteroscedasticity-robust standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

Table 4.5 2SLS regression (single IV, second-stage regression)

	Dependent variables:					
	(1)	(2)	(3)	(4)	(5)	(6)
Instrumental variable: MB_MERGER_TRANSFER	LnSHORT_ BANKS	LnLONG_ BANKS	LnTOTAL_ BANKS	LnSHORT_ BANKS	LnLONG_ BANKS	LnTOTAL_ BANKS
Number of bank relationships						
BANKS	-3.049**	6.736***	5.400***			
	(1.461)	(1.274)	(1.147)			
MULTIPLE_BANKS				-6.676**	15.426***	12.159***
				(2.984)	(2.976)	(2.695)
Firm characteristics						
EMPLOYEES	0.043	0.029	0.027	0.054*	-0.000	0.006
	(0.028)	(0.028)	(0.019)	(0.028)	(0.025)	(0.018)
HIGHRELATION	0.153	-1.483*	-1.082	0.250	-1.752**	-1.289
	(0.730)	(0.785)	(0.759)	(0.723)	(0.849)	(0.801)
MANAGER_AGE	0.055	-0.014	0.027	0.043	0.012	0.049
	(0.034)	(0.038)	(0.034)	(0.034)	(0.043)	(0.038)
MALE	-1.514	1.255	0.443	-1.206	0.647	-0.089
	(1.617)	(2.041)	(1.681)	(1.533)	(1.988)	(1.528)
OFFICES	-0.269	-0.481	-0.566**	-0.289	-0.433	-0.538*
	(0.311)	(0.326)	(0.288)	(0.289)	(0.359)	(0.314)
SCORE	-0.114	-0.269***	-0.207***	-0.117	-0.262***	-0.205***
	(0.077)	(0.076)	(0.071)	(0.075)	(0.088)	(0.079)
Firm financial information						
CASH	-0.001	-0.003	0.001	0.000	-0.006	-0.001
	(0.008)	(0.010)	(0.008)	(0.007)	(0.007)	(0.006)
ACCOUNTS_RECEIVABLE	-0.008	-0.003	0.004	-0.004	-0.013	-0.004
	(0.008)	(0.011)	(0.010)	(0.007)	(0.008)	(0.008)
TOTAL_ASSETS	-0.006	-0.001	-0.003	-0.005	-0.002	-0.005
	(0.004)	(0.005)	(0.005)	(0.003)	(0.005)	(0.004)
ACCOUNTS_PAYABLE	-0.000	-0.011	-0.025*	-0.005	0.001	-0.015
	(0.015)	(0.015)	(0.013)	(0.010)	(0.009)	(0.010)
LnSHORT_BORROWING		-0.091**			-0.046	
		(0.043)			(0.047)	
LnLONG_BORROWING	-0.002			-0.013		
	(0.059)			(0.052)		
TOTAL_LIABILITIES	0.010**	0.002	0.006	0.008**	0.006	0.009*
	(0.005)	(0.007)	(0.006)	(0.004)	(0.006)	(0.005)
CAPITAL_ADEQUACY_RATIO	-0.029**	-0.052***	-0.038**	-0.029**	-0.050***	-0.037**
	(0.013)	(0.014)	(0.015)	(0.013)	(0.015)	(0.016)
ROA	0.029**	0.052***	0.038**	0.030**	0.050***	0.038**
	(0.013)	(0.014)	(0.015)	(0.013)	(0.015)	(0.016)
CAPITAL	-0.071	-0.004	-0.083	-0.078	0.015	-0.071
	(0.052)	(0.061)	(0.058)	(0.050)	(0.063)	(0.062)
Prefecture characteristics						
HHI	-4.988	14.335	3.290	-1.180	6.140	-3.340
	(9.069)	(9.744)	(8.924)	(8.436)	(9.688)	(8.846)
BANKS_RATIO	-4.606***	-1.318	-3.028*	-4.727***	-0.853	-2.826*
	(1.524)	(1.644)	(1.559)	(1.537)	(1.821)	(1.688)
GPP	-0.000	0.000	0.000*	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FIRMS	0.000	-0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GROWTH_RATE	0.131	-0.207	-0.064	0.097	-0.141	-0.007
	(0.219)	(0.221)	(0.198)	(0.205)	(0.240)	(0.204)
Constant	9.161	2.954	3.856	6.109	9.658	9.449
	(6.056)	(7.274)	(6.231)	(5.483)	(7.019)	(5.897)
Accounting year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Dummies for main bank type	Yes	Yes	Yes	Yes	Yes	Yes
Wald chi-squared	737.510	1991.410	1070.630	759.120	1652.040	960.510
Number of observations	708	708	708	708	708	708

Note: The upper rows are coefficients and the lower rows are heteroscedasticity-robust standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

In column 1, the coefficient on BANKS is significantly negative at the 5% level, meaning that an increase in the number of bank relationships reduces the log of short-term lending per bank. This result is consistent with Hypothesis 4.1. In contrast, an increase in the number of bank relationships increases the log of long-term and total borrowing per bank (Table 4.5, columns 2 and 3), which is consistent with Hypothesis 4.2. This result can be interpreted in at least three different ways. First, the financial institutions that have entered late in the scene free ride on the efforts of antecedent lending financial institutions for producing information. Second, the amount of lending by these late entrants is larger than their predecessors'. Finally, the late entrants emphasize the screening already performed by the precedent financial institutions.

With regard to columns 4–6, the coefficients on MULTIPLE_BANKS have the same signs as columns 1–3 and are statistically different from zero at the 5% or 1% level. Furthermore, in Table 4.5, the magnitude of the coefficients on MULTIPLE_BANKS is more than twice as large as the coefficients on BANKS. This result suggests that the most significant difference in the impact of the number of bank relationships on bank lending is the difference between a single bank relationship and multiple bank relationships. In other words, once a firm acquires a good reputation in the lending market through transaction with the first lending financial institution, the firm can obtain longer-term and higher total loans.[7]

Turning to other variables, the results except for the coefficients on EMPLOYEES are generally similar to those in the OLS regression; in other words, the coefficients on SCORE, CAPITAL_ADEQUACY_RATIO, ROA, and BANKS_RATIO have the same signs and their significance levels are almost the same as in Table 4.3.

Although we cannot perform a test of overidentifying restrictions, as aforementioned, instrument exogeneity is likely to be satisfied because the event fallen under MB_MERGER_TRANSFER is an unpredictable future event for firms. MB_MERGER_TRANSFER tends not to be associated with the credit demand by

[7] This mechanism is also close to Diamond (1989).

firms. Furthermore, to reduce the effects of outliers, we conduct the same regression as in Table 4.5 after excluding the firms whose number of bank relationships exceeds five, and obtain similar results (not reported). Thus, an increase in the number of bank relationships increases total lending to new firms, and this increase may be through the increase in long-term lending.

On balance, the results in this subsection support Hypotheses 4.1–4.3.

4.6.2. Multiple instrumental variables

Next, we conduct 2SLS estimation employing MB_MERGER_TRANSFER and MB_DISAPPEAR_TRANSFER as instrumental variables. Compared to the single instrumental variable regression in Table 4.5, in this multiple instrumental variables regression, we cannot completely deny the possibility that MB_DISAPPEAR_TRANSFER is endogenous for credit demands by firms. However, from a common sense perspective, this instrumental variable is unlikely to be endogenous for the demand factor with high validity. Hence, similar to the regression in Table 4.5, borrowing for firms in this case also equals lending to firms.

Tables 4.6 and 4.7 report the results of the first-stage and second-stage regressions, respectively. The structures of Tables 4.6 and 4.7 are the same as Tables 4.4 and 4.5 except for the inclusion of the instrumental variable MB_DISAPPEAR_TRANSFER.

In the first-stage regression, as in Table 4.4, the coefficients on MB_MERGER_TRANSFER are positive and statistically significant at the 1% level in all columns. Thus, this variable meets the conditions of instrumental variables. In addition, although the coefficient on MB_DISAPPEAR_TRANSFER is insignificant in column 2, the coefficients are significant in other columns. Moreover, the t-value of the coefficient in column 2 is 1.524 (not reported). Hence, MB_DISAPPEAR_TRANSFER also almost meets the conditions of instrumental variables.

Table 4.6 2SLS regression (multiple IVs, first-stage regression)

	Dependent variable: BANKS			Dependent variable: MULTIPLE_BANKS		
Instrumental variables: MB_MERGER_TRANSFER MB_DISAPPEAR_TRANSFER	(1)	(2)	(3)	(4)	(5)	(6)
Firm characteristics						
EMPLOYEES	0.003	0.005	0.005	0.003***	0.004***	0.004***
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
HIGHRELATION	0.146*	0.135	0.134	0.084**	0.079*	0.079*
	(0.082)	(0.084)	(0.084)	(0.040)	(0.041)	(0.041)
MANAGER_AGE	0.004	0.004	0.004	-0.000	0.000	-0.000
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
MALE	-0.292	-0.309	-0.312	-0.089	-0.097	-0.096
	(0.201)	(0.198)	(0.199)	(0.082)	(0.080)	(0.080)
OFFICES	0.043	0.041	0.039	0.017	0.015	0.016
	(0.037)	(0.038)	(0.039)	(0.016)	(0.016)	(0.016)
SCORE	0.011	0.007	0.006	0.004	0.002	0.002
	(0.007)	(0.007)	(0.007)	(0.004)	(0.004)	(0.004)
Firm financial information						
CASH	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
ACCOUNTS_RECEIVABLE	-0.002	-0.002	-0.002	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
TOTAL_ASSETS	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
ACCOUNTS_PAYABLE	0.002	0.002	0.002	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.000)	(0.000)	(0.000)
LnSHORT_BORROWING		0.004			-0.001	
		(0.005)			(0.002)	
LnLONG_BORROWING	0.022***			0.009***		
	(0.005)			(0.002)		
TOTAL_LIABILITIES	0.000	0.000	0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
CAPITAL_ADEQUACY_RATIO	-0.002*	-0.003***	-0.003***	-0.001	-0.001***	-0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ROA	0.002*	0.003***	0.003***	0.001	0.001***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
CAPITAL	0.007	0.009*	0.008	0.002	0.003	0.003
	(0.005)	(0.005)	(0.005)	(0.003)	(0.003)	(0.003)
Prefecture characteristics						
HHI	-1.459*	-1.347	-1.353	-0.090	-0.051	-0.049
	(0.873)	(0.888)	(0.887)	(0.443)	(0.451)	(0.450)
BANKS_RATIO	-0.091	-0.111	-0.130	-0.065	-0.085	-0.080
	(0.148)	(0.151)	(0.149)	(0.089)	(0.090)	(0.090)
GPP	-0.000*	-0.000*	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FIRMS	0.000*	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GROWTH_RATE	0.016	0.013	0.013	0.002	0.001	0.001
	(0.023)	(0.023)	(0.023)	(0.010)	(0.010)	(0.010)
Instrumental variables						
MB_MERGER_TRANSFER	1.160***	1.403***	1.388***	0.536***	0.621***	0.624***
	(0.209)	(0.188)	(0.191)	(0.085)	(0.084)	(0.083)
MB_DISAPPEAR_TRANSFER	0.381***	0.211	0.223*	0.607***	0.549***	0.546***
	(0.131)	(0.139)	(0.134)	(0.065)	(0.065)	(0.064)
Constant	2.856***	3.468***	3.467***	0.853***	1.089***	1.089***
	(0.590)	(0.564)	(0.563)	(0.289)	(0.278)	(0.278)
Accounting year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Dummies for main bank type	Yes	Yes	Yes	Yes	Yes	Yes
Adj R-squared	0.146	0.110	0.110	0.075	0.052	0.053
Number of observations	708	708	708	708	708	708

Note: The upper rows are coefficients and the lower rows are heteroscedasticity-robust standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

Table 4.7 2SLS regression (multiple IVs, second-stage regression)

	Dependent variables:					
	(1)	(2)	(3)	(4)	(5)	(6)
Instrumental variables: MB_MERGER_TRANSFER MB_DISAPPEAR_TRANSFER	LnSHORT_ BANKS	LnLONG_ BANKS	LnTOTAL_ BANKS	LnSHORT_ BANKS	LnLONG_ BANKS	LnTOTAL_ BANKS
Number of bank relationships						
BANKS	-1.588	4.966**	4.527***			
	(2.751)	(2.318)	(1.712)			
MULTIPLE_BANKS				0.511	-2.163	1.648
				(5.652)	(8.277)	(6.938)
Firm characteristics						
EMPLOYEES	0.038	0.037	0.031*	0.031	0.067*	0.045
	(0.028)	(0.026)	(0.018)	(0.032)	(0.036)	(0.030)
HIGHRELATION	-0.053	-1.252	-0.968	-0.318	-0.444	-0.505
	(0.775)	(0.773)	(0.747)	(0.805)	(0.941)	(0.834)
MANAGER_AGE	0.050	-0.007	0.030	0.044	0.011	0.047
	(0.034)	(0.036)	(0.033)	(0.033)	(0.034)	(0.029)
MALE	-1.091	0.713	0.173	-0.588	-1.012	-1.073
	(1.653)	(1.921)	(1.615)	(1.481)	(1.656)	(1.385)
OFFICES	-0.332	-0.407	-0.531*	-0.410	-0.170	-0.377
	(0.304)	(0.313)	(0.280)	(0.278)	(0.331)	(0.279)
SCORE	-0.130	-0.256***	-0.201***	-0.150*	-0.214***	-0.176***
	(0.080)	(0.072)	(0.069)	(0.078)	(0.072)	(0.065)
Firm financial information						
CASH	-0.001	-0.004	0.001	-0.000	-0.006	-0.001
	(0.007)	(0.008)	(0.007)	(0.007)	(0.005)	(0.005)
ACCOUNTS_RECEIVABLE	-0.006	-0.007	0.002	-0.003	-0.016**	-0.006
	(0.008)	(0.010)	(0.009)	(0.007)	(0.007)	(0.006)
TOTAL_ASSETS	-0.005	-0.001	-0.004	-0.005*	-0.002	-0.004
	(0.003)	(0.005)	(0.004)	(0.003)	(0.003)	(0.003)
ACCOUNTS_PAYABLE	-0.003	-0.007	-0.023*	-0.007	0.006	-0.012
	(0.014)	(0.013)	(0.012)	(0.009)	(0.009)	(0.009)
LnSHORT_BORROWING		-0.083**			-0.064	
		(0.040)			(0.040)	
LnLONG_BORROWING	-0.035			-0.075		
	(0.075)			(0.061)		
TOTAL_LIABILITIES	0.010**	0.003	0.006	0.009**	0.004	0.008**
	(0.004)	(0.006)	(0.005)	(0.004)	(0.004)	(0.004)
CAPITAL_ADEQUACY_RATIO	-0.026**	-0.057***	-0.041**	-0.023*	-0.076***	-0.053***
	(0.013)	(0.016)	(0.016)	(0.013)	(0.020)	(0.019)
ROA	0.026**	0.057***	0.041**	0.023*	0.076***	0.053***
	(0.013)	(0.016)	(0.016)	(0.013)	(0.020)	(0.019)
CAPITAL	-0.081	0.012	-0.076	-0.093*	0.062	-0.043
	(0.052)	(0.059)	(0.057)	(0.049)	(0.054)	(0.052)
Prefecture characteristics						
HHI	-2.761	11.816	2.044	-0.276	4.555	-4.274
	(9.458)	(9.446)	(8.736)	(8.096)	(8.166)	(7.206)
BANKS_RATIO	-4.515***	-1.460	-3.114**	-4.393***	-1.999	-3.463**
	(1.486)	(1.557)	(1.525)	(1.495)	(1.651)	(1.538)
GPP	-0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FIRMS	-0.000	-0.000	-0.000*	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GROWTH_RATE	0.106	-0.182	-0.052	0.078	-0.109	0.011
	(0.205)	(0.202)	(0.189)	(0.184)	(0.181)	(0.166)
Constant	5.027	9.052	6.861	0.107	28.473***	20.694**
	(8.922)	(9.516)	(7.472)	(6.821)	(9.931)	(8.562)
Accounting year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Dummies for main bank type	Yes	Yes	Yes	Yes	Yes	Yes
Wald chi-squared	786.630	1638.040	703.890	818.760	1469.760	742.040
Overidentifying restrictions test (p =)	0.504	0.140	0.438	0.336	0.133	0.220
Number of observations	708	708	708	708	708	708

Note: The upper rows are coefficients and the lower rows are heteroscedasticity-robust standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

Unlike the first-stage regression, the results in the second-stage regression of the multiple instrumental variables in Table 4.7 are different from those of the single instrumental variable in Table 4.5. In column 1, the coefficient on BANKS is indeed statistically insignificant, but has a negative sign. This result suggests that an increase in the number of bank relationships may reduce short-term lending to new firms because standard errors in the IV methods tend to be overestimated. From this viewpoint, this result is almost consistent with Hypothesis 4.1. In addition, similar to the results in Table 4.5, BANKS has significant positive coefficients in columns 2 and 3, meaning that an increase in the number of bank relationships increases long-term and total lending to such firms. On the other hand, the coefficients on MULTIPLE_BANKS are insignificant in columns 4–6, implying that the difference between a single bank relationship and multiple bank relationships is not important in bank lending.

The results of the estimated coefficients on the other explanatory variables are similar to those in Table 4.5; in other words, the coefficients on SCORE, TOTAL_LIABILITIES, CAPITAL_ADEQUACY_RATIO, ROA, and BANKS_RATIO have the same signs, and the magnitudes of these coefficients are close to those in Table 4.5.

The significant difference between the regressions using a single instrumental variable and multiple instrumental variables is whether it performs a test of overidentifying restrictions. As shown in Table 4.7, the Wald tests of exogeneity are not rejected at the 10% significance level in all columns, indicating that two instrumental variables, MB_MERGER_TRANSFER and MB_DISAPPEAR_TRANSFER, are less likely to be endogenous.

On balance, MB_MERGER_TRANSFER and MB_DISAPPEAR_TRANSFER satisfy the conditions of instrumental variables. Furthermore, as with the single instrumental variable regression in Table 4.5, we exclude the firms whose number of bank relationships exceeds five to reduce the effects of outliers. As a result, the

coefficient on BANKS is not statistically significant in column 2, but it is positive and statistically significant at the 5% level in column 3 (not reported).[8] Thus, an increase in the number of bank relationships increases total lending to new firms, and this increase in total lending seems to be through the increase in long-term lending.

To summarize, the results in this subsection are consistent with Hypothesis 4.2, while inconsistent with Hypotheses 4.1 and 4.3.[9]

4.7. Conclusion

Using a unique firm-level data set, we examine the effect of the number of bank relationships on bank lending to new firms. We find that an increase in the number of bank relationships increases total lending to such firms, and this increase in total lending seems to be through the increase in long-term lending. We also find that the increase in the number of bank relationships is likely to reduce short-term lending to such firms. However, we do not find strong evidence that the most significant difference in the effects of the number of bank relationships on bank lending is the difference between a single bank relationship and multiple bank relationships.

Our findings have important implications for firms. As mentioned earlier, the number of bank relationships significantly affects new firms from the standpoint of lending terms and conditions, performance, and bankruptcy risk. However, the effects differ depending on the situation. This study provides new standpoints for new firms when they choose the number of bank relationships. For instance, empirical studies on firm performance and bankruptcy generally show that many bank relationships are negatively associated with firm performance and responsible for increasing bankruptcy risks (e.g., Degryse and Ongena 2001, Castelli et al. 2012, Ogane 2016). In contrast,

[8] The t-value of the coefficient on BANKS in column 2 is 1.334. Therefore, the coefficient on BANKS in column 2 may be actually statistically significant also in the case of excluding outliers because the IV methods tend to overestimate standard errors.

[9] However, Hypothesis 4.1 may be supported because standard errors in the IV methods tend to be overestimated.

the findings in this chapter indicate that many bank relationships ease funding constraints for new firms. In sum, the findings in previous literature and in this chapter suggest that while firms that want to improve firm performance and reduce bankruptcy risks should establish a small number of bank relationships, firms that want to increase their credit availability should establish a larger number of bank relationships.

In addition, our findings cast new light on unresolved issues from previous literature. For example, Ogane (2016) does not show the detailed mechanism of why many bank relationships increase the risk of firm bankruptcy. However, the finding in this chapter provides one possible explanation for this: an increase in the number of bank relationships reduces short-term lending, and thus this reduction in short-term lending increases the risk of bankruptcy. This is only one example of the application of our findings. Therefore, further research on this topic is needed to reveal detailed mechanisms and other effects of the number of bank relationships on firms.

Chapter 5: Effects of Main Bank Switch on Small Business Bankruptcy

5.1. Introduction

The aim of this chapter is to examine whether the switching of firm–main bank relationships increases the probability of firm bankruptcy. For SMEs, firm–bank relationships are quite important because such firms largely depend on indirect finance. Thus, numerous studies in banking have examined how the continuation of firm–bank relationships affects lending terms and conditions (e.g., Petersen and Rajan 1994, Berger and Udell 1995, Cole 1998, Degryse and Cayseele 2000, Hernández-Cánovas and Martínez-Solano 2006). In this strand, some studies argue that relationship lending leads to a flexible supply of funds to firms in financial distress and serves as insurance against a temporary shortage of liquidity (e.g., Chemmanur and Fulghieri 1994, Berlin and Mester 1998). In addition, other studies suggest that banks play important roles in avoiding the bankruptcy of client firms (e.g., Mayer 1988, Hoshi et al. 1990, Grunert and Weber 2009, Shimizu 2012, Ogane 2016). Hence, based on these studies, the continuation of firm–bank relationships may improve business performance, and thus may reduce the bankruptcy of SMEs.

Because young SMEs are the most vulnerable and prone to bankruptcy among all firms, most firm bankruptcies occur when firms are young and small. For example, as repeatedly mentioned, the first five- and ten-year survival rates of startup companies in Japan are 41.8% and 26.1%, respectively.[1] This report indicates that most young firms exit during the early stages of the entrepreneurial process, and that the exit rate of startup companies gradually diminishes as they grow. In addition, some studies argue that entrepreneurial activity contributes to economic growth (e.g., Stel et al. 2005,

[1] As previously mentioned, these figures are based on the 2006 White Paper on Small and Medium Enterprises in Japan.

Wong et al. 2005). Hence, it is important to verify whether the termination of firm–bank relationships increases the bankruptcy of young SMEs. However, to the best of our knowledge, no study has empirically examined the impact of the switching of such relationships on the probability of firm bankruptcy.

Against this background, this chapter is the first to examine the effects of the switching of firm–bank relationships on the probability of firm bankruptcy, while focusing on firm–main bank relationships. In addition, we focus on young and unlisted SMEs because most firm bankruptcies occur during the early stages of the entrepreneurial process.[2] To deal with possible biases caused by omitted variables and/or reverse causality, we employ the propensity score matching estimation approach. Moreover, we divide the switching of firm–main bank relationships into "transfer" and "new transaction." The former is the case in which firms switch their main banks to other banks with which the firms have already transacted before the switching. On the other hand, the latter is the case where we cannot confirm that firms switch their main banks to other banks with which the firms have transacted before the switching.

The major findings of this chapter are as follows. We find that the switching of firm–main bank relationships increases the probability of firm bankruptcy. In addition, this probability is increased only when the switching is a "new transaction," as mentioned above. This result may be because the switching of such relationships worsens the financial conditions of client firms. We also find that the result holds only when the ex-post main banks are not descendants of their ex-ante main banks.

The contributions of this study are summarized as follows. First, we examine the effect of the termination of firm–main bank relationships on firm bankruptcy. Previous studies that investigated the effects of the continuation of firm–bank relationships on business performance could not reveal the above effect. Hence, this study contributes to future research on the effects of the continuation of such relationships on client firms. Second, we focus on young and unlisted SMEs as a sample. Gambini and

[2] The probability of bankruptcy per year among these firms is quite higher than that among other enterprises.

Zazzaro (2013), who may have been the only ones to use a sample of small firms to investigate the effect of long-lasting relationship lending on firm performance, do not reveal the effect of switching on the bankruptcy of client firms. Young and unlisted SMEs are faced with the most severe financial constraints among all enterprises because they generally do not have other sources of financing. Hence, revealing the effects on bankruptcy contributes to draw implications for supporting the survival of the firms. Finally, we divide the switching of firm–main bank relationships into "transfer" and "new transaction." The characteristics of these two types of switching are different, and it is therefore important to distinguish between them to grasp the effects in more detail. This division is not made by previous studies.

The remainder of the chapter is organized as follows. Section 5.2 reviews previous literature. Section 5.3 develops our empirical hypotheses. Section 5.4 provides our data set, definitions of the switching and bankruptcy, and the variables. Section 5.5 presents the empirical methodology and results. Section 5.6 concludes the chapter.

5.2. Literature review

Because the continuation of firm–main bank relationships is important, many studies have investigated the switching of firm–bank relationships. This chapter is closely related to the following three strands of literature.

First, we review the literature on the switching of firm–bank relationships and the establishment of new bank relationships. Ongena and Smith (2001) empirically examine the duration of firm–bank relationships using hazard models, and show that firms are more likely to switch their main banks with the increase in the duration of the relationships.[3] This result suggests that banking transactions are immune from the lock-in effect. In addition, Ioannidou and Ongena (2010) find that a bank offers a

[3] According to the theoretical models presented by Sharpe (1990) and Rajan (1992), close firm–bank relationships increase the cost of switching main banks.

lower interest rate to a firm when the firm establishes a new bank relationship. Furthermore, Gopalan et al. (2011) argue that small public firms that do not transact with larger banks are more likely to build new banking relationships.

Second, we review the literature on how firm–main bank relationships affect business performance, particularly in Japanese cases.[4] These studies mainly target large and listed companies and often regard firms that are members of corporate groups (*keiretsu*) as firms that have main banks.[5] Some studies argue that there is no evidence that firm–main bank relationships improve corporate performance. For example, Prowse (1992) shows that there is no significant difference in net profits between members of *keiretsu* and independent firms. In addition, Kang and Shivdasani (1999) argue that the operating profits of independent firms are larger than those of firms with group affiliations. Moreover, Weinstein and Yafeh (1998) do not find evidence that the existence of main bank relationships affects firm growth, but find that the existence of the relationships decreases firm profitability. Furthermore, Hanazaki and Horiuchi (2000) show that there is no evidence that stable firm–main bank relationships affect the firms' total factor productivity (TFP) in 1980 or before, but show that such relationships significantly reduce the TFP in the 1980s and in 1990. In contrast, Lichtenberg and Pushner (1994) show the opposite result (i.e., main bank relationships improve corporate performance). More specifically, Lichtenberg and Pushner (1994) examine the relationship between TFP and financial institution shareholding using the data of listed manufacturing firms, and find that equity ownership by financial institutions increases firm productivity.

Third, this chapter is closely related to the literature on how the switching or continuation of firm–main bank relationships affects firm performance. However, few studies have examined the effects of the continuation of such relationships on the

[4] The role of main banks in Japan is broad (Sheard 1994). Thus, in Japanese cases, the definition of "main bank" is different in each study.

[5] *Keiretsu* firms and their main banks have very close relationships (Hoshi et al. 1991, Wu and Yao 2012). For details of the *keiretsu*, see Miwa and Ramseyer (2002).

business performance of SMEs. Hori (2005) examines the effects of the Hokkaido Takushoku Bank (HTB) failure on the ex-post profitability of the bank's client firms, but does not find evidence that the bank's failure significantly affects the client firms' profitability. In addition, Gambini and Zazzaro (2013) investigate the correlation between long-lasting relationship lending and firm growth using a sample of Italian manufacturing firms, and find a negative correlation between them. Moreover, Tsuruta (2014) argues that ex-post firm performance improves after the switching of firm–main bank relationships when firms that have distressed main banks switch their main bank relationships. The above studies, except for Gambini and Zazzaro (2013), employ a sample of large and listed companies.[6]

5.3. Empirical hypotheses

In this chapter, we posit the following three hypotheses:

Hypothesis 5.1: The switching of firm–main bank relationships increases the probability of ex-post firm bankruptcy.

Hypothesis 5.2: In patterns of the switching, the effect of the transfer of firm–main bank relationships on the probability of ex-post firm bankruptcy is statistically insignificant, whereas the switching to a bank with which a firm has not transacted before the switching significantly increases the probability of ex-post firm bankruptcy.

Hypothesis 5.3: Hypothesis 5.1 is supported only when a firm switches its main bank relationships to another bank that is not a descendant of its ex-ante main bank.

[6] As previously mentioned, as far as we know, no study except for Gambini and Zazzaro (2013) conducts a direct empirical analysis on the effects of the continuation of firm–main bank relationships on the performance of small firms.

Hypotheses 5.1–5.3 are based on the “relationship lending hypothesis.” Previous literature on relationship lending shows that the continuation of firm–bank relationships benefits client firms. It predicts that the switching of firm–main bank relationships is detrimental for the firms. Hence, we expect that the switching of such relationships increases the probability of firm bankruptcy (Hypothesis 5.1).

In addition, the “relationship lending hypothesis” suggests that the transfer of firm–main bank relationships does not affect the probability of firm bankruptcy. The transfer of such relationships does not fall under the termination of firm–bank relationships because the firms have transacted with the ex-post main banks before switching. In contrast, in the case of switching to a bank with which a firm has not transacted before the switching, this switching means the termination of the relationship. Hence, we expect that switching, except for the transfer of relationships, increases the probability of firm bankruptcy (Hypothesis 5.2).

Furthermore, the continuation of firm–main bank relationships is not terminated when a firm switches its main bank relationship to another bank that is a descendant of its ex-ante main bank. As in the case of transfer, switching to a descendent bank does not fall under the termination of the relationship. Hence, we expect that Hypothesis 5.1 is supported only when a firm switches its main bank relationships to another bank that is not a descendant of its ex-ante main bank (Hypothesis 5.3).

Based on previous studies of relationship lending, there are several reasons why the switching leads to bankruptcy. First, the switching worsens the financial conditions of client firms. Specifically, reductions in loans from main banks are likely to significantly deteriorate business performance, and thus increase the probability of bankruptcy. Second, the switching reduces the support from main banks, non-financial support such as advice on management. Third, these two phenomena occur simultaneously, and thus the probability of bankruptcy increases.

5.4. Data, definitions, and variables

5.4.1. Data

We construct a unique firm-level data set from the following sources. First, we employ the firm-level database provided by the TSR. This data set comprises three types of files: the TSR Enterprise Information File, TSR Bankrupt Information File, and TSR Stand-Alone Financial Information File. Our original sample contains firms incorporated in Japan between April 2003 and June 2008 as unlisted companies whose startup capital is less than 50 million yen.[7] This data set consists of 887 continuing firms and 121 bankrupt firms. Moreover, this data set includes only the information at the first settlement of accounts. These 1,008 firms represent almost all firms that meet the above data extraction conditions in the TSR database. Thus, the bias associated with sample extraction is likely to be small.

In addition, we use the following aggregate data for each prefecture: *Nihon Kinyu Meikan* (directory of Japanese financial institutions), published by *Nihon Kinyu Tsushin Sha*; the Report on Prefectural Accounts, produced by the Cabinet Office; the Number of Prefectural Sorted Ordinary Corporation, published by the National Tax Agency; and Orbis, provided by Bureau van Dijk.

5.4.2. Switching of main bank relationships

Following widely accepted convention, we define a main bank as the financial institution at the head of the bank name list in the TSR Enterprise Information File.[8] In this file, financial institutions are generally arranged in descending order of the amount

[7] As mentioned earlier, the Annual Report of Bankrupt Enterprises (published by the Organization for Small & Medium Enterprises and Regional Innovation, Japan) reports that around 95% of bankrupt firms in Japan are firms with capital of less than 50 million yen.

[8] Previous studies focusing on SMEs generally define main banks as the banks at the head of firms' correspondent bank name lists, and, in these studies, such banks are often the largest lending banks for client firms.

of their loan. Hence, the main bank in this chapter is almost the same as the financial institution with the largest amount of lending of a firm's correspondent financial institutions. In addition, we judge the switching of firm–main bank relationships by checking whether we can confirm the switching at least once between the first settlement of accounts and five years later. We call the first settlement of accounts the "first term" and call the period five years later the "second term" for the sake of simplicity.[9] Moreover, in this chapter, we employ two types of definitions of the switching of firm–main bank relationships; one is narrow, and the other is broad.

The switching of main bank relationships in the narrow sense includes only the case in which a firm switches its main bank to another bank in a completely different group. Thus, this case completely eliminates the possibility that a firm's ex-post main bank is a descendant of its ex-ante main bank.

In contrast, the switching of main bank relationships in the broad sense includes almost all patterns of switching.[10] In this definition, we judge the switching only by whether the name of a firm's main bank is changed between the first and second terms. For this reason, this definition includes the case in which the name change results from the merger of the banks, and thus a main bank of a firm in the second term may be a descendant of its main bank in the first term.

As noted above, we divide the switching of firm–main bank relationships into the "transfer" and the "new transaction." These two types of switching are used as the variables TRANSFER and NEW_TRANSACTION, and the definitions of these variables and difference between the two are discussed in Section 5.4.4.

5.4.3. Firm bankruptcy

[9] Note that the data of bankrupt firms comprise the information on the first settlement term and the term immediately before bankruptcy because these firms went bankrupt within five years of the first settlement. Hence, in the case of bankrupt firms, we call the term immediately before bankruptcy the "second term."

[10] The number of switches in the broad sense is 135.

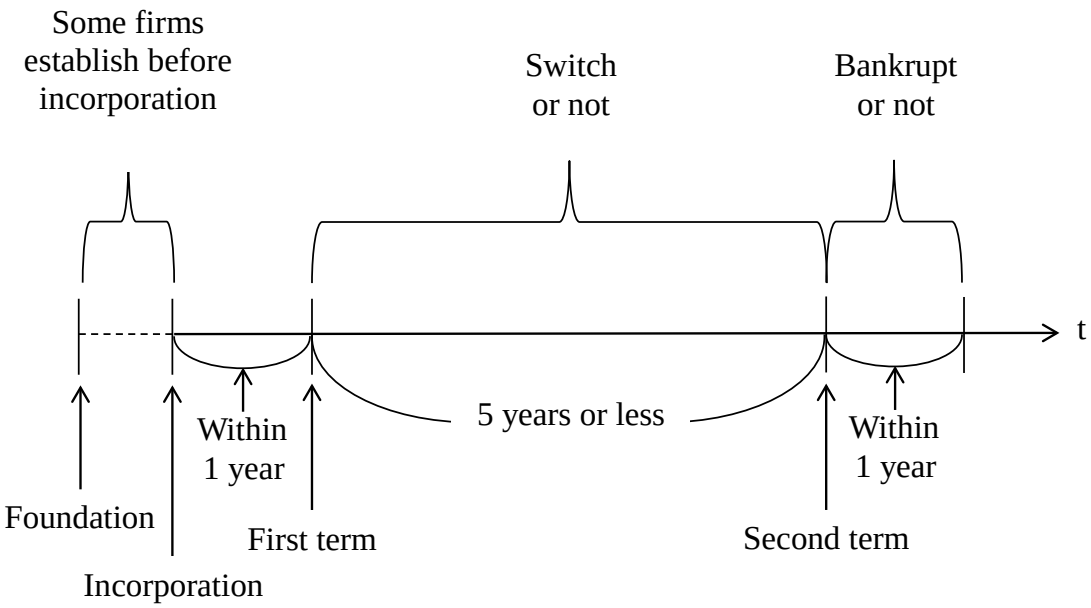
To examine the effects of the switching of firm–main bank relationships on the probability of firm bankruptcy, we focus on firm bankruptcy occurring within one year from the second term. Hence, the aim of this chapter is almost the same as investigating how the switching of firm–main bank relationships within the past five years affects the probability that a client firm will go bankrupt in the following year. The timeline of the switching of firm–main bank relationships and the bankruptcy of firms is shown in Fig. 5.1. The bankruptcy rate of the switching group is 3.3%, while that of the non-switching group is 1.5% (not reported). The differences between the two groups are statistically insignificant at the 10% level. It should also be noted that the bankruptcy rate of all the firms is 1.7%.[11]

5.4.4. Variables

Table 5.1 shows the variable definitions and Table 5.2 presents the descriptive statistics.[12] BANKRUPTCY is the dependent variable that is equal to one if a firm goes bankrupt within one year from the second term. SWITCH, TRANSFER, and NEW_TRANSACTION are our key explanatory variables. These variables are the dummies with respect to the switching of firm–main bank relationships. More specifically, SWITCH equals one if a firm switches its main bank between the first and second terms. TRANSFER and NEW_TRANSACTION are derived from SWITCH. TRANSFER means the switching of a main bank to another bank with which a firm has already transacted before switching. NEW_TRANSACTION means the switching of a main bank to another bank with which a firm does not transact in the first term.

[11] Because our sample is unique, the percentage of firm bankruptcy per year is smaller than usual.
[12] It is coincidental that the number of switching firms equals the number of bankrupt firms.

Fig. 5.1 Timeline of switching and bankruptcy



Other explanatory variables are as follows, and these are mainly based on Shumway (2001), Chava and Jarrow (2004), and Campbell et al. (2008).[13] First, we employ the following firm characteristic variables: the number of employees (EMPLOYEES), the number of correspondent financial institutions (BANKS), the age of firms (FIRM_AGE), the age of managers (MANAGER_AGE), the dummy indicating whether a manager of a firm is male (MALE), and the normalized credit score from TSR (SCORE). These variables are taken from the TSR Enterprise Information File.[14]

Second, we also use the following firm financial information variables: the total liquid assets (LIQUID_ASSETS), the quick assets (QUICK_ASSETS), the cash and cash in bank (CASH), the total assets (TOTAL_ASSETS), the total current liabilities (CURRENT_LIABILITIES), the total borrowing (BORROWING), the total liabilities (TOTAL_LIABILITIES), the capital adequacy ratio

[13] As the determining factors in the probability of firm bankruptcy, they control for firm size, liquidity, sales, profit, and so forth.

[14] The age of firms is the number of years from establishment. However, for firms whose establishment dates are unclear, we substitute the time from incorporation for the number of years from establishment.

(CAPITAL_ADEQUACY_RATIO), the return on assets (ROA), the return on equity (ROE), the capital (CAPITAL), the total accumulated profit (ACCUMULATED_PROFIT), the sales (SALES), and the profit (PROFIT). These variables are taken from the previously mentioned TSR Stand-Alone Financial Information File.

Table 5.1 Variable definitions

Variable	Definition
Dependent variable	
BANKRUPTCY	1 if the firm goes bankrupt from the second term to the next term, 0 otherwise
Main bank switch	
SWITCH	1 if the firm switches its main bank between the first and second terms, 0 otherwise
TRANSFER	1 if the firm transfers its main bank between the first and second terms, 0 otherwise
NEW_TRANSACTION	1 if the firm builds new banking relationships between the first and second terms, and switches its main bank to the bank between the two terms, 0 otherwise
Firm characteristics	
EMPLOYEES	Number of employees
BANKS	Number of correspondent financial institutions
FIRM_AGE	Age of firms
MANAGER_AGE	Age of managers
MALE	1 if the manager of the firm is male, 0 otherwise
SCORE	Normalized credit score from Tokyo Shoko Research (0-100)
Firm financial information	
LIQUID_ASSETS	Total liquid assets (billion yen)
QUICK_ASSETS	Quick assets (billion yen)
CASH	Cash and cash in bank (billion yen)
TOTAL_ASSETS	Total assets (billion yen)
CURRENT_LIABILITIES	Total current liabilities (billion yen)
BORROWING	Total borrowing (billion yen)
TOTAL_LIABILITIES	Total liabilities (billion yen)
CAPITAL_ADEQUACY_RATIO	Capital adequacy ratio: = (total assets - total liabilities) / total assets * 100 (%)
ROA	Return on assets: = current profit / total assets * 100
ROE	Return on equity: = current profit / total shareholders' equity * 100
CAPITAL	Capital (billion yen)
ACCUMULATED_PROFIT	Total accumulated profit (billion yen)
SALES	Sales (billion yen)
PROFIT	Profit (billion yen)
Prefecture characteristics	
HHI	Herfindahl index of the number of financial institutions
BANKS_RATIO	Ratio of the number of financial institutions to the number of ordinary corporations (%)
GPP	Real gross prefectural product (billion yen)
FIRMS	Number of ordinary corporations
GROWTH_RATE	Growth rate of the real gross prefectural product
STARTUP_RATE	Startup rate of small and unlisted enterprises (%)

Table 5.2 Descriptive statistics

	All						SWITCH = 1						SWITCH = 0					
	N	Mean	S.D.	Min.	Median	Max.	N	Mean	S.D.	Min.	Median	Max.	N	Mean	S.D.	Min.	Median	Max.
Dependent variable																		
BANKRUPTCY	1,008	0.017	0.129	0	0	1	121	0.033	0.180	0	0	1	887	0.015	0.120	0	0	1
Main bank switch																		
SWITCH	1,008	0.120	0.325	0	0	1	121	1.000	0.000	1	1	1	887	0.000	0.000	0	0	0
TRANSFER	1,008	0.046	0.209	0	0	1	121	0.380	0.487	0	0	1	887	0.000	0.000	0	0	0
NEW_TRANSACTION	1,008	0.073	0.261	0	0	1	121	0.612	0.489	0	1	1	887	0.000	0.000	0	0	0
Firm characteristics																		
EMPLOYEES	1,008	11.326	27.253	0	5	543	121	14.620	25.426	0	6	190	887	10.877	27.475	0	5	543
BANKS	1,008	1.844	1.121	1	2	9	121	2.264	1.395	1	2	9	887	1.787	1.066	1	1	9
FIRM_AGE	1,008	8.300	13.932	0	1	73	121	7.238	12.982	0	1	56	887	8.445	14.058	0	1	73
MANAGER_AGE	1,008	47.441	11.169	22	47	84	121	46.611	11.352	22	46	73	887	47.554	11.146	24	47	84
MALE	1,008	0.951	0.215	0	1	1	121	0.917	0.276	0	1	1	887	0.956	0.205	0	1	1
SCORE	1,004	45.838	5.331	16	46	66	121	47.413	4.993	34	47	60	883	45.622	5.342	16	46	66
Firm financial information																		
LIQUID_ASSETS	1,008	0.137	0.561	0.000	0.024	8.641	121	0.231	0.772	0.001	0.036	5.884	887	0.124	0.524	0.000	0.021	8.641
QUICK_ASSETS	1,008	0.078	0.255	0.000	0.018	4.423	121	0.111	0.326	0.000	0.025	2.736	887	0.073	0.244	0.000	0.016	4.423
CASH	1,008	0.030	0.123	0.000	0.006	2.328	121	0.052	0.203	0.000	0.009	2.037	887	0.027	0.107	0.000	0.006	2.328
TOTAL_ASSETS	1,008	0.201	0.832	0.000	0.030	11.713	121	0.285	0.993	0.001	0.049	8.502	887	0.190	0.808	0.000	0.028	11.713
CURRENT_LIABILITIES	1,008	0.120	0.503	0.000	0.016	8.624	121	0.172	0.499	0.000	0.026	3.773	887	0.113	0.503	0.000	0.014	8.624
BORROWING	1,008	0.085	0.492	0.000	0.005	8.000	121	0.130	0.694	0.000	0.007	6.953	887	0.079	0.458	0.000	0.005	8.000
TOTAL_LIABILITIES	1,008	0.173	0.684	0.000	0.025	8.818	121	0.246	0.896	0.000	0.039	8.464	887	0.163	0.650	0.000	0.023	8.818
CAPITAL_ADEQUACY_RATIO	1,008	-25.501	1,398.834	-44,366.670	15.555	99.980	121	22.404	29.083	-89.576	13.797	99.593	887	-32.036	1,491.139	-44,366.670	15.623	99.980
ROA	1,008	-52.495	1,400.011	-44,426.670	0.521	57.826	121	-2.914	20.879	-133.350	0.795	53.022	887	-59.259	1,492.404	-44,426.670	0.496	57.826
ROE	1,008	-12.026	898.585	-22,976.920	7.476	5,476.344	121	44.872	453.830	-1,691.103	10.661	4,645.455	887	-19.788	943.043	-22,976.920	6.919	5,476.344
CAPITAL	1,008	0.008	0.009	-0.019	0.005	0.072	121	0.010	0.010	0.000	0.009	0.051	887	0.008	0.009	-0.019	0.005	0.072
ACCUMULATED_PROFIT	1,008	0.000	0.105	-3.108	0.000	0.498	121	0.009	0.054	-0.089	0.000	0.498	887	-0.001	0.110	-3.108	0.000	0.424
SALES	1,008	0.269	0.767	0.000	0.073	14.543	121	0.416	0.946	0.000	0.111	6.320	887	0.249	0.738	0.000	0.069	14.543
PROFIT	1,007	0.002	0.027	-0.236	0.000	0.424	121	0.002	0.017	-0.089	0.000	0.089	886	0.002	0.028	-0.236	0.000	0.424
Prefecture characteristics																		
HHI	1,008	0.112	0.069	0.035	0.101	0.322	121	0.111	0.067	0.035	0.102	0.276	887	0.112	0.069	0.035	0.101	0.322
BANKS_RATIO	1,008	0.928	0.360	0.388	0.954	1.901	121	0.951	0.366	0.388	0.972	1.901	887	0.925	0.359	0.388	0.954	1.829
GPP	1,008	28,300.000	31,500.000	2,040.349	17,600.000	102,000.000	121	25,400.000	28,300.000	2,040.349	16,500.000	102,000.000	887	28,700.000	31,900.000	2,070.339	17,800.000	102,000.000
FIRMS	1,008	152,504.700	178,531.100	9,416.000	76,524.000	587,825.000	121	138,698.900	165,104.600	9,416.000	72,455.000	587,825.000	887	154,388.000	180,290.400	10,381.000	86,543.000	587,825.000
GROWTH_RATE	1,008	1.206	2.638	-9.149	1.376	8.675	121	1.657	2.463	-6.773	1.740	6.326	887	1.145	2.657	-9.149	1.308	8.675
STARTUP_RATE	1,008	3.258	1.035	1.063	3.118	7.018	121	3.119	0.991	1.538	2.810	7.018	887	3.277	1.040	1.063	3.172	7.018

Finally, the following are aggregate data for each prefecture: the Herfindahl index of the number of financial institutions (HHI), the ratio of the number of financial institutions to the number of ordinary corporations (BANKS_RATIO), the real gross prefectural product (GPP), the number of ordinary corporations (FIRMS), the growth rate of the real gross prefectural product (GROWTH_RATE), and the startup rate of small and unlisted enterprises (STARTUP_RATE). HHI is taken from *Nihon Kinyu Meikan*. BANKS_RATIO is taken from *Nihon Kinyu Meikan* and the Number of Prefectural Sorted Ordinary Corporation. GPP and GROWTH_RATE are taken from the Report on Prefectural Accounts. FIRMS is taken from the Number of Prefectural Sorted Ordinary Corporation. STARTUP_RATE is taken from Orbis. Dummy variables for accounting year, industry, and type of main bank are also included in the regressions.[15]

5.5. Empirical methodology and results

5.5.1. Methodology

Using the data set and variables just described, we employ switching in the narrow sense and examine the effects of the switching of firm–main bank relationships on the probability of firm bankruptcy. To investigate the above effects, we should address possible selection bias because we cannot deny the possibility that a firm that switches its main bank relationship may innately tend to go bankrupt. For this reason, in this chapter, we use a propensity score matching estimation approach. The procedure of this approach is as follows.

First, to calculate the propensity scores, we conduct a probit estimation that models the probability that a firm switches its main bank conditional on the covariates that are

[15] Based on Ogura (2007), the dummy variable for industry takes a value of one if a firm is classified into a business type that has many opportunities to receive advice from its main bank.

described in Section 5.4.4. Next, for each treatment observation, the matched observation is selected from the sample of non-switching firms that has the "closest" propensity score. In this chapter, we employ three matching algorithms (i.e., nearest neighbor matching, 5-nearest neighbor matching, and nearest neighbor matching within a caliper).[16] Finally, we examine the effects of the switching of such relationships on the probability of bankruptcy employing the matched observations. In this estimation, we use an average treatment effect on the treated (ATT) estimator.

5.5.2. Results

Table 5.3 reports the results of the probit regressions whose dependent variables are SWITCH, TRANSFER, and NEW_TRANSACTION. The marginal effects of BANKS are significantly positive in columns 1 and 2, indicating that firms with many bank relationships are likely to switch their main banks and the switching is likely to be caused by the transfer. This result is natural because these firms have more opportunities to transfer their main banks. MALE has a negative marginal effect in column 3, suggesting that male managers are conservative in switching their main bank relationships to financial institutions with which the firms do not have long relationships. Alternatively, female managers may be likely to be offered loans under favorable terms by financial institutions that come to be their new main banks. In addition, GPP has negative marginal effects in columns 1 and 3, implying that firms do not switch their main bank relationships if they reside in prefectures with large scale of economies. In contrast, the marginal effects of FIRMS are positive in columns 1 and 3, suggesting that firms that reside in prefectures that have many corporations tend to switch their relationships. This result seems to indicate that firm–main bank relationships in these areas are in flux.

[16] In this chapter, we employ nearest neighbor matching for baseline estimations, and employ 5-nearest neighbor matching and nearest neighbor matching within a caliper for robustness checks.

Table 5.3 Probit estimations of the switching

Dependent variables:	(1) SWITCH	(2) TRANSFER	(3) NEW_ TRANSACTION
Firm characteristics			
EMPLOYEES	-0.000	0.000	-0.000
	(0.001)	(0.000)	(0.001)
BANKS	0.019 **	0.004 ***	-0.004
	(0.008)	(0.005)	(0.005)
FIRM_AGE	-0.001 *	-0.000	-0.001
	(0.001)	(0.000)	(0.001)
MANAGER_AGE	-0.001 *	-0.000	-0.001
	(0.001)	(0.000)	(0.000)
MALE	-0.057	0.001	-0.056 **
	(0.047)	(0.004)	(0.038)
SCORE	0.004 *	0.000	0.002
	(0.002)	(0.000)	(0.001)
Firm financial information			
LIQUID_ASSETS	0.184 *	0.010	0.154
	(0.103)	(0.018)	(0.101)
QUICK_ASSETS	0.012	-0.002	-0.103
	(0.106)	(0.011)	(0.123)
CASH	0.129	0.037 *	-0.420
	(0.173)	(0.047)	(0.320)
TOTAL_ASSETS	-0.241	-0.077	0.007
	(0.161)	(0.097)	(0.140)
CURRENT_LIABILITIES	0.080	0.011	0.001
	(0.102)	(0.018)	(0.152)
BORROWING	0.179 *	0.014	-0.037
	(0.111)	(0.021)	(0.089)
TOTAL_LIABILITIES	-0.086	0.044	-0.106
	(0.177)	(0.072)	(0.252)
CAPITAL_ADEQUACY_RATIO	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
ROA	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
ROE	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)
CAPITAL	1.636	0.309 **	0.949
	(1.056)	(0.375)	(0.798)
ACCUMULATED_PROFIT	0.425	0.102	-0.226
	(0.278)	(0.126)	(0.207)
SALES	0.026	0.004	-0.004
	(0.026)	(0.005)	(0.030)
PROFIT	-0.901	-0.101 *	0.046
	(0.530)	(0.117)	(0.515)
Prefecture characteristics			
HHI	-0.223	-0.017	-0.052
	(0.208)	(0.033)	(0.124)
BANKS_RATIO	0.031	0.002	0.002
	(0.039)	(0.005)	(0.023)
GPP	-0.000 **	-0.000	-0.000 **
	(0.000)	(0.000)	(0.000)
FIRMS	0.000 **	0.000	0.000 **
	(0.000)	(0.000)	(0.000)
GROWTH_RATE	0.005	0.001	0.001
	(0.004)	(0.001)	(0.003)
STARTUP_RATE	0.000	-0.001	0.001
	(0.011)	(0.002)	(0.007)
Accounting year dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Dummies for main bank type	Yes	Yes	Yes
Pseudo R^2	0.100	0.291	0.086
Log pseudolikelihood	-332.539	-132.319	-241.293
Number of observations	1,003	1,003	1,003

Note: The upper rows are marginal effects and the lower rows are standard errors.

*Significant at the 10% level.

**Significant at the 5% level.

***Significant at the 1% level.

Turning to the treatment effects of the switching of firm–main bank relationships, Table 5.4 reports the results of the unmatched and ATT estimators. More specifically, rows (1), (2), and (3) report the results of the estimations using SWITCH, TRANSFER, and NEW_TRANSACTION as the variables of interest, respectively. In this estimation, we employ nearest neighbor matching as a matching algorithm. In row (1), SWITCH is statistically insignificant in the case of the unmatched estimator. Thus, we do not find evidence that the switching of firm–main bank relationships increases the probability of firm bankruptcy before dealing with the possible selection bias. In contrast, SWITCH is positive and statistically significant at the 5% level in the case of the ATT estimator, which is consistent with Hypothesis 5.1. This result also indicates that the switching of firm–main bank relationships increases the probability of firm bankruptcy by 0.033 percentage points. The economic impact of this estimator is not negligible because the percentage of bankrupt firms in our sample is 1.7%. In row (2), TRANSFER has a positive sign but is statistically insignificant in both cases of the unmatched and ATT estimators. Thus, we find no evidence that the transfer of firm–main bank relationships affects the probability of firm bankruptcy. This result is consistent with Hypothesis 5.2. In row (3), although NEW_TRANSACTION is statistically insignificant in the case of the unmatched estimator,

Table 5.4 Treatment effect estimations for firm bankruptcy (nearest neighbor matching)

	Treatment	Treated	Controls	Difference	S.E.	T-stat
(1)	SWITCH					
	Unmatched	0.033	0.015	0.018	0.013	1.46
	ATT	0.033	0.000	0.033	0.016	2.03 **
(2)	TRANSFER					
	Unmatched	0.022	0.017	0.005	0.020	0.26
	ATT	0.022	0.000	0.022	0.022	1.00
(3)	NEW_TRANSACTION					
	Unmatched	0.041	0.015	0.025	0.016	1.63
	ATT	0.041	0.000	0.041	0.023	1.76 *

Note: The matching algorithm is nearest neighbor matching.

*Significant at the 10% level.

**Significant at the 5% level.

NEW_TRANSACTION is positive and statistically significant at the 10% level in the case of the ATT estimator. This result indicates that the "new transaction" of firm–main bank relationships increases the probability of firm bankruptcy by 0.041 percentage points. This result is also consistent with Hypothesis 5.2. In addition, as with row (1), the economic magnitude of this estimator is important.

In sum, the results in Table 5.4 support Hypotheses 5.1 and 5.2.

5.5.3. Robustness checks

Next, we check the robustness of the results in Section 5.5.2 employing 5-nearest neighbor matching as a matching algorithm. Table 5.5 reports the results of this matching algorithm. The structure of the table is the same as that of Table 5.4.

In row (1), although SWITCH is statistically insignificant in the case of the unmatched estimator, it is positive and statistically significant at the 10% level in the case of the ATT estimator. This result is also consistent with Hypothesis 5.1. In addition, as with Table 5.4, the switching of firm–main bank relationships increases the probability of firm bankruptcy by 0.033 percentage points. The result in row (2) is similar to Table 5.4; in other words, TRANSFER has a positive sign but is statistically

Table 5.5 Treatment effect estimations for firm bankruptcy (5-nearest neighbor matching)

	Treatment	Treated	Controls	Difference	S.E.	T-stat
(1)	SWITCH					
	Unmatched	0.033	0.015	0.018	0.013	1.46
	ATT	0.033	0.003	0.030	0.017	1.74 *
(2)	TRANSFER					
	Unmatched	0.022	0.017	0.005	0.020	0.26
	ATT	0.022	0.000	0.022	0.022	1.00
(3)	NEW_TRANSACTION					
	Unmatched	0.041	0.015	0.025	0.016	1.63
	ATT	0.041	0.003	0.038	0.023	1.61

Note: The matching algorithm is 5-nearest neighbor matching.

*Significant at the 10% level.

insignificant in the cases of the unmatched and ATT estimators, which is consistent with Hypothesis 5.2. In row (3), NEW_TRANSACTION is indeed statistically insignificant in the case of the unmatched and ATT estimators. However, these estimators are almost statistically significant at the 10% level because the t-values of the estimators are 1.63 and 1.61, respectively.[17] Moreover, the ATT estimator of NEW_TRANSACTION is significant at the 10% level in the case of employing k-nearest neighbor matching if limited to the case in which k is smaller than five (not reported). Thus, this result is almost consistent with Hypothesis 5.2. Furthermore, the "new transaction" of firm–main bank relationships increases the probability of firm bankruptcy by 0.041 percentage points.

Furthermore, as a robustness check, we also conduct the same analysis as Table 5.4 employing nearest neighbor matching within a caliper, and the results are reported in Table 5.6.[18] Although we cannot obtain the result of TRANSFER on the probability of bankruptcy because the sample size is small, the results of SWITCH and NEW_TRANSACTION are robust to those in Table 5.4. Thus, the results in Table 5.4 are substantially based on the matching of relatively close propensity scores.

To summarize, the results in Tables 5.5 and 5.6 also support Hypotheses 5.1 and 5.2.

[17] In this case, the critical value at the 10% significance level is 1.646.

[18] Based on Rosenbaum and Rubin (1985), we use a caliper size of 0.023, which is 0.25 * (the standard deviation of the estimated propensity score).

Table 5.6 Treatment effect estimations for firm bankruptcy (nearest neighbor matching within caliper)

	Treatment	Treated	Controls	Difference	S.E.	T-stat
(1)	SWITCH					
	Unmatched	0.033	0.015	0.018	0.013	1.46
	ATT	0.034	0.000	0.034	0.017	2.03 **
(2)	NEW_TRANSACTION					
	Unmatched	0.041	0.015	0.025	0.016	1.63
	ATT	0.041	0.000	0.041	0.023	1.76 *

Note: The matching algorithm is nearest neighbor matching with a caliper of 0.023.

*Significant at the 10% level.

**Significant at the 5% level.

5.5.4. Further analyses

Finally, we conduct two analyses: one is the analysis on the effects of switching in the broad sense on the probability of firm bankruptcy, and the other is the analysis on the path to bankruptcy.

5.5.4.1. Effects of switching in the broad sense on the probability of firm bankruptcy

We employ switching in the broad sense and conduct the same analyses as in Section 5.5.2. The estimation in this subsection is conducted to test Hypothesis 5.3. As mentioned earlier, this definition of switching includes almost all patterns of switching. Unfortunately, however, we cannot use only the firms that switch their main bank relationships to descendants of their ex-ante main banks due to data limitations. Hence, we use switching in the broad sense and investigate how the switching of firm–main bank relationships affects the probability of firm bankruptcy.

Table 5.7 reports the results for the unmatched and ATT estimators. Although the structure of Table 5.7 is the same as that of Table 5.4, the definitions of SWITCH, TRANSFER, and NEW_TRANSACTION in Table 5.7 are different from those of Table 5.4; SWITCH, TRANSFER, and NEW_TRANSACTION in Table 5.7 are

Table 5.7 Treatment effect estimations for firm bankruptcy (in the broad sense of the switching)

	Treatment	Treated	Controls	Difference	S.E.	T-stat
(1)	SWITCH					
	Unmatched	0.030	0.015	0.015	0.012	1.23
	ATT	0.030	0.015	0.015	0.021	0.71
(2)	TRANSFER					
	Unmatched	0.021	0.017	0.005	0.019	0.24
	ATT	0.021	0.000	0.021	0.021	1.00
(3)	NEW_TRANSACTION					
	Unmatched	0.034	0.015	0.019	0.014	1.30
	ATT	0.034	0.011	0.023	0.025	0.92

Note: SWITCH, TRANSFER, and NEW_TRANSACTION are in the broad sense.
The matching algorithm is nearest neighbor matching.

defined in the broad sense. The ATT estimators are statistically insignificant in all rows, indicating that there is no evidence that the switching in the broad sense affects the probability of firm bankruptcy. In addition, this result implies that switching of firm–main bank relationships has no effect on bankruptcy when the ex-post main banks are descendants of their ex-ante main banks. This result is consistent with Hypothesis 5.3.

5.5.4.2. Path to bankruptcy

Finally, we examine the possibility of the path to bankruptcy. As mentioned in Section 5.3, there are several possibilities for bankruptcy.

Here, we verify whether firms that switch their main bank relationships face financial constraints after the switching. Table 5.8 reports the distribution of total borrowing in the first and second terms. More specifically, Table 5.8 (A) is classified by switching and non-switching firms, and Table 5.8 (B) is classified by continuing and bankrupt firms. In Table 5.8, the number of observations decreases from 1,003 to 688, and most of the bankrupt firms are omitted (from 121 to 17) due to data limitations. Hence, the total borrowing of bankrupt firms is larger than that of continuing firms (see Table 5.8 (B)). However, this is not important because the purpose of Table 5.8 is to compare total borrowing between the first and second terms.

Table 5.8 Distribution of total borrowing

(A) Classification by switching and not switching firms

		BORROWING = Total borrowing (in millions of yen)			
		Mean		Median	
		First term	Second term	First term	Second term
Switching firm	121	129,793.6	310,118.0	6,502.0	78,035.0
Non-switching firm	567	89,711.6	120,329.9	5,016.0	25,070.0
Total	688	96,760.9	153,708.3	96,760.9	153,708.3

(B) Classification by continuing and bankrupt firms

		BORROWING = Total borrowing (in millions of yen)			
		Mean		Median	
		First term	Second term	First term	Second term
Continuing firm	671	92,360.3	149,788.1	5,174.0	31,787.0
Bankrupt firm	17	270,455.9	308,441.6	27,673.0	63,285.0
Total	688	96,760.9	153,708.3	96,760.9	153,708.3

In Table 5.8 (A), the mean and median of total borrowing in the second term are larger than those in the first term in both the switching and non-switching firms. This result indicates that funding constraints are mitigated as the firms grow. In addition, in Table 5.8 (B), the mean and median of borrowing in the second term are larger than those in the first term in both the continuing and bankrupt firms. Hence, Table 5.8 seems to indicate that the switching of firm–main bank relationships does not worsen the financial conditions of client firms, let alone increase the probability of bankruptcy.

However, the results in Table 5.8 do not necessarily deny the possibility that the switching does not worsen the financial conditions of the firms. Table 5.9 reports the ratio of short-term borrowing to total borrowing.[19] In Table 5.9 (A), the difference in the ratio of short-term borrowing to total borrowing between the two groups in the first term (44.4% and 44.8%) is statistically insignificant, whereas that in the second term

[19] In this chapter, we define short-term borrowing as the borrowing that firms must repay within one year.

Table 5.9 Ratio of short-term borrowing to total borrowing

(A) Classification by switching and not switching firms

	First term (%)	Second term (%)	Total (%)
Switching firm	44.4	45.4	45.1
Non-switching firm	44.8	35.1	39.3
Total	44.8	38.8	41.1

(B) Classification by continuing and bankrupt firms

	First term (%)	Second term (%)	Total (%)
Continuing firm	41.8	36.5	38.5
Bankrupt firm	85.1	82.6	83.8
Total	44.8	38.8	41.1

(45.4% and 35.1%) is statistically significant at the 5% level. This result suggests that the continuation of firm–main bank relationships makes it possible for client firms to refinance short-term borrowings with long-term borrowings.

Table 5.9 (B) indicates that bankrupt firms rely heavily on short-term borrowing, and that this high dependence on short-term borrowing can lead to firm bankruptcy. Firms must repay the borrowing within the term of payment, and, if they do not, the firms experience a suspension of business transactions with banks, which substantially means bankruptcy. Therefore, heavy dependence on short-term borrowing has high risk of bankruptcy.

In sum, Table 5.9 implies that the switching of firm–main bank relationships prevents firms from refinancing with long-term borrowing, and thus increases the probability of firm bankruptcy.

5.6. Conclusion

Employing a unique firm-level data set, we examine the effects of the switching of firm–main bank relationships on the probability of firm bankruptcy. We find that the switching of firm–main bank relationships increases the probability of firm bankruptcy. In particular, the results suggest that switching increases the probability of bankruptcy in the case of switching to banks with which client firms have not transacted before the switching. Furthermore, we find that the result holds only when the ex-post main banks are not descendants of their ex-ante main banks.

Our findings have important implications for firms. For example, avoiding bankruptcy is one of the most important issues for young SMEs. Hence, in terms of continuing their business, firms should avoid switching their main bank relationships, if possible. Moreover, this study is unique because it uses a new classification method for the switching of firm–main relationships. Specifically, we use two types of switching (i.e., “transfer” and “new transaction”) in combination with two types of definitions of switching (i.e., in the narrow sense and in the broad sense). To our knowledge, there is no previous study that classifies switching in such detail, including the latest studies, such as Ono et al. (2016). Unfortunately, we cannot check the robustness of the finding that the switching of firm–main bank relationships prevents firms from refinancing with long-term borrowing and thus increases the probability of firm bankruptcy; therefore, we need to hold further discussions on this issue.

Chapter 6: Conclusion

Employing a data set covering new firms incorporated in Japan, we examine the effects of firm–bank relationships on the bankruptcy of new firms. We find that firm–bank relationships affect the probability of bankruptcy. In addition, the results suggest that the worsening of the relationship between firms and financial institutions leads to severe financial constraints for client firms and thus increases the probability of bankruptcy.

This study makes two key contributions. First, it contributes to future research on banking. Since Petersen and Rajan (1994), who are considered to firstly examine the effects of firm–bank relationships on lending terms and conditions for client firms using a sample of SMEs, a number of banking studies have investigated these effects. Moreover, other studies, including Gambini and Zazzaro (2013), have examined the effects of such relationships on business performance. However, these studies do not reveal the impact of such relationships on the bankruptcy of SMEs, let alone young and unlisted SMEs; hence, identifying this impact will contribute to future research. Second, our study contributes to support the survival of new firms. As repeatedly mentioned, most young and unlisted SMEs go bankrupt during the early stages of the entrepreneurial process. Despite the fact that it is necessary to identify the impact of firm–bank relationships on the bankruptcy of new firms, it has long been an open question. In contrast, this study is the first to examine the effects of firm–bank relationships on the bankruptcy of new firms; hence, it also contributes to the real world by providing implications to support the survival of such firms.

However, this paper has several issues that remain to be addressed in future research. First, the detailed mechanism through which firm–bank relationships affect bankruptcy remains unexplained. In this paper, we reveal some of the effects of firm–bank relationships on the bankruptcy of new firms and thus indicate the possibility that these bankruptcies occur owing to the worsening of the firms' financial conditions;

however, we cannot check the robustness of the path to bankruptcy. Second, the impact of the differences in the strength of firm–bank relationships on bankruptcy also remains an open question. Although most of the relevant studies properly control for the strength of such relationships, we cannot do it. Properly controlling for the differences in this strength should enable us to grasp the effects of firm–bank relationships on bankruptcy in more detail. Unfortunately, we cannot address these two open questions due to data limitations. However, these open questions present intriguing research topics, and therefore, this paper clearly points to directions for future research.

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