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The Effect of Financial Agglomeration on Economic Growth in Guangdong-Hong Kong-Macau Greater Bay Area

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Abstract

The financial industry plays an important role in promoting the economic development of a certain region. Financial agglomeration is a manifestation of the sound development of the regional financial industry. The Guangdong-Hong Kong-Macau Greater Bay Area is an essential Economic Zone in China and even the whole world. This article aims to apply location entropy and ordinary least squares regression model to analyze the effect of financial agglomeration on economic growth. Based on the relevant data of GDP, financial employment rate, bank assets, and insurance gross premium income in Guangdong Province, Hong Kong, and Macau from 2011 to 2020, equation models are set up. To overcome the endogeneity, the residual stationarity of the regression model is tested. The study finds that the high level of financial agglomeration has a promoting effect on the regional economic development of the Guangdong-Hong Kong-Macau Greater Bay Area, but different financial resource agglomeration has various impacts. Financial agglomeration is a vital factor influencing the regional economic growth of the Greater Bay Area, and local regional economy can be boosted by encouraging financial agglomeration.

Keywords

Financial agglomeration; Location entropy; Economic growth; Regional economy.

1. Introduction

Finance can somehow represent the modern economy. The relationship between the level of development of the financial industry and regional economic growth has long been a heated discussion. Financial agglomeration is just the embodiment of the level of the regional financial development[1,2].

The Guangdong-Hong Kong-Macau Greater Bay Area (the Greater Bay Area) includes the Hong Kong Special Administrative Region, the Macau Special Administrative Region and nine municipalities in Guangdong Province. It is one of the four major bay areas in the world and one of the most open and economically dynamic Economic Circles in China that makes critical contributions to the Chinese economy. Meanwhile, the financial industry here is developing rapidly. Thus, strengthening the exploration of the synergy mechanism of financial agglomeration and regional economic growth is of great value in enhancing the healthy development of these two.

2. Financial Agglomeration

To find out the impact of financial agglomeration on economic growth in the region, firstly it is needed to see whether the financial agglomeration exists or not. The article uses the location entropy, which is the most commonly used index to analyze the degree of financial agglomeration[3,4].

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Location Entropy: $LQ_{ij} = \frac{q_{ij}/q_j}{q_i/q}$

LQ_{ij} is the location entropy of the i industry in the j region in the whole country;

q_{ij} refers to the output or the number of the employment of i industry in the j region;

q_j refers to the output or employment of all industries in j region;

q_i refers to the output or employment of i industry nationwide;

q is the output or employment of all industries in the whole country.

Generally, the higher the value of LQ_{ij} is, the higher the level of agglomeration of i industry in the j region. If $LQ_{ij} > 1$, we consider that the regional economy of j region has an advantage in the whole country. In other words, there may be an industrial agglomeration in the region. In contrast, if $LQ_{ij} < 1$, the regional economy of j region has a disadvantage in the whole country. Thus, an industrial agglomeration does not exist in this region.

Therefore, we can evaluate the level of the financial agglomeration in the Greater Bay Area by calculating the location entropy. The data is collected from 'National Bureau of Statistics of China', 'Government of Macao Special Administrative Region Statistics and Census Service', 'Government of Hong Kong Special Administrative Region Census and Statistics Department' and 'Guangdong Provincial Bureau of Statistics'. The location entropy of financial industries of Greater Bay Area (GBA), Hong Kong (HK), Macau and Guangdong Province based on the financial employment rate from year 2011 to 2020 is shown in Table 1 and drawn in Figure 1.

Table. 1. Location Entropy in Four Regions

	Greater Bay Area	Hong Kong	Macau	Guangdong Province
2011	1.147	9.318	3.728	1.142
2012	1.119	8.966	3.452	1.114
2013	0.984	8.799	3.654	0.979
2014	0.911	8.535	3.717	0.906
2015	0.887	8.032	3.426	0.883
2016	0.890	7.445	3.059	0.886
2017	0.791	7.452	3.285	0.787
2018	0.958	7.510	3.037	0.954
2019	1.105	6.690	2.850	1.102
2020	1.186	6.825	2.831	1.183

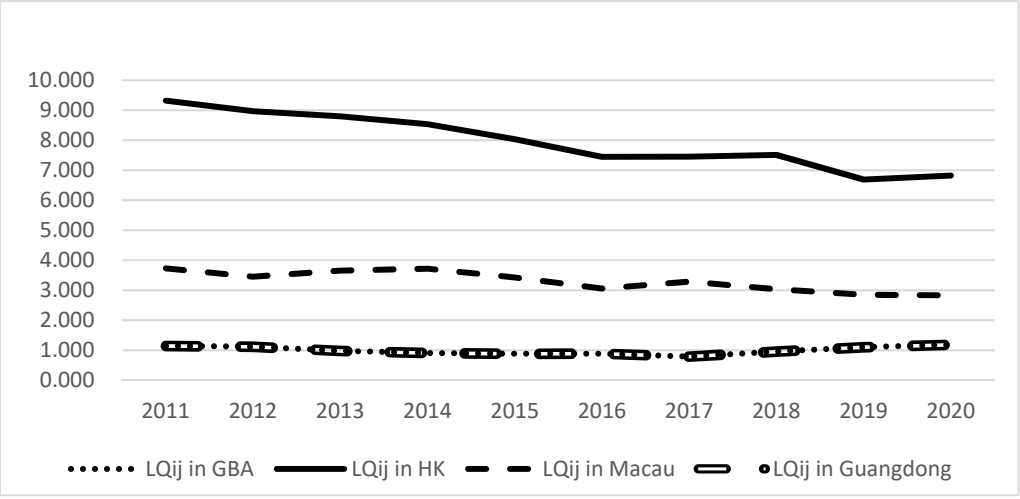

Figure 1. Plot of the Location Entropy

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It can be seen obviously that both Hong Kong, with an average location entropy of 8, and Macau whose average location entropy is 3.3, appear to have financial agglomeration indicators greater than one in the past 10 years, suggesting a relatively manifest level of financial agglomeration. Especially in Hong Kong, the value is considerably high, while the other three regions have not even reached the lowest. However, when it turns to Guangdong Province and the Greater Bay Area, this value keeps fluctuating around one. This suggests that the financial agglomeration mainly occurs in two regions, Hong Kong and Macau. But the two curves of Guangdong and Greater Bay Area have shown an upward trend and their location entropy is gradually getting bigger than one in recent years. Therefore, we can still conclude that financial agglomeration also exists in the Greater Bay Area and Guangdong.

According to Figure 1, the curves of the Greater Bay Area and Guangdong Province almost overlap. This is because that it is the employment rate in financial industry that is being used to calculate the location entropy. Guangdong Province, with its huge population, contributes the most to the financial agglomeration level of the Greater Bay Area than Hong Kong and Macau.

3. The Effect of Financial Agglomeration on Economic Growth

Having proved that there is financial agglomeration in the Greater Bay Area, this paper will analyze the influence of financial industry and its sub-industries agglomeration on economic growth.

3.1. Model Setting

3.1.1. Linear Equation

Take the value of the total assets of banking from 2011 to 2020 as an index to measure the development of banking industry in the Greater Bay Area. Also, use the total gross premium income of the insurance from the year 2011 to 2020 to represent the level of development of insurance industry in the region. Since the financial agglomeration is mainly reflected in the agglomeration of financial institutions, it tends to ignore the securities industry in the article[5]. Assume banking and insurance both contribute to half of the financial agglomeration, so that the indicator of financial industry equals to 0.5 times the total assets of banking plus 0.5 times the total gross premium income of the insurance.

Define the Gross Domestic Product in Guangdong-Hong Kong-Macau Greater Bay Area (Y) as the dependent variable, and the indicators of banking, insurance, and financial industry as the independent variables. Add the number of employment and the government expenditure (expressed as $lngovex$) as the control variables. Set up equations and use Python to run the OLS regression. The results are shown in Table 2.

$$Y = \beta_1 + \beta_2 finance + \beta_3 employment + \beta_4 lngovex \quad (1)$$

$$Y = \beta_1 + \beta_2 bank + \beta_3 employment + \beta_4 lngovex \quad (2)$$

$$Y = \beta_1 + \beta_2 insurance + \beta_3 employment + \beta_4 lngovex \quad (3)$$

$$Y = \beta_1 + \beta_2 bank + \beta_3 insurance + \beta_4 employment + \beta_5 lngovex \quad (4)$$

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Table 2. OLS Outcomes of Equation (1) to (4)

	Equation (1)	Equation (2)	Equation (3)	Equation (4)
Intercept	-1411.9173 (3.25e+04)	5474.8843 (3.01e+04)	-5486.8161 (3.21e+04)	5.028e+04 (3.03e+04)
$finance$	2.0611 (1.431)			
$bank$		2.5406 (1.377)		2.9037** (1.067)
$insurance$			9.5998 (7.262)	11.6702* (5.106)
$employment$	5.8446** (2.223)	4.1952 (2.329)	5.9517** (2.262)	3.5177 (1.809)
$lngovex$	-2153.3907 (3024.333)	-2163.9397 (2675.467)	-1895.0825 (3043.412)	-5149.3445* (2430.532)
R^2	0.985	0.987	0.984	0.994
Adjusted R^2	0.977	0.980	0.976	0.988

Note: ①Brackets under the regression coefficients are the standard errors; ②***, **, and * denote the 1%, 5%, and 10% significance levels in the t-test respectively.

According to Table 2, when the effects of finance, banking and insurance on regional economy are analyzed separately in Equation (1), (2) and (3), none of them is significant.

However, it is worth noting that, when the impacts of banking and insurance are analyzed at the same time as shown in Equation (4), both of them become significant. And banking is more significant at 5% level. Moreover, both coefficients of these two variables are positive, which means that they enhance the economic growth in the region.

3.1.2. Non-linear Equation

If the data is reprocessed into the square term, similarly, rerun the OLS regression in terms of the new equations, Equation (5) to (8), that are set up. The outcomes are shown in Table 3.

$$Y = \beta_1 + \beta_2 finance + \beta_3 finance^2 + \beta_4 employment + \beta_5 lngovex \quad (5)$$

$$Y = \beta_1 + \beta_2 bank + \beta_3 bank^2 + \beta_4 employment + \beta_5 lngovex \quad (6)$$

$$Y = \beta_1 + \beta_2 insurance + \beta_3 insurance^2 + \beta_4 employment + \beta_5 lngovex \quad (7)$$

$$Y = \beta_1 + \beta_2 bank + \beta_3 bank^2 + \beta_4 insurance + \beta_5 insurance^2 + \beta_6 employment + \beta_7 lngovex \quad (8)$$

It is noticeable that all the linear terms and the quadratic terms of the explanatory variables in the Equation (5) and (7) are statistically significant and the coefficients of $finance^2$ and $insurance^2$ are highly significant at 1% significance level. While in Equation (6), the effect of banking industry on regional economy is not explicit. Meanwhile, the coefficients of $finance$ and $insurance$ are negative and the coefficients of $finance^2$ and $insurance^2$ are positive, indicating that the financial industry as well as insurance industry agglomeration would firstly inhibit the economic growth in the Greater Bay Area and later facilitate the growth when the values of $finance$ and $insurance$ increase. This is because it consumed some capital or

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resources at the beginning of the agglomeration. But when the financial industry is sustainably developing, it accelerates the economic growth.

Table 3. OLS Outcomes of Equation (5) to (8)

	Equation (5)	Equation (6)	Equation (7)	Equation (8)
Intercept	-3.72e+04* (1.48e+04)	-6556.8822 (2.26e+04)	-3.682e+04** (1.38e+04)	-9.655e+04 (4.84e+04)
$finance$	-5.5072** (1.487)			
$finance^2$	2.6486*** (0.478)			
$bank$		-2.8458 (2.395)		-0.6554 (1.982)
$bank^2$		7.6331* (3.077)		-2.7514 (3.746)
$insurance$			-2.7055** (0.696)	-5.3752* (2.195)
$insurance^2$			7.6295*** (1.320)	13.3983* (4.803)
$employment$	8.0993*** (0.998)	6.1993** (1.890)	8.0431*** (0.964)	10.9851** (2.498)
$lngovex$	-473.906 (1276.960)	-1704.9707 (1970.981)	-504.7694 (1226.627)	2643.1011 (2760.293)
R^2	0.998	0.994	0.998	0.999
Adjusted R^2	0.996	0.989	0.996	0.996

Note: ①Brackets under the regression coefficients are the standard errors; ②***, **, and * denote the 1%, 5%, and 10% significance levels in the t-test respectively.

Yet when it turns to Equation (8), where the linear and the quadratic terms of banking and insurance are put in simultaneously, the effect of insurance industry becomes less significant with only a 10% significance level. Banking is still insignificant.

3.1.3. Conclusion

For different models, the results are different. Nevertheless, the outcomes demonstrate that high level of financial and two financial sub-industries agglomeration will positively contribute to economic growth in Guangdong-Hong Kong-Macau Greater Bay Area.

3.2. Stationary Test

The financial industry is the foundation of a region's improvement of the economy. At the same time, the rapid growth of regional economy may also provide support and impetus for financial agglomeration. Therefore, due to the possibility of the existence of endogeneity among the data, it is required to test the stationarity. By drawing all the residual series of the preceding eight equations, test the stationarity for the residuals based on Augmented Dickey-Fuller test statistic (ADF test statistic) using EViews 11. The results are shown in Table 4.

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Table 4. Stationarity Test Results

	t-Statistic	P-value	Significance	Stationarity
Equation (1)	-2.2382	0.2085	Insignificance	Non-stationary
Equation (2)	-2.3652	0.1746	Insignificance	Non-stationary
Equation (3)	-2.3758	0.1744	Insignificance	Non-stationary
Equation (4)	-3.2889	0.0480	5% level	Stationary
Equation (5)	-4.7690	0.0080	1% level	Stationary
Equation (6)	-3.9975	0.0178	5% level	Stationary
Equation (7)	-4.4273	0.0121	5% level	Stationary
Equation (8)	-4.7120	0.0086	1% level	Stationary

In light of Table 4, the ADF test results of the residuals of Equation (4) to (8) are stationary, which means that after concerning the endogeneity and the stationarity of the data, the outcomes and conclusions of Equation (4) and the non-linear models are still valid.

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