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The Effect of Easing Monetary Policy in Regional Lending Markets in Japan

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Mamoru Nagano
Institute of Economic Research, Nagoya City University

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Mamoru Nagano

Nagoya City University

[1] Corresponding author, Professor, Nagoya City University, Yamanohata 1, Mizuho, Nagoya 467-8501 Japan, Tel/Fax : +81-52-872-5736, Email: mnagano@econ.nagoya-cu.ac.jp

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Abstract

This paper investigates the factors that support a funding demand increase in regional economies under easing monetary conditions. The following results were empirically obtained by using regional data from the forty-seven prefectures during a zero interest rate period in Japan. The first result is that funding demand increases where the relative size of private capital stock is large. This result suggests that industrial agglomeration complements easing monetary policy to induce regional funding demand. The second result is that high competition in lending markets also contributes to an increase in the funding demand. This suggests that another possible requirement of the money suppliers must be fulfilled to induce the regional funding demand. In conclusion, additional policy measures are needed to activate the easing monetary policy, as the transmission process of monetary policy is not uniform in the diversified market structure.

JEL Classification Code: R11, R12, G21
Keywords: Regional Policy, Regional Banking Market, Monetary Policy

1. Introduction

In Japan, a zero interest rate and quantitative easing monetary policy continued for the five-year period spanning 2001–2005. This policy was lifted in 2005 when the Japanese economy showed signs of recovery, but, as of March 2009, the policy interest rate has again declined to zero percent. A concern relating to this policy that researchers were unable to solve during the previous zero interest rate period is: what policy measures should be employed when monetary easing does not induce the funding demand? Overcoming this "liquidity trap" was a very important task for the Japanese economy policy makers in the first half of the 2000s. In fact, overcoming the liquidity trap has been a common policy concern across all major industrialized countries since 2008.

In Japan, the zero interest rate economy has continued for long-term period, and participants of the Japanese financial market regard this as a stationary state. The reason being that the corporate funding

demand shows little signs of recovery even under an extreme easing monetary policy that has continued for a long-term period. Domestic bank restructuring and dramatic structural changes of the financial industry, which began in 1998, also support the stationary state view. Coupled with the direct financing trend of the borrowers, the loan–deposit ratio of the regional banks was pushed down to a 60%–70% level, which is a 20% decrease from the loan–deposit level in 1988.

Over the last thirty years, it has become commonplace for the regional banks in Japan to absorb household savings in each regional deposit market, this includes commercial lending contracts with firms in three major cities (i.e., Tokyo, Osaka, and Nagoya). Therefore, as the number of direct financing firms in these areas increase, the regional banks need to find new clients. As a result, the regional banks have tried to find new borrowers in local markets and have tried to enhance their relationship with potential clients. Unfortunately, over the last ten years, regional funding demand has slumped due to the above banking restructuring process. This paper sought to discover a common non-financial regional factor that would promote funding demand in any given region by using data from the forty-seven prefectures of Japan over the past ten years in the current low interest rate economy.

The hypotheses that this paper examined are as follows. The first is that we hypothesize the transmission process of easing monetary policy varies depending on relative size of the private capital stock in any given region. The second, as the prominent existing literature suggests, is that funding demands in the regions where there are many manufacturers are likely to be stimulated by a cut in interest rates. We regard that the above two hypotheses as regional factors of the money-demand side. The regional factors of the supply-side are also important. Three additional hypotheses are the stability, competitiveness, and ownership structure of the regional banking sectors. We propose the above financial supply-side requirements are necessary to induce the funding demand of non-financial firms.

This paper is divided into six sections. The first is the introduction section. In the next section, we review literature relating to our hypotheses and show how this paper contributes to the existing body of literature. In section three, we explain our hypothesis, empirical models, and our approach for analyzing and verifying the data. Section four explains how we obtained our data. In section five, we provide three sets of empirical results based on the methodologies as explained in section three. Finally, in section six we derive our conclusion from the empirical results detailed in section four.

2. Background and Existing Literature

There is a vast amount of literature discussing the relationship between financial intermediation and the transmission process of monetary policy. Garrison and Chang (1979), Toal (1977), Beare (1976), and Garrison and Kort (1983) have focused their research on the relationship between regional economy and monetary policy[2]. On the other hand, the amount of literature that treats the relationship between regional diversification of banking markets and the transmission process of monetary policy is not large. Among a small number of these research papers, there is agreement that the following three regional factors are engines of the regional funding demand: 1) the interest elasticity of funding demand for firms, 2) the ratio of manufacturing firms and small to medium sized enterprises, and 3) the stability of the regional banking sector.

A. Interest Elasticity of Funding Demand in a Given Region

As Carlino and Defina (1998)(1999) pointed out, many researchers have found that high-interest elasticity of funding demand is an important regional factor that stimulates funding demand in the economy. In other words, some firms are stimulated by a cut in interest rates, but others are not. Therefore, the number of interest-elastic firms was a key to activating easing monetary policy and depended on the interest elasticity of funding demand.

The recent trends of regional fixed asset investment have become increasingly polarized over the last twenty years. Firms in Tokyo and the neighboring prefectures actively increased investment, and consequently, private capital stock strongly increased. Funding demand for those investments were also very strong in the Tokyo area. On the other hand, firms in prefectures where there is a smaller population and where fewer industrial agglomerations were made found it very difficult to induce the funding demand. Therefore, in case of regional economies within Japan, the interest elasticity of funding demand and regional industrial agglomeration seem to be correlated.

In the mid-1990s, Carlino and DeFina (1995) employed vector autoregression (VAR) in their empirical analysis. Since then, this methodology has become the main econometric model used in the field of economics. One of the merits of this methodology is that it enables researchers to examine causalities among variables. Fratantoni and Schuh (2003), Owyang and Wall (2005), and Schunk (2004) employed Carlino and

[2] These literatures respectively examined eight regions of the United States and derived implications how the transmission of easing monetary policy by Federal Reserve Board were diversified across the regions.

DeFina's (1995) VAR model to examine the regional transmission mechanism. Carlino and DeFina (1998, 1999) had also developed their previous studies by estimating the regional transmission magnitudes.

The implications from Carlino and Defina's (1998)(1999) work can help us to understand what is happening in Japan. According to Carlino and Defina, the funding demand of interest rate elasticity depends on the formation of industrial agglomeration. If regional industrial policy has been successful in the region, the accumulated private capital stock will be relatively large and there will also be many supporting industries there. In these regions, as bank lending rates lower, it will likely induce the funding demand of the regional firms.

B. Ratio of Small to Medium Enterprises and Manufacturers in Region

The existing literature indicates that the ratio of small to medium enterprises (SMEs) and manufacturing firms to the total number of firms in a region also influences the regional funding demand. This is due to the managerial information of large firms being relatively transparent, as it is an accountability requirement for investors. As a result, there are various funding methodologies available to large firms. However, SMEs generally do not have various funding methodologies. SMEs often depend on bank borrowing for their external funding. Therefore, funding demands in regions with a high ratio of SMEs are likely to be induced by a cut in interest rates.

According to Bernanke (1993), Bernanke and Blinder (1988), and Gertler and Gilchrist (1993), the ultimate purpose of the central bank's monetary policy is to influence the balance sheet of financial intermediaries through a change in policy interest rates. However, as financial disintermediation progresses, firms have various funding tools that are not related to the market interest rate. Generally, the firms with various funding tools are large firms, which includes publicly listed firms. Most of these large firms are located in metropolitan areas. On the other hand, firms in regional areas are mainly unlisted firms and small firms. As Oliner and Rudebusch (1995) pointed out, bank borrowing is a main funding tool for regional firms, and this funding activity is likely to be influenced by changes in interest rates. Although commercial banks undertake corporate credit risks, in this case, the easing monetary policy directly stimulates regional funding demand.

C. Stability and Competitiveness of the Regional Banking Market Sector

Another important regional factor that may influence the funding demand is the status and stability of regional banks. Researchers have suggested that bank stability and competitiveness in a region may influence borrowers' fixed investment activities. This is a controversial topic among researchers in this field. Kashyap and Stein (1994) suggested that having large banks open up new regional branches would create an additional increase in commercial loans because the large banks generally have a high creditworthiness.[3]

The regions with interest rates above zero tend to have a high banking competitiveness. As Lee and Nagano (2008) pointed out, while many regional lending markets are not competitive in Japan, a small number of regions are very competitive, and the lending rates are relatively low in these regions. In addition to lending market competitiveness, we believe that the regional banking stability is also an important factor for the induction of regional funding demand. Hosono (2006) stressed the importance of bank stability for the regional financial intermediation. We also share this view.

There are a small number of literature sources that focus on the relationship between the Japanese regional banks and the regional economies under easing monetary policy. Hori and Kotaki (2003) and Noma (2007) discussed the relationship between regional economic trends and the business performance of the regional banks. Hori and Kotaki (2003) concluded that there were no statistical causalities between regional banking stability and regional macroeconomic performance. Alternatively, Noma (2007) concluded that an increase in regional commercial lending contributed to a growth in the industrial sector. However, neither Hori and Kotaki (2003) nor Noma (2007) mentioned the relationship between the diversification of the banking markets and the transmission mechanisms of monetary policy.

D. Ownership Structure of the Regional Banks and their Lending Behaviors

Recent studies have focused on the relationship between bank ownership structures and commercial loan behaviors. The reason for this interest is that ownership is also influenced by the liberalization of the

[3] In this regard, the opposite view of Moore and Hill (1982) said that more active behaviors of the existing regional banks were more important than new entries by large banks since the regional banks had long-term relationship with borrowers in the region and there were fewer asymmetric information problems.

financial sector, which began in the 1990s. In a prominent study, Bonin et al. (2005) empirically concluded that an increase in foreign-ownership ratio improved the cost efficiency of the commercial banks.

However, there are some researchers who do not agree with Bonin et al.'s (2005) view. Yildirm and Philippatos (2002) pointed out that an increase of foreign ownership of banks generally improved the cost efficiency of the bank, but it did not lead to the expansion of commercial loans. Lensink et al. (2006) denied that improvement of bank cost efficiency brought by an increase in foreign-ownership ratio; they concluded the improvement depended upon the domestic banking regulations. Freis and Taci (2005) analyzed various conclusions from multiple sources and pointed out that the improvement of cost efficiency by foreign ownership depended not only on banking regulations, but also on the ownership structure.

Freis and Taci's (2005) study suggested that a bank performed well with an increase of foreign ownership when that bank was previously owned by the government; however, performance was not improved when the previous major owners were private firms. Other than foreign ownership, ownership concentration by the CEO, directors, and other bank insiders was found to be debatable. Anderson and Fraser (2000) pointed out that an increase in the insider-ownership ratio tended to show an increase in risk-adverse activities within that bank.

3. Testing the Hypothesis and the Equation Model

The purpose of this paper was to examine the regional factors that might influence the interest elasticity of funding demand in Japan. We first verified the regional factors that were empirically supported by the existing literature. These regional factors included the ratio of manufacturing industries in the region and regional bank stability. Secondly, we examined new variables that have not been discussed in the existing literature. These regional factors included: private capital stock, regional banking competitiveness, and bank ownership structure. We chose to employ these variables because we hypothesized that easing monetary policy is effective where the existing regional private capital stock is large. We also hypothesized that easing monetary policy is effective where the high competitiveness of the banking market promotes a lowering of the lending rate within that region. High competitiveness includes the bank having international owners.

$$I_{it} = f(X_{it}, Y_{it}^1, \ldots, Y_{it}^m, Z_{it}^1, \ldots, Z_{it}^n) \tag{3.1}$$

$$X_{it} = g(R_{it}, Z_{it}^1, ..., Z_{it}^n) \tag{3.2}$$

Here, I denotes the regional average of the firm's fixed asset investment of region i in year t, X is the regional average of firm's funding costs, Y are the factors that influence the firm's funding demand in region i, R is real lending interest rate within region i, and Z are the factors that influence lending behaviors of regional banks within region i.

$$\partial^2 I / \partial X \partial Y < 0, \qquad \partial X / \partial R > 0, \qquad \partial^2 X / \partial R \partial Z < 0 \tag{3.3}$$

Summarizing the above overall hypothesis of this paper, a decrease in interest payments improves internal funding ability, but it alone does not induce the firm's fixed asset investment. When the necessary regional conditions are fulfilled the investment additionally increases. To examine the above hypotheses, this paper employed the following empirical equations.

$$I/K = const + +\phi_1 DIR(CF) + \phi_2 MFG + \phi_3 STK + \phi_4 RI + \phi_5 RI^2 + \phi_6 STK \times RI + \varepsilon \tag{3.4}$$

$$DIR(CF) = const + \theta_1 I/K + \theta_2 DRI + \theta_3 CAR + \theta_4 CMP + \theta_5 DRI \times CAR + \theta_6 DRI \times CMP + \theta_7 DRI^2 + \zeta \tag{3.5}$$

I/K: fixed tangible asset net increase (current year) plus depreciation expense (current year) divided by fixed tangible assets (previous year) of firms, averaged by prefecture
DIR: interest payments (current year) divided by total debt of firms, averaged by prefecture
CF: cash flow (current year) divided by total sales (current year) of firms, averaged by prefecture
MFG: nominal gross prefectural product from manufacturing sector to gross prefectural product in each prefecture
STK: private regional capital stock divided by gross prefectural product in each prefecture
RI: real short-term prime lending rate in each prefecture
DRI: first difference of RI
CAR: weighted average of capital adequacy ratios of commercial banks registered in National Banker's Association in each prefecture where the banks' headquarters book value of total assets are used for the weight
CMP: Herfindahl-Hirschman Index of regional bank lending outstanding in each prefecture

Equations 3.4 and 3.5 also employed variable *CF*, instead of *DIR*, as a proxy variable to measure how easing monetary conditions influences regional investments.

As for the private capital stock, we used Ishikawa's (2003) methodology to estimate regional private capital stock. Ishikawa (2003) estimated values of private capital stocks of the forty-seven prefectures between 1980–1994. We extended these values to 2005 by using the following formula:

$$STK_{i,t} = STK_{i,t-1} \times (1 - a_t) - DP_{i,t} / p_{i,t} + IP_{i,t} \qquad (3.6)$$

STK: non-government capital stock in each prefecture; *DP:* consumption of non-government fixed capital stock in each prefecture; *IP:* non-government fixed capital formation in each prefecture; *P:* deflator of non-government fixed capital formation in each prefecture; *a:* adjustment parameter

We calculated real values of non-government capital stock for each prefecture and then converted these to nominal values. The adjustment parameter of a was obtained from Ishikawa's (2003) work. Our hypotheses expected the following positive or negative results for equation models 3.4 and 3.5.

	Dependent Variables	
	Fixed Asset Investment / Fixed Tangible Assets (*I/K*)	*DIR:* Interest Payments / Debt (*DIR*)
Independent Variables:		
I/K: Fixed Asset Investment / Fixed Tangible Assets		+
DIR: Interest Payments / Debt	-	
MFG: Manufacturing GPP / total GPP	+	
STK: Private Capital Stock/GPP	+	
RI: Real Short-term Prime Lending Rate	-	
*STK*RI:* Intersected Variable between STK and RI	-	
DRI: Changes of Real Short-term Prime Lending Rate		+
CAR: Capital Adequacy Ratio of Regional Banks		+ or -
CMP: Herfindahl-Hirschman Index of regional bank lending		-
*DRI*CAR:* Intersected Variable between DRI and CAR		+
*DRI*CMP:* Intersected Variable between DRI and CMP		+

Another of our hypotheses, which relates to the literature on bank ownership structure discussed in the previous section, is that the foreign ownership concentration lowers the regional loan increase. We modified empirical equations 3.4 and 3.5 by adding variables that represent the ownership structure of the bank. The foreign-ownership ratio and the managerial-ownership ratio of banks were weight-averaged by the book value of total assets by prefecture.

4. Data

We obtained data from the Cabinet Office, Nikkei Data Co., Nikkin Communications Inc., Thomson Reuters Inc., and Tokyo Commercial Research Inc. Financial data of publicly listed firms were obtained from Nikkei Data Co., while those of unlisted firms were from Tokyo Commercial Research Inc. The number of publicly listed samples was 3,722 and the number of unlisted firms was 110,726. We excluded firms within the financial sector as well as real estate businesses from the samples and calculated averaged financial ratios by prefecture in 1999–2006, respectively. The number of the samples in the forty-seven prefectures is provided in the Appendix.

The regional bank data were obtained from Nikkei NEEDs Data of

Nikkei Data Co. We obtained capital adequacy ratio, total assets, and other necessary data that represent regional banking stability and competitiveness from the regional bank data. Data from Nikkin Communications Inc. was also included in the regional bank data. This data were necessary because the lending data of regional banks from Nikkei NEEDs included data from both inside and outside the region of each bank's headquarters. We needed to employ lending data inside the prefecture. We also prepared these bank data by prefecture from 1999-2006.

Regional macroeconomic variables such as the ratio of manufacturing firms and private capital stock were obtained from the Cabinet Office. Historically, these data were provided by region. We obtained ownership data of regional banks from Thomson Reuters Inc. We prepared a panel dataset by merging the above data by prefecture from 1999-2006.

5. Empirical Analyses

5. 1 Analysis of Regional Unlisted Firms

A SME is defined as being an enterprise with less than 300 employees. According to the Establishment and Enterprise Census of the Japanese Ministry of Affairs and Communications, SMEs account for more than 99% of the total enterprises in Japan. This suggests that regional industrial sectors are mainly comprised of SMEs. Based on this background, our first empirical analysis focused on publicly unlisted firms from the forty-seven prefectures by employing the equation models discussed in section 3.

The empirical results are reported in Table 1. In model I, parameters of cash flow (*CF*) are insignificant, but those of private capital stock (*STK*) and prime lending rate (*RI*) are significant. The parameter of intersected variables between private capital stock (*STK*) and the prime lending rate (*RI*) are also significant. Alternatively, in model II, when the independent variable is interest payment to debt (*DIR*), the parameter of intersected variables between the changes of prime lending rate (*DRI*) and the bank's capital adequacy ratio (*CAR*) is significant. The intersection of variables between the changes in prime lending rate (*DRI*) and bank's competitiveness (*CMP*) are also significant.

Table. 1 Regional Factors that Influence Regional Funding Demand: Unlisted Firms

(A) Model I

	(a) Dep. Var.= I/K		(b) Dep. Var.= I/K		(c) Dep. Var.= I/K		(d) Dep. Var.= I/K	
	Fixed Effect		Random Effect		Fixed Effect		Random Effect	
Endogenous Variable								
DIR	0.0383 ***	(0.0130)	0.0135 *	(0.0071)				
CF					0.0194	(0.1075)	0.0124	(0.0773)
Instruments Variables								
MFG	0.1261	(0.1189)	0.0276	(0.0180)	0.1263	(0.1214)	0.0194	(0.0177)
STK	0.1044 **	(0.0413)	0.0542 **	(0.0226)	0.1190 ***	(0.0418)	0.0593 ***	(0.0226)
RI	4.3142 **	(2.1045)	2.9395 *	(1.6063)	4.6168 **	(2.1474)	3.2570 **	(1.6204)
RI^2	3.3607	(4.8705)	5.8762	(4.5552)	4.1045	(4.8863)	5.8739	(4.5890)
STK*RI	-2.3791 **	(1.0527)	-1.6792 **	(0.7738)	-2.6031 **	(1.0669)	-1.8320 **	(0.7796)
Dum99	-0.0099 *	(0.0051)	-0.0046	(0.0043)	-0.0004	(0.0039)	-0.0014	(0.0039)
Dum00	-0.0086 *	(0.0048)	-0.0044	(0.0042)	-0.0007	(0.0039)	-0.0017	(0.0039)
Dum01	-0.0091 **	(0.0044)	-0.0075 *	(0.0039)	-0.0075	(0.0044)	-0.0069 *	(0.0040)
Dum02	-0.0167 ***	(0.0046)	-0.0151 ***	(0.0042)	-0.0140 ***	(0.0046)	-0.0145 ***	(0.0042)
Dum03	-0.0158 ***	(0.0041)	-0.0141 ***	(0.0039)	-0.0144 ***	(0.0042)	-0.0136 ***	(0.0039)
Dum04	-0.0051	(0.0040)	-0.0041	(0.0039)	-0.0048	(0.0040)	-0.0040	(0.0039)
Dum05	-0.0120 ***	(0.0046)	-0.0092 ***	(0.0041)	-0.0074	(0.0062)	-0.0076	(0.0080)
Const	-0.2933 ***	(0.0870)	-0.1255 ***	(0.0462)	-0.2395 ***	(0.0865)	-0.1067 **	(0.0458)
F Statistic	1.340 *				1.190			
Wald Chi2	60.940 ***		38.690 ***		50.980 ***		34.760 ***	
Hausman Specification Test	70.540 ***				45.190 ***			
Observations	376		376		376		376	
Regions	47		47		47		47	

(B) Model II

	(a)' Dep. Var.= DIR		(b)' Dep. Var.= DIR		(c)' Dep. Var.= CF		(d)' Dep. Var.= CF	
	Fixed Effect		Random Effect		Fixed Effect		Random Effect	
Endogenous Variable								
I/K	0.0943	(0.0793)	0.0703	(0.0837)	0.0051	(0.0302)	0.0078	(0.0289)
Instruments Variables								
DRI	-0.1320	(0.3667)	-0.0088	(0.4381)	0.1246	(0.1384)	0.1028	(0.1389)
CAR	-0.1235 ***	(0.0056)	-0.1372 ***	(0.0055)	0.0024	(0.0021)	0.0024	(0.0019)
CMP	-2.6547 ***	(0.1820)	-2.5888 ***	(0.1756)	-0.0945	(0.0680)	-0.8543	(0.6146)
DRI*CAR	0.0564 ***	(0.0025)	0.0628 ***	(0.0024)	-0.0004	(0.0009)	-0.0006	(0.0008)
DRI*CMP	1.3722 ***	(0.0779)	1.2226 ***	(0.0775)	0.0490 *	(0.0290)	0.0333	(0.0271)
DRI^2	-40.4237	(33.9695)	-54.8471	(36.0836)	0.5793	(11.5852)	-0.0489	(-4.8890)
Dum99	0.0791 ***	(0.0108)	0.0714 ***	(0.0100)	0.0071 *	(0.0040)	0.0054	(0.0035)
Dum00	0.0387 ***	(0.0071)	0.0280 ***	(0.0069)	0.0020	(0.0026)	0.0020	(0.0024)
Dum01	0.0146 **	(0.0061)	0.0075	(0.0062)	0.0050 **	(0.0023)	0.0044 **	(0.0022)
Dum02	0.0180 ***	(0.0067)	0.0107	(0.0068)	0.0018	(0.0025)	0.0016	(0.0024)
Dum03	0.0121 **	(0.0061)	0.0088	(0.0064)	0.0065 ***	(0.0023)	0.0060 ***	(0.0022)
Dum04	0.0035	(0.0056)	0.0011	(0.0059)	0.0018	(0.0021)	0.0015	(0.0021)
Dum05	0.0325 ***	(0.0101)	0.0253 ***	(0.0073)	0.0045	(0.0027)	0.0039	(0.0025)
Const	2.0787 ***	(0.0265)	2.1450 ***	(0.0146)	0.0202 **	(0.0098)	0.0305 ***	(0.0052)
F Statistic	10.98 ***				7.48 ***			
Wald Chi2	1.9E-06 ***		6058.9 ***		4,727.0 ***		15.040	
Hausman Specification Test	84.030 ***				59.180 ***			
Observations	376		376		376		376	
Regions	47		47		47		47	

Notes:
1 : ***, **, * indicate significance at 1%, 5%, and 10% levels of confidence, respectively.
2 : Dum99 – Dum05 are dummy year variables.

5. 2 Analysis of Regional Listed Firms

We obtained more than 1.1 billion unlisted firm samples for analysis; we found that some prefectures had a small number of publicly listed firms. Therefore, we excluded prefectures that had less than three

publicly listed firms from the samples. For example, Aomori prefecture was excluded from the sample based on this criterion. We added the variable "listed" to equation 3.4 as a proxy for the number of large firms.

We wanted to employ the variable that represented the number of SMEs in each region, but this data did not exist in Japan. Therefore, we chose the number of publicly listed firms to be a proxy for the number of large firms, which is the inverse of the share of small firms in each region[4].

The empirical result is shown in Table 2. First, the insignificant parameters of regional prime lending rate (*RI*) suggest that the decline does not contribute to an increase in the regional fixed asset investment (*I/K*). However, parameters for the intersected variables between private capital stock (*STK*) and prime lending rate (*RI*) were significantly negative. The result of the Hausman Specification Test of model (a) and (c) are insignificant. Therefore, either the random effect model or the ordinary least squares (OLS) model was chosen for these equations. Both results suggest that accumulation of regional capital stock positively influences the induction of fixed asset investment.

On the other hand, results from model II indicated that the parameter of banking market competitiveness (*CMP*) was not significantly positive to the debt to equity ratio (*DER*) and the ratio of cash flow to total sales (*CF*). Unfortunately, the parameter of the change in regional lending prime rate (*DRI*) was also insignificant. However, the parameter of the intersected variables between the banking competitiveness (*CMP*) and the lending rate change (*DRI*) were significantly positive. We take this to mean that the decline in the lending rate induces an increase in bank borrowing and cash flow when banking market competitiveness is high in the region.

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[4] In Model II, the ratio of cash flow to total sales and debt to equity ratio were employed as independent variables. This variable selection was also different from the analysis in the previous section. We chose these variables because listed firms generally have a higher debt to equity ratio compared to unlisted firms. Therefore, we thought that decline of the lending interest rate would not directly influence the firm's interest coverage, but would partly lead to the reduction of the volume of debt.

Table. 2 Regional Factors that Influence Regional Funding Demand: Listed Firms

(A) Model I

	(a) Dep. Var.= I/K		(b) Dep. Var.= I/K		(c) Dep. Var.= I/K		(d) Dep. Var.= I/K	
	Fixed Effect		Random Effect		Fixed Effect		Random Effect	
Endogenous Variable								
DER	0.0154	(0.0569)	0.0091	(0.0314)				
CF					-0.0747	(0.1267)	-0.0413	(0.0780)
Instruments Variables								
MFG	0.2596	(0.2404)	0.1213 *	(0.0709)	0.2584	(0.2415)	0.1172 *	(0.0706)
STK	-0.0092	(0.1025)	0.1350 *	(0.0738)	-0.0051	(0.1015)	0.1381 *	(0.0743)
RI	7.4229	(5.1908)	7.4873	(4.7995)	7.8871	(5.2580)	7.7241	(4.8275)
RI^2	17.4077 *	(9.7249)	14.6256	(9.6221)	17.3143 *	(9.6728)	14.4447	(9.5660)
STK*RI	-4.6682 *	(2.5649)	-4.4625 *	(2.3611)	-4.8907 *	(2.6015)	-14.5763 *	(7.5525)
listed	-0.0058	(0.0098)	0.0000	(0.0001)	-0.0005	(0.0010)	0.0000	(0.0001)
Dum99	-0.1221 ***	(0.0091)	-0.1196 ***	(0.0081)	-0.1208 ***	(0.0084)	-0.1189 ***	(0.0079)
Dum00	-0.0411 ***	(0.0089)	-0.3674 ***	(0.0807)	-0.0396 ***	(0.0081)	-0.0359 ***	(0.0078)
Dum01	-0.1027 ***	(0.0091)	-0.1088 ***	(0.0081)	-0.1018 ***	(0.0086)	-0.1084 ***	(0.0079)
Dum02	-0.0850 ***	(0.0094)	-0.0946 ***	(0.0088)	-0.0844 ***	(0.0089)	-0.0943 ***	(0.0086)
Dum03	-0.0561 ***	(0.0082)	-0.0623 ***	(0.0079)	-0.0555 ***	(0.0081)	-0.0620 ***	(0.0078)
Dum04	-0.0075	(0.0079)	-0.0107	(0.0078)	-0.0069	(0.0079)	-0.0104	(0.0078)
Dum05	-0.0112	(0.0089)	-0.0158	(0.0264)	-0.0031	(0.0084)	-0.0134	(0.0080)
Const	0.8363	(0.2224)	0.5604 ***	(0.1506)	0.8412 ***	(0.2202)	0.5640 ***	(0.1488)
F Statistic	6.300 ***				6.290 ***			
Wald Chi2	1.3E+05 ***		442.820 ***		1.3E+05 ***		443.340 ***	
Hausman Specification Test	14.080				8.810			
Observations	367		367		367		367	
Regions	46		46		46		46	

(B) Model II

	(a)' Dep. Var.= DER		(b)' Dep. Var.= DER		(c)' Dep. Var.= CF		(d)' Dep. Var.= CF	
	Fixed Effect		Random Effect		Fixed Effect		Random Effect	
Endogenous Variable								
I/K	0.0224	(0.0559)	0.0227	(0.0569)	-0.0006	(0.0211)	-0.0018	(0.0253)
Instruments Variables								
DRI	0.5055	(0.5265)	0.4828	(5.3643)	0.1431	(0.2271)	0.1430	(0.2270)
CAR	0.0064	(0.0082)	0.0075	(0.0082)	0.0036	(0.0034)	0.0033	(0.0033)
CMP	-0.6151 **	(0.2606)	-0.6613 **	(0.2604)	-0.3687 ***	(0.1114)	-0.3566 ***	(0.1081)
DRI*CAR	-0.0021	(0.0035)	-0.0029	(0.0036)	-0.0014	(0.0015)	-0.0013	(0.0015)
DRI*CMP	0.2411 **	(0.1127)	0.2585 **	(0.1129)	0.1635 ***	(0.0479)	0.1578 ***	(0.0470)
DRI^2	-32.1138	(46.5417)	-29.4426	(47.4880)	3.2944	(20.5901)	2.6695	(20.5348)
Dum99	0.0603 ***	(0.0159)	0.0577 ***	(0.0158)	-0.0027	(0.0069)	-0.0025	(0.0067)
Dum00	0.0619 ***	(0.0098)	0.0618 ***	(0.0098)	0.0010	(0.0042)	0.0010	(0.0041)
Dum01	0.0597 ***	(0.0103)	0.0593 ***	(0.0103)	-0.0028	(0.0045)	-0.0029	(0.0044)
Dum02	0.0494 ***	(0.0102)	0.0493 ***	(0.0103)	-0.0039	(0.0045)	-0.0040	(0.0044)
Dum03	0.0336 ***	(0.0090)	0.0331 ***	(0.0091)	0.0014	(0.0040)	0.0014	(0.0039)
Dum04	0.0193 **	(0.0077)	0.0191 **	(0.0078)	0.0033	(0.0034)	0.0033	(0.0033)
Dum05	0.0311 ***	(0.0098)	0.0222 ***	(0.0098)	-0.0011	(0.0043)	-0.0011	(0.0042)
Const	0.5488 ***	(0.0595)	0.5556 ***	(0.0601)	0.0974 ***	(0.0262)	0.0378 ***	(0.0099)
F Statistic	100.52 ***				76.76 ***			
Wald Chi2	7.4E+04 ***		147.73 ***		10,366.1 ***		22.830 **	
Hausman Specification Test	54.190 ***				42.550 ***			
Observations	367		367		367		367	
Regions	46		46		46		46	

Notes:
1 : ***, **, * indicate significance at 1%, 5%, and 10% levels of confidence, respectively.
2 : Dum99 – Dum05 are dummy year variables.

5. 3 Foreign Ownership of Regional Banks and Regional Investment

According to the descriptive statistics of bank ownership data, the foreign ownership ratio of ninety-nine publicly listed Japanese banks dramatically increased in 1999 to 2006. The ratio was 19.0% in 1999 and

increased to 39.7% in 2006. The insider-ownership ratio also increased from 1.6% in 1999 to 5.9% in 2006. The existing literature suggests that these two ownership ratios create a risk-adverse lending behavior in regional banks, as noted in the previous section.

Empirical results indicated that a rise in the regional banks' foreign ownership ratio increased both fixed asset investment and debt to equity ratio for the unlisted borrowers. On the other hand, the relationship between the bank insiders' equity holdings and the fixed asset investment and debt to equity ratio of the borrowers were entirely insignificant. Bonin et al. (2005) pointed out that an increase in the foreign ownership of regional banks improved their cost efficiencies. Our empirical results do not directly support the idea of Bonin et al. (2005). However, these results at least deny the hypothesis of Yildirm and Philippatos (2002) that pointed out that an increase in the foreign ownership of banks did not lead to the expansion of commercial bank loans. Our results can be better explained by the theory of Freis and Taci (2005) rather than that of Yildirm and Philippatos (2002). In other words, an increase in the foreign ownership of regional banks brought some structural changes in inefficient regional banking markets that originally were geographically separated from metropolitan areas. Historically, mutual share holdings were held among regional commercial banks in Japan. We believe an increase in the foreign ownership ratios of regional banks are related to the recent trends of dissolving bank cross-share holdings.

Table. 3 Regional Funding Demand and Bank Ownership Structure

(A) Model I

	(a) Dep. Var.= I/K		(b) Dep. Var.= I/K		(c) Dep. Var.= I/K		(d) Dep. Var.= I/K	
	Fixed Effect		Random Effect		Fixed Effect		Random Effect	
Endogenous Variable								
DER	1.1214 **	(0.4626)	0.1034 *	(0.2588)	1.1234 **	(0.4112)	0.224	(0.2821)
Instruments Variables								
MFG	0.0975	(0.1215)	0.0156	(0.0175)	0.0884	(0.1325)	0.022	(0.0214)
STK	0.1237 ***	(0.0410)	0.0624 **	(0.0224)	0.1443 ***	(0.0512)	0.074 ***	(0.0244)
RI	5.3999 **	(2.1157)	3.5636 *	(1.5970)	4.9925 **	(2.1120)	4.462 ***	(1.4417)
RI^2	3.6775	(4.8460)	5.7746	(4.5544)	2.4140	(3.3633)	4.143	(5.4200)
STK*RI	-2.7807 ***	(1.0508)	-1.9193 **	(0.7672)	-2.4358 **	(1.2242)	-1.871 *	(0.8470)
Foreign	0.0021 ***	(0.0009)	0.0010 ***	(0.0020)				
Own					-0.0041	(0.0224)	-0.003	(0.0371)
Dum99	-0.0147 **	(0.0061)	-0.0073	(0.0050)	-0.0142 ***	(0.0032)	-0.006	(0.0060)
Dum00	-0.0130 **	(0.0056)	-0.0074	(0.0048)	-0.0125 ***	(0.0049)	-0.004	(0.0067)
Dum01	-0.0148 ***	(0.0051)	-0.0120 *	(0.0046)	-0.0155 ***	(0.0062)	-0.017 ***	(0.0057)
Dum02	-0.0235 ***	(0.0057)	-0.0203 ***	(0.0050)	-0.0195 ***	(0.0044)	-0.020 ***	(0.0058)
Dum03	-0.0202 ***	(0.0049)	-0.0186 ***	(0.0046)	-0.0199 ***	(0.0033)	-0.017 ***	(0.0041)
Dum04	-0.0088 *	(0.0046)	-0.0087	(0.0045)	-0.0055	(0.0041)	-0.004	(0.0044)
Dum05	-0.0092 *	(0.0048)	-0.0098	(0.0046)	-0.0088	(0.0056)	-0.015 ***	(0.0036)
Const	-0.2858 ***	(0.0874)	-0.1137 ***	(0.0464)	-0.3112 ***	(0.0941)	-0.112 **	(0.0451)
F Statistic	1.330 *				1.440 *			
Wald Chi2	61.820 ***		39.800 ***		71.220 ***		33.341 ***	
Hausman Specification Test	62.220 ***				54.400 ***			
Observations	376		376		376		376	
Regions	47		47		47		47	

(B) Model II

	(a)' Dep. Var.= DER		(b)' Dep. Var.= DER		(c)' Dep. Var.= DER		(d)' Dep. Var.= DER	
	Fixed Effect		Random Effect		Fixed Effect		Random Effect	
Endogenous Variable								
I/K	0.0136 **	(0.0068)	0.0125 **	(0.0068)	0.0147 **	(0.0069)	0.0135 **	(0.0069)
Instruments Variables								
DRI	0.0005	(0.0354)	-0.0013	(0.0355)	0.0011	(0.0356)	-0.0010	(0.0357)
CAR	-0.0010	(0.0001)	-0.0008	(0.0001)	-0.0001	(0.0001)	-0.0001	(0.0001)
CMP	-0.0061	(0.0129)	0.0039	(0.0113)	-0.0065	(0.0129)	0.0035	(0.0114)
DRI*CMP	0.0052 **	(0.0024)	0.0004 **	(0.0027)	0.0024 **	(0.0011)	0.0003 **	(0.0018)
DRI^2	-5.5066 *	(2.9235)	-4.9785 *	(2.9242)	-5.5928 *	(2.9404)	-5.0899	(2.9416)
Foreign	0.0020 **	(0.0010)	0.0021 **	(0.0009)				
Own					-0.0040	(0.0046)	-0.0033	(0.0045)
Dum99	0.0075 ***	(0.0010)	0.0078 ***	(0.0010)	0.0073 ***	(0.0010)	0.0076 ***	(0.0010)
Dum00	0.0062 ***	(0.0006)	0.0064 ***	(0.0006)	0.0061 ***	(0.0006)	0.0063 ***	(0.0006)
Dum01	0.0023 ***	(0.0006)	0.0025 ***	(0.0058)	0.0022 ***	(0.0006)	0.0025 ***	(0.0006)
Dum02	0.0020 ***	(0.0007)	0.0021 ***	(0.0007)	0.0020 ***	(0.0007)	0.0021 ***	(0.0007)
Dum03	0.0006	(0.0006)	0.0007	(0.0006)	0.0071 **	(0.0006)	0.0008	(0.0006)
Dum04	-0.0005	(0.0006)	-0.0004	(0.0006)	-0.0005	(0.0006)	-0.0005	(0.0006)
Dum05	-0.0005	(0.0006)	-0.0004	(0.0006)	-0.0005	(0.0006)	-0.0004	(0.0006)
Const	0.0345 ***	(0.0023)	0.0319 ***	(0.0016)	0.0351 ***	(0.0023)	0.0324 ***	(0.0016)
F Statistic	17.38 ***				17.43 ***			
Wald Chi2	6.6E+04 ***		483.4 ***		6.6E+04 ***		472.980	
Hausman Specification Test	48.150 ***				57.460 ***			
Observations	376		376		376		376	
Regions	47		47		47		47	

Notes:

1 : ***, **, * indicate significance at 1%, 5%, and 10% levels of confidence, respectively.

2 : Dum99 – Dum05 are dummy year variables.

5. 4 Additional Examinations with Individual Firm Data

The empirical results of the previous three sections entirely supported our hypotheses that industry agglomeration and high banking market competition are two necessary requirements to induce the fixed asset investment demand under monetary easing conditions. This section reexamines the empirical tests to confirm if the results are also common when it is verified using firm individual data. We once again estimated, by prefecture, the interest elasticity of funding demands. Although we estimated these elasticities with regional aggregated or averaged data in sections 5.1–5.3, this section estimates them by using firm individual data. We employed the following empirical model.

$$I/K = const + \omega_1 ITR + \omega_2 ROA + \omega_3 ASSET + \psi \quad (5.1)$$

I/K: Fixed tangible asset net increase (current year) plus depreciation expense (current year) divided by fixed tangible assets (previous year) of each firm
ITR: Interest payments (previous year) divided by total debt (previous year) of each firm
ROA: Net profit (previous year) divided by total sales (previous year) of each firm
ASSET: Total asset (previous year)

The concept of the above equation is based on that of (3.1). However, variables of industry agglomeration and high banking market competition are common; that is, this micro data analysis uses only one data respective to each prefecture. Therefore, we first estimated (5. 1) for forty-seven prefectures and compared elasticities between the regions having high industry agglomeration and banking market competition and the others.

All the variables except *ROA* are converted to natural logarithm. We regard the parameter of ITR as interest elasticity of funding demand. First, we prepared the dataset of the sample firms of the forty-seven prefectures and estimated the above equation with fixed effect and random effect estimations. We reported both based on the information obtained from Hausman Specification Test and Breush Pagan LM Test in Table 4. The sample period is 2003–2008. The firm data are obtained from Tokyo Commercial Research Inc., and the estimation uses data from unlisted firms. Independent variables other than ITR are employed in order to eliminate the influence of liability of the sample firm from the internal funding ability and scale effect from the liability of the sample firm. Since the ratio of manufacturing industries in a region might influence the regional funding demand, five industrial dummies are added.

To compare interest elasticities of the funding demand between regions having high private capital stock and banking market competition and the others, we calculate, in advance, the deviation scores of private capital stock per capita and banking market Herfindahl-Hirshman Index, by region. Then, we compare the values of interest elasticity of demand between the region having high and low deviation scores. Each deviation score is shown in Appendix C.

The results are generally consistent with those in 5.1-5.2. Nine prefectures in the top ten deviation score regions have shown that the interest elasticities of funding demand are significant, while two prefectures in the lowest ten score prefectures recorded significance. The point estimate values and the 95 percent confidence interval are also generally high in the top 10 deviation score prefectures. Tokyo is the only exception among the top 10 regions. We believe this result to have originated from the diversification of the corporate funding in this region.

Table. 4 Interest Elasticity of Funding Demand Estimated by Individual Firm Data of 2003-2008

(A) Top Ten Prefectures in Regional Deviation Value of Private Capital Stock and Banking Market HHI

	(a)ITR	(b)95% Conf.Interval.	(c)ROA	(d)SIZE	(e)Dummies	(f)Estimation	(g) Firms & Observations
Aichi	-0.0764 *	-0.1570	1.0673 ***	0.2687 ***	Industry-yes	Fixed	4,222
	(0.0411)	0.0042	(0.0701)	(0.1005)	Year-yes		8,225
Tokyo	-0.0572	-0.1339	0.3563	0.9227 ***	Industry-yes	Fixed	5,116
	(0.0391)	0.0194	(0.3687)	(0.0929)	Year-yes		9,965
Shizuoka	-0.1075 ***	-0.1333	0.3597 ***	0.0890 ***	Industry-yes	Random	3,360
	(0.0132)	-0.0817	(0.1160)	(0.0136)	Year-yes		7,599
Hiroshima	-0.1452 *	-0.2999	0.6144	1.3777 ***	Industry-yes	Fixed	2,398
	(0.0789)	0.0095	(0.4773)	(0.1582)	Year-yes		4,464
Kanagawa	-0.1519 ***	-0.2299	0.2388	0.5970 ***	Industry-yes	Fixed	3,112
	(0.0398)	-0.0739	(0.3026)	(0.0881)	Year-yes		7,949
Osaka	-0.1057 **	-0.1933	0.5542	1.2698 ***	Industry-yes	Fixed	4,993
	(0.0447)	-0.0181	(0.4929)	(0.1036)	Year-yes		9,380
Hyogo	-0.1404 ***	-0.1956	1.6395 ***	-0.1310 ***	Industry-yes	Random	2,049
	(0.0207)	-0.0853	(0.3841)	(0.0207)	Year-yes		3,804
Shiga	-0.0776 *	-0.1586	0.7258 *	-0.1030 ***	Industry-yes	Random	742
	(0.0413)	0.0035	(0.3819)	(0.0313)	Year-yes		1,831
Ibaragi	-0.0540 **	-0.1078	-0.1505	0.0587 **	Industry-yes	Fixed	869
	(0.0272)	-0.0014	(0.2994)	(0.0262)	Year-yes		3,574
Kyoto	-0.0690 **	-0.1313	0.1229	0.5038 ***	Industry-yes	Fixed	1,487
	(0.0318)	-0.0067	(0.2686)	(0.0234)	Year-yes		3,614

Notes:

1. ***, **, and * indicate significance at 1%, 5%, and 10% levels of confidence, respectively.
2. The first and second rows under "(b) 95% Conf. Interval." are the lower and upper bound of the interval estimators, respectively.
3. The top rows under "(g) Firms and Observations" are the number of sample firms and the lower rows indicate the number of observations.

(B) Ten Lowest Prefectures in Regional Deviation Value of Private Capital Stock and Banking Market HHI

	(a)ITR	(b)95% Conf.Interval.	(c)ROA	(d)SIZE	(e)Dummies	(f)Estimation	(g) Firms & Observations
Tokushima	-0.1012	-0.2723	0.2524	1.1028 ***	Industry-yes	Fixed	699
	(0.0872)	0.0698	(0.8146)	(0.2038)	Year-yes		1,877
Miyazaki	-0.1540	-0.3869	-0.8673	1.2653 ***	Industry-yes	Random	812
	(0.1187)	0.0790	(0.7519)	(0.1926)	Year-yes		2,043
Hokkaido	0.0530	-0.0279	-0.1691	1.3235 ***	Industry-yes	Fixed	5,420
	(0.0413)	0.1339	(0.3218)	(0.1221)	Year-yes		8,998
Iwate	-0.1102 **	-0.2053	0.2518	0.4598 ***	Industry-yes	Fixed	1,541
	(0.0485)	-0.0151	(0.2964)	(0.1441)	Year-yes		3,555
Kochi	-0.0034	-0.1530	0.6671	0.8176 ***	Industry-yes	Fixed	634
	(0.0762)	0.1462	(0.9623)	(0.2189)	Year-yes		1,573
Shimane	-0.0383	-0.2503	-0.4859	0.9894 ***	Industry-yes	Fixed	863
	(0.0779)	0.1736	(0.6068)	(0.1973)	Year-yes		2,173
Kumamoto	-0.0883	-0.2376	0.1584	0.7907 ***	Industry-yes	Fixed	1,168
	(0.0761)	0.0610	(0.7941)	(0.1878)	Year-yes		2,596
Saga	-0.2253	-0.4442	-3.1172 ***	1.3404 ***	Industry-yes	Fixed	507
	(0.2105)	0.0831	(1.1239)	(0.2656)	Year-yes		1,080
Okinawa	-0.1003	-0.2220	1.5433 *	0.4155 ***	Industry-yes	Fixed	1,178
	(0.0620)	0.0214	(0.9215)	(0.1592)	Year-yes		2,770
Nara	-0.2792 ***	-0.4377	0.9716 **	0.5677 ***	Industry-yes	Fixed	645
	(0.0808)	-0.1208	(0.8649)	(0.1843)	Year-yes		1,780

Notes:

1. ***, **, and * indicate significance at 1%, 5%, and 10% levels of confidence, respectively.
2. The first and second rows under "(b) 95% Conf. Interval." are the lower and upper bounds of the interval estimators, respectively.
3. The top rows of "(g) Firms and Observations" are the number of sample firms, and that below is the number of observations.

6. Discussion

Our empirical results suggest that the hypotheses of this paper were supported. One of the most important results is that funding demand depends on the degree of industrial agglomerations in the regional economy. Particularly in the case of publicly unlisted firms, private capital stock intersected with lending rates significantly influences the regional fixed asset investment. Therefore, the role of the capital stock is evidently important for stimulating the corporate funding demand in regions. These empirical analyses suggest that a zero interest rate monetary policy alone would not stimulate the funding demand of the regional firms; the high degree of industrial agglomerations is a required condition to achieve the policy goal.

Some hypotheses on the relationship between regional banking market competition and the funding demand in a region were also supported. We statistically found that banking markets under high competition had a lower interest rate of debt and the parameter of intersected variable between prime lending rate and banking competitiveness is significant to interest rate of debt. Therefore, lowering policy interest coupled with the market competitiveness influences the

interest payment of the borrowers. However, according to the empirical results, this lower interest rate did not relate to an improvement in cash flow for the firm. It is our belief that corporate cash flow is generally influenced by the business performance itself and that the level of the lending rate is not major factor in determining cash flow.

Based on the above empirical results, we derived the following conclusions. The first is that the regional diversification of interest elasticity of funding demand depends on the degree of industrial agglomerations and the banking market competitiveness across the regions. This means that without appropriate industrial policies and banking competitive policy in regions monetary policy alone will not stimulate the regional funding demand. In other words, factors to increase the interest elasticity of funding demand are both on the demand- and the supply-side of the money funding market.

Another significant finding is the relationship between the ownership structure of regional banks and bank-lending behaviors. The number of studies regarding the relationship between ownership concentrations of regional banks and the business performance is not large. Konishi and Yasuda's work (2004) was the only exceptional one according to our survey. This paper examined how ownership concentrations of foreign investors and insiders influenced the regional bank lending. Our empirical results suggested that an increase in foreign ownership concentration also increased borrowings of publicly unlisted firms. Therefore, it is our belief that increasing foreign ownership concentration leads to the positive impact on the regional economies. To sum up the above results, an enhancement of the regional industrial agglomeration, an improvement in the banking market competition, and an increase in external bank ownership ratios are three key factors to stabilize regional firms and stimulate funding demand in outlying regions.

Concluding Remarks

This paper focused on an increasing regional diversification of the funding market in Japan. The lending markets in metropolitan areas are different from those in smaller cities, as metropolitan areas have a large number of publicly listed firms. The markets in metropolitan areas are also heterogeneous and diversified. This paper has empirically shown why a long-term zero interest rate monetary policy has not created new regional funding demand. The reason for the lack of regional funding demand is that easing monetary policy is only one of the requirements; the other requirements are: developing industrial agglomerations, increasing the competitiveness in lending markets, and increasing foreign ownership of

banks.

A good example that supports the conclusions drawn in this paper is that well-performing regional banks recorded good financial results in 2009. The Bank of Yokohama Ltd., Chiba Bank Ltd., Hiroshima Bank Ltd., Shizuoka Bank Ltd., and Suruga Bank Ltd. are examples of these well performing banks. The headquarters for all of these banks are located in the regions where industrial agglomerations have historically progressed. Since the capital stock of manufacturing industries has increased in each region, the number of households and the population has also increased. In these regions, banking market competition has also been promoted because outsiders (i.e., banks from the Tokyo area and neighboring prefectures) have participated in the market. In these areas, competitive market environments have forced poor performing regional banks to exit from the markets. As a result, the existing regional banks are highly efficient and competitive.

This paper employed new additional variables to examine the determinants of regional diversification of funding demand. Accumulated private capital stock as a proxy for industrial agglomerations is one of these variables. This variable is also influenced by the size of public capital stock, but this paper did not verify the relationship between industrial agglomerations and the size of public capital stock. We have concluded that multiple requirements are needed to increase regional funding demand. Future studies should examine how the public sector performs contributes to regional funding demand

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Appendix A: The Number of Samples and the Descriptive Statistics

The following statistics are the number of firms employed for the empirical analyses. Variables for "Unlisted" or "Listed Firms" were calculated based on individual firm financial data by region. Descriptive statistics in Table A2 are for all sample periods.

Table A1 Number of Sample Firms by Prefecture

	Unlisted Firms	Listed Firms		Unlisted Firms	Listed Firms
Hokkaido	8,317	49	Shiga	755	11
Aomori	1,648	1	Kyoto	916	79
Iwate	1,619	3	Osaka	6,760	557
Miyagi	2,784	17	Hyogo	3,105	146
Akita	819	3	Nara	687	7
Yamagata	1,595	3	Wakayama	601	7
Fukushima	1,863	8			
			Tottori	650	3
Ibaragi	797	17	Shimane	896	4
Tochigi	1,087	10	Okayama	1,494	17
Gunma	1,109	18	Hiroshima	4,167	44
Saitama	1,930	56	Yamaguchi	903	16
Chiba	2,724	34			
Tokyo	13,870	1,790	Tokushima	788	1
Kanagawa	3,058	182	Kagawa	1,233	19
			Ehime	2,049	10
Niigata	3,322	30	Kochi	661	5
Toyama	1,320	25			
Ishikawa	2,576	24	Fukuoka	6,320	77
Fukui	1,368	11	Saga	590	3
Yamanashi	574	6	Nagasaki	1,472	5
Nagano	2,598	25	Kumamoto	1,942	7
Gifu	1,446	26	Oita	2,092	6
Shizuoka	5,067	49	Miyazaki	878	3
Aichi	6,258	212	Kagoshima	1,279	7
Mie	1,199	15	Okinawa	2,178	4

Note: Empirical analysis for the listed firms in section five excluded prefectures where the number of the sample firms was less than three. The numbers of regions are different between the analysis of unlisted firms and those of listed firms, accordingly.

Table A2 Descriptive Statistics

		Mean	Stv	Max	Min
I/K	fixed tangible asset net increase (current year) plus depreciation expense (current year) divided by fixed tangible assets (previous year) of firms, averaged by prefecture				
	Unlisted Firms	0.005	0.023	0.132	-0.236
	Listed Firms	0.011	0.029	0.170	-0.176
DIR	interest payments (current year) divided by total debt of firms, averaged by prefecture				
	Unlisted Firms	2.144	0.197	2.810	1.650
CF	cash flow (current year) divided by total sales (current year) of firms, averaged by prefecture				
	Unlisted Firms	0.040	0.015	0.195	0.022
	Listed Firms	0.098	0.060	0.365	-0.146
DER	total debt (current year) divided by total capital (current year) of firms, averaged by prefecture				
	Listed Firms	0.599	0.161	1.101	0.060
MFG	nominal gross prefectural product from manufacturing sector to gross prefectural product				
	Regional Data	0.220	0.081	0.420	0.041
STK	private regional capital stock divided by gross prefectural product in each prefecture				
	Regional Data	1.921	0.225	2.521	1.123
RI	real short-term prime lending rate in each prefecture				
	Regional Data	0.029	0.005	0.046	0.009
DRI	first difference of RI				
	Regional Data	0.001	0.006	0.025	-0.020
CAR	weighted average of capital adequacy ratios of commercial banks registered in National Banker's Association in each prefecture where the banks eadquarter, book value of total assets are used for the weight				
	Regional Data	8.672	3.014	14.870	0.654
CMP	Herfindahl-Hirschman Index of regional bank lending outstanding in each prefecture				
	Regional Data	0.231	0.130	0.612	0.005
List	the number of listed firms in each prefecture				
	Regional Data	75	256	1,790	0.000
Foreign Ownership	weighted average of foreign ownership ratio of banks in each prefecture				
	Regional Data	0.156	0.197	1.000	0.000
Inside Ownership	weighted average of insider's ownership ratio of banks in each prefecture				
	Regional Data	0.023	0.042	0.191	0.000

Note: The numbers of observations were 376 for the unlisted firm dataset and 368 for the listed firm dataset. The regional macroeconomic data were 376.

Appendix B: OLS Estimation Results of Regional Publicly Listed Firms

Two empirical equation results of the publicly listed firms indicated insignificant results of Hausman Specification Test. In this case, the equation should have employed either the random effect model or the OLS model. However, Breusch Pagan LM Test cannot be technically employed in the case of two-stage least squares for panel-data with instrumental variables. Therefore, we show random effect results in the text and the results of OLS in Appendix B. It indicates that both parameters of the intersected variables between private capital stock and lending rate are negatively significant.

Table B. OLS Results of Regional Factors that Influence Regional Funding Demand: Listed Firms

(A) Model I

	(a) Dep. Var.= I/K		(c) Dep. Var.= I/K	
	OLS		OLS	
DER	0.0095	(0.0181)		
CF			-0.0391	(0.0470)
MFG	0.0791 **	(0.0371)	0.0763 **	(0.0368)
STK	0.0372 **	(0.0145)	0.0374 **	(0.0145)
RI	-1.1690	(4.2653)	-1.1792	(4.2617)
RI^2	16.7387	(50.3124)	16.4427	(50.0733)
STK*RI	-2.1431 ***	(0.0115)	-2.1499 ***	(0.0114)
listed	0.0005 ***	(0.0324)	0.0005 ***	(0.0304)
Year Dummy	Yes		Yes	
Const	0.7466 ***	(0.0324)	0.7536 ***	(0.0304)
F Statistic	14.061 ***		14.061 ***	
R2	0.446		0.447	
Observations	367		367	
Regions	46		46	

Notes: ***, **, * indicate significance at 1%, 5%, and 10% levels of confidence, respectively.

Appendix C: Deviation Scores of Private Capital Stock per Capita and Banking Market Herfindahl-Hirshman Index

We estimated the interest elasticity of funding demand of twenty prefectures with firm individual data of 2003–2006. The prefectures are chosen on the basis of the total deviation scores given below of the private capital stock per capita and the banking market HHI.

Table C. The top 10 and the lowest 10 Deviation Scores of Private Capital Stock per Capita and Banking Market Herfindahl-Hirshman Index

		1) Private Capital Stock divided by Population	2) HHI in Banking Market	3) Total
1	Aichi	75.3	74.8	150.1
2	Tokyo	96.1	51.1	147.2
3	Shizuoka	84.6	44.9	129.5
4	Hiroshima	61.9	58.2	120.1
5	Kanagawa	46.5	71.7	118.3
6	Osaka	47.3	69.6	116.8
7	Hyogo	46.5	62.9	109.4
8	Shiga	46.5	61.4	107.9
9	Ibaragi	47.0	60.9	107.9
10	Kyoto	47.0	60.6	107.7
38	Tokushima	45.1	46.3	91.4
39	Miyazaki	44.8	46.5	91.3
40	Hokkaido	38.3	51.8	90.1
41	Iwate	42.5	46.9	89.3
42	Kochi	40.9	47.2	88.1
43	Shimane	39.8	46.7	86.5
44	Kumamoto	38.5	46.4	84.9
45	Saga	36.8	47.0	83.7
46	Okinawa	35.7	46.0	81.7
47	Nara	33.5	46.6	80.1

Note: The above deviation scores are calculated by using averaged data of private capital stock per capita and banking market HHI in 1999–2006 by prefecture.