Study on the Coordinated Development of Water Ports and Urban Economy in Southern Sichuan Urban Agglomeration

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Abstract

"Prospering the city with port, prospering the city with port, developing the city with port, and prospering together" is the goal of the coordinated development of the relationship between water transport economy and urban development. This paper studies the relationship between the development of four cities in southern Sichuan and port and waterway economy, the evaluation index system of coordination between water transport economy and urban development is established. This paper puts forward a quantitative analysis method to measure the coordinated development degree of port and city economy, to evaluate the coordinated development level of the port and city for scientific research institutions and government decision-making bodies, it provides a systematic and complete method. For promoting the new development of the economic relationship between water ports and cities, to explore the new path of the coordinated development of water transport economy and city, deepen the understanding of the development law and trend of the relationship between water transport economy and city development has strong application value. It has an important guiding role and reference significance to promote the coordinated development of China’s water transport economy and cities.

Keywords

Southern Sichuan City, Port; Economics; Coordinate.

1. Introduction

Southern Sichuan urban agglomeration refers to the region composed of Neijiang, Zigong, Yibin and Luzhou in southern Sichuan, these four cities are rich in water transport resources, which have derived strong characteristic industries. Among them, Yibin and Luzhou have long been among the top three ports in Sichuan Province in terms of handling capacity. In addition, South Sichuan urban agglomeration is located in the middle of Chengdu Chongqing Economic Zone, it is the second largest urban agglomeration after Chengdu economic circle, outside, it is the bridgehead connecting Chongqing. It can also radiate Yunnan Guizhou region, with obvious geographical advantages. With the planning and construction of the national road network and the joint development of the four cities in southern Sichuan, planning of Intercity Railway in South Sichuan, construction and upgrading of expressways. With the rapid construction of a large number of projects, the four cities in southern Sichuan are more closely linked. Further enhance and consolidate the four cities in the province’s water transport advantages, but also for the four cities to further play the advantages of water transport to create a broad stage. Scholars at home and abroad have done some research and Discussion on urban economic development and port construction. The research on the relationship between port and urban economic development in foreign countries has a history of more than 60 years. On the one hand, some scholars believe that there is a positive relationship between the development of
port and local economy, for example, Haddad believes that efficient water transportation can bring more economic benefits, and it will produce more cargo throughput, the inefficient waterway and port can separate an area from cheap inputs or markets. However, some scholars think that the relationship between the development of port and local economy is negative, for example, Gripaios thinks that the spatial attraction of transportation nodes in manufacturing activities is weakened, the position of the port economy has changed or the hinterland has been restructured. This will lead to a reduction in employment related to the water transport industry.

The relationship between water transport port and urban economic development is constantly updated. Many scholars have calculated the water transport ecological environment index. For example, Carrera-Gome G quantified the ecological footprint of Xihong port [3]. Asgari N. used analytic hierarchy process to rank British ports according to economic and environmental factors [4].

China’s research on the relationship between port and urban economic development is mainly divided into qualitative analysis and quantitative analysis. Yang Cheng believes that economic conflict is the initial reason for the interactive development of port economy and regional economy, and finally gradually evolved into mutual benefit and mutual promotion [5]. Wu Xiaodong and Qu Chang established a linkage development system composed of port subsystem, industry subsystem and city subsystem, studied the internal elements and external environment of the system, and focused on the competition and cooperation among ports, industries and cities [6]. Wen Wenhua mentioned that the role of ports in port cities can not be underestimated. The number of port cities in China is small, but their economic aggregate accounts for a large proportion [7]. Shen Yongfeng conducted extensive research and scientific identification on port related economic activities, constructed the evaluation index system of port's contribution to regional economy, and designed the calculation method adapting to the characteristics of China's economic development and port industry production [8].

Therefore, domestic and foreign researches on port economy and urban economy are mostly focused on coastal areas, and less on inland port cities. Especially in learning from the experience of other ports, combined with the characteristics and advantages of inland ports, in order to improve the urban economy research is particularly weak. This paper studies the coordinated development of inland port economy and urban economy by taking four cities in southern Sichuan as the research objects, so as to provide help for the further optimization of development between them. From the existing data, it can be seen that the southern region, which has an important strategic position in the development process of Sichuan, has a significant impact on the urban economic development. However, whether the regional water transport system is an obstacle or an advantage to the urban economy, and whether the two are coordinated still need to be further studied. This paper makes a quantitative study on this problem, evaluates the mutual promotion efficiency between port economy and cities in southern Sichuan Urban Agglomeration by using DEA (Data envelopment analysis) model, and discusses the effect and reasons based on examples.

2. DEA Model

DEA is a method of operational research and economic production boundary research, which was first proposed by Charnes in 1978. In this paper, through the establishment of DEA efficiency analysis model of port and regional economy, the CCR model is used to quantitatively study whether the ports of four cities in southern Sichuan can promote the regional economy, so as to provide theoretical support and suggestions for the development of urban ports and economy. The basic model of two-way promotion between urban economy and port is as follows:
\[
\min \theta \\
\text{s.t.}
\begin{align*}
\sum_{j=1}^{n} \lambda_j x_j + s^- &= \theta x_0 \\
\sum_{j=1}^{n} \lambda_j y_j - s^+ &= y_0 \\
s^- \geq 0, s^+ \geq 0, \lambda_j &\geq 0 \\
\theta &\text{ unconstrained}
\end{align*}
\]

In this case, if there is \( \theta = 1 \), and \( s^- = 0, s^+ = 0 \), then \( DMU_{j0} \) overall effective. Because Zigong and Neijiang have no perfect ports, the paper takes Yibin and Luzhou's regional GDP, total investment in fixed assets, total industrial production value, retail sales of social products and the number of employees as urban economic research indicators; The port cargo throughput, port berth and container throughput of Yibin and Luzhou are taken as the research indexes. The statistical data are shown in Table 1.

<table>
<thead>
<tr>
<th>Particular Year</th>
<th>City</th>
<th>Urban economic evaluation index</th>
<th>Port evaluation index</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Urban GDP (100 million)</td>
<td>Total investment in fixed assets (100 million)</td>
</tr>
<tr>
<td>2015</td>
<td>Yibin</td>
<td>1525.90</td>
<td>1295.51</td>
</tr>
<tr>
<td></td>
<td>Luzhou</td>
<td>1353.41</td>
<td>1463.71</td>
</tr>
<tr>
<td>2016</td>
<td>Yibin</td>
<td>1653.05</td>
<td>1464.52</td>
</tr>
<tr>
<td></td>
<td>Luzhou</td>
<td>1481.91</td>
<td>1730.38</td>
</tr>
<tr>
<td>2017</td>
<td>Yibin</td>
<td>1847.32</td>
<td>1685.1</td>
</tr>
<tr>
<td></td>
<td>Luzhou</td>
<td>1596.21</td>
<td>2042.11</td>
</tr>
<tr>
<td>2018</td>
<td>Yibin</td>
<td>2026.37</td>
<td>1460.56</td>
</tr>
<tr>
<td></td>
<td>Luzhou</td>
<td>1694.97</td>
<td>165.46</td>
</tr>
</tbody>
</table>

The DEA models between ports and urban economy in each row in Table 1 are established, and the results are summarized in Table 2.

<table>
<thead>
<tr>
<th>Particular Year</th>
<th>City</th>
<th>City economy --- port</th>
<th>Port --- City economy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>( \theta )</td>
<td>( \theta )</td>
</tr>
<tr>
<td>2015</td>
<td>Yibin</td>
<td>0.8490</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Luzhou</td>
<td>1</td>
<td>Y</td>
</tr>
<tr>
<td>2016</td>
<td>Yibin</td>
<td>0.8859</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Luzhou</td>
<td>1</td>
<td>Y</td>
</tr>
<tr>
<td>2017</td>
<td>Yibin</td>
<td>0.9122</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Luzhou</td>
<td>1</td>
<td>Y</td>
</tr>
<tr>
<td>2018</td>
<td>Yibin</td>
<td>0.7208</td>
<td>N</td>
</tr>
<tr>
<td></td>
<td>Luzhou</td>
<td>0.9762</td>
<td>N</td>
</tr>
</tbody>
</table>

It can be seen from the evaluation results. ① In 2015-2018, Yibin and Luzhou took urban economy and port as input index and the other as output index, respectively, and the effective coefficients were not all 1. Most of the time, Luzhou city is located at \((0.9,1)\), which indicates that Luzhou's economy and port are in good condition. Although the effective coefficient of Yibin City is slightly lower than that of Luzhou City, it is basically at \((0.8,1)\). ② The impact of...
The function between port and city economy

3.1. The role of port in urban economy

3.1.1. Port is an important part of the development of water transport industry.

Compared with other inland cities, the four cities in southern Sichuan are located in the middle of Chengdu Chongqing Economic Zone, connecting Chongqing and radiating Yunnan Guizhou region, with obvious geographical advantages. But before, Chongqing was used as a water and land transportation hub for the external exchanges and economic ties between Sichuan and Chongqing, and it was realized through the Yangtze River waterway. Relatively speaking, only about 30% of the water freight volume went in and out of Sichuan through the ports in southern Sichuan, and most of the rest left Sichuan through Chongqing. It can be seen from the statistical data of 2018 that the freight volume of Yibin and Luzhou through water transportation is 12.343 million tons, which is second only to road transportation and higher than 8.5911 million tons of railway transportation, indicating that water freight transportation is an important part of the transportation network of four cities in southern Sichuan.

3.1.2. Port has an important influence on economic structure.

The port economy is to attract a large number of port processing industries to gather by using the port’s distribution function, information flow and capital flow. The scale economy formed by cluster effect can realize the optimal allocation of water transport resources. On the one hand, the port involves the transit, transportation, loading and unloading of goods, and forms a professional comprehensive service supply chain through integration. At the same time, it can give full play to the effect of resource integration, further refine the division of labor, so that the port can get high-efficiency and high-quality value-added services. On this basis, it can also extend to other industries and provide new ideas and opportunities for other industries in the city; Secondly, as an open port, the port is more sensitive to receive external information, and the industrial structure is also more sensitive to the change of industrial investment return. Therefore, the port has a significant impact on the adjustment of urban industrial structure. Finally, with each loading and unloading operation of the port, the transportation operation will produce the accumulation and aggregation of funds, which will make the city’s industrial structure change slowly. Especially now, the main function of the inland port is to gradually develop from the transportation of people and goods to the direction of tourism development, such as Yibin and Leshan in Sichuan, Port tourism has become an important economic source of the city, and the proportion of tourism industry in the gross national product is also increasing, which is the impact of the port on the adjustment of the city’s industrial structure and promotes the transformation of the city’s economic structure.

3.1.3. The development of the port will directly provide a large number of jobs for the city.

The development of the port will not only have a direct impact on the city's economy, increase economic benefits and enhance the city's industrial development, but also directly provide jobs and jobs, which can absorb a large number of employees in the water transport industry. According to the survey, the transportation industry usually absorbs 5% - 8% of the wage
earners. The GDP created by the port per 10000 tons of throughput can contribute about 26 people to the employment of the city. Therefore, the development of the port can effectively promote urban employment and enhance the income of industry practitioners to a certain extent.

3.2. The role of urban economy on ports

Through the development of the port, the urban economy will get better development. Therefore, more and more businessmen are attracted to invest in Hong Kong. The extended industries will widely cover industry, commerce, tourism, catering, services and other aspects, which can have a huge push for the development of the urban economy. After the city gets the capital injection, it can in turn improve the port facilities and environment, which will form a good cycle.

3.2.1. Urban economy provides human capital and reserve talents for port development.

With the development of the times, advanced technology is changing with each passing day. Port construction is not only the construction of a transportation hub, but also a diversified economic development entity integrating information, intelligence, big data and other advanced technologies. The development of port is inseparable from scientific management level and advanced technological innovation. Compared with coastal ports, the ports in southern Sichuan are relatively backward. It is more necessary to make good use of the economic development of hinterland cities and rely on the advantages of urban environment to attract a lot of high-quality talents to settle down and develop.

The economic development of southern Sichuan urban agglomeration needs the strong support of water transport economy, talent cultivation of colleges and universities and talent reserve of enterprises, which are inseparable from the support of the industry. Although the four cities in southern Sichuan have set up their own universities with logistics and transportation majors, such as Yibin University and Luzhou Police College, it is obviously not enough to support the development of the port group in southern Sichuan. The government should also introduce some special awards and subsidies for engineering and technical personnel to attract and retain talents from various industries, break through the boundaries between industries, and realize the deep integration of multi disciplines, so as to lay a solid foundation for the cultivation of high-tech, high-energy and professional talents, the development of ports and the prosperity of regional economy.

3.2.2. Urban hinterland economy provides material basis for port economic development.

As the economic hinterland of the port, the profound and powerful economic strength of the city directly plays a decisive role in the development of the port. The performance of the city’s economic strength can not only provide the port with advanced facilities and equipment, loading and unloading machinery and berth scale, but also have a decisive impact on the port cargo throughput and port cargo varieties, which is the basic guarantee for the rapid development of the port economy.

On the one hand, the growth of urban economy will lead to the increase of capital investment that can be directly used for port construction and stimulate consumption in Hong Kong. The investment of funds can provide a large number of advanced infrastructure equipment for the port. It can also improve the efficiency of cargo transportation and save costs through economies of scale, thus increasing the attraction scope of its economic hinterland and further increasing the port cargo throughput. On the other hand, the city's industrial development has a crucial impact on the port economy. The development of a city can bring advantageous industries, and it will produce a large number of advantageous products with characteristics.
These products also need to be distributed by the port, which can bring throughput to the port and also produce economic benefits. Finally, they can form the economic pillar of the city and the port, and these industries will also become the capital of the port and the urban economy. At the same time, the development of the city’s tertiary industry can make the port city develop coordinately and make the port and city economy develop in an all-round way.

4. Problems and suggestions on economic coordination of port cities in southern Sichuan

4.1. Current situation and existing problems

The water transport port of Yibin City is relatively well coordinated with the urban economy. The overall traffic system of Yibin City is relatively reasonable. The four traffic systems of highway, railway, water and air are relatively perfect. Yibin port has a good advantage in developing water transport. In recent years, the economy of Yibin has developed rapidly, and the gap with Deyang and Mianyang is gradually decreasing.

The coordination between Luzhou port and urban economy is second only to Yibin, and other transportation systems in Luzhou are also well developed. The throughput of Luzhou port is in the top three in Sichuan all the year round, and Luzhou is connected with Chongqing, with a wide economic hinterland.

The water transport ports of Neijiang and Zigong are relatively poor in coordination with the urban economy. Except that the economic pillar industries of these two cities are slightly weaker than those of Yibin and Luzhou, these two cities lack air transportation system, rail and water transport system, and characteristic inland ports.

At present, there are some problems in the coordination between urban ports and urban economy in southern Sichuan

(1) The total industrial economy is relatively weak. The current industrial system of southern Sichuan city is not perfect and reasonable, Luzhou City has developed into a modern logistics port city and business center; Neijiang is a transportation hub city which mainly develops electronic information industry and green circulation industry; Yibin is a modern port ecological city mainly developed by Baijiu and textiles. But on the whole, the industrial economic aggregate of the four cities is still relatively imperfect.

(2) There are some differences in the degree of coordination among the four cities, and there is a lack of mutual cooperation. Although the South Sichuan port operation group was established in Luzhou before, under the jurisdiction of 18 enterprises such as Luzhou port, Yibin port (Group) company, Leshan dongle heavy cargo company, Yangtze River water transport company, on the whole, the development of urban agglomeration economy between the four cities relying on water transport ports is not in place.

(3) Relying on the port to carry out tourism, but all belong to the exploration stage, the development and management are not perfect, and some tourism project facilities are old, which is not conducive to the long-term development in the future.

4.2. Promotion strategy of coordinated development between port and city

4.2.1. Improve the urban and port industrial system.

The four cities in southern Sichuan have the problem of imperfect industrial system. We should grasp the development of both domestic and foreign markets at the same time, gradually upgrade the development of industrial chain, build port industrial park and logistics park, identify the pillar industrial projects of the city, and optimize the layout of urban industrial system. Therefore, we can focus on introducing foreign capital, absorbing advanced technology and talents, and provide strong support and promotion for the port industry and urban
economic development as far as possible. At the same time, we should pay attention to the development and transformation of the port, the development of the eco-tourism industry along the river, the improvement of water sightseeing facilities and equipment, the construction of port tourism routes, and the creation of international tourism routes relying on the upper reaches of the Yangtze River. In the process of developing tourism industry, we should pay attention to green economy, circular economy and realize sustainable development of industrial economy.

4.2.2. Improve the logistics and transportation system.
The overall transportation network of the four cities in southern Sichuan is deficient, especially the construction of waterway transportation system should be strengthened, and the port throughput and freight capacity should be strengthened. At the same time, we should further improve the transportation capacity of railway, highway and air freight, gradually build a modern and multi-channel comprehensive transportation network, expand the attraction scope of the port’s economic hinterland through the transportation network connected with the port, and actively develop the modern logistics industry in the hinterland. In addition, it is also very important to build a logistics information platform with mutual connection and coordination as soon as possible, so as to ensure the smooth flow of information and organizational efficiency.

4.2.3. Establish a coordinated management system among the four cities
The four cities in southern Sichuan have strong local protectionism, and there are obvious barriers between the four markets. Different management systems have serious constraints on the economic market of the four cities. The four cities should consider establishing a unified management system to realize the management coordination and resource sharing of the urban agglomeration. Through the innovation of the water transport management system, we should establish a coordinated integrated water transport management system for Southern Sichuan urban agglomeration, and jointly establish a highly relevant water transport channel construction and operation system. Taking into account the comprehensive interests of cities and ports, we should make overall arrangements for the construction of port infrastructure and equipment, make unified planning, unified distribution and step-by-step implementation, and jointly build the interconnection network between cities and ports, so as to maximize the economic benefits of ports and cities.

5. Conclusion
This paper starts with the relevant indicators of port and urban economy, and analyzes the relationship between port and urban economy from the simple to the deep by establishing the efficiency analysis model. In view of the coordinated development of water transport ports and urban economy of the four cities in southern Sichuan, the following conclusions are drawn: 1) the ports and urban economy of the four cities in southern Sichuan have basically formed a coordinated role, but the coordination is not stable, and the water transport ports and other transportation systems are relatively backward. ② The interaction between port and urban economy is not completely effective. There are some problems, such as the imperfect industrial and logistics system, the serious industrial barriers between the four cities, the urgent need to improve the development of tourism and service industry. Relying on the upper reaches of the Yangtze River, the four cities in southern Sichuan shoulder the important task of connecting the East and the West and opening up the waterway freight transportation in Southwest China, which has an important strategic position and broad development prospects. Therefore, the suggestions put forward in this paper are of certain theoretical significance and reference.
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References