Journal of Quantitative Finance and Economics. **2020**, 2, 2

ARF INDIA
Academic Open Access Publishing
www. arfjournals. com

Spatial Effects of Uneven Regional Development on the Efficiency of the Banking Industry in China

Chung-Yu Wu[1], Chien-Hsun Chen[1], Chun-Hung Lin[2] and Chao-Cheng Mai[3]

[1]*Chung-Hua Institution for Economic Research, 75 Chang Hsing St., Taipei, Taiwan 10672*
E-mail: matebee@yahoo.com.tw
Corresponding author: [1]E-mail: chchen@cier.edu.tw
[2]*Department of Industrial Economics, Tamkang University, 151 Yingzhuan Rd., Tamsui Dist., New Taipei City 25137, Taiwan, E-mail: chlin@mail.tku.edu.tw*
[3]*Department of Industrial Economics, Tamkang University and Research Center for Humanities and Social Sciences, Academia Sinica, 128 Sec. 2, Academia Rd., Nankang, Taipei 11529, Taiwan*

Received: 15 May 2020; Revised: 3 June 2020; Accepted: 20 July 2020; Publication: 07 October 2020

Abstract: The semiparametric geographically weighted regression (GWR) analysis showed that before the financial crisis, a higher degree of financial industry agglomeration enabled banks to benefit more from agglomeration economies, which led to the banks' improved cost efficiency. The effect was particularly significant for Chongqing and nearby western region as well as for Beijing and the nearby Bohai Economic Rim. However, following the financial crisis, market size became essential for improving the banks' cost efficiency; such a phenomenon was significantly prominent in Inner Mongolia, Hebei, Shanxi, and Gansu, four provinces with the degree of industrial agglomeration higher than their financial industry agglomeration. Regarding the banks' profit efficiency, before the financial crisis, regions with frequent economic and trade activities (e.g., Sichuan and Chongqing in west region and the eastern coastal region) had a higher financial industry agglomeration that resulted in superior profit efficiency.

Keywords: China's uneven regional development; China's banking industry; Financial industry agglomeration; Spatial econometric analysis; Cost efficiency; Profit efficiency

JEL Classification: G210; P340; R120

1. Introduction

China is a country of considerable land mass. Each region features a different geographical location, natural resources, and the potential for economic development; therefore,the extent and directions of economic and industrial developmentsvary considerably by regions.On average, the economic growth rates of China'seastern region are higher than those of thewestern regions. Indeed, geography and government policies are crucial contributors to the eastern coastal region'ssuperior economic performance.The timing

of government-instituted economic development policies varied across the regions,economic development was primarily concentrated in the Pearl River Delta from 1980 to 1992, shifted to the provinces of Jiangsu and Shanghai (located in the Yangtze River Delta) from 1993 to 2000 and latermoved to Beijing, Tianjin, and Shandong (of the Bohai Economic Rim) from 2001 to 2007. Since 2008, an economic development plan called "China Western Development" ("Go West Policies") began to gather momentum, targeting Chengdu (in Sichuan) as well as Wuhan (in Hubei) and Chongqing.

Compared with policies for China'swestern regions, key development policies (i.e., Rise of Central China Plan) for interiorprovinces nearCentral China (i.e., Shanxi, Henan, Anhui, Hubei, Hunan and Jiangxi) were implemented comparatively late. Similarly, the Northeast Area Revitalization Plan, a major regional development plan forthe northeastern region such as Heilongjiang, Jilin, Liaoning, and Eastern Inner Mongoliawere implementedonly recently. Meanwhile, the 12th Five-Year Plan, effectivefrom 2011 to 2015, continues to implement the China Western Development plan and the Northeast Area Revitalization Plan to sustain the areas' stable economic and social developmentin the long-run. Because their economic development preceded that of Central China, the eastern coastal regionhas been able to demonstrate superior economic performance.

In 2013, China introduced a transnational development plan called "One Belt and One Road (OBAOR)," which was put into effect in 2015. The OBAOR plan not only uses China's surplus production capacity more effectively and increases the diversity of accessible resources, but also improves the regions' infrastructure, thus minimizing disparity in regional development.

The level of development and operational performance of a banking industry are not only influenced by uneven regional development but also changes in related policies as well as the general economic environment.[1] For example, the financial crisis of 2008 severely impacted the global economy. To facilitate alleviating this economic impact, the Chinese government has introduced a number of policies. Nevertheless, the policies developed and enacted by relevant governmental units before and after 2008 differed considerably. For example, prior to the financial crisis, China began to strengthen and improve the constitution of its domestic banks in an effort to meet the Open Door Policy requirementsof the WTO. After the financial crisis, which severely disrupted the global financial regime, China began to implement a series of monitoring and management measures while fulfilling its duty as a WTO memberby remaining open to foreign investments.

According to the aforementioned discussions on development disparity across China's regions and the financial crisis of 2008 inevitably influenced banks' operating conditions before and after 2008. Because the banks' financial reports did not contain information about their regional branches, this study used the geographical locations of the head offices of various banks (herein after abbreviated as "head offices") to preliminarily identify the average operation performance of the banks before and after the financial crisis. In addition, the effect of a region's degree of financial industry development, market size, and locational distribution of foreign banks on its cost efficiency and profit efficiency was analyzed using semiparametric geographically weighted regression (GWR) analysis. Related data in 2008 and in 2012 were selected to represent the banks' performance before and after the financial crisis, respectively. The advantage of using GWR analysis to build an empirical estimation model is that the model's sample data display spatial correlations and spatial heterogeneity; therefore, the effect of explanatory variables on explained variables normally differs between regions. Assuming that the economic behavior of different regions is spatially heterogeneous, this enables the GWR analysis results to reflect real-life situations more accurately. Thus, using GWR analysis allows governments to formulate location-specific policies with different and appropriate financial policies for regions featuring dissimilar economic development. This study contributes to the literature onChina's banking industry efficiency by bridging the gap with regards to spatial analysis. Cross-sectional analysis will be concentrated onbeing performed to determine the effect of uneven regional development on the efficiency of banks in China before (2008) and after (2012) the financial crisis.

This study reveals that the cost efficiency (CEFF) of China's five major state-owned banks improved yearly during the sample period (from 2002 to 2012), surpassing that of foreign-funded banks by the end of the financial crisis in 2008. Similarly, their profit efficiency (PEFF), although initially trailing, eclipsed that of foreign-funded banks after the financial crisis.

The GWR analysis showed that before the financial crisis, a higher degree of financial industry agglomeration enabled banks to benefit more from agglomeration economies, which led to the banks' improved cost efficiency. However, following the financial crisis, market size became essential for improving the banks' cost efficiency. Regarding the banks' profit efficiency, before the financial crisis, regions with frequent economic and trade activities had a higher financial industry agglomeration that resulted in superior profit efficiency. By contrast, regions with a higher industrial agglomeration (e.g., northeastern provinces such as Jilin and Heilongjiang) exhibited poorer profit efficiency. Nonetheless, following the

financial crisis, the domestic market (created by the "Go West Policies") became the factor that sustained the banks' profit performance.

The remainder of this paper is organized as follows. Section 2 reviews the related literature. Section 3 establishes efficiency estimation model and semiparametric geographically weighted regression model for empirical investigation. Section 4 illustrates trends of China's bank efficiency and spatial distribution. Section 5 reports the empirical results of geographically weighted regression. Section 6 presents the conclusions drawn from this study.

2. Literature review

A number of related studies have investigated the phenomenon of China's uneven regional development and the reasons contributing to it. For example, Hu (2002) identified uneven economic development since the Chinese economic reform in 1979. By the 1990s, differences in the level of economic development across the regions became more pronounced. However, Fan and Sun (2008) indicated that interprovincial disparity declined from 2004 to 2006. Andersson *et al.* (2013) supported that China's unbalanced development strategies will lead only to short-term regional disparity. Wang *et al.* (2014) noted that the development disparity in urban areas was smaller than that in rural areas, but the disparity is gradually widening. By contrast, Lemoine *et al.* (2015) reported a diminishing disparity between China's coastal and interior regions. Herrerías and Monfort (2013) showed that, compared with provinces located in Central and Western China, provincesin the coastal region benefited more from economic reform. In addition, these provinces have formed their own small-scale regional clusters.

Finance-related studies on China have considered the effect that different levels of economic developments have on its banking industry. Liu and Wu (2008) confirmed that bank asset allocations were highly correlated with provincial GDPs, and that developing a sound financial system provides local businesses with sufficient loans, which introduces a flow of cash that stimulates local economic development. They also identified a high level of regional disparity regarding China's financial development. He and Fu (2008) investigated the correlation between the locational preferences of foreign banks and the relaxation of banking regimes across regions; in their study, they also consideredthe effect of the degree of a city's openness to foreign investments, local market opportunities (i.e., GDP per capita), and local banking opportunities (i.e., the total amount of bank deposits and loans) on the "follow-the-customer" strategy adopted

by its foreign banks. He and Yeung (2011) explored the correlation between the locational distribution of foreign banks and the "follow-the-customer" strategy adopted by these banks. Zhang *et al.* (2015) determined that a gradient difference emerges in the regional financial efficiency among the six major regions of China. Studies on the financial industry in China have investigated the efficiency in China's financial development as well as its banking industry. Chen *et al.* (2005) indicated that China's financial liberation in 1995 successfully improved the cost efficiency of its banks and that its small and large state-owned banks exhibited cost efficiencies superior to those of medium state-owned banks prior to China joining the WTO. Ariff and Can (2008) confirmed that the profit efficiency of China's banking industry was worse than its cost efficiency and that medium-sized and joint-stock banks were the most efficient bank types before 2004. Lin *et al.* (2009) asserted that compared with the pre-WTO accession period, the effect of competition improved the efficiency of the banking industry after China's entry into the WTO and that small city commercial banks and new entrants on average higher efficiency than large banks did. Moreover, Berger *et al.* (2009); Fu and Heffernan (2009), and Lin and Zhang (2009) have further identified that large state-owned banks had the worst operation efficiency before 2004, whereas foreign banks showed relatively higher operation efficiency. Wu *et al.* (2007) confirmed that large state-owned banks featured poorer profitability than that of joint-stock banks and that profitability was negatively correlated with years of operation. However, all of the discussed literature on bank efficiency failed to consider the possible influence of geographical location on a region's unbalanced economic development.

3. Model Setting and Data Analysis

3.1. Efficiency estimation models and banks' input and output variables

The cost efficiency (CEFF) and profit efficiency (PEFF) of each bank from 2002 to 2012 were estimated using data provided by Bank Scope and the *Almanac of China's Finance and Banking*. Banks with higher cost efficiency (CEFF) indicated that a lesser amount of input costs were required for them to achieve any given level of output. Conversely, banks with higher profit efficiency (PEFF) were able to generate higher profits for any given level of input costs. In general, efficiency estimation values range from 0 to 1, in which 1 indicates the highest efficiency. In this study, cost efficiency (CEFF) and profit efficiency (PEFF) were estimated using stochastic frontier analysis (SFA). Regarding the model setting, a commonly used method called the"translog function" was employed, as shown below:

$$\begin{aligned}&\ln(\text{Total cost} / \bar{p}F)_{bt}\\&= \alpha_0 + \sum_q \alpha_q \ln\left(y_q / F\right)_{bt} + \frac{1}{2}\sum_q \sum_k \alpha_{qk} \ln\left(y_q / F\right)_{bt} \ln\left(y_k / F\right)_{bt}\\&\quad + \beta \ln\left(p / \bar{p}\right)_{bt} + \sum_q \tau_q \ln\left(y_q / F\right)_{bt} \ln\left(p / \bar{p}\right)_{bt} + \lambda_{bt} + \mu_{bt},\end{aligned} \tag{1}$$

$$\text{where} \quad \mu_{bt} = \zeta_0 + \zeta_y year_t + \sum_k \zeta_k \left(D_k\right)_{bt} + \varepsilon_{bt},\ \lambda_{bt} \sim N(0, \sigma_\lambda^2),\ \varepsilon_{bt} \sim N(0, \sigma_\varepsilon^2), \mu_{bt} \geq 0.$$

In equation (1), *b* and *t* represent the bank and year, respectively; α, β, τ, and ζ are the model's regression coefficients, where $\alpha_{qk} \equiv \alpha_{kq}$ and $\beta_{qk} \equiv \beta_{kq}$; y_q and y_k signify the *q*th and *k* thoutput; (λ_{bt} + μ_{bt}) indicates the composite error term of the model; λ_{bt} is the purely random error; and μ_{bt} denotes a bank's inefficiency level. Concerning variable selection, this study referred to the following SFA-related studies, for example, Berger *et al.* (2009), Fang *et al.* (2011) and Pasiouras *et al.* (2007). To estimate profit efficiency (PEFF), total cost (TC) was converted to total profit before tax (PBT). The sign of the inefficiency term μ_{bt} was changed from positive to negative to signify that banks with relatively poorer profit efficiency (PEFF) earned less profit.Term *F* is the total earning assets (TEA) and is categorized as a bank's fixed input (*F*). Term *p* is the price of the input factor, which is represented by"cost of loanable funds (CLF) =total interest expense / deposits. "Dividing equation (1) by another the standard equation of the input price, "price of capital" (PC, $\bar{p}$), which equals"noninterest expense divided by fixed assets," satisfies the characteristic that cost function is homogenous of degree 1 in input price.Output (*y*) from the equation contained three variables: "total loans (LOAN) less bad debt,""other earning assets" (OEA), and "noninterest revenues"(which represented fees and commissions income, FEE). Although FEE is not used by Berger *et al.* (2009), Fang *et al.* (2011) and Pasiouras *et al.* (2007), this study believed that using the FEE output variable enabled the study results to fully reflect the profit structure of China's banking industry, an industry that contains not only a revenue from interest rate spread but also fees and commissions income (an increasing percentage each year). In this study, the aforementioned variables were measured in million RMB; related descriptive statistics are shown in Table 1.

This study used the estimation model proposed by Battese and Coelli (1995) and Coelli *et al.* (1999) and investigated four exogenous variables of environmental factors. Three variables were dummy variables (*D*) related to government reform and financial opening, with a control variable related

to year of operation. As indicated by Caudill *et al.* (1995) and Wang and Schmidt (2002), this estimation model outperforms two-stage estimation approach by estimating technical efficiencies without considering exogenous environmental variables, thusresulting in more accurate technical efficiency estimations.

Government reform and financial opening were addressed by the following three dummy variables (*D*): "were foreign investments acquired" (D_1; a value of "1" was assigned if the bank had acquired foreign investments as part of its shareholding structure, if it was a foreign-funded bank, or if the bank was a joint venture bank.); "is the bank listed" (D_2; the variable was set as 1 starting from the year the bank was listed on the Chinese market), and "does the bank adopt a joint-stock method" (D_3; the variable was set as 1 starting from the first year when the bank adopted a joint-stock method). For "year of operation," values of 1 to 11 were assigned for 2002 to 2012, respectively.

In China's banking industry, the average total assets and average total deposit of the studied bank sample accounted for 84% and their loans accounted for 93%, thus featuring favorable representativeness. The number of samples (sample period: 2002 to 2012) totaled 1,206 bank branches of 197 different banks; 111 of these banks were city commercialbanks, 40 were joint ventures or foreign-funded banks, and 26 wererural commercial banks. Table 2 shows the number of banks by bank type.

Table 1
Descriptive statistics of bank input and output variables

Unit: RMB million

	Maximum	*Mean*	*Minimum*	*Standard deviation*
TC	6050862.00	27875.37	0.16	2702727.73
PBT	2458727.00	12942.51	-230.50	1098113.80
CLF	6.35	0.03	0.00	2.83
PC	43.68	2.50	0.13	19.02
LOAN	59621867.00	408104.50	2.23	26615592.50
OEA	114447905.00	480259.92	2.56	51126494.18
FEE	246481.00	2252.84	-1070.40	110097.10
TEA	149040110.00	888319.23	4.79	66548585.73

When labor input is included in the efficiency estimation model, the effective sample size drops from 1,206 to 610, and the representativeness of the sample is diminished. Therefore, labor input was not included as an input variable in this study when estimating efficiencies.

Table 2
Number of banks by bank type, 2002-2012

	Five major state-owned banks	*Three major policy banks*	*12 major national joint-stock banks*	*City commercial banks*	*Foreign-funded banks*	*Rural commercial banks*	*Total*	*Number of regions with a head office*
2002	3	3	10	20	7	2	45	14
2003	5	3	10	27	7	2	54	17
2004	5	3	11	35	7	3	62	17
2005	5	3	11	48	8	9	84	22
2006	5	3	12	75	11	12	118	25
2007	5	3	12	83	25	15	143	28
2008	5	3	12	65	29	16	130	24
2009	5	3	12	70	34	15	139	26
2010	5	3	12	70	36	19	145	28
2011	5	3	12	77	34	19	150	28
2012	5	3	12	64	33	17	134	26
Total	53	33	126	634	231	129	1206	

3.2. Spatial regression model and study variables

Because of uneven economic development across China's regions, this study used a spatial econometrics modelcalled semiparametric geographically weighted regression (GWR), which was developed by Fotheringham *et al.* (1998) and Fotheringham *et al.* (2002). It was employed in this study to analyze factors of influence for each province. GWR is a spatial regression model derived from considering individual differences regarding the geographical locations of different objects (called "spatial heterogeneity"). The explanatory variables used by GWR may be divided into two categories: with spatial heterogeneity (i.e., local variable: x_{hi}) and without spatial heterogeneity (i.e., global variable: z_{li}). Global variables do not change from region to region; similar to ordinary least squares (OLS), they have only one corresponding regression coefficient. Because GWR contains both local and global variables, it is a semiparametric partial linear model. In this study, the following formula is used for GWR:

$$EFF_i = \rho_0(u_i, v_i) + \sum_h \rho_h(u_i, v_i)x_{hi} + \sum_l \gamma_l z_{li} + \varepsilon_i, \quad (2)$$

where EFF_i is the average efficiency of the bank in region i, x_{hi} is the hth local explanatory variable, z_{li} is the lth global explanatory variable with a fixed coefficient γ_l, ε_i is the error term at location i, (u_i, v_i) is the location in geographical space of the ith observation, and the coefficient $\rho_h(u_i, v_i)$ is the varying value of continuous function $\rho_h(u, v)$ with each location i. This

study assumed that observed values located closer to location *i* were more heavily influenced by those located farther away; thus, samples located in the vicinity of location *i* were given a greater weight than those located farther away. Consequently, the explanatory variables did not remain constant but changed as the sample location changed. The estimation formula for the explanatory variables is as follows:

$$\hat{\rho}(u_i, v_i) = [\boldsymbol{X}^T \boldsymbol{W}(u_i, v_i) \boldsymbol{X}]^{-1} \boldsymbol{X}^T \boldsymbol{W}(u_i, v_i) EFF$$

where $\boldsymbol{X}^T$ is the matrix derived by transposing matrix $\boldsymbol{X}$, which was created using explanatory variable *x*. The spatial weight ($\boldsymbol{W}$) was set as a continuous and decreasing function. The weight value of observation at location *j* for estimating the coefficient at location *i* can be set using the following formulas:

(a) As a Gaussian function: $W_{ij} = \exp\left[-\left(d_{ij}/\theta\right)^2\right]$,

(b) As a bi-square function: $W_{ij} = \begin{bmatrix} -\left(d_{ij}/\theta\right)^2 \end{bmatrix}^2 \quad ,if\ d_{ij} < \theta$
$\qquad\qquad\qquad\qquad\qquad\quad 0 \qquad\qquad\quad ,otherwise$

where d_{ij} is the Euclidean distance between *i* and *j* and θ was a fixed bandwidth size defined by a distance metric measure.[2] The cross-validation (CV) method and Akaike information criterion (AIC) method are commonly used to find the optimal value of θ. When θ varies, the θ corresponding to the minimal CV or AIC values between the compared models is the optimal bandwidth. Fotheringham *et al.* (2002) introduced a method for determining whether to use GWR or OLS: when the AIC between the GWR and OLS is greater than 3, analytical framework of GWR issuperior to that of OLS.

Table 3 shows the variables selected in this study. Three variables denoted factors that influenced a region's bank efficiency. These factors included the financial industry agglomeration (AGGF), market size (called "bank opportunity" (BAOPP) in the study and related literatures) as represented by a region's total deposits and loans, and the "proportion of foreign-funded banks in a region to the total number of foreign-funded banks in China" (abbreviated as "FR"), which represented a region's openness to foreign investments. The FR was also related to the government's financial development policies. The AGGF was used to illustrate the effect of uneven regional development on financial industry agglomeration, a result that could be used to support the assertion made by Parkand Essayyad (1989), who indicated that the forming of international financial centers creates industrial agglomeration. This study used the

Table 3
The definitions of the regression variables

	Code	*Name of variable*	*Unit*	*Definition and description*
Explained variables (*EFF*)	CEFF	Cost efficiency	Efficiency	Average efficiency of the head office in a province or
	PEFF	Profit efficiency	Efficiency	municipality
Explanatory variables (*x*)	AGGF	Degree of financial industry agglomeration	Agglomeration level	(Output of the financial industry as a ratio of the output of all industries in the province) ÷ (Output of the financial industry as a ratio of the national GDP)
	GDP	Regional output	RMB100 million	Total output of a region
	BAOPP	Bank opportunity	RMB100 million	Total amount of deposits and loans held by banks in a region
	FR	Foreign-funded banks ratio	%	Number of foreign-funded banks in a region as a percentage of the total number of foreign-funded banks in the country
	FDI	Foreign direct investment	US$100 million	Total amount of foreign investments in a region
	TRD	Total import and export volume	US$100 million	Total amount of imports and exports in a region

Sources: *China Statistical Yearbook* (2002-2012); *Almanac of China's Finance and Banking* (2002-2012); BankScope (2002-2012).

agglomeration index to determine whether the economies of scale created by forming financial centers,as well asthe subsequent industrial agglomeration, improved local banks' operation efficiency. Descriptive statistics of the variables for 2008 and 2012 are shown in Table 4.

Economic development in China differs between regions; regions in which economic policies had been heavily implemented generally showed economic performance superior to that of other regions. The variables on aggregate of each region thus exhibited a high degree of correlation. The correlation coefficient of independent variables for 2008 and 2012 are shown in Table 5. The correlations among regional GDP, BAOPP (represented by a region's total deposits and loans), total import and export trade volume (TRD), and FDI were significant and highly correlated. Because this study aimed to explore problems related to the banking industry, only BAOPP was selected from the four as a study variable, thus preventing the problem of collinearity in model estimations. BAOPP denoted the market size of a region, which represented a region's business environment. Therefore, this study used market size to explore the effect of different business environments on bank efficiency.

Because BAOPP and variables TRD and FDI were highly correlated, this study used the FR to illustrate a region's degree of openness. Zhao *et al.* (2004) found that the higher a region's degree of openness is, the higher is the demand for financial services.In addition,multinational company headquarters and high-end financial services are more likely to agglomerate in a region. Although high-end financial services lead to higher costs, higher fees and commissions can compensate for the costs. When this phenomenon occurs, cost efficiency (CEFF) drops but profit efficiency (PEFF) rises.

4. Trends of bank efficiency

The cost efficiency (CEFF) and profit efficiency (PEFF) of each bank were estimated using equation (1). Fig. 1 and 2 show the cost efficiency CEFF and profit efficiency (PEFF) trends of each bank type for the period 2002 to 2012. The study sample comprised 1,206 bank branches.The annual average in Fig. 1 reveals that the average cost efficiency (CEFF) of the Chinese banking industry increased yearly after 2002 until 2008, it dropped due to the global financial crisis, with the impact of the crisis continuing for two years. In 2010, the average cost efficiency (CEFF) began to rise again. Foreign-funded banks experienced a significantly stronger decline after the financial crisis, which might have resulted from the Chinese public exhibiting less trust in foreign-funded banks. Consequently, foreign-funded banks were forced to invest more resources to compensate for lost business.

Table 4
Descriptive statistics of the study variables

2008	*Mean*	*Maximum*	*Minimum*	*Standard deviation*
CEFF	0.818	0.907	0.653	0.064
PEFF	0.916	0.967	0.883	0.027
AGGF	0.968	3.272	0.348	0.673
GDP	12634.732	35696.460	1098.510	8966.246
BAOPP	29105.977	87594.060	3012.470	22748.887
FR	0.042	0.515	0	0.112
FDI	883	4159	24	1147
TRD	10442647	68496879	187940	16577480
2012				
CEFF	0.853	0.917	0.623	0.065
PEFF	0.990	0.996	0.986	0.003
AGGF	1.015	2.685	0.388	0.536
GDP	21120.873	57067.900	2341.300	14147.981
BAOPP	57156.174	172176.630	6879.280	42869.644
FR	0.038	0.525	0	0.108
FDI	1181	6249	30	1572
TRD	14647102	98402046	221670	22749620

Table 5
Correlation coefficients of the explanatory variables

	AGGF	*GDP*	*BAOPP*	*FR*	*FDI*
GDP	0.13				
	(-0.01)				
BAOPP	0.61	0.83			
	(0.48)	(0.83)			
FR	0.63	0.17	0.51		
	(0.60)	(0.12)	(0.48)		
FDI	0.45	0.75	0.83	0.53	
	(0.37)	(0.76)	(0.85)	(0.53)	
TRD	0.55	0.77	0.91	0.55	0.91
	(0.44)	(0.76)	(0.92)	(0.52)	(0.88)

Note: Numbers without parentheses are for 2008, whereas those in parentheses are for 2012.

Jeon *et al.* (2013) reported that the financial shock experienced by foreign-funded banks in their home countries is transmitted to their foreign subsidiaries. Therefore, their cost efficiency (CEFF) significantly dropped as they attempted to manage the investment losses of the head office in their home countries and foreign subsidiaries.

The trend shown in Fig. 2 indicates that the overall profit efficiency (PEFF) of the Chinese banking industry increased yearly before the financial crisis, with foreign-funded banks displaying the highest profit efficiency (PEFF). However, immediately before and after the financial crisis of 2008, the five major state-owned banks surpassed foreign-funded banks in profit efficiency (PEFF). These results correspond with China's state-owned banks being number one worldwide regarding assets owned and profits earned.

5. Empirical results of geographically weighted regression (GWR) before and after the financial crisis

Before the spatial regression analysis was conducted, tests and analyses were performed to determine whether the average efficiency of the banks from each province was spatially agglomerated. Next, the spatial

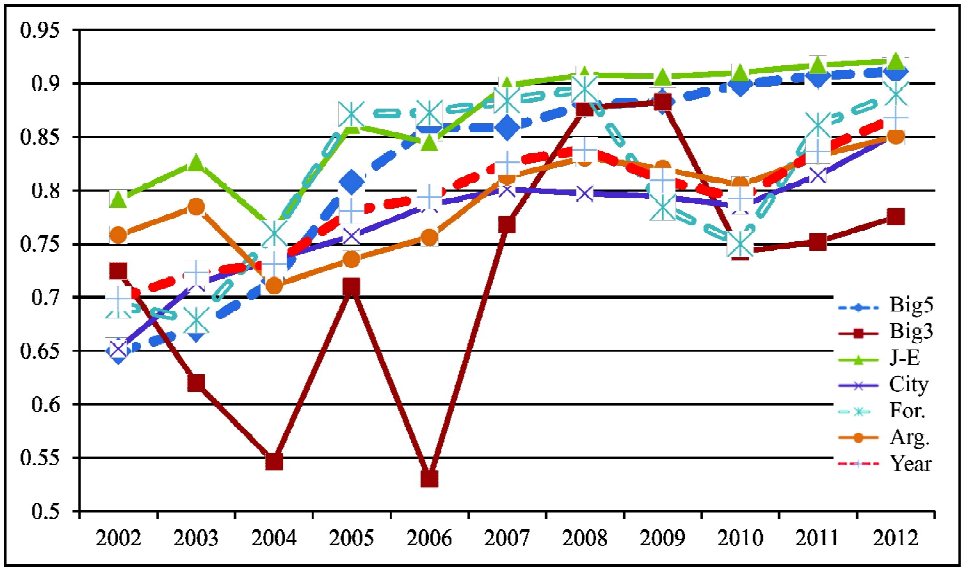

Figure 1: Cost efficiency (CEFF) trend for each bank type, 2002-1012

Notes: Big5 is the five major state-owned banks, including (1) Industrial and Commercial Bank of China, (2) China Construction Bank, (3) Bank of China, (4) Agricultural Bank of China, and (5) Bank of Communications. Big3 is the three major policy banks, including (1) China Development Bank, (2) Agricultural Development Bank of China, and (3) Export-Import Bank of China. J-E is the 12 major national joint-stock commercial banks, including (1) China Merchants Bank, (2) China CITIC Bank, (3) Shanghai Pudong Development Bank, (4) China Minsheng Bank, (5) Industrial Bank, (6) China Everbright Bank, (7) Ping An Bank, (8) Hua Xia Bank, (9) China Guangfa Bank, (10) Evergrowing Bank, (11) China Bohai Bank, and (12) China Zheshang Bank. City is city commercial banks and other regional joint-stock commercial banks. For.is foreign-funded banks and joint venture banks. Arg. is rural commercial banks. Year is the overall average efficiency of the banking industry by year.

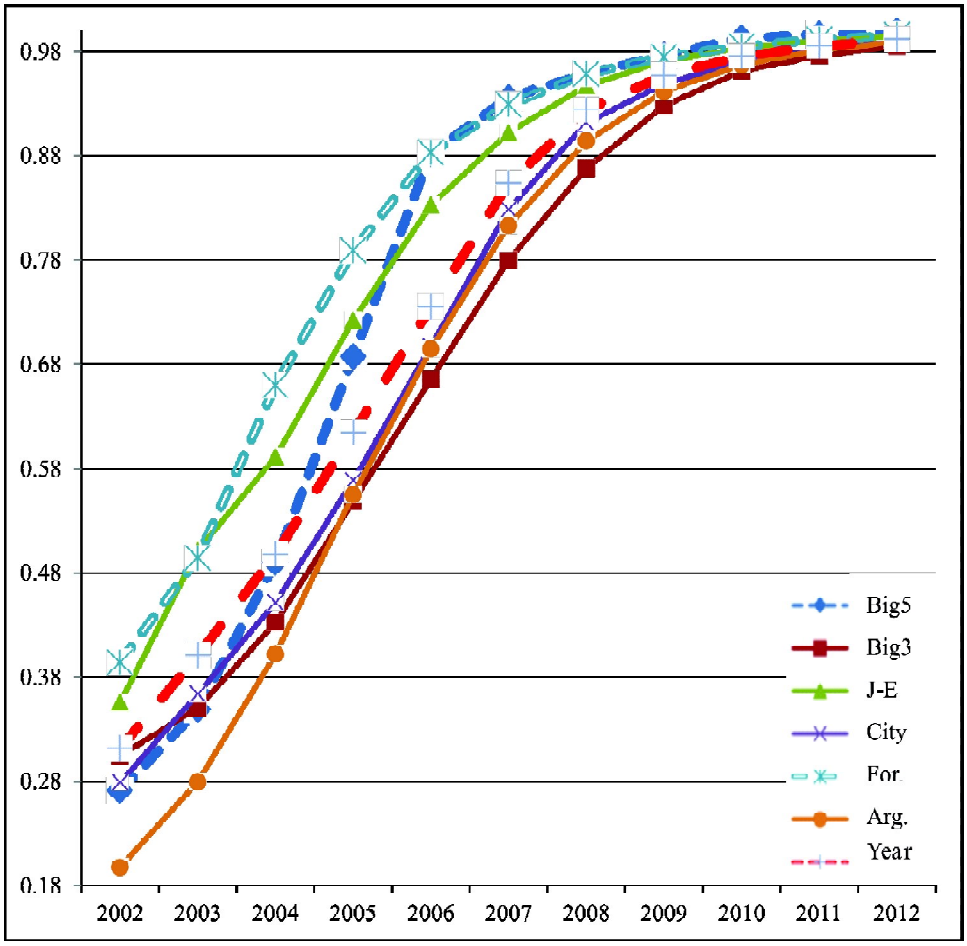

Figure 2: Profit efficiency (PEFF) trend for each bank type, 2002-2012

Note: See Fig. 1.

correlations between other explanatory variables were examined. The values of Moran's I in Table 6 show the results produced using an adjacent-type spatial weight matrix, in which CEFF, PEFF, AGGF, and BAOPP exhibited positive spatial correlations and a spatial agglomeration was observed geographically.[3] These results indicated that a region and its neighboring regions could show similar efficiencies. Because the economic performance of the coastal provinces differed from that of the interiorregi on, this study confirmed China's uneven resource allocation. Next, a spatial weight matrix (generated by using the reciprocal of the distances between the provincial capitals after standardization) was used in which negative spatial correlations were observed between some regions; however, none of the

negative spatial correlations achieved a significant level. No significant spatial effect was observed in the FR. The study results showed that apart from the FR, all of the data exhibited were spatially effect; therefore, using a spatial regression model for the analysis was appropriate.

The regression analysis involved two periods: "before the financial crisis" and "after the financial crisis." Because it immediately preceded the financial crisis and itscost efficiency (CEFF) and profit efficiency (PEFF) showed significant spatial correlations in Table 6, 2008 was selected to represent the period before the financial crisis. Conversely, 2012 was chosen to represent the period after the financial crisis because it offered the latest data.

Estimations were made using both OLS and geographically weighted regression (GWR); OLS did not include the factor of space, whereas GWR considered each region to be an independent unit (with its own regression coefficient). The GWR-estimated coefficients for each region are expressed as mean, standard deviation, maximum, and minimum. The explanatory variables in the GWR estimations were divided into two categories: with

Table 6
Statistics of Moran's I for different variables

	Dist.[a]				*Queen*[b]			
	CEFF		*PEFF*		*CEFF*		*PEFF*	
2002	0.02		0.02		0.16		0.31	***
2003	-0.02		-0.01		0.08		0.24	**
2004	0.06	***	0.07	***	0.29	***	0.36	***
2005	0.02		0.02		0.17	*	0.29	***
2006	0.02		0.04	**	0.24	**	0.39	***
2007	-0.01		0.01		0.14		0.18	**
2008	0.08	***	0.06	***	0.40	***	0.39	***
2009	0.05	**	0.03	*	0.06		0.12	
2010	-0.03		-0.01		0.04		0.16	*
2011	-0.02		-0.01		0.08		0.16	*
2012	0.02		0.02	***	0.26	***	0.28	***
	2008		**2012**		**2008**		**2012**	
AGGF	0.01		0.02		0.19	**	0.22	**
BAOPP	-0.01		0.02		0.24	**	0.25	**
FR	-0.03		-0.02		0.05		0.07	

Notes: [a]"Dist." means that the spatial weight matrix used the reciprocal of the distances between the provincial capitals after standardization.[b]"Queen" means that the spatial weight matrix employed was a first-order queen-based contiguity matrix derived after standardization. *, **, *** represent statistical significance at *p*-value of 0.1, 0.05, and 0.01,respectively.

spatial heterogeneity (local variables) and without spatial heterogeneity (global variables). Because the FR showed no significant spatial characteristics from estimations made using either spatial weight matrix of Moran's I, it was defined as a global variable. By contrast, because the AGGF and BAOPP showed spatial characteristics in first-order adjacency relations, they were defined as local variables.

Tables 8 and 9 show that the goodness of fit (R^2) of the GWR model, which considered the "spatial heterogeneity" of the factors, was superior to that of the OLS model (Table 7); The AIC for both models decreased by more than 3. Global variable FR failed to achieve a significant level in either model because the market share of foreign-funded banks accounted for less than 2% of the Chinese banking industry and were thus unable to exert a significant influence. With spatial heterogeneityincluded in the model, the results showed that the effect of the local explanatory variables on cost efficiency (CEFF) and profit efficiency (PEFF) could be both positive and negative. The level of influence (i.e., their estimated regression coefficients) that the explanatory variables had oncost efficiency (CEFF) and profit efficiency (PEFF)in the various regions as well as the corresponding *t*-values are shown in Fig. 3 and 4. Moran's I of residuals (Tables 8 and 9) all failed to reach statistical significance, indicating that the residuals were not spatial autocorrelation.

Before the financial crisis, market size (represented by BAOPP) was unable to significantly improve a region'scost efficiency (CEFF) (Fig. 3). By contrast, higher financial industry agglomeration (AGGF) enabled regional banks to benefit more from agglomeration economies, which improved their cost efficiency (CEFF). However, the effect of the financial industry agglomeration (AGGF) on cost efficiency (CEFF) became insignificant after the financial crisis, suggesting that the effect of industrial agglomeration was reduced because of the financial shock.At this point, a favorable market size was required to improve cost efficiency (CEFF).

According to the spatial distribution, for eastern coastal, Beijing and its surrounding regions and the western regions neighboring Chongqing, a high financial industry agglomeration (AGGF) indicates that these regions benefited considerably from the demonstration with financial business and spillovers about policy information of the regional financial centers located in these regions or in neighboring regions. Consequently, the bank's operating costs improved, thereby raising cost efficiency (CEEF). Chongqing and its neighboring regions (e.g., Sichuan, Guizhou, and Guangxi) as well as Beijing and its neighboring regions (e.g., Tianjin, Hebei, Shandong, Shanxi, and Henan) displayed the greatest statistical significance. This

Table 7
OLS estimation results

	CEFF				*PEFF*			
	2008		*2012*		*2008*		*2012*	
Intercept	0.928	***	0.513	**	0.949	***	0.988	***
	(5.119)		(2.573)		(12.357)		(124.383)	
AGGF	0.052	*	0.032		0.016		0.004	***
	(1.709)		(0.928)		(1.216)		(2.715)	
BAOPP	-0.01		0.032	*	-0.003		0.0002	
	(-0.567)		(1.727)		(-0.424)		(0.284)	
FR	0.073		-0.052		0.064		0.007	
	(0.485)		(-0.348)		(1.008)		(1.114)	
AIC	-62.019		-65.585		-103.237		-233.187	
R^2	0.249		0.206		0.249		0.497	
Obs.	24		26		24		26	

Notes: Numbers in parentheses represent *t*-values. *,**, and *** represent statistical significance at *p*-value of 0.1, 0.05, and 0.01, respectively.

Table 8
GWR results of cost efficiency (CEFF) before and after the financial crisis

CEFF	*2008*[a]		*2012*[a]	
	Average estimate	*Estimate min, {MAX}*[b]	*Average estimate*	*Estimate min, {MAX}*[b]
Intercept	1.001	-0.249,{1.646}	0.722	0.061,{1.422}
	(0.443)		(0.370)	
AGGF	0.074	-0.484,{0.417}	0.041	-0.105,{0.141}
	(0.158)		(0.047)	
BAOPP	-0.022	-0.075,{0.076}	0.011	-0.049,{0.071}
	(0.037)		(0.033)	
FR[c]	-0.046		-0.04	
AIC	-69.881		-70.894	
R^2	0.766		0.719	
Moran's I of residuals	-0.030		-0.043	
Obs.	24		26	

Notes: Numbers in parenthesis indicate standard deviations.[a]"2008" shows data before the financial crisis of 2008, whereas "2012" displays data after the financial crisis. [b]For "Estimate min, {MAX}," numbers in braces indicate the maximal value of the estimated coefficient, whereas the other numbers represent the minimal value of the estimated coefficient. [c] Regarding the three explanatory variables, the FR is a global variable, whereas the degree of financial industry agglomeration (AGGF) and bank opportunity (BAOPP) are local variables (i.e., variables that vary between regions). The settings of GWR are as follows: (1) Kernel type: fixed bisquare (distance), (2) Bandwidth: golden section search, (3) Selection criteria: AIC. For the Kernel type, the "fixed bisquare (distance)" type was selected because the "adaptive" type could result in nonheterogeneousregional coefficients.

Table 9
GWR results of profit efficiency (PEFF) before and after the financial crisis

PEFF	*2008*		*2012*	
	Average estimate	*Estimate min, {MAX}*	*Average estimate*	*Estimate min, {MAX}*
Intercept	0.909	0.248,{1.332}	0.952	0.940,{1.042}
	(0.257)		(0.044)	
AGGF	0.018	-0.297,{0.107}	0.005	0.001,{0.013}
	(0.078)		(0.003)	
BAOPP	-0.003	-0.040,{0.049}	0.00002	-0.004,{0.005}
	(0.023)		(0.002)	
FR	0.017		0.013	
AIC	-111.974		-240.303	
R^2	0.774		0.834	
Moran's I of residuals	-0.031		-0.032	
Obs.	24		26	

Note: See Table 8.

statistical significance was attributed to them being located near either the head office of the People's Bank of China (located at the international financial center in Beijing) or a People's Bank of China branch (located inthe regional financial centersof Jinan, Guangzhou, and Chengdu).

Following the financial crisis, only five regions in the north (i.e., Ningxia, Inner Mongolia, Hebei, Shanxi, and Gansu) used market size to lower the costs of searching for customers and improve CEFF. Except for Ningxia, all of the regions had higher degree of industrial agglomeration (AGGM) than financial industry agglomeration (AGGF), which implied that the industrial agglomeration created a wave of manufacturers, resulting in a stronger demand for loans to expand factories and conduct research and development. The AGGM was defined as the industrial output of a region as a ratio of the total output of all industries in the region divided by the national industrial output as a ratio of the national GDP. Consequently, the costs of searching for customers were reduced for banks.

Fig. 4 shows that for banks located in the eastern coastal regions (which featured frequent economic and trade activities) and the western regions (i.e., Sichuan and Chongqing), the higher the financial industry agglomeration (AGGF) was before the financial crisis, the more the banks benefited from agglomeration economies, which led to improved profit efficiency (PEFF). However, the eastern coastal regions were unable to significantly improve profit efficiency (PEFF) after the financial crisis, whereas an increased number of provinces in the western regions

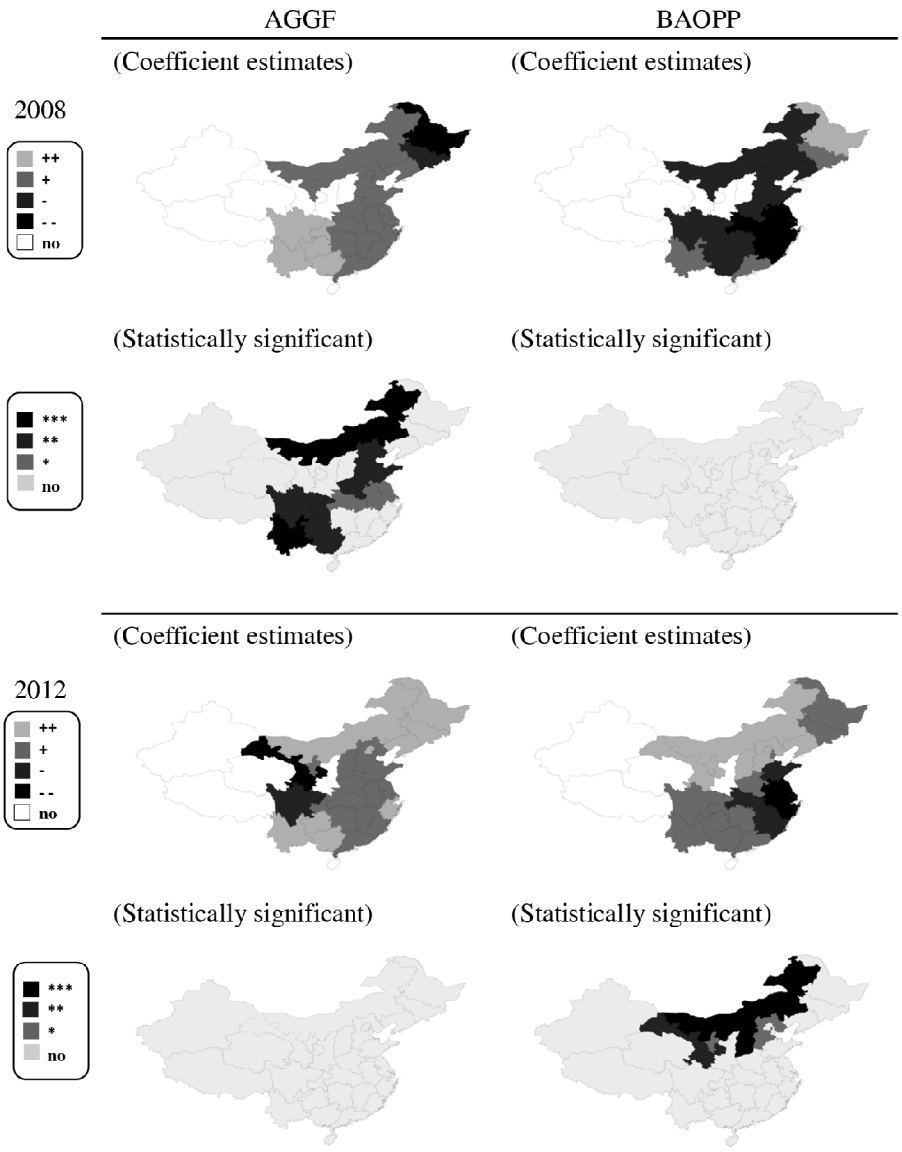

Figure 3: Choropleth map of GWR coefficient estimates and significance of *t*-values (explained variable: CEFF)

Notes: "++" and "+" correspond to a positive coefficient, and"++ (+)" denotes this values>(<)the average of the positive value."- -" and "-"correspond to negative coefficient, and"- - (-)" denotes this values<(>)the average of the negative value.*, **, and *** denote *t*-value reaches a level of significance at *p*-values of 0.1, 0.05, and 0.01, respectively."no" indicates regions without data or where the *t*-value was insignificant.

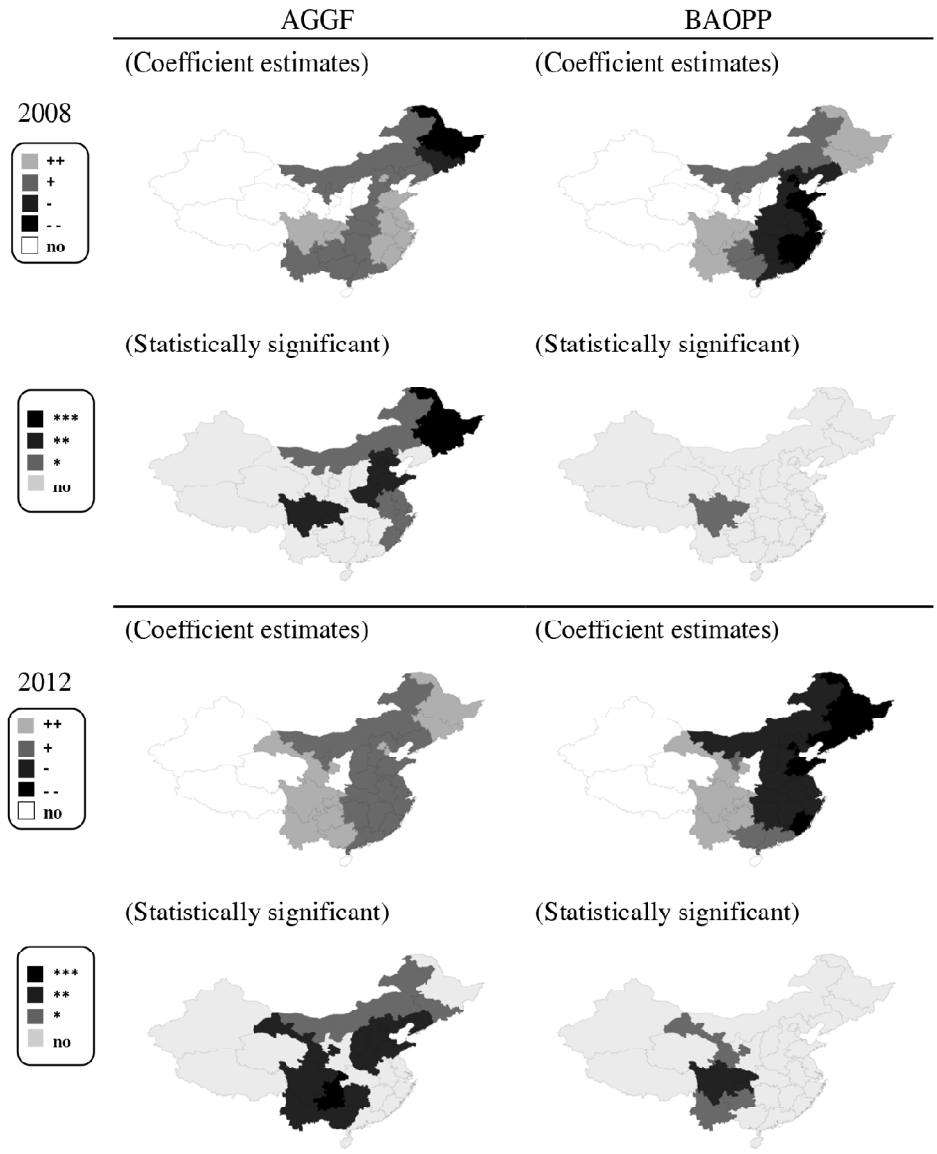

Figure 4: Choropleth map of GWR coefficient estimates and significance of *t*-values (explained variable: PEFF)

Note: See Fig. 3.

demonstrated improved profit efficiency (PEFF).This phenomenon was observed because the southeast region was active in terms of foreign trade and investment activities, which were severely impacted due to the global economic recession after the financial crisis, leading to decreased benefits

from openness. By contrast, the "Go West Policies" in the western regions created demand within the domestic market, enabling the banks to remain profitable.

For northeastern provinces such as Jilin and Heilongjiang, correlations between the financial industry agglomeration (AGGF) and profit efficiency (PEFF) in 2008 were negative, indicating that an increase in the financial industry agglomeration (AGGF) decreased banks'profit efficiency (PEFF). A possible explanation for this phenomenon was that the two provinces were regions with relatively high degree of industrial agglomeration (AGGM), in which industrial manufacturers were the banks' primary source of customer to loans. Therefore, shifting the development focus to the financial industry resulted in a lower interest income from loans, posing a negative effect on banks'profit efficiency (PEFF).

Market size, represented by BAOPP, significantly improved only the profit efficiency (PEFF) of Sichuan (a province in the western region) before the financial crisis. However, the effect of market size increased after the financial crisis, significantly expanding to cover provinces in the midwestern region. This phenomenon could be attributed to the effect of the "Go West Policies."

To verify whether the discussed results featured favorable robustness, this study substituted each regional degree of agglomeration in the industrial sector (AGGM) into the GWR. The Moran's Iresults for the AGGM in 2008 and 2012 were calculated using the adjacent-type spatial weight matrix (which used the reciprocal of the distances) and produced respective values of 0.056 (-0.11) and 0.058 (-0.076), which were not statistically significant. Therefore, the AGGM was classified as a global variable.

After introducing the new variable, a number of regions that were characterized originally as demonstrating "no statistical significance" showed "statistical significance." As shown in the cost efficiency (CEFF) model (Table 10), the financial industry agglomeration (AGGF) in 2008 was the only variable that remained unchanged regardless of whether the degree of agglomeration in the industrial sector (AGGM) was introduced to the GWR model, indicating that the original estimation results featured favorable robustness. Concerning other variables, regions presenting changes were geographically adjacent to original regions that showed significant; therefore, only the size of the agglomeration regions that were originally significantly had changed, whereas the direction of the influence of the coefficients remained unchanged. This phenomenon suggests that the results were robust to a certain extent. Specifically, in the cost profit (CEEF) model, except for market size (BAOPP) in 2012, which had Ningxia

Table 10
Robustness of GWR model

2008				*2012*			
CEFF							
AGGF		*BAOPP*		*AGGF*		*BAOPP*	
Inc.[a]	*Dec.*[a]	*Inc.*	*Dec.*	*Inc.*	*Dec.*	*Inc.*	*Dec.*
Nil	Nil	Jiangsu, Anhui, Jiangxi (coefficient was positive for all three regions)	Nil	Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia (coefficient was positive for all five regions)	Nil	Beijing, Henan (coefficient was positive for all two regions)	Ningxia (coefficient was positive)
PEFF							
Jiangxi, Hubei, Hunan, Ningxia (coefficient was positive for all four regions)	Shanghai, Zhejiang, Fujian (coefficient was positive for all three regions)	Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Hubei, Hunan (coefficient was positive for all eight regions)	Nil	Heilongjiang, Jiangsu, Anhui, Jiangxi, Hubei, Ningxia (coefficient was positive for six regions)	Nil	Nil	Chongqing, Guizhou, Yunnan, Gansu (coefficient was positive for all four regions)

Note: [a]"Inc."("Dec.")indicates the new significant regions increase (decrease) in GWR estimates after AGGM was incorporated into the model.

showing a decrease region in cost efficiency (CEFF), all others had the number of significant regions increase in cost efficiency (CEFF). Furthermore, in the profit efficiency (PEFF) model, AGGF (2008) and BAOPP (2012) contained the number of significant regions decrease, whereas both AGGF and BAOPP in 2008 as well as AGGF in 2012 had the number of significant regions increase in profit efficiency (PEFF).

6. Conclusions

To identify the factors that changed the cost efficiency (CEFF) and profit efficiency (PEFF) of each province, this study considered the heterogeneity of economic development across regions in China, analyzing it using GWR, a model that considers the effect of spatial heterogeneity. Through regression analysis, financial industry agglomeration (AGGF) was the factor that improved the cost efficiency (CEFF) of each region before the financial crisis, after the financial crisis was market size (BAOPP). Prior to the financial crisis, no significant changes in cost efficiency (CEFF) were observed in the southeastern regions, whereas significant changes were found only in northern regions after the financial crisis. When the degree of agglomeration in the industrial sector (AGGM) was incorporated into the GWR model, the financial industry agglomeration (AGGF) was shown to significantly improve cost efficiency (CEFF) in Beijing and the surrounding areas after the financial crisis. The financial industry agglomeration (AGGF) significantly elevated the profit efficiency (PEFF)of most of the regions, whereas market size (BAOPP) significantly enhanced the profit efficiency (PEFF) of only a few of the regions. However, the financial industry agglomeration (AGGF) showed a significant and negative effect on profit efficiency (PEFF) in northeastern provinces where the degree of agglomeration in the industrial sector (AGGM) was higher than financial industry agglomeration (AGGF) (e.g., Jilin and Heilongjiang) in 2008, and the effect of the financial industry agglomeration (AGGF) differed between the other regions. This result shows that, to avoid counter productive results that would in turn cause policy failures in several regions, governments must consider the local conditions and industry characteristics of respective regions when formulating policies related to improving banks' profit efficiency (PEFF).

Finally, because the time at which the Chinese government implemented economic development policies differed across regions and because each region possessed distinct resources, the industrial agglomerations and levels of economic and trade development differed among regions. The geographical distribution of bank efficiency is influenced not only by the temporal factor of the financial shock but also by the sequence of a region's

economic development. The analytical results of this study revealed that financial industry agglomeration could significantly influence more regions than market size could, and that regions demonstrating significant changes comprised the Bohai Economic Rim (surrounding Beijing) as well as the key development regions in which the "Go West Policies" were adopted. Examining these results according to geographical and spatial distributions showsthat the industrial agglomeration resulting from the enactment of economic development policiesis one of the crucial factors influencing bank efficiency.

Notes

1. The details of the related literature about China's uneven regional development will be reviewed in next section.
2. Other weight-setting methods include the adaptive bandwidth method; details about the weight-setting procedure can be found in Nakaya (2014). This study initially used the adaptive bandwidth method and did not find heterogeneity between the estimated coefficients of each region.
3. Local Moran's I served as the index for measuring the spatial correlations between the observed values of a variable in a given region with that of neighboring regions. (seeAnselin1995) This positive (negative) value indicates positive (negative) spatial correlation.

References

Andersson, F. N., Edgerton, D. L., & Opper, S. (2013). A matter of time: Revisiting growth convergence in China. *World Development*, 45, 239–251.

Anselin, L. (1995). Local indicators of spatial association—LISA. *Geographical Analysis*, 27, 93–115.

Ariff, M., & Can, L. (2008). Cost and profit efficiency of Chinese banks: A non-parametric analysis. *China Economic Review*, 19, 260–273.

Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. *Empirical Economics*, 20, 325–332.

Berger, A. N., Hasan, I., & Zhou, M. (2009). Bank ownership and efficiency in China: What will happen in the world's largest nation? *Journal of Banking and Finance*, 33, 113–130.

Caudill, S. B., Ford, J. M., & Gropper, D. M. (1995). Frontier estimation and firm-specific inefficiency measures in the presence of heteroscedasticity. *Journal of Business and Economic Statistics*, 13, 105–111.

Chen, X. G., Skully, M., & Brown, K. (2005). Banking efficiency in China: Application of DEA to pre-and post-deregulation eras: 1993–2000.*China Economic Review*, 16, 229–245.

Coelli, T., Perelman, S., & Romano, E. (1999). Accounting for environmental influences in stochastic frontier models: With application to international airlines. *Journal of Productivity Analysis*, 11, 251–273.

Fan, C. C., & Sun, M. (2008). Regional inequality in China, 1978–2006. *Eurasian Geography and Economics*, 49, 1–18.

Fang, Y., Hasan, I., & Marton, K. (2011). Bank efficiency in South-Eastern Europe. *Economics of Transition*, 19, 495–520.

Fotheringham, A. S., Charlton, M. E., & Brunsdon, C. (1998). Geographically weighted regression: A natural evolution of the expansion method for spatial data analysis. *Environment and Planning A*, 30, 1905–1927.

Fotheringham, A. S., Brunsdon, C., & Charlton, M. (2002). *Geographically Weighted Regression: The Analysis of Spatially Varying Relationships*. Hoboken:John Wiley and Sons.

Fu, X. M., & Heffernan, S. (2009). The effects of reform on China's bank structure and performance. *Journal of Banking and Finance*, 33, 39–52.

He, C., & Fu, R. (2008). Foreign banking in China: A study of 279 branch units in 32 cities. *Eurasian Geography and Economics*, 49, 457–480.

He, C., & Yeung, G. (2011). The locational distribution of foreign banks in China: A disaggregated analysis. *Regional Studies*, 45, 733–754.

Herrerías, M. J., & Monfort, J. O. (2015). Testing stochastic convergence across Chinese provinces, 1952–2008. *Regional Studies*, 49, 485–501.

Hu, D. (2002). Trade, rural–urban migration, and regional income disparity in developing countries: A spatial general equilibrium model inspired by the case of China.*Regional Science and Urban Economics*, 32, 311–338.

Jeon, B. N., Olivero, M. P., & Wu, J. (2013). Multinational banking and the international transmission of financial shocks: Evidence from foreign bank subsidiaries. *Journal of Banking and Finance*, 37, 952–972.

Lemoine, F., Poncet, S., & Ünal, D. (2015). Spatial rebalancing and industrial convergence in China. *China Economic Review*, 34, 39–63.

Lin, H. L., Tsao, C. C., & Yang, C. H. (2009). Bank reforms, competition and efficiency in China's banking system: Are small city bank entrants more efficient? *China and World Economy*, 17, 69–87.

Lin, X., & Zhang, Y. (2009). Bank ownership reform and bank performance in China. *Journal of Banking and Finance*, 33, 20–29.

Liu, W., & Wu, W. (2008). Development of local financial systems in Mainland China. *Eurasian Geography and Economics*, 49, 160–179.

Nakaya, T. (2014). GWR4 user manual. *https://geodacenter.asu.edu/drupal_files/gwr/GWR4manual.pdf*

Pasiouras, F., Tanna, S. K., & Zopounidis, C. (2007). Regulations, supervision and banks'cost and profit efficiency around the world: A stochastic frontier approach. Working Paper, University of Bath Management.

Park, Y. S., & Essayyad, M. (1989). *International Banking and Financial Centers*. Berlin: Springer.

Wang, C., Wan, G., & Yang, D. (2014). Income inequality in the People's Republic of China: Trends, determinants, and proposed remedies. *Journal of Economic Surveys*, 28, 686–708.

Wang, H. J., & Schmidt, P. (2002). One-step and two-step estimation of the effects of exogenous variables on technical efficiency levels. *Journal of Productivity Analysis*, 18, 129–144.

Wu, H. L., Chen, C. H., & Shiu, F. Y. (2007). The impact of financial development and bank characteristics on the operational performance of commercial banks in the Chinese transitional economy. *Journal of Economic Studies*, 34, 401–414.

Zhang, Q., Xu, Z., Feng, T., & Jiao, J. (2015). A dynamic stochastic frontier model to evaluate regional financial efficiency: Evidence from Chinese county-level panel data. *European Journal of Operational Research*, 241, 907–916.

Zhao, S. X., Zhang, L., & Wang, D. T. (2004). Determining factors of the development of a national financial center: The case of China. *Geoforum*, 35, 577–592.