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Analysis on the Correlation between the Spatial Spillover Effect of Digital Economy and Urban Green Development

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ABSTRACT
This paper deeply explores the correlation between the spatial spillover effect of the digital economy and urban green development. Firstly, it expounds the definition, characteristics, and development status of the digital economy and introduces the definition and types of the spatial spillover effect. Then, it analyzes the positive impacts of the digital economy on surrounding areas and its role in promoting coordinated development among cities. Finally, it focuses on the association between the digital economy and urban green development, including promoting green technology innovation and digital transformation in urban green development. Research shows that the spatial spillover effect of the digital economy is conducive to urban green development, providing a theoretical basis for promoting regional sustainable development.

KEYWORDS
digital economy; spatial spillover effect; urban green development; coordinated development; green technology innovation

In the context of global economic transformation, the digital economy has gradually become an important driving force for urban development. Urban green development, as a new goal of current economic development, emphasizes environmental protection while promoting economic growth and realizing the sustainable use of resources. This paper will analyze the impact of the digital economy on urban green development from the perspective of its spatial spillover effect.

1 Overview of the Digital Economy

1.1 Definition and Characteristics of the Digital Economy

The digital economy is a new economic form built on digital technology. In this economic form, information and knowledge are the core elements for various economic activities. Its high - efficiency is reflected in the fact that digital technology can quickly process vast amounts of information, greatly improving the efficiency of various economic links such as production, transaction, and management. For example, enterprises can obtain market information instantly through digital management systems and make production decisions, reducing losses caused by decision - making delays. In terms of innovation, the digital economy constantly gives birth to new

business models, products, and services. For instance, the sharing economy model is an innovative product of the digital economy. By connecting supply and demand sides through digital platforms, it has changed the traditional ways of resource ownership and utilization. Networking is a prominent feature of the digital economy. Digital technology closely connects various economic entities, forming a vast network system. Whether it is the industrial chain collaboration between enterprises or the interaction between consumers and enterprises, it all depends on this networked structure, enabling resources to be optimized in a broader range, breaking through the geographical and time limitations of traditional economic activities.

1.2 Development Status of the Digital Economy

In recent years, the digital economy has shown a booming development trend globally. With the continuous progress of information technology, from the widespread popularization of the Internet to the iterative upgrading of mobile communication technology, the digital economy has penetrated into all aspects of the economy and society. Governments around the world have deeply recognized the huge potential of the digital economy and have successively regarded it as a key area for enhancing national competitiveness. Against this background, investment in digital infrastructure has been continuously increased. For example, the construction of high - speed broadband networks has been carried out on a large scale in many countries and regions, and 5G networks are also being accelerated globally. At the same time, cloud computing centers, data centers, and other infrastructures have emerged in large numbers, providing solid hardware support for the storage, processing, and analysis of massive data. At the enterprise level, all kinds of enterprises are actively promoting the application of digital technology. Whether it is traditional manufacturing enterprises carrying out digital transformation, using the Internet of Things technology to realize equipment interconnection and improve production efficiency, or Internet enterprises constantly expanding their business boundaries and developing new digital products and services, such as the continuous innovation of online office software and e - commerce platforms, all indicate that the digital economy is changing the global economic pattern at an unprecedented speed[1].

2 Theoretical Basis of Spatial Spillover Effect

2.1 Definition of Spatial Spillover Effect

The definition of the spatial spillover effect shows that when an economic activity occurs in a specific region, the impact of this activity will not be limited to the interior of this region. For example, when a large - scale high - tech industrial park is established in a city, enterprises in the park will spread their influence to the surrounding areas through various channels when conducting economic activities such as R & D, production, and sales. From a technical perspective, new technologies developed by enterprises in the park may be borrowed, learned, or imitated by enterprises in the surrounding areas, thereby enhancing the technical level of surrounding enterprises; from the aspect of talent flow, high - quality talents gathered in the park may flow to enterprises in the surrounding areas to work, bringing advanced management experience and innovative thinking; from the perspective of the industrial chain, the development of enterprises in the park may drive the rise of related supporting industries in the surrounding areas, such as raw material supply and parts production. This phenomenon that the economic activity in one area spreads to the surrounding areas in space and generates positive or negative impacts (external benefits) is the spatial spillover effect[2].

2.2 Types of Spatial Spillover Effect

The spatial spillover effect includes different types, such as technology spillover, knowledge spillover, and industrial chain extension, which have an important impact on regional economic development. Technology spillover refers to the spread of new technologies of an enterprise or industry in a region to the surrounding areas through various non - market - trading methods, improving the production efficiency of surrounding enterprises and the overall regional technical level. Knowledge spillover covers various aspects of knowledge. Knowledge achievements generated by universities and research institutions can spill over to surrounding enterprises through various channels, enhancing the innovation and management capabilities of enterprises. Industrial chain extension is manifested as the development of the leading industry in a region promotes the layout of upstream and downstream related industries in the surrounding areas. For example, the development of the automobile industry drives the upstream and downstream industries to establish bases in the surrounding areas. This not only promotes the coordinated development of industries but also increases employment, enhances the total amount, stability, and competitiveness of the regional economy.

3 Analysis of the Spatial Spillover Effect of the Digital Economy

3.1 Influence of the Digital Economy on Surrounding Areas

The digital economy has a positive impact on surrounding areas. From the perspective of innovation, the innovative characteristics contained in the digital economy have a strong radiation ability. For example, regions with a developed digital economy are often the birthplaces of new business models and innovative technologies. After these innovative achievements are generated, they will be spread to surrounding areas in various ways. Enterprises and entrepreneurs in surrounding areas can draw on these innovative ideas and carry out localized innovation practices. For example, the e - commerce live - streaming model developed in some big cities can be learned by merchants in small - city or rural areas around. They can promote local characteristic products to a broader market by using this sales model, thus driving the local economic development.

In terms of technology dissemination, digital technologies on which the digital economy depends, such as big data, artificial intelligence, and cloud computing, can spread across geographical space. Enterprises in surrounding areas can obtain these technologies to optimize their own production processes and improve management efficiency. For example, an enterprise in a developed area uses artificial intelligence technology to achieve precise production scheduling and improve production efficiency. Enterprises in surrounding areas can introduce relevant technologies or cooperate with this enterprise and adopt similar technical means in their own production processes, reducing resource waste and improving the utilization efficiency of resources. This not only helps the development of enterprises in surrounding areas but also enhances the economic vitality of the entire surrounding area, realizing the benign development of the economy.

3.2 Digital Economy Promotes Coordinated Development among Cities

The digital economy plays a crucial role in promoting coordinated development among cities. With the development of digital technology, the cost of information exchange between cities has been greatly reduced, which lays a good foundation for cooperation between cities. For example, through digital platforms, enterprises in different cities can conveniently share market information and understand each other's demand and supply situations. In terms of industrial development, the digital economy promotes the formation of close cooperation relationships between cities. Some

cities have advantages in digital technology R & D, while others may have a solid foundation in traditional manufacturing or agriculture. With the connecting role of the digital economy, cities with R & D advantages can provide technical support for the digital transformation of traditional industry cities. For example, they can help manufacturing cities use the Internet of Things technology to realize the intelligent transformation of production equipment, or provide digital solutions for precision agriculture for agricultural cities. This cooperation helps to form a regional economic community, and cities can share resources. For example, resource - rich cities can share natural resources, labor, etc. with resource - demanding but technologically advanced cities; in terms of complementary advantages, cities with a developed digital economy can combine their advanced digital technologies, innovative business models, etc. with the geographical location, industrial characteristics, etc. of other cities to jointly create more competitive regional industrial clusters, enhance the economic strength of the entire region, and promote the coordinated development within the region to a higher level[3].

4 Correlation between the Digital Economy and Urban Green Development

4.1 Digital Economy Promotes Green Technology Innovation

The digital economy is closely related to urban green development, and the digital economy has a strong driving force for green technology innovation. In today's era, the digital economy is developing rapidly, and its characteristics such as massive data, powerful computing ability, and efficient information dissemination inject new vitality into the research and promotion of green technology. First, from the data perspective, a large amount of data generated by the digital economy can provide a rich information base for the R & D of green technology. For example, through the collection and analysis of energy consumption data and environmental monitoring data, researchers can more accurately understand the links with low energy utilization efficiency and the sources of environmental pollution, thus providing a clear direction for the R & D of green technology. Second, technologies in the digital economy such as cloud computing and big - data analysis can greatly improve the efficiency of green technology R & D. In terms of simulating the environment and optimizing algorithms, these technologies can enable researchers to test more schemes in a shorter time, accelerating the transformation process from theory to practice of green technology. Moreover, in terms of promotion, the extensive network platforms and efficient information dissemination channels constructed by the digital economy can make environmental protection technologies known to relevant enterprises and users more quickly. Enterprises can quickly obtain the latest information on green technology through digital platforms, evaluate its applicability to their own production and operation, and thus accelerate the application of green technology in the production process, promoting the city to move towards the direction of green development[4].

4.2 Digital Transformation in Urban Green Development

In the process of urban green development, digital transformation plays an irreplaceable important role.

From the perspective of resource management, digital transformation has brought significant changes. With the help of digital technologies such as the Internet of Things, big data, and artificial intelligence, cities can accurately monitor and manage various resources. For example, by installing sensors in every corner of the city, real - time data on water resource use can be collected, including water consumption and water quality changes. After these data are transmitted to a unified

management platform and analyzed by big data, the areas with water resource waste or the sources with pollution risks can be accurately located, thus realizing refined water resource management and improving the utilization efficiency of water resources.

In terms of energy use, digital transformation also provides many efficient solutions. The construction of smart grids is a typical example. Through digital technology, real - time monitoring and intelligent scheduling of power generation, transmission, and consumption are realized. For example, according to the electricity demand in different time periods and the energy supply situation, the smart grid can automatically adjust the power distribution, encourage enterprises and residents to use electricity during off - peak hours, and reduce energy waste. At the same time, the popularization of smart home systems also helps save energy at the household level. Users can remotely control the running state of household appliances through mobile devices such as mobile phones, optimizing the energy use pattern. These digital transformation measures are helpful to promote green production and consumption. For enterprises, digital technology can optimize the production process, reduce energy consumption and resource waste in the production process, and realize green production.

5 Conclusion

The spatial spillover effect of the digital economy is closely related to urban green development. The digital economy has a positive impact on surrounding areas through the spread of innovative achievements and technology diffusion, promoting coordinated development among cities. In terms of urban green development, the digital economy can not only promote green technology innovation but also facilitate the digital transformation of cities, thereby improving efficiency in resource management, energy use, etc., and promoting green production and consumption. Therefore, attaching importance to the development of the digital economy and giving play to its spatial spillover effect is of great significance for promoting urban green development. In regional development planning, the digital economy should be actively guided to combine with the green development strategy to achieve sustainable development goals.

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