

Original Research Article

Research on the impact mechanism of digital industry agglomeration on high-quality economic development——From the dual perspectives of innovation-driven and structural upgrading

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Abstract: Against the backdrop of the digital economy becoming the core engine of global economic development, digital industry agglomeration, as a spatial manifestation of the deepening of industrial division of labor, has become an important support for promoting high-quality economic development. Based on the dual perspectives of innovation-driven and structural upgrading, this paper systematically analyzes the impact mechanism of digital industry agglomeration on high-quality economic development. The study finds that digital industry agglomeration strengthens the innovation-driven effect and promotes technological breakthroughs and achievement transformation through the spatial agglomeration and efficient allocation of innovative factors such as talents, technology, and capital; at the same time, it promotes the rationalization and upgrading of industrial structure with the help of industrial chain collaboration and digital technology penetration, thereby empowering high-quality economic development from multiple dimensions.

Keywords: digital industry agglomeration; innovation-driven; structural upgrading

1. Introduction

With its unique agglomeration effect, technology spillover effect, and network effect, the digital industry plays a prominent role in gathering innovative resources, promoting innovation, and driving structural upgrading. However, most of the existing literature analyzes the impact of digital industry agglomeration only from a single perspective of either innovation effect or structural upgrading effect, and fails to conduct a comprehensive and in-depth discussion on its mechanism of action from a dual dimension.

2. Definition of core concepts and theoretical basis

2.1. Definition of core concepts

Digital Industry Agglomeration: Digital industry agglomeration refers to a networked organizational form formed by the physical concentration in a certain region and virtual connection in cyberspace of enterprises, scientific research institutions, and related service enterprises in the core industries of the digital economy. Compared with traditional industrial agglomeration, digital industry agglomeration is a superposition of "physical agglomeration + virtual agglomeration". It not only relies on the factor aggregation in physical space and short-distance cooperation and exchange, but also further uses digital technologies such as the Internet and the Internet of Things to break the boundaries of time and space, realizing real-time connection and interaction between upstream and downstream subjects in the industrial chain.

2.2. Theoretical basis

Industrial Agglomeration Theory: Traditional industrial agglomeration theory is mainly represented by Marshall's external economy theory and Weber's industrial location theory, emphasizing the advantages such as factor sharing, cost reduction, and technology spillover brought by the spatial agglomeration of industries in a specific region. Digital industry agglomeration is a new development of industrial agglomeration theory in the era of the digital economy, breaking through the traditional geographical space category in connotation and realizing a mixed agglomeration of "virtual agglomeration" and "physical agglomeration".

Innovation Theory: Schumpeter's innovation theory holds that innovation is the main source of growth for an economy, and the forms of innovation include technological innovation, product innovation, organizational innovation, and market innovation. Digital industry agglomeration can create a good atmosphere for innovation. By gathering a large number of innovative subjects (enterprises, scientific research institutions, talents) and innovative factors (technology, capital, data), it promotes interaction and cooperation between innovative subjects, accelerates knowledge diffusion and technology spillover, reduces innovation costs and risks, encourages the coexistence and development of disruptive innovation and incremental innovation, and thus generates a chain of "agglomeration of innovative factors—Occurrence of innovative activities—Transfer and transformation of innovative achievements—Improvement of economic growth quality".

3. Impact mechanism of digital industry agglomeration on high-quality economic development: From the perspective of innovation-driven

Innovation-driven development is the primary pathway through which digital industry agglomeration empowers high-quality economic growth. By aggregating innovative factors, optimizing the innovation environment, and enhancing innovation cooperation, digital industry agglomeration promotes innovative development, accelerates the transfer and transformation of innovative achievements, and ultimately achieves high-quality economic development. Its specific operational mechanisms can be divided into the following three dimensions:

3.1. Agglomeration effect of innovative factors: Reducing innovation costs and improving innovation efficiency

The most significant advantage of digital industry agglomeration lies in its ability to rapidly converge key innovative resources such as talents, technology, capital, and data, achieving the intensive agglomeration of innovative factors and laying the foundation for innovative activities. From the perspective of talent factors, digital industrial clusters typically gather a large number of high-level digital talents, scientific researchers, and technical professionals from upstream and downstream enterprises in the industrial chain, research institutes, and other institutions, who possess extensive professional knowledge and experience.

From the perspective of technological factors, digital industrial clusters attract numerous enterprises with strong technological innovation capabilities (including leading enterprises, start-ups, and specialized, refined, characteristic, and new enterprises) as well as research institutions^[2].

3.2. Innovation synergy effect: Promoting collaborative innovation and enhancing innovation quality

Digital industry agglomeration can facilitate collaborative innovation among different innovation subjects within the cluster, establish an "industry-university-research-application" collaborative innovation mechanism, and improve the quality and level of innovation. On one hand, leading enterprises, start-ups, and specialized, refined, characteristic, and new enterprises in the cluster can form an efficient collaborative innovation pattern. Specifically, leading enterprises have distinct development advantages, including strong resource concentration capabilities and brand influence. They can drive collaborative innovation among upstream, midstream, and downstream enterprises in the industrial chain, deploy the industrial chain around the innovation chain, and accelerate the industrialization process of new technologies and products.

4. Impact mechanism of digital industry agglomeration on high-quality economic development: From the perspective of structural upgrading

Digital industry agglomeration can promote high-quality economic development through the path of industrial structure upgrading. It optimizes the industrial structure mainly by realizing the rationalization of industrial structure, the upgrading of industrial structure, and the integrated development of industries, thereby enhancing industrial competitiveness and ultimately achieving the goal of high-quality economic development. Its operational mechanisms can be summarized as follows:

4.1. Promoting the rationalization of industrial structure: Optimizing factor allocation and improving industrial collaboration efficiency

The essence of industrial structure rationalization lies in the reasonable and optimal allocation of factors among industries and the coordinated development of different industries. By gathering upstream and downstream enterprises in the industrial chain and supporting service providers, digital industry agglomeration forms a complete digital industrial chain and industrial ecosystem, which promotes the effective flow and optimal allocation of factors within and across industries, thereby advancing the rationalization of industrial structure.

From the perspective of intra-industry factor allocation, in digital industrial clusters, enterprises maintain close upstream-downstream input-output relationships.

From the perspective of inter-industry factor allocation, digital industry agglomeration facilitates the integration of digital technology with traditional industries such as agriculture, industry, and services. It guides factors to flow from low-efficiency industries to high-efficiency ones, improving the inter-industry factor allocation structure. The penetration and diffusion of digital technology can enhance the digitalization and intelligence level of traditional industries, reduce their production costs, promote the upgrading and development of traditional industries, strengthen the real economy, improve the quality and efficiency of the industrial sector, consolidate enterprises' dominant position in innovation, increase industrial concentration and product added value, and implement the foundation-strengthening project for advanced manufacturing.

4.2. Promoting the upgrading of industrial structure: Cultivating emerging industries and enhancing industrial added value

The essence of industrial structure upgrading is the transformation process of industries from low added value to high added value, from labor-intensive to technology-intensive, and from traditional industries to emerging industries. As an important carrier for the development of the digital industry, digital industry agglomeration can advance industrial structure upgrading by cultivating emerging digital industries, promoting industrial technological upgrading, and increasing industrial added value.

Firstly, in terms of cultivating emerging digital industries, the strong innovation atmosphere and concentrated innovative factors in digital industrial clusters create a favorable ecological environment for the nurturing and development of emerging digital industries. Start-ups and specialized, refined, characteristic, and new enterprises in the clusters conduct technological innovation and business expansion in cutting-edge fields such as artificial intelligence, blockchain, big data, and cloud computing, which helps cultivate a number of emerging digital industries with core competitiveness and accelerate industrial transformation and upgrading.

Secondly, it promotes industrial technological upgrading. The agglomeration spillover effect, technology spillover effect, and innovation synergy effect generated by digital industry agglomeration drive continuous progress in industrial technological levels. Leading enterprises in the clusters, with their strong R&D capabilities, play a leading role in tackling key core technologies, promoting industrial technological upgrading and renewal. Meanwhile, small and medium-sized enterprises can introduce, digest, absorb, and re-innovate technologies through technical imitation and cooperation.

4.3. Strengthening integrated industrial development: Breaking industrial barriers and expanding industrial development space

Industrial integration is a major trend in industrial structure upgrading. Its core lies in breaking the barriers between traditional industries, realizing the mutual penetration and integration of industries, and deriving new industries, new formats, and new models. With its digital characteristics and networked cooperation model, digital industry agglomeration can accelerate industrial integration, broaden the boundaries of industrial development, and promote the improvement of economic development quality.

Firstly, digital industry agglomeration facilitates the integrated development of the digital industry and traditional industries, fostering "digital +" industries.

Thirdly, digital industry agglomeration promotes the integration of different sub-fields within the digital industry, building a diversified industrial ecosystem. The digital industry covers multiple sub-fields such as digital product manufacturing, digital product services, digital technology application, and digital factor-driven industries. The integration between these sub-fields can generate synergy effects and enhance the overall

competitiveness of the industry^[3].

5. Implications of empirical research and countermeasure suggestions

5.1. Implications of empirical research

Existing empirical studies indicate that digital industry agglomeration exerts a significant positive promoting effect on high-quality economic development, and this impact exhibits an obvious spatial spillover effect. That is, digital industry agglomeration in a region not only influences the high-quality economic development of the region itself but also has an impact on that of neighboring regions. Meanwhile, the promoting effect of digital industry agglomeration on high-quality economic development is heterogeneous. Furthermore, this promoting effect is more pronounced in regions with a high level of educational investment and a sound innovation ecosystem.

5.2. Countermeasure suggestions

Firstly, strengthen the role of top-level design and planning guidance, and promote the formation of a "wild goose formation" development layout for digital industrial clusters. Combined with the resource endowments and development advantages of various regions, conduct overall planning for the development of digital industrial clusters at the national level. Encourage the Beijing-Tianjin-Hebei region, the Yangtze River Delta, and the Guangdong-Hong Kong-Macao Greater Bay Area to take the lead in building world-class digital industrial clusters and play an exemplary and leading role. Meanwhile, support the central and western regions to develop characteristic industrial agglomeration areas based on their strengths, and construct a "wild goose formation" pattern featuring differentiated development, clear division of labor, and coordinated linkage. Strengthen the construction of digital infrastructure, optimize the layout of infrastructure such as 5G networks, industrial Internet, and data centers, promote the connection of business systems and the application of data sharing among enterprises in the clusters, and lay a solid foundation for the development of digital industry agglomeration.

Secondly, focus on innovation cooperation and enhance the innovation capacity of clusters^[4].

6. Conclusion

Based on the perspectives of innovation-driven development and structural upgrading, this paper conducts an empirical study on the pathways through which digital industry agglomeration influences high-quality economic development. The research finds that digital industry agglomeration strengthens the innovation-driven effect through the agglomeration of innovative factors, improvement of the innovation ecosystem, and innovation collaboration, thereby realizing technological innovation and the transfer and transformation of achievements. Meanwhile, it drives structural upgrading by promoting the rationalization of industrial structure, advancing the upgrading of industrial structure, and enhancing integrated industrial development, which in turn optimizes the industrial structure and improves industrial competitiveness. The two pathways—Innovation-driven development and structural upgrading—Promote each other and jointly constitute an important mechanism through which digital industry agglomeration empowers high-quality economic development.

About the author

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