How can China leapfrog the “middle-income trap”in the digital economy?

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Abstract. At present, China is only one step away from crossing the "middle-income trap", which has become a common concern in the industry and academia. Meanwhile, the booming digital economy based on big data, blockchain and artificial intelligence provides an important opportunity for China's economy to "overtake". This paper answers how the digital economy can help China cross the "middle-income trap" from the demand side and the supply side respectively, as well as some thoughts on the policy regulation of the digital economy by government departments in this process, and provides policy suggestions for China to use the digital economy to cross the "middle-income trap".

1.Background of the study of digital economy to help cross the "middle-income trap

The concept of "middle-income trap" is used to describe the phenomenon that some developing economies cannot sustain economic growth in the process of moving from middle income to high income and stagnate in their current economic growth pattern. This phenomenon was first seen in Brazil and Colombia after World War II, which have not escaped from the "middle-income trap" for many years until now, thus entering the ranks of high-income countries. On December 17, 2021, China's gross domestic product (GDP) in 2020 was 1,013,567 billion yuan, with a per capita gross national income (GNI) of $10,610, as finally verified by the National Bureau of Statistics (NBS) in the preliminary accounting. Compared to 2019's GDP of 986,515 billion yuan, GNI per capita is US$10,390, the first time China has reached the trillion yuan mark and the only major economy in the world to achieve positive growth in 2021. China has gone through the low-income stage from 1978-1998, the lower middle-income stage from 1999-2009, and the upper middle-income stage from 2010-2020, and is now just a "foot away" from crossing the middle-income trap. The 13th Five-Year Plan and the 5th Plenary Session of the 19th Central Committee also mentioned that efforts should be made to cross the "middle-income trap" and the 2035 visionary goal of reaching the level of medium developed countries in terms of GDP per capita. From the perspective of China's GNI per capita in 2020, China is only one step away from crossing the middle-income trap. Therefore, the five years of the 14th Five-Year Plan from 2021 to 2025 is a critical period for China to cross the middle-income trap. Looking around the world, the situation of competition and strategic games among major powers is intensifying. China's difficulties and resistance in expanding overseas markets will increase significantly. Throughout the country, China is changing its economic growth model and moving to a stage of high-quality economic development from supply-side structural reform, but the supply-side factors that support our economic development, such as population, capital, technology and other aspects of the dividend is gradually decaying. As the world's second-largest economy for a long time and still maintaining positive economic growth after the impact of the new crown epidemic, whether China can successfully cross the middle-income trap will certainly cause the academia and industry to think.

As mentioned earlier, China faces a complex international political situation as well as a domestic economic environment with receding dividends. However, unlike the situation of gradually declining dividends of factors of production such as population and capital, the corresponding situation is the booming digital economy. With the rapid development of big data, cloud computing, blockchain and artificial intelligence, data, as a new type of production factor different from traditional production factors, has been officially included in China's vigorous development plan. Compared with traditional factors of production such as population and capital, Fei et al. (2018) [1] found that "data" has relatively low storage costs and can break through traditional resource constraints and growth limits, while its marginal output is much higher than marginal costs. Ding (2020) [2]also pointed out that data can be integrated with traditional factors of production to expand the boundaries of production possibilities and bring higher productivity. Qi and Chu (2021) [3]proposed a Chinese solution to achieve economic structural transformation in China to cross the "middle-income trap" in the context of digital economy. There is not much literature on how to cross the "middle-income trap" in China from the perspective of the digital

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economy and how to regulate the digital economy in the process to help it better achieve the function of crossing the "middle-income trap". Therefore, based on the background of the booming digital economy, this paper attempts to answer the question of how the digital economy can help China cross the "middle-income trap"? And how should the government regulate the digital economy in this process? The answers to the above two questions are of great theoretical and practical significance. On the one hand, it helps to clarify the important functions of digital economy in crossing the "middle-income trap", and on the other hand, it provides theoretical support for the relevant policies of Chinese government departments.

2.Analysis of the path of digital economy to help cross the middle-income trap

The digital economy can promote high-quality economic development from both the demand side and the supply side, and help to cross the "middle-income trap". On the one hand, the digital economy can improve the shortage of effective demand, stimulate the transformation and upgrading of residents' consumption, invest in new infrastructure of digital economy, and enhance the international comparative advantage of products and services to boost exports. On the other hand, the digital economy vigorously promotes supply-side structural reform, optimizes the allocation and combination of factors, and promotes industrial model improvement and industrial transformation and upgrading.

2.1. Digital economy pulling effect based on the demand side

The direct pull of the digital economy on China's economic quality is most obvious in the upgrading of consumption, and the form of consumption of Chinese residents has been transformed and upgraded from the traditional offline consumption to digital consumption, and this growth momentum is relatively strong. According to statistics, the pull of consumption to the national economy in 2020 is 54.4%, accounting for more than half. According to CNNIC data, by the end of 2020, China's e-tailing will account for 30% of the total retail sales of social consumer goods. The General Office of the State Council issued the "Opinions on Accelerating the Development of Circulation to Promote Commercial Consumption", which points out the use of big data, cloud computing, mobile Internet generation information technology to cultivate new models of intelligent consumption, information consumption and so on. The State has introduced a series of policies and measures to promote consumption, reflecting that the digital economy is transforming the consumption habits, behavior and structure of the population to help China's economy achieve high-quality development. Currently, scholars have conducted theoretical and empirical studies on issues related to the effect of driving high-quality economic development through promoting consumption in the digital economy era. Zhang and Tan (2019) [4] studied the development of digital economy based on the perspective of digital economy development by empirically testing that the development of digital economy helps to enhance residents' consumption through digital inclusive finance index and Chinese household tracking survey. Ma (2020) [5]based on Marxian production as a theoretical basis, systematically sorts out the functional role played by the digital economy in the transformation of China's residential consumption and the inner mechanism of its role, arguing that the digital economy can promote the transformation and upgrading of China's residential consumption through information transmission, consumption scenarios and tapping demand. Cheng and Gong (2020) [6] used a systematic GMM estimation method to find that digital inclusive finance can influence the development of the real economy by stimulating consumption.

The pull of the digital economy to the high quality of our economy is also reflected in the investment in the digitization of industries and digital industrialization. The digital economy has gone through four different stages: the consumer Internet, the industrial Internet, the industrial digital network and the industrial digital network that we are currently emphasizing. Since investment in the digital economy can yield high social returns in the short term and has greater development potential in the long term, investment in the digital economy has become a key area for both private and government investment. Xu (2017) [7] points out that the digital economy has been integrated into the global value chain, and digital multinationals investing in digital economy infrastructure in developing countries can rapidly improve the competitiveness of hosts and improve the domestic investment environment as well as the attractiveness to international investors. First of all, investment in digital industrialization, China still needs to further strengthen its R&D investment in high-end chips, operating systems, core components and other industries. The second is the investment in industrial digitization. Traditional industries integrate digital industries for enterprise digital transformation to help enterprises achieve high-quality development. The complementary innovation of digital industrialization and industrial digitalization can become the new grasp of "accelerating overtaking" and "changing lane to overtake" under the new situation.

The last point is that the pull of the digital economy on the high quality of our economy is also reflected in the cultivation of new advantages in exports. The digital economy is changing the form and pattern of international trade. Ju et al. (2020) [8] found that cross-border e-commerce helps to overcome fixed costs and provides new opportunities for international trade in non-coastal provinces and high value-added industries. Zhang and Li (2020) [9] analyzed in depth the integration role played by blockchain technology in cross-border e-commerce, digital economy and digital trade, and concluded that China needs to rely on blockchain technology to seize the new economic high ground. Yao (2021) [10] used data from 30 Chinese provinces using

structural equation modeling to find that digital trade can enhance the technological complexity of Chinese exports and improve the technological innovation capacity of Chinese exports.

2.2 Supply-side based digital economy pulling effect

The first stage of the digital economy is the demand-driven Internet stage, but the important driving force is actually on the supply side. To leap over the "middle-income trap" with the digital economy, it is necessary to play not only the pulling role of the demand side, but also the driving role of the supply-side structure. Scholars have studied the digital economy around the supply side, including industrial structure, enterprise digitization, and employment activeness. Zhang (2018) [11] argues that the digital economy drives China's industrial structure to the middle and high end by exploring new connotations of industrial development, expanding new business economies, production factors, and infrastructure, and giving rise to new areas of industry. Zhao et al. (2020) [12] found that the digital economy can enhance entrepreneurial activity and promote the prosperity of various types of SMEs. Moreover, it has a spatial spillover effect, which can drive innovation activity and high-quality economic development in surrounding areas. Jing and Sun (2020) [13] proposed a theoretical framework for the digital economy to promote economic development based on the higher resource allocation efficiency and total factor productivity generated by the economies of scale, scope and long tail economy of Internet technology with strong theoretical significance. Zhao et al. (2021) [14]used text analysis to construct an empirical study of enterprise digital transformation data and found that digital transformation improved the innovation capability of enterprises, optimized the human capital structure, and promoted the total factor productivity of enterprises through the spillover effects of intellectual capital and human capital, increased the proportion of productive service factors in the integration of two industries and improved the operation level of enterprises thereby. Liu et al. (2021)[15]used the tracking survey data of enterprises and applied the stochastic frontier model to find that the digital input and output efficiency of enterprises showed an inverted "U" shape relationship, and after the "painful period" before the critical point, the advantages of digital management of enterprises would be further highlighted and drive the enterprises to improve their total factor productivity. After the "painful period" before the critical point, the advantages of digital management of enterprises will be further highlighted and the output efficiency of enterprises will be improved. We can find that the digital economy can firstly change the production method of traditional manufacturing industries to make our supply system more high-quality, efficient and diversified. The value of digital elements is greatly exploited, so that the contradiction of mismatch between supply and demand structure in China is greatly alleviated. Secondly, the digital transformation of enterprises can help them share innovation resources at a lower cost, promote the transformation of large-scale achievements, and drive the total factor productivity and output efficiency of enterprises.

3. Policy regulation in the digital economy helps cross the middle-income trap

The information technology revolution has greatly promoted the development of digital economy, and the development of digital economy has greatly promoted the high-quality development of China's economy, helping China to cross the "middle-income trap". However, in the process of developing the digital economy, the government needs to regulate the digital economy accordingly. In view of the current problems in the development of China's digital economy, the following are some thoughts and suggestions:

First of all, huge amount of data is extracted and collected, and one thing we can make clear is that data is the key element and core resource of the digital economy. However, there are various problems for such factors of production as data, such as whether the data are collected according to law and regulations, whether the issue of ownership is clearly defined, whether the boundary of power is clear, and whether the rules of use are standardized, which are directly related to individual interests, collective interests and national public interests. On the one hand, the government should legislate to regulate the source, directory management, and security management of data resources, establish an appropriate market allocation mechanism for data elements, and improve the data asset protection system. The government should promote the sharing of data elements through the establishment of an integrated big data service platform, develop and implement management methods for sharing data elements, a regulatory system for public data resources, and a management mechanism for the aggregation, storage, and security of shared and open data. On the other hand, the government should improve the top-level design. China still lacks laws, systems and policies that are compatible with data elements, so it is urgent to improve laws, systems and policies related to data elements by clarifying transaction rules and regulatory measures through laws and regulations. At the same time, a sound punitive compensation system regarding digital resources is the key to enhance the security level and risk prevention level of data elements.

Secondly, clear property rights are the key to guaranteeing personal gains and the growth of the digital economy, and the institutional environment at this stage can no longer meet the requirements of the digital era. The government should be based on the new features of development in the digital economy era, and the foresight and scientific nature of legislation needs to be further strengthened. The existing intellectual property laws and regulations are no longer fully applicable, and there is an urgent need to further develop intellectual property laws and regulations in the digital era in order

to play the role of legal protection and policy support for economic and social development. On the one hand, it is necessary to improve the legal system of intellectual property from both the top-level design level and enhance the participation of intellectual property in the process of industrial and economic development policy making, so as to provide a good market environment and institutional guarantee. Through the reform of institutional mechanisms in related fields, we should improve the policy systems of market competition, finance and taxation, and innovation, and also maintain the enforcement system of intellectual property rights at the level of implementation and operation, so as to provide fundamental guarantees for the high-quality development of the digital economy.

Finally, the development of digital economy has also brought some negative impacts, such as the monopolistic behavior of Internet finance by Ant Financial, the "ripening" behavior of various digital platforms that target different users with big data and Data leakage and other issues. In recent years, China has also amended some existing economic laws, such as the Anti-Unfair Competition Law, the Anti-Monopoly Law, and the Law on the Protection of Consumer Rights and Interests, as well as enacted the E-Commerce Law and the Network Security Law to address these issues. Therefore, it is necessary to further explore the policy measures to prevent the disorderly expansion of data capital and maintain economic security, so as to help China achieve "crossing the middle-income trap".

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