

The Influence of the Development of Digital Economy on the Structural Upgrading of Manufacturing Industry in China

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Abstract: Throughout the process of global industrial change, technological progress has been the core decisive force. Every technological progress has been accompanied by a substantial increase in productivity, and realized the transformation and upgrading of traditional industries through the deep integration of technological innovation and traditional industries, forming a new industrial form. At present, China is in the critical stage of economic structural transformation. Digital economy, as a new economic form, provides new opportunities for the transformation and upgrading of manufacturing industry. The configuration effect of the digital economy not only changes the way of knowledge acquisition, but also improves the efficiency of factor allocation, which can bring significant economic effects. Therefore, it is of great significance to seize the opportunity of the new round of digital technological revolution to realize the transformation and upgrading of manufacturing industry.

Keywords: Digital Economy, Manufacturing industry, Structural Upgrading.

1. Introduction

With the rapid development and widespread popularization of digital technology, Internet terminals and digital thinking, the digital technology system with big data, cloud computing, blockchain, artificial intelligence, etc. being the core has widely affected the development and transformation of traditional industries. With the innovation of industrial development concept, the empowerment of industrial technology application and the innovation of industrial management, the digital economy has effectively promoted the sustainable innovation and development of various industries, improved the operating efficiency of traditional industries, enhanced the competitive vitality of traditional industries, boosted the internal development power of traditional industries, and provided favorable business ideas, technological empowerment and innovation paths for the further transformation and upgrading of China's economy.

2. Basic Understanding of Digital Economy

2.1. The Connotation and Category of Digital Economy

Tapscott Don (1996) [1] put forward the concept of digital

economy for the first time in a book called Digital Economy. In the book, he analyzed the characteristics of digital economy from three aspects: digital economy and its elements, business and governance under the Internet scenarios, and leadership to adapt to the era of change. He pointed out that compared with traditional economy, information flow in the new economic era exists in a digital way. Digital economy is a concept with a broad connotation, which continues to expand with the human society gradually entering a new stage marked by digitalization. In 2018, in the report of "Defining and Measuring Digital Economy", the US Bureau of Economic Analysis pointed out that the digital economy is composed of three parts: related infrastructure development, e-commerce and digital media. Based on the research results of the international community on the concept of digital economy, this paper holds that the digital economy takes digital knowledge and information as the key production factors, digital technology as the core driving force, and modern information network as the important carrier, and constantly improves the digital, networked and intelligent level through the deep integration of digital technology and real economy, accelerating the reconstruction of a new economic form of economic development and governance mode.

Table 1. The classification of digital economy industry [2]

No.	Classification	Major Industries
1	Digital product manufacturing industry	Computer manufacturing, communication and radar equipment manufacturing, intelligent equipment manufacturing
2	Digital product service industry	Digital product wholesale, digital product retail, digital product leasing
3	Digital technology application industry	Software development, telecommunication broadcasting and satellite TV transmission services, information technology services
4	Digital factor-driven industry	Internet platform, Internet wholesale and retail, Internet finance, digital content and media, information infrastructure construction
5	Digital efficiency promotion industry	Intelligent agriculture, intelligent manufacturing, intelligent transportation, intelligent logistics, digital finance, digital commerce, digital society, digital government

2.2. Progress in Digital Transformation of Manufacturing Industry in Developed Countries

Different countries and industries have different definitions of digital transformation. The digital transformation of the United States is mainly to form a more efficient production system by connecting virtual networks and entities. Germany's digital economy strategy is reflected in its "Industry 4.0" strategic layout. In 2016, Germany released "Digital Strategy 2025", which identified 10 action areas of "Digital Germany" from the national strategic level, including: building a gigabit optical fiber network, supporting entrepreneurship, establishing a regulatory framework for investment and innovation, promoting intelligent interconnection in the field of infrastructure, strengthening data security and safeguarding data sovereignty, promoting the digital transformation of small and medium-sized enterprises' business models, implementing "Industry 4.0", strengthening the R & D and innovation of digital technology, realizing digital education at all stages, and establishing a federal digital agency. The UK put forward the "UK Digital Strategy", which mainly includes seven strategic tasks of connectivity, skills and inclusiveness, digital sector, macro-economy, cyberspace, digital governance and data economy. In 2019, Japan proposed "Society 5.0", aiming to replace capital with data and drive everything through technologies such as artificial intelligence, Internet of things, robots, etc. to infiltrate digitalization into all levels of economy, society and life, generate new values and services, and finally realize the high integration of virtual space and real space, forming a "super intelligent society".[3]

3. The Influence of the Development of Digital Economy on the Structural Upgrading of Manufacturing Industry in China

3.1. The Development of China's Digital Economy Enables "Made in China" To Move Towards "Intelligent Manufacturing in China"

In recent years, breakthroughs in enabling technologies such as artificial intelligence, knowledge engineering and neural networks have opened the era of intelligent transformation of manufacturing industry. Unlike the substitution of machines for human physical labor in the digital and networked transformation, the intelligent transformation has realized the expansion and substitution of machines for mental labor, and enables machines to have the functions of self-learning, self-perceiving and self-deciding, forming a new development mode of intelligent manufacturing.

Intelligent production is to integrate advanced manufacturing technology with the new generation of information technology, and make the intelligent transformation of the whole production process based on data, scene, algorithm and computing power to realize the intelligent production mode such as automatic order receiving, machine learning, intelligent decision-making, intelligent production scheduling, process monitoring, equipment perception, etc. Intelligent production was first proposed by the United States in the 1990s. Other industrial developed countries such as Germany and Japan also formulated their own intelligent manufacturing development plans. Intelligent production is developed from digital production and networked production, which has completed the evolution from program control to the internet of everything and then to intelligent manufacturing. Intelligent production can reduce time, land and labor costs, reduce energy consumption, and improve the quantity, quality and technological level of products, which can increase the added value of the whole industrial chain, especially the manufacturing link, lift and flatten the "smile curve", and promote the upgrading of the manufacturing industry.

A typical smile curve is shown in the figure 1. From the left to right at the horizontal axis, there are the upstream, midstream and downstream manufacturers of the industry. Specifically, the upstream manufacturers include R&D and design, parts manufacturers, the midstream includes product assembly manufacturers, and the downstream includes brands, distributors, and after-sales service providers. The vertical axis reflects the level of added value. It is not difficult to find that both ends of the smile curve rise, which means that R&D and marketing are at the level of high added value, while the middle part of the curve sinks, which means that the assembly and manufacturing are at the level of low added value. This curve corresponds to the current economic situation in many industries.[4] At present, the profit generated by manufacturing is low, and the global manufacturing supply has exceeded the demand, thus the middle of the curve is sinking. However, the added value of R&D and marketing is high, which is the reason why both sides of the curve rise. R&D and marketing correspond to the parts with high threshold and low competitiveness of the value chain principle, while assembly production corresponds to the parts with low threshold and high competitiveness, which is also the environment faced by the manufacturing industry in China.

With the development of "intelligent manufacturing", all links in the value chain will jointly create, transmit and share value. In this way, the "Internet + industry" will conduct a transformational reshaping of the "smile curve" that is the value chain of the manufacturing industry. Personalized customization gives the front-end R&D design to the user, and users directly place orders with enterprises, which also weakens the back-end sales, thus flattening the "smile curve" and re-integrating into the value chain.

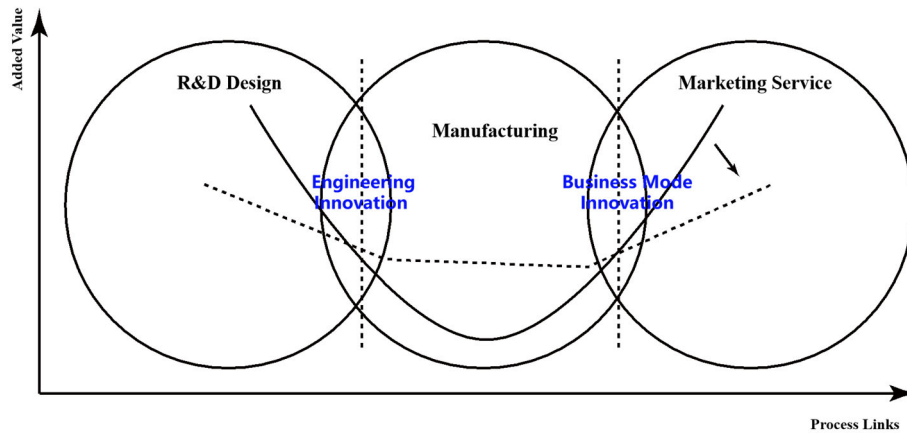


Figure 1. The change of “smile curve” of manufacturing industry under the background of intelligent manufacturing

3.2. The Development of Digital Economy Is A Breakthrough for China to Avoid the Middle-Income Trap

Economic structure and economic growth are mutually causal, mutually affecting and closely related. Different forms of economic structure reflect different modes of economic growth, and the transformation of economic growth mode is largely determined by economic structural adjustment. Economic growth is not only the result of the transformation and upgrading of economic structure, but also the reason for the further transformation of economic structure. Only by combining the process of economic growth with the comprehensive transformation of economic structure can we promote the transformation of economic growth mode, optimize the economic structure, and bring high growth quality, thus promoting the healthy and sustainable development of the economy.

The importance of economic structural transformation to

economic growth is self-evident. If countries fail to timely transition from resource-driven growth with low-cost labor and capital to productivity-driven growth, they will fall into the middle-income trap [5]. However, economic structural transformation is often a painful process. In the process of world economic development, there are many countries that fell into the middle-income trap due to their failure to grasp the opportunities of structural transformation. For example, the stagnation of economic structural transformation in Latin American countries is one of the fundamental reasons why they fell into the middle-income trap. Similarly, for countries in the process of economic structure transformation and upgrading, the risk of falling into “transformation trap” cannot be ignored. As far as China is concerned, the resources and environment that can promote rapid economic growth in a short term are no longer sufficient. The potential inducements of the “transformation trap” may be factors such as uncoordinated regional economic development, widening income distribution differences, and increasing constraints from the resource and environment.

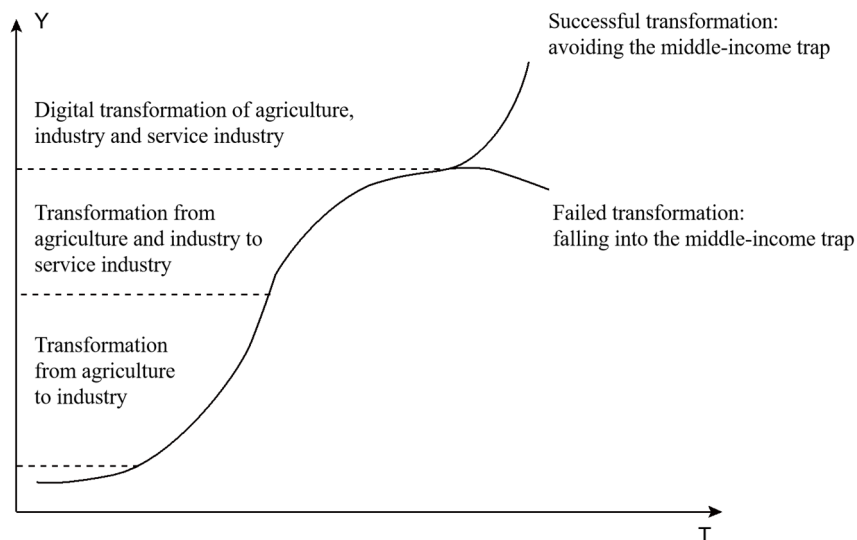


Figure 2. China’s economic structure transformation and economic growth

As shown in Figure 2, China is currently in a critical period of economic and social digital transformation. To get out of the “transformation trap”, it is urgent for China to break through the obstacles of mechanism and system that hinder

the transformation of economic structure, grasp the historical opportunities of digital economic development, take digital transformation as a breakthrough to overcome the middle-income trap, and breed new drivers of economic growth

through the transformation and upgrading of economic structure and adjustment of growth mode.

3.3. Digital Technology Innovation Is A New Driving Force for The Upgrading of Manufacturing Structure

Firstly, a number of high-tech industries have emerged. The information technology revolution has promoted the formation of the digital economy paradigm. A number of high-tech industries have emerged in China's manufacturing industry, such as the production data elements including cloud storage equipment manufacturing and the electronic information manufacturing industry that provides information and communication technology, as well as the mechanical equipment manufacturing industry where data elements and information and communication technology are applied most intensively, including the production of high-end CNC systems, intelligent logistics and storage equipment manufacturing, industrial robots, additive equipment manufacturing, etc. As the driving and transmitting sectors of the digital economy paradigm, these industries are the major force of economic growth, expanding the proportion of output value of high-tech industries.

Secondly, the technological level of existing industries has been improved. The integration of information and communication technology with manufacturing technology has been applied to the development, production and marketization of new products, replacing the original process flow, making the manufacturing industry undergo digital, networked and intelligent transformation, and evolve from a labor-intensive industry to a technology-intensive industry.

Thirdly, digital technology innovation has promoted the upgrading of the factor structure and market structure of the manufacturing industry. The upgrading of industrial structure is affected by technological structure, factor structure and market structure, among which technological structure is the major factor. On the one hand, technological innovation is conducive to the increase of the supply quantity, quality and technological level of the manufacturing industry, further stimulating the market demand for intelligent equipment and

intelligent products. On the other hand, the diversity of demand drives the reform of supply structure and technological innovation. The rationalization of both technical structure and supply & demand structure can be realized.

4. Conclusion

This paper analyzes the influence of the development of digital economy on the structural upgrading of manufacturing industry in China, and is of significance to the realization of digital transformation of manufacturing industry. The author believes that the digital economy provides opportunities for the manufacturing industry of developing countries to narrow the gap and catch up with developed countries, and the world economic pattern will face profound adjustment. The next 30 years are the golden development period of the digital economy paradigm. Whether China can seize the opportunity of the times and make the core technology breakthrough as soon as possible is of great importance for the promotion of industrial transformation and upgrading as well as the building of a manufacturing power.

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