Optimization Strategy Research of Spatial Organization Structure in Yangtze River Delta Urban Agglomeration

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Abstract: Space problem has always been the core issue of urban and regional research. For a long time, urban agglomeration spatial structure has always been an important research content in the regional economics, urban economics and related disciplines. This article analysis spatial structure of the Yangtze River delta urban agglomeration first, and then explore the spatial structure influence mechanism of Yangtze River delta urban agglomeration, finally put forward forward urban agglomeration spatial structure optimization strategy, Push in the spatial organization structure of Yangtze River delta urban agglomeration to realize leaping development in innovation. Research results deepened the systemic theory of cognitive structure of urban agglomeration spatial organization, perfect the relevant theories of urban agglomeration spatial organization structure, are of great significance to enhance urban competitive power, promote rapid economic development, and promote the integration of urban and rural planning.

Keywords: influence mechanism, optimization strategy, spatial organization structure, Yangtze River Delta Urban Agglomeration

1 Introduction

Yangtze River delta urban agglomeration locate in the Yangtze river delta region along the east coasts of our country, is the highest density region of our country town, and has the most complete industry, the highest level of urbanization and economic development level and the most dynamic. The urban agglomeration area will become the main population community in the future, is also the first global regional and global city region in the process of globalization in our country. As an important part to participate in international competition and unit in our country, Yangtze River delta urban agglomeration has stepped into the world's sixth largest city, the evolution process of space structure development will play a positive role in the development and construction of urban agglomeration in China.

2 Research areas

Yangtze River delta region has a pivotal position in the development of urbanization process and the overall social economy in our country. It takes Shanghai as its center, Nanjing, Hangzhou as its sub center, consists of 16 cities and 74 counties and cities of their jurisdiction including Wuxi, Suzhou, Changzhou, Nantong, Yangzhou, Zhenjiang, Nantong, Taizhou in Jiangsu province, Ningbo, Jiaxing, Huzhou, Shaoxing, Zhoushan, Taizhou in Zhejiang province. It takes Shanghai-Hangzhou, Shanghai-Nanjing expressway, and multiple lines as the link, and couples the urban agglomeration areas into an organic whole. The total area is 11.01 square kilometers, takes 1.15% of the national land area, the gross industrial output value accounts for the gross output value of a quarter, and has a population of more than 158 million people.

3 Spatial structure analysis of Yangtze River Delta Urban Agglomeration

3.1 The growth and evolution of the spatial organization structure of Yangtze River Delta Urban Agglomeration

Since the reform and opening up, the spatial structure of Yangtze River Delta Urban Agglomeration changed dramatically Firstly, the pattern that it takes Shanghai as its center, Nanjing, Hangzhou as its sub center has get further optimization, the radiating and driving function of the core city has been enhanced. Secondly, Yangtze river delta urban agglomeration develop from by along the railway to by along the Yangtze river, coastal development, it makes the original development pattern of Yangtze river delta change from "Z" type gradually into the contrary "K" word. The growth and evolution of the spatial structure of Yangtze River delta urban agglomeration mainly experienced three stages (Tab.1): ① Point structure (before the 1980s). Yangtze River delta urban agglomerations as a whole has not been received enough attention in the stage, Shanghai as a core city influence on other nodes city only radiation to the southern Jiangsu and the Hangzhou bay in some cities, Each node city has not strong connection between each other, and takes Shanghai as the core city, Nanjing, Hangzhou as the sub city, make up a point structure. ② Point-axis structure.
Tab.1 Spatial structure characteristics of the urban agglomeration in different developmental stages

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(1990s). The change of the spatial pattern of Yangtze River delta urban agglomeration mainly started from the Pudong development in 1992 as a starting point, it drive the surrounding area along the Shanghai-Nanjing, Shanghai-Hangzhou and Hangyong develop like a "Z" type development axis developed rapidly. Three axis are intertwined constitute the "Z" word space development pattern of Yangtze river delta urban agglomeration which takes Shanghai as its core city, Nanjing and Hangzhou as its sub city. In 2000, the three axes GDP reached 1.3388 trillion Yuan, account for 82.7% of economy in the Yangtze River delta urban agglomeration. Nanjing, Hangzhou as the sub center of the urban agglomeration the effect begin to enlarge, Suzhou extroverted economy development quickly by the advantages of its location near Shanghai, becomes one of the most popular city to attract foreign investment in China. ③ Multi-center network structure (since the 21st century). As the implementation of along the Yangtze River in Jiangsu province coastal strategy and Zhejiang along the bay, and the completed of Sutong bridge and Hangzhou Bridge, Yangtze River delta urban agglomeration has created a new economic shaft, namely the coastal economic belt. In addition, with the rapid development of county economy of Suzhou, Wuxi, Ningbo, and Yangtze River delta urban agglomeration, it has formed a new industrial concentration area, and is expanding along Hangzhou, Tai lake tin industry shaft, Yangtze River delta urban agglomeration multicenter and network layout began to form.

3.2 Spatial organization structure characteristics of Yangtze River Delta Urban Agglomeration

The big, medium, small cities of different levels, structure and function in Yangtze River delta has formed a urban agglomerations structure of "pyramid" through the contact of industry, transportation, information technology, etc. Its spatial structure presents the salient feature of the following five aspects:

3.2.1 Axis characteristics of the spatial organization

The spatial organization structure of Yangtze River delta urban agglomeration connects each other in a certain axis linkage. The city traffic axis alone the three node city of Shanghai, Ningbo, Hangzhou, there is a city every 30 kilometers, has formed an urban agglomeration of gradient development of big, medium, small cities. Especially the Su, Xi, Chang region, formed a city distribution pattern of "traffic corridor type". From the perspective of the effect of space connection and diffusion, Yangtze river delta urban agglomeration spatial structure formed three basic axis: ① The north line: Shanghai-Suzhou-Wuxi-Changzhou-Zhenjiang-Yangzhou-Nanjing; ② The south line: Shanghai-Jiaxing-Huzhou-Hangzhou-Ningbo; ③ The east line: Shanghai-Shaoxing-Ningbo-Zhoushan. While the formation and evolution of the axis spatial structure of the Yangtze River delta urban agglomeration Is relying on its advanced traffic framework to implement its spatial join.

3.2.2 Industrial spatial integration features

As the deepen of labor space division, Yangtze river delta cities not only exist the industrial division, department division, labor division , product division, but also many products internal division\[^{[1-3]}\]. In terms of the structure of industry, the industrial structure of Yangtze River delta region is "three, two, one" pattern. In terms of the manufacturing industry, the industry linked closely city to city of Yangtze river delta urban agglomeration, it takes Shanghai as the core city, formed urban agglomeration industry belt along the Yangtze river, coastal belt and the surrounding city, the specialization division marked by the industry cluster formed preliminarily. The paper takes the second and third industry output value of 16 cities in 2012 as the basis data which get from the China statistical yearbook, and uses Hector seaman index (HHI) to reveal the spatial agglomeration of industries. Hector seaman index is a composite index to measure the industrial concentration
Shanghai-Nanjing, Shanghai-Hangzhou, Hangzhou, Yangtze River delta region has constructed the Shanghai Hangyong highway; the eastern coastal city of Hangzhou-Ningbo railway and shanghai-Hangzhou, ocean shipping port. Since the reform and opening up, Xi is the scale of the enterprise. 2013, cultivated land per capita of long triangle area Yangtze River delta region decreased by 14.8%, until since the 1990s, the protected agricultural land of Suzhou and Wuxi construction space is almost endless.

Area which takes Shanghai as its core city including time. After more than 30 years of high-speed urbanization, the spatial structure of Yangtze River delta urban agglomeration has already the north, south, east basic axis. The three basic axes rely on traffic framework are respectively: the Yangtze river shipping, Shanghai-Nanjing railway, shanghai-Nanjing expressway; Shanghai-Hangzhou, Hangzhou-Ningbo railway and Shanghai-Hangzhou, Shanghai Hangyong highway; the eastern coastal city of ocean shipping port. Since the reform and opening up, Yangtze River delta region has constructed the Shanghai-Nanjing, Shanghai-Hangzhou, Hangzhou, Ningtong expressway, Hujiahang, southern Jiangsu along the Yangtze River, Ningbo expressway, etc. and Jiangyin Bridge, Hangzhou bay bridge, the East China Sea Bridge and high-speed rail. Through the construction of these projects, Yangtze River delta region has formed a more fast and convenient transport network. In addition, the watery is intensive in Yangtze River delta; lead to the sea, the scale of the port has been ranked the top of the world. As the implementation of the strategy along the bay, the Yangtze River delta urban agglomeration is of the contrary "K" word.

3.2.5 The formation of network space structure

Network space structure is the framework that regional economic and social activities for the spatial distribution, it scattered the decentralized resources, elements, enterprises, economic sectors and regional organizations connected into a regional economic system which has different levels, different function and division of labor cooperation in the area. Yangtze River delta urban agglomeration takes Shanghai, Ningbo, Hangzhou as the core area and the sub area, a number of regional central cities and small towns scattered around, form a network space structure which is composited by the distinctive cities such as super city, big city, medium city, small city, town and modern transport system such as highway, railway, shipping, aviation. With the improvement of the infrastructure and the strengthening of economic exchanges, the Yangtze river delta urban agglomeration network characteristics have already produced a prototype. According to the size of the economy, around Shanghai, the economic growth pole, Yangtze River delta urban agglomeration can be divided into three layers, the link density fade out from inside to outside. The first circle includes Su, Xi, Hangzhou and Ningbo, the third industry accounted for about 36%, private economy is very prosperous. The second circle includes Nanjing, Jiaxing, Shaoxing, Changzhou and Zhenjiang, the development of machinery, electronics industry is rapid, the industrial structure is in the "two, three, one" phase. The third circle includes Yangzhou, Nantong, Huzhou, Zhoushan, the first industry accounts for a large proportion; the level of industrial structure is low relatively. On the basis of network space structure, the production network, market network, transport network, information network developed highly of Yangtze River delta urban agglomeration, the cash flow, information flow, and commodity flow was highly mobile between the node cities, the economy extroverted degree increased day by day, Yangtze River delta urban

\[ HHI = \sum_{i=1}^{N} \left( \frac{X_i}{X} \right)^2 \]

In the formula, \( X \) is the overall scale of the market; \( X_i \) is the scale of the enterprise.

The calculated result showed that, in the third industry, the capital-intensive and port information, finance, commerce, scientific research, computer services and software industry, wholesale and retail, leasing services dominate the Yangtze river delta in Shanghai, the second industry is mainly concentrated in the food manufacturing, tobacco products, oil processing and coking and nuclear fuel processing industry, transportation equipment manufacturing industry. In Zhejiang province, the labor-intensive manufacturing such as the beverage manufacturing, textile, wood furniture manufacturing paper printing, chemical fiber manufacturing, and rubber manufacturing industry has gathered efficiency. In Jiangsu province, the capital intensive and technology intensive manufacturing such as mining, chemicals, metal smelting, general equipment, communications equipment manufacturing industry occupy the important position.

3.2.3 Contrary "K" features of traffic space

After years of development, the spatial structure of Yangtze River delta urban agglomeration has already the north, south, east basic axis. The three basic axes rely on traffic framework are respectively: the Yangtze river shipping, Shanghai-Nanjing railway, shanghai-Nanjing expressway; Shanghai-Hangzhou, Hangzhou-Ningbo railway and Shanghai-Hangzhou, Shanghai Hangyong highway; the eastern coastal city of ocean shipping port. Since the reform and opening up, Yangtze River delta region has constructed the Shanghai-Nanjing, Shanghai-Hangzhou, Hangzhou, Ningtong expressway, Hujiahang, southern Jiangsu along the Yangtze River, Ningbo expressway, etc. and Jiangyin Bridge, Hangzhou bay bridge, the East China Sea Bridge and high-speed rail. Through the construction of these projects, Yangtze River delta region has formed a more fast and convenient transport network. In addition, the watery is intensive in Yangtze River delta; lead to the sea, the scale of the port has been ranked the top of the world. As the implementation of the strategy along the bay, the Yangtze River delta urban agglomeration is of the contrary "K" word.

3.2.4 Ecological space truss structure of "Two horizontal two vertical"

Yangtze River delta urban agglomeration is the area where has many people, less land and most densely populated in our country, land resources are scarce all the time. After more than 30 years of high-speed urbanization process, at present, Yangtze River delta core area which takes Shanghai as its core city including Suzhou and Wuxi construction space is almost endless. Since the 1990s, the protected agricultural land of Yangtze River delta region decreased by 14.8%, until 2013, cultivated land per capita of long triangle area
agglomeration direct to the integration of network.

4 Space organization structure influence mechanism analysis of Yangtze River Delta Urban Agglomeration

Urban agglomeration spatial structure evolution is a process of breaking the old and setting the new evolution, need a lot pushing and pulling of power factor. Yangtze River delta urban agglomeration development and evolution follows the evolution path of economic activity space organization, during the process [10-15], the policy guidance of government and the change of system also caused a very important role [16-19]. The paper explores the dynamic mechanism of Yangtze River delta urban agglomeration spatial structure evolution from the perfection of market mechanism, industrial agglomeration and the government play a coordinating mechanism.

4.1 The perfection of market mechanism

With the constant improvement of the socialist market economy system, market forces play an important role in the Yangtze River delta urban agglomeration [20-24]. The reason why the Yangtze River delta urban agglomerations become the most economically developed core has great relationship with Wholesale market group which is formatted by a number of different levels, rank, type, radiation function wholesale market. After years of development, the Yangtze River delta region has present a market structure of consumer goods wholesale markets, wholesale markets, production data and wholesale markets of agricultural and sideline products wholesale market cross each other. From the perspective of spatial structure of wholesale market, market main body distribution is in a certain region, and happens closely linked to each other. In the whole city area, the center of the national wholesale market as a market group, on the one hand, contacted with a number of market supply and demand [25-28], on the other hand, maintained close ties between the different levels of wholesale market [29], in order to form a relatively complete urban agglomerations wholesale market network spatial structure. The trading market system of complex structure has a high efficiency and function of commodities circulation, at the same time of the commodity market and factor market development in the long triangle area, also drive the market by relying on the expansion of urban space.

4.2 The spatial agglomeration of industries

Industrial spatial organization form affects the spatial pattern of urban agglomeration directly, so from the historical process of industry succession, regional industry cluster development is one of the important powers of regional spatial structure reorganization [30-31]. Reviewing the development of Yangtze River delta since the reform and opening up, we can draw such a conclusion: enterprise and industry agglomeration came first, and then with the development of urban agglomerations [32-33]. Especially the large enterprise, by the division of labor of the cooperation of big, medium and small cities, the management function of the enterprise agglomerate in the big cities, put the production and processing function into small and medium-sized cities, promotes the spatial agglomeration of industries. In the 1990s, Shanghai with its geographical advantage, industrial base, and openness, attracted numerous enterprises in Zhejiang and Jiangsu move their headquarters to Shanghai. The space transfer of the enterprise strengthens the contact between the nodes cities of Yangtze River delta urban agglomeration further. In the 21st century, under the background of economic globalization, the international manufacturing industry speed up the pace of the shift to Yangtze River delta region in China, the industry cluster of foreign capital enterprise in Yangtze River delta region has become the important motivation of spatial structure evolution development in Yangtze river delta urban agglomeration. As the Yangtze River delta center city, Shanghai be the first choice of the multinational company headquarters because of its good financial environment, policy environment and mature supporting facilities. While high land prices and labor costs have driven multinational companies moving production base to the surrounding areas of Shanghai, make Suzhou, Wuxi, Nanjing, Hangzhou, Ningbo and other cities near Shanghai become the focus of the foreign capital transfer base for priority. Then, the foreign capital enterprise spread into small and medium-sized cities further, led the labor and other factors of production to flow constantly. The agglomeration and diffusion of industrial on the space formed system of industrial division of labor function complementary in Yangtze River delta urban agglomeration also strengthen the economic ties between the cities of all nodes.

4.3 The role of government coordination mechanism

In essence, the evolution power of spatial pattern in the Yangtze River delta urban agglomeration come from the power market forces from bottom-up and government regulation from top-down. At present, market power is still the dominant the main factors of spatial development in Yangtze River delta urban agglomeration, the government regulation force marked by the elderly triangle joint meeting system in 16 cities in 1997, is constantly improved and optimized phase. Central and local government administer division adjustment, regional development policy, coordination mechanism and other related government policies as well as the implementation of institutional change in different periods affect the process of cooperation and integration between the Yangtze river delta urban agglomeration, become the main factors to promote the development of the Yangtze river delta urban agglomeration in a transition period. The economic zone break the boundary between the administrative region economies, configure
the elements in this area, division of labor cooperation in the region. At present, the 16 cities of Yangtze river delta focus on transportation, science and technology, energy, environmental protection, and other areas, start the long triangle "all-in-one-card" communication coordination, implement Yangtze River delta regional integration, establish the joint meeting and communication system between the government department, make the local market segmentation to the coordinated development of the Yangtze river delta cities is in declining. The establishment of these cooperation coordination mechanism and system promotes the interest coordination between urban agglomerations.

5 Spatial organization structure optimization strategy of Yangtze River Delta Urban Agglomeration

5.1 The integration of systems and mechanisms need to be innovative of Yangtze River Delta Urban Agglomeration

At present, Yangtze River delta regional integration trend has become obvious increasingly, in the integral space layout, it present the basic characteristics of the following three aspects. Firstly, the infrastructure system of spatial structure layout has formed basically in the Yangtze River delta urban agglomeration "City effect" is highlighted. Secondly, the trend of transfer from rural population to urban population is increasing, regional urbanization level increase gradually; urbanization rate reached 67.17% in 2012. Thirdly, in the city system layout, super city and big city is less. In the 16 city of the Yangtze river delta, there are only two megacities which has a population of more than 3 million, there are five cities which has a population between 1 million and 3 million population, and small cities and towns of a population under 50000 is nearly one thousand. At present, Yangtze River delta urban agglomeration integration of systems and mechanisms are still exist many obstacles, which restrict the development of regional integration seriously, mainly displays in the following three aspects. Firstly, the excessive competition is still there. Although the Yangtze River delta cities has reached a consensus on regional integration development, due to the complexity of system division, administrative subordination relations among the cities, the economic operation has obvious interests characteristics of the administrative area, competition is more than cooperation, factors of production can't fully free flow, affects the industrial chain of division of labor and cooperation. Secondly, cooperation and communication is inadequate. Only the division of labor and complementary functions between cities can make economic integration into reality. But the current administrative system of the long triangle, the local government one-sided pursuit of local economic growth, lack of cooperation consciousness, on the cooperation pattern and mechanism, There is a tendency of that the production elements flow to unilateral conducive to the development of local, no considering the problem from the overall regional development request. Thirdly, the administrative coordination management function is weak. At present, the cooperation coordination mechanism of Yangtze River delta regional has about three levels: firstly, the regular meeting of main leadership of Jiangsu, Zhejiang, Shanghai; secondly, annual symposium of economic cooperation and development of Jiangsu, Zhejiang, Shanghai; thirdly, the mayor of joint meeting system of the 16 member cities. But these coordination mechanisms are lack of management function, and are still weak in the local and regional interests coordination, regional cooperation is not set up a functional organization, which increased cooperation costs between the regional governments virtually.

5.2 Deepening the integration factors of Yangtze River delta region further

In order to promote the Yangtze River delta regional integration comprehensively, the region shall determine the regional industry's overall development strategy which is seeking opportunities in common and interests of the intersection, to form a scientific and reasonable system of regional industry collaboration. To speed up the integration of infrastructure construction, accelerate to form the "local" of traffic in all major cities in Yangtze River delta. Speed up the construction of unified and open market system; keep the area elements openness such as capital, technology, labor market, implement the regional cooperation which takes enterprise as the main body, the market as the link. Promote the co-construction and sharing of the social service system in Yangtze River delta urban agglomeration, implement the integration of people livelihood field including education, health care and employment. Perfect the regional innovation system construction, build the innovative sharing platform, form a city innovation system which takes knowledge innovation as the basis, technology innovation as the key point, the system innovation as the guarantee gradually.

5.3 Strengthening the system cooperation of the Yangtze River delta urban agglomeration constantly

To break the administrative boundaries really, form a rational layout, complete function of system coordination mechanism, and a regional cooperation framework organization which is the combination of top-down and bottom-up. To make regional ecological construction and environmental protection plan together, explore the differentiation regional ecology, resource utilization policy, set up the ecological and resources compensation mechanism, realize the common construction, protection and governance of regional ecological environment together. To set up the cooperation coordination and development fund of Yangtze River delta regional, make the regional interests balance and compensation, implement the regional deep cooperation. Establish a advisory committee, put forward
feasible suggestions to major issues for regional cooperation, form a scientific and reasonable appeal interests expression mechanism. Enact a "regional economic cooperation promotion law" as soon as possible, eliminate the system bottlenecks in the regional cooperation, and accelerate regional cooperation institutionalized process.

References