

## Research on China's Regional Economic Development and Regional Economic Differences Based on Spatial Spillover Effect

Huang Jiyu

University of Illinois at Urbana-Champaign, School of Liberal Arts and Sciences, Urbana Champaign, the United States

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**Abstract:** With the deepening of reform, China's economy is showing a rapid development trend. At the same time, due to the common influence of different factors such as economic globalization, reform and opening up, and economic development, the exchanges between enterprises in the region are increasingly close. Marketization reform has eliminated market segmentation between different regions in China, accelerated the flow of production factors and labor products among different regions, and improved the efficiency of resource allocation. Traditional time and space constraints have less and less effect on the process of finding the best allocation of resources in the global scope. Any economic activity has been incorporated into the global production network consciously or unconsciously. Behind the rapid growth, the level of economic development in different regions of China is very different. The interdependence and spatial spillover effect between different regions have an important influence on China's regional economic development. Based on the spatial spillover effect, this paper analyzes the regional economic development and regional economic differences in China.

### 1. Introduction

Since the seventies of last century, the process of world economic integration has accelerated, and the scale circulation of resources in the global scope has become an important feature of today's world economic development. With the progress of science and technology and the continuous optimization of industrial structure, China's economy has seen a substantial growth [1]. The development of information technology provides a good foundation and premise for regional cooperation and exchange in our country, thus the exchange between regions in our country has been further improved. Structural evolution [2]. Marketization reform has eliminated market segmentation among different regions in China, accelerated the flow of factors and products among different regions, and improved the efficiency of resource allocation [3]. Marketization reform has eliminated market segmentation among different regions in China, accelerated the flow of production factors and labor products among different regions, and improved the efficiency of resource allocation [4]. Under the background of economic globalization, various resources flow across regions and borders under the control of factor price laws, which has built economic space in the world. The possibility of regions entering regional external markets has increased, making external economic development create favorable market demand conditions for the region's economic development and play a role in driving the region's economic development [5]. The spillover benefits of economic growth have gradually begun to appear in China, which has promoted the overall development of China's economy and made China's GDP significantly improved [6].

The increase in the possibility of entering the external market in the region has made the external economic development create favorable market demand conditions for the economic development of a region. The economic development of some regions has also played a role in the economic development of other regions [7]. The multiplier effect in the region refers to the output growth and economic development brought about by the interaction and mutual promotion between various industrial sectors in one region. The inter-regional spillover effect refers to the one-way economic development in one region. Impact [8]. Compared with the eastern region, the central and western

regions have their own disadvantages. This disadvantage directly affects the rapid development of the economy in the central and western regions, but the role played by the eastern region in the economic development of the central and western regions is also a question worthy of further study [9]. Traditional space-time constraints have become less and less restrictive in the process of finding the best allocation of resources on a global scale, and any economic activity has been incorporated into the global production network consciously or unconsciously [10]. If there is no unified big cycle and a mutually separated cycle system is formed, then two-way flow channels of resource elements cannot be formed between China's regions, thus further widening the already large economic gap between the eastern and central and western regions [11]. Inter-regional feedback effect indicates that while economic changes in one region have an impact on the economy of another region, economic changes in another region in turn have an impact on the economy of that region.

China has a vast territory and there are huge development differences among regions. With the proposal of the national economic integration development strategy, the unbalanced regional economic development has attracted much attention [12]. The trend of the times is irreversible. Scholars have realized the urgency and difficulty of studying the spatial structure of regional economy under the background of globalization. Most believe that the correlation of regional economic development in the 21st century will become more and more obvious. This development trend will to a large extent affect the economic development speed and structure of backward regions [13]. If multiplier effect studies the economic development of a single region, then the spillover and feedback effects of economic development among regions, especially the research content of spillover effects, pay more attention to the development of multi-region economy [14]. The implementation of the strategy at the national level has driven the development of the local economy and improved the unbalanced development of the regional economy to a certain extent. It has been put into practice to coordinate with the national regional economic integration strategy [15]. Behind the rapid growth, the level of economic development in different regions of China is very different. Interdependence and spatial spillover effect between different regions have a noticeable influence on China's regional economic development [16]. Therefore, it is of positive practical significance to analyze China's current regional correlation and spillover effects of economic growth. Based on the spatial spillover effect, this paper analyzes and discusses China's regional economic development and regional economic differences.

## **2. China's Regional Association**

Since the reform and opening up, China's economy has made continuous development, and the degree of marketization has also been continuously improved. There are both competitive and cooperative relations between various regions. With the development of the theory of regional economic structure, the debate on whether the growth of equilibrium or non-equilibrium is more conducive to a country's economic development is increasingly fierce. The global spatial correlation between different regions in China is closely related to the local spatial correlation. The geo-spatial effect of economic development must play an important role in regional economic development [17]. One of the main functions of input-output analysis is to decompose the change of total output into the change of input-output structure and the change of total final demand. Changes in final demand can be further decomposed into changes in various demand factors such as final consumption, final capital formation and exports. The characteristics of local spatial agglomeration in China will gradually become obvious with the development of time. Areas with higher economic development level are mainly associated with areas with similar development level, and vice versa [18]. Under the regional connection, the developed regions will be affected by the echo effect of the less developed regions, which will further improve the development speed and the gap between regions will become larger and larger. There is a close relationship between the spatial correlation of locality and the spatial correlation of globality in our country. The role of geographical space in economic development cannot be ignored. Regional spatial spillover is mainly manifested in the spatial spillover of locality.

The growth spillover effects between different types of regions in China may differ in direction and size, so in order to distinguish different spillover effects caused by different degrees of relative development. Under the influence of the diffusion effect of developed regions, underdeveloped regions will speed up their development, thus achieving coordinated development of regional economy, thus reducing the regional gap. Products and factors are circulating continuously under this cooperative and competitive relationship, and the economic ties between regions are also strengthening day by day. When it comes to economic spatial structure, we need to trace back to the discussion of market structure. Since China's reform and opening up, the economic development in the eastern region has been much faster than that in the central and western regions, and compared with inland regions, the eastern region has a better development foundation [19]. At present, with the increasing cooperation and communication, the products in each region may be used as final products to meet the final needs of other regional economic entities. With the passage of time, the multiplier effect coefficient in the region is decreasing, while the feedback effect coefficient and spillover effect coefficient between regions are increasing. This shows that with the further deepening of reform and opening up, China's regional ties are closer and the flow of products and factors between regions is smoother.

In the process of economic integration, industries in each region will inevitably provide intermediate input to industries in other regions more or less. The relevant data are substituted into the system to run, and the original model is repeatedly corrected to obtain a series of fitting indexes of the corrected model. However, the other two sub-indicators market learning ability and marketing promotion ability have significant impact on marketing performance, but to a lesser extent. For example, Table 1 shows the estimation and significance test of structural parameters of performance indicators.

Table 1 Performance indicator structure parameter estimation and significance test

Path description	t value	Path coefficient
Market learning ability → influence performance	3.52	1.66
Marketing ability → marketing performance	3.34	1.48
Customer Management Capabilities → Marketing Performance	4.48	1.45

There are n indicators for evaluating the independent innovation capability of enterprises. Based on this part of the indicators, the independent innovation capability of enterprises is quantitatively divided into T grades, which are described as the following quantitative comprehensive evaluation matter element models:

$$Q(u_{ij}) = \sum_{i=1}^n \text{Max}\{g_{ij}(T)\} \quad (1)$$

According to the above formula, China as a whole is taken as the research object and the market potential is analyzed, and then the spatial spillover effect of economic growth is comprehensively analyzed. The growth of China's national economy is closely linked to the development of many regional economies and has played an immeasurable role in the sustained economic growth of China. Links between regions have been strengthened, various products and factors have moved freely among different regions, the efficiency of resource allocation has been effectively improved, and the market space between provincial administrative regions has been effectively expanded. Through the detailed implementation of China's regions to specific provinces, it means that the market potential will obviously decrease with the increasing distance between provinces, and the ability and extent to drive regional economic growth will show a downward trend. With the development of the times, relevant scholars use the spatial distance to measure the regional output value and the scale of potential demand for services, and to examine the impact of market potential on the regional wage level. Excessive reliance on investment and export will also have a negative

impact on the healthy growth of the economy. Promoting the pulling effect of consumer demand on China's economic growth is still an important issue that China needs to solve at present and in the future. When a province's economy develops rapidly, its spatial spillover effect becomes more and more obvious, which can effectively promote the common economic growth of neighboring provinces.

In the world, because of the influence of externalities on the economy, the economic development of various countries and regions is seriously unbalanced. When organizing production activities according to the needs of foreign markets, due to the gap in production technology with developed countries abroad, all kinds of technical equipment are mainly imported from abroad, and all kinds of energy, raw materials and labor are mainly supplied by the domestic market. The new growth theory holds that the key factor affecting economic development lies in the technological progress of fixed capital investment. There is a certain degree of spatial dependence between different regions in China, so this kind of geo-spatial dependence information must be introduced into the model to obtain more reliable estimation results [20]. The higher the level of regional economic development, the larger the scale of its total economic volume and the faster its development speed will increase. Therefore, the region's demand capacity for various products in the surrounding areas is also relatively large [21]. Space economy is closely related to the spatial connection of space units. Spillover effect of space economy is the spatial distribution state and spatial combination form of various economic activities, and the spillover effect of sample-sending space economic structure [22]. Changes in market potential directly affect the per capita income growth of a region, and the market potential of the region is mainly related to the economic development level, price and market distance of neighboring regions.

### 3. Spatial Spillover Effect of Regional Economic Development in China

#### 3.1 Global Estimation Analysis

The further each region of China is from the coastal ports, the higher the cost of transporting various products in overseas markets, thus presenting negative effects on regional development. The spatial dependence of a region on other regions has been characterized by the variable of market potential. However, we know that the dependence of one region on other regions is quite complicated. There is also obvious autocorrelation between provinces and regions in our country, and there is a clustering phenomenon in the geographical location, and this clustering feature will become more and more obvious under the influence of time, which effectively indicates that there is spillover effect of economic development between different regions [23]. The outward-oriented economic characteristics in the eastern part of the country and the inward-oriented economic characteristics in the central and western parts of the country are obvious. The outward-oriented economic characteristics in our country are mainly caused by the rapid expansion of the total economic volume in the eastern part.

Regional relevance is proportional to distance, that is, the shorter the distance between regions, the stronger the relevance. The matter-element model formed by the allowable value range of each index in the comprehensive evaluation of independent innovation capability is called nodal matter-element:

$$y_{f-n_m} = \sum_{i=1, i \neq n}^N \sum_{l=1}^M \sqrt{p_{i_l}} \mathbf{h}_{i, n_m}^T \mathbf{W}_{i, i_l} s_{i_l} \quad (2)$$

For the enterprise to be evaluated, the data or analysis result obtained by the evaluation is represented by the matter element P:

$$d = 2r_b \left( \frac{\sqrt{2}\sigma_R B}{2\sigma_{td}} \right)^{1/\beta} \left( \frac{\sqrt{2}\rho_0 D^2 n k^{-2\gamma} l_e B}{16\sigma_{cd}} \right)^{1/\alpha} \quad (3)$$

The role of resource allocation has been significantly improved, and the access to the regional external market is less limited, which makes the external economic development create good market demand conditions for the economic development of a region. If the central and western regions can provide all kinds of production factors for the production of export products in the East, it is possible to form a two-way interactive pattern between the East and the central and western regions. However, when the central and western regions are unable to meet the various resource conditions needed for the production of export products in the East, the East can only find a supply chain system matching the production of export products in the foreign market. Spatial spillover effect is not only a problem that local economy can affect the overall economy, but also a problem that needs to be able to connect the past and the future sustainable development. Due to the introduction of the market potential index, we can also effectively correlate the spatial spillover effect between provinces and the spatial correlation between regions. The implementation of the policy of developing the west, revitalizing the northeast and central China not only improves the economic level of these areas, but also promotes the industrial docking and integration between these areas and the relatively developed southeast coastal areas. The spatial spillover effect we are studying should be rooted in the realistic background, a relatively open space system closely connected with history, the future and the outside world, and cannot be locked into an isolated regional space. The further the distance between regions, the less relevant it is. From the perspective of time, the correlation between regions in our country is positively correlated with time. As time goes on, the correlation is continuously strengthened.

When facing huge user data, any enterprise needs to find data suitable for its own development characteristics. Only when users' real demand feedback is obtained can enterprises obtain good economic benefits. Each service circuit set must pass as few communication nodes as possible in order to improve the compactness of the topology. Fig. 1 shows the situation of original data and predicted data.

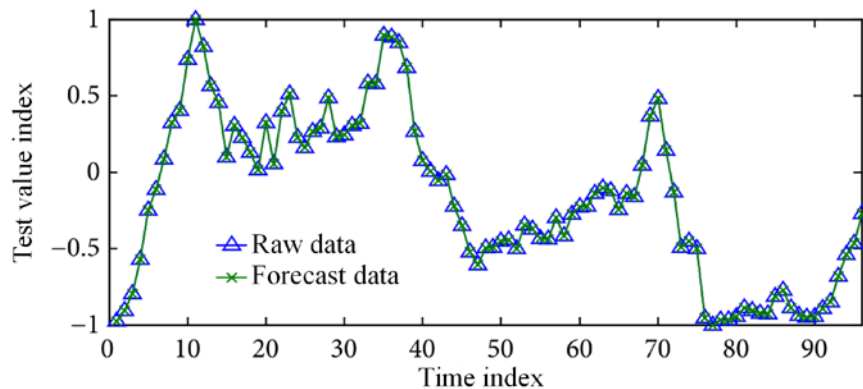


Fig. 1 Raw data and forecast data

Through a comparative analysis of the economic development of China's provinces and regions, it is found that the growth of labor and capital investment plays an important role in the economic development of China's regions. The existence of regional spatial correlation will definitely appear in the measurement of spatial spillover effect. However, an important phenomenon is that the correlation between regions may gradually weaken with the expansion of the inter-region gap. The spillover effect of economic development in coastal areas on inland areas is not obvious, even less than that of inland areas on coastal areas. Due to the existence of spatial heterogeneity, the impact of trade development on China's regional economic spatial effect is complex. With the gradual deepening of China's reform and opening up and the deepening of market integration in different regions, the development of China's regional economy has gradually shifted from relying on the pull of regional final product production to relying on the pull of external regional final product production. The spillover effect between regions has become an important power source that cannot be ignored in China's regional economic development.

The economic growth of various regions in China also indirectly affects the economic growth of other regions through random error effect, and the spatial distance between regions will not affect

this spillover effect. Spatial correlation analysis has found that China's regional economic development has spatial correlation, so it is necessary to use spatial econometric models to estimate [24]. The larger the spatial distance, the smaller the estimated value of the market potential parameter. If the straight distance between the provincial capitals of the two provinces is less than 1,000 kilometers, the market potential will have the greatest impact on economic development. Only relying on one indicator of market potential may not be able to fully grasp all the influencing factors, and other factors that may affect the regional economic growth and have spatial correlation will enter the error term of the model. The development of productivity in a region directly depends on the rationality of the distribution of local industries. Reasonable industrial layout can give full play to the efficiency of regional factors of production and promote the development of local economy.

### 3.2 Analysis of Locality Estimation

The spatial distance of different regions may affect the spatial spillover effect. The closer the spatial distance is, the more significant the spatial spillover effect is. Since it is a panel data model, the selection of estimation methods is extremely important, and it needs to be selected between fixed effect estimation and random effect estimation methods. Although China's regional economic development shows the basic characteristics of increasing contribution of interregional spillover effect, not all regions have the same characteristics of change. The greater the distance between China's various regions and coastal ports, the higher the transportation cost to enter the overseas market, thus presenting negative effects. There are great differences in the degree and speed of economic development in various regions of our country. Therefore, regions with good economic development will inevitably affect other neighboring regions and drive their economic development. From the perspective of regional coordinated development and urban-rural integration, it should be shifted from regional tilt to regional coordination and urban-rural integration, which means that attention should be shifted from external demand to internal demand [24].

When a region carries out an economic activity, it will not only produce the expected effect of the activity, but also bring about a blessing economy to the surrounding regions, and the driving effect on the economic development of other regions will also appear. In order to improve the value of products as a whole, enterprises must pay attention to the importance of teamwork in the development of new products. With the help of the basic platform, existing application systems and resources can be integrated, allowing relevant personnel of products to access required product data anytime and anywhere. Since the application of computer and information technology in molecular biology research, tens of thousands of data sources have been generated in a short time. The proposed metadata schema is shown in Fig. 2.

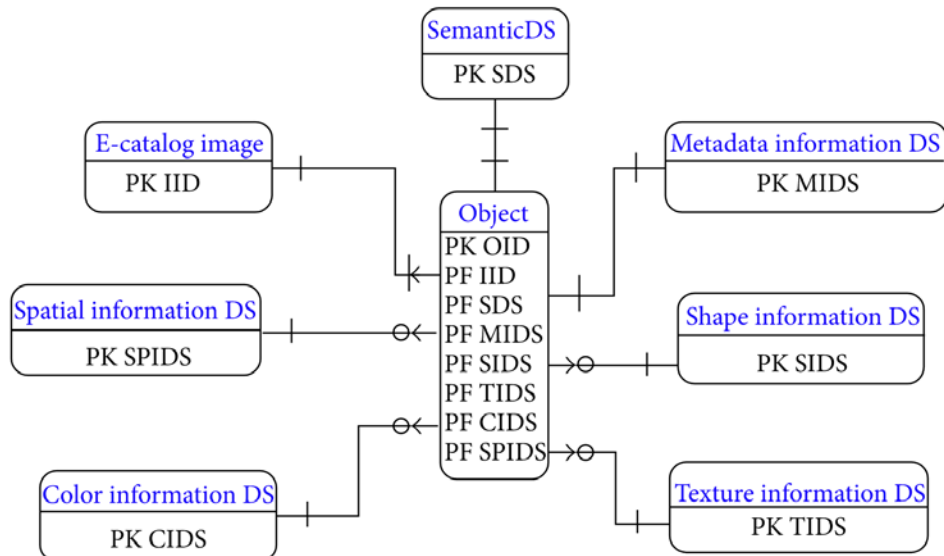


Fig. 2 Metadata architecture

Considering the law of spatial correlation between general regions: The shorter the distance between different regions, the stronger the correlation between regions. As the distance between regions increases, the correlation between regions will gradually weaken. The underdeveloped areas in the central region have obvious spillover effects on the developed areas in the east. This spillover effect is the demand-type spillover effect, that is, the eastern region requests various resource elements from the central region. The size of the technology spillover effect is largely determined by the acceptance of the subject's knowledge. For example, a primary school student is almost impossible to accept the calculus knowledge of the university curriculum. There is no spillover effect on the central region in the eastern region. If there is such a spillover effect, it should be a return-type spillover effect. The party that accepts the spillover technology must have the necessary preparatory knowledge. If the accepted enterprise's own knowledge endowment is not enough, then its digestion and absorption of new technology is very weak.

The theory of regional economics believes that under the background of the circumstance that various elements of the market society flow across regions, the spatial spillover effect is more deeply reflected in the dynamic change of the multi-dimensional staggered points, axes and faces of the economic objects in the regional space. . In the current global economic recession, China's economic development urgently needs to shift to a path based on domestic demand. Only in this way can we successfully realize the industrial transformation in the eastern region, the industrial rise in the central region, and the industrial development in the western region. The convergence of development between different markets has accelerated the flow of economic factors between regions. Breaking the market segmentation problem is also urgent, and this requires further rationalizing the relationship between governments at all levels and changing the assessment system of local government officials. China's policy of opening to the outside world not only introduces foreign advanced management technologies, but also opens up the global market for China. The development of a regional economy has brought about the effects of the surrounding regional influence.

#### **4. Conclusion**

China has continuously strengthened its reform and opening-up, and the market segmentation between different regions has gradually decreased, showing a trend of integration. With the deepening of China's reform and opening up, the market segmentation between different regions has been continuously eliminated. The free flow of products and factors between different regions not only improves the efficiency of resource allocation, but also expands the market space of various provinces. This paper reveals how China's regional economic growth is affected by the economic development of its surrounding areas through a new economic geography model that represents the impact of market potential on regional economic development. Under the influence of the reform and opening up, the cooperation and exchange among regions have been continuously strengthened, the correlation between regions has begun to appear, and the spatial spillover effect of economic growth has begun to appear. On the whole, the increase of spillover effect between regions in China is still caused by the increase of final demand, in which investment is the most important contribution, followed by the increase of export and consumption. From the perspective of time dimension, with the passage of time, the positive spatial autocorrelation in the whole domain is strengthening. The economic development of each region is not only affected by the input of various factors in the region, but also by the market demand scale of the neighboring regions. Therefore, in order to promote the comprehensive and in-depth development of China's regional economy, it is necessary to analyze the interaction between regions from the perspective of economic geography.

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