Identifying the Dual Hypotheses in Lending Market: Evidence from Japanese Prefectural Lending Markets[1]

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Abstract

This paper investigates the effect of oligopoly power to the loan rate and lending outstanding in the regional lending market using prefectural panel data in Japan and Herfindahl-Hirschman Index (HHI) as the measure of the degree of oligopoly power. In other word, we compare with dual hypotheses; the market conduct performance hypothesis and efficiency structure hypothesis, to implement above investigation. We construct the estimation models of lending rate and outstanding lending which identifies the borrowing demand and lending supply. With this model, we capture the effects of HHI to the lending rate and the lendings outstandings.We find that HHI has the positive corelation with lendings outstanding, while does not lending rate. This result implies efficient effects or scale effects is dominat to market strcuture effects provided by oligopoly.

Key Words: market conduct performance hypothesis, efficient structure hypothesis, Herfindahl-Hirschman Index (HHI), Prefectural Panel Data.
JEL Classification: G21, E51, R51

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1. Introduction

Many countries now or will face on the aging population problem. Aging causes shrink of demographic and economic activity. Especially, Japanese rural regions are threatened by the rapid population decrease and then the regional banks feel a sense of danger with respect to their sustainability. In fact, some regional banks merge or try to do another bank[2].

As for the discussion about correlation between market competitiveness and outcomes of loan market, there are two opposite hypotheses. The one is the structure conduct performance hypothesis that is based on the traditional oligopoly theory. The other is efficiency structure hypothesis which higher oligopolistic power decreases loan rate. The logic is that more efficient bank wins the competition and increases the market share. For example, when a bank which information acquisition cost is smaller merges other one which cost is bigger, management efficiency improves as the total information acquisition cost is smaller.

This paper investigates how the degree of market competitiveness affects the segmented regional loan market. That is, we mainly focus on which

[2] For example, Juroku bank merged Gifu bank in 2012 and Juhachi bank was trying to merge Shinwa bank, but the Japan Fair Trade Commission stopped.

oligopolistic power, which is measured by some index: e.g. Herfindahl-Hirschman Index (HHI, hereafter), increases or decreases the outcome of loan market; i.e. loan rate and stock of lending. We obtain the reduced-form equations of them which are based on the structural demand and supply function. We see that increase in HHI decreases the loan rate and increases the stock of lending. That is, our results show that the efficiency structure hypothesis is more appropriate for recent Japanese regional lending market. This result is consistent with alternative estimations. At the same time, we check the exogeneity test of HHI applying the method of Revankar and Yoshino (1990).

The remainder of this article is organized as follows. In Section 2, we survey past research that informs the investigation. In Section 3, we explain the analytical framework; i.e. model specification. In Section 4, we report and discuss the result of our analysis with alternative ones and we offer concluding remark in Section 5.

2. Literature Review

There have been several studies to investigate the relationship between the

market competitiveness and the quantity or price of lending market.

As for the supportive evidences of the market conduct performance hypothesis, there are some literatures , such as Edward（1965）, Rhoades（1981）, Gilbert （1984）, Mori and Tsutsui （1989）, Alley（1993）and Ishikawa and Tsutsui (2013). Edward (1965) and Rhodes (1981) showed empirically that the loan rate increase when the degree of oligopoly in lending market is higher[3]. Gilbert (1984) surveyed the literatures about investigating the market conduct performance hypothesis and cannot obtain the consensus. In Japanese lending market, Mori and Tsutsui (1989) and Alley (1993) obtained the supportive result of this hypothesis in Japanese regional loan market, but Ishikawa and Tsutsui (2013) did not obtain it.

As for the supportive evidences of the efficiency structure hypothesis, Demsetz (1973) proposed it which is relevant discussion of Williamson (1968) in viewpoint of firm merger. Sapienza (2002) and Erel (2011) investigated the effects of bank merger on the loan spread and found that spread decreased in a few years after bank merger. Focarelli and Panetta (2003) investigated the both short and long effect of bank merger on deposit rate and found the

[3] On the other hand, Whitehead（1977）reports the opposite result.

efficiency structure hypothesis was dominated in the long-run.

3.Analytical Framework

In this section, we introduce the analytical framework[4].

3.1. Loan Demand Function

We obtain the (aggregate prefectural) loan demand function D as follow[5]:

(1) $\mathrm{D}(r_{it}; E_{it}, U_{it}, Pop_{it}, Land_{it}, House_{it}, BR_{it}, HHI_{it})$

$= d_0 + d_1 r_{it} + d_2 E_{it} + d_3 U_{it} + d_4 Pop_{it} + d_5 Land_{it} + d_6\, House_{it} + d_7 BR_{it} +$

$d_8 HHI_{it},$

where r_{it} is lending rate, E_{it} is the number of employees, U_{it} is the number of unemployment, Pop_{it} is the population density per a thousand residentsm $Land_{it}$ is the official land price (housing) of the highest place at each prefecture, $House_{it}$ is the housing start, BR_{it} is the number of the

[4] Revankar and Yoshino (2008) estimates the specified lending demand and supply functions. Appendix explains the induction of both demand and supply functions.

[5] We see that the loan demand of each bank (or branch) faces on the

bankruptcies and HHI_{it} is the Herfindahl-Hirschman Index of lending share at each prefecture. i represents the notation of region, t represents time,d_i is the parameter.

3.2. Lending Supply Function

We induce the (aggregate prefectural) lending supply function S as follow[6]:

$$(2) \qquad S(r_{it}; B_{it}, U_{it}, BR_{it}, HHI_{it}) = s_0 + s_1 r_{it} + s_2 B_{it} + s_3 U_{it} + s_4 BR_{it} + s_5 HHI_{it},$$

where B_{it} is the level of deposit, s_i is the parameter. *HHI* represents the degree of market competitiveness has two opponent power.[7],

3.3. Reduced-Form Equations

Combining with Eq. (1) and (2), we obtain two reduced- form (lending rate and stock of lending) equations as follows:

$$(3) \qquad r_{it} = a_0 + a_1 E_{it} + a_2 U_{it} + a_3 B_{it} + a_4 Pop_{it} + a_5 Land_{it} + a_6 House_{it} +$$

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[6] Detailed induction of supply function is written in Appendix A.

[7] We use the number of employees as the latent variable of borrowers' fundamentals. As for the gross prefectural products, we are not available the data from FY2015.

$a_7 BR_{it} + a_8 HHI_{it} + \varepsilon_{it}^r$,

(4) $L_{it} = b_0 + b_1 E_{it} + b_2 U_{it} + b_3 B_{it} + b_4 Pop_{it} + b_5 Land_{it} + b_6 House_{it} +$

$b_7 BR_{it} + b_8 HHI_{it} + \varepsilon_{it}^L$,

As we can see, eq. (3) and (4) represent the reduced form equations which satisfy $D = S$; i.e. the lending market equilibrium is satisfied. If the efficiency (market structure) hypothesis is dominated, $a_8 > (<)0$and $b_8 > (<)0$.

4. Estimation Result

4.1. Data

We use annual data from each prefecture between fiscal year 2006-2015[8]. We obtain data of the number of employee and unemployment from Labor Force Survey and stock of deposit from the Financial Service Agency in Japan. For the robustness check, we use two types of HHI; HHI_A includes the all city, regional bank and credit associations and HHI_B uses not individual credit association but sum of them[9]. Table 1 reports the descriptive statistics.

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[8] Definitions of stock of lending, loan rate and HHI is explained in Appendix B.

[9] The reason why we also estimate the HHI without credit associations controls the regional specific problems. For example, Hokkaido has many small credit associations because of large area and may underestimate.

4.2. Results

Table 2,3,4 and 5 report the results of reduced-form loan rate and stock of lending functions. We report the full model in Model 1 at each table and check robustness in Model (2) and (3) dropping some control variables (). These tables show that HHI is not correlated in loan rate but positively in stock of lending. That is, our results imply that the efficiency hypothesis is satisfied, because the stock of lending has positive correlation to HHI and scale effect of concentration may reallocate the excess personnel to new lending.

We now add the interpretation of the results and reason why we obtain the different result from some previous literature, such as Ishikawa and Tsutsui (2013), Uesugi and Uchino (2011) and Kitamura et al. (2015)[10]. Ishikawa and Tsutsui (2013) estimates the demand and supply function using the prefectural annual data between 1990 and 2001, which period faced the financial crisis of bubble-crash and the non-performing loan problems. It is difficult to remove the effects of them completely. Uesugi and Uchino (2011) estimated the effect of mega-bank merger on loan rate and did not discuss

[10] Ishikawa and Tsutsui (2013) and Kitamura et al. (2015) mainly focus on the other research interest and set HHI as control variable of their estimation equations.

about regional bank. Kitamura et al. (2015) estimates the panel error correction model of loan rate using economic statistics of Bank of Japan[11].

4.3. Robustness Check

We check the robustness to estimate two approaches.

4.3.1. Estimating Structural Models and Exogeneity Test

We check the validity of the result in previous section to re-estimate the structural equations in Eq. (1) and (2). We use the two-step least squares (2SLS) to identify the demand and supply functions.

Table 6 and 7 report the estimation results of demand and supply functions. We see that the coefficients of HHI on supply functions support the efficiency structure hypothesis. In addition, HHI has a positive correlation in demand function.

In addition, we apply the weak exogeneity test of Revankar and Yoshino (1990). Revankar and Yoshino (1990) suggest the methodology that add the

[11] Ishikawa and Tsutsui (2013) and Kitamura et al. (2015) use the outstanding lending data of the Bank of Japan that is collected by each bank's questionnaires which do not include the information of branch. On the other hand, our data comes from the FSA which is collected by every branches and head office at each bank.

novel regression equation with respect to the variables which have possibility of endogeneity and obtain the residuals. That is, we estimate the following equation:

$$(5) \qquad HHI_{it} = \delta_{it} + \theta \boldsymbol{Z}_{it} + v_{it}^{HHI},$$

where $\boldsymbol{Z}_{it}$ is the vector of variables which are relevant to HHI and v_{it}^{HHI} is residual of Eq.(5)[12].

Next, we re-estimate Eq. (1) and (2) adding v_{it}^{HHI} as an explanatory variable and check its statistical significance as following Eq. (1)' and (2)':

$$(1)' \qquad \mathrm{L}_{it} = d_0 + d_1 r_{it} + d_2 E_{it} + d_3 U_{it} + d_4 Pop_{it} + d_5 Land_{it} + d_6 House_{it} + d_7 BR_{it} + d_8 HHI_{it} + \theta_D v_{it}^{HHI} + \varepsilon_{it}^{D},$$

$$(2)' \qquad \mathrm{L}_{it} = s_0 + s_1 r_{it} + s_2 B_{it} + s_3 U_{it} + s_4 BR_{it} + s_5 HHI_{it} + \theta_S v_{it}^{HHI} + \varepsilon_{it}^{S}.$$

If HHI satisfies the weak exogeneity, $\theta_D = \theta_S = 0$ under the criteria of Revankar and Yoshino (1990). We show the results in Table 7 and 8 and both results show the

[12] We use the one-period lag of HHI as $\boldsymbol{Z}_{it}$. At the same time, we also use artificial HHI suggested by Garmaise and Moskowitz (2006) and obtain the qualitatively similar result (although this paper does not report).

(weak) exogeneity of HHI.

4.3.2. Unit Root Test and Cointegration Approach

Since we use the prefectural panel data, we need to consider about the possibility of unit root. We show the results of panel unit root test in Table 10. Table 10 shows that the stock of lending, the number of employees and unemployment are I(1) [13]. Therefore, we test the Padroni's panel cointegration test with respect to these variables and show the results in Table 11. We show that the null hypothesis is rejected for all tests. Table 12 reports the cointegration vectors based on the reduced-form of stock of lending function. We see that the qualitative result is similar to the case in Table 4 and 5[14].

5. Conclusion

This paper investigates which the degree of competitiveness of regional lending market increases or decreases loan rate and stock of lending. We

[13] As for loan rate, the result of Levin et al (2002)'s test is I(0) and then we assume stationary.

[14] As for the loan rate, we check the Pedroni's test and obtain the cointegration. And then we estimate FMOLS and DOLS and obtain the qualitatively similar result in Table 2 and 3.

obtain the reduced-form equations of them which are based on the structural demand and supply function. We see that increase in HHI decreases the loan rate and increases the stock of lending. That is, our results show that the efficiency structure hypothesis is more appropriate for recent Japanese regional lending market. This result is consistent with alternative structural equations estimation and panel-cointegration approach.

There is a new avenue for future research. Our analysis assumes that the regional market is completely segmented. Considering about the interregional relationship of lending and deposit is worth trying to expand our research interest.

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Appendix A. Deviation of Lending Supply Function

The (representative) regional bank maximizes his or her profit as follow:

$$\min_{L_i} \pi_i = r(L_i; HHI \quad , \boldsymbol{Y}) L_i - r^b B_i - C(L_i; HHI \quad)$$

Where **Y** is the (exogenous) macroeconomic (e.g. The number of unemployment) or risk (e.g. the number of bankrupt) factors and C is cost function. We assume that the private bank only uses the deposit. The profit maximization problem of the regional bank is written as follow:

$$\frac{\partial \pi_i}{\partial L_i} = r_1 L_i + r L_i - \frac{r^b}{\mu} - C_1 = 0,$$

where $r_1 = \frac{\partial r}{\partial L_i} < 0, C_1 = \frac{\partial C}{\partial L_i} > 0.$

Using implicit function theorem, we obtain the general form as follow:

$$L_i = S(r; HHI, \boldsymbol{Y})$$

Using the first-order approximation, we obtain Eq. (2).

Appendinx B. Data Definitions of Lending Rate and Quantity

Lending outstanding: Total level of lending which has the head office and branches of Mega and regional bank and credit associations at each prefecture (Source: Financial Service Agency in Japan)

Loan rate: Weighting average on estimating the settlement of accounts of companies in same prefecture (Source: TEIKOKU Databank)

HHI: Calculating $HHI_j = \Sigma_i \sigma_{ij}^2$, where σ_i is the lending share of i's bank in j's prefecture (Source: Financial Service Agency in Japan).

Table 1. Descriptive Statistics

Name	Lending Rate	Stock of Lending	Number of Employees	Number of Unemployment	Stock of Deposit	Number of Bankrupt
Unit	%	Trillion Yen	100 Thousand	100 Thousand	Trillion Yen	
Average	1.94	11.5	1.334	0.057	21.521	265.7
Standard Deviation	0.2998	2.845	1.369	0.062	33.519	440.42
Max	2.775	213.61	7.349	0.367	249.03	3115
Min	1.31	1.534	0.272	0.007	3.572	15

Name	Population Density	Land Price(Housing)	New Housing Starts	HHI_A	HHI_B
Unit	Person/㎢	Thousand yen/㎡	Thousand		
Average	659.82	78.253	20.308	0.195	0.212
Standard Deviation	1143.5	59.127	26.155	0.056	0.05
Max	6063.5	426.7	186.2	0.3	0.302
Min	64.834	29.3	2.076	0.046	0.076

Table 2. Estimation Results of Loan Rate Equations (using HHI_A)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Constant	1.9138		1.9231		2.0619		1.4304		1.4304		1.7882	
(t value)	6.158	***	6.719	***	9.099	***	4.782	***	4.782	***	1.665	*
Deposit	-0.0175		-0.0162		-0.0156		-0.0001		-0.0168		-0.0078	
(t value)	-3.924	***	-3.222	***	-3.407	***	-2.981	***	-3.744	***	-3.257	***
Employment	0.0001		0.0001		0.0011				0.0003			
(t value)	2.817	***	2.345	**	2.974	***			2.885	***		
Unemployment	0.0020		0.0019		0.0019		0.0020					
(t value)	4.306	***	4.532	***	4.538	***	4.876	***				
Bankrupt	-0.0002										-0.0001	
(t value)	-3.348	***									-3.682	***
Pop Density	0.0001		0.0002				0.0003		0.0002		0.0001	
(t value)	0.785		1.132				0.215		1.3293		0.508	
Land Price	0.0001		0.0002		0.0001		0.0001		0.0001		0.0002	
(t value)	5.525	***	6.325	***	6.183	***	6.401	***	5.499	***	5.841	***
Housing	-0.0001		-0.0001		-0.0001		-0.0001		-0.0001		-0.0001	
(t value)	-3.707	***	-3.652	***	-2.761	***	-2.667	**	-3.028	***	-3.128	***
HHI_A	-15.3936		-13.154		-14.1772		-13.6312		-13.6134		-14.1029	
(t value)	-0.231		-0.537		-0.193		-0.185		-0.313		-0.186	

Table 3. Estimation Results of Loan Rate Equations (using HHI_B)

	Model 7		Model 8		Model 9		Model 10		Model 11		Model 12	
Constant	1.7884		1.7833		1.8051		1.9264		1.2965		1.7696	
(t value)	5.629	***	5.629	***	6.114	***	7.916	***	4.236	***	7.114	***
Deposit	-0.0174		-0.0205		-0.0210		-0.0096		-0.0162		-0.0078	
(t value)	-3.701	***	-3.920	***	-3.949	***	-3.598	***	-3.707	***	-3.761	***
Employment	0.0001		0.0001		0.0011				0.0003			
(t value)	2.821	***	2.706	***	2.732	***			2.867	***		
Unemployment	0.0020		0.0019		0.0019		0.0020					
(t value)	3.943	***	4.543	***	4.550	***	4.883	***				
Bankrupt	-0.0002										-0.0001	
(t value)	-3.109	***									-3.697	***
Pop Density	0.0001		0.0004				0.0004		0.0003		0.0001	
(t value)	0.756		1.093				0.276		1.199		0.526	
Land Price	0.0001		0.0001		0.0001		0.0001		0.0001		0.0002	
(t value)	5.343	***	7.074	***	6.854	***	6.123	***	5.222	***	5.843	***
Housing	-0.0001		-0.0001		-0.0001		-0.0001		-0.0001		-0.0001	
(t value)	-2.684	***	-2.675	***	-2.718	***	-2.617	**	-3.252	***	-3.126	***
HHI_B	-14.4236		-14.609		-14.4499		-14.8552		-13.3902		-14.0516	
(t value)	-0.544		-0.569		-0.557		-0.185		-0.469		-0.159	

Table 4. Estimation Results of Stock of Lending Equations (using HHI_A)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Constant	-10.9502		-16.7259		-11.7416		-16.7337		-7.5943		-13.2383	
(t value)	-3.476	***	-6.694	***	-3.740	***	-6.694	***	-2.326	***	-5.918	***
Deposit	0.7034		0.5841		0.6139		0.5841		0.6110		0.6838	
(t value)	28.068	***	32.911	***	25.333	***	32.911	***	24.504	***	33.623	***
Employment	0.0027		0.0022		0.0035				0.0057			
(t value)	2.493	**	2.811	***	2.811	***			2.934	***		
Unemployment	-0.0049		-0.0049		-0.0199		-0.0221					
(t value)	-3.036	***	-4.031	***	-4.163	***	-4.515	***				
Bankrupt	-0.0507										-0.0054	
(t value)	-8.034	***									-9.527	***
Pop Density	0.0007		0.0005				0.0011		0.0009		0.0012	
(t value)	0.431		0.303				0.6932		0.495		0.714	
Land Price	0.0005		0.0001		0.0001		0.00006		0.0008		0.0005	
(t value)	4.502	***	8.072	***	7.790	***	7.676	***	6.958	***	4.468	***
Housing	0.0001		0.0001		0.0001		0.0001		0.0001		0.0001	
(t value)	10.674	***	10.085	***	10.272	***	9.253	***	9.213	***	10.741	***
HHI_A	16.2088		21.6235		21.0654		20.8033		22.5232		16.2363	
(t value)	2.877	***	2.672	***	3.444	***	3.715	***	2.736	***	2.669	***

Table 5. Estimation Results of Stock of Lending Equations (using HHI_B)

	Model 7		Model 8		Model 9		Model 10		Model 11		Model 12	
Constant	-10.9177		-12.4371		-11.9701		-16.8942		-7.4591		-13.2302	
(t value)	-3.402	***	-3.558	***	-3.661	***	-6.251	***	-2.227	**	-5.510	***
Deposit	0.7038		0.6154		0.6143		0.5819		0.6110		0.6806	
(t value)	28.014	***	25.122	***	25.266	***	32.707	***	24.415	***	33.436	***
Employment	0.0029		0.0039		0.0038				0.0059			
(t value)	3.595	***	3.997	***	2.945	***			3.067	***		
Unemployment	-0.0050		-0.0210		-0.0201		-0.0225					
(t value)	-3.043	***	-4.184	***	-4.188	***	-4.822	***				
Bankrupt	-0.0051										-0.0052	
(t value)	-8.052	***									-9.580	***
Pop Density	0.0001		0.0007				0.0003		0.0007		0.0013	
(t value)	0.519		0.404				0.571		0.383		0.827	
Land Price	0.0005		0.0009		0.0009		0.0009		0.0008		0.0004	
(t value)	4.444	***	7.679	***	10.366	***	8.016	***	6.878	***	4.405	***
Housing	0.0001		0.0001		0.0001		0.0001		0.0001		0.0001	
(t value)	10.730	***	10.334	***	10.366	***	10.142	***	9.284	***	10.770	***
HHI_B	16.6638		21.8671		21.5172		21.0832		22.5219		15.7564	
(t value)	2.023	**	2.450	**	2.431	**	2.358	**	2.475	**	2.409	**

Table 6. Estimation of Lending demand and supply function (Panel IV Estimation (Two way Fixed Effect), using HHI_A)

Independent Variable: Stock of Lending

	Demand Function (HHI_A)		Supply Function(HHI_A)	
Constant	−26.856	***	−7.627	***
(t value)	−9.604		-5.02	
Loan Rate	−1.611	***	1.1643	***
(t value)	−5.842		6.252	
Employment	0.031	***		
(t value)	15.19			
Unemployment	0.012		-0.014	**
(t value)	0.9024		-2.105	
Deposit			0.5868	***
(t value)			28.89	
Pop Density	0.028			
(t value)	1.482			
Bankrupt			-0.011	***
(t value)			-12.223	
Land Price	0.012	***		
(t value)	10.878			
Housing	0.004	***		
(t value)	4.947			
HHI_A	16.950	**	18.855	***
(t value)	2.173		3.302	

(Note)***:1% ,**:5% and*:10％ statistical significant

List of instrumental variables:
Demand function: Deposit; Supply function: The number of employment

Table 7 Estimation of Lending demand and supply function (Panel IV Estimation (Two way Fixed Effect), using HHI_B)

Independent Variable: Stock of Lending

	Demand Function (HHI_B)		Supply Function(HHI_B)	
Constant	−26.856	***	−7.077	***
(t value)	−9.604		−4.249	
Loan Rate	−1.611	***	1.351	***
(t value)	−5.842		5.887	
Employment	0.031	***		
(t value)	15.19			
Unemployment	0.012		-0.013	**
(t value)	0.902		-2.096	
Deposit			0.584	***
(t value)			28.64	
Pop Density	0.026			
(t value)	1.360			
Bankrupt			-0.009	***
(t value)			-12.115	
Land Price	0.012	***		
(t value)	10.824			
Housing	0.004	***		
(t value)	5.014			
HHI_B	15.423	**	15.9306	**
(t value)	2.326		2.585	

(Note)***:1% ,**:5% and*:10％ statistical significant

List of instrumental variables:
Demand function: Deposit; Supply function: The number of employment

Table 8. Re-estimation of Lending demand and supply function a la Revankar and Yoshino (1990) (Panel IV Estimation (Two way Fixed Effect) using HHI_A)

	Demand Function		Supply Function	
Constant	−38.614	***	−4.113	
(t value)	−6.351		-1.184	
Loan Rate	−1.612	***	1.456	***
(t value)	−5.842		6.252	
Employment	0.031	***		
(t value)	15.19			
Unemployment	0.012		-0.018	**
(t value)	0.9024		-2.105	
Deposit			0.743	***
(t value)			33.531	
Pop Density	0.014			
(t value)	0.431			
Bankrupt			-0.007	***
(t value)			-12.115	
Land Price	0.008	***		
(t value)	4.849			
Housing	0.004			
(t value)	1.221			
HHI_A	48.454	**	23.412	*
(t value)	2.220		1.821	
Residual	-29.513		28.345	
(t value)	-1.289		0.218	

(Note)***:1% ,**:5% and*:10% statistical significant

Note: We calculate the Residual to estimate the AR(1) model of HHI1_A (the coefficient of one-period lag of HHI_A is 0.697 (t-value is 12.355)).

Table 9. Re-estimation of Lending demand and supply function a la Revankar and Yoshino (1990) (Panel IV Estimation (Two way Fixed Effect), using HHI_B)

	Demand Function		Supply Function	
Constant	−26.856	***	−7.0777	***
(t value)	−9.604		−4.249	
Loan Rate	−2.3512	***	1.728	***
(t value)	−5.008		3.269	
Employment	0.027	***		
(t value)	13.061			
Unemployment	0.008		-0.015	***
(t value)	0.991		-3.813	
Deposit			0.688	***
(t value)			28.64	
Pop Density	0.003			
(t value)	1.157			
Bankrupt			-0.007	***
(t value)			-10.361	
Land Price	0.006	***		
(t value)	3.245			
Housing	0.006	***		
(t value)	3.483			
HHI_B	39.312	**	5.381	**
(t value)	2.023		2.585	
Residual	-20.826		18.613	
(t value)	-0.974		1.126	

(Note)***:1% ,**:5% and*:10% statistical significant

Note: We calculate the Residual to estimate the AR(1) model of HHI1_B. (the coefficient of one-period lag of HHI_A is 0.6637(t-value is 13.143)).

Table 10. The Results of Panel Unit Root Tests

Variables		Levin et al. (2002)	Im et al.(2003)
Stock of Lending	Level	6.267	7.343
	1st Diffrerence	-5.434***	-2.32**
Loan Rate	Level	-8.811***	3.683
	1st Diffrerence		-10.573***
Stock of Deposit	Level	7.724	12.349
	1st Diffrerence	-21.238***	-11.729***
The Number of Employees	Level	-23.445***	-7.404***
	1st Diffrerence		
The Number of Unemployment	Level	1.201	2.93
	1st Diffrerence	-15.118***	-4.233***
Population Density	Level	-2.109**	6.649
	1st Diffrerence		-3.869***
Land Price	Level	-13.494***	-1.473*
	1st Diffrerence		-3.774***
New Housing Starts	Level	-13.475***	-6.115***
The Number of Bankrupt	Level	-0.885	3.232
	1st Diffrerence	-24.766***	-12.748***
HHI_A	Level	-14.332***	-5.417***
HHI_B	Level	-13.068***	-4.442***

Table 11. Results of Pedroni's Panel Cointegration Test

	Statistics
Panel Philips-Perron	-7.634***
Panel Augmented-Dickey Fuller	-29.539***
Group Philips-Perron	-2.918***
Group Augmented-Dickey Fuller	-8.198***

Note: We use the three variables (lending outstanding, the level of deposit and the number of unemployment)

Table 12. Results of Stock of Lending Equation in FMOLS and DOLS

	Fully Modified OLS				Dynamic OLS			
Employment	0.004	***	0.004	***	0.005	***	0.005	***
(t value)	4.603		4.592		7.457		6.606	
Unemployment	-0.065		-0.0001		0.005	***	0.003	*
(t value)	-0.047		-0.12		2.877		1.673	
Deposit	0.216	***	0.235	***	0.364	***	0.339	***
(t value)	18.52		10.326		13.992		12.831	
Bankrupt	-0.027	***	-0.025	***	-0.042	***	-0.041	***
(t value)	-7.610		-7.752		-8.377		-8.463	
HHI_A	17.31	***			4.023	***		
(t value)	9.404				3.937			
HHI_B			18.22	***			3.416	***
(t value)			3.272				3.432	

(Note)***:1% ,**:5% and*:10％ statistical significant