



Analysis of the Impact Mechanism of the Digital Economy on the Real Economy

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Abstract. This article adopts a review research method to systematically sort out the relevant research literature on digital transformation and the real economy at home and abroad, extract the two core mechanisms of technological innovation and factor restructuring for digital transformation to empower the real economy, and complete a comprehensive evaluation from three dimensions: efficiency improvement, innovation-driven, and structural optimization. At the same time, the heterogeneity characteristics of the impact at the industrial, regional, and enterprise levels are analyzed, and the differences in the empowerment paths of digital finance and service industry digital transformation are compared and clarified. The study summarizes the core consensus and existing research shortcomings in the current field, and proposes practical implications for the integration of data and reality from three levels: policy formulation, enterprise practice, and risk prevention, and points out future research directions. This article aims to construct a clear theoretical analysis framework, provide a reference for subsequent academic research, and offer practical ideas to drive the deep integration of digital transformation and the real economy.

Keywords: Digital Economy, Digital Transformation, Real Economy, Impact Mechanism

1 Introduction

Currently, the development momentum of the digital economy is strong, and the integration speed of the digital technology with various industries has reached an unprecedented level, profoundly reshaping the global economic structure and industrial form. As the foundation of the national economy, the high-quality development of the real economy is not only the core support for stabilizing economic operation and preventing and resolving systemic risks, but also the key to achieving sustainable economic growth. Digital transformation has outstanding advantages in optimizing resource allocation, improving production efficiency, and expanding market boundaries, and has become the core driving force for promoting the quality and efficiency improvement of the real economy and achieving transformation and upgrading. The deep integration of digital transformation and the real economy has therefore become a focus of attention for both academia and industry.

So far, the academic community has conducted extensive research on the integration and development of digital transformation and the real economy, covering multiple dimensions such as theoretical construction, empirical testing, and case analysis. Previous studies have explored the specific impact of digital transformation on the real economy from three levels: micro enterprises, meso industries, and macroeconomics. They have also analyzed the pathways through which digital technology, digital finance, and other factors empower the transformation of the real economy, providing rich theoretical and empirical support for clarifying the correlation mechanism between the two. However, from the overall research status, the relevant achievements are still relatively scattered, and different research perspectives, methods, and conclusions have not yet formed a systematic integration. There is still a shortage of comprehensive and clear academic analysis framework for key issues such as the core mechanisms, boundary effects, and heterogeneity characteristics of the impact of digital transformation on the real economy. At the same time, existing research lacks an in-depth comparative analysis of the empowering path differences between digital finance and the digital transformation of the service industry. Discussions on topics such as long-term impacts and potential risks during the transformation process also need to be further refined and deepened. Xia and Li (2024) have clarified the core driving mechanism and optimized implementation path of digital-real integration for high-quality economic development, which is highly consistent with the core conclusion of this study, it is not simply a combination of technology, but involves systematic changes in technology, factors, institutions, and other aspects.

Based on this, this article adopts a review research method to systematically sort out the literature related to digital transformation and the real economy at home and abroad in recent years, summarize and extract the core mechanisms of digital transformation affecting the real economy, compare and analyze the differences in the empowerment paths of digital finance and service industry digital transformation, summarize the core consensus and existing shortcomings of current research, and draw on domestic and foreign research experience to propose future research directions. I wish this review can provide clear theoretical references for subsequent related research, and at the same time, provide practical ideas for promoting the deep integration of digital transformation, the real economy, and promoting high-standard development of the real economy.

2 The Core Mechanism of Digital Transformation Empowering the Real Economy

2.1 Technical Innovation: Technological Integration and Upgrading, Refactoring Production and Operation Models

The deep integration of digital technology and the real economy lies in the combination of digital technology and traditional fixed assets, the implementation of human-machine collaboration models, and the large-scale application of intelligent equipment to

achieve the reconstruction of production and operation models, greatly improving production efficiency and capital allocation efficiency. The deep integration of digital technology with fixed assets such as industrial robots and intelligent production lines promotes the intelligent upgrading of traditional production equipment, effectively raising the efficiency of capital use and marginal output. The human-machine collaboration model breaks the traditional human constraints of production, freeing workers from repetitive and mechanical work and shifting them to higher value work processes such as creative design and process control, achieving the complementary advantages of human capital and digital technology. The popularization of intelligent equipment promotes the automation, precision, and intelligence of the production process, reduces human errors in the production process, and improves overall production efficiency and product quality stability. Technological innovation is not only the simple application of digital technology in the real economy, but also a comprehensive upgrade of the traditional production technology system, injecting technological momentum into the development of the real economy. In fact, the development of digital finance is also an important driving force for the technological innovation of real enterprises, and the empirical test based on Chinese enterprise panel data has verified this positive correlation (Xie et al., 2018).

2.2 Element Restructuring: Empowering Factors with Data to Improve Total Factor Productivity

In the era of the digital economy, data has become a new core productivity factor alongside labor, land, and capital. Digital transformation promotes the deep integration of data factors with traditional production factors, realizes data-driven decision-making models, and completes the restructuring and optimization of production factors, significantly improving the total factor productivity of the real economy. Data elements have characteristics such as non-competitiveness, replicability, and unlimited supply, which can break the scarcity constraints of traditional production factors. By collecting, analyzing and applying of data from various links such as production, circulation, and consumption, precise allocation and efficient utilization of traditional elements such as labor, capital, and land can be achieved. The data-driven decision-making model has replaced traditional empirical decision-making. Enterprises can accurately grasp market demand, optimize production plans, and adjust supply chain layout based on massive data, making production and operation decisions more scientific and efficient. The core of factor restructuring is to construct a new combination model of "data+traditional factors", which empowers the development potential of traditional production factors through data elements and achieves overall improvement in the efficiency of factor allocation in the real economy.

2.3 Comprehensive Evaluation of Digital Transformation Empowering the Real Economy

The empowering effect of digital transformation on the real economy is reflected in multiple dimensions of economic development. Based on existing research results, a

comprehensive evaluation of the empowering effect of digital transformation can be conducted from three core perspectives: efficiency improvement, innovation-driven, and structural optimization.

The empowering effect of digital transformation on the real economy can be comprehensively evaluated from three aspects: efficiency improvement, innovation-driven, and structural optimization. Cai's (2018) research shows that digital technology breaks the information barrier, promotes the cross-regional flow of production factors, and the manufacturing industry uses the industrial Internet to shorten order response time, reduce transaction costs, and achieve a fundamental change in the production and supply chain model. Jing and Sun (2019) pointed out that digital tools lower the R&D threshold for small and medium-sized enterprises, giving rise to "inclusive innovation" that breaks the monopoly of innovation resources by large enterprises and enriches the innovation entities of the real economy. The research group of the Development Research Center of the State Council (2022) found that digital transformation reshapes industrial connections, and digital platforms promote the deep integration of primary, secondary, and tertiary industries. For example, smart agriculture achieves direct production and sales through e-commerce, forcing production standardization. Digital transformation is a systematic reconstruction of the real economy industry chain and supply chain, making the industrial structure more reasonable and efficient.

3 Heterogeneity Characteristics of the Impact of Digital Transformation on the Real Economy

3.1 Industrial Heterogeneity: Different Industrial Attributes Result in Significant Differences in Empowerment Effects and Pathways

There are essential differences in the information intensity, production mode, and factor structure of different industries, leading to significant industrial heterogeneity in the impact of digital transformation on the real economy. Among them, the digital transformation characteristics of information-intensive service industries, manufacturing industries, and agriculture are the most typical.

The information-intensive service industry (finance, entertainment, logistics, etc.) itself has the characteristics of light assets and high informatization. The integration threshold of digital technology with these industries is lower, and the compatibility is higher. Digital transformation mainly revolves around efficiency improvement, scene innovation, and service upgrading. For example, digital finance improves the accessibility and efficiency of financial services through mobile payments, big data risk control, and other technologies, and its development has a significant spatial spillover effect on the transformation and upgrading of the service industry, with a clear attenuation boundary in the driving effect across different regional spaces (Li & Jiang, 2024). The entertainment industry creates immersive experiences and personalized content recommendations through digital technology, and the empowerment effect is fast and significant. As the core of the real economy, the manufacturing industry belongs to capital and technology-intensive industries. The digital transformation focuses on the

industrial Internet, intelligent manufacturing, and lean production, focusing on the realization of intelligent production links and supply chain synergy. The transformation process requires a lot of fixed asset investment and technological transformation, and the enabling effect shows a gradual and cumulative effect. Agriculture has the characteristics of long production cycles, decentralization, and being greatly influenced by natural conditions. Digital transformation is centered around digital finance, smart agriculture, and e-commerce platforms, focusing on solving the problems of difficult financing, narrow sales channels, and low standardization of agricultural production. Constrained by factors such as rural digital infrastructure and human capital, the speed and empowerment effect of agricultural digital transformation are relatively slow.

3.2 Regional Heterogeneity: Differences in Development Foundations and Persistent Gap in Digital Transformation

There are significant differences in digital infrastructure, human capital reserves, industrial foundations, and economic development levels among different regions in China, resulting in significant regional heterogeneity in the impact of digital transformation on the real economy.

The eastern coastal area has perfect digital infrastructure, an advanced layout of 5G, a big data center, industrial Internet and other new infrastructure, sufficient human capital reserves, high-end technical talents and digital talents gathering, and a sound industrial foundation of manufacturing and service industries. Enterprises have a stronger willingness and ability to transform digitally, and the integration of digital transformation and the real economy is higher, with more significant enabling effects. The construction of digital infrastructure in the central and western regions and remote areas lags behind; digital talents are scarce, and the industrial foundation is mainly based on traditional agriculture and resource-based industries. Enterprises have insufficient investment in digital transformation, weak technological capabilities, slow progress in digital transformation, a low degree of integration between data and reality, and the problem of the "digital divide" is constantly widening. In addition, the gap in digital infrastructure and digital literacy between urban and rural areas has led to a significant lag in the digital transformation of the rural real economy compared to cities, becoming a weak link in the integration of digital and real economy.

3.3 Heterogeneity of Enterprises: Different Characteristics of Enterprises Result in Uneven Transformation Capabilities and Effects

As the micro subject of digital transformation, the differences in property rights, scale, operational capabilities, technological reserves, and other characteristics of enterprises lead to significant heterogeneity in the impact of digital transformation on different enterprises.

From the perspective of property rights, state-owned enterprises have more sufficient funds, policy support, and resource reserves, stronger investment capabilities for

digital transformation, and are more likely to carry out large-scale technological transformation and platform construction. However, due to factors such as institutional mechanisms, the flexibility and efficiency of transformation are relatively low. Private enterprises have higher market sensitivity, stronger willingness and motivation for transformation, and can quickly adjust their digital transformation strategies according to market demand, resulting in higher transformation efficiency. However, due to constraints such as funding, technology, and talent, the scale and depth of transformation are relatively limited.

From the perspective of enterprise size, large enterprises have a sound organizational structure and sufficient resources, which enable them to independently build digital platforms and conduct technological research and development. The autonomy and controllability of digital transformation are stronger, and the transformation effects are more easily highlighted. Small and medium-sized enterprises face a shortage of funds and technical talents, and the threshold for digital transformation is higher. They rely more on external digital platforms and technology services, and the depth and breadth of transformation are limited. However, small and medium-sized enterprises are easy to turn around and can achieve efficiency improvement through lightweight and low-cost digital transformation, such as expanding the market with e-commerce platforms and digitizing management with financial software.

4 Practical Insights from the Integration of Digital Transformation and the Real Economy

Combining the achievements of numerous researchers, Guo (2020) has explored the specific paths for the digital economy to integrate with the real economy and boost high-quality economic development, laying a practical foundation for the exploration of mechanism innovation and risk prevention in this paper, promoting the deep integration of digital transformation and the real economy requires both mechanism innovation and risk prevention, which has important enlightening significance for policymakers and business operators. At the policy level, the institutional system construction ideas proposed by Yang (2024) have practical value, and the improvement of relevant systems should focus on two aspects: first, the data property protection system, clarifying the ownership and protection rules of data, so that physical enterprises dare to invest resources in data construction. The second is the system of balanced development of digital infrastructure, narrowing the digital gap between urban and rural areas and regions, and enabling more physical enterprises to participate equally in digital transformation.

For physical enterprises, empirical research by He and Liu (2020) shows that digital transformation can significantly improve business performance, but this cannot be achieved overnight. Enterprises should choose appropriate transformation paths according to their own industry characteristics: manufacturing enterprises can focus on industrial Internet construction to improve production efficiency. Agricultural enterprises can leverage digital finance and e-commerce platforms to connect the entire production to sales chain. Service industry enterprises should focus on scenario innovation

and user experience. The research of Huang and Zhang (2022) emphasizes the importance of open innovation, which provides inspiration for research. Physical enterprises cannot work in isolation, but should cooperate with digital technology enterprises and research institutions to consolidate the joint force of transformation.

At the same time, cannot ignore the risks that may arise during the transformation process. The rapid development of digital technology may lead to the disappearance of some traditional positions, which require skills training and other means to help workers adapt to the changes. The issues of data security and privacy protection are becoming increasingly prominent, requiring enterprises and governments to work together to build a security protection system. Zhang (2024) and others remind researchers from the perspective of social reproduction that the integration of digital transformation and the real economy is a systematic project that needs to take into account all aspects of production, distribution, exchange, and consumption in order to achieve sustainable development.

In short, digital transformation provides a strong impetus for the high-quality development of the real economy, but this integration is not simply adding digital technology and the real economy, but involves systematic changes in institutions, technology, talent, and other aspects. Only by accurately grasping its core mechanisms and path differences, and gradually promoting it according to the actual situation of different regions and industries, can digital transformation truly become an accelerator for the development of the real economy, injecting lasting vitality into sustainable economic growth.

5 Conclusion

This study indicates that the deep integration of digital transformation and the real economy is an important path for high-quality economic development in the new era. From the perspective of its mechanism of action, digital technology reconstructs traditional production and operation models through technological innovation, activates the potential of traditional production factors through factor restructuring, and drives the real economy to improve production efficiency and total factor productivity. From a comprehensive perspective, digital transformation has achieved efficiency improvement, innovation driven development, and structural optimization in the real economy, injecting core vitality into the high-quality development of the real economy. Digital finance and the digital transformation of the service industry, as important empowerment paths, each have their own focus and complement each other. The former provides financial support for the transformation of physical enterprises, but there is a problem of uneven regional empowerment. The latter releases consumer demand and drives the development of the real economy, but puts higher demands on practitioners' digital literacy.

Promoting deep integration of data and reality requires collaborative efforts from multiple parties. At the policy level, it is necessary to improve the institutional system, strengthen data property protection, promote balanced development of digital infrastructure, and introduce differentiated support policies. At the enterprise level, it is necessary to choose a suitable transformation path based on its own reality, adhere to open

innovation, strengthen industry university research cooperation to enhance the quality of transformation. At the social level, it is necessary to attach importance to risk prevention, coordinate efforts to address potential issues such as employment structure adjustment and data security, and ensure the sustainable promotion of the integration of data and reality.

The digital transformation brings important opportunities for the development of the real economy, and the full release of its empowering value requires comprehensive cooperation in technological innovation, institutional improvement, conceptual transformation, and talent adaptation. It needs to be gradually promoted in combination with the heterogeneity of industries, regions, and enterprises. Future research can focus on the long-term effects of digital transformation on the real economy, the inherent mechanisms of heterogeneity, and the construction of a risk warning system for the integration of data and reality, to provide more targeted theoretical and practical support for promoting deep integration of data and reality, and make digital transformation truly an accelerator for the development of the real economy.

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