RIETI Discussion Paper Series 07-E-037

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Bank Consolidation and Soft Information Acquisition in Small Business Lending*

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This version: May 2007

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* This paper is the result of research performed at the Industrial and Financial Structure Workshop at the Research Institute of Economy, Trade, and Industry in Japan. This paper was presented at Chuo University. We are grateful to Yuji Honjo and Eiji Okuyama for their insightful comments. We also gratefully acknowledge the financial support by the Daiginkyo Forum of the Osaka Bankers' Association.

ABSTRACT

We empirically examine the impact of bank consolidation on bankers' acquisition of soft information about borrowers. Using a dataset of small businesses, we found that bank mergers have a negative impact on soft information acquisition by small banks while those by large banks that have less interest in acquiring soft information irrespective of mergers have no impact. Detailed analyses of the post-merger organizational restructuring show that the measures of an increase in organizational complexity have a negative and significant impact on soft information acquisition by small banks, while the measures of cost-cut do not have any significant impact on soft information acquisition. This result implies that the increase in organizational complexity by bank mergers hindered soft information acquisition, which is consistent with Stein's prediction [2002, J. Fin.] on the comparative advantage of simple and flat organizations in acquiring and processing soft information.

Key words: Relationship lending, soft information, bank consolidation, merger

JEL classification code: G21, G34, L22, L14, D82

I. Introduction

A surge in bank consolidation has been observed worldwide since the late 1980s and 1990s. In response to this trend, a large volume of empirical literature on the effects of bank consolidation has been developed to investigate its economic impact.[1] In several studies, researchers have examined the impact of bank consolidation on bank performance or its market value.[2] In other studies, researchers have examined the impact of bank consolidation on deposit/credit market performance.[3]

In accordance with the development of the literature on bank-borrower relationships, recent studies have shifted their focus to the impact of bank consolidation on the credit availability or performance of relationship borrowers, who are typically small businesses. Since bank consolidation usually accompanies the reevaluation of existing borrowers, it is likely to have a detrimental effect on the bank-borrower relationships and would, thus, be harmful to borrowers. In fact, numerous empirical studies have obtained evidence that is supportive of this view.[4] However, the existing evidence is indirect in the sense that these studies do not investigate the consolidation impact on the key factor that makes the bank-borrower relationship meaningful, *soft information*. Soft information is defined as information that is difficult to communicate in a

[1] Amel, Barnes, Panetta, and Salleo [2004] and Berger, Demsetz, and Strahan [1999] provide concise literature reviews on this subject.

[2] The literature along this line includes Cornnet, McNutt, and Tehranian [2004], Hosono, Sakai, and Tsuru [2006], Houston, James, and Ryngaert [2001], Humphrey and Vale [2004], Kane [2000], Knapp, Gart, and Becher [2005], Penas and Unall [2004], Rhodes [1998], Rime and Stiroh [2003], Stiroh [2000], Stiroh and Rumble [2006], and Yamori, Harimaya, and Kondo [2003].

[3] As for deposit interest rates, it is found that they temporarily go down after bank mergers (Prager and Hannan [1998]) but eventually go up as efficiency gains materialize in the long-run (Focarelli and Panetta [2003]). Regarding loan interest rates, it is observed that loan rates increase in a market segment in which competition is stifled by a merger (Calomiris and Pomrojnangkool [2005]), while they go down as a result of improved cost efficiency if the market shares of merging banks are not too large (Sapienza [2002]).

[4] Studies using U.S. data found that bank consolidation can decrease small business lending by merging banks, but that rivals eventually compensate for it (Berger, Saunders, Scalise, and Udell [1998], Peek and Rosengren [1998]). Studies using Italian data also found that bank-firm relationships are more likely to be terminated when the lending bank is acquired (Focarelli, Panetta, and Salleo [2002], Sapienza [2002]), but this adverse effect is compensated by other banks in the long run (Bonaccorsi-di-Patti and Gobbi [2007]). Some studies also found that in-market mergers decrease the market values of the borrowers of acquired banks (Carow, Kane, and Narayanan [2006], Karceski, Ongena, and Smith [2005]).

verifiable manner even within an organization, such as an entrepreneur's competence and employee morale (Boot [2000], Stein [2002]), and is considered to be accessible exclusively from a primary incumbent lender.[5]

In the present study, we try to provide direct evidence for the impact of bank consolidation on this key factor, the production or acquisition of soft information by banks. We propose the three hypotheses shown below about the bank-consolidation impact on the production of soft information suggested by the existing theories and statistically investigate the relative importance of these hypotheses.

First, an increase in the bank size and organizational complexity due to consolidation may deter soft information acquisition. Stein [2002] shows that information-collecting sections of banks, such as bank branches, have smaller incentive to collect soft information when the decision authority is alienated from them. This is because soft information is hardly used when making decisions, and, thus, it is rarely rewarded in such an organization. Although Stein's original theory [2002] does not include the impact of consolidation, we can naturally extend the theory to predict that bank consolidation that increases the size of an organization and widens the discrepancy between loan-decision sections and information-production sections is likely to hinder soft information production. The difference in the corporate culture among pre-merger banks may also prevent the communication of soft information. Hereafter, we call this detrimental effect of bank consolidation the *bank-complexity hypothesis*.

Second, bank consolidation entails large-scale restructuring to realize the synergy effect mainly resulting from improved cost efficiency, as found in the existing empirical literature. The restructuring includes shutdowns of duplicated branches and administrative sections. In the process of such personnel reductions and relocations, soft information production capacity may be diminished. This hypothesis, which we call the *cost-cut hypothesis*, predicts that bank mergers

[5] By investing to acquire soft information about existing borrowers, a relationship lender can make a profit from informational advantage over rival banks in the future, while borrowers can ensure credit availability for their promising projects (Sharpe [1990]).

decrease soft information acquisition by banks.

Third, a decrease in the intensity of the lending competition due to consolidation may increase soft information acquisition. As Hauswald and Marquez [2006] demonstrated, the return from the investment for information acquisition is more likely to be recouped in the future in less competitive lending markets. This theory predicts that bank consolidation that is likely to decrease competitive pressure in a lending market promotes soft information acquisition by banks. We call this the *competition hypothesis*.

A unique micro dataset collected from *the Management Survey of Corporate Finance Issues in the Kansai area* of Japan sets the stage for our empirical investigation of the consolidation impact on the production of soft information. The survey, which was conducted right after the bank consolidation wave in Japan since the late 1990s in response to the banking crisis, asked firms to evaluate to what extent their main banks knew about the responding firms, their owners or managers, industries that they belonged to, communities where they were located, and the markets of their products/services. We use these evaluations to measure soft information acquisition by main banks. The survey also provides information about the identification of the main bank of each responding firm, its financial standing, and the bank-firm relationship. Matching this information with the bank consolidation data makes it possible to test the impact of bank consolidation on soft information acquisition by banks.

Our statistical analyses show that bank mergers decrease soft information acquisition. This result is consistent with the bank-complexity hypothesis and/or the cost-cut hypothesis explained above. The analyses also show that this negative merger impact is observed only among small banks but is not observed among large banks, which are less intended to acquire soft information regardless of mergers. This implies that bank mergers hinder soft information production by small banks, whereas no deterioration of soft information is observed for large banks. The result for small banks is consistent with both the bank-complexity hypothesis and the cost-cut

hypothesis explained above, while the result for large banks implies that large banks may not acquire soft information.

The additional analysis on the characteristics of merging banks shows that the post-merger increment of the organizational complexity and the post-merger cost-cut do not significantly differ by bank size. However, it shows that the post-merger complexity increment has a negative and significant impact on soft information acquisition, in particular, that by small firms, while the post-merger cost cut does not have any significant impact. Thus, our empirical result shows that the bank-complexity hypothesis is the primary factor that explains the negative impact of mergers.

In summary, we obtained results that are consistently supportive of Stein's theory [2002] or its extension. For small banks, bank mergers have a negative impact through the mechanism of the bank-complexity hypothesis, which implies that mergers complicate the managerial organization and reduce incentives to produce soft information. For large banks, no consolidation impact is observed, which implies that soft information is not likely to be produced in these banks. In addition to these findings related to bank consolidation, we also obtained evidence that directly supports Stein's theory [2002]: irrespective of whether or not bank consolidation takes place, small banks tend to acquire soft information more often than large banks do. Thus, our findings support Stein's theory [2002] on the comparative advantage of simple and flat organization in producing and processing soft information from three angles.

Consolidation decisions by banks are an exogenous variable in the context of soft information acquisition since it is hardly plausible that the primary purpose of bank consolidation is to reduce soft information production. Therefore, bank consolidation serves as a natural experiment to test the effect of the change in organizational complexity or cost reduction on soft information acquisition. In this sense, the present study provides robust evidence for Stein's organizational theory [2002] and reinforces the evidence found by Berger, Miller, Petersen, Rajan, and Stein [2005] using U.S. data and that found by Uchida, Udell, and Watanabe [2006] using

Japanese data.

The rest of the paper is organized as follows. Section II is a summary of the existing theories that can predict the effect of bank consolidation on the acquisition of soft information. Section III is an introduction of our dataset and our measures of soft information acquisition. Section IV is the result of univariate analysis. The methodology of our multivariate analysis is explained, and the main results are presented in Section V. Section VI is a detailed analysis of the bank-complexity hypothesis and the cost-cut hypothesis. The final section is a summary and conclusion of the findings.

II. Background Theory

In small business lending, loan underwriting decisions by banks are often made on the basis of qualitative information of borrowers, such as entrepreneurs' competence and enthusiasm or employee morale and skills.[6] This type of information, called *soft information*, is difficult to communicate precisely in a verifiable manner. We can present a few determinants of the intensity of bankers' soft information acquisition in the context of small business lending. In this section, we review these theories in detail and extend them to predict possible impacts that bank consolidation would have on soft information acquisition.

A. The bank-complexity hypothesis

Stein [2002] has shown that an organization in which the decision-making authority is allocated to a lower level in the hierarchy tends to acquire more soft information. Soft information is usually collected at a lower level of the hierarchy, such as loan officers at bank branches. If the authority of loan-underwriting decisions is allocated to an upper level, it is hard for soft information

[6] See, for example, Berger and Udell [2002, 2006].

to reflect on decision-making, and the effort to acquire such information is not rewarded.[7] Consequently, soft information acquisition becomes less intensive in an organization in which those who acquire soft information do not have a decision-making authority[8].

Needless to say, bank consolidation increases bank size and complicates the decision-making process within the organization. Furthermore, merged banks have diverse historical backgrounds; thus, communication across different corporate cultures becomes harder within the new organization. This may also discourage soft information accumulation by a loan officer at a branch level. Therefore, we can extend Stein's theory [2002] to predict that bank consolidation decreases soft information acquisition by banks. We call this the *bank-complexity hypothesis*.

B. The cost-cut hypothesis

An important purpose of bank consolidation is to realize a synergy effect. Financing costs for merged banks may decrease as a result of getting a too-big-to-fail status (Penas and Unal [2004]) or acquiring the ability to construct more diversified portfolios. Operation costs also decrease by trimming off duplicated branch networks and other administrative costs. In order to realize such cost efficiency, especially with respect to operation costs, merged banks need to cut down on personnel expenses and relocate personnel at the time of consolidation. Such a personnel cut or relocation can reduce the production capacity for soft information. If a merged bank considers the accumulation of soft information as a valuable asset that can yield future profits exceeding the cost efficiency resulting from a personnel cut, then the bank would try to preserve the information production capacity by limiting the personnel cut. Otherwise, the bank would discard parts of the production capacity for soft information at the time of consolidation. We refer to this

[7] Liberti and Mian [2006] empirically show that loan underwriting decisions made at the upper level of the bank hierarchy tend to depend less on soft information than those made at a lower level.

[8] Consistent with this prediction, studies such as those by Cole et al. [2004], Berger, Miller, Petersen, Rajan, and Stein [2005], and Uchida, Udell, and Watanabe [2006] give evidence that banks with a more complex organization tend to have weaker relationships with their borrowers than banks with a smaller and simpler organization.

deterioration of soft information as the *cost-cut hypothesis*.

C. The competition hypothesis

Some theoretical studies have been focused on the effect of increased lending competition on soft information acquisition by banks. Hauswald and Marquez [2006] show that the investment in information acquisition decreases as the number of competing banks increases in a framework of localized oligopoly. An additional market share that can be captured by information advantage becomes smaller as the number of rivals increases. Therefore, the investment in information acquisition is less likely to be recouped. This results in the decrease in the investment in soft information acquisition. Boot and Thakor [2000] also show that bankers' investments in relationship lending (sector specialization), which can be interpreted as an investment in the acquisition of soft information, decrease with the number of competing banks.[9] Bank consolidation decreases the number of competitors. It should, therefore, have a favorable impact on the investment in soft information acquisition. We call this the *competition hypothesis*.

In short, the bank-complexity hypothesis and the cost-cut hypothesis predict that a bank consolidation decreases soft information acquisition, while the competition hypothesis predicts the opposite. As a first step, we now examine the overall direction of the bank consolidation impact on soft information acquisition by banks.

III. Data

Most of our dataset is collected from the micro data of *the Management Survey of Corporate*

[9] Boot and Thakor [2000] also show (in their Theorem 3) that banks are more likely to provide relationship lending for a larger portion of borrowers as the number of rivals increases, given a certain level of upfront investment in sector specialization, in order to shield their existing customers from poachers. We do not focus on this effect in this paper, since our dataset captures how much soft information banks maintain as a result of upfront investment, rather than how intensively they utilize it.

Finance Issues in the Kansai Area of Japan, which was conducted by the Regional Finance Workshop at the Research Institute of Economy, Trade, and Industry (RIETI) in June 2005. The survey asks small and medium-sized enterprises (SME) in three prefectures in the Kansai area, Osaka, Hyogo, and Kyoto, about firm characteristics, including financial standing, management strategies, bank relationships, and loan transactions.[10]

Target firms from each prefecture are randomly chosen by employee-size categories ((1) 1-20 employees, (2) 21-50 employees, (3) 51-100 employees, (4) more than 100 employees). The target size from each prefecture is adjusted according to the relative number of enterprises in each prefecture; i.e., 5,000 firms from Osaka Prefecture, 2,500 firms from Hyogo Prefecture, and 1,500 firms from Kyoto Prefecture are selected as target firms.

A total of 2,020 of 9,000 target firms responded effectively. The response rate was 22.4%. The number of observations was reduced to 1,405 after dropping those firms whose main banks are not private banks and those for which no soft information indicators were available, which is explained below. Further, the number of observations was reduced to 992 after dropping the observations whose dependent or independent variables were not available. The industry composition in this final dataset is manufacturing (38.1%), information and communications (3.3%), transportation (6.4%), wholesale (20.1%), retail (5.8%), real estate (1.7%), restaurants and hotels (1.3%), and other services (10.8%).

A. Measure of soft information

The survey contains a question that enables us to obtain information about the information production by banks. Each respondent company is asked to evaluate the knowledge or satisfaction level of its main bank in terms of various factors, and six of them are related to soft information:

[10] The Kansai area is the second largest metropolitan area in Japan and the business center of Western Japan. The area consists of six prefectures. Among these, the target firms were chosen from Osaka, Hyogo, and Kyoto, including those located in three major cities, Osaka, Kobe, and Kyoto, in their respective prefectures. Osaka is the second largest city in Japan.

knowledge about (Q1) the responding company itself, (Q2) owners or managers of the company, (Q3) the industry that the company belongs to, (Q4) the local community where the company is located, (Q5) the market for the products/services of the company; and satisfaction with (Q6) the frequency of contacts by loan officers of a main bank. For each of these items, responding companies grade their main banks from grade 1 (inadequate or low) to 5 (excellent or high). We use the resulting indicators as the measures of soft information acquisition by main banks.

In addition to using these indicators separately, we also use the variable SOFTINFO, which is defined by the primary principal component of the six soft-information indicators.[11] The principal component is calculated from 1,405 observations whose indicators are all available. We consider that SOFTINFO represents sufficient information that is contained in the six indicators, since it captures 57.8% of the variance-covariance of the six indicators.

A shortcoming of these variables is that the responding firms may not necessarily think only of soft information when they answer the questions. For example, an established and publicly well-known firm that submits solid financial statements to its main bank may give the bank a rating of 5 (excellent) with respect to the banks' knowledge about the responding company itself (Q1) not because the main bank accumulates soft information about the borrower but because a significant amount of hard information is available for the firm. In order to treat this potential problem, we will control the availability of hard information for main banks in the regression analysis below.

B. Bank consolidation

We focus on five types of lending institutions in Japan that constitute the majority of main banks in

[11] SOFTINFO is similar to the soft information indices in Scott [2004] and Uchida, Udell, and Yamori [2006]. However, their indices are constructed from "5 (excellent)" answers only. Our SOFTINFO makes use of "1" through "4" information as well. In addition, their indices utilize information about the respondent firms' view on the extent that their main banks *should* know about the firms with respect to the relevant items. Our SOFTINFO does not utilize this information, and, in this sense, it is more focused on the *actual* knowledge of the main banks.

our data set: city banks (banks operating nationwide), long-term credit banks (banks specializing in long-term finance), trust banks (banks that are legally allowed to operate trust services), regional banks (local banks operating within or around one prefecture), and Shinkin banks (cooperative institutions that are allowed to lend to member firms only).[12] City banks, long-term credit banks, and trust banks are the largest, operate nationwide, and provide a wide variety of services. Regional banks are smaller and usually specialize in commercial banking in specific regions. Shinkin banks are local community banks and the smallest in our sample.[13]

In response to the serious financial distress since the late 1990s in Japan, a lot of financial institutions experienced consolidation. Among these events, we focus on bank mergers and the establishments of bank holding companies.[14] We set the window period from April 2001 to June 2005. This is because the RIETI Survey was conducted in June 2005, and it is well-known that the effects of bank consolidation vanish after approximately three years (see, for example, Rhodes [1998]). During this period, the Japanese banking industry experienced a surge of bank consolidation. There were 12 incidences of the establishment of a bank holding company, 63 events of bank mergers, and 3 cases in which banks became subsidiaries of other banks. Among the 63 merger events, 5 were among city and long-term credit banks, 4 were among trust banks, 5 were among regional banks, and 49 were among Shinkin banks.

Focusing on the main banks of our sample firms, we observed 14 mergers (5 among city banks, 3 among trust banks, 2 among regional banks, and 4 among Shinkin banks) and 4 bank failures (1 regional bank and 3 Shinkin banks) from April 2001 to June 2005. In our 992 sample firms, 595 firms' main banks experienced a merger in this period. From this information, we define a dummy variable, Merger, which is equal to one if a firm's main bank experienced a merger

[12] Member firms of Shinkin banks have 300 or fewer employees or capital of 900 million yen or less.
[13] The average total asset of each institution type in our dataset as of March 2005 is 48,059 billion JPY for major banks (city, long-term credit, and trust banks), 2,716 billion JPY for regional banks, and 918 billion JPY for Shinkin banks.
[14] As explained below, a variable representing banks' asset acquisitions from a liquidated bank is also available. Due to the small number of observations, however, detailed analysis on this variable is impossible, and the variable is generally insignificant in the regression analysis below.

during the period from April 2001 to June 2005, and, otherwise, zero.

As for the establishment of a bank holding company (BHC) in this period, 8 banks among the main banks in our dataset were involved in the foundation of bank holding companies, and 2 banks became subsidiaries of other banks. In order to capture the effect of these changes in ownership structure, we define a dummy variable, BHC, which is equal to 1 if the firm's main bank established a bank holding company or became a subsidiary of another bank and, otherwise, zero. There are several banks that experienced both a merger and the establishment of a bank holding company. In this case, the dummy variable BHC is set to be equal to zero in order to isolate the merger effects from the effect of BHC establishments.

IV. Univariate Analysis

Before running regressions, we conducted a univariate analysis of our soft information measures. Table 1 is a comparison of the distribution of the responses to each of the survey questions regarding the soft information acquisition by main banks based on whether or not a main bank experienced a merger (Panel A) and whether or not a main bank established a bank holding company (Panel B). Pearson's χ^2 statistics about the independence between row items and column items are also shown. In Panel A, it is shown that the companies whose main banks experienced mergers tend to give lower grades to their main banks' knowledge about the companies. The Chi-squared tests significantly reject the independence between the merger experience and the 1-5 answers in all questions but Q3. Therefore, we can expect that bank mergers will deter soft information acquisition by merged banks, which is consistent with the bank-complexity hypothesis and/or the cost-cut hypothesis. In contrast, significant correlations are shown in Panel B between column items and row items only in Q4 and Q5. At this point, the effect of BHC establishment on soft information seems weaker than that of mergers.

Descriptive statistics are shown in Table 2 of our soft information measures that are sorted by whether or not the main bank experienced a merger (Panel A) and whether or not the main bank experienced the establishment of a bank holding company (Panel B). The points observed in Table 1 are verified in this table as well. Statistically significant differences in the mean responses to most questions are shown in Panel A, while such differences are not seen in Panel B. Furthermore, the mean of SOFTINFO is significantly lower for the firms whose main banks experienced mergers, whereas the difference is insignificant for those in which main banks founded BHCs.

Figure 1 depicts the histogram of SOFTINFO, sorted by Merge (Panel A) and BHC (Panel B). The figures suggest that SOFTINFO tends to be somewhat lower for those companies in which the main bank experienced mergers. However, the difference in the distribution of SOFTINFO by whether the main bank established a BHC is less apparent.

Finally, we examine the difference of SOFTINFO by bank size. Table 3 shows the mean levels of SOFTINFO by splitting the sample firms by bank size and merger experiences. In the table, city banks, long-term credit banks, and trust banks are classified as large banks, while regional banks and Shinkin banks are classified as small banks. First, when we simply split the sample by the size of the main banks, we find that large banks are less inclined to acquire soft information (first row). This is consistent with the original prediction by Stein [2002]. Second, mergers decrease SOFTINFO of small main banks significantly (third low), while they do not affect SOFTINFO of large main banks at all (second row). There seems to be a difference in the merger impact across bank types. We elaborate on this relative impact in a later section.

In summary, the univariate analyses show that bank consolidation, especially mergers by small banks, is likely to hinder soft information acquisition. This result is consistent with the bank-complexity hypothesis and/or the cost-cut hypothesis. In the next section, we will examine whether these findings are robust even after controlling for potential covariates.

V. Multivariate Analysis

A. Methodology

In order to examine the impact of bank consolidation on soft information acquisition after controlling for other potential factors that could also influence soft information acquisition, we run the following linear regression:

$$SOFTINFO_i = \beta_0 + \beta_1 * Merger_i + \beta_2 * BHC_i + \beta_3 * control\ variables_i + \varepsilon_i, \quad (1)$$

where *i* is the index of responding companies. The definition of the control variables is presented in Table 4 together with their descriptive statistics. We are mostly interested in the sign and the significance of the coefficient β_1. If this coefficient is negative and significant, then we can interpret that the bank-complexity hypothesis and/or the cost-cut hypothesis is stronger. If it is positive and significant, then we can interpret that the competition hypothesis is stronger.

A potential shortcoming of this dataset is that, since the information is limited to that about the *current* main bank, we cannot determine whether a firm switched main banks upon merger, although several empirical studies have shown that there are positive impacts of mergers on the probability to switch main banks (Bonaccorsi and Gobbi [2007], Focarelli, Panetta, and Salleo [2002], and Sapienza [2002]). In order to overcome this shortcoming, we include the length of the relationship with the main bank into explanatory variables to control for such main-bank switching. If the length of the relationship is short, the implication is that the firm switched main banks recently, possibly due to a main-bank merger. Relationship terminations as an ultimate negative impact should be captured in the coefficient of the length of relationship, although we cannot single out the impact since a relationship may terminate due to reasons other than mergers. By

controlling the effect of such switches, the coefficient β_1 captures a merger impact on the soft information with respect to firms that kept lending relationships with their main banks in spite of merging. In this sense, β_1 represents the most *conservative* estimate of the merger impact on soft information acquisition.

In addition to this baseline specification, we adopt two other specifications. First, to accommodate the possibility that the effects of bank consolidation differ according to the type of main bank, we use another specification that includes the interaction terms between consolidation dummies (Merger and BHC) and bank-type dummies (Regional bank and Shinkin bank). This is to capture the difference in the merger impact by bank type. Second, we also regress *each* of the six soft-information indicators on the explanatory variables by ordered logit to determine the component that is the most seriously affected by the consolidation events.

As for the control variables, a few variables are worth mentioning. First, the dummy variables of the Regional bank and Shinkin bank by themselves are used as proxies for bank size or organizational complexity, which is expected to have positive coefficients according to the original prediction by Stein [2002] that small banks are more likely to acquire soft information. Second, as reported in the previous section, the *knowledge* of the main bank about the borrowing firm may include *hard information*, such as monthly financial reporting. The variables, Audited, Financial statement, Financial reporting frequency, and Assets of a firm are used to capture such portion of knowledge.

B. Main results

The estimated coefficients are listed in Table 5. Specification (1) is the baseline regression. Specification (2) uses the asset size of banks instead of the bank-type dummies as the proxy for bank size or complexity. Specification (3) includes the interaction terms of the consolidation dummies and the bank-type dummies.

In Specifications (1) and (2), both the Merger and BHC dummies have negative coefficients. The coefficients are statistically significant for the Merger dummy, while the BHC dummy is statistically less significant. The result is consistent with the univariate one in Table 2 and supports the bank-complexity hypothesis and/or the cost-cut hypothesis, which predict that bank mergers decrease soft information acquisition.

However, the results of Specification (3) show that the type of bank matters. A negative effect of the bank merger on soft information is observed only when the main bank is a regional or a Shinkin bank. This is consistent with the results in Table 3. In other words, bank mergers have a negative impact on soft information acquisition only for small banks, and no deterioration of information is observed from the mergers of large banks. The BHC dummy is not statistically significant.

Table 6 is a summary of the estimated coefficients of the Merger and BHC dummies when the response of each question (Q1-Q6) is regressed on these dummies and other covariates by ordered logit. In Specifications (1) and (2) (Panels A and B), the coefficients of the Merger dummy are negative in all regressions and statistically significant with respect to four questions. The signs of the coefficients of the BHC dummy are generally negative although the coefficients are insignificant except for Q4 and Q5. In Specification (3) (Panel C), the coefficients of the interaction terms of the Merger dummy and the small bank dummies, Regional and Shinkin, have negative and significant coefficients. The interactions of the BHC dummy do not have statistically significant coefficients, although they have negative coefficients. The results of Specification (3) in this table are, therefore, consistent with those in Table 5.[15]

The presence of a merger impact against small banks, as opposed to its absence against large banks, is quite suggestive about the mechanism generating the negative impact of mergers on soft information acquisition. Another important and noteworthy result is that small banks seem to

[15] As mentioned above, if we change the BHC dummy to include banks that have undergone a merger and the establishment of a bank holding company, the effect of the merger dummy becomes less significant.

accumulate soft information, while large banks do not, irrespective of mergers (the first row in Table 3, or the coefficient of the Shinkin dummy in Table 5), which is consistent with the prediction of the original theory of Stein [2002].[16] Taken together, these findings suggest that it is highly likely that the increase in the complexity upon merger negatively affects the acquisition of soft information by small banks, as predicted by the bank-complexity hypothesis.

However, it is also possible that the difference of merger impacts just stems from the difference in the magnitude of an increase in organizational complexity and/or of the cost cut across bank types. For example, if a cost reduction that accompanies a merger is less severe for large banks than for small banks, the negative impact against small banks and lack of impact against large banks are nothing but the consequence of the cost-cut hypothesis. It is, therefore, interesting to examine what brings about the difference in the merger impact by bank type in detail. We investigate this issue in the next section using additional data about the characteristics of merged banks.

The result of the weaker effect of the BHC establishment as opposed to the negative and significant effect of a merger possibly reflects the fact that bank mergers accompany drastic cost reduction and often entail the shift of the authority to make lending decisions, while BHC establishments rarely entail such drastic reorganizations or cost reduction. However, we cannot deny the possibility that the BHC dummy works as a partial proxy for bank size or bank type since most banks that experienced the establishment of BHC are large banks.

The estimated coefficients of a couple of control variables are worth mentioning. First, the size of the firm measured by a log of assets has positive and significant coefficients. This may well be interpreted as large firms being *well-known*. A similar effect can also be seen in the coefficients of the financial reporting frequency. These results imply that a hard-information component commingled with our soft information measures is successfully controlled by these

[16] However, it is significant at a 10% level, and another small bank dummy, the regional bank dummy, is not significant. The interaction term of the regional bank dummy and the merger dummy is significant and negative.

explanatory variables. Second, the non-performing loan ratio of a main bank has a negative and significant coefficient in all the specifications. This result implies the possibility that the accumulation of non-performing loans prevents banks from actively producing soft information about borrowers, although we need more careful examination of the causality between bad loans and soft information acquisition.

VI. Bank-complexity hypothesis and cost-cut hypothesis

The analysis in the previous section revealed that a bank merger has a negative impact on soft information acquisition. This result is consistent with both the bank-complexity hypothesis and the cost-cut hypothesis. We also found the presence of a negative merger impact against small banks and its absence against large banks. The difference may be because large banks do not acquire soft information, as predicted by Stein [2002], or it may be because the extent of the complexity increment in banking organizations and/or the extent of cost reduction differs by bank type. In this section, we investigate the cause of the impact difference by bank size with additional information about the organizational complexity and organizational restructuring of main banks.

A. Univariate analysis

We define the measures of the increase in organizational complexity and the measures of cost reductions upon mergers. First, we define the measures of the complexity increase from the proxies of organizational complexity: asset size, loan size, number of bankers, and number of branches. For merged banks, we use the average increasing rate of each variable from *each* pre-merger bank to the post-merger bank. To be more specific, for each variable X (= asset size, loan size, number of bankers, or number of branches), we calculate the following measure:

Complexity measure for Merged banks

(X of the post-merger bank at the end of year s) / (weighted average

of X of pre-merger banks at the end of year s-1) – 1, (2)

where s is the year during which the merger took place. For non-merged banks as the controlling group, we use the annual increasing rate of each variable averaged throughout the window period from 2001 through 2005:

Complexity measure for non-merged banks

$$\frac{1}{5}\sum_{t=2001}^{2005}[\,(X \text{ at the end of year } t) / (X \text{ at the end of year } t\text{-}1) - 1\,]\,. \quad (3)$$

Second, to investigate the extent of cost reduction, we focus on the increasing rates of four variables: the number of branches, the number of bankers, overhead and personnel expenses, and ordinary expenses. For merged banks, we calculate the three-year increasing rates of each variable summed over all the pre-merger banks. That is, the cost-cut measure of variable X (=number of branches, number of bankers, overhead and personnel expenses, and ordinary expenses) is:

Cost-cut measure for merged banks

(X of the post-merger bank at the end of year s+2) / (X summed over all the pre-merger banks at the end of year s-1) – 1. (4)

This measure represents to what extent total costs are reduced as a whole among banks involved in the merger. We take the three-year period because it is likely to take more than one year to complete the cost reduction. For non-merged banks as the controlling group, we use the annual increasing rates of these variables averaged through the window period, but this time they are multiplied by three to match the duration of merged banks' rates:

Cost-cut measure for non-merged banks

$$3 \cdot \frac{1}{5}\sum_{t=2001}^{2005}[\,\{(X \text{ at the end of year } t) / (X \text{ at the end of year } t\text{-}1) - 1\}\,] = 3 * (2). \quad (5)$$

Table 7 is a comparison of the means of the measures for the complexity increment in banking organization (Panel A) and for cost reduction (Panel B). Panels A-1 and B-1 are calculated from all banks, panels A-2 and B-2 are calculated from large banks only (Regional = Shinkin = 0), and panels A-3 and B-3 are calculated from small banks only (Regional or Shinkin = 1). Panels A-4 and B-4 show the statistics for the test of the difference in means.

Panel A clearly shows that mergers increased the organizational complexity. The test statistics show that the differences in the means of all the measures for merged banks and non-merged banks differ at a 1% level of significance. This remains the case when banks are classified according to type. The last column shows that the increase in organizational complexity upon merger does not differ significantly according to the size of the merging banks.

Panel B shows that banks that experienced a merger cut down on all the items presented in the table by some 20% or more on average within two years after a merger. In contrast, banks without any merger events decrease the items by smaller rates. The difference in the magnitude of the cost cut between merged banks and non-merged banks is significant, although the statistical significance is weaker than that of the complexity increment. If banks are sorted by type, the difference becomes more insignificant. The decrease in the number of bankers is more precipitous for merged banks than for non-merged banks, but, as to other cost-cut measures, non-merged banks reduce costs as much as merged banks. The difference between large banks and small banks is not significant again (the last column).

In summary, we conclude that mergers are accompanied by a significant complexity increment, whereas cost reduction due to mergers is not very extensive since banks that did not experience mergers also reduced costs. This finding, therefore, implies that the bank-complexity hypothesis is more likely to hold than the cost-cut hypothesis.

As for the difference in the merger impact across bank types, the last column shows that there is no difference in the magnitude of the complexity increment or in cost reduction between large banks and small banks. This implies that the finding in section V.B that the impact of a merger differs by bank type does not stem from a difference in the extent of the complexity increment or the post-merger cost reduction across bank types. Rather, this supports the interpretation along the line of the original theory of Stein [2002] predicting that large banks do not normally produce soft information and that, as a result, no deterioration is observed upon merger.

B. Multivariate analysis

We further investigate the impact of the increment in organizational complexity and cost cut by multivariate analysis. In this analysis, in place of bank consolidation dummies in Specification (2) in the previous section, we use each of the complexity measures or the cost-cut measures. Table 8 contains excerpts of the major results of this analysis.

The results show that the complexity measures have a negative impact on SOFTINFO (Panel A), while the cost-cut measures have a positive impact (Panel B). The significance of the estimated coefficients is not strong in either specification except that the complexity increment measured by the amount of loans has a negative and significant impact on SOFTINFO. The significance levels of the other complexity measures are, at worst, significant at a 20% level, while the coefficients of cost-cut measures are by far less significant. This result provides more evidence for the significance of the bank-complexity hypothesis, although the significance of the result is weaker.

Finally, the difference in the impact is examined according to bank type. Panel C of Table 8 contains a report of the results. In Specifications (1) and (2), the complexity measures have negatively significant impacts on SOFTINFO when the main bank is a regional bank. When the main bank is a Shinkin bank, the coefficients of the cross terms are insignificant, but the p values are small. The interactions of bank-type dummies and cost-cut measures (not reported) do not have any statistically significant coefficients. Thus, it is more likely that the bank-complexity hypothesis is the primary hypothesis that explains the negative impact of mergers on soft information acquisition by small banks.

VII. Summary and Conclusion

In this paper, we have found that:

(1) Bank mergers have a negative impact on soft information acquisition by small banks, whereas no impact is observed for large banks (Tables 3, 5, and 6).

(2) The increase in organizational complexity upon merger has a significant impact on information acquisition by small banks, while the cost reduction upon merger does not (Table 8).

(3) The magnitudes of the cost reduction and the complexity increments upon merger do not vary according to bank size (Table 7).

(4) When a merger does not take place, small banks are likely to acquire soft information more extensively than large banks (Tables 3, 5, and 6).

Finding (1) is consistent with the bank-complexity hypothesis and/or cost-cut hypothesis for small banks. Finding (2) suggests that the former is the primary mechanism that generates the negative impact of mergers against soft information acquisition by small banks. Finding (3) proves that the asymmetric impact by bank size does not come from the difference in the magnitude of complexity increments or cost reduction upon merger by bank size. Rather, as confirmed in Finding (4), the asymmetry in the merger impact is likely to come from the lack of the production of soft information by large banks in a typical operation, which supports the prediction of the original theory of Stein [2002].

Thus, our findings support the theory by Stein [2002] on the comparative advantage of simple and flat organization in producing and processing soft information from three angles. First, small banks acquire more soft information than large banks do in a typical operation. Second, when a merger takes place, it complicates managerial organization and deters the production of soft information or the maintenance of that accumulated in small banks (the bank-complexity hypothesis). Third, such an effect is not observed in large banks that accumulate little soft information before mergers.

The promotion of bank mergers is a popular policy for improving the stability of the banking sector. Our analysis suggests that there can be a proviso against this prescription, i.e., soft information accumulated through existing bank-firm relationships might be deteriorated by bank mergers, which could be economically costly for small banks and their borrowers. However, to the best of our knowledge, no thorough analysis of the welfare impact of bank mergers taking into account the production of information by banks has ever been conducted.[17] Empirical studies that integrate both the impact on information production, which we investigated in this paper, and the efficiency improvement by synergy effects are required in order to evaluate the overall welfare impact of bank consolidation. More general and extensive empirical/theoretical studies on this subject remain to be done.

[17] As an exception, Hauswald and Marquez [2006] suggest the possibility that bank mergers improve economic efficiency by decreasing duplicated information acquisition costs.

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Table 1 Distribution of responses to the survey questions on soft information

Each cell contains the number of respondent companies concerning the questions asking to what extent their current main banks are satisfied with the bank's knowledge about (Q1) the responding company, (Q2) the owners or managers of the company, (Q3) the industry that the company belongs to, (Q4) the local community where the company is located, and (Q5) the major market of the company; and with (Q6) how often a loan officer of the main bank contacts the company. In Panel A, the distribution is presented by whether the company's main bank experienced a merger (Merger=1) or not (Merger=0) during the period from Apr. 2001 through Jun. 2005, whereas, in Panel B, the distribution is presented by whether the company's main bank established a bank holding company (BHC=1) or not (BHC=0) during the same period. "Pearson χ^2" and "P-values" are statistics for the hypothesis testing about the independence between row items and column items. *, **, and *** indicate that the hypothesis of no-independence is rejected at a significance level of 10%, 5%, and 1%, respectively.

A. Distribution of grades, sorted by Merger.

Reply to each question	Q1		Q2		Q3		Q4		Q5		Q6	
(5:excellent- 1:inadequate)	Merger=0	Merger=1	Merger=0	Merger=1	Merger=0	Merger=1	Merger=0	Merger=1	Merger=0	Merger=1	Merger=0	Merger=1
5	124	151	126	138	42	39	66	39	32	23	62	57
4	209	306	191	286	136	215	117	165	92	183	170	250
3	50	105	67	131	187	287	185	335	233	313	142	216
2	11	27	11	29	29	46	26	48	37	62	17	54
1	3	6	2	11	3	8	3	8	3	14	6	18
Number of observations	992		992		992		992		992		992	
Pearson χ^2	9.01		15.58		5.83		28.82		17.93		17.19	
P-value	0.061 *		0.004 ***		0.212		0.000 ***		0.001 ***		0.002 ***	

B. Distribution of grades, sorted by BHC.

Reply to each question	Q1		Q2		Q3		Q4		Q5		Q6	
(5:excellent- 1: inadequate)	BHC=0	BHC=1	BHC=0	BHC=1	BHC=0	BHC=1	BHC=0	BHC=1	BHC=0	BHC=1	BHC=0	BHC=1
5	255	20	242	22	75	6	101	4	50	5	109	10
4	463	52	436	41	322	29	265	17	260	15	381	39
3	143	12	175	23	427	47	464	56	485	61	322	36
2	34	4	38	2	69	6	63	11	92	7	68	3
1	7	2	11	2	9	2	9	2	15	2	22	2
Number of observations	992		992		992		992		992		992	
Pearson χ^2 (4)	4.05		3.29		2.17		12.62		7.91		2.55	
P-value	0.399		0.510		0.704		0.013 **		0.095 *		0.637	

Table 2 Descriptive statistics for soft information variables

Descriptive statistics for the variables representing the acquisition of soft information are shown. "Response to Q1" through "Response to Q6" are variables explained in Table 1 (with a 1-5 value). SOFTINFO is the first principal component of the principal component analysis over "Response to Q1" through "Response to Q6" variables. In Panel A, the statistics are presented for "Merger=0" firms vs. "Merger=1" firms, whereas, in Panel B, they are presented for "BHC=0" firms vs. "BHC=1" firms, where the definitions of "Merger" and "BHC" are the same as in Table 1. *, **, and *** indicate that the sample mean of each group is different at a significance level of 10%, 5%, and 1%, respectively (two-sided test).

A. Descriptive statistics for soft information variables, sorted by Merger

	Merger=0					Merger=1				
Variables	No. of obs.	Mean	S.D.	Min.	Max.	No. of obs.	Mean	S.D.	Min.	Max.
Response to Q1	397	4.108	0.779	1	5	595	3.956 **	0.838	1	5
Response to Q2	397	4.078	0.799	1	5	595	3.859 ***	0.892	1	5
Response to Q3	397	3.466	0.808	1	5	595	3.388	0.778	1	5
Response to Q4	397	3.547	0.871	1	5	595	3.301 ***	0.764	1	5
Response to Q5	397	3.285	0.773	1	5	595	3.234	0.779	1	5
Response to Q6	397	3.668	0.844	1	5	595	3.461 ***	0.897	1	5
SOFTINFO	397	0.370	1.773	-7.462	4.199	595	-0.077 ***	1.783	-7.462	4.199

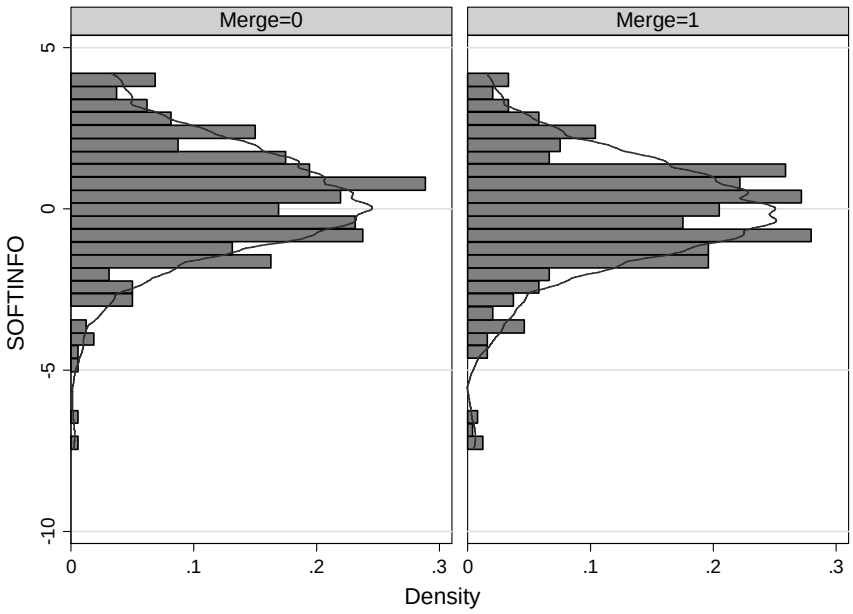
B. Descriptive statistics for soft information variables, sorted by BHC

	BHC=0					BHC=1				
Variables	No. of obs.	Mean	S.D.	Min.	Max.	No. of obs.	Mean	S.D.	Min.	Max.
Response to Q1	902	4.025	0.814	1	5	90	3.933	0.859	1	5
Response to Q2	902	3.953	0.860	1	5	90	3.878	0.885	1	5
Response to Q3	902	3.427	0.790	1	5	90	3.344	0.796	1	5
Response to Q4	902	3.428	0.818	1	5	90	3.111 ***	0.756	1	5
Response to Q5	902	3.264	0.781	1	5	90	3.156	0.733	1	5
Response to Q6	902	3.540	0.888	1	5	90	3.578	0.821	1	5
SOFTINFO	902	0.130	1.779	-7.462	4.199	90	-0.180	1.897	-7.462	4.199

Figure 1 Histogram of SOFTINFO by the merger experience of main banks

Histogram of the variable SOFTINFO (for its definition, see Table 2). In Panel A, the histograms of the firms in which the main bank experienced a merger ("Merge=1") and did not ("Merge=0") are compared. In Panel B, the histograms of the firms in which the main bank established a bank holding company ("BHC=1") and did not ("BHC=0") are compared.

A. Sorted by Merge



B. Sorted by BHC

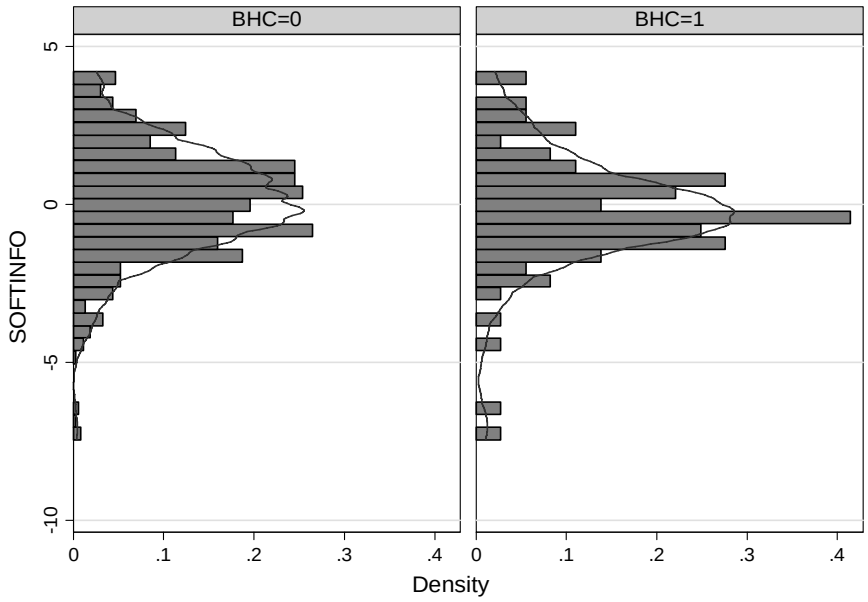


Table 3 Difference in SOFTINFO by bank size and merger

P-values for the test about the difference in the means of SOFTINFO among two groups are also shown. For the definition of SOFTINFO, see Table 2. *** indicates the statistical significance at a 1% level in each mean difference *t*-test.

Mean of SOFTINFO (s.d.)	# of obs.	Mean of SOFTINFO (s.d.)	# of obs.	t-test H_0: |(1)-(2)|=0 p-value
(1) Large banks		(2) Small banks		
-0.059	655	0.413	337	0.000
(0.068)		(0.100)		***
A. Large banks only				
(1) Merged banks		(2) Non-merged banks		
-0.049	571	-0.124	84	0.715
(0.074)		(0.186)		
B. Small banks only				
(1) Merged banks		(2) Non-merged banks		
-0.746	24	0.502	313	0.001
(0.445)		(0.100)		***

Table 4 Descriptive statistics of covariates

Variables	No. of Obs.	Mean	S.D.	Min	Max	Definition
Regional bank	992	0.203	0.402	0	1	A dummy equal to 1 if the main bank is a regional bank and 0 otherwise.
Shinkin bank	992	0.137	0.344	0	1	A dummy equal to 1 if the main bank is a Shinkin bank and 0 otherwise.
Audited	992	0.121	0.326	0	1	A dummy equal to 1 if the firm is audited and 0 otherwise.
Financial reporting frequency	992	2.604	3.099	1	13	Frequency of submission of the financial statements to the main bank (months).
Financial statement	992	0.978	0.147	0	1	A dummy equal to 1 if the firm has a financial statement and 0 otherwise.
Assets	992	20.94	1.507	12.95	26.21	Natural log of assets of the firm.
Firm profit in the last two yrs. (deficit, surplus)	992	0.098	0.297	0	1	A dummy equal to 1 if the firm reported deficit two years ago and surplus in the previous year and 0 otherwise.
Firm profit in the last two yrs. (surplus, deficit)	992	0.067	0.249	0	1	A dummy equal to 1 if the firm reported surplus two years ago and deficit in the previous year and 0 otherwise.
Firm profit in the last two yrs. (deficit, deficit)	992	0.055	0.229	0	1	A dummy equal to 1 if the firm reported deficit both 2 years ago and in the previous year and 0 otherwise.
Paying dividend	992	0.422	0.494	0	1	A dummy equal to 1 if the firm pays dividends and 0 otherwise.
Firm age	992	49.98	24.18	1.333	135.7	Firm age (years old).
Years of relationship with MB	992	27.48	16.08	0	100	Years of the relationship of the firm with its main bank (years).
Time distance from MB	992	19.23	19.25	5	180	Time distance from the firm to its main bank (minutes: categorical).
Subsidiary of other companies	992	0.109	0.312	0	1	A dummy equal to 1 if the firm is a subsidiary of other company and 0 otherwise.
Visit by non-MBs increased (0,1)	992	0.611	0.488	0	1	A dummy equal to 1 if the visits by loan officers of non-main banks increased and 0 otherwise.
Number of bank branches	992	43.64	38.73	1	139	Number of bank branches in the city where the firm is located.
Asset acquisition	992	0.037	0.190	0	1	A dummy equal to 1 if the main bank acquired assets of a liquidated bank during the period from April 2001 to June 2005.
Assets of MB (log)	992	30.67	1.727	26.29	32.14	Natural log of the assets of the main bank.
Loan/deposit of MB	992	0.695	0.176	0.178	1.390	Loan/deposit ratio of the main bank.
Capital ratio of MB	992	0.037	0.012	0.022	0.127	Capital ratio of the main bank.
Non-performing loan ratio of MB	992	0.023	0.011	0.008	0.098	{(loans to borrowers in legal bankruptcy) + (past due loans in arrears by 6 months or more) + (loans in arrears by 3 months or more and less than 6 months) + (restructured loans)} / (total loans outstanding) of the main bank.

Table 5 Effects of mergers and BHCs on soft information

Dependent variable: SOFTINFO. OLS with robust standard errors. The definitions of "Merger" and "BHC" are the same as in Table 1. Other covariates are as shown in Table 3. Constant terms are omitted from the table. *, **, and *** indicate that the coefficient is different from zero at a significance level of 10%, 5%, and 1%, respectively (two-sided test).

Independent variables	(1)		(2)		(3)	
Merger (0,1)	-0.893	**	-0.862	***		
	(0.392)		(0.284)			
BHC (0,1)	-0.711	*	-0.764	**		
	(0.423)		(0.355)			
Merger*major bank (0,1)					-0.455	
					(0.584)	
Merger*regional bank (0,1)					-1.223	***
					(0.466)	
Merger*Shinkin bank (0,1)					-1.469	**
					(0.599)	
BHC*major bank (0,1)					-0.415	
					(0.624)	
BHC*regional bank (0,1)					-0.028	
					(0.789)	
Audited (0,1)	-0.231		-0.235		-0.221	
	(0.169)		(0.170)		(0.167)	
Fin. reporting frequency	0.031	*	0.029	*	0.031	*
	(0.018)		(0.017)		(0.017)	
Financial statement (0,1)	-0.412		-0.415		-0.466	
	(0.376)		(0.376)		(0.391)	
Assets (log)	0.406	***	0.407	***	0.413	***
	(0.050)		(0.050)		(0.051)	
Firm profit in the last two yrs.	0.151		0.167		0.136	
(deficit, surplus)	(0.194)		(0.195)		(0.192)	
Firm profit in the last two yrs.	-0.405	**	-0.415		-0.433	**
(surplus, deficit)	(0.202)		(0.204)		(0.204)	
Firm profit in the last two yrs.	0.215		0.219		0.218	
(deficit, deficit)	(0.255)		(0.254)		(0.255)	
Paying dividend (0,1)	-0.341	***	-0.346	***	-0.350	***
	(0.125)		(0.125)		(0.125)	
Firm age (log)	-0.037		-0.036		-0.031	
	(0.123)		(0.123)		(0.123)	
Years of relationship with MB (log)	0.037		0.033		0.028	
	(0.074)		(0.074)		(0.074)	
Time Distance from MB (log of min.)	-0.128	*	-0.124	*	-0.128	*
	(0.067)		(0.068)		(0.067)	
Subsidiary of other companies	-0.568	***	-0.559	***	-0.574	***
	(0.208)		(0.208)		(0.208)	
Visit by non-MBs increased (0,1)	0.158		0.156		0.142	
	0.113		0.113		(0.114)	

(Table 5 continued)

Number of bank branches (log)	-0.036		-0.038		-0.046	
	(0.061)		(0.061)		(0.061)	
Regional bank (0,1)	0.400				0.719	
	(0.421)				(0.622)	
Shinkin bank (0,1)	1.172	*			1.557	*
	(0.653)				(0.891)	
Assets of MB (log)			-0.136			
			(0.093)			
Asset acquisition (0,1)	-0.195		-0.064		-0.290	
	(0.284)		(0.274)		(0.288)	
Loan/deposit of MB	1.571	**	0.478		1.416	
	(0.802)		(0.438)		(0.868)	
Capital ratio of MB	-13.014	**	-13.650	**	-11.307	*
	(6.242)		(6.506)		(6.316)	
Non-performing loan ratio of MB	-19.135	**	-17.545	**	-16.947	**
	(7.623)		(7.220)		(8.457)	
Industry Dummies	YES		YES		YES	
Urban dummies (Osaka, Kobe, Kyoto)	YES		YES		YES	
Adjusted R-squared	0.126		0.125		0.127	
Number of observations	992		992		992	

Table 6 Effects of mergers and BHCs on each component of soft information

Dependent variable: Response to each question (1-5) (see Table 1). Ordered logit. The definitions of "Merger" and "BHC" are the same as in Table 1. Other covariates are as shown in Table 3. *, **, and *** indicate that the coefficient is different from zero at a significance level of 10%, 5%, and 1%, respectively (two-sided test).

A. Specification (1) (the set of explanatory variables is the same as Specification (1) in Tables 4 and 5).

	Q1	Q2	Q3	Q4	Q5	Q6
Merger (0,1)	-0.356	-0.882 **	-0.909 *	-1.019 **	-0.887 **	-0.022
	(0.465)	(0.426)	(0.477)	(0.500)	(0.448)	(0.416)
BHC (0,1)	-0.217	-0.560	-0.762	-1.359 ***	-0.946 **	0.409
	(0.482)	(0.419)	(0.484)	(0.499)	(0.470)	(0.413)
Pseudo R-squared	0.056	0.055	0.054	0.056	0.043	0.049
Number of observations	992	992	992	992	992	992

B. Specification (2) (the set of explanatory variables is the same as Specification (2) in Tables 4 and 5).

	Q1	Q2	Q3	Q4	Q5	Q6
Merger (0,1)	-0.577 *	-0.572 *	-0.704 **	-1.077 ***	-0.762 **	-0.406
	(0.338)	(0.318)	(0.348)	(0.355)	(0.331)	(0.325)
BHC (0,1)	-0.485	-0.386	-0.718 *	-1.508 ***	-0.895 **	0.096
	(0.396)	(0.367)	(0.404)	(0.416)	(0.396)	(0.364)
Pseudo R-squared	0.054	0.055	0.052	0.057	0.043	0.047
Number of observations	992	992	992	992	992	992

C. Specification (3) (the set of explanatory variables is the same as Specification (3) in Tables 4 and 5).

	Q1	Q2	Q3	Q4	Q5	Q6
Merger*major bank (0,1)	-0.169	-0.021	-1.165	-0.806	-1.290	0.926 *
	(0.570)	(0.941)	(1.202)	(0.796)	(1.074)	(0.493)
Merger*regional bank (0,1)	1.088	-0.531	-1.729 ***	-3.295 ***	-1.496 ***	0.446
	(1.600)	(0.901)	(0.625)	(0.660)	(0.476)	(0.529)
Merger*Shinkin bank (0,1)	-1.299 **	-1.557 ***	-0.832	-0.902	-0.923	-1.352 *
	(0.625)	(0.570)	(0.718)	(0.783)	(0.682)	(0.708)
BHC*major bank (0,1)	-0.151	0.244	-1.111	-1.312	-1.472	1.234 **
	(0.618)	(0.971)	(1.217)	(0.813)	(1.093)	(0.554)
BHC*regional bank (0,1)	0.387	-0.295	-0.109	-0.327	-0.132	1.047
	(0.831)	(0.659)	(0.936)	(0.754)	(0.974)	(0.699)
Pseudo R-squared	0.058	0.057	0.055	0.060	0.045	0.052
Number of observations	992	992	992	992	992	992

Table 7 Complexity increment measures and cost-cut measures

The degrees of the increment in organizational complexity (Panel A) and cost reduction (Panel B) are compared between banks that experienced a merger (Merged) and those that did not (Non-merged). For Merged banks, a complexity measure of X (= Asset, Loan, …) is calculated as (X of post-merger bank at s+1) / (weighted average of X of pre-merger banks at s-1)-1, while a cost-cut measure X is calculated as (X of post-merger bank at s+2) / (sum of X of pre-merger banks at s-1) -1, where s is the year a merger took place; for Non-merged banks, each complexity measure is the average annual increase in X throughout the window period, and each cost-cut measure is three times the average annual increase. P-values for the test about the difference in the means are also shown. ***, **, and * mean that the means are statistically different at a 1%, 5%, and 10% significance level, respectively.

[A. Complexity measures]

Variables	[A-1 All banks]				[A-2 Large banks]				[A-3 Small banks] (Regional, Shinkin)				[A-4 Difference in means]			
	Merged		Non-merged		Merged		Non-merged		Merged		Non-merged		Merged vs. Non-merged (all banks, P-value)	Merged vs. Non-merged (large only, P-value)	Merged vs. Non-merged (small only, P-value)	Large vs. Small (merged only, P-value)
	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.				
Asset	1.059	10	0.011	43	0.884	5	-0.010	2	1.234	5	0.012	41	0.000	0.072	0.007	0.664
	(0.843)		(0.033)		(0.782)		(0.062)		(0.955)		(0.032)		***	*	***	
Loan	0.979	10	-0.005	43	0.753	5	-0.040	2	1.206	5	-0.003	41	0.000	0.046	0.009	0.537
	(0.799)		(0.030)		(0.594)		(0.050)		(0.978)		(0.028)		***	**	***	
Number of bankers	1.112	8	-0.032	43	1.010	4	-0.006	2	1.213	4	-0.033	41	0.000	0.018	0.021	0.800
	(0.757)		(0.037)		(0.506)		(0.011)		(1.026)		(0.038)		***	**	**	
Number of branches	1.033	8	-0.013	43	0.937	4	-0.008	2	1.128	4	-0.013	41	0.000	0.005	0.006	0.740
	(0.563)		(0.035)		(0.320)		(0.013)		(0.783)		(0.036)		***	***	***	

[B. Cost-cut measures]

Variables	[B-1 All banks]				[B-2 Large banks]				[B-3 Small banks] (Regional, Shinkin)				[B-4 Difference in means]			
	Merged		Non-merged		Merged		Non-merged		Merged		Non-merged		Merged vs. Non-merged (all banks, P-value)	Merged vs. Non-merged (large only, P-value)	Merged vs. Non-merged (small only, P-value)	Large vs. Small (merged only, P-value)
	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.	mean (s.d.)	# of obs.				
Number of bankers	-0.260	6	-0.096	43	-0.270	4	-0.017	2	-0.240	2	-0.100	41	0.004	0.031	0.043	0.784
	(0.090)		(0.112)		(0.107)		(0.034)		(0.069)		(0.113)		***	**	**	
Number of branches	-0.178	6	-0.039	43	-0.178	4	-0.025	2	-0.178	2	-0.040	41	0.023	0.101	0.348	1.000
	(0.106)		(0.105)		(0.088)		(0.040)		(0.183)		(0.107)		**			
Overhead & personnel expenses	-0.180	7	-0.056	43	-0.180	5	0.038	2	-0.181	2	-0.060	41	0.074	0.117	0.353	0.994
	(0.144)		(0.090)		(0.157)		(0.064)		(0.162)		(0.089)		*			
Ordinary expenses	-0.435	7	-0.134	43	-0.488	5	-0.339	2	-0.305	2	-0.124	41	0.039	0.633	0.536	0.640
	(0.273)		(0.253)		(0.262)		(0.246)		(0.355)		(0.252)		**			

Table 8 Impacts of the complexity increment and cost-cut on SOFTINFO

OLS with robust standard errors. ***, **, and * mean that the respective means are statistically different at a 1%, 5%, and 10% level of significance, respectively. The independent variables shown below are the relevant measures shown in Table 7.

A. Complexity increment measures only

	(1)	(2)	(3)	(4)
Asset	-0.189			
	(0.119)			
Loan		-0.232 *		
		(0.136)		
Number of bankers			-0.245	
			(0.179)	
Number of branches				-0.287
				(0.205)
Adjusted R^2	0.119	0.119	0.143	0.143
Number of observations	986	986	731	731

B. Cost-cut measures only

	(1)	(2)	(3)	(4)
Number of bankers	0.589			
	(0.608)			
Number of branches		0.099		
		(0.821)		
Overhead & personnel expenses			0.431	
			(0.470)	
Ordinary expenses				0.247
				(0.259)
Adjusted R^2	0.146	0.145	0.121	0.121
Number of observations	718	718	968	968

C. Impact of the complexity increment by bank type

	(1)	(2)	(3)	(4)
Asset	0.098			
	(0.150)			
Asset * Regional bank dummy	-1.244 **			
	(0.504)			
Asset * Shinkin bank dummy	-0.547			
	(0.386)			
Loan		0.076		
		(0.127)		
Loan * Regional bank dummy		-1.292 **		
		(0.552)		
Loan * Shinkin bank dummy		-0.566		
		(0.387)		
Number of bankers			0.039	
			(0.207)	
Number of bankers			-2.168	
* Regional bank dummy			(3.991)	
Number of bankers			-0.528	
* Shinkin bank dummy			(0.413)	
Number of branches				0.045
				(0.233)
Number of branches				-1.568
* Regional bank dummy				(3.133)
Number of branches				-0.621
* Shinkin bank dummy				(0.484)
Adjusted R^2	0.125	0.125	0.188	0.188
Number of observations	986	986	731	731