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Research on the technology path selection of China's manufacturing industry under the high-quality development strategy

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Abstract

As the foundation and leading force of national economic development, manufacturing determines a country's comprehensive strength and international competitiveness, and is the key to achieving transformation, upgrading and high-quality development. Based on the perspective of global value chain embedding, this paper explores the issue of technology path selection and high-end development in my country's manufacturing industry. Against the background of Internet development, this paper analyzes the basis for technology path selection in my country's manufacturing industry to achieve intelligent transformation and high-quality development. By constructing an analytical framework for technology path selection from two aspects of internal and external factors, the theoretical basis for technology path selection in my country is proposed. Guided by high-quality development, this paper studies the internal mechanism of technology path selection that can promote the high-end, intelligent, service-oriented and green development of manufacturing industry, and discusses the technology path selection for manufacturing industry to achieve green and sustainable development. Based on an in-depth analysis of the impact and mechanism of global value chain embedding, Internet development, productive services and environmental constraints on technology path selection, this paper proposes the optimal decision equation for R&D resource allocation in my country based on factor endowment conditions, thereby promoting the transformation of manufacturing industry from factor-driven to innovation-driven, accelerating the process of achieving high-end, intelligent, service-oriented and green development, which is of great significance to promoting the high-quality development of manufacturing industry.

Keywords

High-quality development, Chinese manufacturing, Technological path, Intelligent transformation.

1. Introduction

1.1. Research Background

Since the reform and opening up, China's economy has continued to grow at a high speed and has achieved historic achievements in many fields. However, with the emergence of multiple pressures such as rising factor costs and environmental constraints, improving the quality and efficiency of economic development has become an inevitable choice for achieving transformation and upgrading and high-quality development. As the foundation and leading force of national economic development, manufacturing is the key to achieving transformation and upgrading and high-quality development, and has always led the development direction of

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China's economy. Especially since the reform and opening up, China's manufacturing industry has developed rapidly, its comprehensive strength and production capacity have been continuously enhanced, and it has become the world's largest manufacturing country. However, we must also be soberly aware that the manufacturing industry still has problems such as "big but not strong, and low development quality". The traditional growth model has been difficult to adapt to and meet the requirements of high-quality development. Overcoming the bottleneck constraints of this period is crucial to moving towards high-quality development. Therefore, in order to actively respond to changes in the external environment and the opportunities and challenges it brings, it is necessary to rethink the choice of technology paths for China's manufacturing industry in the context of high-quality development. Through the input of factors based on knowledge, technology, data, etc., combined with technological innovation and structural adjustment, the manufacturing industry can be promoted to achieve quality improvement and efficiency upgrade, and then achieve the development goals of high-end, intelligent, service-oriented and green.

1.2. Significance

In the new development stage and context, this paper constructs an analysis framework of internal and external factors for the choice of technology paths in my country's economy, in order to further supplement and improve the theoretical basis for the selection of appropriate technology paths in my country's economy. Through this analysis framework, this paper takes the high-quality development of the manufacturing industry as its guide, and with the help of the expanded endogenous growth model, clarifies the basis for the selection of appropriate technology paths, providing a solid theoretical basis for the choice of technology paths for the realization of high-quality development of China's manufacturing industry, and also providing corresponding theoretical references for other countries in the catching-up stage.

In terms of practical significance, this paper takes the high-quality development of the manufacturing industry as its guide, combines the current stage characteristics of economic development and the background trend of development, and explores the basis for the selection of technical paths for China's manufacturing industry to achieve better development from a new research perspective. The selection of manufacturing technology paths is examined from different perspectives, and the appropriate technical paths for manufacturing enterprises with different industry attributes and in various regions are clarified, providing useful experience and suggestions for the technical selection of China's manufacturing industry to achieve quality improvement, efficiency increase and transformation and upgrading. Based on the research conclusions, this paper puts forward corresponding policy recommendations for the technological improvement of the manufacturing industry and the high-end, intelligent, service-oriented and green development, so as to promote the manufacturing industry to achieve quality improvement and efficiency upgrade through the reasonable allocation of R&D resources and continuous innovative R&D investment, which has important practical guidance and reference significance.

2. Literature review

2.1. Research on high-quality development of manufacturing industry

Regarding the connotation and measurement of high-quality development of the manufacturing industry, Jin Bei (2018) believes that the essential characteristics of high-quality development are multidimensional and rich. On the one hand, it is reflected in the continuous optimization of the national economy. On the other hand, it is reflected in the high-efficiency development and green development based on innovation, as well as the development of continuously improving people's quality of life and people's comprehensive literacy (Li

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Jinchang et al., 2019). Jiang Xiaoguo et al. (2019) showed that high-end, intelligent, high-quality and green are the main characteristics of high-quality development of the manufacturing industry. Saleem (2019) pointed out that total factor productivity is widely used as an important indicator to measure the level of high-quality development. Ren Baoping (2021) proposed that high-quality development is a development mode that conforms to the laws of economic development, which helps to cross the "middle-income trap", reduce environmental pollution and enhance international competitiveness. Regarding the influencing factors of high-quality development of the manufacturing industry, Yu Yongze and Hu Shan (2018) pointed out that innovation is the first driving force for promoting high-quality economic development. Market-oriented reforms and a new round of opening up should be used as important channels to improve the quality of economic development through building an ecological civilization and promoting equalization of public services.

2.2. Research on technology path selection and high-quality development

Regarding the research on technology paths and export trade, Becker (2013) believes that compared with technology introduction, digestion, absorption, and tracking and imitation, independent research and development has a more obvious effect on export promotion. Regarding the research on technology paths and industrial upgrading , Fu Yuanhai et al. (2014) showed that the transformation of technology paths is conducive to the rational development of the manufacturing structure, but it will not have an impact on the upgrading of the industrial structure. Only on the basis of digesting and absorbing foreign investment technology, Independent innovation can promote the upgrading and rationalization of industrial structure. Regarding the research on technological paths and technological innovation, Hu Xiaojuan and Chen Xin (2017) found through research that both technological imitation and independent research and development have a significant positive impact on export trade, and the promotion effect of independent research and development will decrease as the technological gap shrinks. Gradually greater than the introduction of imitation. Han Yafeng and Zhao Ye (2020) examined the impact of independent research and development, FDI, intermediate product imports, etc. on the rise of the innovation value chain. They found that external technology acquisition such as intermediate product imports and investment in independent research and development factors are the main forces driving the improvement of the innovation value chain. Regarding the research on technological paths and green transformation, Song Dian et al. (2020) focused on the role of technological paths on industrial green development under the influence of environmental regulations and found that independent innovation first inhibits and then promotes green transformation, while technology introduction has an impact on green transformation. The impact of sustainable development is opposite, showing a tendency of promoting first and then inhibiting.

2.3. Brief Comments

This project combed through the relevant literature on technology path selection and high-quality development of the manufacturing industry, and found that the research on technology path selection of my country's economy has a long history, but there are few literatures that combine technology path selection with high-quality development. Based on an in-depth analysis of the formation mechanism and essential differences of different technology paths, this project constructs an internal and external factor analysis framework for technology path selection of my country's economy. While based on the internal factor endowment and development status, it emphasizes the impact of external factors on technology path selection. Combined with the existing research on high-quality development of the manufacturing industry, by refining the core connotation of high-quality development of the manufacturing industry, the technology path selection of the manufacturing industry is studied. Enriching the theoretical system of technology path selection of my country's economy provides a theoretical

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basis for the technology path selection of China's manufacturing industry to achieve high-quality development; providing experience suggestions for the technology path selection of high-quality development of the manufacturing industry, and also has certain reference value and reference significance for the formulation of relevant policies.

3. Theoretical study on the technological path of China's manufacturing industry under the high-quality development strategy

3.1. The connotation and characteristics of high-quality development

High-quality development is a development concept that is different from the traditional growth model. It emphasizes the efficiency, innovation, sustainability and inclusiveness of economic development. High-quality development not only focuses on the growth of the total economic volume, but also pays more attention to the quality of growth, structural optimization and improvement of development benefits. Its core connotations mainly include the following aspects:

First, high-quality development emphasizes innovation-driven development. Innovation is the primary driving force for development and a key factor in achieving high-quality economic development. Innovation-driven development includes not only technological innovation, but also management innovation, business model innovation, and institutional innovation. By continuously improving innovation capabilities and promoting the transformation and application of scientific and technological achievements, we can improve total factor productivity and enhance economic competitiveness.

Secondly, high-quality development pursues coordination. Coordinated development means that all aspects of economic development should be promoted in a coordinated manner, especially the relationship between economic growth and social development, the relationship between urban and rural development, and the relationship between regional development. By promoting regional coordinated development and narrowing the urban-rural gap and regional gap, a more balanced development pattern can be achieved.

Thirdly, high-quality development emphasizes green development. Green development is an important part of high-quality development, which aims to promote the coordination of economic development and ecological environmental protection. In the process of economic development, we must fully consider the rational use of resources and environmental protection, reduce pollution emissions, and achieve resource conservation and environmentally friendly development. Sustainable development can be achieved by developing green industries, promoting clean energy and improving resource utilization efficiency.

Finally, high-quality development focuses on openness. Open development requires participation in international competition and cooperation on a larger scale, in a wider field and at a higher level, and active integration into the global economic system. By expanding opening up, optimizing the foreign trade structure and introducing foreign investment, we can introduce advanced technology and management experience and enhance the competitiveness of domestic industries.

3.2. Key drivers of high-quality development of manufacturing industry

Promoting high-quality development of the manufacturing industry is the key to achieving economic transformation and upgrading and enhancing international competitiveness. Achieving this goal requires the synergy of multiple key drivers to enhance the overall level and competitiveness of the manufacturing industry. Technological innovation is one of the core driving factors for the high-quality development of the manufacturing industry. It not only includes the research and development of new technologies, but also covers improving

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production processes, improving product quality and optimizing production processes. Enterprises should increase investment in R&D, cultivate innovation capabilities, and develop core technologies with independent intellectual property rights to reduce dependence on external technologies. This kind of technological innovation can improve production efficiency, reduce production costs, and significantly increase the added value of products, thus enhancing the market competitiveness of enterprises. In the current wave of digitalization and intelligence, manufacturing companies should actively adopt advanced manufacturing technologies, such as artificial intelligence, the Internet of Things, and big data analysis, to promote intelligent manufacturing and digital transformation.

High-quality human capital is also an important support for the high-quality development of the manufacturing industry. Talents with innovative awareness and professional skills are the key to promoting technological progress and process improvement. Enterprises need to establish a sound talent training system and improve the technical level and innovation ability of employees through continuous education and training. The government should also strengthen vocational education and skills training, promote school-enterprise cooperation, build a team of highly skilled industrial workers, and provide strong talent guarantee for the innovative development of the manufacturing industry. The coordinated upgrading of the industrial chain is an important path for the high-quality development of the manufacturing industry. Enterprises should strengthen cooperation with upstream and downstream suppliers and customers, and achieve the coordinated development of the industrial chain by extending and optimizing the industrial chain. Optimizing supply chain management and improving the overall efficiency and flexibility of the supply chain can achieve optimal allocation of resources and lean management of production. In addition, enterprises should actively introduce advanced production equipment and automation technology to promote the intelligence and digitalization of the production process and improve production efficiency and product quality.

Green development is an inevitable requirement for the high-quality development of the manufacturing industry. With the increasing global awareness of environmental protection and increasingly stringent environmental regulations, manufacturing enterprises must take green development as an important strategy. Adopt clean production technology and environmentally friendly materials, reduce pollutant emissions and resource consumption, and promote the greening and sustainable development of the production process. In addition, the development of a circular economy can reduce production costs, improve resource utilization efficiency, and enhance the environmental protection image and social responsibility of enterprises through the recycling of resources and the reuse of waste. Policy support is also an important guarantee for the high-quality development of the manufacturing industry. The government should formulate and implement policy measures that are conducive to the high-quality development of the manufacturing industry, such as fiscal subsidies, tax incentives, financial support, and technological innovation incentives. At the same time, strengthen intellectual property protection, create a fair and competitive market environment, and provide institutional guarantees for the innovative development of enterprises. Promote the construction of public infrastructure, improve logistics and communication conditions, and provide a good external environment for the high-quality development of the manufacturing industry. By coordinating and optimizing these driving factors, manufacturing enterprises can achieve efficient, green and sustainable development goals and promote the high-quality development of the national economy.

3.3. Theoretical Basis of Technology Path Selection

3.3.1. Endogenous Growth Theory

Endogenous Growth Theory emphasizes that economic growth comes from internal factors, especially technological innovation and knowledge accumulation. The theory believes that

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enterprises can achieve long-term economic growth through continuous R&D investment and technological innovation. Endogenous Growth Theory emphasizes that knowledge and technology, as key production factors, will not have diminishing marginal benefits, but will continue to increase due to the spillover effect of knowledge. This provides theoretical support for manufacturing enterprises to choose the development path driven by independent R&D and innovation.

3.3.2. Global Value Chain Theory

The Global Value Chain Theory focuses on the position and role of enterprises in the global production and trade network. The theory points out that by embedding in the global value chain, enterprises can obtain advanced technology, management experience and market resources, thereby improving their production efficiency and product competitiveness. Global value chain embedding provides a theoretical basis for manufacturing enterprises to choose technology introduction and international cooperation paths, helping enterprises to position and develop in the global market.

3.3.3. Technological Innovation Theory

Technology Innovation Theory studies the sources, processes and impacts of technological progress. The theory believes that technological innovation is the core driving force of economic growth and industrial upgrading. Innovation can be achieved through incremental improvement and disruptive change. Technology Innovation Theory provides a theoretical basis for manufacturing enterprises to choose technological paths, especially the choice of different paths such as independent research and development, technology introduction and imitation innovation.

3.3.4. Resource-Based Theory

Resource-Based View (RBV) emphasizes the core position of internal resources and capabilities in competition. According to this theory, enterprises can establish and maintain competitive advantages by accumulating and utilizing unique resources and capabilities. Resource-Based View provides a basis for manufacturing enterprises to choose technology paths, especially how to use internal resources and capabilities for technology development and innovation.

4. Analysis of different perspectives on the strategy of achieving high-quality development of China's manufacturing industry

4.1. Global value chain embeddedness perspective

From the perspective of global value chain embedding, the high-quality development of China's manufacturing industry cannot be separated from its deep integration into the global production and trade network. The global value chain theory points out that by embedding in the global value chain, enterprises can obtain advanced technology, management experience and market resources, and improve production efficiency and product competitiveness. Chinese manufacturing enterprises should actively participate in the international division of labor, integrate into the high-end links of the global value chain, and realize the transformation from a "manufacturing power" to a "manufacturing power". Specifically, enterprises should strengthen cooperation with multinational companies, participate in international technology research and development and standard setting, and continuously enhance their position and influence in the global value chain. At the same time, the government should formulate favorable policies to promote the coordinated development of upstream and downstream of the industrial chain, build a sound industrial ecological system, and provide solid guarantees for enterprises to integrate into the global value chain.

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4.2. Intelligent manufacturing and digital transformation perspective

Intelligent manufacturing and digital transformation are important paths to promote the high-quality development of China's manufacturing industry. With the deepening of the fourth industrial revolution, new-generation information technologies such as artificial intelligence, big data, and the Internet of Things are accelerating their penetration into all aspects of the manufacturing industry. Through digital transformation, manufacturing companies can realize the intelligence and automation of the production process, improve production efficiency and product quality, and reduce production costs. Enterprises should actively adopt advanced manufacturing technologies, build intelligent manufacturing systems, and realize digital transformation and intelligent upgrading of production lines. At the same time, enterprises should also strengthen data management and analysis capabilities, use big data technology for precision marketing and personalized services, and improve market response speed and customer satisfaction. The government should promote the construction of information infrastructure, support the digital transformation of enterprises, and provide strong support for the development of intelligent manufacturing.

4.3. Green development and sustainable development perspective

Green development and sustainable development are inevitable requirements for the high-quality development of China's manufacturing industry. Against the backdrop of increasing global environmental awareness and increasingly stringent environmental regulations, manufacturing companies must take green development as an important strategy. By adopting clean production technologies and environmentally friendly materials, reducing pollutant emissions and resource consumption, the greening and sustainable development of the production process can be achieved. Enterprises should actively develop a circular economy, promote the recycling of resources and the reuse of waste, reduce production costs, and improve resource utilization efficiency. At the same time, enterprises should also fulfill their social responsibilities, create a green brand image, and enhance market competitiveness. The government should introduce corresponding policies to encourage enterprises to conduct green technology research and development and investment in environmental protection facilities, increase support for green development, and provide strong guarantees for the green transformation of the manufacturing industry. Through green development and sustainable development, China's manufacturing industry can achieve high-quality development goals while contributing to global environmental protection and sustainable development.

5. Policy recommendations for the selection of technological paths for China's manufacturing industry under the strategy of high-quality development

With the accelerated changes in the global economy and the transition of domestic development stages, the traditional cost-oriented technology catch-up approach has been difficult to adapt to new development needs. In the choice of technology paths, latecomer countries no longer rely solely on internal factor endowment conditions. The emergence of external factors not only affects the cost of technology paths by changing the mode of production and the techno-economic paradigm, but also provides latecomer countries with a window of opportunity for development and expands the difference in benefits between different technology paths. Therefore, in the new development stage, latecomer countries need to consider the influence of both internal and external factors when choosing technology paths in order to reasonably allocate limited R&D resources and gain competitive advantages while making full use of their latecomer advantages. On this basis, this paper, guided by the high-quality development of the manufacturing industry, explores the internal mechanism of

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technology path selection to promote the high-end, intelligent, service-oriented and green development of the manufacturing industry, thereby promoting the transformation of the manufacturing industry from factor-driven to innovation-driven, and achieving quality improvement, efficiency enhancement and transformation and upgrading. Based on the conclusions, this paper puts forward the following policy recommendations.

5.1. Actively encourage the transformation of manufacturing technology paths

Increase policy support and guarantee efforts, and further improve infrastructure construction. In the new development stage and background, technological innovation in the manufacturing industry has great development potential and development space. The government should provide corresponding policy support for the main difficulties in the manufacturing industry in independent research and development activities. On the one hand, through measures such as talent introduction, financial services, and fiscal subsidies, talent and technology bottlenecks can be alleviated, and the manufacturing industry can be encouraged to invest more factors in independent innovation activities in the process of R&D resource allocation ; on the other hand, by accelerating infrastructure construction and social supporting guarantee measures, the industrial foundation can be consolidated, and the driving role of technological innovation platforms in the independent research and development of the manufacturing industry can be deepened, so as to create a new development model driven by independent innovation. Attach importance to the cultivation of high-quality knowledge capital and human capital, and optimize the technological innovation environment . Knowledge capital and human capital are the basis for the selection of technological paths. Therefore, full attention should be paid to the cultivation of innovative talents, and the development of innovative concepts should be encouraged. By turning the "demographic dividend" into a "talent dividend", a higher level of technology-intensive elements can be injected into innovation activities, and the ability to absorb and transform technology and innovation efficiency can be improved.

5.2. Adhere to a high level of opening up

Adhere to a higher level of opening up to the outside world, and by taking advantage of the opportunities of open innovation, coordinate domestic and foreign resources, provide sufficient innovative talents, funds and technical elements for the transformation of technology paths and the improvement of independent research and development capabilities, and gradually get rid of dependence on external core technologies. Adhere to comprehensive opening up and encourage the manufacturing industry to actively participate in international division of labor and cooperation. By embedding the global value chain and open innovation, integrating global scientific and technological resources, introducing advanced technology and high-skilled manpower, and providing sufficient innovative talents and financial and technical support for independent research and development, we will gradually get rid of dependence on external core technologies and realize the transformation from imitation and technology introduction to independent innovation. Accelerate the combination of industrial chain and innovation chain, expand and extend the value chain. In the era of knowledge economy, the integration of industrial chain and innovation chain is the key to determining the competitive advantage of science and technology. We should seize the window period of the re-layout of the global value chain, build a complete industrial chain and innovation chain, embed the innovation chain into each link of the industrial chain, and realize the added value of the value chain and the improvement of national competitiveness. As the global value chain becomes more deeply embedded, more R&D resources should be shifted to core areas, focusing on cultivating competitiveness in architecture, R&D design, core technologies, and other aspects, as well as technical capabilities for value chain division of labor, breaking through the bottlenecks of technology and value chain climbing, avoiding path dependence and low-end lock-in in the

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global value chain division of labor, and striving for the right to speak in the formulation of key technologies and standards.

5.3. Promote the deep integration of the Internet and manufacturing

Accelerate the integration and development of the Internet and manufacturing, and give full play to the advantages of the new generation of information technology. Internet-based emerging industries are new engines for future economic development and represent the direction of industrial and technological development . We should find the right combination of industry and the Internet, strengthen key core technology research, and promote the intelligent transformation of the manufacturing industry. With the emergence of 5G technology, we should accelerate the integration of manufacturing and the Internet, promote the application of information technology in manufacturing design, research and development, production, manufacturing and marketing services, so as to seize the commanding heights of science and technology, stimulate new vitality in the manufacturing industry, and achieve production efficiency improvement and development mode transformation. In order to coordinate the coordinated development among regions, it is necessary to improve the Internet level in the central and western regions and promote technological innovation and high-quality development of local manufacturing industries. At the same time, we should focus on promoting the integration of high-tech industries and the Internet, accelerate the construction of innovation systems, and achieve intelligent transformation. We should actively encourage private enterprises to carry out independent innovation and give full play to their vitality in digital and intelligent transformation through flexible market mechanisms.

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References

[1] Tan Si, Chen Weiping. Theoretical mechanism, practical basis and path selection of digital technology driving high-quality development of rural industries[J]. Rural Economy, 2024, (04): 26-33.

[2] Han Zhen, Zhao Yuheng, Zhao Li, Yan Lanqing. The formation path and solution strategy selection of "bottleneck" technology: a case study based on the chip industry [J]. Science and Technology Progress and Countermeasures, 2023, 40(24): 82-91.

[3] Hu Yanan, Yu Donghua. Internet, technology path selection and high-quality development of manufacturing industry[J]. Finance and Trade Research, 2023, 34(11): 1-13.

[4] Wang Chengdong, Jiao Hui, Wang Chen, SARAH Yvonne Cooper. Technological innovation efficiency curve, industrial heterogeneity and innovation path selection: An empirical study based on the dual innovation perspective and high-end equipment manufacturing industry[J]. China Soft Science, 2023, (02): 61-72.

[5] Xing Yan, Yang Xiaohui. Path selection for high-quality development of manufacturing industry under the new development pattern of “dual circulation”: based on the perspective of technological gap [J]. Research on Technological Economy and Management, 2023, (02): 117-123.

[6] Jia Ronglin, Chen Wenhui. Research on the characteristics of the digital fashion industry and its development strategy: Analysis of the development experience and path selection of the deep integration of digital technology and fashion industry at home and abroad [J]. Price Theory and Practice, 2022, (06): 27-31+181.

[7] Hu Yanan, Yu Donghua. Low-carbon city pilot policy and technology path selection for China's manufacturing industry[J]. Finance and Economics, 2022, (02): 102-115.

ISSN: 2710-0170

[8] Hu Yanan, Yu Donghua. Global value chain embedding, technology path selection and high-quality development of manufacturing industry[J]. Science and Technology Progress and Countermeasures, 2021, 38(21):44-52.

[9] Yu Donghua, Hu Yanan. Service-oriented manufacturing, technology path selection and high-quality development[J]. Economic and Management Research, 2021, 42(09):28-41.

[10] Helian Zhiwei, Meng Qinghong, Wei Xiaoyang. Research on the path selection of technology resource allocation for sudden transformation of manufacturing enterprises[J]. Macroeconomic Research, 2021, (04): 128-140.