International Business & Economics Studies
ISSN 2640-9852 (Print) ISSN 2640-9860 (Online)
Vol. 6, No. 3, 2024
www.scholink.org/ojs/index.php/ibes

*Original Paper*

# Analysis on the Competitiveness of Guigang Shipbuilding Industry

Zhusong Huang[1*]

[1] College of Economics, Guangxi University, Nanning, Guangxi, China

[*] Corresponding author

Received: April 29, 2024 Accepted: June 11, 2024 Online Published: June 30, 2024

doi:10.22158/ibes.v6n3p196 URL: http://dx.doi.org/10.22158/ibes.v6n3p196

***Abstract***

*The ship manufacturing industry is one of the important industries in Guigang City.The well-developed ship manufacturing industry can not only drive the local manufacturing technology progress and the sustainable development of economy, but also increase the employment opportunities of local residents and realize the growth of people's income and social stability. However, compared with other cities with advanced shipbuilding industry, there are still many problems in the shipbuilding industry of Guigang city. Therefore, this paper mainly studies the competitiveness of the shipbuilding industry of Guigang City, summarizes the advantages of the development of the shipbuilding industry of Guigang City and the existing problems, puts forward the factors affecting the improvement of its competitiveness, and puts forward corresponding countermeasures for the existing problems. In order to effectively improve the development status of Guigang shipbuilding industry and improve its development level.*

***Keywords***

*shipbuilding industry, industrial competitiveness, principal component analysis*

## 1. Introduction

Guigang became a prefecture-level city in 1995. Since its establishment, Guigang, Guangxi Province, has actively carried forward the idea of revitalizing the city by industry, and vigorously promoted the development of the city's ship manufacturing industry around the goal of building a core port city in the Xijiang River basin. Before the establishment of the city, there were only 2 shipbuilding enterprises with an output value of less than 100 million yuan. By 2015, there were 22 shipbuilding enterprises in Guigang with an output value of 5.367 billion yuan. The output value of shipbuilding industry accounted for 75.9% of the machinery manufacturing industry, driving the output value of machinery manufacturing industry to grow by 9.69 percentage . In the output value, as well as the number of

employees have a great development. With the continuous improvement of technology and technology, Guigang City now adopts the modern shipbuilding mode of segmented construction, which can build various types of vessels such as tourist boats, container and cargo carriers. The total shipbuilding volume and shipbuilding capacity have been greatly improved, and the shipbuilding industry has become an important support for the industrial development of Guigang City.

However, there are still many deficiencies in the shipbuilding industry of Guigang. First of all, the infrastructure of the shipbuilding industry of Guigang is weak. Compared with the old shipbuilding bases such as Shanghai and Guangzhou, the shipbuilding industry of Guigang started late, and it is difficult to form a good infrastructure due to the backward local economy. Secondly, Guigang shipbuilding industry's independent research and development ability is low, the number of technical research and development personnel is insufficient. According to the data of the Fourth National Economic Census Bulletin of Guigang (No. 6) released by Guigang in 2018, the R&D expenditure of ship and other transportation equipment manufacturing enterprises in Guigang in 2018 was only 1.4 million yuan, and the ratio of R&D expenditure to operating income was 0.05%. Third, Guigang shipbuilding industry has a serious shortage of funds and financing difficulties. Shipbuilding industry is an industry with huge investment in the early stage. The ship manufacturing enterprises in Guigang are relatively small in scale, most of them are small and medium-sized enterprises, which are short of funds and difficult in financing. Therefore, there are still many problems to be solved in the development of ship manufacturing industry in Guigang.

## 2. Literature Review

### *2.1 Theoretical Basis of Research on Industrial competitiveness*

In 1776, Adam Smith put forward the theory of absolute advantage in his “A Study of the Nature and Causes of National Wealth”, which holds that countries can realize their own development by using their absolute advantages to carry out international division of labor and provide exchange products. This theory cannot explain the existence of trade in spite of the absolute advantages or disadvantages of the productive forces of all products in each country. Based on Adam Smith, David Ricardo put forward the theory of comparative advantage, which holds that if a country can produce products with relatively low cost, it can still trade with other countries, so that both sides can gain benefits. On the basis of the theory of comparative advantage, Ohlin and Heckscher put forward the theory of factor endowment. They believe that there are differences in production factors (such as land, capital and labor) among countries, and the more abundant the endowment of a certain factor, the lower the price, and the lower the cost of production with this factor. According to this, countries should produce according to their factor endowments in order to obtain benefits. In 1990, Porter published "National Competitive Advantage" and put forward a new theory that affects national industrial competitiveness, namely the "diamond model" theory, which combines the characteristics of resource factors, demand conditions, auxiliary industries and enterprise strategies into a diamond shape.

*2.2 Evaluation Methods of Industrial Competitiveness*

The evaluation methods of manufacturing competitiveness include single index method and multi-index method. In the aspect of single index method, many scholars use the index of Revealed Comparative Advantage (RCA) to judge the industrial competitiveness of a country or region. Tian (2010) selected the RCA and found that the overall competition level of the equipment manufacturing industry in Shandong Province was not high, and the core advantages were not obvious. Further, Su and Li (2016) found that there is a negative relationship between the upstream degree of the industry and the international competitiveness of the manufacturing industry (measured by RCA). The low labor productivity is not conducive to the development of China's manufacturing industry. The single index method is characterized by its simple method and clear purpose, but it also has shortcomings, it is one-sided and unconvincing.

More scholars use the multi-index method when measuring the competitiveness of manufacturing industry. In the aspect of cluster analysis, Ming (2020) found that the development of competitiveness of China's equipment manufacturing industry is unbalanced, and the competitiveness of eastern coastal provinces is significantly stronger than that of western regions due to their good industrial foundation, geographical advantages and better financing environment. In terms of principal component analysis, Zhang (2013) compared the equipment manufacturing industry of Shaanxi province with that of the whole country through principal component analysis and found that although the overall competitiveness of the equipment manufacturing industry of Shaanxi Province is weak, it can give full play to its comparative advantages and give priority to the development of industries with comparative advantages such as the transportation equipment manufacturing industry to improve the comprehensive competitiveness of the equipment manufacturing industry of Shaanxi Province. At the same time, it is necessary to make full use of Shaanxi's better innovation and competitive environment, accelerate the construction of industrial clusters and attach importance to investment to promote the development of Shaanxi's equipment manufacturing industry (Wang & Yin, 2016). The study of Zhou (2018) found that the ranking of comprehensive competitiveness of manufacturing industry in Yangtze River Delta cities is relatively stable, although there is a gap in manufacturing competitiveness between different cities, but the gap is narrowing. While resources, technology and development potential are important factors affecting industrial competitiveness, different cities should adjust to local conditions and make up for the deficiency in these aspects. Wang (2021) found through the global principal component analysis that the industrial competitiveness of Hubei Province was on the rise on the whole, but the development among cities, states and regions was very uneven. New industrial cities have good development potential, while old industrial cities need to carryout industrial transformation and upgrading and explore new industrial growth points.

Most of the previous studies took the competitiveness of the manufacturing industry as the research object from the national or provincial level, while there were few studies from the municipal level. This paper evaluates the competitiveness of the shipbuilding industry of Guigang, which is helpful to

understand the status of the competitiveness of the shipbuilding industry of Guigang. To provide policy reference for improving the competitiveness of Guigang's shipbuilding industry.

### 3. Index Selection

Based on Rostow's works From Take-off to Self-Sustaining Growth and Stages of Economic Growth, the characteristics of the dominant sector are firstly good innovation ability and rapid absorption of new results, secondly, sustained high growth rate, and thirdly, good correlation effect. As well as the indicators of industrial competitiveness of equipment manufacturing industry proposed by other scholars. The article selects the innovation ability index, scale strength index, related industry development index and infrastructure index to form the evaluation index system of Guigang shipbuilding industry competitiveness (Table 1).

**Table 1. Guigang Ship Manufacturing Industry Competitiveness Evaluation**

| Target Layer | Level 1 Indicators | Secondary indicators |
|---|---|---|
| Competitivenes of ship equipment manufacturing industry | Indicators innovation of capability | X1 R&D expenditure |
| | | X2 Ratio of R&D expenditure to operating income |
| | | X3 Number of secondary vocational students |
| | Size strength indicator | X4 Output of ship manufacturing products |
| | | X5 Growth rate of ship manufacturing product output |
| | | X6 Added value of ship manufacturing industry |
| | | X7 Share of value added of shipbuilding industry in GDP |
| | Relevant industrial development indicators | X8 steel production |
| | | X9 Waterway passenger and cargo volume |
| | | X10 Port cargo throughput |
| | Infrastructure indicators | X11 Value add for transportation and warehousing |
| | | X12 Total GDP |

According to the framework design of the evaluation index system, it is divided into four categories of

indicators.

The first is the innovation ability index, which is measured by the R&D expenditure and the ratio of R&D expenditure to operating income. Because some industries may have less R&D expenditure, but if we further consider the ratio of R&D expenditure to operating income, we can better measure the determination of industrial innovation. At the same time, the number of secondary vocational students is included in the index of innovation ability. Since the research and development of shipbuilding industry is more inclined to technology research and development, vocational students may have better space to play, so it is taken as one of the indicators to measure.

The second is the scale strength index, which is measured by the output, added value of shipbuilding products and the proportion of added value to the added value of GDP. The absolute scale can be measured by the output and added value of shipbuilding products, and the scale of an industry relative to other industries in the city can be measured by the proportion of added value of shipbuilding industry to the added value of GDP.

The third is the development indicators of related industries. The development of related industries is also very important for the development of the shipbuilding industry. The iron and steel industry provides shipbuilding raw materials for the shipbuilding industry. As for the demand for its products, because the data can not be obtained, it can be measured by the volume of passenger and cargo traffic of waterways and the cargo throughput of ports, because the increase of these two will make enterprises need more ships for transportation and increase the demand for ships.

Fourth,infrastructure indicators. Since the transportation of steel is inseparable from the development of transportation and warehousing, the added value of transportation and warehousing industry is regarded as an important infrastructure indicator. At the same time, the more developed a city's economy, its infrastructure will also develop better, so the total GDP as an important indicator to measure infrastructure.

## 4. Guigang Ship Manufacturing Industry Competitiveness Evaluation

This part uses the principal component analysis method and the evaluation indicators selected above to analyze the ship manufacturing industry of Guigang City. The index data comes from the Statistical Annual Report of Guigang City and the Statistical Yearbook of Guigang City.

### *4.1 Principal Component Analysis of Guigang from 2009 to 2021*

In this paper, stata statistical software was used for principal component analysis. The results areas follows:

**Table 2. Guigang Ship Manufacturing Industry Competitiveness Evaluation**

| Components | Initial eigenvalues | | |
|---|---|---|---|
| | Total | Percentage of variance | Cumulative percentage |
| 1 | 6.106 | 0.5102 | 0.5102 |
| 2 | 4.436 | 0.3706 | 0.8808 |
| 3 | 0.852 | 0.0712 | 0.9520 |
| 4 | 0.392 | 0.0327 | 0.9847 |
| 5 | 0.103 | 0.0086 | 0.9933 |
| 6 | 0.038 | 0.0032 | 0.9965 |
| 7 | 0.028 | 0.0023 | 0.9988 |
| 8 | 0.010 | 0.0009 | 0.9997 |
| 9 | 0.003 | 0.0003 | 1.0000 |
| 10 | 0.0007 | 0.0001 | 1.0000 |
| 11 | 0.00001 | 0.0000 | 1.0000 |
| 12 | 0.00021 | 0.0000 | 1.0000 |

As can be seen from Table 2, the first 9 digits of the eigenvalues of the correlation coefficient matrix are:α1 =6.106, α2=4.436, α3=0.852, α4=0.392, α5=0.103, α6 =0.038, α7=0.028, α8 =0.010, α9 =0.003, and only the first two eigenvalues are greater than 1. Therefore, two principal components are taken, and their cumulative contribution rate reaches 88.08%, note Contains information about the original variable 88.08%.

**Table 3. Guigang Ship Manufacturing Industry Competitiveness Evaluation**

| | Components | |
|---|---|---|
| | 1 | 2 |
| X1 R&D expenditure | 0.9327 | 0.3452 |
| X2 Ratio of R&D expenditure to operating revenue | 0.9271 | 0.3581 |
| X3 Number of students enrolled in secondary Vocational and technical schools | 0.0843 | 0.4709 |
| X4 Production of Marine manufacturing products | 0.3025 | 0.9085 |
| X5 Growth rate of ship manufacturing product output | 0.2466 | 0.7897 |
| X6 Value added of shipbuilding industry | 0.6108 | 0.7821 |
| X7 Share of value added ofshipbuilding industry in GDP | 0.0849 | 0.9877 |
| X8 steel output | 0.9644 | 0.1167 |
| X9 Waterway passenger and cargo volume | 0.9880 | 0.0048 |
| X10 Port cargo throughput | 0.9873 | 0.0108 |
| X11 Value added for transportation and warehousing | 0.0018 | 0.9422 |
| X12 Total GDP | 0.9780 | 0.1727 |

It can be obtained from Table 3 that: the first principal component has a large load explanation power on X9, X10, X12, X8, X1 and X2, while the load on other variables is relatively small, so it is named as market factor and scientific research factor. The second principal component has a large load explanation ability on X7, X11 and X4, and a small load on other variables, which mainly reflects the scale factor. In general, X9, X10, X12, X8, X1, X2, X7, X11 and X4 have a great impact on the competitiveness of Guigang shipbuilding industry.

## 5. Guigang Ship Manufacturing Industry Competitiveness Improvement Strategy

By observing the results of principal component analysis from 2009 to 2021, it is found that the development of ship manufacturing industry in Guigang is greatly affected by market factors, scientific research factors and scale factors. Therefore, the competitiveness improvement strategy is proposed from these aspects.

### *5.1 Improving the Level of Scientific and Technological Research and Development*

It is necessary to increase the investment in scientific research funds, which has been insufficient for a long time in the shipbuilding industry of Guigang. For example, through the "Rapid Growth of R&D Funds in Guigang—Analysis of Research and Experimental Development (R&D) in Guigang" in 2021, it can be seen that the R&D investment of the shipbuilding industry is 10.665 million yuan. It only accounts for 0.4% of the main business income, much lower than other developed cities (such as 2.65% in Taizhou and 2.62% in Nantong), which greatly affects the improvement of the scientific research level of the shipbuilding industry. In this regard, Guigang municipal government should increase the investment in scientific research through policy support, competitive bidding, capital market, absorbing idle funds and other ways.

### *5.2 Expanding the Scale of Shipbuilding Industry*

The scale factor also has a great impact on the competitiveness of ship manufacturing industry in Guigang. Therefore, Guigang needs to integrate resources to form a group of large-scale and cost-effective large-scale ship manufacturing enterprises, support the transformation and upgrading of key ship manufacturing enterprises such as Hongxin and Dazhong, and promote the development of small and medium-sized enterprises by using large-scale and backbone enterprises. At the sametime, financing concessions are given to ship enterprises, encouraging them to introduce investment to expand the scale.

### *5.3 Expand the Market and Improve the Influence*

Market factors are also important factors affecting Guigang shipbuilding industry. In terms of market supply, the Guigang government should strengthen the joint development of the industry, and provide good raw materials for the shipbuilding industry with the support of its abundant steel production. In terms of market demand, Guigang should strengthen the expansion of the Southeast Asian marketso as to obtain more foreign orders.

**References**

Huang, J. Y. (2011). *Research on Competitiveness of Shipbuilding Industry in Shandong Province*. Changchun University of Technology.

Smith, A. (1776). *An Inquiry into the Nature and Causes of National Wealth*. https://doi.org/10.1093/oseo/instance.00043218

David, R. (2009). *Political Economy and Principles of Taxation*. Guangming Daily Press.

Ohlin, H. (2008). *Interregional Trade and International Trade*. Huaxia Publishing House.

Michael, P. (2002). *National Competitive Advantage* (Chinese Edition). Huaxia Publishing House.

Tian, G. Y. (2010). Evaluation on competitiveness of Shandong equipment Manufacturing industry based on revealed comparative advantage index. *Business Economics*, *2010*(08), 12-13.

Su, H., & Li, H. Y. (2016). Industry upstream degree and International Competitiveness of China's Manufacturing Industry. *Research on Financial and Economic Issues*, *2016*(08), 31-37.

Yu, W., Cai, Z. F., & Liu, L. Q. (2020). A new measurement and interpretation of the vulnerability of China's manufacturing industry to international competitiveness: A deep perspective based on enterprise micro-data. *Research of Finance and Economics*, *46*(08), 124-139.

Ming, X., & Hu, L. J. (2020). Research on competitiveness evaluation of regional equipment manufacturing based on cluster analysis. *Macroeconomic Research*, *2020*(06), 114-121.

Zhang, X. T., & Dong, G. M. (2013). Comparative study on competitiveness of Seven major industries of equipment manufacturing industry in Shaanxi Province. *Journal of Xi 'an Technological University*, *33*(11), 908-913.

Wang, X. A., & Yin, J. Y. (2016). Research on Domestic competitiveness evaluation of equipment Manufacturing Industry in Shaanxi Province—Based on principal component analysis. *Journal of Xi 'an University of Finance and Economics*, *29*(04), 68-75.

Zhou, W. Q. (2018). Research on dynamic evaluation of urban manufacturing competitiveness in Yangtze River Delta. *Economic Issues Exploration*, *2018*(04), 66-72.

Wang, L. (2021). Dynamic evaluation of regional industrial competitiveness in 17 cities (prefectures and districts) of Hubei Province: Estimation based on global principal component analysis. *Social Sciences of Hubei Province*, *2021*(03), 77-83.