



A Comparative Study on the Development of Advanced Manufacturing Industry Between the West Bank of Pearl River and Northeast China

Taking Harbin, Dalian, Zhuhai and Foshan as Examples

Kangsheng Du¹, Xiang Huang¹(✉), Yanping Hong¹, Xiaoyue Zheng¹, and Yingying Meng²

- ¹ School of Greater Bay Area Film and Television Industry, Guangdong University of Finance and Economics, Foshan, China
15630063561@163.com
- ² International Business College, China Guangdong University of Finance and Economics, Foshan, China

Abstract. Since China's reform and opening up, the Pearl River region has developed into an urban functional network of advanced manufacturing zones in the West Bank, and has become an important equipment manufacturing production base in Guangdong. As one of the most important industrial bases in China, the northeast region is undergoing transformation and upgrading of its own advanced equipment manufacturing industry. In order to deepen the study of the impact of advanced equipment manufacturing industry on regional development, Zhuhai and Foshan are taken as examples in the west bank of the Pearl River, and Harbin and Dalian are taken as examples in the northeast region. The urban function complementary coefficients of the two cities are compared, and the development degree and speed of the two cities under the influence of the policy of developing advanced equipment manufacturing industry are studied. The influence of the region on the advanced equipment manufacturing industry and the existing problems are analyzed, and the corresponding countermeasures are put forward.

Keywords: Advanced Equipment Manufacturing Industry · Complementary Urban Functions · Pearl River West · Northeast China

1 Introduction

1.1 Research Background

In response to the “Guiding Opinions on Deepening the Integration of Manufacturing and Internet Development” promulgated by the Ministry of Commerce of the People's Republic of China and the “Opinions on Accelerating the Development of Advanced Equipment Manufacturing Industry” issued by the General Office of the People's Government of Guangdong Province, the People's Government of Zhuhai has issued relevant documents such as “the Development Plan of Advanced Equipment Manufacturing

Industry in Zhuhai (2015–2025)” and “the 13th Five-Year Plan” for the Development of Advanced Equipment Manufacturing Industry in Zhuhai, and promoted the construction of service support system engineering around the advanced equipment manufacturing industry in Zhuhai. In 2014, Foshan government issued the “Foshan City to build trillion-scale advanced equipment manufacturing industry base work plan”, which clearly defined the specific objectives and implementation path of the development of Foshan advanced equipment manufacturing industry.

In November 2016, the General Office of Liaoning Provincial Party Committee and the General Office of Liaoning Provincial Government jointly issued the “Notice on the Issuance of Guidance on the Development of Key Fields of Equipment Manufacturing Industry in Liaoning Province” which clarified the eight major fields of key development of high-end CNC machine tools, robots and intelligent equipment, and aviation equipment, as the development focus of Liaoning Province at present and during the 13th Five-Year Plan period.

1.2 Research Significance

Advanced equipment manufacturing industry is an important symbol to measure the degree of industrialization and international competitiveness of a country or region. Accelerating the cultivation and development of advanced equipment manufacturing industry is an inevitable requirement for major manufacturing provinces to improve their core competitiveness, and an inevitable choice to seize the commanding heights of future economic and technological development.

There is still much room for improvement in the development of advanced equipment manufacturing industry in Northeast China compared with that in the West Bank of the Pearl River. Studying and analyzing the current situation of advanced equipment manufacturing industry in Northeast China, correctly understanding the strategy of developing advanced equipment manufacturing industry is of far-reaching significance for accelerating industrial transformation and upgrading, building a modern industrial system, and realizing the transformation from a major manufacturing province to a strong manufacturing province.

2 Formatting of Manuscript Components

Patrick Geddes [2] first proposed the concept of world city in his book “evolving city”. He defined it as the city where most of the world’s most important business activities must be carried out, which is a profound insight into the future development direction of the city. Ben Wang [6] proposes from a new perspective how to redesign advanced manufacturing when explicitly supported by policymakers. Rudolf and Noemi [4] believed that advanced manufacturing has not been widely considered in international business (IB) and marketing. Geraci believes that ‘advanced manufacturing’ has become a snapshot of the complex integration of materials and technology elements. Without a single advanced manufacturing industry, it can be identified in different industries through manufacturing technology.

China's research on the development of different cities, mainly concentrated in the urban spatial structure, manufacturing, service industry, less concentrated in the field of advanced equipment manufacturing. Wang [6], from the perspective of the development characteristics of the equipment manufacturing industry in Northeast China, the Pearl River Delta and the Yangtze River Delta, found that the equipment manufacturing industry in Northeast China is quite different from that in the Pearl River Delta and the Yangtze River Delta in the external environment, thinking innovation, production efficiency and producer services. From the perspective of drawing on the experience of the Pearl River Delta and the Yangtze River Delta, he proposed that the development of the equipment manufacturing industry in Northeast China must strengthen cooperation, clarify division of labor and improve the level of regional integration.

3 Research Methods and Design

3.1 Research Methods

This study takes the cities of the advanced equipment manufacturing belt in the west bank of the Pearl River and the cities in the northeast region as the research objects, uses the Krugman new economic geography theory model and the urban function network model to conduct mathematical statistics and analysis of the data, and forms quantitative conclusions.

In this study, Zhuhai and Foshan in the west bank of the Pearl River are taken as the first comparison group, Harbin and Dalian in the northeast region are taken as the second comparison group, and the policy of developing advanced equipment manufacturing industry is taken as the stimulating factor. The correlation coefficient of the two groups is calculated and compared. In order to compare the effectiveness, this study tested the models used in the four-year data test of two pairs of cities from 2016 to 2019: the complementary coefficient between cities (FCLij).

3.2 Model Application

New Economic Geography Theory describes the structural characteristics and stability of long-term equilibrium in an economy with two regions. This paper discusses the changes in the complementary urban functions of Zhuhai and Foshan on the west coast of the Pearl River and Harbin and Dalian in the northeast region based on the geographical location. In order to facilitate measurement, we believe that we can measure the product or service of a sector through the number of industry practitioners in that sector, so we can reflect the competitiveness of the industries of the two cities through the location quotient calculated by the number of practitioners, the formula is as follows: i Area k Industry Location Quotient:

$$LQ_{ik} = \frac{E_{ik}/E_i}{E_k/E} \quad (1)$$

$LQ_{ik} > 1$ indicates that the proportion of total employees in the region allocated to the industry exceeds the national distribution proportion, that is, the industry is a specialized sector in the region compared with the whole country, and has greater ability to provide services for regions outside the region. There is a competitive advantage across the country. The greater the LQ_{ik} is, the higher the proportion is, that is, the more obvious the competitive advantage of the industry is. $LQ_{ik} < 1$ indicates that there is no competitive advantage or less competitive advantage in regional industries.

By calculating the complementary coefficient (FCI_{ij}) between cities, this paper studies the urban functional network of cities belonging to advanced equipment manufacturing zones.

$$FCI_{ij} = \sum_{k=1}^n |LQ_{ik} - LQ_{jk}| \quad (2)$$

4 Research Statistics and Analysis

4.1 Analysis of Location Quotient (Lqik)

According to the above research methods, this study obtained the city advanced equipment manufacturing industry end-of-year employment E_{ik} , the total number of end-of-year employees E_i , the study city (Zhuhai, Foshan, Harbin, Dalian) advanced equipment manufacturing industry end-of-year employment total E_k , the study city end-of-year employees total E . According to the above data, we can calculate the relevant location quotient and complementary coefficient for analysis (Figs. 1 and 2).

Although the status of Harbin and Dalian in the advanced equipment manufacturing industry is not as high as Zhuhai and Foshan, but the development trend is biased towards good, has maintained a relatively stable rate of growth. Even though Dalian has a relatively large advantage, there was a smaller negative growth in 2019. Foshan and Zhuhai have great competitive advantage in the advanced equipment manufacturing industry, and the situation is good. They have good development momentum, and are gradually moving towards a more competitive advantage.

4.2 Analysis of Functional Complementarity Coefficient (Fciij)

From the data and charts, it can be concluded that from 2016 to 2019, the urban functional complementary coefficient of Zhuhai's railway, shipbuilding, aerospace and other transport equipment manufacturing industries to Foshan and Harbin's railway, shipbuilding, aerospace and other transport equipment manufacturing industries to Dalian decreased by 38.341% and 9.66%, respectively (Table 1).

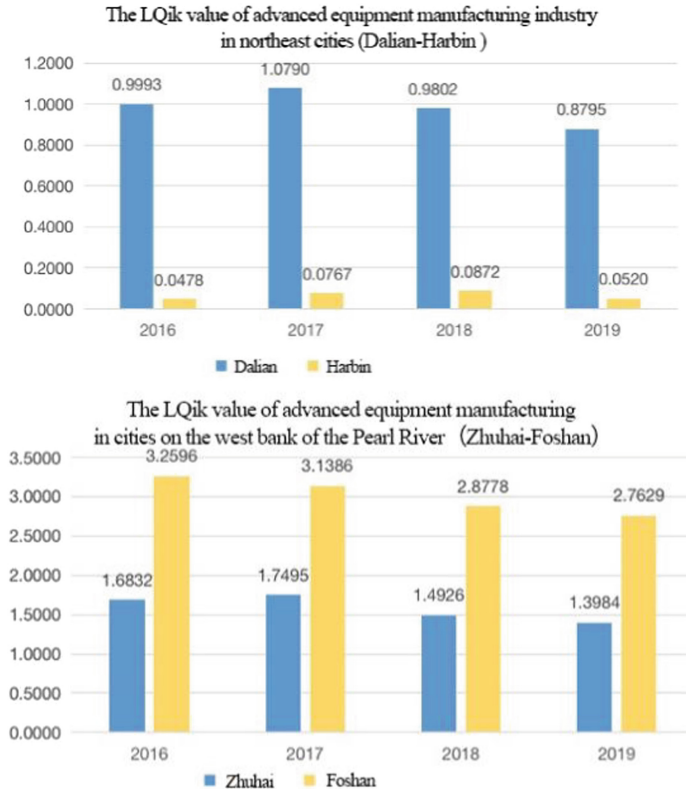


Fig. 1. Location entropy of Harbin and Dalian, Zhuhai and Foshan Advanced Equipment Manufacturers from 2016 to 2019.

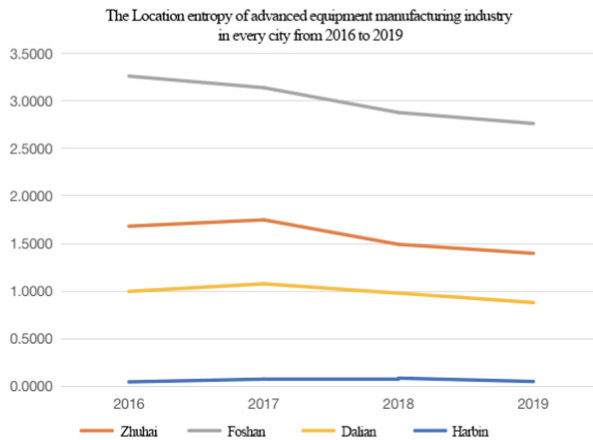


Fig. 2. Location entropy of advanced equipment manufacturing industry in every city from 2016 to 2019.

Table 1. The FCI_{ij} values of Intercity railways, ships, and aerospace and other transportation equipment manufacturing in every city from 2016 to 2019

The FCI _{ij} values of Intercity railways, ships, and aerospace and other transportation equipment manufacturing in every city from 2016 to 2019				
		Foshan	Harbin	Dalian
Zhuhai	2016	0.5404	0.2070	5.5287
	2017	0.3501	0.0528	5.1025
	2018	0.4982	0.2604	4.7672
	2019	0.3332	0.2724	4.9092
Foshan	2016		0.7474	4.9883
	2017		0.2973	4.7524
	2018		0.2378	4.2690
	2019		0.6055	4.5761
Harbin	2016			5.7357
	2017			5.0497
	2018			4.5068
	2019			5.1816

5 Conclusion and Suggestion

5.1 Conclusions

Zhuhai, Foshan, Harbin and Dalian maintained a stable trend from 2016 to 2019. In 2019, Foshan and Dalian along the coast developed rapidly, with better development momentum and higher growth rate. Foshan and Dalian have clear deployment and scientific guidance for the specific implementation plan of the ‘advanced equipment manufacturing industry’ construction strategy promulgated by the state, and have received good results on the basis of existing advantages.

With the railway, shipbuilding, aerospace and other transportation equipment manufacturing industry as the research industry, Zhuhai-Foshan, Harbin-Dalian city industry is toward industrial transformation and high value-added, high technology content of emerging industries development, is in the rising stage.

As a traditional manufacturing base, cities in the West Bank of Pearl River have advanced equipment manufacturing base or huge application market to a certain extent, which leads to the lack of positioning and planning of urban development, repeated industrial construction and fierce competition. In the industrial structure of advanced equipment manufacturing industry, the distribution is not reasonable enough, and the urban functional network formed by surrounding cities is not fully utilized.

The implementation of the relevant policies did not significantly improve the growth rate of contact intensity between the two cities, and the effectiveness of the policy needs to be strengthened.

5.2 Suggestion

Strengthen innovation carrier and environmental construction. Give full play to the agglomeration effect of Harbin demonstration zone, attract funds, talents and other innovative elements to gather in Harbin faster, and add impetus to the transformation and upgrading of equipment manufacturing industry in Harbin.

Improve the collaborative innovation mechanism. Around the intelligent equipment manufacturing industry, the industry leader enterprises are encouraged to form a community of interests with universities and colleges, focusing on improving core competitiveness, integrating innovation elements and innovation resources, establishing industry-university-research innovation alliance, jointly tackling common, key and core technical problems, and breaking through the bottleneck of industrial development.

Acknowledgment. This paper is a phased research result of the Guangdong Provincial Education Department (No. 2019WTSCX031).

References

1. Tao F, Cheng Y, Zhang L, Nee AYC (2017) Advanced manufacturing systems: socialization characteristics and trends. *J Intell Manuf* (5)
2. Chen W (2010) The connotation and characteristics of the world city. Beijing Federation of Social Science Circles. The new goal of the development of the world city Beijing - 2010 Capital Forum Proceedings. Beijing Federation of Social Science Circles: Beijing Federation of Social Science Circles 5
3. Liu T (2019) Research on urban linkages from the perspective of urban functional network — taking the Pearl River Delta as an example. *Geography* 03
4. Sinkovics RR, Sinkovics N (2020) The Internet and international marketing-from trigger technology to platforms and new markets. *Int Mark Rev* 37(3):437–446
5. Wang B (2018) The future of manufacturing: a new perspective. *Engineering*
6. Wang F (2010) Comparative research on the advantages of equipment manufacturing industry development in Northeast China, Pearl River Delta and Yangtze River Delta 11

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

