

Research on the Development Status and Countermeasures of Industrial Clusters

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Abstract:

With the deepening of industrial development, the market competition is becoming more and more fierce. In order to occupy a strong competitive position, many enterprises have begun to focus on the combination of themselves and other related enterprises, which has prompted the formation of industrial clusters. Industrial clusters are an important carrier to promote the high-quality development of the regional economy, and are of great significance to promoting the advanced industrial base and the modernization of the industrial chain, and building a strong manufacturing and quality country. China's industrial clusters have developed rapidly since the reform and opening up, but there are still some problems that restrict the long-term development of the industry. Based on this, this paper analyzes the development status of China's industrial clusters, expounds the main development models of industrial clusters, and puts forward measures such as strengthening the guidance of industrial clusters, integrating local resources to form their own characteristics, improving industrial chains, and improving innovation capabilities. By looking for a scientific cluster development method, gradually narrow the gap between different regions, promote the intra-industry division of labor between regions, accelerate industrial revitalization with industrial clusters, form a more competitive industrial pattern, and promote high-quality development of the industrial economy.

Keywords: *industry; manufacturing industry; industrial spatial layout; cluster; countermeasures*

I. INTRODUCTION

In recent years, despite the downturn of the world economy, China's industry has maintained medium-to-high-speed growth in a complex and severe economic environment, and the production of emerging industries has grown rapidly, while the transformation and upgrading of traditional industries have been accelerated, providing a strong guarantee for China's economy to move towards high-quality development. The total industrial added value and its growth rate in recent years are shown in Fig. 1.

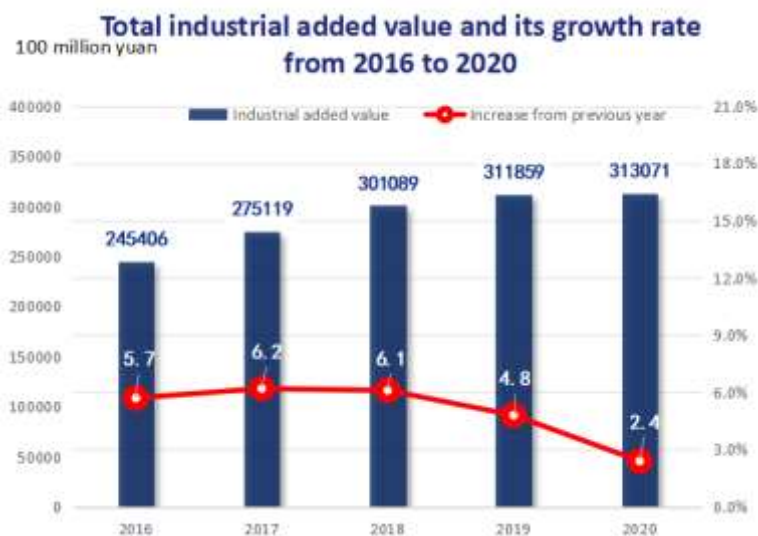


Fig. 1. Total industrial added value and its growth rate from 2016 to 2020

Source: National Bureau of Statistics

China's economy has transformed from high-speed growth to high-quality development. In the context of current economic globalization, increasingly fierce corporate competition has prompted China's industrial clusters to sprout. An industrial cluster refers to a certain number of industrial enterprises and related supporting institutions that are closely related to each other in a specific field and a specific region with an industrial leading industry as the core, and form a group of enterprises with strong and sustainable competitive advantages. Due to the characteristics of lasting vitality and strong competitiveness, industrial clusters have gradually become an important pillar of the regional economy and even the economic progress of the entire country. [1] There is a clear relationship between the competitiveness level of industrial clusters in most regions and the process of industrialization. The regions with stronger industrial clusters have a higher degree of industrialization. Industrial clusters are an inevitable trend in the development of industrialization to a certain stage. Due to its own advantages, industrial clusters have indeed made great contributions to the development of regional economy and the improvement of competitiveness, but the problems exposed by them are also increasingly prominent. This paper analyzes the overall development status and main problems of China's industrial clusters, and puts forward corresponding countermeasures according to the inherent laws of cluster development, so as to actively adapt to the trend of globalization and climb the high-end of the global value chain for China's industrial clusters. and provide reference for promoting high-quality economic development.

II. BASIC INFORMATION OF INDUSTRIAL CLUSTERS

2.1 Industrial spatial layout

In the early days of the founding of New China, China's economic development was very backward, coupled with the blockade of western countries, which formed many development bottlenecks. In the

domestic and international environment at that time, the central government made a strategic decision to give priority to the development of heavy industry, that is, to build iron and steel, coal, electricity, petroleum, machinery manufacturing, military, nonferrous metals and basic chemical industries, which laid the foundation for China's industrialization and played an important role in accelerating industrialization, building a complete industrial system, and cultivating scientific and technological talents and industrial workers. After the reform and opening up, the adjustment of industrial layout has become an important way to cultivate China's economic growth poles, such as "taking the lead in development in the East" and "Great Western Development Strategy", which are all driven by industry. At present, most areas in China are in the first half and the second half of the late stage of industrialization, a few areas such as Beijing, Tianjin and Shanghai have completed their industrialization, but some areas are lagging behind in the industrialization process, such as Hainan and Ningxia. Beijing and Shanghai have a high level of industrialization process, but with a low degree of industrial clusters, which has something to do with their functional positioning in the country that Beijing is the political center, and Shanghai is the economic center.

The spatial layout of industry is the joint result of factors endowment, economic policy, international environment, industry characteristics, market demand and unexpected events. According to the change in Gini coefficient of industrial space of 31 provinces in China from 1992 to 2018 (see Fig. 2), China's industry generally presents the trend of "agglomeration first, then dispersion" with 2004 as the boundary. Among them, the Gini coefficient of industrial space increased slightly from 2013 to 2016, but it didn't last, and showed an obvious downward trend since 2016, indicating that the trend of industrial decentralization and transfer has not changed since 2004. On the whole, China's industry is still in the process of decentralization and transfer. [2]

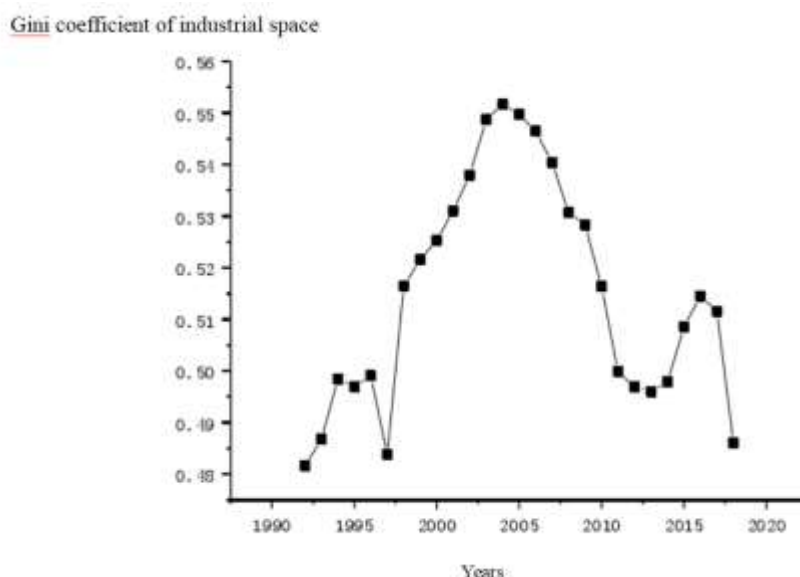


Fig. 2. Gini coefficient of industrial space from 1992 to 2018

The spatial distribution of industrial economic activities shows the characteristics of "large dispersion" and "small concentration". The spatial concentration of industries is mainly due to the following reasons:

firstly, there are still transportation cost restrictions in the production of material products, and the spatial clustering of upstream and downstream industries is conducive to reducing the cost of integrated logistics; Second, scientific and technological innovation is playing an increasingly important role in the development of the industry, and the high spatial clustering of the industry is conducive to innovation. [3]

2.2 Basic situation of manufacturing cluster

The so-called industrial cluster driving economic development basically refers to the cluster of manufacturing industry, which has the characteristics of high labor productivity, strong driving force, and being able to create more market demand, and plays an important driving role in the regional economic development. Developed countries have perfect data of enterprise location change, and usually use enterprise migration as an alternative index to measure the direction and scale of industrial transfer [4]. There are basically two methods used by domestic scholars to measure China's industrial transfer: one is to quantitatively evaluate inter-regional industrial transfer based on the regional input-output table regularly published by the National Bureau of Statistics; the other is to construct different industrial transfer indicators to indirectly evaluate the degree of industrial transfer. With the adjustment of economic structure and industrial transformation and upgrading, the traditional manufacturing industry in the southeast coast of China is shifting from the eastern region to the inland. East China and South-Central China are the main distribution areas of labor-intensive manufacturing industry in China, among which East China is the main transfer-out area of labor-intensive manufacturing industry, and South-Central China and Northeast China are the main transfer-in areas of labor-intensive manufacturing industry. In addition, the southwest region, northwest region and north China region have the transformation of transfer-in region and transfer-out region respectively. The northeast region was the main transfer-in region of industrial transfer from 2004 to 2013, but industrial transfer-out persisted from 2013 to 2016. [5] The inter-regional transfer of industries can not only promote the elimination of relatively backward industries in the eastern region, concentrate on the development of advanced industries with high technology content and high added value, and promote the adjustment and optimization of industrial structure, but also help the central and western regions to use the "late-development advantage" to improve the industrial level and level, realize new industrialization and urbanization, promote regional coordinated development, and optimize the industrial division pattern. [6]

By 2019, with the construction of advanced manufacturing industrial parks and bases, industries with linkage effect have achieved geographical agglomeration, and advanced manufacturing clusters with certain scale and influence have basically been built, which mainly involve the fields of new generation information technology, high-end equipment, advanced materials and biomedical manufacturing, covering the ten key areas provided in Made in China 2025, and have played a positive role in radiating and driving the economy of surrounding areas. The main advanced manufacturing clusters in China are shown in TABLE I. In China, the overall spatial distribution pattern of advanced manufacturing clusters characterized by "one belt, three cores and two supports" has been formed, in which "one belt" refers to the coastal economic belt, "three cores" refers to the three core areas of the Bohai Bay, the Yangtze River Delta and Guangdong, Hong Kong and Macao, and "two supports" include key city circles in central

and western regions. According to the development situation, the advanced manufacturing industry has a solid industrial foundation in the eastern coastal areas, and the growth rate of industrial added value in the central and western regions is obviously accelerated, and the supporting role of the central and western regions will be further highlighted in the future. [7]

TABLE I. Major advanced manufacturing clusters in China

Fields of advanced manufacturing industry	Cluster regions	Clustered industries
New generation of information technology	Shenzhen electronic information industrial cluster	An important electronic information industry base in the world
	Wuhan chip-screen-end-network industrial cluster	China optoelectronic industrial base
	Hefei intelligent voice industrial cluster	China intelligent voice industrial base
High-end equipment manufacturing	Xi' an aerospace industrial cluster	An important base for the development and production of large and medium-sized aircraft in China
	Changsha construction machinery industrial cluster	The "Matrix" of China's construction machinery industry
	Zhuzhou rail transit industrial cluster	China's largest rail transit equipment manufacturing industrial base
Advanced materials manufacturing	Ningbo petrochemical industrial cluster	The scale ranks in the forefront of the seven petrochemical industrial bases in China
	Suzhou nano new material industrial cluster	The world's largest cluster of nanotechnology application industries
Biomedical manufacturing	Beijing zhongguancun biomedical industrial cluster	Leading the national biomedical industry
	Shanghai Zhangjiang biomedical industrial cluster	Innovative cluster of biomedical industry attracting worldwide attention
	Jiangsu Taizhou biomedical industrial cluster	The only state-level pharmaceutical high-tech zone in China

Source: CCID Think Tank White Paper on World-class Advanced Manufacturing Clusters

III. MAIN DEVELOPMENT MODELS OF INDUSTRIAL CLUSTERS

3.1 Professional Radiation Mode

The development of industrial clusters is accompanied by the agglomeration of industrial resources in space, and forms an industrial circle in the region through a strong radiation effect, which leads to the optimization of the regional economic development pattern. [8] Within the industrial cluster, a large number of related enterprises gather in one place, in the same or similar industrial chain, with backward or horizontal industrial links, which enables the region to achieve large-scale production and implement specialized division of labor among enterprises within the industry. Accordingly, industrial clusters have

created a larger market demand space. For example, in Shaoxing textile industry, chemical fiber, weaving, printing, dyeing and clothing are all linked together, around which there are auxiliary industries such as textile machinery, dye auxiliaries and textile technology services. These closely related and frequently interactive industries and their affiliated enterprises form a huge textile industry cluster. The China Textile City in Shaoxing, the button market in Wenzhou, and the plastic products market in Luqiao District of Taizhou are all professional markets with annual trading volume of over tens of billions. Among them, China Textile City, a specialized market for textile fabrics in Shaoxing County, has developed into the largest textile distribution center in China and even in Asia.

3.2 Resource-driven mode

For example, in Wenzhou low-voltage electrical appliance cluster, there are hundreds of thousands of accessories for low-voltage electrical appliances, including metal parts, alloy materials, injection molding parts, punching, pickling and mold processing, among which 70% can be purchased in Liushi Town. For those raw materials and components that need to be purchased from outside, their suppliers also set up local offices because of the attraction of the cluster. The localization of industrial chain not only reduces the procurement and supply costs of enterprises in Liushi Town, but also greatly facilitates the communication and interaction between upstream and downstream enterprises, thus creating conditions for mutual cooperation in technological innovation.

3.3 Faucet drive mode

Leading enterprises drive the operation of the industrial chain and lead the development of the industry, and are the "core engine" that promotes the development of industrial clusters. Give play to the role of leading enterprises and promote the transformation and upgrading of the block economy to modern industrial clusters. Qingdao home appliance industry has gathered a group of leading enterprises represented by Haier, Hisense, Aucma, etc. Relying on the brand effect and scale effect of leading home appliance enterprises, it has attracted many upstream and downstream enterprises in the industrial chain to settle in Qingdao. In 2020, the enterprises on the scale of the household appliance industry chain in Qingdao achieved a revenue of 193.56 billion yuan, and the total output of the "four major pieces" of household appliances reached 53.757 million units. In 2021, the Qingdao smart home appliance industry cluster was successfully selected as the advanced manufacturing cluster of the Ministry of Industry and Information Technology. At present, Qingdao's home appliance industry has a total of 7 national well-known trademarks, 27 Chinese famous brands, 41 national technology innovation carriers such as the National Technology Standard Innovation Base (household appliances), and more than 60 nationally well-known universities and scientific research institutions. It has accumulated more than 50,000 technological innovation resources around the world, and is the home appliance cluster that has won the most national-level scientific and technological achievement awards. Haier has been the No. 1 brand of home appliances in the world for 12 consecutive years, Hisense TV ranks No. 3 in the global market in terms of shipment share, and Aucma refrigerators maintain the No. 1 sales of similar products in the country.

3.4 Industry Undertaking Mode

The central and western regions have gradually formed industrial clusters in the process of undertaking industrial transfer from the eastern coastal areas. Chuzhou City, Anhui Province vigorously undertakes the transfer of the household appliance industry in coastal areas, and takes multiple measures to promote the development of the entire industrial chain of the household appliance industry. From the perspective of product classification, from traditional TV sets, refrigerators, air conditioners, washing machines, to dishwashers, water dispensers, coffee machines, and vacuum cleaners, there are various types; from the perspective of industrial chain, from product research and development, mold equipment, and parts production, host assembly, testing and certification, logistics and transportation, online and offline sales, and the chain is complete; Bosch Siemens, Konka, Skyworth, Yangzi, Huike and other well-known enterprises have formed agglomeration, with 108 industrial enterprises and 12 complete machine enterprises. There are more than 40 important spare parts enterprises. In 2020, the total output value of Chuzhou's home appliance industry will exceed 50 billion yuan, and the output of major home appliances will reach 14.001 million units.

IV. PROBLEMS EXISTING IN THE CONSTRUCTION OF INDUSTRIAL CLUSTERS

4.1 Lack of relevant guidelines for industrial development

Enterprises in industrial clusters in different regions have the tendency to pursue "small and complete" to varying degrees. Most of the clusters are simple "clusters" of similar companies, with homogenized products and chaotic markets. The guiding ideology for the development of some regions is still based on the traditional idea that pillar industries drive local economic development. There is no real professional division of labor among enterprises, nor mutual recognition and collaboration based on a common regional and cultural background. In addition, industrial parks around the country are characterized by irrational distribution, confusion, complexity and dispersion, as well as imperfect internal management and organizational structure, which fail to form effective industrial clusters to help the rapid development of the national industrial economy.

4.2 The development of industrial clusters is in the primary stage of development

At present, most areas in China are still at an initial stage in the development of industrial clusters, as evidenced by the fact that the existing industrial clusters are mainly composed of traditional industries such as textiles and clothing, chemical industry and building materials, which are related to the daily necessities of the residents, or the low-end links in the value chain such as processing and manufacturing of emerging industries such as electronic information, biological medicine and new materials; there are relatively few industrial clusters in the field of heavy industry with relatively concentrated large enterprises, and the degree of agglomeration is generally low. Due to the high degree of dependence on industrial resources and the slow development of high-tech industries, industrial clusters have been in a low-level development

state dominated by labor-intensive industries for a long time, and are weak in product research and development and independent brand building, resulting in insufficient stamina for cluster development.

4.3 Unbalanced geographical distribution of clusters

From the geographical distribution of industrial clusters, it can be seen that they are mainly distributed in the eastern coastal areas around the Bohai Bay, the Yangtze River Delta, and the Pearl River Delta. Especially in Zhejiang and Guangdong provinces, industrial clusters are the most densely distributed and have the most distinctive features, and their development speed and level are also higher than those of similar clusters in other regions. However, only sporadic industrial clusters exist in the vast central and western regions, and the scale and level of development generally lag behind those in the eastern regions. Overall, the competitiveness of industrial clusters in the eastern region is the strongest, followed by the central region and the weakest spatial pattern in the western region.

4.4 The ability of technological innovation is not strong

At present, most industrial clusters in China have not established a unified innovation platform, and most enterprises in industrial clusters are insufficient in innovation power and ability. Most of the industrial clusters are mainly based on the application of applicable and simple technologies, and imitate more than innovative products, with low technical content. At the same time, small and medium-sized enterprises are mostly labor-intensive industries, lacking innovative talents in research, development, design, etc., with less cooperation between enterprises and scientific research institutions. [9]

V. CONCLUSIONS AND POLICY RECOMMENDATIONS

In 2020, China's total industrial added value for the year was 31,307.1 billion yuan, up by 2.4% over the previous year, and industrial added value above designated size increased by 2.8%, making it the world's largest manufacturing country for 11 consecutive years. The proportion of manufacturing industry contributed nearly 30% to the world manufacturing industry. At present, China has basically achieved the goal of industrialization on schedule. On this basis, China's industrialization has entered a later stage, and the proportion of industry in the economic structure will continue to decline. As the market penetration rate of all kinds of general commodities continues to increase, the demand for industrial products will be diversified, personalized and quality-oriented.

According to the division of eastern, central and western regions of China, the provinces and regions with strong competitiveness of industrial clusters are mainly concentrated in the eastern and central regions. Among the top 15 regions in competitiveness, the eastern region has 8, the central region has 5 and the western region has only 2, indicating that the gap between regions is obvious. Industrial agglomeration tends to decline with the evolution of time and the improvement of GDP per capita, indicating that with the expansion of economic scale, it is no longer possible to rely solely on a few industries to support the economic development of the region. It is necessary to find a more scientific

cluster development mode, gradually narrow the gap between different regions, promote the intra-industry division of labor between regions, based on strengthening the leading position, supplementing the chain and gathering clusters, accelerate industrial revitalization by industrial agglomeration, form a more competitive industrial pattern, and strive to promote the high-quality development of industrial economy. The following suggestions are put forward:

5.1 Strengthen the guidance of industrial clusters

In terms of spatial layout, it is necessary to implement fair but differentiated industrial layout policies according to regional environmental affordability and industrial development conditions, accurately match industrial demand with spatial supply, give full play to regional comparative advantages, improve development efficiency, avoid low-level redundant construction and industrial structure convergence, and enhance industrial complementarity. For the central and western regions, the government should formulate differentiated industrial transfer policies according to local conditions and industries, and help them rely on the existing industrial base and their own resource advantages, support key industries, and foster new advantages in industrial development. For the eastern region, the government should encourage innovation, expand high-tech industries, actively promote the application of the new generation of information technology in the manufacturing industry, and improve the status of Chinese manufacturing industry in the global value chain system. In cultivating and developing the industrial chain, both the existing industrial base and the future development direction, both the development of local industries and the undertaking of industrial transfer in the east, and both comprehensive development and key breakthroughs should be considered, so as to strive to form a new pattern of industrial development with clear positioning, industrial agglomeration, spatial concentration and efficient operation.

5.2 Integrate local resources to form its own characteristics

According to the characteristics of the industry, regional systems and cultural characteristics, each region chooses a development path with regional and local characteristics, and deeply excavates and creatively integrates local characteristic resources. Combining the resource advantages, industrial advantages and location advantages of the region, identify the entry point for the development of industrial clusters, select suitable industrial clusters to focus on cultivation, form characteristic industrial clusters, dislocate competition, and improve scale, quality and efficiency from characteristics. From the international experience of industrial cluster development, not only local characteristic material resources should become the basis for cluster development, but also its unique historical, social and cultural resources should be integrated into the resource system of industrial clusters, which is what truly forms industrial characteristics. The key is to solve the problems of industrial restructuring and excessive competition among domestic industrial clusters, and also to solve the contradiction between regional and global.

5.3 Improve the industrial chain

The internal fine division of labor is an important experience for the success of successful industrial clusters at home and abroad, and a perfect industrial chain is also an important way to improve the competitiveness of the cluster. China has the most complete industrial categories in the world, and the refined industrial division of labor has formed a complete industrial support system and a rapid supply chain response capability. Integrate the internal structure of the industry, develop the upstream and downstream industries of the existing industry, develop industrial projects with high industrial correlation, lengthen the industrial chain, and enhance the correlation and cooperation between enterprises. At the same time, it is also necessary to promote the integration of clusters into the global value chain. Make leading enterprises bigger and stronger, make leading enterprises become the core force for high-end development, give full play to their leading role in the entire cluster, promote the development of industrial cluster technology level, increase market share, and enhance the overall competitiveness of the cluster.

5.4 Improve innovation ability

Innovation is the power source of industrial development. The decline of demographic dividend and the increase of product cost in a country will force enterprises to strengthen innovation, update technology and products, and ultimately benefit the economic development of the country. [10] According to the endogenous growth model of two regions, foreign scholars found that industrial agglomeration can accelerate the speed of technology spillovers, which is conducive to the common growth of central and peripheral regions.[11] By enabling traditional research and development institutions, the in-depth connection with new research and development institutions will be accelerated. It is necessary to increase investment in capital, technology and personnel training, encourage industrial clusters, universities, scientific research institutions and large enterprises to build industrial technology platforms such as joint laboratories, industrial research institutes and industrial internet, and create dual-creation platforms such as space, promote the combination of scientific research achievements with enterprise development, further improve the scientific and technological innovation system, and enhance the market value of innovative technologies. In addition, it is necessary to take the initiative to meet the national strategy, give priority to the layout of advanced manufacturing industries, coordinate information, space and policy resources, strive to break through a number of key technologies affecting industrial development, and promote the industrial transformation of a number of major innovation achievements. Moreover, it is necessary to optimize the subsidy mode and effect of technological innovation projects, pay attention to the practical application of innovative projects, and conduct follow-up evaluation, so as to guide and promote the investment in technological innovation of enterprises by means of marketization and promote the transformation from "Made in China" to "Wisdom in China". Competitiveness comes from the intensive interaction among complementary enterprises in the group, which can not only promote the utilization efficiency of shared resources, but also stimulate innovation activities with frequent exchange of experiences, making the technical exchange and information dissemination of group members more convenient. [12] Cluster enterprises promote the production transfer of new knowledge and new technology through cooperation. Realizing the industrial transformation from low value-added labor-intensive to high value-added capital

and technology-intensive and improving China's international competitive advantage.

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