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Master Thesis

The Effects of Regional Bank Mergers on Local Firms

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Abstract

I study the effects of regional bank mergers on corporate borrowers using eight large in-market mergers between 2004 and 2018 in Japan, exploiting an event study framework. My unique firm-level panel data with more than 100,000 unique firms enables me to combine firm-bank relationships, firms' financial statements, and other firm characteristics. There are three findings. First, firm-bank relationships change significantly after the mergers. The number of banks persistently declines after the mergers. Also, the probability of switching the main bank increases by about 50% from the sample mean. Second, I observe a reduction in loan amounts after the mergers, but the effect sizes are limited relative to the sample mean. On the other hand, there is no effect on borrowing costs on average. Third, I find reductions in annual sales and employment in the first two years following the mergers. However, the real adverse effects vanish after two years, suggesting that firms can mitigate the initial negative effects.

Keywords: Bank Mergers; Firm-Bank Relationships; Interest Rate; Credit Availability

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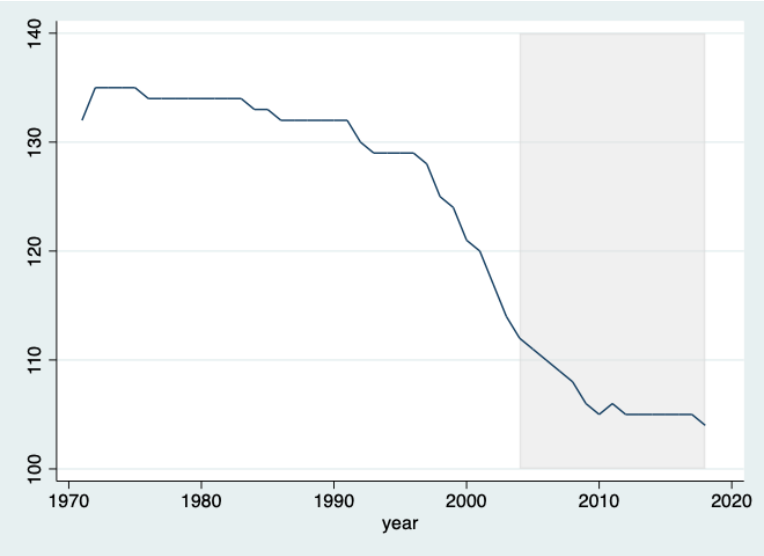
1 Introduction

The question of how bank mergers affect corporate borrowers is essential for both researchers and policymakers. The existing literature suggests that the effects of bank mergers on firms are ambiguous. Classic theories suggest that credit market concentration harms borrowers because banks exert higher interest rates or low credit supply (e.g., Klein 1971). The more recent studies incorporating asymmetric information show that the concentration of the credit market improves firms' access to credit (e.g., Petersen and Rajan 1995; Marquez 2002[1]). In sum, the effects of bank mergers on borrowers can be either negative or positive. Motivated by these theoretical predictions, a large body of empirical studies has been conducted. Some studies find unfavorable effects of bank mergers, especially for borrowers of targeted banks (Sapienza 2002; Karceski, Ongena, and Smith 2005). On the other hand, some studies suggest that bank mergers may benefit firms via improving access to credit (Strahan and Weston 1998).

This paper provides new evidence on the effects of bank mergers on firms and their mechanisms exploiting regional bank mergers in Japan. Figure 1 shows that the number of regional banks has steadily decreased since the late 1990s. While there was a wave of bankruptcies in the banking industry until 2003, the decline of bank numbers since 2004 is solely due to mergers and acquisitions. My study exploits regional bank mergers from 2004 for the analysis.

[1] Petersen and Rajan (1995) show that monopolistic lenders are better at providing credit to noncreditworthy firms since they can extract future surplus of assisting risky firms. Marquez (2002) shows that smaller pools of borrowers in competitive markets lower the screening ability of banks. As a result, both models predict higher loan rates in more competitive lending markets.

Figure 1: Number of Regional Banks in Japan



Notes: This figure plots the number of regional banks in Japan. The number of regional banks is calculated as the sum of "first-tier" and "second-tier" regional banks. The shaded region is the sample period in this paper. *Source*: Deposit Insurance Corporation of Japan.

I investigate the effects of bank mergers using firm-level panel data, which contains unique and rich information on firms in Japan. My sample covers over 14 years and more than 100,000 unique firms. The sample period covers eight cases of large in-market regional bank mergers in Japan[2]. To identify the causal effects of bank mergers, I exploit variations in exposure to mergers of main banks across firms and time. Specifically, my identification strategy is an event study model. My identification assumption is that treatment and control groups share parallel trends in the outcomes before the mergers. To check the validity of this assumption, I present that the estimated event study coefficients for main outcomes indicate no pre-trend before mergers.

There are three findings. First, bank mergers have a significant impact on firm-bank relationships. The number of banks decreases after the mergers, and the probability of switching the main bank significantly increases after the mergers. These results confirm that merger cases in my study indeed have a considerable impact on firms' borrowing opportunities.

Second, I find a small but statistically significant reduction in loan amounts after the mergers. This could result from either a reduction in the supply of bank credit of firms or a lower dependency

[2]To classify "large" mergers, a $10 billion threshold of pre-merger total assets is often employed (e.g., Berger et al. 1998; Erel 2011; Nguyen 2019; Minton, Taboada, and Williamson 2021). My merger cases are most relevant to those "large" mergers in the literature as most regional banks in Japan have more total assets than $10 billion.

on bank credit. On the other hand, I find no effect on borrowing costs on average.

Third, I find reductions in annual sales and employment for the first two years following the mergers. These results may imply that some firms face lower credit availability after the mergers. However, the adverse effects diminish after two years. This implies that firms can mitigate the initial adverse effects after several years.

The rest of this paper proceeds as follows. Section 2 describes the institutional details and the related literature. Section 3 introduces the empirical strategy and its underlying assumption. Section 4 explains the data and the sample construction. Section 5 presents the results and their robustness. Section 6 concludes.

2 Background

2.1 Japanese Local Lending Market

I consider the Japanese local lending market from 2004 to 2018. Japanese local lending market consists of four major types of banks, in order of bank sizes, (i) city, (ii) first-tier regional, (iii) second-tier regional, and (iv) shinkin banks. In 2020, there are 5 city banks, 62 first-tier regional banks, 38 second-tier regional banks, and 254 shinkin banks (Deposit Insurance Corporation of Japan). In particular, I focus on regional bank mergers in this paper for two reasons. First, city banks are out of the scope of this study since there is only one major merger case for city banks in my sample period that has been studied by Uchino and Uesugi (2022)[3]. Second, I do not cover mergers of shinkin banks since they are relatively small and are nonprofit financial institutions. Regional banks are relatively large, with more total assets than $10 billion, and I expect that competitive effects could arise after a merger.

The average loan rates vary across bank types. Panel (a) of Figure 2 shows the average loan rates from 2000 to 2020 for each bank type. Loan rates of city banks are the lowest, and those of shinkin banks are the highest. Panel (a) of Figure 2 also indicates regime shifts in local markets. That is, the average loan rates are declining due to prolonged monetary easing.

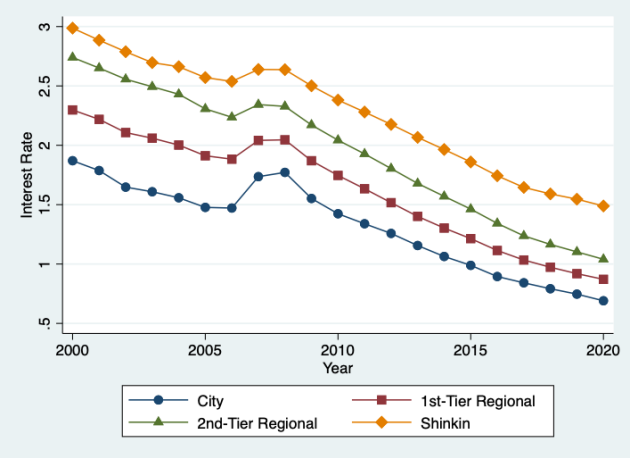
Reduction in loan demand induced by the aging population is another challenge for local lenders.

[3] Uchino and Uesugi (2022) find that a merger between two city banks increases borrowing costs of borrowers who had transacted with either bank or both.

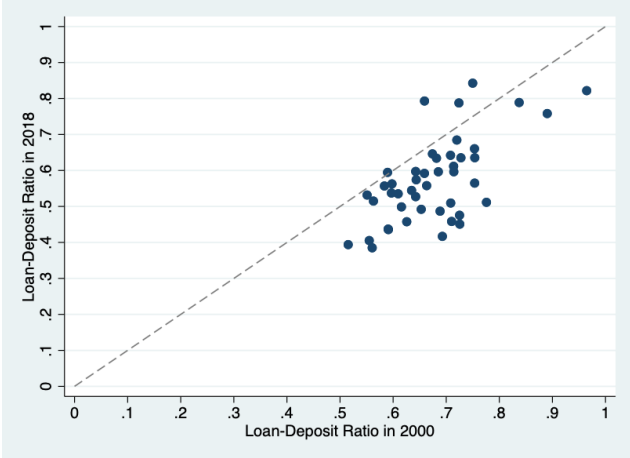
Panel (b) of Figure 2 provides suggestive evidence that loan demand does not increase in the local lending market. The unit of observation is prefectures. The horizontal axis is a loan-deposit ratio, loan amounts divided by deposits, in 2000. The vertical axis is a loan-deposit ratio in 2018. The dashed line represents a 45-degree line. In most prefectures, loan-deposit ratios have dropped in 18 years.

Figure 2: Japanese Banking Industry

(a) Average Interest Rates



(b) Loan-Deposit Ratio in 2000 and 2018



Notes: Panel (a) plots the average loan rates on outstanding loans and discounts for each bank type between 2000 and 2020. The navy points are city banks, the red ones are first-tier regional banks, the green ones are second-tier regional banks, and the yellow ones are shinkin banks. The original data is at the monthly level and is transformed into the yearly level. Panel (b) plots the prefecture-level loan-deposit ratio in 2000 (x-axis) and in 2018 (y-axis). To focus on local economies, I omit Tokyo and Osaka, the two largest prefectures where major industries are concentrated. The dashed line is a 45 degree line. The region below the 45 degree line contains prefectures that experience reductions in loan-deposit ratios between 2000 and 2018.
Source: Bank of Japan, author's own calculations.

Consistent with the descriptive evidence above, Ogura (2020) shows that local lenders' business circumstances in Japan have been intensified. He finds that the lending market has been more competitive using a structural estimation approach. He also shows that the degree of intensified competition correlates with banks' risk taking.

There are ongoing policy debates against regional bank mergers. The Financial Services Agency (FSA), the financial regulator in Japan, tries to promote regional bank consolidations to sustain the profitability of regional banks under the aging population. On the other hand, the Japan Fair Trade

Commission (JFTC), the competition authority in Japan, has been conservative against bank mergers because of potential competitive effects. More recently, the Japanese government has introduced several policies to promote regional bank mergers. First, the JFTC introduced a new remedy for mergers of regional banks in 2019 and relaxed merger restrictions. Reflecting concerns by the JFTC, the remedy imposes that the financial regulator will monitor banks whether they increase interest rates after the mergers (Wakui 2021). Moreover, the Japanese government introduced financial incentives for consolidations of regional banks (Uranaka and Hagiwara 2021).

2.2 Related Literature

This paper makes three contributions to the literature on the effects of bank mergers on corporate borrowers. The first contribution of this paper is to expand the literature on the effects of bank mergers on firms' external finance. The most relevant settings to my cases are large-scale mergers that occurred with market overlap. The existing studies suggest that large in-market mergers lead to higher interest rates and lower loan amounts (Sapienza 2002; Bonaccorsi Di Patti and Gobbi 2007; Erel 2011)[4]. My paper is the first to investigate the effects of mergers occurring in shrinking markets, as I overviewed in the previous subsection. The external validity of the existing literature to Japanese cases is a concern since merged banks may not exert market power in shrinking markets where demand for bank credit stagnates. My findings provide policy implications not only for Japan but also for other countries where the local lending market is going to decline.

The second contribution of this paper is to investigate the dynamic effects of bank mergers using an event study framework. The existing research has reached different conclusions about the long-term effects of bank mergers on firms, and my paper aims to fill the gap. On the one hand, some studies find that the negative effects of bank mergers diminish in about three years (Berger et al. 1998; Bonaccorsi Di Patti and Gobbi 2007). On the other hand, Erel (2011) observes positive effects on loan rates three years after bank mergers. However, little research studies the effects longer than three years. Since a long panel dataset is available, I can investigate the dynamic effects for up to five years. Also, I can visually indicate the dynamic treatment effects of bank mergers exploiting an

[4]For example, Sapienza (2002) shows that in-market mergers with more than 6.15% market share lead to increased interest rates. All merger cases in my study have larger shares than this threshold. Erel (2011) finds that mergers with mega acquirers, defined by more than $10 million total assets, increase loan rates. Since most regional banks in Japan have more than $10 million, this result is also comparable for my setting.

event study design.

The third contribution is to study the real effects of bank mergers. Little is known about the effects of bank mergers on firms' real activities. One exception is Fraisse, Hombert, and Lé (2018), who study the effects of a megabank merger on firm exit, investment, and employment. They find that a megamerger increases the probability of exit while there is no impact on investment and employment. However, this study investigates a single merger case. Exploiting my firm-level rich dataset, I provide further evidence on the real effects of bank mergers pooling multiple cases.

3 Empirical Strategy

3.1 Identification Strategy

Benchmark Framework

To identify the causal impact of a regional bank merger on local firms, I exploit two sources of variations in an exposure of a bank merger: a variation across firms and a variation across time. My baseline specification is an event study model. The benchmark model takes the form:

$$\begin{aligned} Y_{ijpt} =& \text{Treat}_i \times \left[\tau_{-4} 1\{t - M_i \leq -4\} + \sum_{l=-3, l\neq -1}^{4} \tau_l 1\{l = t - M_i\} + \tau_5 1\{t - M_i \geq 5\} \right] \\ &+ X_{pt}\beta + \alpha_i + \gamma_t + \delta_j + \mu_p + \epsilon_{ijpt} \end{aligned} \tag{1}$$

where Y_{ijpt} is the outcome variable for firm i of industry j locating in prefecture p at year t. Treat_i is a treatment variable that takes 1 if firm i has the main bank relationship with merged banks at the year prior to the mergers. M_i is the year that firm i's main bank merges. The indicator variables $1\{l = t - M_i\}$ measure the relative time to the mergers year M_i, which varies across firms. Since the number of observations is limited in distant relative times, I bin the distance relative times earlier than Year -4 and later than Year 5, respectively. X_{pt} is a vector of controls determined at the prefecture level [5]. α_i denotes firm fixed effects, and γ_t represents year fixed effects. I additionally control for 2-digit level industry fixed effects δ_j and prefecture fixed effects μ_p. The key parameters

[5]The control variables include the population growth in prefecture p and the unemployment rate in the region to which prefecture p belongs.

are τ_l for $l > 0$, representing the dynamic effect of regional bank mergers on the outcome variable relative to the baseline period $l = -1$, the year prior to the mergers.

My event study approach to evaluate the effects of mergers is in line with the literature on retrospective merger analysis in other industries[6]. The most related study in terms of an identification approach is Russell (2021), who investigates the effect of college and university mergers with differential timings on tuition using an event study design. Russell (2021) points out, an important advantage of utilizing an event study approach in merger analysis is that I need no clear market definitions. Since there is no solid consensus of how to define the Japanese local lending market, my event study approach enables me to estimate the causal effects of bank mergers without strong assumptions of market definitions[7].

Robust Estimation under Potential Treatment Effects Heterogeneity

My identification strategy relies on regional bank mergers with staggered timing. The recent literature highlights concerns that the conventional event study estimates with staggered timing of treatment could be biased when the treatment effect is heterogeneous (e.g., Callaway and Sant'Anna 2020; Borusyak, Jaravel, and Spiess 2021; Goodman-Bacon 2021; Sun and Abraham 2021). To deal with this concern, I use the estimator proposed by Sun and Abraham (2021), which is robust to dynamic treatment effects heterogeneity under the parallel trends assumption and no anticipation effects. Unlike the conventional event study approach, this alternative estimator does not use not-yet-treated and already-treated units as a control group. In this paper, I use only never-treated units as a control group following the estimation procedure of Sun and Abraham (2021)[8].

3.2 Identification Assumption

My identification strategy requires that exposure of a merger should be exogenous after controlling for time-varying variables and fixed effects listed in Equation 1. If this assumption holds, the pre-trend dynamics of outcome variables and other observable characteristics should be similar between

[6]See, e.g.,Ashenfelter and Hosken (2010), Cooper et al. (2019), Dafhy (2009), and Russell (2021).

[7]While the existing literature often defines the local lending market at the prefecture level, some research suggests loan markets for regional banks are not segmented at the prefecture level (Kano and Tsutsui 2003).

[8]I use the Stata package eventstudyinteraction Sun (2021) for implementation.

treatment and control groups. In Section 5, I check that the estimates of τ_l for $l < 0$ are close to zero and statistically insignificant.

One specific threat to the parallel trends assumption is that regional banks may endogenously determine mergers depending on local economic conditions or population growth. Severe local economic conditions may induce regional bank mergers to maintain their profitability. Also, low population growth may affect both demands for bank credit and banks' willingness to merge. To alleviate this concern, I relax the assumption, including the unemployment rate and the population growth at the firm's region in the control variables of my baseline specification.

4 Data

4.1 Sample Construction

The unit of observation in this paper is firm (i)-year(t) level it. I use firm-level yearly data from 2004 to 2018 collected by Tokyo Shoko Research, Ltd. (TSR), the credit report agency in Japan. I construct the analysis sample using the dataset containing firm-level characteristics and the dataset covering balance-sheet information.

Firm-Level Information

The first dataset is the TSR Firm Information File (*Kigyo Jyohou File*). This data covers comprehensive yearly information of more than 850,000 firms in Japan. The key feature of the TSR data in my setting is that I can observe firm-bank relationships each year. The TSR data lists up to ten firm-bank relationships in descending order of transaction amount[9]. I assume that the firm-bank relationship listed at the beginning represents the main bank. Yearly information on firm-bank relationships enables me to observe variations in exposure to mergers of the main bank across firms and over time.

It is important to note that constructing panel data from the Firm Information File requires particular attention. Unlike administrative data or usual panel surveys, information of some firms

[9]More precisely, the TSR data identifies firm-bank-branch relationships each year. 3.6 % of observations in the TSR data transact with multiple branches of the same bank. Since banks allow their customers a single bank account in general, I omit observations transacting with multiple branches of the same bank.

is not updated, although the data is compiled at the firm-year level. To restrict my sample to observations with up-to-date information, I restrict my sample to observations whose most recent accounting period matches with the panel year[10].

Balance-Sheet Information

Another source of data is the TSR Financial Information File (*Zaimu Jyohou File*). This dataset covers balance-sheet information of a part of firms covered in the Firm Information File. The unique feature of this dataset is that it contains balance-sheet information of unlisted firms. Using the dataset enables me to understand the effects of bank mergers on unlisted firms that need bank credit as the main source of external finance.

Sample Construction

From the TSR data, I restrict the sample for firms with financial information from balance sheets and income statements. To focus on firms that rely on bank credit as a source of external finance, I drop listed firms that account for about 1% of the sample. I further restrict my baseline sample to firms that transact with regional banks as their main bank in 2004 to make the sample more homogeneous. Since I define a treatment variable using firm-bank relationships the year prior to the mergers, I restrict my sample to observations with available information on the previous year. Finally, I restrict my attention to observations with non-zero loan amounts and interest paid to focus on firms that rely on bank credit.

As a result, the sample is an unbalanced panel data from 2004 to 2018 consisting of 107,197 firms and 746,527 firm-year observations. Appendix A.2 explains this sample construction procedure in detail. Figure A.1 in Appendix A.4 shows that my analysis sample is relatively creditworthy compared to the whole TSR data. One possible reason is that the TSR Financial Information File may contain financial statements of relatively creditworthy firms. Although it would not be a threat to identification as long as the parallel trends assumption holds, I have to keep in mind this feature of my analysis sample.

[10]According to the TSR, the TSR usually updates firm information of a given year from August of the previous year. Thus, I restrict the sample to observations whose accounting period is later than August of the previous year.

Merger Sample

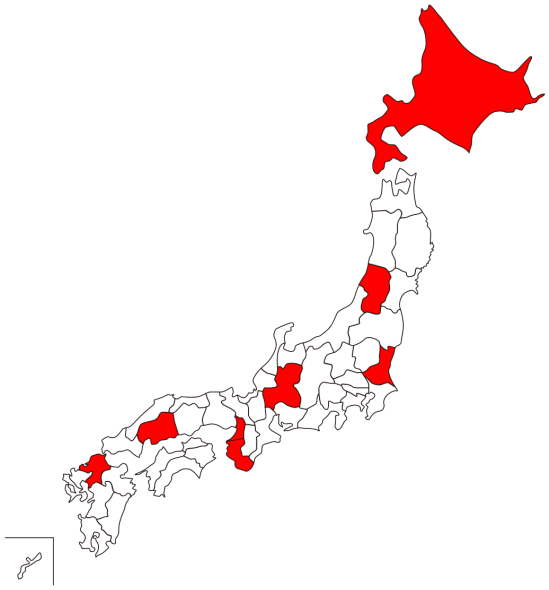
My analysis sample covers eight merger events that occurred in the sample period. Each merger case is an in-market merger. That is, each merger occurred within a single prefecture. Table 1 summarizes the mergers events used in the analysis. Figure 3 shows the prefectures of merger events occurred. Most merger events are regionally isolated, and I do find any particular patterns for the regional distribution of merger events.

Table 1: Timing of the mergers

Prefecture	Acquiring Bank	Target Bank	Month/Year
Hiroshima	Hiroshima-Sougo	Setouchi	05/2004
Fukuoka	Nishi-Nihon	Fukuoka-City	10/2004
Wakayama	Kiyou	Wakayama	10/2006
Yamagata	Syokusan	Yamagata-Siawase	05/2007
Hokkaido	Hokuyou	Sapporo	10/2008
Ibaraki	Kanto-Tsukuba	Ibaraki	03/2010
Osaka	Ikeda	Sensyu	05/2010
Gifu	Jyuroku	Gifu	09/2012

Notes: This table shows the timing of bank mergers used in the analysis. It covers all regional bank merger events except for three cases: (i) the mergers between *Kansai-Urban* and *Kansai-Sawayaka* in 2004, (ii) between *Kansai-Urban* and *Biwako* in 2010, and (iii) between *Kinki-Osaka* and *Kansai-Urban* in 2018. Note that *Kansai-Urban* was involved in all three cases. I omit these three mergers to exclude the possibility of multiple treatment events in the same firms. I omit observations whose main banks involved mergers with *Kansai-Urban*. *Source*: Japanese Bankers Association.

Figure 3: Regional Distribution of Merger Events



Notes: This figure plots the prefectures that merged banks locate. Merger events are counted within the sample period from 2004 to 2018. Each merger event occurred within a prefecture, i.e., both an acquiring bank and a target bank located in the same prefecture.

Next, I confirm that sample merger cases indeed affect the concentration of the market. The concentration measure is $BorrowerHHI_{pt}$, which is defined as

$$BorrowerHHI_{pt} = \sum_{b=1}^{N} \left[\left(\frac{Number\ of\ Borrowers_{bpt}}{\sum_{b=1}^{N} Number\ of\ Borrowers_{bpt}} \right) \times 100 \right]^2$$

where $Number\ of\ Borrowers_{bpt}$ is at the number of borrowers for bank b located in prefecture p at year t. I identify the number of borrowers for each bank in each prefecture using the TSR data using the information of main bank relationships[11]. Figure 4 indicates the hikes in $BorrowerHHI$ after the most merger cases [12]. This confirms that most merger cases in my study indeed affect the market structure. The sizes of increase in $BorrowerHHI$ in some cases are considerable. the mergers cases in Fukuoka, Wakayama, and Yamagata resulted in increases of the HHI by more than 300 points which are higher than the levels that the mergers may be subject to challenge under the current merger guidelines in Japan[13].

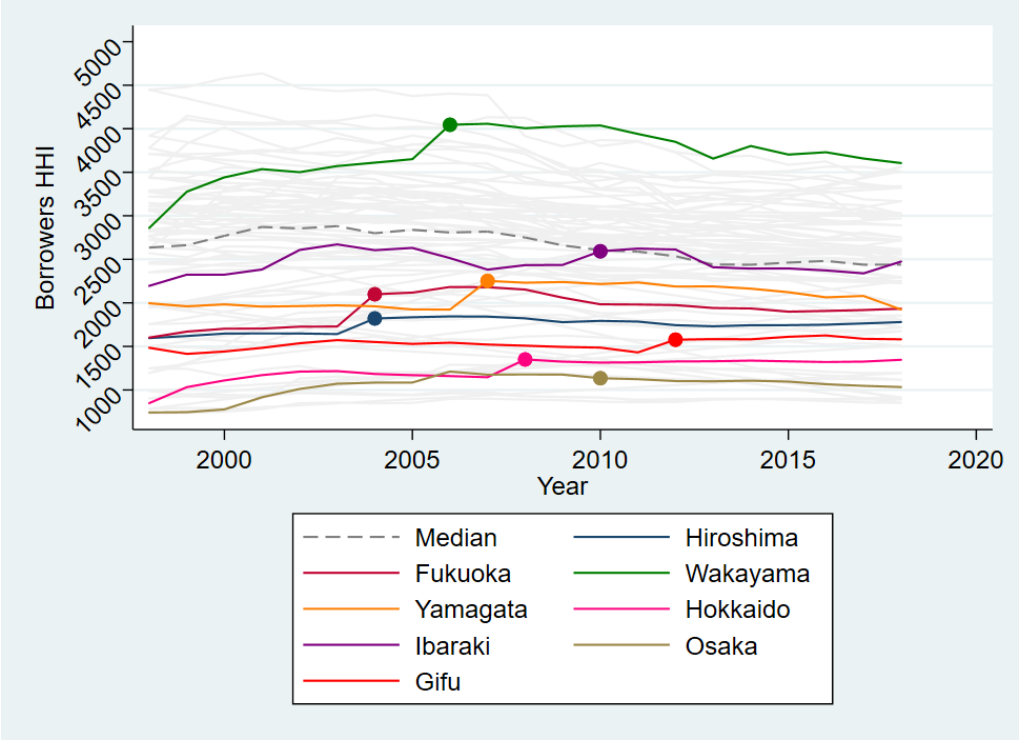
It is worth noting that all merger cases, with one exception, occurred in prefectures with a lower concentration than the median value. This is understandable because banks in less concentrated markets may be more likely to merge to sustain profitability. Also, banks in highly-concentrated markets cannot merge because the competition authority would not approve the mergers. Although firms in a treatment group of my study tend to locate in a highly-concentrated local lending market, my results are valid as long as the parallel trends assumption is maintained. However, it is important to bear in mind that the implication of my study may not be applicable to future mergers in highly-concentrated markets, which are not fully covered in my study.

[11] I define the HHI using the number of borrowers instead of the loan amount because of data availability. Since the comprehensive coverage of the TSR data, $BorrowerHHI_{pt}$ plausibly captures how the local lending market is concentrated. Following the literature on the local lending market in Japan, I assume that the local lending market is defined at the prefecture level. See, e.g., Ishikawa and Tsutsui (2013) and Ogura (2020).

[12] The one exception is the mergers in Osaka, which is the second-largest prefecture in Japan and where urban banks have relatively large shares.

[13] In Japan, the safe harbor using the HHI was introduced in 2007, which was after the approvals of these three merger cases. The safe harbor in Japan rules that mergers are not subject to challenge as long as (i) HHI$\leq$ 1500, (ii) 1500 $\leq$ HHI $\leq$ 2500 and ΔHHI $\leq$ 250, or (iii) HHI $\geq$ 2500 and ΔHHI $\leq$ 150.

Figure 4: Merger Sample and the local lending market Concentration



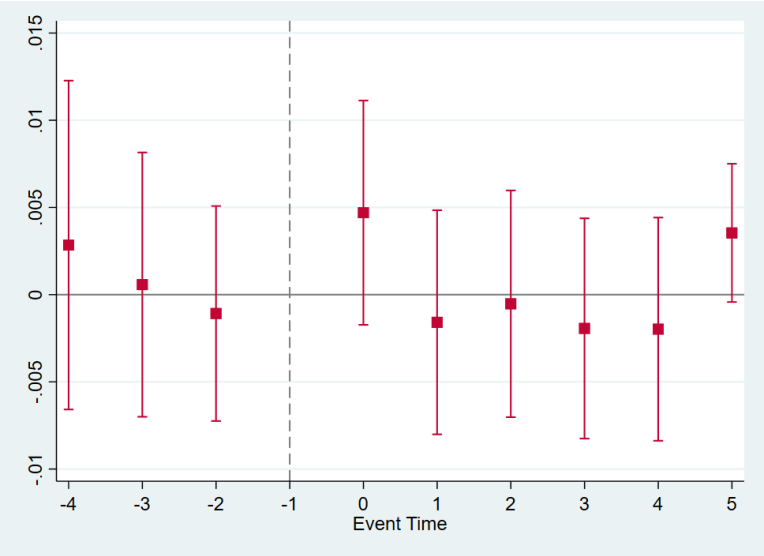
Notes: This figure plots how local lending concentrations vary over time. The concentration measure $BorrowerHHI_{pt}$ is defined as the sum of squared market share of borrowers in a prefecture p in year t. Thus, the unit of observation is the prefecture-year level. Line plots indicate the time series of the concentration measure for each prefecture with bank mergers. The circle point shows the timing of the mergers in a given prefecture. The dashed line denotes the median value of the concentration for each year. The other gray lines are the concentration measures for other prefectures without mergers.
Source: The Firm Information File of the TSR, author's own calculations

4.2 Sample Selection

One concern is that the sample construction procedure above may generate sample selection bias for my main results. As explained in Subsection 4.1, I restrict my sample to firms with non-zero loan amounts and interest paid. However, it may be possible that creditworthy firms are more likely to be independent of bank credit after the mergers. In such a situation, my results can be suffered from the sample selection bias coming from endogenous attrition of creditworthy firms after the mergers. To test this possibility, I implement the event study analysis using the sample before excluding observations with zero loan amounts or zero interest paid. The outcome variable is a dummy variable *NoBorrowing* that takes 1 if loan amounts or interest paid is equal to zero. Figure

5 report the estimated event study coefficients. I find no evidence that the probability of taking zero loan amounts or interest paid increases after bank mergers.

Figure 5: Probability of Zero-Loan or Zero-Interest Paid



Notes: This figure plots the estimated event study coefficients from Equation 1 using the estimator of Sun and Abraham (2021). the mergers occur in Year 0. The baseline period is Year -1, the year prior to the mergers. The outcome variable is $NoBorrowing$, a dummy variable that takes one only if either loan amounts or interest paid are zero. The treatment variable $Treat$ takes one if a firm transacts with a merging bank in the year prior to the mergers and zero otherwise. In addition to the baseline sample explained in Subsection 4.1, the sample in the analysis contains the observations with zero-loan amount or zero-interest paid. The outcome variable is a dummy variable that takes 1 if the loan amount or interest paid is zero. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level, and I indicate 95% confidence intervals.

5 Results

In this section, I present the estimated effects of bank mergers on firms using event study plots. My results are twofold. First, I examine how bank mergers affect firm-bank relationships. Firm-bank relationships are the immediate results of bank mergers. If merger cases in this paper have meaningful effects on firms, I expect that the number of banks and the probability of switching the main banks are affected in the first place. These "first-stage" results on firm-bank relationships help me to confirm that bank mergers indeed affect corporate borrowers. Next, I study the effects of bank mergers on firms' external finance, which are the main scopes of my study. Finally, I investigate the

effects of mergers on creditworthiness and real outcomes to examine whether the effects on external finance are economically important.

For each part, I define outcome variables of interest. The details of the variable definitions are summarized in Appendix A.1. Table A.2 compares summary statistics of the variables of interest for the total sample, the treatment, and the never-treated group. The treatment group consists of firms whose main banks experience a bank merger. The never-treated group consists of firms whose main banks do not experience any mergers. The summary statistics show that the treatment and the never-treated group's observable characteristics and outcome variables are similar.

5.1 Firm-Bank Relationships

Number of Banks

I start out with the effects on firm-bank relationships to check whether regional bank mergers affect firms' borrowing environment. First, I focus on the effect on the number of banks. The primary outcome is $BankNumber$, the number of banks for each firm. To closely examine the dynamics, I define two additional outcomes. The second outcome is $Termination$ that takes 1 if the number of banks decreases relative to the previous year. $Termination$ captures the probability of termination of firm-bank relationships. The third outcome is $Initiation$ that takes 1 if the number of banks increases relative to the previous year. This variable reflects the probability of initiation of firm-bank relationships.

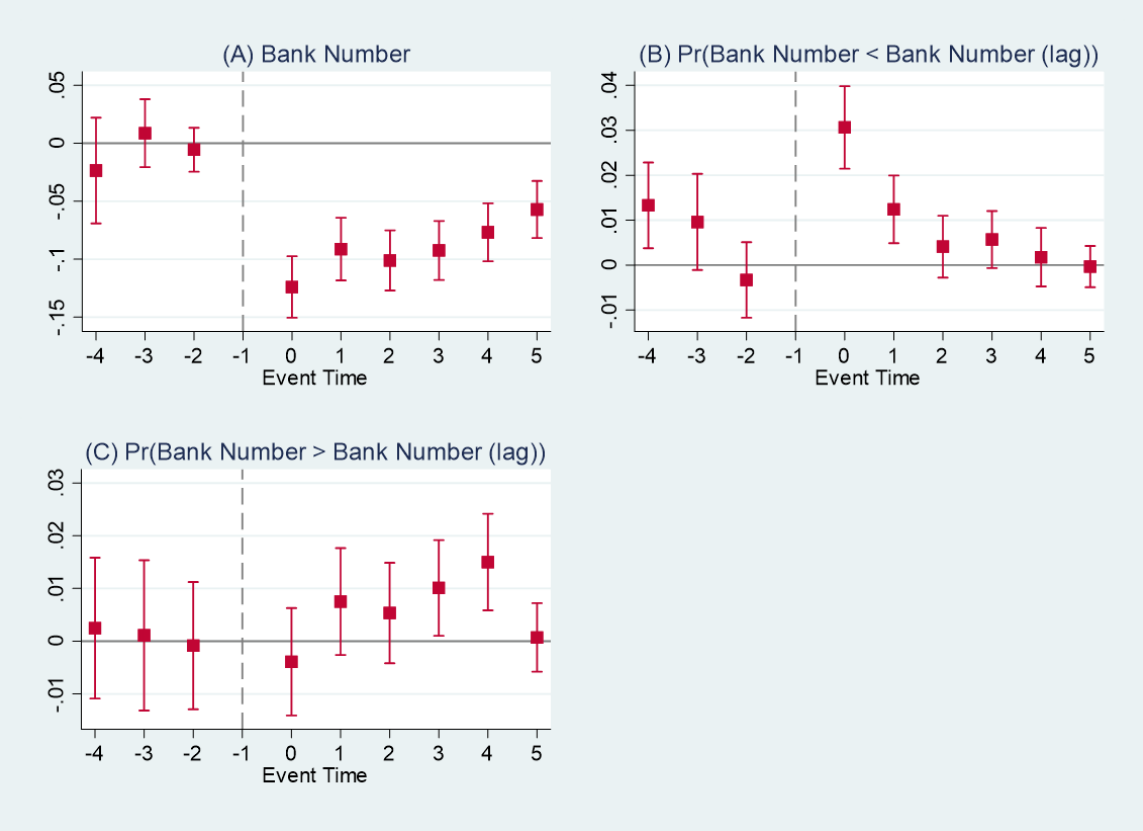
The results are indicated in Figure 6. These figures provide evidence that firms experience a significant decline in the number of banks after the mergers. Panel A shows that the number of banks significantly declines after the mergers. In the mergers year (Year 0), the number of banks drops by more than -0.1. The estimates for the following are smaller than the mergers year, which suggests some firms can compensate for the initial declines in the number of banks.

Panel B finds that the probability of declining the number of banks relative to the previous year increases for two years after the merger. In Year 0, the probability of termination increases by three percentage points or about a 100% increase from the sample mean.

On the other hand, Panel C shows that the effect on the probability of increasing the number of banks is moderate. The event study coefficients are positive and significant only in Year 3 and 4.

This suggests that it takes about three or four years for firms to compensate for the initial decline in firm-bank relationships. However, the effect sizes in Year 3 and 4 are about 1 percentage point increases that are relatively small compared to Panel B. This suggests that some firms do not fully compensate for the decline in the number of banks either willingly or unwillingly.

Figure 6: Number of Banks



Notes: These figures plot the estimated event study coefficients from Equation 1 using the estimator of Sun and Abraham (2021). the mergers occur in Year 0. The baseline period is Year -1, the year prior to the mergers. The treatment variable $Treat$ takes one if a firm transacts with a merging bank in the year prior to the mergers and zero otherwise. Panel A plots coefficients for $BankNumber$, the number of banks. Panel B plots coefficients for $Termination$, the probability of a decline in the bank number. Panel C plots coefficients for $Initiation$, the probability of an increase in the bank number. See Appendix A.1 for detailed definitions. Note that scales vary across three panels. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level, and I indicate 95% confidence intervals.

Switch of Main Bank

Next, I examine the effect on the switch of the main bank. The main outcome variable is $Switch$; a dummy variable equals one if the firm switches its main bank from the previous year and zero

otherwise. Since I restrict my sample to observations of which the firm-bank relationships of the previous year are observable, the outcome *Switch* is well defined for all observations in my analysis sample.

To examine what kinds of banks are alternatives to merged banks, I additionally construct the following three outcomes based on a rank of banks[14]. First, *Downgrade* is a dummy variable that takes 1 only if the firm switches to lower-rank banks (e.g., a regional bank to a shinkin bank). Second, *Upgrade* is a dummy variable that takes 1 only if the firm switches to higher-rank banks (e.g., a regional bank to a city bank). Third, *SameGrade* is a dummy variable that takes 1 only if the firm switches to the same-grade banks (e.g., a regional bank to another regional bank). These definitions enable me to study the types of alternatives of merged banks[15].

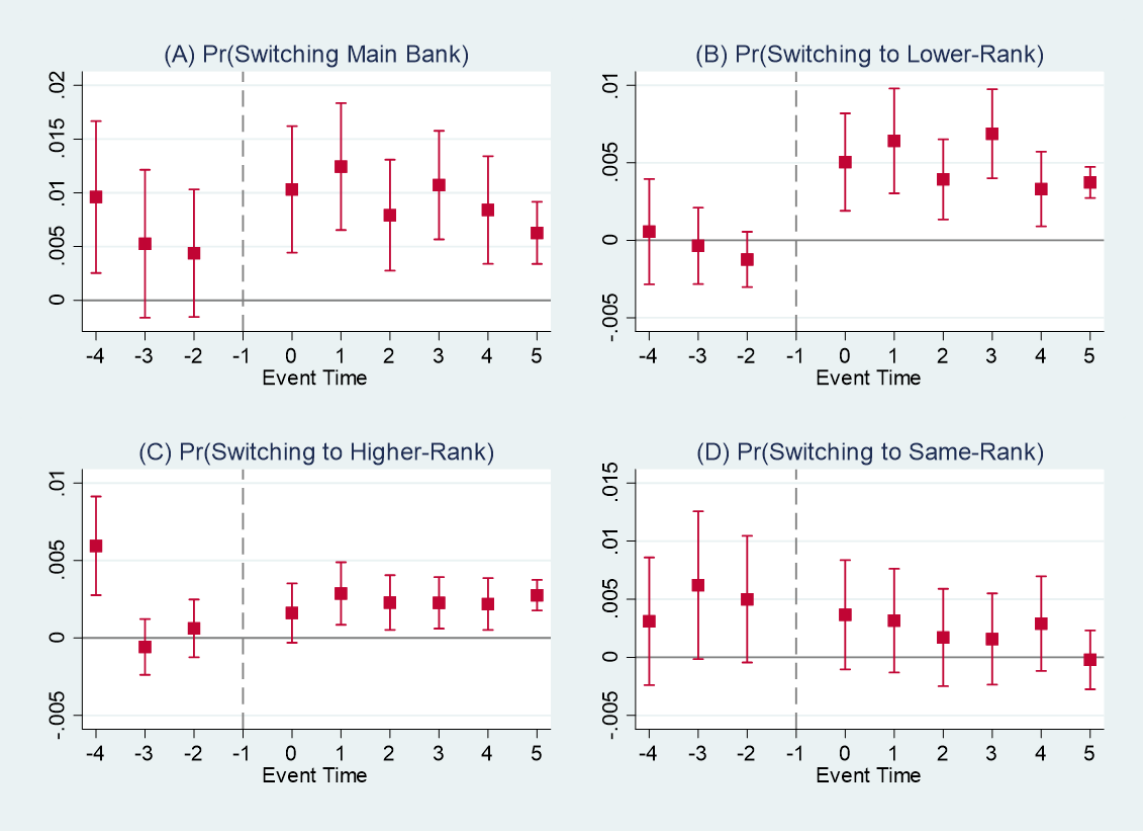
The results are reported in Figure 7. These figures show that the probability of switching the main bank increases after the mergers. After the mergers, the probability of switching the main bank increases by about 1 percentage point, or about 50% increase relative to the sample mean (Panel A). The estimated coefficients are statistically significant, although I observe a slight pretrend in Year -4. The effect persists over five years or more after the mergers.

I observe similar patterns for the effects on *Downgrade* (Panel B) and on *Upgrade* (Panel C). The effect size of *Downgrade* is larger than that of *Upgrade*. On the other hand, I find no effect on *SameGrade* (Panel D). Overall, the results suggest that lower- or higher rank banks are important alternatives to merged banks.

[14]I define four ranks of banks. To list from the highest to the lowest rank, (i) city bank, (ii) regional bank, (iii) shinkin bank, and (iv) credit cooperative. To consistently categorize the ranks, I omit observations whose main banks do not belong in the four categories (e.g., government banks)

[15]Recall that my analysis sample is restricted to firms that transact with regional banks in 2004, as explained in Section 4. Thus, more than 90% of my analysis sample transact with regional banks as their main bank. This implies that the effect on *Upgrade* can be approximately interpreted as switching to city banks. Similarly, the effect on *Downgrade* can be approximately interpreted as switching to shinkin banks or credit cooperatives.

Figure 7: Switch of Main Bank



Notes: These figures plot the estimated event study coefficients from Equation 1 using the estimator of Sun and Abraham (2021). the mergers occur in Year 0. The baseline period is Year -1, the year prior to the mergers. The outcome variable is *Switch*, a dummy variable that takes one only if the main bank changes from the previous year. The treatment variable *Treat* takes one if a firm transacts with a merging bank in the year prior to the mergers and zero otherwise. Panel A plots coefficients for *Switch*, the probability of switching the main bank. Panel B plots coefficients for *Downgrade*, the probability of downgrading the main bank. Panel C plots coefficients for *Upgrade*, the probability of upgrading the main bank. Panel D plots coefficients for *SameGrade*, the probability of switching to the same-rank bank. See Appendix A.1 for detailed definitions. Note that scales vary across four panels. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level, and I indicate 95% confidence intervals.

5.2 External Finance

The previous subsection demonstrated that bank mergers in my analysis have notable effects on firms' borrowing opportunities. I then investigate the effects of these environmental changes on firms' external finance. There are two primary outcomes. The first outcome is *LoanRatio*, loan

amounts normalized by total liabilities[16]. Note that the interpretation of the effect on *LoanRatio* should be cautious as it can be interpreted as either the effect on loan supply or on loan demand. The second outcome is *IntRate*, interest paid divided interest-bearing debt. *IntRate* captures the aggregate borrowing cost of each firm[17].

To examine the net effects of mergers on firms' external finance, I additionally construct two variables. First, *TradeRatio* is the amount of trade credit divided by total liabilities[18]. While trade credit is another major source of external finance for firms, it is usually more expensive than bank credit[19]. If firms face lower availability of bank credit after the mergers, I expect a positive impact in *TradeRatio*. Second, *ExternalRatio* is the sum of *LoanRatio* and *ExternalRatio*. This captures the net effect of bank mergers on external finance availability, taking account of substitution to trade credit.

Figure 8 graphically shows the estimated coefficients. Panel A shows that *LoanRatio* persistently declines after the mergers. The estimates are between 0.5 and 1.5 percentage points. There are two possible interpretations. First, bank mergers could lead to a reduction in banks' loan supply. Second, bank mergers could lead to less dependency on bank credit. However, it is important to note that the effects are limited compared to the sample mean of 57.5%.

Panel B presents that *TradeRatio* increases by about 0.4 percentage points after the mergers, although I find pretrends before the mergers. While I should need cautious interpretation, this result is consistent with the view of a reduction in the supply of bank credit of firms. Panel C aggregates the effect on *LoanRatio* (Panel A) and on *TradeRatio* (Panel B). I find that *ExternalRatio* slightly declines after the mergers. These results provide some evidence suggesting a reduction in the supply of bank credit of firms after the mergers.

On the other hand, Panel D finds no effects on borrowing costs. The estimated coefficients are close to zero and statistically insignificant.

Overall, the results from Figure 8 suggest that there is no clear evidence that firms face severe

[16]I normalize the loan amount by total liabilities following Fraisse, Hombert, and Lé (2018).

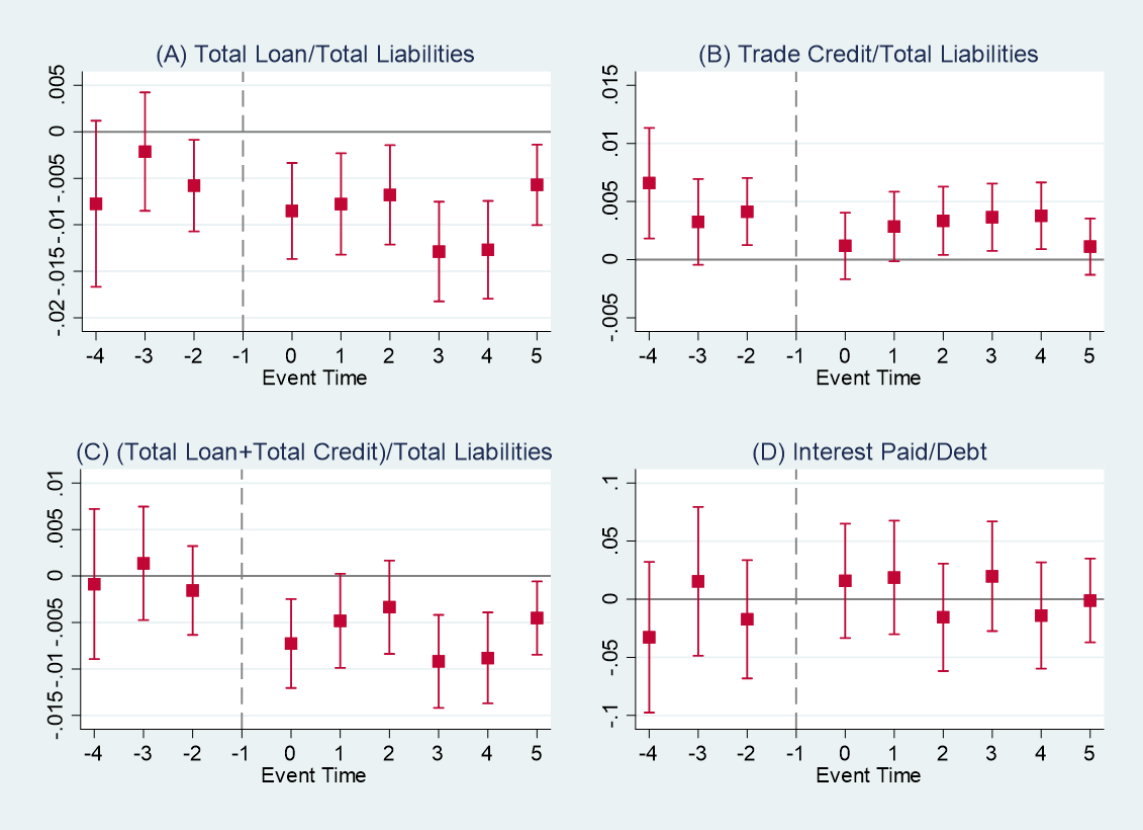
[17]Note that *IntRate* is different from the actual loan rates from the main bank. While I cannot observe the actual loan rates, I claim that *IntRate* is a good proxy for borrowing costs for firms since it can take into account outside options other than the main bank.

[18]The amount of trade credit is defined as the sum of accounts payable and note payable.

[19]The recent literature supports this commonly-held view. Chen, Ma, and Wu (2019) find that firms reduce trade credit after they exogenously have better access to bank credit.

borrowing conditions. While Panel A and B provide some evidence of a reduction in the bank credit supply, the effect sizes are relatively small. One potential mechanism is outside options of firms. Figure 7 shows that the probability of switching main bank increases after the mergers. Bank mergers may have little impact since firms could switch their main banks if they face adverse loan conditions.

Figure 8: External Finance



Notes: These figures plot the estimated event study coefficients from Equation 1 using the estimator of Sun and Abraham (2021). the mergers occur in Year 0. The baseline period is Year -1, the year prior to the mergers. The treatment variable $Treat$ takes one if a firm transacts with a merging bank in the year prior to the mergers and zero otherwise. Panel A plots coefficients for $LoanRatio$, loan amounts divided by total liabilities. Panel B plots coefficients for $TradeRatio$, amount of trade credit normalized by total liabilities. Panel C plots coefficients for the sum of LoanRatio and TradeRatio. Panel D plots coefficients for $IntRate$, interest payments divided by interest-bearing debt. See Appendix A.1 for detailed definitions. Note that scales vary across four panels. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level, and I indicate 95% confidence intervals.

Heterogeneity in Effects of Mergers by the creditworthiness

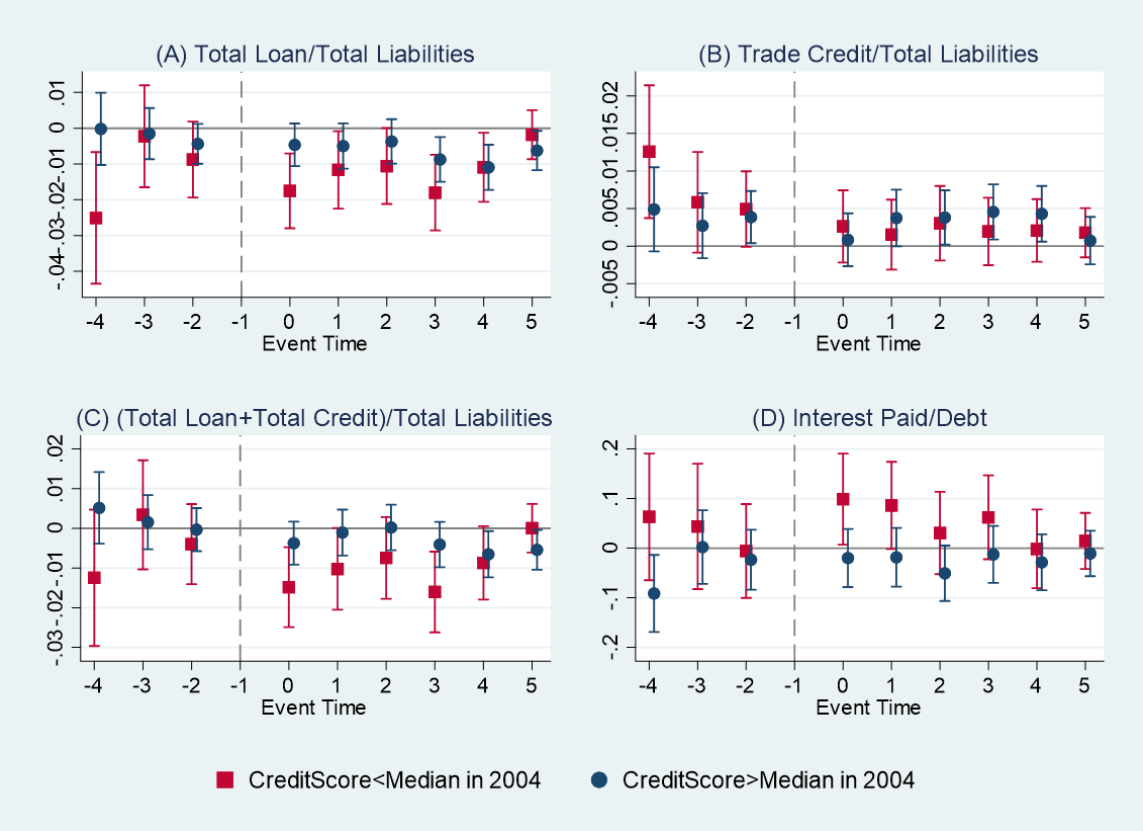
Figure 8 has documented that there is no severe adverse effect of bank mergers on firms on average, and outside options could be a potential channel. However, firms with low bargaining power could be susceptible to mergers. To explore this possibility, I consider heterogeneity by the creditworthiness of firms before the mergers. To focus on noncreditworthy firms, I construct the subsample containing firms whose credit scores measured by TSR were lower than the median value in 2004[20]. For comparison, I also investigate the subsample containing firms whose credit scores were higher than the median value in 2004.

Figure 9 reports the heterogeneous effects by the creditworthiness. The red points denote the results of a subsample of firms with lower credit scores than the median in 2004 (noncreditworthy firms, hereafter). For comparison, the blue points denote the results of a subsample of firms with higher credit scores than the median in 2004 (creditworthy firms, hereafter). Panel A that reductions in *LoanRatio* for noncreditworthy firms are slightly larger than creditworthy firms between Year 0 and 3.

Furthermore, I find *IntRate* of noncreditworthy firms increases by 0.1 percentage points for two years after the mergers (Panel D). I find no effect on *IntRate* after Year 3.

[20]The credit score is assigned by the TSR for each firm every year. It takes discretely between 0 and 100, taking account of the following criteria: (i) management ability (up to 20 points), (ii) future potential (up to 25 points), (iii) financial stability (up to 45 points), and (iv) transparency and reputation (up to 10 points).

Figure 9: External Finance: Heterogeneity

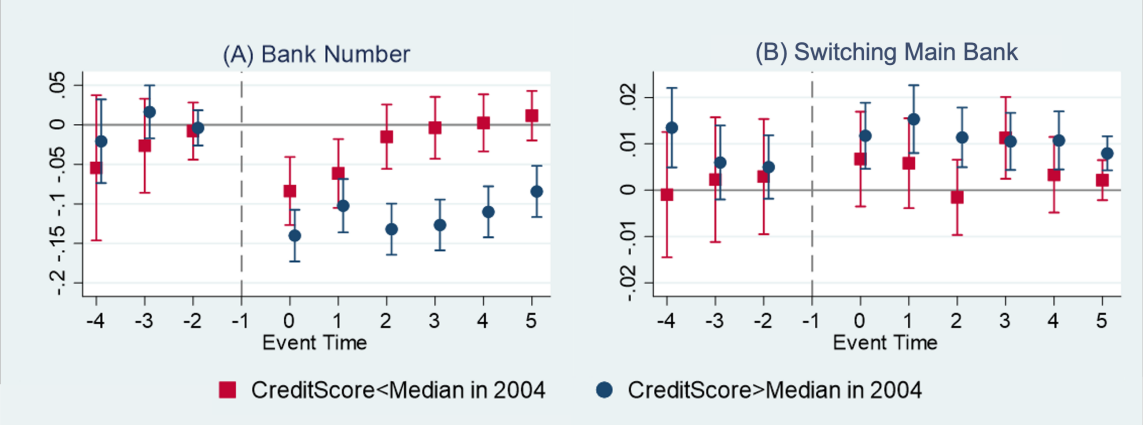


Notes: These figures plot the estimated event study coefficients from Equation 1 using the estimator of Sun and Abraham (2021). the mergers occur in Year 0. The baseline period is Year -1, the year prior to the mergers. The treatment variable $Treat$ takes one if a firm transacts with a merging bank in the year prior to the mergers and zero otherwise. The subsample estimates whose credit scores in 2004 are lower than the median are displayed in red. The subsample estimates whose credit scores in 2004 are higher than the median are depicted in navy. Panel A plots coefficients for $LoanRatio$, loan amounts divided by total liabilities. Panel B plots coefficients for $TradeRatio$, amount of trade credit normalized by total liabilities. Panel C plots coefficients for the sum of LoanRatio and TradeRatio. Panel D plots coefficients for $IntRate$, interest payments divided by interest-bearing debt. See Appendix A.1 for detailed definitions. Note that scales vary across four panels.
I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level, and I indicate 95% confidence intervals.

To further exploit the mechanism of short-term increases in borrowing costs for noncreditworthy firms, I examine the effects on firm-bank relationships. The results are reported inFigure 10. Panel A finds that the number of banks for noncreditworthy firms reduces in Year 0 and 1, but the effects vanish after two years. Panel B shows that there are few effects on the probability of switching main bank for noncreditworthy firms.

These results suggest borrowing costs of noncreditworthy firms increases at least two years after the mergers because (i) it takes about two years for firms to compensate for the initial reduction in the number of banks after the mergers (Panel A) and (ii) noncreditworthy firms cannot switch their main banks easily (Panel B).

Figure 10: Firm-Bank Relationships: Heterogeneity



Notes: These figures plot the estimated event study coefficients from Equation 1 using the estimator of Sun and Abraham (2021). the mergers occur in Year 0. The baseline period is Year -1, the year prior to the mergers. The treatment variable $Treat$ takes one if a firm transacts with a merging bank in the year prior to the mergers and zero otherwise. The subsample estimates whose credit scores in 2004 are lower than the median are displayed in red. The subsample estimates whose credit scores in 2004 are higher than the median are depicted in navy. Panel A plots coefficients for $BankNumber$, the number of banks. Panel B plots coefficients for $Switch$, the probability of switching main banks. See Appendix A.1 for detailed definitions. Note that scales vary across two panels. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level, and I indicate 95% confidence intervals.

5.3 Additional Analyses: Real Activities and Creditworthiness

Real Activities

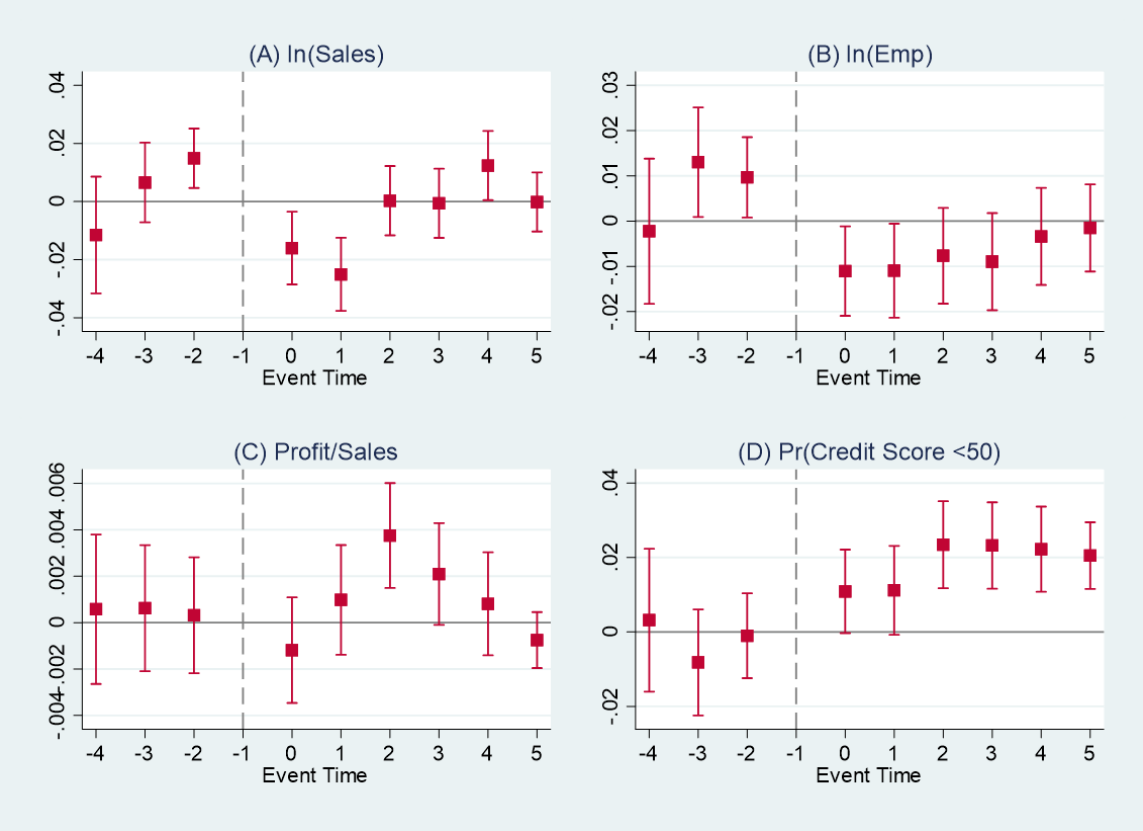
To assess the real effects of bank mergers on firms, I examine the following three outcomes. The first one is $ln(Sales)$, the natural logarithm of annual sales. The second one is $ln(Emp)$, the natural logarithm of employment. The third one is $Profit/Sales$, annual profit normalized by annual sales. Figure B.5 reports the results. Panel A finds that annual sales drop by about 2% in Year 0 and 1, although I observe a slight pretrend. However, I do not find negative effects after Year 2. I find a similar pattern for employment (Panel B). The coefficients in Year 0 and 1 are negative and statistically significant. On the other hand, the estimates are insignificant after Year 2. Note that they should be interpreted cautiously since I observe significant pretrends.

The results from Panel A and B provide suggestive evidence that bank mergers could lead to negative outcomes for firms' real activities at least two years from the mergers. This could imply that firms initially experience lower credit availability after the mergers and financial constraints bind firms' real activities.

Reductions in sales and employment are not necessarily bad for borrowers. Borrowers of merged banks may be better able to adjust their firm size efficiently after the mergers. If that is the case, firms could earn profit more efficiently. To test this possibility, Panel C documents the result where the outcome is $Profit/Sales$. I find that there is an increase between 0.002 and 0.004 points in Year 2 and 3. The effects are large relative to the sample mean 0.005. However, the coefficients in other event years are close to zero and statistically insignificant.

Overall, it is difficult to conclude whether bank mergers affect firms' real activities either negatively or positively. I leave the further investigation of the effects on real activities for future work.

Figure 11: Real Activities and Creditworthiness



Notes: These figures plot the estimated event study coefficients from Equation 1 using the estimator of Sun and Abraham (2021). the mergers occur in Year 0. The baseline period is Year -1, the year prior to the mergers. The treatment variable $Treat$ takes one if a firm transacts with a merging bank in the year prior to the mergers and zero otherwise. Panel A plots coefficients for $lnSales$, the natural logarithm of annual sales. Panel B plots coefficients for $lnEmp$, the natural logarithm of employment. Panel C plots coefficients for $Profit/Sales$, profit normalized by annual sales. Panel D plots coefficients for $Noncreditworthy$, the probability of taking credit scores lower than 50. See Appendix A.1 for detailed definitions. Note that scales vary across four panels. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level, and I indicate 95% confidence intervals.

Creditworthiness

Finally, I study how bank mergers affect firms' creditworthiness. To measure the creditworthiness of firms, I rely on credit scores in the TSR data. I define the outcome variable $Noncreditworthy$, a dummy variable that takes one if the credit score is below 50 and zero otherwise[21].

[21]The TSR categorizes the creditworthiness of firms into five levels using the credit score. According to these five categories, the credit score below 29 is classified as "high risk", and between 30 and 49 is as classified as "moderate risk". Credit scores above 50 are classified as either "mild risk", "safe", and "no risk at all". Thus,

Panel D of Figure B.5 presents the results. I find that the probability of taking credits scores below 50 increases after the mergers (Panel A). The coefficients in Year 0 and 1 are about 0.1 percentage points increase, and the subsequent effects are about 0.2 percentage points increase. However, the effects are limited relative to the sample mean (0.47).

5.4 Robustness

To confirm that my estimation results are not solely driven by the adoption of the estimator of Sun and Abraham (2021), I implement another estimation approach for robustness checks. Specifically, I use a "stacked" difference-in-differences approach[22]. A stacked difference-in-differences approach requires event-specific datasets containing the treated units and the units that are not treated within the event window for each event. Then, I combine all event-specific datasets together[23]. The dynamic treatment effects from the stacked approach are similar to my primary results using the estimator of Sun and Abraham (2021). The event study estimates using these two approaches are reported in Appendix B.1.

6 Conclusion

Using eight large in-market merger cases between 2004 and 2018 in Japan, I have examined the effects of regional banks on corporate borrowers. First, I find that bank mergers reduce the number of banks and increase the probability of switching the main bank. Second, I document a small but significant reduction in loan amounts after the mergers. Third, I find no effect on loan rates on average. Fourth, there are reductions in annual sales and employment in the first two years following the mergers. These results could imply that firms face financial constraints in the first few years. However, further investigation is needed to confirm this conjecture.

For comparison to the existing research, my paper adds three contributions to the literature. First, it provides the first evidence on bank mergers in shrinking markets. Lower loan amounts after the mergers are consistent with the literature on large in-market mergers (e.g., Sapienza 2002).

Noncreditworthy takes one if the firm has either "high risk" or "moderate risk".

[22]For implementation, I use the Stata package stackedev (Bleiberg 2021).

[23]There are several empirical applications of the stacked difference-in-differences approach, such as Cengiz et al. (2019) and Benson et al. (2021). Baker, Larcker, and Wang (2022) review the methodology.

However, I observe no effect on loan rates on average, except for noncreditworthy firms in the first two years. The difference from the literature may suggest that merged banks in shrinking markets could not exert market power.

Second, this study provides unique visual representations of the dynamic effects of bank mergers using an event study model. My results suggest that focusing on the first one or two years may not be enough for assessing the effects of mergers. For example, I observe reductions in sales and employment for two years after the mergers, but the effects diminish in the following years. The diminishing adverse effects of bank mergers are consistent with the literature (e.g., Berger et al. 1998; Bonaccorsi Di Patti and Gobbi 2007), but my paper looks at the longer time periods of more than three years.

Third, I provide new evidence on the real effects of bank mergers. I find temporal negative effects on annual sales and employment. These results vary from Fraisse, Hombert, and Lé (2018), who find no effect on employment and investment. One limitation of this paper is that my estimates for real effects observe pretrends, and causal interpretations are difficult. Future studies should further investigate the real effects of bank mergers.

A Data Appendix

A.1 Variable Definitions

Table A.1: Definitions of Outcome Variables.

Variable	**Definition**	**Source**
BankNumber	The number of banks (up to ten)	Firm Information File
Switching	Dummy variable that takes one if the main bank in year t is different from that in year $t-1$.	Firm Information File
Downgrading	Dummy variable that takes one if the firm switches to a lower-rank bank.[a]	Firm Information File
Upgrading	Dummy variable that takes one if the firm switches to a higher-rank bank.[a]	Firm Information File
SameGrade	Dummy variable that takes one if the firm switches to a same-rank bank.[a]	Firm Information File
LoanRatio	Total Loan[b]/Total Liabilities	Financial Information File
TradeRatio	Trade Credit[b]/Total Liabilities	Financial Information File
ExternalRatio	LoanRatio+TradeRatio	Financial Information File
IntRate	Interest Paid/Interest-Bearing Debt[c] scores in year t are lower than 50.	Financial Information File
ln(Sales)	The natural logarithm of annual sales	Firm Information File
ln(Emp)	The natural logarithm of employment	Firm Information File
Profit/Sales	Annual profit/Annual sales	Firm Information File
Noncreditworthy	Dummy variable that takes one if the credit	Firm Information File

[a] To list from the highest to the lowest rank, (i) city bank, (ii) regional bank, (iii) shinkin bank, and (iv) credit cooperative.
[b] Total Loan is calculated as the sum of short and long-term loans, and trade credit is calculated as the sum of accounts payable and note payable.
[c] Interest-Bearing Debt is defined as the sum of the total loan, corporate bond, and discounted bill.

A.2 Details of Sample Construction

The source of firm-bank relationships and other firms' characteristics is the TSR Firm Information File (*Kigyo Jyohou File 3300byte*) provided by TSR. The source of financial information is the TSR Financial Information File (*Zaimu Jyohou File*) which is also provided by TSR. Merging these two datasets with a unique firm id, I construct the analysis sample at the firm-year level. In my main analyses, I construct the sample by the following procedure:

TSR Firm Information File

- Restrict observations with an account period later than August of the previous year.
- Drop duplicated observations with an identical combination of a firm id and an account period.
- Restrict observations with unlisted firms.
- Drop observations whose address ids take zero.
- Drob observations with zero-employment or zero-capital.
- Drob observations transacting with multiple branches of the same bank.
- Restrict observations with non-bankruptcy.
- Drop if a main bank is neither a city bank, a regional bank, shinkin bank, nor a credit cooperative.

TSR Financial Information File

- Restrict observations whose accounting time period is twelve months.
- Drop if non-negative variables are less than zero.
- Drop all variables are zero.
- Drop if either total assets or total liabilities and equity are zero.
- Drop duplicated observations with an identical combination of a firm id and an account period.

Merging Two Datasets

- Merge two datasets above by a firm id and an accounting period. Drop unmatched observations.
- Keep observations whose firm-bank relationships in the previous year is available.
- Drop if any of outcome variables are missing.
- Winsorizing outcome variables from balance sheets, annual sales, and profits at 1% and 99% tails.
- Drop if merged banks are main banks after the mergers as they no longer exist.
- Drop if either borrowings or interest paid are zero.
- Keep firms whose main banks are regional banks in 2004.

A.3 Summary Statistics

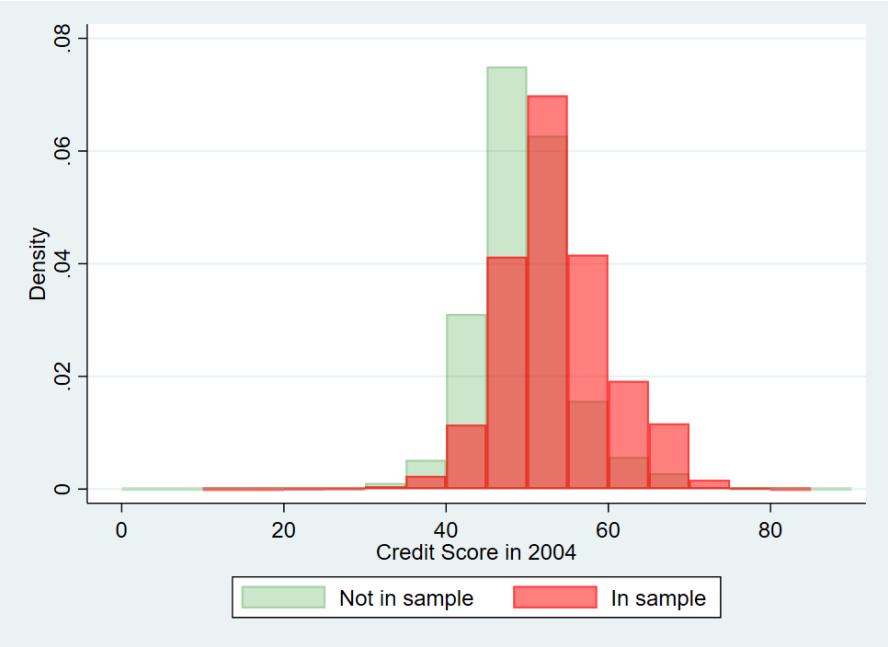
Table A.2: Summary Statistics.

	Sample		
	All	Treated	Never-Treated
BankNumber	2.903	2.977	2.895
	(1.731)	(1.756)	(1.727)
Termination	0.031	0.035	0.030
	(0.173)	(0.184)	(0.172)
Initiation	0.058	0.064	0.057
	(0.234)	(0.245)	(0.232)
Switch	0.021	0.023	0.021
	(0.144)	(0.149)	(0.144)
Downgrade	0.006	0.006	0.006
	(0.078)	(0.077)	(0.078)
Upgrade	0.003	0.003	0.004
	(0.059)	(0.053)	(0.059)
Samegrade	0.012	0.014	0.011
	(0.107)	(0.149)	(0.106)
LoanRatio	0.575	0.579	0.574
	(0.257)	(0.256)	(0.257)
TradeRatio	0.125	0.134	0.124
	(0.180)	(0.186)	(0.180)
ExternalRatio	0.701	0.713	0.699
	(0.240)	(0.234)	(0.240)
IntRate	2.258	2.224	2.263
	(1.708)	(1.710)	(1.708)
Sales (¥10 million)	115.646	126.398	114.362
	(514.369)	(711.606)	(485.472)
Emp	30.960	31.583	30.885
	(87.308)	(96.769)	(86.109)
Profit (¥10 million)	1.367	1.368	1.367
	(20.513)	(14.299)	(21.133)
Profit/Sales	0.005	0.005	0.005
	(0.073)	(0.071)	(0.073)
Credit Score	50.152	49.922	50.180
	(6.505)	(6.208)	(6.539)
1{Credit Score<50}	0.471	0.472	0.471
	(0.499)	(0.499)	(0.499)
N (Individual)	107197	11412	95785
N (Individual × Year)	746527	79640	666887

Notes: This table displays summary statistics of the sample covering the years 2004-2018. Each column reports the means and the standard deviations (in parentheses). These statistics are calculated using the sample used in my main analysis in Section 5.

A.4 Distribution of Credit Score

Figure A.1: Distribution of Credit Score



Notes: This figure plots the distributions of credit scores for my analysis sample (red) and for samples not in my sample but in the entire TSR Firm Information File (green).
Source: The TSR Firm Information File and the TSR Financial Information File

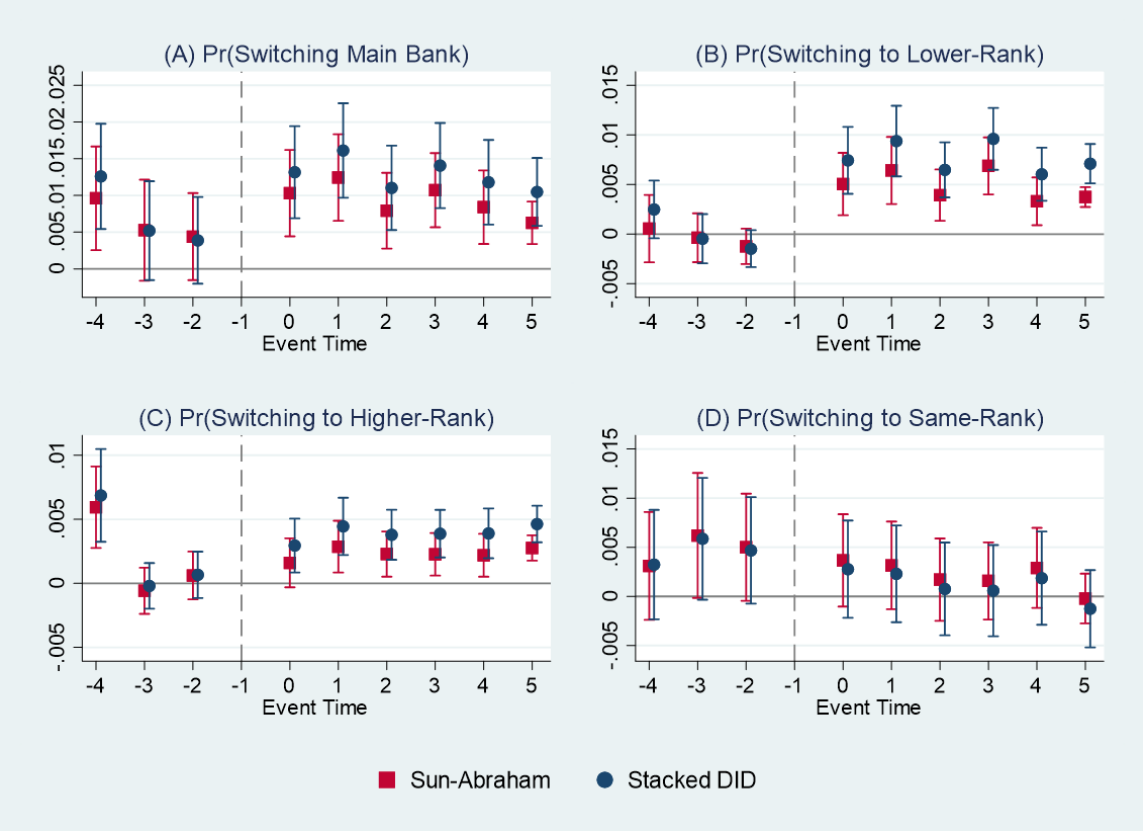
B Additional Figures and Tables

B.1 Additional Analyses and Robustness Checks

Figure B.1: Number of Banks

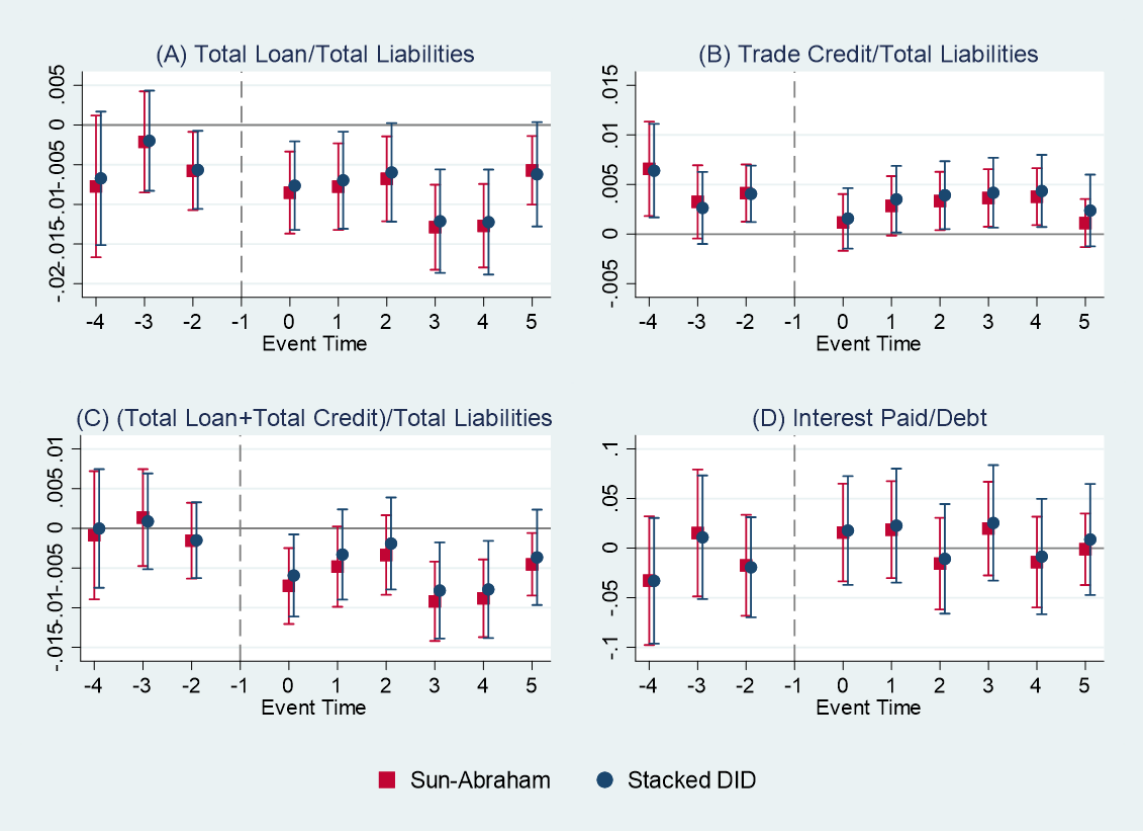
Notes: These figures plot the estimated event study coefficients. The estimates using the imputation estimator of Sun and Abraham (2021) are displayed in red, and the estimates using the stacked difference-in-differences approach are depicted in navy. The omitted category is Year -1. Each bar represents a 95% confidence interval. Panel A is the number of banks, and Panel B is the probability of decreasing the number of banks. Panel C is the probability of increasing the number of banks. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level.

Figure B.2: Switch of Main Bank



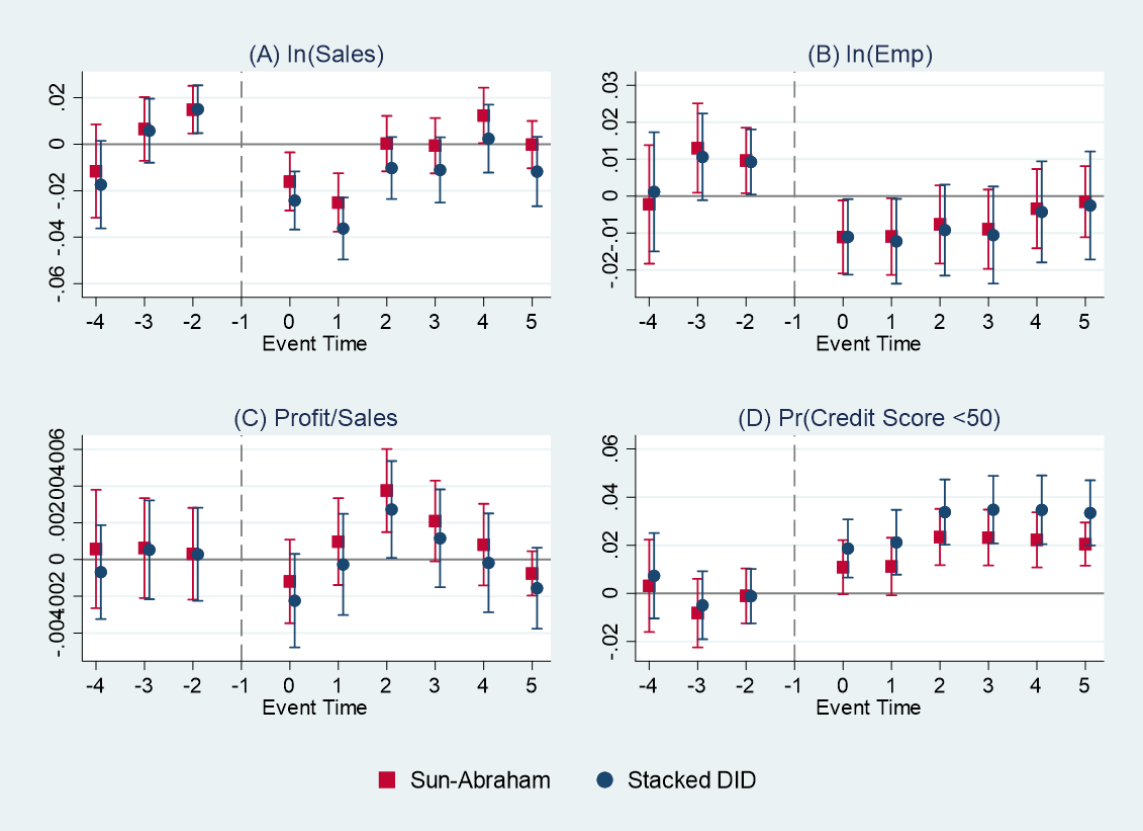
Notes: These figures plot the estimated event study coefficients. The estimates using the imputation estimator of Sun and Abraham (2021) are displayed in red, and the estimates using the stacked difference-in-differences approach are depicted in navy. The omitted category is Year -1. Each bar represents a 95% confidence interval. Panel A is the probability of switching the main bank. Panel B is the probability of downgrading the main bank, and Panel C is upgrading. Panel D is the probability of switching the main bank to the same rank. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level.

Figure B.3: External Finance



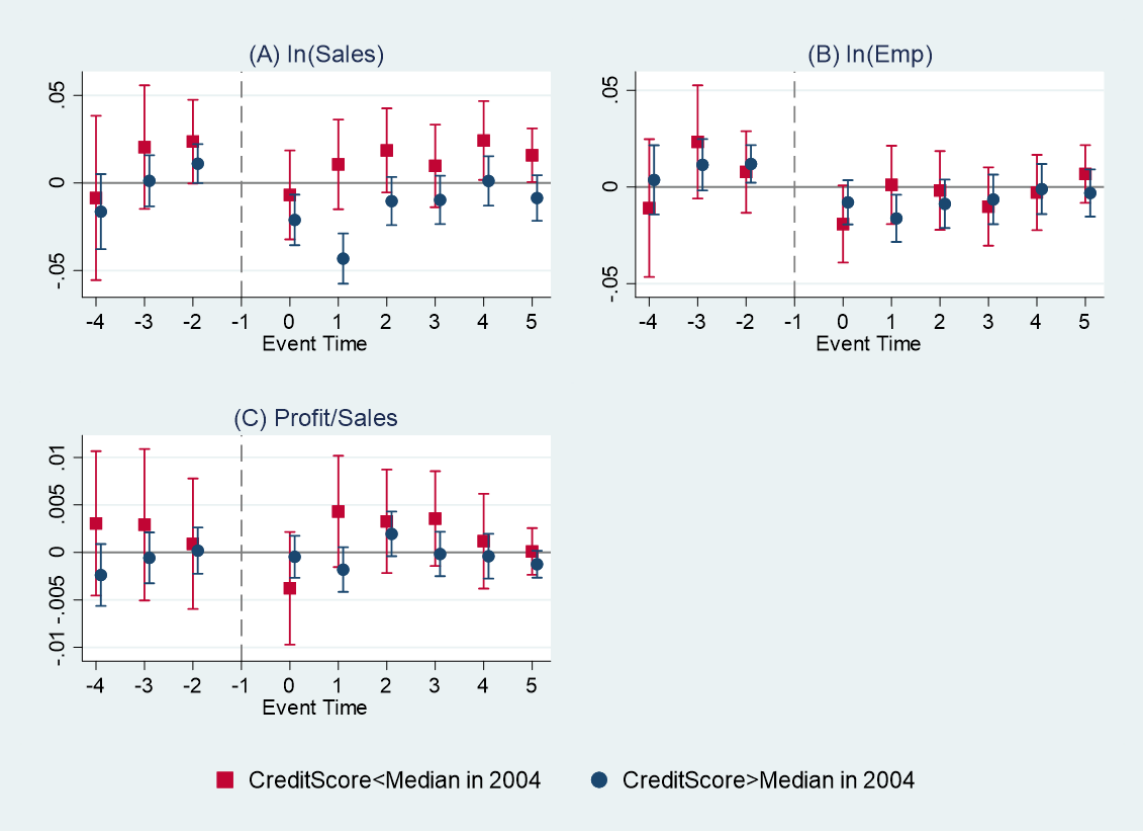
Notes: These figures plot the estimated event study coefficients. The estimates using the imputation estimator of Sun and Abraham (2021) are displayed in red, and the estimates using the stacked difference-in-differences approach are depicted in navy. The omitted category is Year -1. Each bar represents a 95% confidence interval. Panel A is loan amounts divided by total liabilities, and Panel B is amounts of trade credit divided by total liabilities. Panel C is the sum of loan amounts and trade credit, divided by total liabilities. Panel D is interest paid divided by interest-bearing debt. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level.

Figure B.4: Real Effects and Creditworthiness



Notes: These figures plot the estimated event study coefficients. The estimates using the imputation estimator of Sun and Abraham (2021) are displayed in red, and the estimates using the stacked difference-in-differences approach are depicted in navy. The omitted category is Year -1. Each bar represents a 95% confidence interval. Panel A is the natural logarithm of annual sales, and Panel B is the natural logarithm of employment. Panel C is profit divided by annual sales. Panel D is a dummy variable that takes 1 if credit scores are lower than 50. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level.

Figure B.5: Heterogeneity: Real Activities and Creditworthiness



Notes: These figures plot the estimated event study coefficients from Equation 1 using the estimator of Sun and Abraham (2021). the mergers occur in Year 0. The baseline period is Year -1, the year prior to the mergers. The treatment variable $Treat$ takes one if a firm transacts with a merging bank in the year prior to the mergers and zero otherwise. The subsample estimates whose credit scores in 2004 are lower than the median are displayed in red. The subsample estimates whose credit scores in 2004 are higher than the median are depicted in navy. Panel A plots coefficients for $lnSales$, the natural logarithm of annual sales. Panel B plots coefficients for $lnEmp$, the natural logarithm of employment. Panel C plots coefficients for $Profit/Sales$, profit normalized by annual sales. See Appendix A.1 for detailed definitions. Note that scales vary across four panels. I control the unemployment rate and population growth in the firm's region, firm fixed effects, year fixed effects, 2-digit industry fixed effects, and prefecture fixed effects. The standard errors are clustered at the firm level, and I indicate 95% confidence intervals.

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