

# Analysis of Pillar Industries and Competitive Factors in Zhuhai Manufacturing

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## ABSTRACT

From the perspective of revitalizing world economic growth, curbing inflation, and stabilizing employment, the rise and fall of the manufacturing industry can determine the fundamental and direction of whether a country (region) can achieve stable and healthy economic growth. Equipping the manufacturing industry with leading technological forces is the core of taking a new path of industrialization and promoting the healthy and sustainable development of the real economy. It is also the key to enhancing the core competitiveness of the manufacturing industry. Actively promoting the development of the manufacturing industry towards high quality and high level is the main theme of China's current and future economic development. The article analyzes the impact of local governments establishing pillar industries on urban industrial competitiveness from the perspective of urban manufacturing competitiveness, examines the factors that affect the development of manufacturing competition, and proposes countermeasures and suggestions to promote the development of local manufacturing.

**Keywords:** *Manufacturing industry, Competitive power, Pillar industry.*

## 1. INTRODUCTION

The world economy is gradually recovering from the shadow brought by the pandemic, but its growth is slow. According to the "World Economic Situation and Prospects 2024" released by the United Nations, the global economic growth rate is expected to drop from 2.7% in 2023 to 2.4% in 2024. In such a global economic environment, although the growth rate of the Chinese economy has slowed down due to the impact of the epidemic, it is still able to maintain positive growth, which is commendable, largely due to the global position and competitiveness of China's manufacturing industry, as well as its tenacious resilience. Once again, it proves that the manufacturing industry plays a pivotal role in the current national economic system and is an important cornerstone in combating financial risks and economic crises. Improving the economic strength of a city should also start with the real economy. Only by having pillar industries with reasonable structure, strong competitiveness, and sustainable development can the overall competitiveness of the city be promoted. The essence of industrial competition between

cities is how to create an environment that best promotes industrial development, reflecting the attractiveness, concentration, and influence of urban industries.

## 2. THEORETICAL RESEARCH ON MANUFACTURING COMPETITIVENESS

The cost advantage theory holds that the competitiveness of the manufacturing industry is mainly reflected in the cost advantage of products. This is based on the perspective of international economics to examine competitiveness, which includes both the absolute advantage theory, comparative advantage theory, factor endowment theory, and agglomeration advantage theory in traditional trade theory, as well as the human capital theory, technology gap theory, life cycle theory, and economies of scale theory in new trade theory. The above theory explains the process of cost advantage formation from the aspects of factor resources, technological conditions, economies of scale, and human capital. Its essence is the same, that is, analyzing the internal causes of a country or

region's cost advantage from the perspective of the quantity and allocation of production factors, and then deriving specific influencing factors that affect a country or region's industrial competitiveness. Schumpeter's theory of technological innovation holds that innovation is the use of existing technological innovation methods to form new economic capabilities, ultimately making them the source of competitiveness.

Michael. Porter believes that theories such as comparative advantage and economies of scale cannot explain the source of industrial competitiveness, because in modern industrial competition, the value of production factors continues to decline and cannot continue to play a decisive role. Professor Porter's "Competitive Strategy" provides a competitive strategy analysis framework for enterprises, organizations, and even countries, helping managers of enterprises and organizations recognize their own competitive strength, external opportunities, and risks when formulating corporate strategies. This book proposes a framework for analyzing the five basic competitive strengths of an industry: competition among existing competitors, threat from potential entrants, threat from alternative products or services, bargaining power of suppliers, and bargaining power of buyers. These five competitive strengths together affect the overall level of industry competitiveness.

### **3. ANALYSIS OF THE DEVELOPMENT EFFECT OF ZHUHAI'S PILLAR INDUSTRIES**

Since the 2007 Zhuhai Municipal Government Work Report proposed the construction of six major industrial bases in electronic information, home appliances and electrical, petrochemical, power energy, biomedicine, and precision machinery manufacturing, the blueprint for the vigorous development of Zhuhai's six pillar industries has gradually unfolded. In 2007, the added value of the six pillar industries in Zhuhai was 38.441 billion yuan. By 2021, the total added value of the six pillar industries had reached 106.476 billion yuan, accounting for 79.5% of the added value of industrial enterprises above designated size, a year-on-year increase of 10.8%. In 2022, Zhuhai restructured its "4+3" industrial system, establishing new generation information technology, new energy, integrated circuits, biomedicine, and health as the four leading industries, and intelligent home appliances, high-

end equipment manufacturing, and fine chemicals as the three advantageous industries. In the first three quarters of 2024 alone, the "4+3" industry has achieved an added value of 98.35 billion yuan, with an average growth rate of 11.9%, accounting for nearly 80% of the added value of industrial enterprises above designated size. The fastest growing industries are high-end equipment manufacturing, integrated circuits, fine chemicals, and smart home appliances, all of which have double-digit growth rates. Even high-end equipment manufacturing and integrated circuits have growth rates of 33.4% and 28.4%, respectively.

#### **3.1 Biomedical Industry**

In recent years, the development momentum of Zhuhai's biopharmaceutical industry has been good, with about 450 related enterprises in the biopharmaceutical field. Among them, there are 47 enterprises producing chemical drugs, 25 traditional Chinese medicine enterprises, 21 biological product enterprises, 21 raw material enterprises, 337 medical device enterprises, 4 pharmaceutical packaging material enterprises, 4 pharmaceutical excipient enterprises, and 40 health product enterprises. The total output value of the pharmaceutical manufacturing industry in 2022 reached 23.713 billion yuan, an increase of 14.0% over the previous year. In the past five years, the average annual growth rate of biopharmaceuticals has been 20.5%, making it the pillar industry with the highest average annual growth rate in Zhuhai. Biopharmaceuticals are relatively concentrated in Zhuhai, mainly concentrated in the Sanzao Industrial Park. Among the 145 types of industrial products above designated size in Zhuhai, the manufacturing of medical instruments and equipment has grown rapidly, with a year-on-year increase of 115.6%, and the growth rate is the highest among all types of industrial products.

#### **3.2 Electronic Information Industry**

The electronic information industry in Zhuhai grew rapidly from 2007 to 2017, with growth rates reaching double-digit levels. However, the growth rate of the electronic information industry has slowed down since 2018, with an average annual growth rate of only 4.0% in Zhuhai's electronic information industry over the past five years. In 2018, the added value of the electronic information industry above designated size was 20.365 billion yuan, a year-on-year increase of 7.2%; Affected by

the epidemic and macroeconomic environment, the electronic information industry has also been affected. In 2019, the industry's added value decreased by 2.1% year-on-year, and in 2020, it increased by 2.9% year-on-year; By 2021, the economy has gradually recovered in the post pandemic era, with the industrial added value of the electronic information industry reaching 22.637 billion yuan, a year-on-year increase of 5.6%. Among them, the software and information services industry achieved main business revenue of 87.314 billion yuan, a year-on-year increase of 9.56%; In 2022, the cumulative industrial added value of Zhuhai's electronic information industry reached 24.77 billion yuan, a year-on-year increase of 6.8%.

### ***3.3 Household Appliances and Electrical Industry***

As one of the three advantageous industries in Zhuhai, the development of the home appliance and electrical industry has been relatively stable. In 2018 and 2019, the added value growth rate of the home appliance and electrical industry in Zhuhai was 24.8% and 15.2% respectively. Although the growth rate decreased by 1.2% due to the impact of the epidemic in 2020, it recovered quickly. In 2021, the growth rate of the home appliance and electrical industry recovered to 9.7%. In 2022, the industrial added value of the home appliance and electrical industry reached 40.818 billion yuan, a year-on-year increase of 17.1%. In recent years, the home appliance and electrical industry in Zhuhai has paid more attention to industrial upgrading and developed towards intelligent energy-saving appliances and related software/hardware supporting services.

### ***3.4 Petrochemical Industry***

Since 2001, Zhuhai has made the petrochemical industry one of the key industries to be cultivated, and has made great efforts to build the Gaolan Port Petrochemical Industrial Zone. By focusing on the two core industrial chains of PTA and advanced synthetic resin, a large number of related petrochemical enterprises have gathered, including BP Petroleum, Shell, Altana, LG, PetroChina, CNOOC and many other large petrochemical enterprises, as well as many local chemical enterprises such as Yuhua Polyester, Liancheng Chemical, Yufutong Polyester, Dongguo Spandex, Xiaoxing Spandex, Zhuhai Zhongfu, etc. The Gaolan Port Petrochemical Industrial Base has gradually grown into an important distribution

center for oil, gas and chemicals in South China, and is one of the five major petrochemical bases in Guangdong Province. After more than 20 years of development, Zhuhai has accumulated a certain industrial foundation in the fine chemical industry. In 2023, Zhuhai will focus on building a "4+3" industrial cluster, among which fine chemical industry is one of the three advantageous industries.

### ***3.5 Electric Power and Energy Industry***

Under the goal of "peak carbon emissions and carbon neutrality", Zhuhai is committed to building a leading "zero carbon demonstration city" in the country, and the power energy industry has been striving to develop towards an environmentally friendly and energy-saving new energy industry. With the integration of technologies such as big data, artificial intelligence, and the Internet of things into the field of new energy, the pace of upgrading the new energy industry continues to accelerate, and the scale of the industry is rapidly increasing. They have attracted more than ten upstream and downstream supporting enterprises in the entire industry chain of photovoltaic equipment manufacturing and new energy storage system manufacturing, and built a new energy industry cluster represented by photovoltaics and new energy storage. With the rapid development of the new energy vehicle industry, the manufacturing of key components for new energy vehicles has become a blue ocean in the market. More than 60 hydrogen energy and new energy vehicle manufacturers have gathered in Zhuhai, strengthening the new energy industry market in Zhuhai. In the past three years, Zhuhai will spare no effort to build a new energy industry cluster with a scale of 500 billion yuan, in order to support Zhuhai's determination and strength to move towards a "trillion yuan" industrial powerhouse.

### ***3.6 High-end Equipment Manufacturing Industry***

Zhuhai has never stopped exploring and developing the integration and upgrading of the equipment manufacturing industry chain. Relying on abundant marine resources and favorable location advantages, the scale of the shipbuilding and marine engineering equipment manufacturing industry continues to grow, gathering a large number of strong and stable marine engineering equipment manufacturing enterprises, such as Sany Marine Heavy Industry, Zhonghai Fulu, Yuchai Shipbuilding, and Fenghuo Marine Jutao Oil and

Gas Equipment. The industrial geographical agglomeration degree is high, mainly concentrated in the Gaolan Port Park in Zhuhai. The various links of marine engineering equipment manufacturing, such as supporting, processing, final assembly, and follow-up services, cooperate and develop throughout the entire industry chain to improve enterprise production efficiency. In addition, the general aviation industry is also one of the high-end manufacturing industries that Zhuhai is striving to develop. As the only aviation industry park in Guangdong Province, the Zhuhai General Aviation Industry Park has been deeply involved in general aviation manufacturing, aviation maintenance, aviation supporting parts manufacturing, and business jet operation services since its establishment in 2008. It focuses on the low altitude economy and strives to build an overall industrial chain of low altitude aircraft such as vertical takeoff and landing aircraft, flying cars, and drones.

#### **4. THE INFLUENCING FACTORS OF MANUFACTURING COMPETITIVENESS IN ZHUHAI**

##### ***4.1 Technology Research and Development Investment***

The investment in technological research and development can be measured by the total research and experimental development funds of the whole society, which specifically includes the actual investment in basic research, applied research, and experimental development by the whole society of a country or region. Technology research and development investment is a long-term and systematic work with strategic significance. It not only brings about the accumulation of knowledge, but also stimulates the emergence of new technologies, processes, and products, thereby enhancing the innovation vitality of the entire manufacturing industry. Especially for high-end manufacturing industries, R&D funding investment is a key link in promoting their development from weak to strong and sustainable. In promoting intelligent manufacturing and enterprise digitization, investment in technology research and development plays a crucial role in improving production efficiency, innovating product applications, and improving operational processes.

##### ***4.2 Foreign Direct Investment***

The technology spillover effect of foreign direct investment on the manufacturing industry is mainly positive. Firstly, foreign-invested enterprises help to break the local industry monopoly pattern and improve resource allocation efficiency; Secondly, the entry of foreign-invested enterprises into the local market will generate a catfish effect, prompting local enterprises to continuously improve their technological level; Thirdly, in the process of cooperation between upstream and downstream enterprises in the industrial chain, foreign-invested enterprises will to some extent transfer their own technology and management experience to local enterprises. In addition, relevant studies have shown that the technology spillover effects of foreign direct investment have different impacts on different types of manufacturing industries. Generally, the technology spillover effects of foreign direct investment in labor-intensive manufacturing industries are not significant, while in technology intensive manufacturing industries, there is a very obvious positive technology spillover effect. This means that foreign direct investment has a very significant promoting effect on the development of high-tech manufacturing industries.

##### ***4.3 Vertical Specialization Level***

Vertical specialization division of labor refers to the continuous increase in the scale of intermediate goods trade among countries, the continuous extension of the vertical trade chain between countries, and the specialized division of labor and trade phenomenon in which each participating country or region is only responsible for a certain production link of the product. In this process, each country or region imports intermediate goods from other countries as inputs for its own production, processes them, and exports them to a third country. The third country repeats this process until the final product is completed and enters the consumption stage. Related studies have shown that the international competitiveness of the manufacturing industry is closely related to a country's level of vertical specialization and division of labor. Taking China as an example, since the 1990s, the production and manufacturing links in technology intensive industries in developed countries have continued to transfer to China, which has rapidly improved China's level of vertical specialization and division of labor. China has seized the historical opportunity, leading to an unprecedented

increase in the international competitiveness of its manufacturing industry. Overall, vertical specialization division of labor is beneficial for improving the overall labor productivity level of society and enhancing the international competitiveness of a country or region's manufacturing industry. However, for traditional labor-intensive manufacturing industries, due to their involvement only in rough processing of products, their participation in global vertical specialization division of labor is relatively low, so the effect of enhancing competitiveness is often not significant.

In today's international trade system, vertical specialization division of labor enables the two-way flow of factors between developed and developing countries, thereby achieving mutual benefit and win-win results through optimized allocation of resources. Due to the "incentive compatibility" of the interests of all parties involved, vertical specialization division of labor can be sustained in the long run. On the other hand, vertical specialization is also a double-edged sword. If relevant countries and regions are only satisfied with undertaking low-end manufacturing industries from developed countries and cannot make breakthroughs in technology, intellectual property, talent, and market, it will be difficult for them to stand at the top of the manufacturing industry chain. For Zhuhai, it has been at the forefront of foreign trade for a long time after the reform and opening up. Vertical specialization division of labor once led to the vigorous development of Zhuhai's manufacturing industry. However, in recent years, the international market competition has been fierce, and the pressure for upgrading Zhuhai's industry has increased. In the future, it should focus on improving our own level of vertical specialization division of labor and move towards the high-end links of the industrial chain. Only in this way it can achieve high-quality and sustainable development of Zhuhai's manufacturing industry.

#### ***4.4 Service level of manufacturing industry***

Manufacturing servitization refers to the process in which manufacturing enterprises promote the transformation of their value chain from manufacturing centered to service-oriented, ultimately enhancing their competitiveness. Its connotation includes two aspects: firstly, the internal service efficiency of manufacturing enterprises is increasingly becoming a decisive

factor in their competitiveness, such as product development, value chain management, human resource coordination, legal and financial services, etc. Its importance and complexity are increasing day by day; Secondly, the level of external services related to the product also significantly corresponds to the competitiveness of the enterprise, such as transportation and installation, maintenance and repair, technical support, financing, etc. Related studies have shown that since the 1970s, intermediate inputs in manufacturing have shown a service-oriented trend. With the continuous deepening of socialization, specialization, and informatization of production, the proportion of service elements in manufacturing input factors has become an important factor affecting industrial competitiveness.

Specifically, the level of servitization in the manufacturing industry mainly affects its industrial competitiveness in three aspects: firstly, in the process of investing service elements in the manufacturing industry, stimulating effects such as economies of scale, economies of scope, and "learning by doing" will be derived, which expand the production boundaries of products, greatly enrich product types, improve product quality levels, and significantly enhance consumers' purchasing experience; Secondly, the trend of service-oriented investment in manufacturing can help reduce fixed and variable costs for enterprises, improve their production efficiency, and in the long run, enhance their advantages in international trade; Thirdly, manufacturing enterprises that focus on investing in service elements will generate a "ripple effect", gradually externalizing the service department, shifting the core profit department of the enterprise to both ends of the production process, thereby achieving the goal of focusing on the main business operation, realizing intensive production, ultimately reducing costs and increasing efficiency, and enhancing international competitiveness. In summary, the improvement of service-oriented level in manufacturing industry cannot be achieved without the support of productive service industry. The enhancement of manufacturing competitiveness in a region should not only focus on the manufacturing industry itself, but also vigorously improve the supporting service level of manufacturing industry, such as design and research and development, information consulting, legal and financial services, etc. This has great reference significance for Zhuhai to enhance its manufacturing competitiveness.

## **5. SUGGESTIONS FOR ENHANCING THE COMPETITIVENESS OF ZHUHAI'S MANUFACTURING INDUSTRY**

### ***5.1 Increasing Investment in Scientific and Technological Research and Development, and Leading the Development of Advanced Manufacturing Industry***

To enhance the competitiveness of Zhuhai's manufacturing industry, it is necessary to continuously increase the level of scientific and technological research and development investment, improve the structure of scientific and technological research and development investment, and thereby enhance the innovation level of key technologies. One is to actively strive for special funds for scientific and technological research and development from higher authorities, accelerate the construction of scientific and technological innovation platforms, improve the comprehensive quality of scientific research personnel, increase scientific research rewards, directly assist the scientific and technological research and development activities of universities, various research and development institutions, and enterprises in Zhuhai, and reduce the cost and risk of enterprises conducting independent scientific and technological research and development. The second is to place support for technological innovation in a key position of government financial expenditure, promote the annual growth of financial research and development funds for science and technology at the local level in Zhuhai, establish a stable growth mechanism for financial research and development funds throughout the city, and arrange for at least 10% annual growth of science and technology research and development funds at the municipal level in Zhuhai to guide manufacturing enterprises towards high-quality development. Thirdly, measures should be taken to broaden the sources of funding for scientific and technological research and development, and various support policies should be formulated and improved, such as reducing or exempting corporate income tax, increasing credit investment for innovative enterprises, etc. At the same time, various sectors of society should be united to establish innovative investment funds, regulate social funds at the institutional level, and ensure the diversification of funding sources for scientific and technological research and development. The fourth

is to guide manufacturing enterprises to increase their own investment in scientific and technological research and development. It is necessary to continue to improve the scientific and technological innovation system that combines industry, academia, and research. While enterprises carry out technological innovation themselves, they should also guide them to combine with universities and research institutes. Through horizontal scientific research projects, they can solve the problems of technological innovation and achievement transformation. They can also encourage enterprises to reinvest in scientific and technological research and development through tax incentives and other preferential policies, and effectively exert their subjective initiative to truly become the main body of scientific and technological innovation.

### ***5.2 Fully Lifting Restrictions on Foreign Investment Access and Increasing Efforts to Attract Foreign Investment***

On March 19, 2024, the State Council issued the "Action Plan for Solidly Promoting High level Opening up and Attracting and Utilizing Foreign Investment with Greater Efforts", which clearly stated the need to comprehensively lift restrictions on foreign investment in the manufacturing industry and deepen opening up to the outside world. In this context, Zhuhai should respond quickly and take multiple measures to increase foreign investment attraction and enhance manufacturing competitiveness. One is to make good use of the economic influence of the Hong Kong Zhuhai Macao Bridge, further reduce the application threshold for Hong Kong cars to go north, increase the scale and frequency of Hong Kong cars going north, simplify the customs clearance process for Hong Kong cars, strengthen personnel and material exchanges between Zhuhai and Hong Kong, make Zhuhai easier to absorb the spillover effects of the Hong Kong International Financial Center, and help foreign and Hong Kong capital enter Zhuhai's manufacturing industry. Second, with Hengqin Guangdong Macao in-depth cooperation zone as the core, it should enhance Zhuhai's investment attraction to Portuguese speaking countries and the "the Belt and Road" countries, build Hengqin into a bridgehead for Zhuhai to attract foreign investment, make it an important hub for Zhuhai to connect the domestic and international markets, and lead the high-quality development of Zhuhai in biomedicine, new energy, new materials, integrated circuits, high-end

equipment manufacturing, etc. through the regional layout of Hengqin R&D and Zhuhai manufacturing. Thirdly, they need to optimize the business environment and strengthen services for foreign-invested enterprises. They need to establish a regular communication mechanism with foreign-invested enterprises and relevant international organizations, provide targeted service guarantees, and treat all parties equally in terms of bidding, qualification permits, and financial and tax preferential policies. At the same time, they need to improve the scientific level of law enforcement for enterprises, gradually promote non site supervision methods that focus on prevention, create the "Invest in Zhuhai" brand, and showcase Zhuhai's high-quality business environment and development opportunities to foreign investors in all aspects.

### ***5.3 Continuously Promoting High-level Opening up and Accelerating Integration into the Global Industrial Chain***

The most important thing for Zhuhai to enhance its manufacturing competitiveness is to maintain an open attitude, and to achieve quality, efficiency, and driving changes in Zhuhai's manufacturing industry by building a new pattern of opening up to the outside world. It is necessary to continuously deepen the international participation level of Zhuhai's manufacturing industry and build a strong manufacturing trade city. One is to make full use of the resources of Hong Kong and Macao, take the Hengqin Guangdong Macao Deep Cooperation Zone as an opportunity, promote the transformation of Zhuhai from a flow based opening of goods and factors to a system based opening of standards and rules, closely connect with the international market in various aspects such as manufacturing industry standards, intellectual property rights, and environmental protection, build a fair and transparent international investment rule system, and promote the deep integration of Zhuhai's manufacturing industry with the international market. Secondly, they should take the implementation of RCEP as the starting point, make good use of the complementary advantages of high-end manufacturing between China, ASEAN, and the EU, actively integrate into the high-end manufacturing industry chain between China ASEAN and China EU, and reduce trade risks between China and the United States; At the same time, they will strengthen production capacity cooperation between Zhuhai and Portuguese speaking countries and the "the Belt and Road"

countries, expand the manufacturing industry chain, stabilize the factor supply chain, and ensure the security of the manufacturing market and resources. The third is to strengthen international coordination at the policy level. To cope with the uncertainty of the international economic and trade environment, Zhuhai should combine its own advantages, strengthen economic and trade cooperation with different countries and regions, grasp the strength and pace of government policies according to changes in domestic and international economic situations, do a good job in policy supervision and coordination in finance, taxation, industry, etc., improve the accuracy and coordination of preferential policies, hedge international trade risks, build a stable supply chain network, and create a harmonious environment for the sustainable development of the manufacturing industry.

## **6. CONCLUSION**

Nowadays, the pillar manufacturing industry in Zhuhai has become a "booster" for economic growth and a "ballast" for resisting external risks. The development speed of the seven pillar industries is gradually diverging, and the three advantageous industries are further expanding their advantages. Among them, the high-end equipment manufacturing industry has the fastest growth rate, and the fine chemicals and smart home appliances have also maintained double-digit growth. The development effect of the integrated circuit industry in the leading industry is relatively significant. The level of scientific research investment, the technology spillover effects of foreign direct investment, the level of vertical specialization in manufacturing, and the level of service-oriented manufacturing are all important factors that affect the competitiveness of the manufacturing industry. In terms of enhancing the competitiveness of the manufacturing industry, the government can encourage enterprises to increase research and development investment, break through key core technologies, and enhance the independent innovation capability of the manufacturing industry through measures such as fiscal subsidies and tax incentives, optimize the business environment and strengthen services for foreign-invested enterprise, and promote high-level opening up and accelerate integration into the global industrial chain.

## **ACKNOWLEDGMENTS**

1 Fund Project: Zhuhai Social Science Base 2022 Project Support. 2. Funding for the "Three

Levels" Talent Construction Project of Zhuhai University of Science and Technology.

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