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Does the Digital Economy Promote the High-quality Development of Manufacturing Industry?

Anqi Li[1], Rui Long[2], Xi Cheng[1]

[1] School of Finance, Anhui University of Finance and Economics, Bengbu 233030, China

[2] School of Law, Anhui University of Finance and Economics, Bengbu 233030, China

Abstract

Digital economy has become a key new engine for the high-quality development of China's economy. This paper discusses the influence path of digital economy on the high-quality development of manufacturing industry, and finds that digital economy can promote the high-quality development of manufacturing industry through information effect, value-added effect and innovation effect. Exploratory innovation and exploitative innovation can play an effective intermediary role between digital economy and the high-quality development of manufacturing industry, and digital economy can indirectly promote the high-quality development of manufacturing industry through exploratory innovation and exploitative innovation. At the same time, the institutional environment has a positive moderating effect on the relationship between digital economy and the high-quality development of manufacturing industry, that is, the better the institutional environment of the region where the enterprise is located, the more effectively the development of digital economy can promote the high-quality development of manufacturing industry.

Keywords

Digital Economy; High-quality Development of Manufacturing Industry; Mechanism of Action.

1. Introduction

Digital economy is an emerging economic form brought about by the development of digital technology and the Internet. All countries have placed it on a strategic level of development. The report to the 20th National Congress of the Communist Party of China proposed to accelerate the development of the digital economy, promote the deep integration of the digital economy and the real economy, and build digital industrial clusters with international competitiveness. At present, the digital economy with emerging information technology as the core is booming and promoting the digital transformation of the real economy, creating new value while realizing the "creative destruction effect", which has given rise to a series of new business forms and models, and become an important driving force of high-quality economic development (Vial G, 2019).

China has been the world's largest manufacturing power for many years in a row, but some traditional manufacturing products have low added value and lack obvious international competitive advantages. Therefore, it is urgent to transform and upgrade towards high-quality development. Due to the impact of COVID-19 in the past two years, China's manufacturing industry has increasingly exposed problems such as insufficient innovation, lack of talents, overcapacity and declining investment growth, and has entered a bottleneck period of slowing growth. As an important foundation of national economic development, China's manufacturing industry is still faced with prominent problems such as "big but not strong, big but not excellent,

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big but not viable", which seriously restricts the high-quality economic development (Xiao, 2020). Therefore, how to break through the bottleneck of "early mature slowdown" in China's manufacturing industry and improve its high-quality development level has become an important issue in the new era. How to crack the squeeze between the low end of China's manufacturing industry chain and the global manufacturing industry is a problem that China's manufacturing industry must face for long-term development (Liao and Bian, 2023).

With the continuous expansion of the application scope of digital technology, digital economy has been generalized to all digital economic activities, and the focus of academic research has gradually shifted to the platform economy, digital transformation, and the growth, innovation and governance of digital economy (Bukht R, 2018). The development of digital economy has brought a variety of emerging intelligent technologies and products, such as the Internet of Things, cloud computing, etc., which has accelerated the transformation of production factors, promoted the improvement of production efficiency and quality, and promoted the high-quality development of national economy. Then, how much does the digital economy promote the high-quality development of the manufacturing industry? How to realize the impact mechanism and effect of digital economy driving the high-quality development of manufacturing industry? Under the background of the profound transformation of the digital economy and the transformation of the traditional manufacturing industry, the answers to the above questions have important theoretical and practical significance for giving full play to the "digital dividend" brought by the digital economy and the high-quality development of China's manufacturing industry. Based on this, this paper uses the development data of China's digital economy and manufacturing industry from 2011 to 2020 to conduct relevant measurement, and explores the influence mechanism of digital economy driving the high-quality development of manufacturing industry.

2. Literature Review

2.1. Connotation of High-quality Development of Digital Economy and Manufacturing Industry

Under the background of the continuous development of digital technology and the in-depth application of data elements, the connotation and extension of digital economy are also expanding. Based on the hierarchy theory, Ouyang (2023) believes that economic activities such as production, consumption, distribution and circulation of digital products and services are important connotation of digital economy, which can be divided into new infrastructure layer, new production factor layer, new ecological environment layer, new real economy layer and new economic form layer (Li Jie and Wang Qinmei, 2022). Zhang Hong et al. (2022) summarized the connotation of high-quality development of digital economy from the five dimensions of "efficiency", "industrial development", "innovation", "sustainable" and "fair" from the theoretical perspective based on the connotation of digital economy and the actual development situation, combined with the definition of high-quality development. In order to promote the high-quality development of digital economy, Liu Shuchun (2019) proposed to break through the bottleneck of digital core technology innovation and build a high-quality digital platform, centering on the key point that digital economy is dominated by digital technology. Wang Bangjiang and Zheng Xiangyu (2022) systematically discussed the logical starting point and core elements of ESG integration based on the three factors of environment, society and corporate governance, and constructed the realization path of ESG integration in the digital economy era.

To achieve high-quality development of the manufacturing industry is the premise and foundation for accelerating the development of the real economy, building a modern industrial system and a modern economic system, and realizing high-quality economic development. At

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present, there are many discussions on the era background, scientific connotation and strategic measures of high-quality economic development in academia, but not enough attention is paid to how to achieve high-quality development of manufacturing industry, especially the research on the main path and driving mechanism of high-quality development of manufacturing industry, which is still in its infancy. Yu Donghua (2020) believed that the high-quality development of manufacturing industry refers to the realization of high-level sustainable development with low input of production factors, high efficiency of resource allocation, strong strength of quality improvement, excellent ecological environment quality and good economic and social benefits in the whole process of production, manufacturing and sales. Fu Baozong (2023) pointed out that the high-quality development of manufacturing industry drives the comprehensive effect of income improvement and quality improvement, which will provide important support for the realization of common prosperity. In the face of the current new situation and challenges in the international economy, advanced manufacturing is a key force driving high-quality economic development. On the basis of three-dimensional research, Cheng Qingqing (2019) believes that the innovative development of advanced manufacturing industry is to widely equip high-tech equipment in the manufacturing industry, andwidely apply high-tech technology to all links of the manufacturing industry, so as to achieve high-quality development of the manufacturing industry. Wang Juan and Ye Meilan (2021) summarized that the supporting factors for the high-quality development of advanced manufacturing industry are scientific and technological innovation, market demand, human capital and system innovation, and put forward countermeasures and suggestions to promote the high-quality development of advanced manufacturing industry from the four aspects of innovation, coordination, green and openness.

2.2. Evaluation and Measurement of the Development Level of Digital Economy and Manufacturing Industry

Due to the differences in the definition of the connotation of digital economy, the evaluation criteria for the development of digital economy have not been unified. The Organization for Economic Cooperation and Development (2014) proposed 38 statistical indicators for measuring digital economy around five key areas of digital economy. The DESI Index published by the European Union (2021) takes into account the latest technological and policy developments and finally focuses on four main areas of the digital compass-human capital, broadband connectivity, digital technology integration and digital public services. Domestic scholars also have unique opinions on the selection of indicators. From the perspective of data elements, Qu et al. (2022), taking the panel data of provinces in the Yangtze River Economic Belt as an example, constructed an evaluation system to reflect the new driving force of digital economy from the dimensions of technological readiness, industrial development and social influence. Zhang and Chen (2018) constructed an index system from the perspectives of economic efficiency, social progress, structural optimization and sustainable development, but it is difficult to summarize the connotation of digital economy from the perspective of evaluation indicators. Fang Weiwei (2019) believed that the high-quality development of China's digital economy should be aimed at improving digital facilities, increasing the efficiency of digital industry, expanding digital production, strengthening digital application and promoting digital innovation. Under the background of the new development concept guiding development, Li and Wang (2022) constructed the evaluation index system of digital economy based on the new development concept, used the comprehensive weighted TOPSIS method to measure the development level of digital economy in China from 2008 to 2019, and analyzed the spatial-temporal evolution characteristics of digital economy by using kernel density, Dagum Gini coefficient and ESDA.

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Manufacturing industry is a huge industrial system, and its development level has multiple influencing factors. It is unrealistic to form a unified standard to measure its development level. However, in recent years, the academia has not given up the research on the connotation and level of the development of manufacturing industry. In the processof manufacturing industry gradually shifting from "speed up" to "quality improvement", some scholars believe that under the background of the new development concept, innovation, coordination, green, open and sharing constitute a reasonable Angle with a high degree of agreement with the objective evaluation of the development level of manufacturing industry. Duan and Yu (2021) constructed an evaluation system for the development level of the manufacturing industry based on the new development concept, which further promoted the evaluation of the development level of the manufacturing industry based on the new development concept. The development level of manufacturing industry is a multi-dimensional concept. In addition to the five concepts, its operation quality and the degree of achieving development goals can also represent its development level to a certain extent. Li and Wang (2020) believed that the development status of manufacturing industry from the perspectives of efficiency and benefit, structural optimization, innovation-driven and mode transformation is an important dimension of the development level of China's manufacturing industry. The development of manufacturing industry is not only limited by its own internal endowments, but also affected by the external environment. Wang Fang and Shi Xin (2022) constructed indicators from two aspects: green development efficiency and export technology structure. In order to test the stage quality of the development of the manufacturing industry and show the status quo and connection of the development of the manufacturing industry in each province, Liu et al. (2022) constructed an evaluation system for the development level of the manufacturing industry and analyzed the spatial-temporal differences and convergence characteristics of the development level of the manufacturing industry based on the panel data of 30 Chinese provinces from 2012 to 2020. Yang and Xu (2022) constructed a four-dimensional evaluation index system of optimal scale, optimal structure, high efficiency and high benefit, obtained the consistent prosperity index of China's manufacturing industry's high-quality development by using the synthetic index method, and analyzed its volatility and periodicity.

At the macro impact level of digital economy, scholars generally believe that digital economy plays an effective role in promoting high-quality economic development, and at the micro level, more attention is paid to the impact of digital economy on enterprise innovation and risk-taking. The research on the high-quality development of manufacturing industry mainly focuses on its realization path and the construction of evaluation index system.

3. Influence Mechanism of Digital Economy Driving the High-quality Development of Manufacturing Industry

Under the background of the vigorous development of digital economy, exploring how to give full play to the power of digital economy to drive the high-quality development of manufacturing industry has become an important issue in the high-quality development of China's economy. Zhou Zheng et al. (2023) used linear regression model to test the main factors and economic consequences of digital economy driving the high-quality development of manufacturing industry from 1999 to 2018. Qin et al. (2021) took Chengdu and Beijing as the research objects, used the entropy method to compare the comprehensive indexes of the two cities, and then based on the construction of coupling degree model, deeply analyzed the internal relationship between digital economy and the high-quality development of manufacturing industry. Some scholars have carried out corresponding path and effect research centering on the characteristics of digital economy, such as high innovation and strong permeability. Xu Xing et al. (2023) analyzed the coupling effect of digital technology as an

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industrial common technology, a short-cycle technology and the improvement of manufacturing technology innovation efficiency from the dual perspective of technological innovation efficiency improvement and geographical spillover of technological innovation. Wu Jianhui and Xu Zhiyu (2023) analyzed the mechanism of digital economy affecting the green transformation of manufacturing industry. Based on the panel data of 30 provinces, autonomous regions and cities in China from 2011 to 2020, they constructed the intermediary model, threshold model and spatial Durbin model to empirically test the effect and path of digital economy affecting the green transformation of manufacturing industry.

With the vigorous development of digital economy, the factor advantage of data has become increasingly prominent. The manufacturing industry can collect and analyze massive data through the application of digital technology, so as to better understand the market demand, product design, supply chain management and other aspects, and optimize the manufacturing process and decision-making based on data-driven methods, improve efficiency and quality. In terms of the reconstruction and efficiency improvement of manufacturing production process by digital economy, digital economy deconstructed the linear and one-way industrial organization structure and production process of traditional manufacturing industry through the interconnection of resources, elements, objects and personnel (Huang Qunhui, 2018). Digital modularity promotes the reduction of the technological threshold of manufacturing industry (Xing Yuqing and He Yunzhen, 2018). In the era of digital economy, open collaboration has become an important trend in the development of the manufacturing industry. In terms of digital economy's impact on the division of labor and industrial competition in the manufacturing industry chain, digital technology is conducive to shortening the transaction distance of small and medium-sized enterprises and reducing trade costs (Lanz R and Lundquist K, 2018), changing the way of value creation in the manufacturing industry, improving the efficiency of value creation and enhancing the ability of value acquisition (Lyu Tie and Li Zaichi, 2021).

4. Conclusion

By exploring the relationship between digital economy and the high-quality development of manufacturing industry, this paper draws the following conclusions: (1) Digital economy can promote the high-quality development of manufacturing industry through information effect, value-added effect and innovation effect. (2) Exploratory innovation and exploitative innovation can play an effective intermediary role between digital economy and the high-quality development of manufacturing industry, and digital economy can indirectly promote the high-quality development of manufacturing industry through exploratory innovation and exploitative innovation. (3) Institutional environment has a positive moderating effect on the relationship between digital economy and the high-quality development of manufacturing industry, that is, when the institutional environment of the region where the enterprise is located is better, the development of digital economy can effectively promote the high-quality development of manufacturing industry.

Based on the above conclusions, this paper puts forward the following suggestions. We should optimize and upgrade network infrastructure, accelerate the construction of 5G networks, transform and optimize broadband networks, and actively deploy the next generation Internet. We will coordinate the distribution of data and computing infrastructure, accelerate the development of green data centers, and accelerate the building of an application ecosystem for computing centers. We will accelerate the development of integrated infrastructure, and promote intelligent transportation and logistics facilities, energy facilities, and ecological and environmental facilities. Second, we will strengthen core industries in the digital economy. We will foster and strengthen emerging digital industries, vigorously develop the software service

industry, strengthen the innovative application of artificial intelligence, accelerate the development and application of blockchain, and promote the in-depth application of satellite industries. We will make breakthroughs in the core electronics industry and accelerate the development of the data service industry. Third, we will deepen the digital transformation of the manufacturing industry. We will implement a leading project for smart transformation, build a number of smart workshops and factories, and build a number of smart manufacturing benchmarking enterprises to drive the digital transformation of the whole industrial chain. We will implement the industrial Internet development project. We will upgrade enterprise intranets and build a number of benchmarking enterprises' intranets and 5G fully connected factories. We will carry out projects to foster new models and forms of business. We will support manufacturing enterprises in developing new models and forms of business, such as platform-based design, intelligent manufacturing, networked collaboration, personalized customization, service-oriented extension, and digital management.

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