Proceedings of the 2nd International Conference on Business and Policy Studies
DOI: 10.54254/2754-1169/12/20230647

Research on the Transformation and Upgrading of Manufacturing Industry Driven by New Infrastructure in China

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Abstract: Manufacturing industry plays an important role in driving economic development and participating in international competition. Under the background of the layout of new infrastructure in China, it is urgent to drive the transformation and upgrading of manufacturing industry with the help of new infrastructure. This paper analyzes the difficulties in the transformation and upgrading of China's manufacturing industry, and then explores the main driving force of new infrastructure to promote the transformation and upgrading of manufacturing industry. This paper found that communication network infrastructure, new technology infrastructure and cloud computing infrastructure can improve the efficiency of manufacturing industry, and converged infrastructure can enable the transformation and upgrading of manufacturing industry. This paper is of great significance for solving the difficulties and shortcomings in the transformation and development of manufacturing industry and achieving high-quality economic development. It also provides a reference for further optimizing the investment direction of new infrastructure construction.

Keywords: infrastructure investment, new infrastructure, industrial structure upgrading, manufacturing transformation

1. Introduction

With the rapid evolution of science and technology, especially the huge impact of China-US trade friction and the COVID-19 epidemic, new infrastructure has become an important starting point for China's economic transformation and structural adjustment [1]. In December 2018, President Xi Jinping clearly put forward the concept of new infrastructure construction, and point out that the commercial use of 5G should be accelerated, and the construction of new infrastructure such as artificial intelligence, industrial internet and internet of things should be strengthened. Since then, new infrastructure has been mentioned many times in the relevant central meetings. The 2020 government work report clearly pointed out that it is necessary to strengthen the construction of new infrastructure, stimulate new consumer demand and help industrial upgrading. It can be seen that in order to overcome the impact of the pandemic and cope with the challenge of "anti-globalization", China has timely taken major measures to increase the construction of new infrastructure, in order to enable industrial transformation and upgrading and economic development.

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Manufacturing industry has greatly boosted China's economic development and international competitiveness. At present, with the obvious increase in the complexity of domestic environment and the change of internal factor conditions, the manufacturing industry is increasingly large but not strong, comprehensive but not excellent, and faces an urgent need for transformation and upgrading. China's "14th Five-Year Plan" clearly proposes to deeply implement the strategy of making China a strong country and keep the proportion of manufacturing industry basically stable, which fully demonstrates China's determination to promote the development of manufacturing industry. With the continuous development of China's new infrastructure, especially under the stimulation of 5G network and artificial intelligence, the networked and intelligent upgrade of the manufacturing industry will usher in major development opportunities.

In this paper, we analyze the problems faced by the transformation and upgrading of China's manufacturing industry, and then explore the main drivers of new infrastructure driving the transformation and upgrading of the manufacturing industry. This is of great significance for solving the difficulties and shortcomings of the transformation and development of the manufacturing industry and achieving high-quality economic development, and also provides a reference for further optimizing the investment direction of new infrastructure construction. The rest of this paper is arranged as follows. The second section is the literature review, The third section is the main dilemma of the transformation and upgrading of manufacturing industry. The fourth section is the new infrastructure injecting new impetus into the transformation and upgrading of manufacturing industry. And the fifth section is the conclusion and implications.

2. Literature Review

2.1. The Connotation of New Infrastructure

New infrastructure construction mainly includes but is not limited to seven major areas, including 5G infrastructure, ultra-high voltage, intercity high-speed railways and intercity rail transit, charging piles for new energy vehicles, big data centers, artificial intelligence and industrial Internet. Scholars have discussed new infrastructure from different perspectives. Sheng and Yang believe that the new infrastructure is a new generation of digital infrastructure system that provides intelligent products and services oriented by a new round of technological revolution [2]. Liu believes that the new infrastructure should be the infrastructure of the new industrialization, including not only “seven major areas” mentioned above, but also all kinds of infrastructure to support the deepening and expanding industrial revolution [3]. Pan and Wan pointed out that a systematic and qualitative 'intergenerational leap' feature is the core of the new infrastructure [4]. Therefore, compared to the traditional infrastructure, the new infrastructure lays more emphasis on information technologies such as 5G, internet of things, artificial intelligence and industrial internet, and endows the infrastructure with information technology connotation, which has the dual attributes of technology and infrastructure.

2.2. The Impact of New Infrastructure on Industrial Development

Existing research have paid sufficient attention to the impact of infrastructure construction on industrial development. Among them, Mourmouras and Rangazas believe that infrastructure construction can ensure sustainable economic growth and will have an impact on the national industrial structure [5]. Guo and Wang constructed a two-sector general equilibrium model to analyze the impact of infrastructure on industrial structure transformation and productivity and confirmed that the industrial spillover of infrastructure still has room for full play, and investment in infrastructure is not only a steady growth, but also a guarantee to improve labor productivity [6]. Wu et al. found that new infrastructure mainly promoted the technical efficiency improvement of new materials

DOI: 10.54254/2754-1169/12/20230647

industry and biological industry but had no significant impact on the technical efficiency improvement of other industries [7]. For regions, new infrastructure has promoted the improvement of technical efficiency and comprehensive technical efficiency of strategic emerging industries in the central and western regions, but has not played a prominent role in the eastern and northeastern regions. Gao et al. discussed the impact of new infrastructure in the fields of public education, health care, smart city, contact-free economy and pension industry from three aspects of internet infrastructure, new consumption-oriented infrastructure and safety and health-oriented infrastructure [8]. Ma et al. regarded the "Broadband China" pilot as a quasi-natural experiment and tested the impact of the pilot on the upgrading of urban industrial structure, and the results showed that the "Broadband China" pilot promoted the rationalization and advanced level of industrial structure [9]. It can be found that the existing literature has conducted more studies on whether new infrastructure can promote industrial development, but previous research on the transformation and upgrading of manufacturing driven by new infrastructure needs to be further studied.

3. Main Dilemma in the Transformation and Upgrading of Manufacturing Industry

Manufacturing industry is an important boosting force for economic and social development. Although China has the title of "world factory", the transformation and upgrading of the manufacturing industry is imminent, and it faces a series of problems in the development process.

The first problem is that the low-cost advantage of Chinese workers is decreasing, and the independent innovation ability of manufacturing industry needs to be strengthened. Demographic dividends and labor costs, once important drivers of China's global competition, are fading away. Because of the annual increase in labor costs, a growing number of manufacturing orders have gone to developing countries such as Vietnam and India with lower labor costs. Statistics show that the average worker's salary in China is 4,800 yuan, while it is only 1,100 yuan in countries like Vietnam and India. Many labor-intensive manufacturing industries in China are facing severe competition, which forces the transformation and upgrading of China's manufacturing industry. Instead of keeping labor costs low, China must improve its capacity for independent innovation, adopt a high degree of vertical division of labor in the industrial chain, focus on product research and development, and strengthen brand sales channels.

The second problem is that the manufacturing industry chain is not perfect, and the platform system needs to be improved urgently. As the largest manufacturing base in the world, China still has the phenomenon of imperfect industrial chain and not clustered industries in terms of manufacturing. An important symbol of the competitiveness of the world's advanced manufacturing industry is the formation of modern manufacturing clusters. At present, China's modern manufacturing industry has few leading global advanced manufacturing clusters, and many manufacturing firms gather, but the degree of internal coordination is not high. The development of industrial clusters such as business docking, supply and demand balance, and market cooperation needs to be improved. Moreover, the contradiction between supply and demand has become increasingly prominent. On the one hand, there is overcapacity in low-end manufacturing industries with low entry barriers. On the other hand, for high-end equipment fields with high entry barriers, such as micron, nano and sub-nano levels, the manufacturing equipment industry chain is not perfect, and the supply cannot keep up with the demand. Compared with the US, China's manufacturing industry is dominated by labor-intensive low-technology and medium-low technology manufacturing industries. Its exports to the US are mainly low-technology, low-cost and low-end value chain products, while its imports from the US are mainly high- technology, high-added value and high-cost products. The manufacturing industry in the US, dominated by high-tech manufacturing, is at the top of the value chain, and the service industry is extremely developed. Information industry is a retained industry in which the United States has competitive advantages. Among them, leading firms in emerging industries such as IBM and

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Microsoft drive the sustained growth of the American economy. Although China is in the post-industrialization stage, there is still a gap between China's industrialization level and that of the United States.

The third problem is that China's manufacturing industry has fallen into the trap of low-end lock-in, and the construction of high-quality brands needs to be strengthened. Most of the products made in China are labor-intensive products with low profits. They are mainly processed and assembled, and they are located at the bottom of the smile curve value chain. The low added value of products directly affects the overall profitability of China's manufacturing industry. Due to people's demand for a better life have turned to demand for differentiation, high quality products, high-end products in the manufacturing and service supply effectively, make the brand and awareness is not enough, many manufacturing has not yet formed a complete industrial chain and into the scale of industrial cluster, especially many of the end product is not really completely independent intellectual property rights, There are not enough famous high-end brands with great influence in the global international market, and relatively few famous enterprises with strong economic strength, so the products are not competitive in the international high-end market. People's demand for a better life has shifted to the demand for differentiated and high-quality products. At present, the effective supply of high-end products and services in manufacturing is insufficient, and the manufacturing brands and popularity are not enough. Many manufacturing industries have yet to form a complete industrial chain and a large-scale industrial cluster. In particular, many terminal products do not really have completely independent intellectual property rights, and there are not many high-end well-known brands with great influence in the global international market. At the same time, there are relatively few famous firms with strong economic strength, so that the products lack competitiveness in the international high-end market. For developed countries, Germany's high-end precision instruments account for about one-third of the global market. Germany also has advanced technology machine tools, the giant collider built by Siemens, and the world's most powerful gas turbine developed by Siemens. Japan has many globally competitive manufacturing industries, and has cultivated many manufacturing giants such as Honda, Komatsu and Fuji in the automotive, semiconductor, machine tool, construction machinery and other industries. Although the scale of China's manufacturing industry is huge, it lacks real core technologies and high-quality brands.

4. New Infrastructure Injects New Impetus into the Transformation and Upgrading of Manufacturing Industry

4.1. Communication Network Infrastructure Drives Manufacturing Efficiency

Communication network infrastructure mainly includes 5G, internet of things, the internet and other new infrastructures. The application of 5G technology in firm production can meet the data transmission needs of remote operation such as machine control and ultra-high-definition video surveillance, and help firms to remotely control production, transportation and other processes, so as to help the manufacturing industry achieve unmanned operations, improve the efficiency of manufacturing industry and reduce the production cost of manufacturing industry [10]. 5G can help firms better complete product sales and improve their sales performance. Manufacturing firms can improve their sales performance through more accurate big data marketing, high-quality personalized services and faster and more convenient intelligent after-sales service through 5G technology.

4.2. New Technological Infrastructure Drives Manufacturing Efficiency

New technological infrastructure, which mainly includes artificial intelligence, blockchain and other technologies, is an important driving force and path for the new economy to drive the transformation and upgrading of the traditional economy. By simulating the information process of human

DOI: 10.54254/2754-1169/12/20230647

consciousness and thinking, artificial intelligence can create intelligent machines that make decisions similar to human thinking process, which can help firms to realize the unmanned production of manufacturing products, improve the matching degree of production products and market demand, and reduce the probability of waste products [11]. Blockchain is a decentralized shared database, which can solve the problem of information asymmetry, help customers understand the whole process of product production, enable consumers to master more product information, increase the understanding of products, and help firms pay more attention to product quality, so as to improve the production efficiency of firms.

4.3. Cloud Computing Infrastructure Drives Manufacturing Efficiency

Cloud computing infrastructure mainly includes data centers and intelligent computing centers, etc. With the explosive growth of the total amount of information data in the information age, the requirements for computing power and computing efficiency are getting higher and higher. With the help of big data analysis technology provided by data centers, intelligent computing centers and other computing infrastructure, on the one hand, firms can build an intelligent decision-making analysis platform to realize information sharing, promote R&D innovation, help energy conservation and environmental protection, expand sales channels, establish overseas platforms, and carry out distribution trade. On the other hand, firms can also analyze user needs, build user portraits, carry out precision marketing, improve customer experience and increase customer conversion rates.

4.4. Converged Infrastructure Drives the Transformation and Upgrading of Manufacturing Industry

Through the industrial internet, the production and manufacturing process of products can be monitored in the whole process, namely, forward tracking, reverse tracking, risk control, cause investigation and liability investigation. The interconnection in logistics can improve the safety, convenience and efficiency of logistics, and promote the realization of intelligent manufacturing. Integrating innovation and manufacturing resources from different places can help firms analyze problems in the production line, break the situation that every firm must have the required resources in its hand, solve the problem of information islands between firms, improve the production line capacity, and make full use of all resources. With the help of industrial software or industrial APP, lean production can be realized, personalized needs of users and consumers can be better met, and more accurate and fast services can be provided [12].

5. Conclusions and Implications

In the context of the domestic layout of new infrastructure, this paper analyzes the problems faced by the transformation and upgrading of China's manufacturing industry, and then explores the main kinetic energy that new infrastructure drives the efficiency and upgrading of the manufacturing industry. This paper shows that communication network infrastructure, new technology infrastructure and cloud computing infrastructure can improve the efficiency of manufacturing industry, and converged infrastructure can enable the transformation and upgrading of manufacturing industry. In order to actively connect with the cutting-edge competition in manufacturing, strengthen the overall planning, seize the opportunity of the times, and promote the construction of China's manufacturing power, this paper puts forward the following suggestions.

First, improve the independent innovation capability of manufacturing industry. In the context of new infrastructure, on the one hand, new technologies can provide technological innovation support for manufacturing firms, drive to high-end manufacturing, and promote the transformation and upgrading of traditional manufacturing. Relying on the 5G mobile communication, internet

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technology, etc., combined with the actual situation of the industry, formulate long-term strategic plans, improve the R&D, enhance the ability of basic independent development, guide the high-end extension of the industrial chain, and promote the upgrading and adjustment of manufacturing industry. On the other hand, the use of new infrastructure provides firms with tools for business model innovation. The combination of technological innovation and business model innovation can maximize the commercial value of innovation results and realize the transformation and upgrading of manufacturing industry.

Second, improve the innovation platform system of the manufacturing industry. Use the internet, cloud computing, big data, artificial intelligence and other information technologies to integrate innovation resources and create a comprehensive platform for the innovation capability of the manufacturing industry. Use cloud computing, big data and other technologies to collect, mine and analyze industry data, analyze and quickly respond to consumer needs, and improve the manufacturing and production capabilities of firms. In addition, the combination of big data and intelligent manufacturing can more accurately analyze market demand, help firms break down information barriers, achieve zero-distance contact with consumers, link market information and consumer demand with enterprise production, and achieve lean production management. Use data to drive enterprises to carry out intelligent production, optimize and control the activities of R&D, manufacturing, marketing and after-sales service in the enterprise value chain, and realize the transformation and upgrading of manufacturing industry.

Third, increase innovation in building high-quality brands in the manufacturing industry. Residents' consumption demand is increasingly entering the stage of high-quality consumption. In the past, consumption focused on high quality and low price, but now consumption pays more attention to quality and health. In order to meet the diversified consumption needs of consumers, the rise of China's high-quality manufacturing brands is the responsibility, and the quality of the brand determines the living space and internal support of the firm. It is necessary to strengthen the quality construction of the manufacturing industry, focus on manufacturing industry technology, industry, components, materials, etc., strengthen applied research, innovate design, and promote the high-quality transformation of scientific and technological achievements. And, it is necessary to strengthen the legislation and supervision and management of product intellectual property protection, protect the interests of Chinese high-quality brand innovators, and better stimulate the development of high-quality innovative brands.

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