

Study on Temporal and Spatial Evolution Characteristics of Inter-provincial Boundary Effect in Pan-Pearl River Delta Region

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Abstract. In this paper, Barro regression model is constructed by using urban per capita GDP and the shortest transportation distance, and the border effect of Pan-Pearl River Delta region in 2011-2021 is measured in stages. The results show that: (1) the convergence of economic development in this region is strong at first and then weak, especially in Guizhou and Guangxi; (2) The inter-provincial border shielding effect is weakened, but the intermediary effect is enhanced, but the intensity is low, which shows that the boundaries of intermediary effect have increased from 8 in the first five years to 11 in the last five years, and the border shielding effect in Guizhou is stronger; (3) Traffic improvement has promoted urban economic growth, but it has no significant impact on inter-provincial economy, and the influence of distance factors has weakened.

Keywords: Economic Spatial Difference; Boundary Effect; Temporal and Spatial Evolution.

1. Introduction

Different provinces, cities and regions often show obvious spatial differences in economy due to differences in resource endowments, location conditions, policies and systems, which is a common economic phenomenon. However, if we don't take corresponding policies and measures for economic spatial differences, the disharmony of regional economic development will become a major problem that hinders China's economic development and social stability. In today's world, promoting the coordinated development of regional economy has become a common trend of global economic development. In China, the development of regional economic integration is usually manifested in breaking the obstacles of inter-provincial boundaries and promoting coordinated development between regions. Xiao Jincheng proposed in 2004 that the economic gap between provincial boundaries and provincial central cities is the biggest gap between regions [1]. The special location of inter-provincial border areas often leads to serious administrative barriers and regional blockades, and generally lags behind provincial capital cities in terms of logistics, transportation facilities, infrastructure and service system, and economic development often lags behind, which has become a major obstacle to promoting regional integration. Therefore, how to develop the economy in the inter-provincial border areas better and how to transform the border effect into intermediary effect now is a research field with great practical value. As one of the most distinctive and dynamic economic cooperation regions in China, the study of the spatial evolution and causes of its economic spatial differences, as well as the spatial pattern, evolution characteristics and causes of its inter-provincial boundary effects is in line with the strategic policy of "forming a new pattern of economic interconnection, interaction, complementary advantages and coordinated development among the eastern, central and western regions" put forward by the 19th National Congress of the Communist Party of China, and is also the implementation of the concept of "regional coordinated development".

2. Research Method

Construct Barro regression equation suitable for the measurement of inter-provincial boundary effect in Pan-Pearl River Delta region. Firstly, a virtual variable is set, and the virtual variable for cross-provincial comparison is set to 1, and the virtual variable for intra-provincial comparison is set to 0 to measure the intensity of border effect; Secondly, Guangzhou plays the role of the core growth pole

in the Pan-Pearl River Delta region, so the distance variable is introduced to study the influence of traffic factors on regional coordinated development. In this way, Barro regression model is constructed as follows:

$$\frac{1}{T} (\ln(y_{t+T}) - \ln(y_t)) = \alpha_0 + \alpha_1 \ln(y_t) + \alpha_2 \text{dum} + \alpha_3 \text{distance} + \varepsilon_t \quad (1)$$

3. Study on Inter-provincial Boundary Effect

3.1. Analysis on the Characteristics of Inter-provincial Boundary Effect from 2011 to 2016

According to the model (1), the regression measurement results are obtained by substituting relevant data.

First of all, pay attention to α_1 . During 2011-2016, the sign of α_1 in these five years is basically the same as that in the past 10 years, that is, the difference of per capita GDP growth rate between provinces is negatively correlated with the difference of initial per capita GDP, and the degree of convergence in these five years is generally higher than that in the overall 10 years.

Secondly, as shown in Figure 1, the symbol of α_2 is basically the same as that of the whole decade, and the intermediary effect of some provincial boundaries in these five years is stronger than that in the whole decade, such as Guangdong and Fujian, Guangdong and Hunan, Guangdong and Guangxi, Jiangxi and Fujian; There are also cases where the boundary effect is transformed into an intermediary effect or the intensity of the boundary effect is reduced, such as Guangdong and Jiangxi, Guangxi and Hunan, Hunan and Jiangxi, Sichuan and Guizhou, Sichuan and Yunnan; There are also intermediary effects that have changed into boundary effects or the intensity of boundary effects has increased, such as Guizhou and Guangxi, Guizhou and Hunan, Guangxi and Yunnan. Generally speaking, the inter-provincial mediation effect in the Pan-Pearl River Delta region is mainly in the past five years (eight provincial boundaries show the mediation effect, and five provincial boundaries show the border shielding effect), which is basically higher than the overall 10 years.

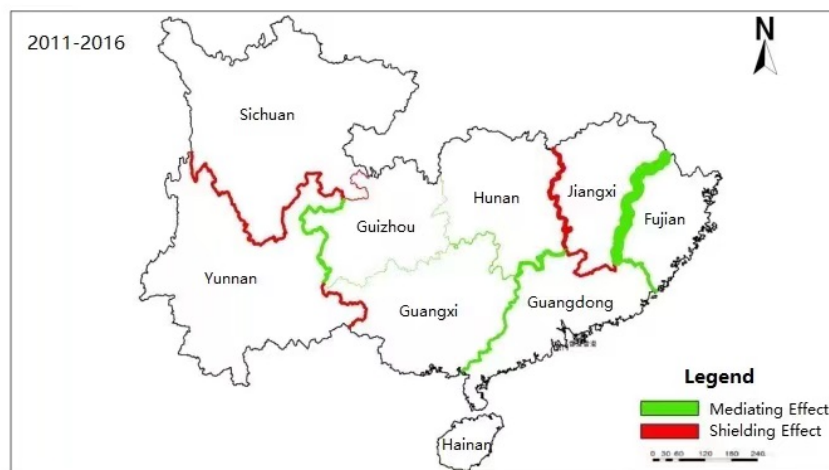


Figure 1. Inter-provincial Boundary Effect in Pan-Pearl River Delta Region from 2011 to 2016

Finally, studying the influence of traffic, the sign of α_3 is basically the same as that of the whole 10 years, and both are negative, indicating that traffic has played a positive role in the development of inter-provincial economic convergence, but the influence is not significant (the absolute value of α_3 is small).

3.2. Analysis on the Characteristics of Inter-provincial Boundary Effect from 2011 to 2016

First of all, we should pay attention to α_1 . Although the symbol of α_1 in 2011-2016 is basically the same as that in the whole 10 years, the value of α_1 is generally lower than that in the past 10 years, indicating that the degree of convergence in these five years is lower than that in the past 10 years, and Guizhou and Guangxi show a trend of divergence in these five years.

Secondly, as shown in Figure 2, there is a significant difference between the symbol of α_2 and the whole 10 years, and the intermediary effect of some provincial boundaries in these five years is lower than that in the whole 10 years, such as Guangdong and Fujian, Guangdong and Hunan, Guangdong and Guangxi, Jiangxi and Fujian; The intermediary effect of some provincial boundaries in these five years is higher than that in the whole 10 years, such as Guangxi and Hunan, Guangxi and Yunnan, Sichuan and Guizhou, and Yunnan and Guizhou; The boundary effect of some provinces is higher than that of the whole 10 years, such as Guizhou and Guangxi, Guizhou and Hunan. Generally speaking, the inter-provincial mediation effect in the Pan-Pearl River Delta region is dominant in these five years (11 provincial boundaries show the mediation effect, and only 2 provincial boundaries show the shielding effect), which shows that the Pan-Pearl River Delta region has shown the trend of regional integration in these five years, but the integration process is slow.

Finally, looking at the influence of traffic, the symbols of α_3 are still negative, indicating that traffic has played a positive role in the development of inter-provincial convergence, but the role is still not significant (the absolute value of α_3 is small).

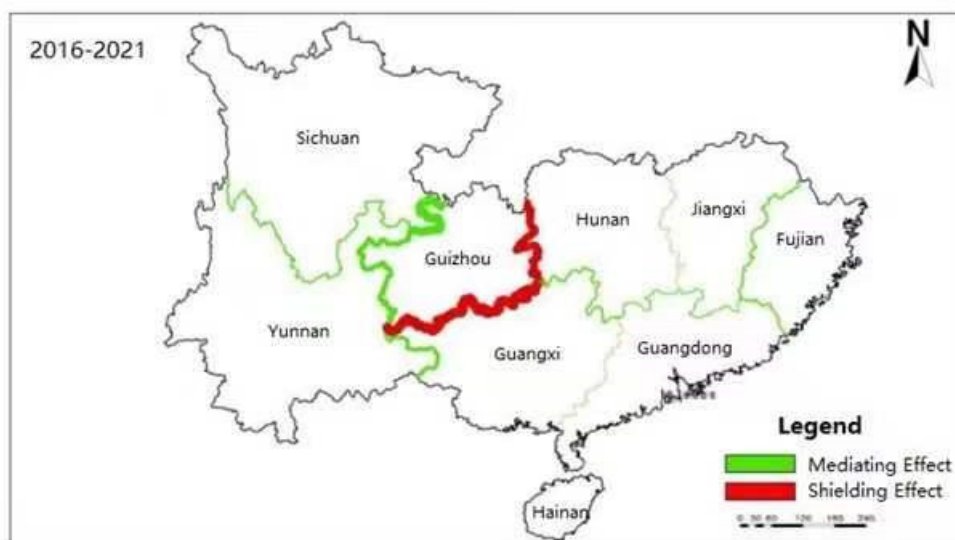


Figure 2. Inter-provincial Boundary Effect in Pan-Pearl River Delta Region from 2016 to 2021

4. Conclusion

Coordinated regional development has become the common goal of world development, so the study of border effect has become a new perspective of coordinated regional economic development. On the basis of summarizing the research results of predecessors and learning the basic theory of boundary effect, this paper establishes a model for judging and measuring the inter-provincial boundary effect, and divides the 10 years into two stages for measurement and visualization respectively, so as to achieve the research purpose of studying the temporal and spatial evolution law of inter-provincial boundary effect. Based on the above analysis, it can be summarized that the spatial and temporal evolution of inter-provincial boundary effect in Pan-Pearl River Delta region in the decade from 2011 to 2021 is characterized by the following points:

(1) During the decade from 2011 to 2021, the overall economy of the Pan-Pearl River Delta region showed a trend of convergence. In 2011, the central and western regions such as Sichuan, Yunnan, Guizhou, Guangxi and Hunan were low-lying areas for economic development, but by 2021, the economic development of these provinces was greatly improved, and the inter-provincial border areas gradually got rid of the low-lying areas, and the inter-provincial economy gradually evolved towards convergence. However, the degree of convergence in the five years from 2011 to 2016 is obviously higher than that in the five years from 2016 to 2021, especially the economic development between Guizhou and Guangxi has changed from convergence to divergence, indicating that the overall economic development convergence in the Pan-Pearl River Delta region has declined.

(2) The primary factor affecting the border effect is the per capita GDP. During the decade from 2011 to 2021, the shielding effect of the inter-provincial boundaries in the Pan-Pearl River Delta region is decreasing, and the intermediary effect is gradually increasing. The number of provincial boundaries showing the intermediary effect has increased from 8 in 2011-2016 to 11 in 2016-2021, indicating that the openness between provinces is gradually increasing and the regional coordinated development trend is good. However, the intensity of intermediary effect is generally low, indicating that the process of regional coordinated development is in the initial stage and the process is slow. What needs attention is that the border effect of Guizhou Province is particularly significant in 2016-2021, and its provincial boundaries with Guangxi and Hunan are the only two boundaries with shielding effect, indicating that the border of Guizhou Province hinders regional coordinated development, and it is necessary to increase the degree of openness and promote the effective circulation of resources, elements and talents.

(3) On the whole, although the improvement of traffic conditions has accelerated the growth of urban economy to a certain extent, the coefficient value of traffic variables is generally low, indicating that the economic impact between provinces is not significantly affected by traffic factors, and traffic conditions are no longer the main factor hindering the coordinated development of regional economy.

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