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Research on the Deep Integration of Digital Economy and Real Economy-Take Beijing as an Example

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ABSTRACT

The integrated development of digital economy and real economy is the due meaning and necessary path for the transformation of national eco- nomic development from high speed to high quality. Deep integrated economic development can promote the driving force of innovative development, improve the efficiency of resource allocation, and improve the quality of economic development. Based on this, this paper to Beijing as the specific research object, through the analysis of Beijing digital economy and the real economy integration situation and the problems existing in the process of depth fusion, discusses the Beijing digital economy and real economy depth fusion measures should be taken to promote the depth of Beijing digital economy and the real economy, in Beijing to promote the economic development of high quality.

KEYWORDS: *digital economy; real economy; integrated development*

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1. INTRODUCTION

With the new wave of scientific and technological revolution and industrial revolution, especially the application of the new generation of information technologies such as big data, artificial intelligence, mobile Internet, cloud computing and 5G, mankind has entered the era of digital economy. With the continuous advancement of digital technology, the colossal scale effects and immeasurable digital dividends brought about by the digital economy are undeniable (Li,2023). The deepening of digital industrialization and industrial digital development, and the building of internationally competitive digital industrial clusters, have pointed out the direction and injected impetus for the digital economy to boost the high-quality development of the real economy. The deep integration of the digital economy and the real economy has become an important supporting force for national economic growth.

From the national economic development strategy to the international eco- nomic development trend under the new development pattern, the digital economy strategy is a necessary path for the national economy to achieve sus- tainable, stable and high-quality development. The deep integration of the digital economy and the real economy is not only conducive to the in-depth implementation of the digital economy strategy, but also can promote the industrial transformation and upgrading of the traditional real economy, and provide new development impetus and innovation opportunities for the high- quality development of China's economy. Cheng et al. (2023) found a positive nonlinear U-shaped relationship, demonstrating that real economy enterprises' TFP is reduced at the initial stage of digital transformation, then improves after exceeding a critical threshold value. Guoteng et al. (2022) adopted The data about China's digital economy and real economy from 2005 to 2019 to conduct an empirical analysis of the convergence level from 2005 to 2019 and predict the development trend from 2020 to 2029. Yuexu & Yujing (2022) ana- lyzesthe development status and distribution characteristics of digital finance, and studies the impact of digital finance on the growth of the real economy based on the panel data of 31

provinces in China from 2011 to 2020. Weiwei et al. (2023) also think that digital economy development has a significant positive effect on promoting a green economy.

Therefore, this paper will focus on the internal logic of the deep integration of digital economy and real economy, and based on the practice of Beijing, try to answer the questions and countermeasures of the deep integration of digital economy and real economy in Beijing.

2. Characteristics of digital economy

At present, there is no unified consensus on the definition of digital economy among countries and organizations around the world. However, in general, digital economy can be understood as: based on digital resources and as an important factor of production, so as to use information and communication technology to transform various production factors, as the main driving force, to promote the unity of fairness and efficiency to a certain extent. As a new economic form, digital economy can be interpreted from the four aspects of elements, technology, carrier and system. Among them, element refers to data resources and data value chain; technology refers to digital technology, information technology network technology, industrial technology and other related technologies; carrier refers to digital platform, basic facilities and modern information network; system refers to an organic whole composed of various aspects and fields of social and economic activities.

As a new model of economic development, digital economy has effectively promoted the change of the quality, driving force and efficiency of global eco- nomic development. In essence, the digital economy is digital knowledge and information as the key factors of production, digital technology innovation as the core driving force, modern information network as the important car- rier, promote digital technology and the real economy to achieve high quality depth fusion, constantly improve the economic and social digital, networked, intelligent, big digital level, to accelerate the reconstruction of urban eco- nomic development system and social governance mode. Digital economy is a new historical stage of human social development after agricultural economy and industrial economy. The connotation of digital economy is relatively rich and has strong practical significance, which promotes the digital transformation and upgrading in various fields, and realizes value added, cost reduction, quality improvement and efficiency improvement. On the whole, the digital economy has four main characteristics.

2.1. High-technical in nature

The high technology of digital economy emphasizes that on the basis of making full use of the latest achievements of digital technology, it should make break- throughs in key core technologies, cultivate digital application scenarios, and build a complete industrial ecological collaborative innovation system, so that the development of information technology can be spread and accurately meet the personalized needs of different consumers. Among them, high investment, high growth, high innovation and high intelligence are the important contents of the high technology of digital economy. High investment is mainly reflected in the creative design of new technology, intelligent product research and development, testing and promotion of new materials, which require a large amount of capital investment, and the cost expenditure a large amount. High growth is the success and recognition of innovative products and services represented by the digital economy in the consumer market, which greatly enhance the core competitiveness of enterprises and quickly occupy the consumer market. As a high-quality development of the digital economy, high innovation will help to improve production efficiency, strengthen industrial cooperation, foster new drivers of growth and create new value. High intelligence is determined by the knowledge-intensive and technology-intensive economic form of digital economy. It must rely on the intellectual labor of innovation and creation, and gather a group of high-quality compound professional digital talents with innovative spirit and creative ability.

2.2. High fusion

Information technology innovation in economic and social applications is mainly reflected in the use of big data, cloud computing, Internet of things, sensor measurement and control, artificial intelligence, promote industry and scientific and technological innovation, fission, promote new forms new mode leading new consumption to speed up the development, promote the digital economy and the real economy depth fusion, which can produce superposition effect, aggregation effect, multiplier effect, fully stimulate the ”double gen” vitality, achieve mutual benefit and win-win situation. On the one hand, the integration of digital economy and production system development. According to the development idea of digital industrialization and industrial digitalization, through the innovation

breakthrough and integrated application of all kinds of information technology, the economic production system of digital driven, intelligent led and value-added service is built. On the other hand, it is the integrated development of digital economy and policy system. Digital technology is an intelligent governance technology, which effectively improves governance capacity and efficiency through incremental empowerment and reconstruction innovation.

2.3. High additive

The main investor of digital products is artificial knowledge, and the knowledge cost, as an intangible asset, cannot be accurately calculated, and the technical barriers are easy to cause the information asymmetry between supply and demand, thus completely breaking through the linear relationship between supply and demand in traditional economics. Therefore, the pricing of digital products does not follow the traditional economic market pricing strategy. From the perspective of traditional economics, digital economy has a high value additive, and this amount of added value is proportional to the advanced level of the investment technology. In other words, the more high-tech products, the higher the added value, the shorter the cost payback period. Data has various characteristics that can be stored, transferred, available, open, processed, classified, and traded, showing a development trend of explosive growth, and has become the core resource to promote the development of digitalization, intelligence, information and network of the real economy. From the perspective of data value, the new value generated by data itself can create new value and improve the innovation ability of business forms through direct or indirect correlation analysis and mining of data.

2.3.1. High permeability

Digital technology has a strong permeability function, hiding the huge radiation ability of network technology. With the continuous expansion of the development process of economic digitalization, the information service industry gradually expands to the primary and secondary industries on a large scale, promoting the increasingly blurred and interpenetrating boundaries between industries, which contributes to the effective interaction and sharing of industrial resources, the continuous innovation of industrial organization mode, and the optimization and upgrading of industrial structure. On the one hand, the rapid development of digital economy has broken the industry boundary of traditional enterprises, deepened the division of labor and cooperation of enterprises, and effectively improved the level of digitalization, informatization and intelligence of enterprises. On the other hand, data collection, data transmission, data management, system monitoring, cleaning and processing and information service and other functions are gathered in one to form an enterprise growth law driven by manufacturing ability, technological innovation ability and overall service ability. The rapid development of digital economy has exerted an important influence on the traditional business operation mode and resource utilization and development mode.

3. The internal logic of the integrated development

It is an inevitable trend of national economic development to shift from high- speed economic development to high-quality economic development, and the integrated development of digital economy and real economy provides opportunities and challenges for the transformation of national economic development. The internal logic of the integrated development of the digital economy and the real economy is the theoretical premise of promoting the high-quantity growth of the national economy through the integrated development.

3.1. Coupling mechanism of the integrated development

From the perspective of industrial structure transformation, studies that the characteristics of the current digital economy and real economy integration for the industry digital transformation acceleration, the reverse penetration and integration of industrial structure in the form of ”consumption-production” transformation, in the process of digital economy and the real economy integration also exist insufficient core technology support, unbalanced fusion, digital governance lags behind the constraints such as industrial development. With the deepening of the integrated development of the digital economy and the real economy, it is necessary to complete the construction of the whole industrial chain in the field of the digital economy, and further promote the digitalization of the governance system by improving the new digital infrastructure, so as to promote the high-quality development of the integrated economy. Starting from the focus of the in-depth development of digital economy strategy, some scholars believe that the future development of digital economy in China should focus on three aspects: first, the development of digital economy should take the government behavior as the guide,

coordinate the infrastructure construction and fulfill the responsibility of standardizing the market and information transaction; second, the development of digital economy should focus on the application and innovation of information technology to seize the advance in the development process; third, the further development of digital economy should focus on encouraging innovation and forming the standardized guidance mechanism of emerging enterprises through the guidance of innovation behavior. At the same time, some relevant studies have discussed the relationship between digital economy and macroeconomic growth from the micro and macro levels, and analyzed the role of digital economy in promoting high-quality economic development. Research believe that by understanding the positive role of digital economy from the micro perspective, we can find emerging digital technologies, such as big data, 5G, Internet + and cloud com- puting, which can give full play to the enabling effect of new technologies, reasonably and efficiently match the supply and demand relationship at the micro level and form a perfect price mechanism. At the macro level, new input elements, new resource allocation efficiency and new total factor productivity can become the core path to boost the high-quality economic development of digital economy.

3.2. The logical path for the deep integrated development

3.2.1. Boosting the impetus of innovative development

The report to the 19th CPC National Congress stressed that the pattern of economic development in the newera should shift from being driven by factors to being driven by innovation. Through the analysis of the production value link, we can find that the increase of the value addition rate mainly depends on the innovative design. Will be the digital economy and the real economy depth fusion development, the enterprise cannot only through digital technology can improve each link from production to service the efficiency of real-time data collection and analysis, at the same time also can share the data, in order to facilitate digital information interaction platform, sharing data platform and talent exchange platform of establishment and collaboration, so as to improve the liquidity of knowledge capital and the effectiveness of decision analysis.

3.2.2. Promoting the efficiency of resource allocation

Economic development under the new development pattern objectively requires improving efficiency in the way of resource allocation, Under the role of the market mechanism, give full play to the advantages of digital technology, strengthen the deep integration with the real economy, improve the efficiency of resource allocation, and create a superior resource allocation environment for high-quality economic development. In this sense, the integration of the digital economy and the real economy can break down the original barriers to resource allocation, enable the reasonable resource allocation of resources across space and time, and achieve more efficient resource allocation.

3.2.3. Improving the quality of economic development

The integrated development of the digital economy and the real economy will help to improve the quality of economic development. Under the demand of high-quality economic development, the decline of environmental quality brought about by the rapid economic development also needs to be paid great attention to. The development of digital economy from the perspective of eco- logical civilization is conducive to the formation of new drivers of economic growth and a new development trend of ecological civilization. Environmental deterioration for the negative impact of the quality of economic development is not only limited to the loss of environmental resources quality, also is brought by the environmental quality of urban survival environment decline and human capital outflow, and digital economy and real economy integration development is conducive to improve environmental quality, reduce environmental problems for the influence of economic development of high quality.

4. Integrated development status in Beijing

In order to accurately judge the integration degree of Beijing's digital economy and the real economy, we should not only analyze the scale and speed of development, but also fully study the structure and form of the integration of the digital economy and the real economy.

4.1. Scale and speed of development

From the perspective of the development scale, the integration speed of Beijing's digital economy and the real economy is accelerating, and it has become the main driving force for the development of the digital economy. According to the Beijing Digital Economy Research Report 2021 released by the China Academy of Information and Communications Technology, the total volume of Beijing's digital economy accounted for 55.9 percent of GDP in 2020, ranking first in China, surpassing Guangdong (47.2 percent) and Shanghai (55.1

percent). Among them, the added value of Beijing's digital economy industry was 1,453.86 billion yuan, accounting for 40.3% of the regional GDP, and the added value of the core industry of the digital economy was 760.13 billion yuan, accounting for 21.1% of the regional GDP.

From the perspective of development speed, the scale of digital industrialization in Beijing in 2020 is 680.8 billion yuan, accounting for 11.5% in 2008 to 18.9% in 2020. The industrial digitalization has become a key engine driving the growth of Beijing's digital economy, with the scale reaching 1337.1 billion yuan, accounting for 8.9% in 2008 to 37.0% in 2020. By the first half of 2021, the proportion of Beijing's digital economy industry has increased by 2.6 per- centage points compared with 2020, still maintaining a high growth rate. This shows that the integration of the digital economy and the real economy is the main driving force for the development of the digital economy in Beijing.

4.2. Development structure

From the perspective of the development structure, the degree of integration of the digital economy and the real economy shows the characteristics of accelerated penetration in the three industries, and the digital transformation of agriculture needs to be further deepened. According to Beijing Digital Economy Research Report 2021, in 2020, the penetration rate of digital economy in Beijing was 43.4%, the penetration rate of secondary industry was 22.1%, and the penetration rate of agricultural digital economy was 5.8%, all higher than the national average except for agriculture.

In terms of digital industry, Beijing focuses on the "bottleneck" link of the industrial chain and supply chain, expands the communication technology industry, and strengthens the innovation drive of the new generation of information technology, including 5G / 6G, cloud computing, artificial intelligence, blockchain and soon. So far, Beijing has opened 56,4005G base stations, providing 5G network coverage in the capital's functional core areas, urban subcentres, important functional areas and important places. At the same time, the innovation and development of blockchain is also accelerating, with 189 blockchain enterprises and a broad space for development. Compared with 2016, the added value of Beijing's software and information technology service industry reached 478.39 billion yuan, accounting for 13.5% of the city's GDP, as shown in Figure 2. In terms of industrial digitalization, Beijing takes manufacturing and service industry as the focus of digital transformation, releases the amplification, superposition and multiplication of digital on economic development, promotes the digital technology into the rural areas, and accelerates the deep integration of digital economy and agricultural and rural economy. Beijing Industrial Internet has a national top node, access to 17 secondary nodes, the number of signs registered more than 2.27 billion, ranking the first in the country. The rate of industrial enterprises above designated size in the city exceeds 40%, and the users of small and medium-sized enterprises exceed 200,000. Beijing is also actively promoting the electronic trading of agricultural products. Among the top 20 agricultural e-commerce enterprises in China, 10 companies, including COFCO Waimai Network and Original Life Network, are headquartered in Beijing. With the continuous promotion of the "Inter- net + agricultural production" project, 35 of the 150 "Internet + agricultural technology promotion cloud platform" projects announced by the Ministry of Agriculture and Rural Affairs in 2019 are in Beijing, accounting for more than 20%.

4.3. Development forms

From the perspective of development form, the development of industrial Internet is accelerating, and the integration of digital economy and real economy in Beijing is developing to the direction of multi-dimensional polar core. According to the Statistical Classification of Digital Economy and Its Core Industries (2021) released by the National Bureau of Statistics, the application scenarios of digital industrialization include smart agriculture, intelligent manufacturing, intelligent transportation, smart logistics, digital finance, digital commerce, digital society, digital government, etc. In order to support the multi-dimensional integrated development of digital economy and real economy, in December 2021, Beijing Municipal Bureau of Economy and Information Technology released the application scenario of the benchmark city construction of Beijing digital economy: Big Data Exchange. By the end of 2020, the total number of public data opened in Beijing has reached 9,214 data sets, with a total of 5.53 billion data records. At present, the total amount of open public data and the number of unconditionally open public data sets in Beijing both rank among the top in China. Through Beijing big data exchange, promote data elements of Beijing market, let data can be safe and orderly flow, to speed up the intelligent agriculture, intelligent manufacturing, digital government construction, with wisdom transportation, wisdom health as the breakthrough

point, deepen the wisdom city efficiency upgrade, promote the integration of digital economy and the real economy.

5. The specific path of the integrated development in Beijing

5.1. Strengthen the top-level design

In order to further deepen the strategy of digital economy and promote the integrated development of digital economy and real economy, Beijing has issued the Action Program for The Development of Smart Cities in Beijing during the Fourteenth Five-Year Plan and the Action Program for Promoting the Innovative Development of Digital Economy (2020-20202) and other relevant documents to promote the development of digital economy. In promoting the implementation of the national big data development strategy, digital China construction and on the basis of digital management system construction, combining with the data of Beijing industry base, characteristic resources and regional characteristics, the Beijing municipal government issued by the Beijing about to speed up the construction of global digital economy bench- marking city implementation plan, for the integration of digital economy and real economy development provides the policy basis and target lead.

5.2. Build an innovative source of the digital economy

Held in haidian district, zhongguancun science chengbei district ”innovation partners” conference, zhongguancun release the zhongguancun science city digital economy innovation development action plan for three years (2021-2023), the construction of digital new infrastructure, breakthrough key core technology, build billions of innovative enterprises, form the international first-class emerging digital industry cluster, become the global digital economy innovation. In zhongguancun science city, university institutes, scientific research institutions, high-tech enterprises based on the layout of more than 100 intelligent manufacturing field key laboratory, research center and advanced innovation center, has gathered the cloud smart, digital generous, ufyou, and the high-end equipment, industrial software and Internet, intelligent manufacturing system services on behalf of the enterprise nearly 200. According to the goal of ”action plan”, by 2023, zhongguancun science city will build a batch of wide coverage, high performance digital new infrastructure, digital field of frontier technology, break through a number of key core technology, strive to foster 1 to 2 globally competitive 500 billion enterprises and a batch of billions, invisible champions, unicorn, backbone innovation enterprises, form the inter- national first-class emerging digital industry cluster, build digital production, life, ecology, life, become the global digital economy innovation.

6. Problems and solutions facing the integrated development in Beijing

6.1. Problems

First, the lack of digital core technology reserves in Beijing, which restricts the deep integration of the digital economy and the real economy. New digital technologies are the key support for integrated development. In recent years, the application of digital technology in Beijing has been accelerating, and the technical capacity has been continuously improved, but there are still some obvious shortcomings in the core technology level. In the software level of digital technology enabling the real economy, the core technology reserve of domestic basic software is relatively insufficient, and the core technology strength of industrial software such as industrial development, simulation testing and manufacturing execution system still needs to be improved. The lack of core technology reserve and independent innovation ability is the key bottleneck affecting the deep integration of Beijing’s digital economy and real economy, and also the main restricting factor of China’s development model from factor driven to innovation driven in the digital era.

Second, the integration of digital economy and real economy in Beijing is not sufficient and unbalanced, and there is a phenomenon of ”light weight”. Especially in the traditional manufacturing field, in the context of supply chain competition, many enterprises only regard digital technology as an auxiliary of production, do not efficiently mine data resources, and do not see the strategic role of data generated in the whole life cycle of manufacturing on the promotion of the industrial chain. For new digital enterprises, although they have sufficient data mining and analysis capabilities, they lack corresponding understanding of the production process and cannot meet the actual production and operation needs. This fusion cognitive bias is particularly common in manufacturing and agriculture with higher production processes and longer production cycles.

Third, Beijing’s digital economy governance system lags behind the industrial development, bringing new risks to the high-quality economic development. The penetration of the digital economy has made the real economy intelligent and become a new driving force of economic

development. However, the relative lag of the digital economy governance system has also led to some negative effects in the economy and society, which is not conducive to high- quality economic development. First, false and vulgar information is widely spread, and the phenomenon of digital infringement has brought a negative impact on the high-quality economic and social development. Second, the phenomenon of algorithm discrimination and ”big data killing” appears. In some online platforms such as online ticketing and online shopping, old customers pay higher prices for the same products and services, which leads to the weakening of consumers' rights and interests and the destruction of consumption fairness. Three is ”winner-take-all effect” caused by industry monopoly and innovation, digital platform has strong scale effect, in the process of economies of scale play is easy to form path dependence, thus form industry monopoly, the monopoly will curb competition, adverse effects on the development of innovative enterprises, in the era of mobile Internet platform of enterprises in the development of this trend.

6.2. Solutions

First, we will strengthen research and development of basic and generic technologies in Beijing to provide innovation support and technical support for high-quality development in the era of digital economy. Technological innovation is the core driving force leading high-quality development. Generic technology can widely empower various industries and make the whole pro- duction process networked, collaborative and ecological. In order to realize the deep integration of Beijing's digital economy and the real economy, it is necessary to break through the basic technology and key generic technology in the digital field. We should cooperate with the research forces of universities, research institutes and large science and technology enterprises to continue to strengthen basic research in the digital field, strive to tackle key basic technologies such as chips and memory needed for the integrated development of the digital economy and the real economy, and achieve fundamental breakthroughs in weak links such as integrated circuits, basic software and core components. We should increase investment in innovation in cutting-edge generic technologies such as 5G networks, artificial intelligence, blockchain and quantum communication, and actively develop and strive to maintain a leading position in the world. We should continue to strengthen the application of big data technology, strive to solve the actual needs of industrial applications, strengthen the analysis, prediction and decision support functions of big data technology, provide sufficient technical support for the integration of digital technology and the real economy, and provide a solid guarantee for the construction of an innovative country and the transformation of high-quality development path.

Second, the digital transformation of Beijing's manufacturing industry is a breakthrough to build the whole industrial chain of Beijing's digital economy and form a diversified digital industry ecosystem. To deepen the penetration of new digital technology of traditional manufacturing, build a new industrial ecology based on the Internet industry, promote digital technology in manufacturing production, research and development, design, manufacturing and other fields of depth application, accelerate the key manufacturing areas of digital intelligent, promote the transformation of ”made in China” to ”made in China”. We will guide enterprises and Internet enterprises to carry out in- depth cooperation, cooperate in developing innovative business based on big data application through business outsourcing and personalized customization, build a number of industry cloud platforms and ”cloud” benchmark enter- prises, and drive the digital transformation of more small and medium-sized enterprises. Efforts to extend the digital industry chain, build the whole industry chain of digital economy, in production, circulation, consumption and build global sharing economic ecosystem, using the digital economy to create more new growth point and new kinetic energy, in the existing ”Internet + industry”, ”Internet + agriculture”, ”Internet + services”, based on digital technology further upgrade to ”intelligent + industry”, ”intelligent + agriculture”, ”smart + services”, expand the new space of the development of digital economy.

Third, strengthen the new system supply of the integration of digital economy and real economy, and improve the digital economy governance system. To strengthen the market competition-oriented digital governance, accelerate the improvement of Beijing's new digital industry monopoly governance policy tools, to create a fair market environment for the integration of Beijing's digital economy and the real economy. It is necessary to strengthen the research and exploration of science and technology ethics governance, establish the corresponding risk prevention and incentive and restraint mechanism based on the public interests of the application of the underlying algorithm, strengthen the algorithm governance, and promote the ”science and technology for good”. To speed up the construction of

multiple subjects involved in the digital governance system, give full play to the role of the government, enter- prises, industry association, including the government focused on the platform monopoly, negative externality governance, platform type enterprise is commit- ted to algorithm values and negative information communication governance, industry association focused on data sharing and self-discipline, through multi- subject participation to build incentive compatible collaborative governance pattern, provide good environment for economic and social development.

Fourth, bridge the digital divide in the integration of digital economy and real economy and promote the development of inclusive digital economy. The concept of ”human development as the center” should be embedded in the development process of digital economy, and open and affordable Internet access should be provided for all regions and groups, so as to provide fairer development opportunities for all people and allow more people to share the fruits of digital economy development. In the process of integrating Beijing’s digital economy and real economy, more attention will be paid to people’s livelihood, especially strengthening the application of digital technology in the fields of online medical care, online education and digital poverty reduction, so as to effectively enhance the public’s sense of gain and happiness, so that digital technology can serve people’s better life. Attaches great importance to the impact of new digital technology on employment, deal with the relationship between fairness and efficiency, targeted policies and measures to strengthen the traditional industry staff skills training and continuing education, enhance backward areas and low-income groups of digital technology knowledge, create more jobs for the digital economy era.

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