

Research on the Construction of Comprehensive Evaluation Index System of Influencing Factors of Port Industry Based on Data Analysis

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Abstract: In this paper, 12 indicators are selected from five categories of factors affecting the port industry: port infrastructure conditions, port operation and service capacity, port hinterland economic conditions, upstream development status of the industry chain and port development potential. The port cargo throughput, berth, port and berth for production quantity, the total length of the port city GDP, the second industry output port city, port city of the tertiary industry output value, port city GDP growth, investment in fixed assets, the balance of loans of financial institutions, total import and export of foreign trade port city, port city actually realized foreign investment total income of postal and telecommunication services, port city, through the analysis of these data to build a set of unique and complete factors comprehensive evaluation index system of port industry.

Keywords: Port industry, Influencing factors, Index system, Construction, Data analysis

1. Factors Affecting the Development of Port Industry

The port industry is an export-oriented economy with the port as the center, the port city as the carrier, the comprehensive logistics and transportation system as the artery, the hinterland resources as the support, the relevant policies and the international cooperation environment as the support, in order to realize the interconnection, organic combination, common development and common prosperity among regions. The factors affecting the development of port industry come from all aspects, especially in recent years with the continuous development of international trade, there have been many favorable factors to promote the development of port industry, but also a lot of factors restricting the development of port industry. Starting from the general definition of port industry, the factors affecting the development of port industry are classified into the following five categories:

1.1 Infrastructure Conditions of Ports

Port is the center and foundation of the development of port industry. The choice of port and its subsequent construction are the prerequisites to determine whether it can develop into an internationally famous port. Considering that the basic factors affecting the development of port industry are the port's own conditions and the construction degree in the following days, the port's own conditions and development degree are regarded as one of the basic factors influencing the development of port industry in this study, and the port's own conditions are first listed as the port's infrastructure conditions: natural factors and hardware facilities.

1.1.1 Natural Factors

In the natural factor, the geographical location condition of the port is the first. An important factor for shipper's choice of port is the total service cost, and an important part of the total service cost is the transportation cost of goods from the origin to the port or from the port to the destination. On the contrary, if the port is far away from the hinterland source of goods and transit source of goods, it will be at a greater disadvantage to compete with other ports in the supply of goods under the same other conditions. For example, Shanghai Port is not only close to the hinterland of the Yangtze River Delta with developed economy and strong import and export trade, but also close to Shanghai, the

transportation hub of water transportation, railway and highway in China. Therefore, it has obvious advantages in geographical location. Proximity to international routes is often more important to transit ports than proximity to the hinterland. The world famous transit port of Singapore is a perfect example. Although its inland hinterland is very limited, its excellent location close to international shipping routes is a major reason for its success. Therefore, the distance between the port and the hinterland source of goods and the distance between the port and the international waterway are two important factors affecting the port industry.

The second is the deep-water shoreline and deep-water berth resources of the port. At present, the trend of large-scale ships is accelerating. Container ships have developed into the sixth generation, and their requirements for the depth of berths have reached 14.5 meters, and natural fine deep-water shoreline is the prerequisite for the construction of these deep-water berths. For example, Guangzhou Port used to be the fastest and earliest developing port in the Pearl River Delta region. However, due to the lack of deep-water berths, it was once overtaken by Shenzhen Port. It was not until the construction of Nansha Port Deep Water Port Area in the later period that it gradually got rid of the embarrassing situation. At present, in order to compete for the position of hub port, some important ports in the world also take the fifth and sixth generation containers as the standard in their planning, and build deep-water berths of more than 14 meters or even deeper.

Finally, the climatic conditions of the port. The ports in northern China are susceptible to freezing weather in winter, and the ports in southern China are susceptible to typhoons or fog in summer, which will affect the operation of the ports.

1.1.2. Port Hardware Facilities

Port hardware facilities are the basis of port operation, and their level directly affects the basic service capacity and level of the port.

Hardware facilities include port berths, the number of loading and unloading machines on the shore, the area of storage yard, the capacity of storage yard and the number of collecting cards, the number of railways, the number of barges and so on. It reflects the port loading and unloading equipment capacity, storage equipment capacity, mechanical operation efficiency and equipment capacity adequacy. In reality, these hardware facilities are directly related to the time of the vehicle and ship in the port, and then affect the total transportation time. The most important indicator in hardware facilities is the number and size of berths. Today, with the increasing size of container ships, high-quality and deep-water berths with wide and deep water are particularly important. The longer the wharf shoreline, the more berths and the more deep-water berths, the more ships can berth at the same time, which will reduce the congestion degree of the port, improve the efficiency of port operation, and thus improve the port industry benefit. Secondly, the area of port storage yard. Port warehouse is the main distributing place of goods, which directly affects the turnover of goods and the docking time of vehicles and ships. The area of storage yard is closely related to the port throughput and handling efficiency, while the effective area of storage yard is interrelated with the handling efficiency. For example, for containers, if the number of container layers in the yard is too high, the loading and unloading efficiency of the port will be affected, and the operation of the whole port will also be adversely affected. The larger the effective area of the yard is, the larger the space for port operation will be and the stronger the operation capacity will be. And finally, the machinery of the port. Modern ports are more and more inclined to mechanization and automation operation, advanced port machinery is an important condition to improve the efficiency of port loading and unloading, it has become an important factor to improve the efficiency of port industry.

1.2 Port Operation and Service Capacity

The operation and service capacity of the port mainly includes two aspects. The first is the port's cargo throughput and container throughput. The cargo throughput and container throughput of a port directly reflect the production capacity of a port, which is the most important index to measure the competitiveness of a port. The throughput reflects the operating income scale and profit scale of a port, while the throughput growth rate reflects the competitiveness and development potential of a port.

The second is the number of port routes. The number of routes directly affects the number of places to which the goods are transported through the port, which strengthens the external contact and promotes foreign trade, thus improving the competitiveness of the port industry.

1.3 Economic Conditions in the Hinterland of the Port

The economic resources of the hinterland are the support for the development of the port industry. The better the economic development of the hinterland is, the better it will be able to provide support for the development of the port industry and deliver the services and products of the hinterland to all parts of the world. Therefore, the economic development level of the hinterland of the port directly affects the development status and prospect of the port. For example, Shanghai Port and Ningbo-Zhoushan Port are backed by the developed Yangtze River Delta Economic Zone, Shenzhen Port is backed by the developed Pearl River Delta Economic Zone, and Tianjin Port is backed by the increasingly developed Bohai Rim Economic Zone.

Port hinterland economy includes two aspects. The first is the level of economic development of the city where the port is located. The development of ports cannot be separated from the cities that provide support for them. Port and port cities are closely linked and mutually promoted. The development of port cities provides sufficient construction funds and human resources for ports, and the improvement of port industry can better promote the economic prosperity of port cities. Therefore, many port cities have developed economically and prospered in foreign trade, and become important cities in the world or in China, such as Rotterdam in the Netherlands. The GDP of a port city is generally positively correlated with the port throughput. The total import and export volume of a port city is closely related to the port throughput. Meanwhile, the proportion and scale of the secondary and tertiary industries of a port city indirectly affect the throughput and revenue capacity of a local port. In China, the economy has undergone great changes since the reform and opening up, and the economic pattern has also undergone major changes. Coastal areas, especially coastal port cities, have become important import and export bases. Therefore, the economic scale and economic structure of coastal cities greatly affect the development of ports. The import and export trade of the port cities is generally quite developed. For example, Shenzhen accounts for most of the import and export trade in the Pearl River Delta region.

The second is the hinterland range of the port. The hinterland is the direct source and destination of goods for a port, and the economic development level of the hinterland directly affects the throughput and competitiveness of a port. The larger the scope of the hinterland, the higher the GDP and the higher the import and export volume, the more developed the logistics and commercial flow of the hinterland will be, and the greater the demand for port services will be. The vast majority of China's foreign trade depends on sea transportation. The analysis of typical port industries in the world in Chapter 5 also shows that hinterland is an important dependence of ports.

1.4 Upstream Development of the Industry Chain

The hub of the port and shipping industry chain is the port, whose upstream mainly includes non-shipping direct business services such as financing insurance, maritime arbitration, maritime norms, maritime consulting, international shipping transactions and technical standards for modern international shipping. It is the most important part of the modern shipping service industry. As a capital-intensive industry, the shipping industry requires huge capital investment in infrastructure construction, shipbuilding, shipping management and trading, and the financial services industry plays a very important role in supporting the development of the shipping industry. Therefore, the operation of finance and insurance industry in the economic component is representative to a certain extent. The support of upstream industry of port industry is a necessary condition to improve its competitiveness.

1.5 Port Development Potential

Port development potential directly affects the future competitiveness of port industry. The first choice is the port industry development status. In view of the increasing importance of the development of port-adjacent industries, the industrial development of various port cities, such as the processing and export industries dominated by foreign investment, has a great impact on the import and export of ports. Therefore, the amount of foreign investment in the city where the ports are located profoundly reflects and influences the import and export of ports. In the early stage of Chinese economic take-off, processing trade dominated by investment from Hong Kong and Taiwan occupied a large amount of import and export trade, such as Foxconn in Shenzhen. Foxconn's investment in Henan doubled Henan's foreign trade. Therefore, foreign investment in a region directly affects the scale and pattern of import and export, and will also increase the impact on the development and competition of ports.

Secondly, the development of port logistics industry. In modern trade, logistics occupies an increasingly important position, first-class logistics services can bring better development of the port industry, because the development of the port industry not only needs good port construction, but also needs convenient transportation and smooth logistics services, so as to drive the port industry to develop rapidly. The perfection of the collection and distribution system mainly refers to the construction of logistics hardware connecting ports, including the dense unimpeded traffic of roads, railways and inland rivers, as well as the construction of various logistics parks. The convenience of logistics reflects the actual ability of the port logistics industry to support the development of the port, including the speed of cargo turnover, and the information industry that provides support for the informatization level of logistics services (as reflected by the index of the post and telecommunications industry).

Finally, to the macro environment, the port industry is not only the economic development in a region, but also the global economic development. Port industry is the product of international trade development under the situation of economic globalization, its development needs the economic coordination within each region, therefore, the macro environment also restricts the development of port industry. The macro environment of a port mainly refers to the government's support of policies and regulations for a port, the government's development plan for port talents, and the degree of international cooperation (to indicate the port's active degree of participating in international cooperation, including the degree of internationalization and integration of the region).

2. The Construction of the Index System

According to the foregoing, this study constructs a comprehensive evaluation system for the influencing factors of the port industry, selects 12 indicators as the main factors affecting the port industry, and highlights the influence of economic factors. As shown in Table 1:

Table 1: Comprehensive evaluation index system of influencing factors of port industry

First level indicator	The secondary indicators
Port service capacity	Port cargo throughput (10,000 tons)
Port infrastructure conditions	Total length of port berth (m)
	Number of berths for port production (pcs)
Economic conditions in the port hinterland	GDP of the city where the port is located (100 million yuan)
	Total output value of the secondary industry in the city where the port is located (100 million yuan)
	Total output value of tertiary industry in the city where the port is located (100 million yuan)
	GDP growth rate of the city where the port is located (%)
Upstream development of the industry chain	Investment in fixed assets (100 million yuan)
	Loan balance of financial institutions (100 million yuan)
Port Development Potential	Total foreign trade import and export volume of port city (US\$100 million)
	The actual amount of foreign investment in the city where the port is located (US\$100 million)
	Post and telecommunications revenue of the city where the port is located (100 million yuan)

3. Conclusion

From the above analysis, it can be seen that factors affecting the development of port industry mainly come from five aspects: port service capacity, port infrastructure conditions, economic conditions in the port hinterland, upstream development of the industry chain, port development potential, twelve indicators were selected from these five aspects: port cargo throughput, total length of port berth, number of berths for port production, GDP of the city where the port is located, total output value of the secondary industry in the city where the port is located, total output value of tertiary industry in the city where the port is located, GDP growth rate of the city where the port is located, investment in fixed assets, loan balance of financial institutions, total foreign trade import and export

volume of port city, the actual amount of foreign investment in the city where the port is located, post and telecommunications revenue of the city where the port is located. Only by constantly strengthening the construction of these five aspects (12 indicators) can the core competitiveness of the port industry be promoted.

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