Does Geographical Proximity Matter in Small Business Lending? Evidence from the Switching of Main Bank Relationships[†]

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Abstract

Using a unique and huge firm-bank matched dataset in Japan during 2000-2010, this paper examines whether the lending distance matters for maintaining firm-main bank relationships. To this end, we utilize exogenous variations in firm-main bank distances brought about by bank mergers and bank branch consolidations. We find, first, that the change in lending distance positively affects the probability of switching firm-main bank relationships. This effect is more pronounced for when the distance increased than for when it decreased. Second, the average lending distance of firms that switched their main banks significantly decreased after the switch. Our findings suggest that geographical proximity is still an important factor for firm-main bank relationships.

JEL classifications: G21, R12

Keywords: lending distance, main bank relationships

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1. Introduction

Loans to small businesses have traditionally been extended by a local lender that has physical presence (headquarter and branches) in the neighborhood, because many of these firms are informationally opaque and thus a lender primarily relies on their "soft" information. Collecting soft information requires a lender to have direct contact with small business borrowers, and creates the "tyranny of distance" in small business lending. However, advances in information technology over the past decades have considerably transformed the landscape of small business lending, and may have weakened the reliance of small businesses on local lenders. In a seminal study on the (decreasing) importance of distance in small business lending, Petersen and Rajan (2002; PR2002 hereafter) report that geographical distance between small firms and their lenders increased between 1973 and 1993 in the United States. The authors primarily attribute the increase in borrower-lender distances to the greater use of information technology such as small business credit scoring, and reject other potential causal factors such as banking industry consolidation and changes in the distribution of firm locations over time. PR2002's conjecture that information technology is the primary driver of the increasing borrower-lender distance is confirmed by the empirical study by DeYoung et al. (2011) that examine the effect of banks' adoption of small business credit scoring on lending distances.

Focusing on Japan between 2000 and 2010, this paper revisits the PR2002's question on whether distance still matters in small business lending. Using a unique and huge firm-bank matched dataset, we perform the following three exercises. First, we examine how the geographical

distances between borrower firms and their main banks have evolved over time. PR2002 report that the distance between small firms and their lenders has grown at 3.4 percent per year during 1973-1993, after controlling for other factors that affect the distance. Brevoort et al. (2010) and DeYoung et al. (2011) also report that borrower-lender distance has increased in the 1980s and 90s in the U.S. with a qualification that the increasing distance was observed only for banks that adopted credit scoring models (DeYoung et al. (2011)) and for firms with high credit quality and with experienced ownership (Brevoort et al. (2010)). In contrast, empirical evidence on the evolution of borrower-lender distance in countries other than the U.S. is rather limited.[5] Degryse and Ongena (2005) use the loan portfolio data of a large Belgian bank and report that the distance between the borrowers and the Belgian bank under study increased only modestly between 1975 and 1997. To the best of our knowledge, our paper is the first to examine the evolution of borrower-lender distance in Japan.

Second, we conduct a simple univariate analysis and multivariate probit model estimations to examine whether the lending distance affects borrower firms' probability of switching their main banks. Extant empirical studies including Agarwal and Hauswald (2010), Bellucci et al. (2013), Degryse and Ongena (2005), DeYoung et al. (2008), and Knyazeva and Knyazeva (2012) find that the geographical proximity among borrowers, their lenders, and other rival potential lenders affect pricing and availability of loans. There are two main arguments for the causal relationship between

[5] There are several empirical studies on distance for countries other than the U.S. that either uses cross-section data (Bellucci et al. (2013) and Mistrulli and Casolaro (2008) for Italy) or focuses on the evolution of distances between a headquarter and branches within banks (Alessandrini et al. (2009) for Italy). Carling and Lundberg (2005) use data on borrower-lender distances between 1994-2000 in Sweden, but they do not report the evolution of the distances during the period.

lender-borrower distance and loan terms. First, shorter geographical distance decreases the search costs and transportation costs between borrowers and the lenders they transact with. Second, shorter borrower-lender distance increases the amount and precision of soft information about borrower firms such as their skills and reputations that lenders can obtain. In addition, the higher precision of information caused by shorter borrower-lender distances also affects the competitive pressure from rival lenders, as these potential lenders become more concerned about adverse selection and "winner's curse", especially when they are located at longer distances to the borrowers (Hauswald and Marquez (2006), Schaffer (1998)). However, in spite of richness of empirical studies on the price and quantity of lending transactions, there is little empirical study that examines the impact of the lending distance on the establishment, continuation, and breakup of long term firm-bank relationships. This paper contributes to the literature on lending distance by investigating whether the geographical distance between firms and their main banks affect the decision to switch their relationships.

Even if we found the positive association between lending distance and the switching of firm-main bank relationships, it is difficult to identify the *causal* impact of geographical distance on firm-main bank relationships. That is, we cannot rule out the possibility of reverse causality; namely a firm that is more likely to switch will choose a main bank located at a longer distance at the outset. Similar reasoning seems to apply for statistical associations between geographical proximity of a borrower-lender and pricing and availability of loans, but most previous studies do not deal with this endogeneity problem. Notable exception in this regard is Kanyazeva and Kanyazeva (2012), which

employs instrumental variable methodology to examine the causal effect of borrower-lender distance on loan spreads. In order to gauge the causal impact of geographical distance, we need to single out exogenous variation in lending distance. To this end, we utilize exogenous changes in firm-main bank distances brought about by bank mergers and bank branch consolidations. Because bank mergers and branch consolidations are not likely to be affected by individual firm-main bank relationships (reverse causality), it is reasonable to assume that *changes* in lending distances due to bank mergers and branch consolidations are exogenous factors that might affect the likelihood of switching firm-main bank relationships.

One of the virtues of focusing on the switch of firm-main bank relationships, rather than loan terms, is that we are able to consider the *interaction* between firm-main bank relationships and lending distances. As ex-ante lending distances are important for the switching probability of firm-main bank relationships, switching relationships themselves directly change firm-bank distances ex-post. This motivates our third exercise, in which we investigate the evolution of lending distances after firms switch their main banks. If higher transaction costs / informational opaqueness associated with longer distances are the main drivers of the main bank switch, we would observe shorter distances with the new main banks. On the other hand, if the lending distance plays relatively a minor role compared to other factors that affect firm-main bank relationships, we would observe no significant differences or even longer distances after the switch.

The major findings of this study are as follows. First, borrower-lender distances increased

modestly in Japan between 2000 and 2010. The mean (median) distance, as measured by the Euclidian distance (straight-line) between a firm-headquarter and its transacting branch of the main bank, increased from 4.97 km (1.51 km) in 2000 to 5.99 km (1.72 km) in 2010. Much of this increasing distance is due to the decreasing share of borrower-lender relationships whose distances are less than 1km and the increasing share of the relationships whose distances fall into the range between 1-50km. We also find that the share of firms that transact with the nearest branch of their main banks decreased from 56.9 percent in 2000 to 52.3 percent in 2010.

Second, we find that exogenous changes in geographical distance positively affect the switching probability of firm-main bank relationships. The impact of lending distance is statistically and economically significant. Based on our estimation result, a marginal one-unit increase in the log differences of lending distance, which corresponds to 4.9km (5.3km) for an median borrower-main bank distance of about 1.6km (1.8km), raises the probability of firm-main bank switches by 8.6 (5.8) percentage points during 2000-2005 (2005-2010). Splitting our observations into a subsample of firm-main bank pairs whose geographical distance increased and a subsample of those whose distance decreased, we find that the positive effect of lending distance on the switching probability of main banks is substantially larger for the former subsample. That is, while the increasing lending distance raises the likelihood of the termination of main bank relationships, the decrease in lending distance does not reduces the switching probability at the same magnitude. Taken together, these findings suggest that although the lending distance increased modestly during the 2000s, it still matters for the

continuation of small firm-main bank relationships.

Third, regarding the firm-main bank relationships being switched, we find that the average lending distance of new relationships becomes significantly shorter than that of old ones. This finding confirms that the lending distance is an important factor for firm-main bank relationships.

The remainder of the paper is organized as follows. The next section explains our dataset. Section 3 documents the evolution of geographical distance between a firm and its main bank in Japan during 2000-2010. Section 4 presents univariate analyses on how borrower-lender distances affect firms' switching probability of their main banks, followed by the probit model estimation that also controls for various characteristics of firms and their main banks. Section 5 examines the ex-post lending distances of firms that changed their main banks. Section 6 summarizes our findings and lay out possible extensions.

2. Dataset

There are two main sources of our dataset. One is the firm-level credit database provided by the Teikoku Databank Ltd. (TDB), a leading credit research firm that compiles information on more than 2 million firms in Japan. From the TDB database, we use information on firms' attributes including their addresses, their basic accounting information and the name of lending banks including transacting branches. To identify a main bank, we resort to the list of banks with which a firm transacts. Following widely accepted convention, we define the main bank as the one listed at the

top, as banks are deemed to be listed in the order of importance to the firm in the TDB database.

The other source is *Nihon Kinyu Meikan* (Almanac of Financial Institutions in Japan) provided by *Nihon Kinyu Tsushinsha* (The Japan Financial News Co., Ltd.). This provides information on the addresses of all bank branches in Japan as well as basic attributes of banks and branches.

In addition to the two sources above, we use *Ginko Hensenshi Database* (Bank History Database) provided by Japanese Bankers Association, *Zenkoku Shinyo-kinko Zaimushohyo* (Financial Statements of Shinkin Banks) and *Zenkoku Shinyo-kumiai Zaimushohyo* (Financial Statements of Credit Cooperatives) provided by *Kinyu Tosho Consultantsha* in order to identify all mergers and acquisitions (M&As) of financial institutions during 2000-2010. As explained below, we need this information in order to correctly identify the switch of main bank relationships.

Using all sources above, we construct our dataset that contains information of borrower-main bank relationships, their geographical distances, borrower firm characteristics, and lender (main bank) characteristics in years 2000, 2005, and 2010. As our main research interest lies in a firm-main bank distance and the switch of the relationship, the unit of observation for most variables is a pair of firm-main bank. Definitions of key variables will be described in detail below.

3. Evolution of lending distance between 2000 and 2010

The main variable of interest in this study is the borrower-lender distance. For every firm in the

TDB dataset, we calculate the Euclidian (straight-line) geographical distance between a firm headquarter and the transacting branch of the firm's main bank. As noted above, we define the main bank as the one listed at the top in the TDB database. In order to identify the geographical location (latitude and longitude) of a firm and its main bank, we geocode their address data using the CSV Address Matching Service provided by the Center for Spatial Information Science, University of Tokyo.

Table 1 provides summary statistics of borrower-lender distances in years 2000, 2005, and 2010. The unbalanced dataset (1,075,885–1,319,848 observations) uses as many observations as possible, while the balanced panel dataset (698,223 observations) contains firms for which we can obtain data for all three years. The mean (median) distance in the unbalanced dataset increased from 4.97 km (1.51 km) in 2000 to 5.99 km (1.72 km) in 2010. The average distances in the balanced panel dataset exhibit a similar pattern, although the mean distances are somewhat longer in the unbalanced panel dataset than those in the balanced panel dataset. The longer mean distances in the unbalanced panel dataset is observed because firms that have entered into the TDB database in the past 5 years (F_ENTRY=1) exhibit longer distances on average. For instance, the mean distance of entrant firms in 2005 (that is, firms that exist in the TDB database in 2005 but did not exist in 2000) is 10.15km, which is much higher than the mean distance of firms in the balanced panel dataset, 4.90km. On the other hand, firms that will have exited in the coming 5 years from the TDB database (F_EXIT=1) also exhibit slightly longer lending distances than firms in the panel dataset, on average.

Exits of firms with slightly longer lending distances than others would lower the average lending distances in the balanced panel dataset. Although entrant and exited firms in Table 1 are not only limited to newly established firms or firms that close down their businesses (for instance, it may simply be the case that the TDB does not conduct the credit research of a firm in a particular year), the findings above suggest that younger firms and firms being forced out of the business transact with main banks at longer distances.

The upper panel of Table 2 compares the distribution of geographical distances in years 2000, 2005, and 2010 using the balanced panel dataset. Distributions of geographical distances are highly skewed to the left and more than 80 percent of firms have transactions with the main bank branches that are located within 5km from the firm headquarters. Table 2 also shows that the increasing lending distances during 2000-2010 is mostly attributable to decreasing share of firms whose geographical distances to the main bank branches are within 1 km and to increasing share of firms having lending distances at 1-50km.

The lower panel of Table 2 presents the distribution of geographical "order" of a firm's transacting branch compared to all the main bank's branches a firm can potentially transact with. For example, if a firm transacts with the nearest branch of its main bank, the geographical order takes the value of one. The lower panel of Table 2 shows that more than half of firms in our dataset transact with the nearest branches of their main banks, but that the shares of those firms decreased from 56.9 percent in 2000 to 52.3 percent in 2010.

Increasing firm-main bank distances and the decreasing share of firms that transact with the nearest branch during the 2000s suggest that the impact of distances on lending transactions and long-term relationships in particular might have been diminishing. To examine this point further, in the following sections, we examine interactions between firm-main bank distances and their relationships. First, we test whether distances are positively associated with the switching probability of firm-bank relationships (section 4). Second, we study the evolution of firm-main bank distances after the switch (section 5).

4. The effect of lending distance on firm-main bank relationships

4.1. Methodology

To examine the effect of lending distance on the termination of firm-main bank relationships, we utilize exogenous *changes* in lending distance. To be more precise, we focus on a subset of firms whose transacting branches of main banks disappeared geographically during t-1 and t, possibly because of bank mergers and/or branch consolidations.[6] If a firm were to maintain the main bank relationship at time t, it needs to transact with another branch of the same main bank located nearby. We assume that this counterfactual transacting branch is the one having the shortest distance with the old transacting branch that disappeared. We then calculate the geographical distance between a firm's headquarter and this counterfactual transacting branch, and takes the difference between the

[6] Note that there were many cases in which the name of a firm's transacting branch changed but the geographical location of the branch did not change despite of bank mergers and/or branch consolidations. We do not include such observations in our empirical analysis in sections 4 and 5.

lending distance associated with an old transacting branch at time t-1 ($DIFF\_DISTANCE_t$). The change in lending distance calculated in this manner is likely to be exogenous for a firm and its main bank's decision on terminating main bank relationships at time t ($SWITCH_t$), because it is unlikely that the bank merger and branch consolidation is driven by an individual firm-bank relationship.

Table 3 shows distributions of firm-main bank pairs based on relocation of firm headquarters and their transacting branches of main banks. Note that changes in lending distance also occur when firm headquarters relocate, while we focus on observations associated with the relocation of main bank branches, the lower left cells of the matrices that are shadowed in gray in Table 3. The share of this subsample is higher during 2000-2005 (19.6 percent) than that during 2005-2010 (9.5 percent), which is consistent with the casual observation that Japanese banking industry experienced bank merger wave and massive consolidations of branching networks in the first half of 2000s (Figure 1).

4.2. Univariate analysis

We first conduct univariate analysis. We divide our samples of firm-main bank pairs into quintiles based on the changes in firm-main bank log distances between time *t-1* and *t* ($lnDIFF\_DISTANCE_t$) and calculate the average frequency of the termination of firm-main bank relationships for each quintile at time *t* ($SWITCH_t$). Following previous studies, we use the log of one plus distance to take into account of the skewed distribution of distances and the likely nonlinearity of the economic impact of distances on a firm's switching probability of its main bank.

As explained in the previous subsection, $\ln DIFF\_DISTANCE_t$ measures the difference between counterfactual lending distance (in log) at time *t* and actual lending distance (in log) at time *t-1*. Counterfactual lending distance is defined as the Euclidian distance between a firm *i*'s headquarter and the branch of its main bank *j* that has the shortest distance with the firm's transacting branch at time *t-1*, which disappeared during *t-1* and *t*.

$SWITCH_t$ is a dummy variable that indicates whether a firm-main bank relationship at time *t-1* breaks up by time *t*. Note that the variable SWITCH takes into account of mergers and acquisitions of main banks. For example, if a firm's main bank is identified as bank X at time *t-1* and bank Y at time *t*, we check whether bank X experienced mergers and acquisitions between *t-1* and *t* and whether the bank's new name after the merger, if any, is Y. If that is the case, we treat it as a non-switching observation and attaches zero to $SWITCH_t$. Note also that if a firm switches the transacting *branch* of the same main bank, SWITCH takes the value zero as well.

Because we have observations for years 2000, 2005, and 2010, time interval for subscript *t* is 5 years and we use observations for *t*=2005 or 2010. That is, we examine how the changes in lending distance during year 2000-2005 and 2005-2010 affect firms' switching probability of their main banks during the same period.

The results of univariate analyses are summarized in Figure 2. Figure 2 indicates that the lending distances are positively associated with the switching probabilities of firm-main bank relationships during both 2000-05 and 2005-10 periods. Note, however, that the positive

relationships disappear for firm-main bank pairs that fall in the range of 3rd quintile and 4th quintile of lnDIFF_DIFFERENCE$_t$.

4.3. Multivariate analysis

4.3.1. Empirical strategy

To control for other factors that affect whether to switch firm-main bank relationships, we estimate the reduced form probit regression models in the following form:

$$\Pr(\text{SWITCH}_{ijt} \mid X_{ijt-1}) = \Psi(\beta_0 + \beta_1 \ln \text{DIFF\_DISTANCE}_{ijt} + \beta_2 \ln \text{DISTANCE}_{ijt-1} + \beta_3 FIRM_{it-1} + \beta_4 BANK_{jt-1} + \varepsilon_{ijt}) \quad (1)$$

where ε_{ijt} is a mean zero error term that encompasses unobservable factors. The unit of observation is a firm-main bank pair, represented by subscripts *i* and *j*, respectively, and we estimate equation (1) separately for periods 2000-2005 (*t*=2005) and 2005-2010 (*t*=2010). Table 4 presents summary statistics of variables explained below.

Key variable of interest is the change in Euclidian distance between a firm *i* and its main bank *j*, ln*DIFF_DISTANCE*$_t$. To control for the possibility that a firm transacting with the main bank located at a longer distance at time *t-1* is more likely to switch, we also include the level of lending distance, lnDISTANCE$_{t-1}$. In addition, the effect of geographical distance on firm-main bank relationships may depend on whether the changes in lending distance is positive, implying a firm's counterfactual distance with the main bank is longer than the older distance with disappeared transacting branch, or negative, implying shorter counterfactual distance. To examine the possibility

that the effect of distance on the switching probability of main banks is asymmetric with respect to counterfactual distances, we also estimate the probit regression models for subsamples of longer distances and shorter distances.

Firm characteristics variables at time *t-1*, $FIRM_{it-1}$, that may affect the switching probability of firm-main bank relationships include a firm's TDB score (F_SCORE) that represents its credit quality. F_SCORE takes a value on a 1-100 point scale, and the TDB researchers calculate the score based on quantitative and qualitative information on the soundness of the firm's management, the firm's repayment ability, and whether others can safely trade with the firm from a third-party viewpoint. Because there are many missing observations for F_SCORE in year 2000, we use current profit to sales ratio (F_PROFIT) instead when estimating the switching probability between 2000 and 2005. A firm's transparency (opaqueness) is represented by the dummy variable indicating whether the firm's financial records are collected by the TDB (F_RECORD). We also control for firm size, represented by the size of employment in logarithm (F_lnEMP), and firm age in logarithm (F_lnAGE).

Main bank characteristics at time *t-1* ($BANK_{jt-1}$) include the number of employees for the main bank at the branch-level (B_lnEMP_BR) and at the bank-level (B_lnEMP_BK), both in logarithm. The former variable is a proxy for the number of loan officers that produce soft information of potential borrower firms, while the latter variable is a proxy for bank size. In addition, dummy variables representing the type of the main bank are included (B_TYPE). The default of

B_TYPE is Shinkin banks. We also include a dummy variable, B_MA, which indicates whether main banks of firms at time *t-1* carried out mergers and acquisitions between *t-1* and *t*.

4.2.2. Results

The results of the probit model estimations are presented in Tables 5. Table 5-(1), and 5-(2) report the results in periods 2000-2005 and 2005-2010, respectively. In each table, column (A) reports the result using all observations. Columns (B) and (C) report the results using subsamples of firm-main bank pairs with longer distances (lnDIFF_DISTANCE is positive) and with shorter distances (lnDIFF_DISTANCE is negative, respectively. We use heteroscedasticity-robust standard errors to gauge the statistical significance of estimands.

As for the variable of interest, we confirm that lnDIFF_DISTANCE positively affected the switching probabilities of firm-main bank relationships after controlling for other factors in columns (A). The marginal effect of an increase in lnDIFF_DISTANCE is 8.6 percent point during 2000-2005 and 5.8 percent point during 2005-2010, respectively, and both are statistically significant at the 1 percent level. For a pair of borrower-main bank with median distance of about 1.6km (1.8km) during 2000-2005 (2005-2010), the one point increase in lnDIFF_DISTANE corresponds to increasing distance from 1.86km (2.12km) to 6.78km (7.48km). Thus, ,the marginal effect of increasing firm-main bank distance on the switching probability is economically significant as well.

Comparing the coefficients of lnDIFF_DISTANCE in columns (B) and that in columns (C)

of Tables 5-(1) and 5-(2), we find that the effect of lending distance on firm-main bank relationships is stronger when the changes in lending distance is positive (columns (B)) than when it is negative (columns (C)). For example, in Table 5-(1), the marginal effect of increasing lending distance is 0.106 and statistically significant, while that of decreasing lending distance is 0.013 and insignificant. That is, firms and banks are more likely to terminate their main bank relationships when alternative bank branches of the same main banks are located farther than the disappeared transacting ones, but this does not necessarily imply that probability of maintaining relationships increases when alternative branches are located at a shorter distance. This result suggest that firms and banks downgrade the value of main bank relationships when they become geographically less proximate, but do not appreciate the value of relationships when they become more proximate.

Regarding firm characteristics, credit quality variable F_PROFIT in years 2000-2005 and F_SCORE in years 2005-2010 are negatively associated with the switching probability in most cases. The results suggest that creditworthy firms are less likely to change their main banks. The marginal effect of transparency F_RECORD is positive, indicating informationally opaque firms that do not record financial statements data in TDB database is less likely to switch. The result is consistent with the theory that concerns on asymmetric information inhibit competing banks to bid aggressively to establish relationships with opaque firms (Rajan (1992)). The marginal effect of F_lnEMP is significantly positive, indicating larger firms are more likely to switch. Firm age (F_AGE) exhibits negative effect, indicating older firms are less likely to switch.

Turning to lender characteristics, bank merger dummy variable (B_MA) is significantly positive in most cases. This implies that firm-main bank relationships are more likely to be terminated when firms' main banks experienced mergers and acquisitions. The number of employees at transacting branch (B_lnEMP_BR) is negatively associated with the switching probability, indicating firms that transact with larger branches are more likely to continue relationships. This result suggests that a branch with a larger number of loan officers has higher ability to produce soft information, and hence is less likely to be switched by client firms. The marginal effect of the number of employees at the bank level (B_lnEMP_BK) is also negative during 2000-2005, but it is positive during 2005-2010. The marginal effects of bank type dummy variables (default is Shinkin bank) suggest that firms whose main banks are larger (city banks, trust banks, and long term credit banks) tend to switch more frequently in general. However, even though credit cooperatives are smaller than Shinkin bank, the switching probability is higher when the main bank is credit cooperatives. Dummy variable for regional banks is positive during 2000-2005, but it is negative during 2005-2010.

5. Evolution of lending distance after the switch

The results of probit model estimations in the previous section suggest that geographical proximity is still an important factor for maintaining firm-main bank relationships. This section re-examines the issue by comparing the ex-post lending distances of firms that switched their main banks with the

counterfactual lending distances with old main banks. If higher transaction costs / informational opaqueness associated with longer distances are the main driver of breaking up main bank relationships, we would observe shorter distances with the new main banks. On the other hand, if the lending distance plays relatively a minor role compared to other factors that affect firm-main bank relationships, we would observe no significant differences or even longer distances after the switch.

In Table 6, rows "SWITCH=1" report the mean and median distances of firm-main bank pairs that changed their relationships during 2000-2005 (upper rows) and 2005-2010 (lower rows). For example, for years 2000-2005, the mean distance of old firm-main bank relationships in year 2000 before the transacting branch disappeared, labeled "Ex-ante," is 9.03 km, whereas the mean of "counterfactual" distance after the transacting branch disappeared is 11.35km. Finally, the mean distance of new relationships after the switch ("Ex-post") is 6.94km. Comparing ex-post lending distances with counterfactual distances, the mean distance decreased by 4.41km, and the t-test indicates that the difference is statistically significant at the 1 percent level. The difference in median, -1.13km, is also statistically significant at the 1 percent level based on Wilcoxon signed-ranks test. We obtain similar results regarding observations in years 2005-2010.

Other than the decrease in ex-post lending distances compared to counterfactual distances above, two things are worth noting in Table 6. First, differences between "counterfactual" and "ex-ante" distances are larger for "switchers" (SWITCH=1) than for non-switchers (SWITCH=0). This is consistent with the probit estimation results in Table 5 that lnDIFF_DIFFERENCE is a

significant determinants of terminating main-bank relationships. Second, the average differences between “ex-post” distances and “ex-ante” distances are negative for switchers while they are slightly positive for non-switchers. This is consistent with the hypothesis that geographical proximity is an important determinant of maintaining firm-main bank relationships.

Overall, Table 6 indicates that the lending distance after the switch became shorter on average and suggests that the distance is indeed a significant factor for firm-main bank relationships.

6. Summary and future works

Using a unique and huge firm-bank matched dataset, this paper examined the evolution of geographical distance between a firm and its main bank in Japan during 2000-2010. We find that the average borrower-lender distance increased modestly in Japan between 2000 and 2010. However, in spite of increasing lending distances, we find evidences for the relevance of geographical proximity for firm-main bank relationships. Not only is the probability of switching firm-main bank relationships positively associated with the exogenous variations in lending distance, but also the average lending distance of firms that switched their main banks decreased significantly after the switch.

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Table 1: Evolution of firm-main bank distances in 2000-10

This table presents summary statistics of firm-main bank distances in kilometers. Entrant firms (F_ENTRY=1) are those that have entered into the TDB database in the past 5 years. Exited firms (F_EXIT=1) are those that will have exited from the TDB database in the coming 5 years.

Year	NOB	Mean	Median	Std. Dev.	Min	Max
Unbalanced panel dataset						
2000	1,075,885	4.97	1.51	30.97	0.00	2394.37
2005	1,195,676	5.47	1.66	34.26	0.00	2394.28
2010	1,319,848	5.99	1.72	38.61	0.00	2390.24
Balanced panel dataset						
2000	698,223	4.43	1.51	26.31	0.00	2394.37
2005	698,223	4.90	1.61	30.22	0.00	2394.28
2010	698,223	5.32	1.67	33.18	0.00	2390.24
Entrant firms (F_ENTRY=1)						
2005	53,846	10.15	1.92	61.26	0.00	1744.75
2010	91,404	10.22	1.78	64.92	0.00	2120.43
Exited firms (F_EXIT=1)						
2000	196,595	6.64	1.56	42.14	0.00	1724.00
2005	221,618	6.56	1.67	41.34	0.00	2132.68

Unit: kilometers

Table 2: Distribution of firm-main bank distances in 2000-10

This table presents percentage shares of distribution of firm-main bank pairs with respect to geographical distance and geographical order, using balanced panel dataset in Table 1. Geographical order measures the rank of a firm's transacting branch in terms of distance compared to all the main bank's branches a firm can potentially transact with. If a firm transacts with the nearest branch of its main bank, the geographical order takes the value of one.

	Share in percent			Differences in percent share		
	2000	2005	2010	2005-2000	2010-2005	2010-2000
Geographical distance						
0-1km	38.00%	35.88%	34.65%	-2.12%	-1.23%	-3.35%
1-2km	20.47%	20.82%	20.82%	0.35%	0.00%	0.35%
2-3km	11.83%	12.13%	12.24%	0.31%	0.11%	0.42%
3-4km	7.63%	7.80%	7.97%	0.17%	0.16%	0.34%
4-5km	5.20%	5.40%	5.51%	0.19%	0.12%	0.31%
5-7km	6.12%	6.36%	6.55%	0.23%	0.19%	0.43%
7-10km	4.38%	4.65%	4.84%	0.27%	0.19%	0.47%
10-50km	5.70%	6.22%	6.59%	0.52%	0.36%	0.88%
50-100km	0.34%	0.35%	0.36%	0.01%	0.01%	0.03%
100km-	0.33%	0.39%	0.47%	0.07%	0.08%	0.14%
Geographical order						
1	56.90%	54.39%	52.31%	-2.51%	-2.08%	-4.59%
2	14.27%	14.62%	15.16%	0.35%	0.54%	0.88%
3	6.72%	6.98%	7.15%	0.26%	0.17%	0.44%
4	4.00%	4.22%	4.33%	0.21%	0.11%	0.33%
5	2.71%	2.80%	2.93%	0.09%	0.13%	0.22%
6	1.92%	2.00%	2.14%	0.08%	0.14%	0.22%
7	1.47%	1.49%	1.58%	0.01%	0.09%	0.11%
8	1.11%	1.20%	1.28%	0.09%	0.08%	0.17%
9	0.93%	0.97%	1.03%	0.04%	0.05%	0.09%
10	0.78%	0.86%	0.87%	0.08%	0.00%	0.08%
11	0.64%	0.69%	0.77%	0.04%	0.08%	0.13%
12	0.53%	0.61%	0.65%	0.08%	0.04%	0.12%
13	0.50%	0.54%	0.57%	0.05%	0.03%	0.08%
14	0.45%	0.47%	0.49%	0.03%	0.01%	0.04%
15 and lower	7.05%	8.15%	8.74%	1.10%	0.59%	1.69%

Table 3: Distribution of firm-main bank pairs based on relocations

These tables present the distributions of firm-main bank pairs based on relocations of firm headquarters and those of main bank branches. The analyses in Figure 2 and Tables 4-6 use firm-main bank pairs in the lower left cells of the matrices that are shadowed in gray; that is, we use observations of firms whose transacting branches of their main banks disappeared geographically during 2000-2005 and 2005-2010.

[2000-2005]

		Relocation of firms' headquarters		
		No	Yes	Total
Relocation of main banks' transacting branches	No	409,662 (63.42%)	79,674 (12.33%)	489,336 (75.75%)
	Yes	126,313 (19.55%)	30,333 (4.70%)	156,646 (24.25%)
	Total	535,975 (82.97%)	110,007 (17.03%)	645,982 (100.00%)

[2005-2010]

		Relocation of firms' headquarters		
		No	Yes	Total
Relocation of main banks' transacting branches	No	690,688 (80.28%)	75,195 (8.74%)	765,883 (89.02%)
	Yes	81,984 (9.53%)	12,509 (1.45%)	94,493 (10.98%)
	Total	772,672 (89.81%)	87,704 (10.19%)	860,376 (100.00%)

Figure 1: Number of financial institutions and offices in Japan

This figure presents the aggregated number of financial institutions and their offices (headquarters and branches) in Japan.

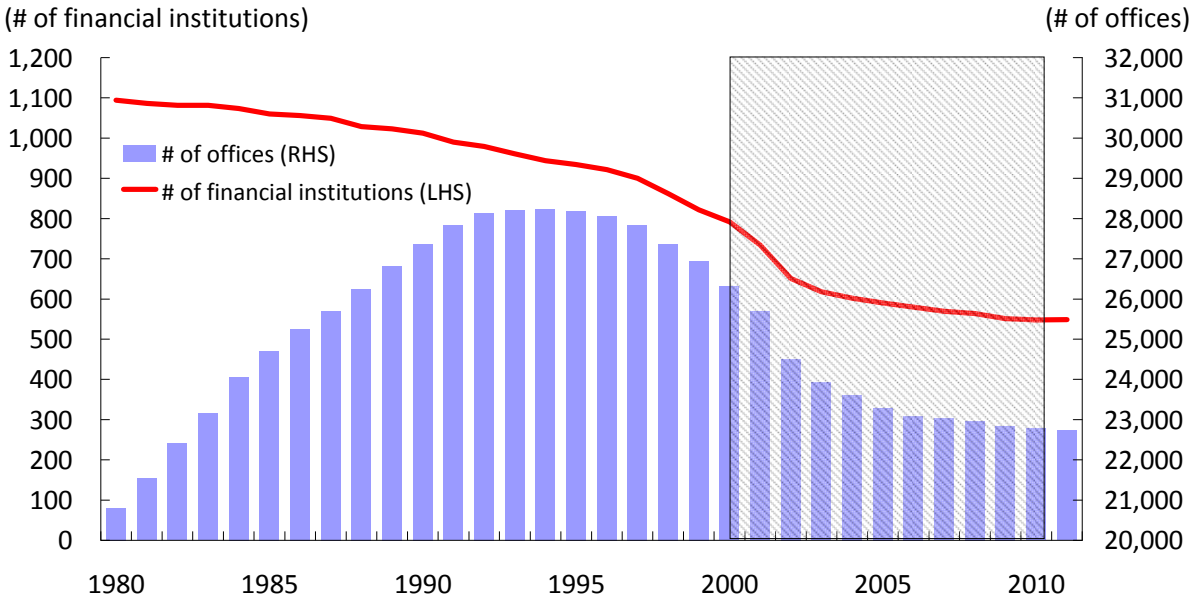

Figure 2: Firm-main bank distances and firm-main bank switches: unvariate analysis

This figure presents associations between quintiles of differences in firm-main bank log distances between time t-1 and t, denoted as lnDIFF_DISTANCE(t), and their switching frequencies between t-1 and t, denoted as SWITCH(t). A gray line represents [t-1, t] = [2000, 2005] and black line represents [t-1, t] = [2005, 2010], respectively.

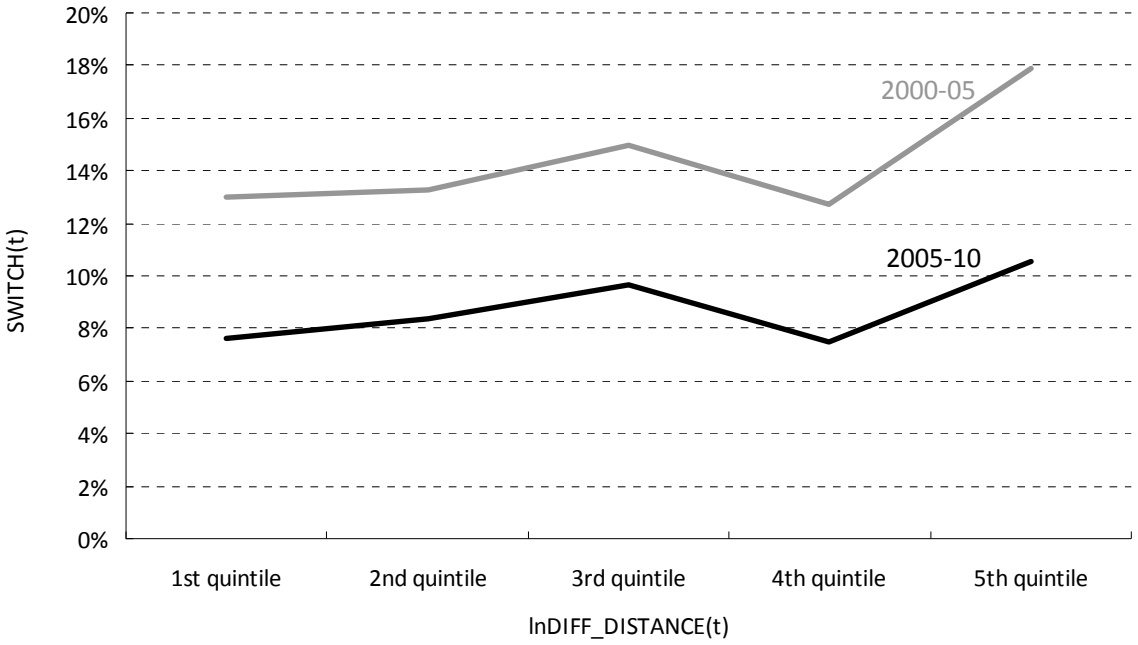

Table 4: Summary statistics

This table presents summary statistics of variables used in the probit model estimations (Table 5). Definitions of variables are provided in the text.

	(1) 2000-2005				(2) 2005-2010			
Variable	NOB	Mean	Std. Dev.	Median	NOB	Mean	Std. Dev.	Median
Dependent variable								
SWITCH	126,313	0.141	0.348	0	81,984	0.085	0.280	0
Borrower-Lender Distance								
lnDIFF_DISTANCE	126,313	0.095	0.392	0.000	81,984	0.102	0.458	0.006
lnDISTANCE	126,313	1.139	0.870	0.957	81,984	1.194	0.861	1.036
Firm characteristics								
F_lnAGE	126,313	3.108	0.659	3.219	81,984	3.189	0.640	3.296
F_lnEMP	126,313	2.306	1.348	2.079	81,984	1.942	1.264	1.792
F_PROFIT	126,313	0.740	5.056	0.174				
F_SCORE					81,984	45.967	9.415	46.000
F_RECORD	126,313	0.196	0.397	0	81,984	0.178	0.382	0
Main bank characteristics								
B_lnEMP_BR	126,313	3.047	0.714	2.996	81,984	2.816	0.703	2.773
B_lnEMP_BK	126,313	7.770	1.356	8.038	81,984	7.265	1.435	7.274
B_CITY	126,313	0.467	0.499	0	81,984	0.225	0.417	0
B_REG	126,313	0.189	0.392	0	81,984	0.325	0.468	0
B_TRUST	126,313	0.007	0.080	0	81,984	0.000	0.014	0
B_LCB	126,313	0.004	0.064	0	81,984	0.000	0.019	0
B_REG2	126,313	0.125	0.331	0	81,984	0.181	0.385	0
B_SHINKIN	126,313	0.175	0.380	0	81,984	0.231	0.421	0
B_CREDIT-COOP	126,313	0.033	0.179	0	81,984	0.037	0.188	0
B_OTHER	126,313	0.000	0.022	0	81,984	0.001	0.035	0
B_MA	126,313	0.693	0.461	1	81,984	0.194	0.395	0

Table 5: Probit estimations on firm-main bank switches

This table presents the probit model estimation results on firm-main bank switches, SWITCH. dF/dx indicate marginal effects of each variable. ***, **, * indicate a significance level of 1, 5, and 10%, respectively. Heteroscedasticity-robust standard errors are reported.

(1) 2000-2005

Estimation method: probit	(1) 2000-2005								
	(A) All			(B) lnDIFF_DISTANCE>0			(C) lnDIFF_DISTANCE<0		
Dependent variable: SWITCH	dF/dx	Robust Std. Err.	z	dF/dx	Robust Std. Err.	z	dF/dx	Robust Std. Err.	z
Borrower-Lender Distance									
lnDIFF_DISTANCE	0.0859 ***	0.0023	36.7500	0.1058 ***	0.0029	36.3500	0.0128	0.0078	1.6300
lnDISTANCE	0.0291 ***	0.0011	27.0200	0.0375 ***	0.0018	20.9100	0.0215 ***	0.0020	10.5200
Firm characteristics									
F_lnAGE	-0.0208 ***	0.0015	-13.7400	-0.0198 ***	0.0024	-8.2900	-0.0185 ***	0.0029	-6.4400
F_lnEMP	0.0052 ***	0.0008	6.2600	0.0059 ***	0.0013	4.3900	0.0063 ***	0.0016	4.0100
F_PROFIT	-0.0008 ***	0.0002	-4.3500	-0.0009 ***	0.0003	-2.8500	-0.0010 ***	0.0003	-2.8700
F_RECORD	0.0319 ***	0.0029	11.6700	0.0303 ***	0.0046	6.9200	0.0276 ***	0.0053	5.4400
Main bank characteristics									
B_lnEMP_BR	-0.0233 ***	0.0016	-14.2100	-0.0228 ***	0.0027	-8.5600	-0.0099 ***	0.0034	-2.9100
B_lnEMP_BK	-0.0059 ***	0.0020	-2.9200	-0.0102 ***	0.0030	-3.3800	-0.0175 ***	0.0036	-4.8200
B_MA	0.0584 ***	0.0028	19.6300	0.0746 ***	0.0042	17.3200	0.0705 ***	0.0052	13.3600
B_CITY	0.0421 ***	0.0072	5.8800	0.0611 ***	0.0115	5.5500	0.0655 ***	0.0141	4.8900
B_REG	0.0156 ***	0.0055	2.8800	0.0276 ***	0.0080	3.5700	0.0232 ***	0.0092	2.5900
B_TRUST	0.3117 ***	0.0202	19.0700	0.3409 ***	0.0256	16.1000	0.2965 ***	0.0414	9.0200
B_LCB	0.1883 ***	0.0255	9.1400	0.4055 ***	0.0614	7.7400	0.2285 ***	0.0534	5.4100
B_REG2	0.0615 ***	0.0055	12.3700	0.0817 ***	0.0081	11.1800	0.0785 ***	0.0099	8.8800
B_CREDIT-COOP	0.1860 ***	0.0085	27.0000	0.1773 ***	0.0122	17.6300	0.1960 ***	0.0177	13.8100
B_OTHER	0.0916 *	0.0575	1.8600	0.1243 *	0.0792	1.8700	0.0638	0.0899	0.8100
Industry dummies (F_IND)	YES			YES			YES		
Number of observations	126,313			53,751			33,529		
Wald chi-sq	4866.96			3228.90			1205.14		
Prob>chi-sq	0			0			0		
Pseudo R-sq	0.0507			0.0770			0.0483		
Log pseudo likelihood	-48721.84			-21235.23			-12529.31		

(2) 2005-2010

Estimation method: probit	(2) 2005-2010								
	(A) All			(B) lnDIFF_DISTANCE>0			(C) lnDIFF_DISTANCE<0		
Dependent variable: SWITCH	dF/dx	Robust Std. Err.	z	dF/dx	Robust Std. Err.	z	dF/dx	Robust Std. Err.	z
Borrower-Lender Distance									
lnDIFF_DISTANCE	0.0577 ***	0.0019	30.2400	0.0702 ***	0.0023	31.1100	0.0168 ***	0.0062	2.7100
lnDISTANCE	0.0207 ***	0.0010	19.7100	0.0266 ***	0.0014	18.3500	0.0139 ***	0.0017	8.3400
Firm characteristics									
F_lnAGE	-0.0171 ***	0.0015	-11.5000	-0.0188 ***	0.0021	-9.0800	-0.0164 ***	0.0023	-7.0900
F_lnEMP	0.0076 ***	0.0008	9.0000	0.0085 ***	0.0012	7.1900	0.0063 ***	0.0013	4.9000
F_SCORE	-0.0002 *	0.0001	-1.7700	-0.0002	0.0002	-1.2500	-0.0003 **	0.0002	-2.1400
F_RECORD	0.0307 ***	0.0031	10.6700	0.0329 ***	0.0044	8.1900	0.0264 ***	0.0048	5.9000
Main bank characteristics									
B_lnEMP_BR	-0.0037 **	0.0017	-2.2000	-0.0036	0.0022	-1.6100	-0.0046 *	0.0027	-1.7100
B_lnEMP_BK	0.0060 ***	0.0017	3.4600	0.0071 ***	0.0024	2.9300	0.0061 **	0.0027	2.2700
B_MA	0.0113 ***	0.0030	3.8400	0.0066	0.0042	1.5800	0.0235 ***	0.0057	4.4900
B_CITY	0.0020	0.0065	0.3100	0.0032	0.0090	0.3500	-0.0004	0.0098	-0.0500
B_REG	-0.0126 ***	0.0036	-3.4000	-0.0103 **	0.0049	-2.0600	-0.0186 ***	0.0055	-3.3100
B_TRUST	0.1114	0.0926	1.5700	-0.0265	0.0692	-0.3300	0.3424 ***	0.1775	2.7000
B_LCB	0.1418 ***	0.0736	2.5900	0.0648	0.0696	1.1300	0.3684 ***	0.1754	2.9100
B_REG2	-0.0005	0.0037	-0.1400	0.0098 *	0.0052	1.9200	-0.0091	0.0057	-1.5400
B_CREDIT-COOP	0.0200 ***	0.0060	3.5700	0.0141 *	0.0085	1.7500	0.0088	0.0106	0.8600
B_OTHER	-0.0487 ***	0.0118	-2.7100	-0.0596 ***	0.0101	-3.2200	-0.0495	0.0305	-1.0200
Industry dummies (F_IND)	YES			YES			YES		
Number of observations	81,984			44,396			32,041		
Wald chi-sq	1807.56			1494.94			424.26		
Prob>chi-sq	0			0			0		
Pseudo R-sq	0.0395			0.0577			0.0230		
Log pseudo likelihood	-22981.21			-12679.41			-8764.40		

Table 6: Evolution of lending distances after the switch

This table presents the summary statistics of firm-main bank distances in kilometers. Rows "SWITCH=1" present summary statistics of firm-main bank pairs that switched relationships and rows "SWITCH=0" present those of non-switchers. For a firm with "SWITCH=1", the rows "Diff." show the difference between ex-post lending distances with the new main bank and counterfactual lending distances with the old main bank (before-after comparison). *** indicate that the difference in mean and median is significant at the level of 1 percent.

	Type of distance		NOB	Mean	Std. Dev.	Median	Min	Max
SWITCH=1	Ex-ante (2000)	(a)	17,779	9.03	54.31	1.97	0.00	1685.27
	Couterfactual (2000-2005)	(b)	17,779	11.35	55.99	2.54	0.00	1685.35
	Ex-post (2005)	(c)	17,779	6.94	48.53	1.41	0.00	1678.51
	Diff. (Ex post-Couterfactual)	(c)-(b)		**-4.41** ***		**-1.13** ***		
	Ex-ante (2005)	(a)	7,004	9.55	60.37	2.33	0.00	2369.43
	Couterfactual (2005-2010)	(b)	7,004	14.34	64.92	3.04	0.00	2369.43
	Ex-post (2010)	(c)	7,004	7.68	49.64	1.66	0.00	1311.03
	Diff. (Ex post-Couterfactual)	(c)-(b)		**-6.67** ***		**-1.38** ***		
SWITCH=0	Ex-ante (2000)	(a)	108,534	5.19	31.27	1.55	0.00	1650.31
	Couterfactual (2000-2005)	(b)	108,534	5.57	31.42	1.77	0.00	1650.31
	Ex-post (2005)	(c)	108,534	5.58	32.09	1.75	0.00	1650.31
	Diff. (Ex post-Couterfactual)	(c)-(b)		0.02		**-0.02** ***		
	Ex-ante (2005)	(a)	74,980	5.63	35.18	1.78	0.00	1744.75
	Couterfactual (2005-2010)	(b)	74,980	6.15	35.60	2.05	0.00	1744.86
	Ex-post (2010)	(c)	74,980	6.03	35.40	1.98	0.00	1744.86
	Diff. (Ex post-Couterfactual)	(c)-(b)		**-0.12** ***		**-0.07** ***		

Unit: kilometers