

# Exploration on Digital Technology in the Dual Circulation Direction

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**Abstract:** *With the outbreak of COVID-19, the world economy has experienced a series of deep recessions. The rise of the digital economy provides a good means to cope with the current downward pressure on the economy, and it is an important measure to build a new development pattern of "dual circulation". In the mechanism of double cycle construction driven by digital economy, this study points out that the supply and demand relationship between digital economy and digital technology is precisely matched to expand domestic demand and enhance economic synergy. In order to explore and evaluate how DT innovation promotes the growth of the digital economy, this article selects a group of companies with DT innovation characteristics as research objects and compares them with ordinary companies. In the comparison between the number of enterprises corresponding to different types of enterprises and the growth rate of the digital economy, the growth rate of emerging enterprises (driven by DT) in the digital economy is 28.6%. The growth rate of digital economy for technology innovation oriented enterprises is 18.4%. This article helps to provide new guidance for the development of dual circulation.*

**Keywords:** *Digital Technology, Dual Circulation Direction, Digital Economy, Digital Technology Innovation, Expanding Domestic Demand*

## 1. Introduction

In recent years, with the iteration of the new generation of information technology and the rapid growth of Internet users, the digital economy has become an indispensable part of people's production and life, and has increasingly become the main driving force for China's economic development. Circular economy is not only the key to promoting the development of China's "big circulation" and "dual circulation", but also a strategic measure to achieve coordinated development of society, economy, and environment. Therefore, it is necessary to continuously promote the development of circular economy, so that it can develop towards higher levels and directions.

This article first presents the insufficient research and exploration of the application of DT in the dual circulation direction (DCD), pointing out that although some places have initially established basic systems for developing circular economy, some of these systems still have shortcomings such as insufficient strength, many loopholes, and weak authority. Then, a dual circulation construction mechanism driven by the digital economy is proposed. Developing the digital economy can help to open up information channels between supply and demand, enabling them to provide timely and effective feedback and communication, reducing information asymmetry and incompleteness between supply and demand. Finally, the promotion effect of DT on the development of cross-border e-commerce is verified.

## 2. Related Work

"Dual circulation" is a new development pattern dominated by China's major circulation and China's international "dual circulation". The national government believes that in the absence of economic development, the protection and inheritance of traditional villages rely on pillar industries. Small scale feed enterprises must rely on resource advantages, establish their own brands, and follow the path of "dual circulation" development. To achieve transformation and upgrading, it must take the path of government leadership, management innovation, and coordinated development of enterprises [1]. Zhao Aiying believed that in recent years, with the gradual promotion of the "dual circulation" strategy, Ansteel has actively responded to the central enterprise's "going out" strategy, carried out

cross-border operations, and increased international business such as cross-border trade and settlement. This has played a positive role in enhancing the internationalization status of the RMB and fulfilling the responsibilities of central enterprises [2]. From the perspective of Anhui Province in the context of dual circulation, Zhu Linni discussed the deepening of cooperation with ASEAN in the context of dual circulation. He summarized the basic situation and development status of agricultural technology cooperation between Anhui and ASEAN, and analyzed ASEAN's agricultural technology needs [3]. Li Xingyue described the problems faced by the integrated circuit industry, including the focus on independent innovation, overcoming key core technologies, and promoting industry upgrading and adjustment. He also developed a new type of "dual circulation" international cooperation model [4]. Xu Erqing proposed the concepts of "digital supply chain" and "smart logistics" based on the shortcomings of the current work philosophy, business model, technical equipment, and other aspects of the power grid company. He starts from the development needs of power grid enterprises, analyzes the constituent elements of digital logistics system, explores the evolution laws of its constituent elements, and constructs a smart logistics system for digital supply chain oriented towards "dual circulation" [5]. However, their research did not provide specific application measures for DT in the DCD.

The digital economy has the characteristic of reducing transaction costs [6-7]. The traditional market transaction costs are too high, making it difficult to achieve some transactions, which limits the company's production and operation, and affects the company's operational performance. DT relies on a large amount of data resources and information, which can effectively reduce the asymmetry of information, greatly reduce the search costs of both supply and demand sides in the transaction process, and thereby reduce the transaction costs of enterprises. It has a certain impact on the employment structure and environmental performance of enterprises. The deep integration of DT and the financial sector has greatly reduced transaction costs and expanded the supply and coverage of financial services.

### 3. Method

#### 3.1 Issues to be Paid Attention to in the Development of Circular Economy

##### (1) The supporting policy system is not yet perfect

Although some places have initially established basic systems for developing circular economy, some of these systems still have shortcomings such as insufficient strength, many loopholes, and weak authority. Therefore, in order to adapt to the new social situation, it is necessary to further improve and upgrade it. At the same time, due to the involvement of multiple departments such as ecological and environmental protection, agriculture and forestry, natural resources, taxation, industry and information technology, and development and reform in the development of circular economy, a unified system has not yet been formed among various departments, and there are also some policy conflicts and blind spots among them.

##### (2) Insufficient connection between production and living systems

The amount of solid waste generated in some places has rapidly increased, but their planned disposal facilities are seriously outdated, and the ability to dispose of sludge in a harmless manner is seriously insufficient. For hazardous waste, some companies cannot find effective disposal methods and the disposal cost is high. Although some places are also promoting the full process collaborative treatment of urban and industrial waste, due to inadequate management mechanisms and inadequate market-oriented charging operation mechanisms, the production and living systems are not well circulated and connected, resulting in a serious surplus of utilization and disposal capacity for high value-added hazardous waste. It also leads to problems such as generally low operating loads of facilities and the inability of most urban household waste and other waste to enter the production system for collaborative disposal.

##### (3) The public's awareness of recycling is not strong enough

In daily life, most people do not pay attention to the energy consumption of environmentally friendly products, have weak energy-saving awareness, and have not developed the habit of saving electricity and using environmentally friendly shopping bags. The recycling and utilization of recyclable materials such as paper and batteries are often overlooked. The energy efficiency of buildings is not high, and the energy-saving renovation of catering units still needs to be intensified. The recycling of kitchen waste is not sufficient. Therefore, although various regions in Guangxi have

actively promoted circular economy and achieved some results in environmental science popularization, they still face many problems and the public's awareness of recycling is still weak.

### 3.2 Digital Economy Driven Double Circulation Construction Mechanism

The digital economy, with its large scale, fast development speed, strong driving ability, and strong radiation ability, is the core of building a new development pattern of dual circulation. In the future, as the proportion of the digital economy continues to increase, its support for the new development pattern of dual circulation can become more prominent [8-9].

#### (1) Promote precise matching of supply and demand relationships

Developing the digital economy can help open up information channels between supply and demand, enabling timely and effective feedback and communication, reducing information asymmetry and incompleteness between supply and demand. This can promote diversification and high-quality development in the supply side, and achieve smooth circulation in China [10]. At the same time, it can also drive the rapid development of DT, leading to significant changes in the entire economy and society. At the same time, it can also bring more new demand and supply, achieving a higher level of supply-demand balance.

#### (2) Expand domestic demand

The digital economy has driven employment, expanded consumption, and enhanced development confidence [11-12], giving rise to a large number of new individuals and micro economies, opening up new employment opportunities, and bringing more convenient digital products and services. Consumer consumption concepts have changed, forming new consumption habits and gradually shifting towards online consumption. Digital consumption can expand into new spaces, constantly generating new and more important forms of consumption.

#### (3) Enhance economic synergy

The digital economy has promoted the interconnection and interoperability between supply chains, industrial chains, and service chains, connecting various links and information nodes of each link. This can enhance the transparency of information, promote the rapid and efficient flow of resources, and also improve the efficiency of resource allocation [13]. At the same time, with the development of the digital economy, the information asymmetry in economic operation has been improved, and the flow barriers of factors such as funds, resources, and products have been improved. This can enhance the coordination and rapid response of the Chinese economic system to external shocks, as well as the overall resilience of the economic system [14-15].

The Gini coefficient is commonly used in machine learning and data analysis to measure the impure or uncertain nature of classification. In the DCD, it can be used to evaluate the diversity of market demand.

$$\text{Gini}(D) = \frac{1}{2\sum(i+cp_i)} \quad (1)$$

Among them,  $D$  represents the dataset,  $c$  represents the number of categories, and  $p_i$  represents the proportion of samples in the  $i$  class.

Euclidean distance is used to measure the straight-line distance between two points and is commonly used in data analysis and pattern recognition. In the DCD, it can be used to evaluate the geographical location or logistics cost of suppliers or customers.

$$d(x, y) = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2 + \dots + (x_n - y_n)^2} \quad (2)$$

Among them,  $x$  and  $y$  represent the coordinates of two points, and  $n$  represents the dimension.

A linear regression model is used to predict the relationship between a dependent variable and one or more independent variables. In the DCD, it can be used to analyze the relationship between market demand and factors such as product price and quality:

$$H_G = x_i + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n \quad (3)$$

Among them,  $x_i$  represents the independent variable, and  $\beta_i$  represents the regression coefficient.

Support Vector Machine is a machine learning algorithm for classification and regression analysis. In the DCD, it can be used to identify market trends and customer groups in order to better formulate

marketing strategies. The formula is:

$$f(x) = K(x, x_i) + b \sum \alpha_i \tag{4}$$

Among them,  $\alpha_i$  represents the Lagrange multiplier, and  $K(x, x_i)$  represents the kernel function.

#### 4. Results and Discussion

##### 4.1 Role of DT Innovation in the Growth of the Digital Economy

Research objective: evaluate how DT innovation promotes the growth of the digital economy.

Experimental design: Select a group of companies with DT innovation characteristics as the research objects, and compare them with ordinary companies.

Evaluation criteria: Growth rate of digital economy

The number of enterprises corresponding to different types of enterprises and the growth rate of the digital economy are shown in Figure 1. The experimental group refers to enterprises with DT innovation characteristics, the control group refers to general enterprises, emerging enterprises refer to enterprises driven by DT, and DT driven enterprises refer to enterprises without DT applications. The digital economy growth rate of emerging enterprises (driven by DT) is 28.6%. The growth rate of digital economy for technology innovation oriented enterprises is 18.4%.

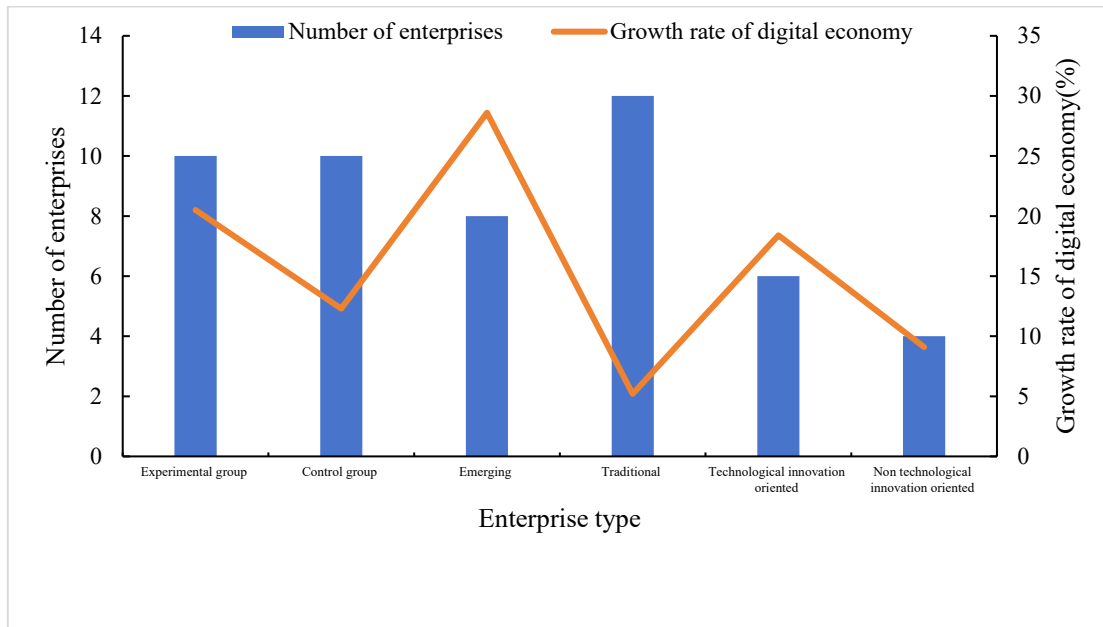


Figure 1: The number of enterprises corresponding to different types of enterprises and the growth rate of the digital economy

##### 4.2 Popularity of DT and the Upgrading Degree of Digital Economy Structure in Different Regions

The popularity of DT and the degree of upgrading of the digital economy structure in different regions are shown in Figure 2. The popularity of DT in region A is 75%, and the degree of upgrading of the digital economy structure is 85%; the popularity of DT in region B is 50%, and the degree of upgrading of the digital economy structure is 60%.

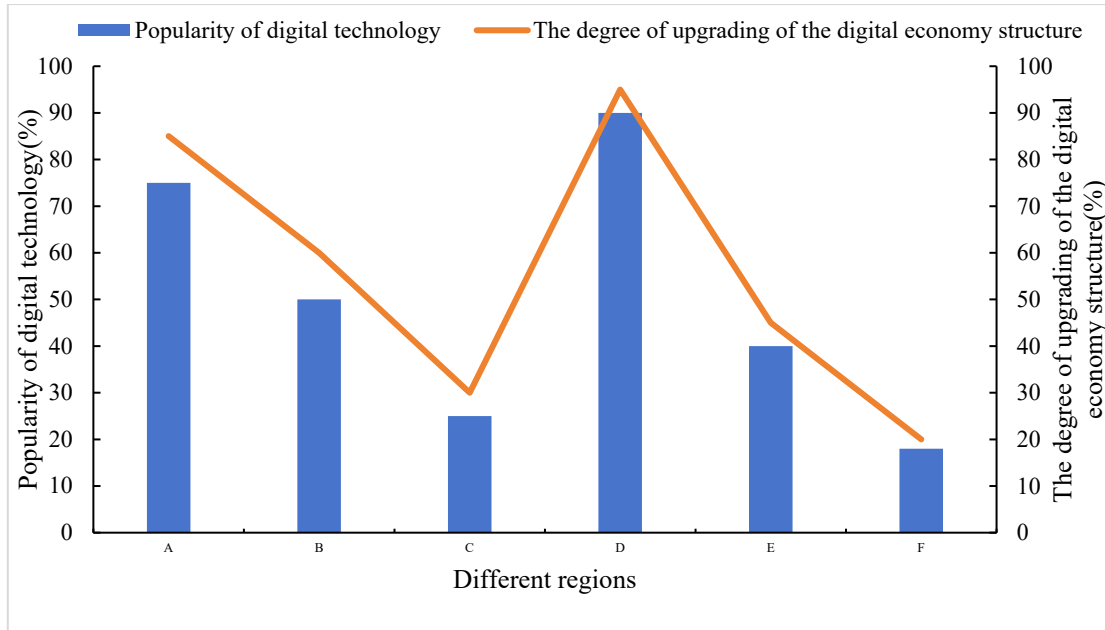


Figure 2: The Popularity of DT and the Upgrading Degree of Digital Economy Structure in Different Regions

**4.3 Promoting Effect of DT on the Development of Cross border E-commerce**

Experimental design: Select several cross-border e-commerce platforms, analyze and compare their data, and explore the impact of digitalization on their development.

Evaluation indicators: growth rate of transaction volume and market share.

The growth rates of transaction volume and market share on different platforms are shown in Figure 3. The growth rate of platform A's transaction volume is 20%, and the market share growth rate is 15%. The growth rate of B platform's transaction volume is 18%, and the market share growth rate is 12%.

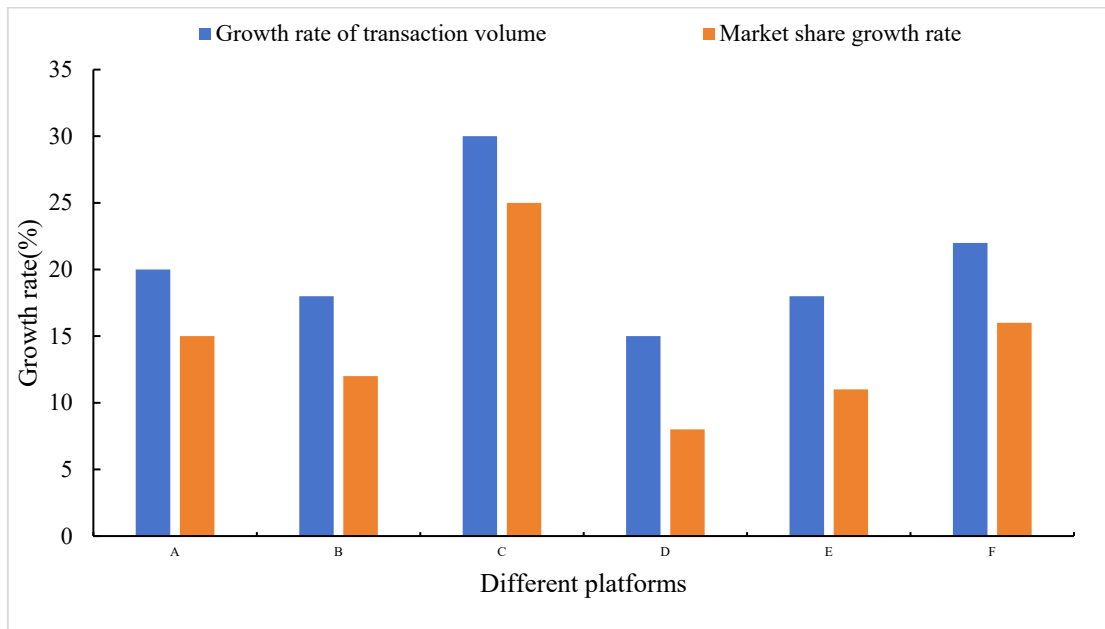


Figure 3: Growth rate of transaction volume and market share on different platforms

**4.4 Degree, Quantity, and Corresponding Development Speed of DT in Different Enterprises**

The degree, quantity, and corresponding development speed of DT application in different

enterprises are shown in Table 1. Innovative enterprises have a high degree of DT application and a development speed of 30%. Entrepreneurial enterprises have a moderate level of DT application and a development rate of 20%.

*Table 1: The degree, quantity, and corresponding development speed of DT application in different enterprises*

Enterprise type	Degree of application of DT	Number	Development speed (%)
Innovative enterprises	High	500	30
Entrepreneurial enterprises	Common	700	20
Emerging enterprises	High	300	25
Traditional enterprises	Low	800	5

#### **4.5 Role of Digital Finance in Promoting the Development of Digital Finance**

Experimental Design: the paper selected some digital financial platforms and traditional financial institutions for empirical research to explore the role of DT in inclusive financial innovation. Evaluation indicators: Popularity of digital finance and level of financial innovation activities.

The penetration rate of digital finance and the level of financial innovation activities corresponding to different types of institutions are shown in Table 2. The penetration rate of digital finance on digital financial platform A is 85%, and the level of financial innovation activities is 55 times per year. The penetration rate of digital finance in traditional financial institution A is 55%, and the level of financial innovation activities is 12 times per year.

*Table 2: Digital finance penetration rate and financial innovation activity level corresponding to different types of institutions*

Institution type	Popularity rate of digital finance (%)	Financial innovation activity level (times/year)
Digital financial platform A	85	55
Digital financial platform B	78	48
Traditional financial institution A	55	12
Traditional financial institution B	48	8
Emerging financial institutions	65	20

#### **4.6 Suggestions and Strategies for the Development of Dual Circulation**

##### **(1) Scientifically and reasonably adjusting industrial structure**

For relatively underdeveloped regions, it is necessary to make reasonable adjustments and layouts to the industrial structure within the region based on the local economy, environmental capacity, and resource supply situation, combined with the actual situation. The circular economy itself is an economy dominated by high technology. To develop the circular economy, it is necessary to have a corresponding innovation system, and the development of the circular economy requires the adjustment and layout of industrial institutions. It must adhere to the concept of green development, adhere to the principle that "technology is the primary productive force", and aim for green and low-carbon transformation. It should accelerate the innovation of traditional industrial production processes, develop new technologies and products that are efficient, high-quality, energy-saving and environmentally friendly, and improve competitiveness. It can make the production process cleaner, reduce resource and energy consumption, and achieve harmonious development of economy and resources.

##### **(2) Building a scientifically reasonable policy system**

It aims to promote local governments to formulate regulations on circular economy. Firstly, scientifically sound relevant laws can be formulated, such as laws on household waste classification, construction waste, kitchen waste, waste electronic products, waste textiles, and the recycling of scrapped vehicles, and a sound energy efficiency labeling and low-carbon certification system can be established. Secondly, it is necessary to improve the access system for the development of circular economy, relax the entry barriers for industries such as renewable resources and new energy, energy conservation and environmental protection, circular economy research and development, and consulting. In areas such as planning and layout, capital investment, tax incentives, project approval,

and land use, it can improve industrial access conditions and prioritize supporting circular economy projects in areas such as energy conservation, environmental protection, and resource output under equal conditions. On this basis, a special fund for the development of circular economy within the autonomous region can also be established through financial and market operations, and funds can be raised through various channels, actively applying for funding from the state to support it. The application process for optimizing corporate tax preferential policies can improve the level of investment project management for enterprises.

## 5. Conclusions

The digital economy has unparalleled advantages over traditional economic transformation models, and has a subtle promoting effect on the formation of a new development pattern of "dual circulation". This article explores the relationship between the degree, quantity, and corresponding development speed of DT application in different enterprises, and finds that innovative enterprises develop faster. In the future, it should take the digital economy as a new driving force, build an innovative ecosystem of digital economy elements, and promote a virtuous cycle of China and the international community.

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