International Journal of Scientific Engineering and Science
Volume 2, Issue 11, pp. 8-11, 2018. ISSN (Online): 2456-7361

# Comparative Study on Regional Competitiveness of Manufacturing Industry in Jiangsu Province

Ya Li
School of Finance and Economics, Jiangsu University, Jiangsu, 212013, Zhenjiang, China

***Abstract*—***Manufacturing industry is the cornerstone of the development of national economy, it is an important basis for the development of national economy, and it is the main force of national economic growth and economic restructuring and upgrading of the foundation, determines the country's international status. Jiangsu Province, as the largest manufacturing province, the development of its manufacturing industry not only made an outstanding contribution to the development of Jiangsu's economy, but also greatly promoted the entire country's industrialization process. This paper uses factor analysis to analyze the competitiveness of 13 manufacturing industries in Jiangsu Province, then discusses the reasons for the differences and puts forward corresponding countermeasures.t.*

***Keywords*—** *Jiangsu Province, Manufacturing Industry, Competitiveness Factor Analysis.*

## I. INTRODUCTION

Since the founding of the People's Republic of China, with the help of the superior geographical environment of Jiangsu Province and the vigorous promotion of the national industrialization strategy, the manufacturing industry in Jiangsu Province has made great progress. As the largest province in China's manufacturing industry, Jiangsu's manufacturing industry's development indicators in recent years are leading in the country and play a pivotal role in the economic construction of the entire country. As international capital continues to gather in the Yangtze River Delta region, Jiangsu Province has seized the opportunity to actively absorb advanced technologies at home and abroad and comprehensively upgrade the level of manufacturing development. At present, an independent and complete industrial system has been formed. However, the level of development of manufacturing industries in different regions is different, and the imbalance of regional development levels is more obvious. Therefore, a comparative analysis of the manufacturing development level of 13 cities in Jiangsu Province to find out the advantages and disadvantages of manufacturing development in different regions and the differences between regions has important theoretical and practical value for improving the overall development of Jiangsu manufacturing industry.

## II. PRESENT SITUATION ANALYSIS

At present, research on industrial competitiveness has achieved fruitful results. Yang Hongjiao and Sun Linyan (2007) built a regional manufacturing competitiveness rating index system, which comprehensively evaluated the competitiveness level of a regional manufacturing industry. In this study, a total of 29 indicators were selected from five aspects: industry's value creation ability, technological innovation ability, operational efficiency ability, international competitiveness and sustainable development ability. Yao Xiaofang and Zhang Renhua (2010) selected 12 competitiveness evaluation indicators from three levels: industrial scale competitiveness, industrial economic efficiency competitiveness and industrial development potential, and used factor analysis method to evaluate the competitiveness of Hefei equipment manufacturing industry. Chen Min and Wang Long (2012) constructed the evaluation index system of automobile industry competitiveness in Jiangxi Province, and systematically analyzed the competitiveness of automobile industry in Jiangxi Province. In the study, the first-level indicators such as environmental competitiveness, manufacturing competitiveness, innovation competitiveness, and market competitiveness were selected, as well as corresponding secondary indicators.

Researchers have also made some research on the competitiveness of manufacturing. Yan Yanjie and Wu Nian (2013) constructed an evaluation index system for equipment manufacturing competitiveness from five aspects: scale competitiveness, market competitiveness, innovation capability, operational capability and solvency. Through factor analysis, 30 provinces and municipalities in China. The competitiveness of the equipment manufacturing industry in the autonomous region was compared and analyzed. Chen Gang (2011), Chen Yanfang (2012) and Shi Aihu (2013) respectively constructed the manufacturing competitiveness index for the development of manufacturing industry in Hebei Province, manufacturing industry in Liaoningand manufacturing industry in Fujian. The evaluation system uses factor analysis to evaluate the competitiveness of various sub-sectors within the manufacturing industry.

## III. COMBINED ANALYSIS

There are many indicators for evaluating the level of development of regional manufacturing in Jiangsu Province. These indicators can assess the development level of regional manufacturing in Jiangsu from different angles. However, due to the complex correlation between indicators, it is difficult to directly evaluate the status of manufacturing development in different regions. This requires summarizing the indicators and eventually forming one or more comprehensive indicators. Factor analysis is a multivariate statistical method that transforms multiple indicators into a small number of uncorrelated and not observable random variables (ie, factors) by studying the internal structure of the original data



http://ijses.com/
All rights reserved

correlation coefficient matrix to extract most of the information of the original indicators.

### A. Index System Construction and Data Preparation

In order to analyze the competitiveness of regional manufacturing in Jiangsu Province, according to the scientific, comprehensive, hierarchical, pertinent and operational principles of the establishment of the indicator system, after several screenings, we selected the following nine economic indicators. X1: Total fixed assets of industrial enterprises (100 million yuan); X2: Market share refers to the proportion of sales volume in all regions in all regions, and is an important indicator reflecting the competitive position of enterprises in the market. It can be expressed as the ratio of regional manufacturing sales revenue to total manufacturing sales revenue; X3: Average annual number of employees in industrial enterprises (10,000 people); X4: Number of industrial enterprises (units);X5: sales revenue margin (total profit / total manufacturing revenue);X6: Cost-based profit margin (total profit/cost of manufacturing);X7: The average size of the industry, usually expressed as the ratio of the sales revenue of the region to the number of business units in the region;X8: Labor productivity, expressed as the ratio of the total manufacturing output value of the region to the annual average number of employees in the region;X9: The strength of fixed assets, expressed as the ratio of fixed assets in the region to the annual average number of employees in the region.

The above indicators are all derived from the 2016 Jiangsu Statistical Yearbook or related indicators. The specific data is shown in Table I.

TABLE I. Indicator values of 13 cities in Jiangsu Province.

| Indicator | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 |
|---|---|---|---|---|---|---|---|---|---|
| Nanjing | 3275.17 | 0.083 | 78.42 | 2714 | 0.069 | 7.49 | 4.488 | 164.564 | 41.764 |
| Wuxi | 3704.19 | 0.096 | 125.51 | 4988 | 0.064 | 6.36 | 2.824 | 115.926 | 29.513 |
| Xuzhou | 3033.48 | 0.082 | 79.57 | 2875 | 0.081 | 8.38 | 4.186 | 153.524 | 38.123 |
| Changzhou | 2515.70 | 0.078 | 86.04 | 4244 | 0.056 | 5.81 | 2.71 | 129.029 | 29.239 |
| Suzhou | 7653.37 | 0.202 | 303.71 | 10062 | 0.051 | 5.3 | 2.959 | 99.599 | 25.2 |
| Nantong | 2908.30 | 0.091 | 99.38 | 5066 | 0.076 | 8.22 | 2.63 | 135.996 | 29.264 |
| Lianyungang | 1349.39 | 0.036 | 29.08 | 1701 | 0.081 | 8.86 | 3.149 | 186.834 | 46.403 |
| Huai'an | 1377.96 | 0.044 | 47.91 | 2647 | 0.057 | 6.14 | 2.472 | 136.934 | 28.761 |
| Yancheng | 2324.30 | 0.055 | 56.94 | 3156 | 0.07 | 7.55 | 2.547 | 144.953 | 40.82 |
| Yangzhou | 1748.85 | 0.061 | 72.48 | 2774 | 0.067 | 7.3 | 3.235 | 126.851 | 24.129 |
| Zhenjiang | 1947.43 | 0.056 | 57.22 | 2843 | 0.068 | 7.27 | 2.888 | 146.868 | 34.034 |
| Taizhou | 1700.49 | 0.073 | 58.34 | 2867 | 0.078 | 8.44 | 3.764 | 189.632 | 29.148 |
| Seconds | 1235.17 | 0.025 | 40.45 | 2565 | 0.101 | 11.2 | 1.448 | 95.509 | 30.536 |

### B. Factor Analysis and Factor Score

In this paper, the raw data is processed by the factor analysis method in the statistical analysis software spss18.

The factor analysis suitability test can be determined by KMO statistic and Bartlett's spherical test.

The specific test results are shown in Table II. KMO statistic is used to probe the partial correlation between variables. It compares the simple correlation and partial correlation between variables. The range of values is between 0-1. If it is greater than 0.5, factor analysis can be used. Table 2 The KMO value is shown to be 0.551, and factor analysis can be used. Bartlet's spherical inspection also passed.

TABLE II. Inspection of KMO and Bartlett.

| | | |
|---|---|---|
| Sampling enough Kaiser-Meyer-Olkin metrics | | 0.551 |
| Bartlett's sphericity test | Approximate chi square | 200.300 |
| | df | 36 |
| | Sig. | 0.000 |

The total variance of the explanation is shown in Table III. The factor load matrix with each variable rotated, the eigenvalues and contribution rates of the common factors are obtained by factor analysis, as shown in Table IV. It can be seen from Table 4 that the cumulative contribution rate of the first, second and third principal factor eigenvalues reaches 91.964%, indicating that the three main factors basically include the total information amount of the nine indicators. Therefore, we can achieve the purpose of obtaining almost all information by analyzing these three main factors. Combined with the relevant knowledge of economics and management, the main factors are named by high-load indicators. The first main factor has high load on X1, X2, X3 and X4. The total fixed assets of industrial enterprises (100 million yuan), X2, X3 and X4 reflect the scale of manufacturing in different regions from different angles, so it is called manufacturing scale factor. The second principal factor has high loads on X5 and X6, while X5 and X6 reflect the economic benefits of manufacturing, so it is called the economic efficiency capability factor. The third principal factor has a high load on X7, X8, and X9, while X7, X8, and X9 reflect the input level of the manufacturing market, so it is called the input capability factor.



http://ijses.com/
All rights reserved

International Journal of Scientific Engineering and Science
Volume 2, Issue 11, pp. 8-11, 2018. ISSN (Online): 2456-7361

TABLE III. Total variance of interpretation.

| Ingredient | Initial eigenvalue | | | Extract square sum loading | | | Rotation square sum loading | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | Variance% | Grand total % | Total | Variance% | Grand total % | Total | Variance% | Grand total % |
| 1 | 5.232 | 58.134 | 58.134 | 5.232 | 58.134 | 58.134 | 3.944 | 43.817 | 43.817 |
| 2 | 1.943 | 21.585 | 79.719 | 1.943 | 21.585 | 79.719 | 2.206 | 24.510 | 68.327 |
| 3 | 1.102 | 12.245 | 91.964 | 1.102 | 12.245 | 91.964 | 2.127 | 23.637 | 91.964 |
| 4 | .499 | 5.541 | 97.505 | | | | | | |
| 5 | .206 | 2.291 | 99.796 | | | | | | |
| 6 | .012 | .130 | 99.926 | | | | | | |
| 7 | .005 | .052 | 99.978 | | | | | | |
| 8 | .002 | .020 | 99.998 | | | | | | |
| 9 | .000 | .002 | 100.000 | | | | | | |

TABLE IV. Post-rotation factor load matrix, eigenvalue, contribution rate, cumulative contribution rate.

| Indicatior | F1 | F2 | F3 |
|---|---|---|---|
| X1 | .965 | -.232 | -.022 |
| X2 | .944 | -.314 | -.006 |
| X3 | .941 | -.270 | -.182 |
| X4 | .898 | -.269 | .306 |
| X5 | .299 | .943 | .030 |
| X6 | -.333 | .932 | .016 |
| X7 | -.186 | -.178 | .887 |
| X8 | -.375 | .015 | .854 |
| X9 | -.230 | .344 | 706 |
| Eigenvalues | 3.944 | 2.206 | 2.127 |
| Contribution rate | 43.817% | 24.510% | 23.637% |
| Cumulative contribution rate | 43.817% | 68.327% | 91.964% |

In order to classify and further explain the manufacturing competitiveness level of 13 provincial cities in Jiangsu Province, the factor scores are calculated for the three main factors. At the same time, the linear weighted summation is obtained by weighting the respective contribution rate to obtain the comprehensive score and the total ranking. The formula is as follows:

$$Z=0.43817\times F1+0.24510\times F2+0.23637\times F3$$

The three main factor scores and composite scores are shown in Table V.

TABLE V. Factor score, total evaluation score and ranking.

| District | $F_1$ | | $F_2$ | | $F_3$ | | Z | |
|---|---|---|---|---|---|---|---|---|
| | Score | Rank | Score | Rank | Score | Rank | Score | Rank |
| Nanjing | 0.28224 | 5 | -0.01143 | 7 | 1.71626 | 1 | 0.53 | 3 |
| Wuxi | 0.3904 | 3 | -0.518 | 9 | -0.54299 | 9 | -0.08 | 8 |
| Xuzhou | 0.42606 | 2 | 0.77437 | 3 | 1.18588 | 3 | 0.66 | 2 |
| Changzhou | -0.40051 | 9 | -1.28855 | 12 | -0.53624 | 8 | -0.62 | 12 |
| Suzhou | 2.90726 | 1 | -0.54334 | 10 | -0.55897 | 11 | 1.01 | 1 |
| Nantong | 0.38391 | 4 | 0.51437 | 4 | -0.46189 | 7 | 0.19 | 5 |
| Lianyungang | -0.60662 | 12 | 0.7917 | 2 | 1.26868 | 2 | 0.23 | 4 |
| Huan'an | -1.1934 | 13 | -1.4001 | 13 | -0.69414 | 12 | -1.03 | 13 |
| Yancheng | -0.38034 | 7 | 0.07234 | 6 | 0.12451 | 5 | -012 | 9 |
| Yangzhou | -0.57579 | 10 | -0.59505 | 11 | -0.55614 | 10 | -0.53 | 11 |
| Zhenjiang | -0.58074 | 11 | -0.37559 | 8 | 0.00299 | 6 | -0.35 | 10 |
| Taizhou | -0.26324 | 6 | 0.17207 | 5 | 0.88147 | 4 | 0.14 | 6 |
| Suqian | -0.38924 | 8 | 2.40721 | 1 | -1.82942 | 13 | -0.01 | 7 |

### *C. Result Analysis*

The first main factor, the regional manufacturing market size factor, matches the size of the manufacturing regions in Jiangsu Province. The top five are Suzhou, Xuzhou, Wuxi, Nantong and Nanjing.

The second main factor, the regional manufacturing economic efficiency capability factor, reflects the economic benefits achieved by manufacturing in various regions. The top five are Suqian City, Lianyungang City, Xuzhou City, Nantong City and Taizhou City.

The third main factor, the regional manufacturing market input factor, reflects the input intensity of manufacturing in various regions. The top five factors in the factor score are Nanjing, Lianyungang, Xuzhou, Taizhou and Yancheng.From the perspective of comprehensive factor scores, the top three are Suzhou, Xuzhou and Nanjing.Suzhou and Nanjing belong to the southern part of Jiangsu Province. They have strong economic development strength and high-quality talents. They provide a good capital foundation and talent base for the development of the manufacturing industry. Although Suzhou ranks first in the manufacturing scale factor, In terms of economic efficiency factors and input capacity factors, they rank 10th and 11th respectively. Therefore, the development of manufacturing industry in Suzhou should continuously improve labor productivity and the strength of fixed assets.

Although Xuzhou is a northern Jiangsu region, the scores of the three factors are in the forefront, so Xuzhou's manufacturing competitiveness ranks in the forefront of Jiangsu Province.



http://ijses.com/
All rights reserved

Secondly, the comprehensive factor scores ranked in the middle are Lianyungang City, Nantong City, Taizhou City, Suqian City, Wuxi City and Yancheng City.Among them, Wuxi belongs to the southern part of Jiangsu Province. Although it ranks third in terms of scale factor, it ranks 9th and 8th respectively on the other two factors. The manufacturing competitiveness is relatively weak compared with Suzhou and Nanjing.Nantong City and Taizhou City are located in the central part of Jiangsu Province. The three factors are ranked in the middle, and the manufacturing competitiveness is relatively high.

The lower comprehensive factor scores are Zhenjiang City, Yangzhou City, Changzhou City and Huai'an City. Zhenjiang City and Changzhou City belong to the southern part of the country, but the ranking of the three factors is not high. Therefore, it is necessary to increase the attention to the manufacturing industry and continuously improve the competitiveness of the manufacturing industry. The three factors in Huai'an City are ranked 13, 13, 12, so the comprehensive factor score is the lowest, and the manufacturing competitiveness is not strong. For these regions, they should seize the opportunity to use their resources in other regions to develop their own advantages and continuously improve the competitiveness of manufacturing

## IV. SUGGESTIONS

### *A. Effectively Increase Investment in Manufacturing in All Regions*

The government must increase capital investment in manufacturing development, whether it is upgrading equipment or cultivating personnel.The development of manufacturing industry needs to continuously improve the ability of technological innovation. The government needs to provide some tax incentives and increase financing channels for enterprises with independent innovation capabilities, which can increase the enthusiasm of enterprises for innovation.

In this way, it is necessary to establish a scientific talent training mechanism, train a group of high-quality professionals with high-level and leading role, as well as attract more high-level talents from China and even abroad to settle in Jiangsu with more favorable policies, thereby improving the manufacturing industry in Jiangsu Province. Input capacity.

### *B. Strengthen Inter-Regional Mutual Cooperation*

From the analysis above, it can be seen that the manufacturing industry in southern Jiangsu is relatively large, but it is relatively weak in terms of economic efficiency and [10] input capacity. Therefore, it is possible to leverage the advantages of each region through mutual cooperation among regions, learn from each other's strengths, and improve the overall competitiveness of manufacturing industry in Jiangsu Province.

### *C. Create a Dominant Industrial Cluster*

Industrial agglomeration is an effective way to enhance industrial competitiveness. Jiangsu Province should build an industrial cluster with certain advantages based on industrial parks. In addition to the continuous expansion of manufacturing-related enterprises, they will form a certain scale advantage, thereby increasing their competitiveness and gradually becoming a leading enterprise. Leading enterprises can promote the rapid development of small and medium-sized enterprises that cooperate with each other, improve the competitiveness of small and medium-sized enterprises, and thus enhance the competitiveness of the entire industrial cluster. Therefore, for some small and medium-sized enterprises in the manufacturing enterprises with rapid development and high technical level, other industries have purposefully gathered resources into the industry, and continuously expanded the industry to form a core enterprise. At the same time, it is necessary to strengthen the inter-enterprise collaboration capabilities and promote the coordinated development of the entire manufacturing industry.

## REFERENCES

[1] Hongjiao Yang, Linyan Sun. Research on the Evaluation System of Regional Manufacturing Competitiveness [J]. Economic Problems Exploration, 2007(7): 125-129.
[2] Xiaofang Yao, Renhua Zhang. Evaluation and Countermeasure Research on Competitiveness of Hefei Equipment Manufacturing Industry Based on Principal Component Analysis[J].China Science and Technology Forum,2010(9):58-64.
[3] Min Chen, Long Wang. Construction of Jiangxi Automobile Industry Competitiveness Evaluation Index System [J]. Enterprise Economy, 2012, 5: 98-101.
[4] Jiejie Yan, Wu Nian. Research on the Competitiveness of Equipment Manufacturing Industry in Western Region Based on Factor Analysis [J]. Science and Technology Management Research, 2013, 33 (1): 78-81.
[5] Gang Chen. Analysis of the competitiveness of manufacturing industry in Hebei Province [D]. Hebei University of Economics and Business, 2011, (4): 12-15.
[6] Yanfang Chen. Analysis of the evaluation of manufacturing competitiveness and its influencing factors in Liaoning Province [D]. Dongbei University of Finance and Economics, 2012, (11).
[7] Aihu Shi. An Empirical Analysis of Manufacturing Competitiveness in Fujian Province [J]. Journal of Jimei University: Philosophy and Social Sciences, 2013(1): 36-42.
[8] Xiulin Yu, Xuesong Ren. Multivariate statistical analysis [M]. Beijing: China Statistics Press, 1999.
[9] Wenzhao Zhang. The world's excellent statistical tools SPSS11 statistical analysis tutorial (Advanced) [M]. Beijing: Beijing Hope Electronic Press, 2002.



http://ijses.com/
All rights reserved