

Research on the Mechanism of Digital Economy's Impact on Regional Industrial Structure Upgrading: A Case Study of Shenzhen

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Abstract. The digital economy, as an integrated economy, has become the driving force behind economic growth in various regions, fueling economic transformation and upgrading and serving as the focal point of industrial competition. Shenzhen, as a major first-tier city and a pilot demonstration area for socialism with Chinese characteristics, is taken as an example in this study. By exploring the mechanisms through which the digital economy impacts the upgrading of regional industrial structures, this paper analyzes how the digital economy promotes regional industrial transformation and upgrading through technological innovation, industrial integration, and market competition. It also discusses the existing problems and challenges, and proposes corresponding policy recommendations in areas such as talent cultivation, improving social welfare, and supporting enterprises to better leverage the role of the digital economy in upgrading the regional industrial structure. These efforts aim to ensure the sustainable development of Shenzhen's economy, making the "new engine" more powerful in leading development, creating jobs, supporting international competition, and driving Shenzhen's economic and social progress toward high quality.

Keywords: digital economy, regional economy, industrial upgrading

1. Introduction

1.1. Research Background

The digital economy, with information technology at its core, utilizes the internet, big data, artificial intelligence, and other tools to transform and upgrade traditional industries. In recent years, the development of the digital economy has significantly promoted global economic structural adjustment and regional economic growth. As a pioneering city in China's reform and opening-up, Shenzhen has achieved remarkable success in the field of the digital economy, resulting in profound changes to its industrial structure with the rise of the digital economy.

1.2. Research Purpose and Significance

This study aims to analyze how the digital economy promotes the upgrading of Shenzhen's regional industrial structure through mechanisms such as technological innovation, industrial integration, and market competition. The research findings can not only serve as a reference for industrial upgrading in other regions but also provide policymakers with a scientific basis to optimize the role of the digital economy in regional economies and achieve sustainable development.

2. Theoretical Framework and Literature Review

2.1. Definition and Characteristics of the Digital Economy

According to data from the White Paper on China's Digital Economy Development (2023), the scale of China's digital economy has exceeded 50 trillion yuan, accounting for nearly 40% of the gross domestic product (GDP) [1]. In the current context, the digital economy refers to an economic form based on digital technologies, characterized by data-driven processes, platformization, and intelligence, which promote the transformation and upgrading of traditional industries. Its main features include a high dependence on information technology, reliance on big data and artificial intelligence, and the integration of industries and markets.

2.2. Mechanism of the Digital Economy's Impact on Industrial Structure Upgrading

The impact mechanism of the digital economy on the upgrading of regional industrial structures can be analyzed from several perspectives.

The digital economy has driven technological innovation and influenced the development of other industries through the knowledge spillover effect. By improving production efficiency, reducing production costs, and enhancing the added value of products and services, digital technologies provide strong momentum for the transformation and upgrading of traditional industries [2].

The widespread application of digital technologies has facilitated deep integration across industries, forming new industrial models such as intelligent manufacturing, e-commerce, and digital finance. These emerging industries not only promote the upgrading of traditional industries but also offer new momentum for economic growth.

With the development of the digital economy, structural transformations have occurred in the labor market. The demand for high-skilled labor has increased, while traditional low-skilled jobs have gradually diminished, having a profound impact on regional industrial structure adjustments. Additionally, the digital economy has fostered the growth of flexible employment and remote work, altering labor relations and employment models [2].

Enhancement of Regional Innovation Capacity: The development of the digital economy requires strong innovation capabilities, which drive the construction of regional innovation ecosystems. By concentrating high-tech enterprises, research institutions, venture capital funds, and other innovation resources, regions can enhance their industrial competitiveness, thereby achieving the optimization and upgrading of their industrial structures [3].

The government plays a crucial role in promoting the development of the digital economy. By formulating industrial policies, optimizing the business environment, and increasing investment in scientific research, the government can effectively guide industrial upgrading. Moreover, the construction of digital infrastructure is also an important factor in promoting the upgrading of regional industrial structures.

2.3. Review of Related Studies

In recent years, research on the digital economy and its impact on regional industrial structure upgrading has gradually increased. Scholars have explored the concept, characteristics, and profound influence of the digital economy on industrial upgrading from various perspectives.

Liu Shenglong et al. (2010) suggested that investment in information infrastructure has positive spillover effects on China's total factor productivity and economic growth [4]. Bian Zhiqiang (2014) pointed out that local information infrastructure enhances local technological efficiency and progress, while infrastructure development in other regions benefits the improvement of local total factor productivity and technological efficiency [5].

According to research published in the White Paper on China's Urban Digital Economy Index (2018) by New H3C Group, the deep integration of cities within the Pearl River Delta region provides strong support for regional digital economic ecosystems through continuous collaborative development, fostering coordinated regional development [6]. The added value of core industries in the digital economy accounts for over 30% of Shenzhen's GDP, creating more than one million new jobs. Research generally shows that factors such as the level of development, policy environment, and infrastructure conditions across regions lead to significant differences in the development of the digital economy. The role of governments in the development of the digital economy has also attracted widespread attention, with studies highlighting that proactive policy guidance and infrastructure development can significantly promote regional industrial structure upgrading. Overall, existing research has provided an important theoretical foundation for understanding the digital economy and its impact on regional industrial structure upgrading. However, as digital technologies continue to evolve, future empirical studies are needed to explore the long-term effects of the digital economy and its potential challenges.

3. Current Development of Shenzhen's Digital Economy

As China's technological innovation hub, Shenzhen began developing its digital economy as early as the 1980s. In recent years, Shenzhen has relied on its strong technological foundation and innovation capacity to become a key city in the development of the digital economy. The city's digital economy is primarily concentrated in several areas, including the internet, artificial intelligence, big data, and fintech.

Shenzhen is home to leading global tech companies such as Huawei, Tencent, and BYD, which have driven the advancement of cutting-edge technologies like 5G and artificial intelligence. The city has gradually achieved, and continues to promote, the deep integration of digital technologies with traditional industries such as manufacturing, finance, and retail, facilitating the optimization and upgrading of its industrial structure [7]. Intense market competition has fostered both technological and business model innovations among enterprises, enhancing the overall competitiveness of the regional economy.

Despite Shenzhen's remarkable achievements in the digital economy, the city still faces several challenges. The development of the digital economy is primarily concentrated in the internet and tech sectors, while the digitalization of traditional manufacturing and service industries remains relatively low. A shortage of high-end technical talent also constrains the further development of the digital economy [7]. Moreover, the rapid expansion of the digital economy has introduced new forms of employment, but the current social security system struggles to adequately cover these emerging professions.

4. Mechanism of the Digital Economy's Impact on Shenzhen's Industrial Structure Upgrading

4.1. Technological Innovation Driving Industrial Upgrading

Digital technologies are widely applied in various sectors of Shenzhen's economy, such as manufacturing and services, significantly improving production efficiency. For instance, the application of industrial internet enables companies to achieve intelligent production management, where real-time monitoring of data during the production process allows for the timely identification and resolution of issues, reducing production costs and enhancing product quality. Smart logistics systems, through big data analysis and Internet of Things (IoT) technologies, optimize distribution routes, improve logistics efficiency, and lower costs [2]. The digital economy has also given rise to a series of emerging industries, including artificial intelligence (AI), big data, cloud computing, and blockchain.

The development of these emerging industries has not only created new growth drivers for Shenzhen but has also promoted the transformation and upgrading of traditional industries. For example, the application of AI technology in sectors such as healthcare, finance, and transportation has opened new opportunities for these industries. Big data and cloud computing technologies provide enterprises with robust data storage and analysis capabilities, helping them better understand market demands and optimize product design and production processes. The development of the digital economy fosters industrial innovation, driving traditional industries toward higher-end, smarter, and greener directions. For instance, Shenzhen's electronics and information industry has continuously innovated, launching a series of high-end products such as smartphones, tablets, and wearable smart devices, thereby enhancing industrial competitiveness [2]. The new energy vehicle (NEV) industry, through ongoing innovations in battery technology and smart driving technologies, has accelerated its rapid development.

4.2. Industrial Integration Promoting Structural Adjustment

The development of the digital economy has facilitated the integration of different industries, driving adjustments in Shenzhen's industrial structure. The application of digital technologies is blurring the lines between manufacturing and service sectors, with an increasing trend toward the servitization of manufacturing and the manufacturing of services. For example, some manufacturing enterprises in Shenzhen have transitioned from being mere product manufacturers to comprehensive service providers by offering full lifecycle services for their products. Similarly, the service sector, empowered by digital technologies, is providing more efficient and convenient services to manufacturing enterprises, such as fintech offering financing services and industrial design providing product design services [2]. The digital economy has also promoted the integration of traditional and emerging industries, fostering the transformation and upgrading of traditional sectors. For instance, Shenzhen's traditional manufacturing industry has undergone smart upgrades by integrating with emerging technologies such as artificial intelligence (AI), big data, and cloud computing. Traditional agriculture has also seen advancements through integration with e-commerce and IoT technologies, enabling online sales of agricultural products and smart production management. Moreover, the digital economy has enhanced the integration of different stages within industries, increasing overall competitiveness. For example, Shenzhen's electronics and information industry has achieved coordinated development across various stages of the industrial chain, including chip design, software development, and hardware manufacturing. The cultural and creative industries have also expanded through the integration of content creation, distribution channels, and derivative product development, achieving diversified industrial growth.

4.3. Market Competition Driving Corporate Innovation

The rise of the digital economy has intensified market competition, prompting Shenzhen's enterprises to continuously innovate and enhance their competitiveness. In the digital economy era, market competition is fiercer, and companies must constantly innovate to survive. This competitive pressure has fueled corporate innovation, encouraging enterprises to increase research and development (R&D) investment, improve technological capabilities, and launch more competitive products and services.

5. Policy Recommendations for Promoting Shenzhen's Industrial Upgrading through the Digital Economy

5.1. Strengthening the Training and Recruitment of Technical Talent

The government should increase funding for higher education and vocational education, encouraging universities and vocational schools to offer courses related to the digital economy, such as artificial intelligence, big data, and cloud computing. This would help cultivate more technical professionals who can meet the demands of the growing digital economy. Additionally, universities should be encouraged to collaborate with enterprises on research and development projects, providing students with practical opportunities to enhance their skills and innovation capabilities. The government could also establish more favorable talent policies to attract outstanding domestic and international digital economy professionals to Shenzhen, offering benefits like housing subsidies, education discounts for their children, and research funding support. A comprehensive talent evaluation system should be developed, focusing on actual skills and achievements, thus creating a fair and just environment for talent promotion and development. Furthermore, businesses should be encouraged to offer internal training to improve employees' digital skills and overall capabilities. The government could provide training subsidies to reduce the cost for enterprises. Public training platforms could also be established to offer free or low-cost digital skills training courses for the general public, improving digital literacy across society [8].

5.2. Promoting the Digital Transformation of Traditional Industries

The government should formulate relevant policies to encourage traditional industries to increase their adoption of digital technologies and investments, promoting their development toward digitalization, intelligence, and sustainability. Special funds could be set up to support digital transformation projects in traditional industries, such as enterprise information technology development and smart manufacturing demonstration projects. A digital economy service platform should be established to provide consulting, technical support, and solutions for the digital transformation of traditional industries. The development of industrial internet platforms should be promoted, encouraging information sharing and collaborative innovation among upstream and downstream enterprises in traditional industries, thus improving overall industrial chain efficiency. A group of representative traditional enterprises should be selected as model cases for digital transformation, receiving key support and cultivation. The successful experiences of these model enterprises should be summarized and promoted to other enterprises, serving as a guiding example [9].

5.3. Improving the Social Security System

A digital economy employment service platform should be established to provide workers with employment information, vocational training, and entrepreneurial guidance. Support for entrepreneurship and innovation in the digital economy should be strengthened, encouraging workers to achieve employment through entrepreneurship. The unemployment insurance system should be improved by raising the standards for unemployment benefits to ensure the basic livelihood of the unemployed. Additionally, the application of digital technology in healthcare should be expanded to improve the efficiency and quality of medical services, such as promoting electronic medical records, telemedicine, and smart medical devices. The basic medical insurance system should also be enhanced by increasing reimbursement rates to reduce the financial burden on patients. Exploration into establishing new elderly care service models for the digital economy era should be undertaken, leveraging technologies like the internet and the Internet of Things to provide more convenient and efficient services for the elderly. Social forces should be encouraged to participate in elderly care services, fostering the development of a diversified elderly care service industry [2].

6. Conclusion

The digital economy has had a significant impact on the industrial upgrading of Shenzhen. Through mechanisms such as technological innovation, industrial integration, and market competition, the digital economy has driven the transformation and upgrading of industries in the region. However, Shenzhen faces certain challenges in the development of the digital economy, including an imbalanced industrial structure, a shortage of technical talent, and inadequacies in the social security system. To

better leverage the role of the digital economy, Shenzhen should adopt measures such as strengthening the training of technical talent, promoting the digital transformation of traditional industries, improving the social security system, and supporting entrepreneurship and innovation to foster the sustainable development of the regional economy.

Authors' Contributions

Rongrong Duan and Rongfei Zheng contributed equally to this work and should be considered co-first authors.

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