

Theoretical analysis of the influence of digital economy on interprovincial trade in frontier areas

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Abstract: *With the rapid development of information technology, the digital economy has shown a strong driving ability and is regarded as an engine of economic growth. Compared with the traditional economic model, digital economy is the manifestation of the marketization and industrialization of information technology revolution. It can play a role in various links such as production, circulation and consumption, and improve the speed of information transmission, reduce data processing and transaction costs, optimize resource allocation, and has a natural connection with trade. This paper theoretically discusses the influence and function mechanism of digital economy on the existence of domestic trade in border areas, and believes that digital economy can promote the trade between border areas and the mainland by breaking trade barriers, reducing trade costs, expanding the trading market and improving the level of innovation. This research highlights the importance of the development of digital economy in theory, but also helps to give full play to the location advantages of the border areas and the outside, and provide certain empirical evidence for accelerating the construction of a domestic unified market.*

Keywords: *Digital Economy, Frontier Trade, Inter-provincial Trade*

1. Introduction

1.1 Research background

Foreign trade is one of the important reasons for the sustained economic growth in border areas. However, in the face of exogenous shocks such as constant trade frictions and rising protectionism and unilateralism, it is not advisable to rely excessively on export-oriented economy to drive development. In this case, the country repeatedly put forward "to speed up the construction of domestic big cycle as the main body, domestic and international binary mutually promote the new development pattern", the existing research also shows that China's provincial trade potential is much higher than the international trade potential^[1], which means that the depth and breadth of internal reform needs to be further strengthened. This move emphasizes the importance of internal market potential, also pointed out the direction for the future development of the frontier areas —— to strengthen internal trade, open commodity elements resources flow in a larger scope, actively participate in building a domestic unified market, based on the large scale of the domestic market, cultivating new advantages of international competition and cooperation. The border area is not only at the edge of the geographical position, but also at the edge of the domestic market system for a long time. Facing the domestic market system with strong trade potential and large economic scale, the border should while maintaining the sustained and steady growth of foreign trade and strengthen the ties with the domestic market. Actively carrying out trade with the mainland provinces is one of the ways to integrate the border areas into the domestic market. At the same time, with the rapid development of information technology, the digital economy has shown a strong driving ability and is regarded as an engine of economic growth. According to the relevant data of China Academy of Information and Communications Technology, the scale of China's digital economy was 22.4 trillion yuan in 2016 and 45.5 trillion yuan in 2021, with a year-on-year nominal growth of 16.2%. In 2020, the CPC Central Committee and The State Council issued the Opinions on Building a More Perfect Physical Mechanism for Market Allocation of factors, pointing out that data has become a new key factor of production, and the inherent innovation and externalities of digital economy play an important role in the cross-regional flow of resources such as information, products and factors. Obviously, the digital economy is not only the core driving force for China's development, but also the key to promoting the construction of a new development pattern in the coming period.

It is the trend of the border areas to strengthen trade with the mainland provinces into the national commodity unified market. Under this background, can the digital economy become a driving force and inject new vitality into it? If so, what's the mechanism behind it? Based on this, this paper tries to theoretically explore the possible influence and action mechanism of digital economy on the domestic trade in frontier areas. This research can not only highlight the importance of the development of digital economy in theory, but also help to give full play to the location advantages of internal and external border areas, provide policy suggestions for narrowing regional differences and improving the degree of integration, and also provide some empirical evidence for accelerating the construction of a domestic unified market.

1.2 Research meaning

The research significance of this paper is to explore the momentum of frontier areas and mainland trade links, the digital economy and provincial trade under the same framework, from the theoretical dimension of digital economy of interprovincial trade flow shadow and mechanism of action, enrich the related research, also to identify the trade promotion effect of digital economy provides a new theoretical reference and experience. In addition, this paper analyzes the development momentum of domestic trade in the border areas under the background of the national unified market, so as to provide new ideas and theoretical support for the border areas to actively build a new development pattern and strengthen the research on the integration of the border areas and the mainland. At the same time, based on the frontier level: "connecting inside and connecting outside" is the location advantage of frontier areas. From the perspective of "connecting inside", this research is of great significance for stimulating the trade potential of frontier areas, narrowing the regional gap, strengthening the circulation of commodity elements, and giving play to the location advantage of connecting outside and inside. Based on the national level: this paper echoes the "construction of a domestic unified market, accelerating the construction of a new development pattern with the domestic big cycle as the main body and the domestic and international double circulation" proposed by the country, and the research conclusion can provide certain empirical evidence for accelerating the construction of a domestic unified market.

2. Current situation and dilemma of trade between frontier and mainland areas

2.1 Internal trade status in border areas

"Frontier" is a concept that covers multiple levels and multiple factors, such as economy, politics and culture, and is constantly changing with the development of The Times. In recent years, domestic scholars have gradually refined the definition of the concept of frontier. Zhou Ping believes that the concept of frontier is divided into broad sense and narrow sense^[2,3]. The broad frontier will refer to the specific part of the national territory, that is, the marginal territory of the state, but this concept is being diluted. Li Dalong started with the use of the term "frontier" in ancient books, divided the concept of "China frontier" into "land frontier" and "sea frontier", and further refined the concept of frontier^[4]. Guang-hui li from the perspective of economic research, the border border, and is connected with adjacent national territory, have complete administrative functions, considerable economic scale, certain social function and population area, specific designated for Yunnan, Guangxi, Inner Mongolia and other nine provinces of 21 city, 11 regions, nine autonomous prefectures and three au, for the first time the concept of frontier to prefecture (state, au) level^[5]. It can be seen that the definition of the frontier in the academic circle has not been unified, and this concept is constantly developing and deepening at any time. In the case of this paper, the border areas refer to the nine provinces and regions passing through the border, including Heilongjiang, Jilin, Liaoning, Inner Mongolia, Gansu, Xinjiang, Tibet, Yunnan and Guangxi.

Trade between the frontier and the mainland can be traced back to the tea-horse market. Tea horse trade was the main form of trade between border areas and mainland during the Southern and Northern Dynasties, but the commodities were not limited to tea horse. Through this means of trade, all regions and ethnic groups have achieved a limited way to meet their needs and exchange needed goods. In the historical perspective, tea and horse exchange plays an important role in the integration of the border areas and the central Plains: first, the central government deepens the rule of the border areas through trade; second utilizes the complementarity between the border and mainland areas, and gradually establishes a national unified economic system through trade to bring the national economy of the border areas into the national market^[6]. Although the tea-horse exchange is a historical product of a certain period, and the centralized ruling form has long since disappeared, it is still one of the feasible

ways to strengthen the economic exchanges within the border, narrow the regional gap and improve the integration level through trade.

As an economic activity reflecting the degree of market integration among provinces, inter-provincial trade can effectively promote the flow of products and factors in a larger range, expand the scale of the domestic market and stimulate market demand^[7], and will inevitably drive regional economic growth. The border area is the gathering place of ethnic minorities and the rich historical and cultural heritage place. The unique agricultural products and cultural extension products are the characteristics of the border area. However, due to the remote geographical location and traffic obstruction, there are always trade barriers with the mainland market. In the early development, the border areas mostly focused on foreign trade, forming an export-oriented economy that relied on foreign trade, while ignoring the potential domestic market with a huge base. At present, it is in the strategic period of building a unified domestic market and realizing the double circulation at home and abroad. The border area can actively integrate into the double circulation strategy by virtue of the location advantage of the internal and external communication. While developing foreign trade, it can go deep into the domestic market and actively develop domestic trade. For itself, the frontier areas lag behind for a long time, relying on the domestic market, realizing the transformation of the momentum of the domestic market, strengthening the integration of the border and facilitating the smooth flow of goods and elements in the whole country is the trend. Therefore, the border areas should seize the development opportunities, give full play to their unique advantages, realize economic development, and narrow the regional differences.

2.2 Development difficulties

China's vast cities, scattered terrain and diverse cultures have long caused trade isolation between regions. Because of its peripheral geographical position, the border area tends to develop foreign trade, and the internal market has been ignored for a long time, resulting in the current trade pattern of high domestic trade cost and uncirculation of trade between regions. At present, the reasons for hindering the border and inland trade are as follows. First of all, the existing studies show that the phenomenon of inter-provincial trade barriers is serious, which hinders the trade exchanges in one region. This total obstacle is mainly reflected in: the large cost of trade between regions, the cost of trade between different provinces is even higher than that of trade between countries; since the reform and opening up, China's exports grow at an annual average rate of 18%, while the annual average growth rate of inter-provincial trade is only 4.8%^[8], inter-provincial trade links are not obvious, even weakened^[9]. Hou Chuanlu and Qin Chenglin used the data of inter-provincial railway freight volume to analyze the characteristics of China's inter-provincial trade, and found that the inter-provincial trade network has a wide coverage and obvious hierarchical differentiation, and the flow and scale of inter-provincial trade were unbalanced^[10]. Li Ziluo et al. (2022b) estimated the inter-provincial trade flow of 26 departments from 1992 to 2019. The results showed that although the trade scale between regions increased, the proportion of inter-provincial outflow trade quota in the national total outflow trade quota showed a trend of rising first and then decreasing. After further measuring the two indicators of boundary effect and trade cost, the research results show that the inter-provincial trade barriers show a change pattern of rising first and then decreasing, and the gap between different provinces is large. Through the above research results, it can be learned that the trade barriers such as local protectionism and border effect among various provinces in China seriously hinder the trade between various provinces and restrict the integration of border areas into the mainland market. Therefore, it is of great significance to the border areas to weaken trade barriers, reduce trade costs, and smooth the circulation of commodities and elements. The birth of digital economy has a natural correlation with every link of trade.

3. The theoretical mechanism of digital economy to promote trade development in border areas

3.1 Digital economy improves the level of trade through technological innovation

In the international trade theory, technological progress has a great influence on the development of international trade. The "technology gap theory" points out that after a country develops new products through its core technology research, it can export these new products to other countries by virtue of the comparative advantage formed by this technology gap. This comparative advantage will not disappear until other countries gradually master the advanced technology by importing new products or through technological cooperation. In other words, technological progress has a positive effect on export, and this effect has dynamic effects. Similarly, there are also technological differences between

different regions within a country, so technological innovation is also one of the factors affecting inter-provincial trade. The digital economy has the characteristics of high permeability, strong innovation and wide coverage, and plays a leading role in technological innovation. The innovation of digital economy relies on information technology, which can combine a large number of digital resources with economic activities, realize the effective allocation of resources and optimize economic activities, so as to improve the productivity and economic benefits of enterprises. At the same time, the combination of intelligent, machine-oriented and networked characteristics realizes the leap-forward technological innovation, and realizes the allocation, organization, production and consumption of resources with higher efficiency. The innovation of digital economy also lies in that it has changed the economic model, broken through the traditional capital-based economic model, and adopted a new technology-based economic model, so that market participants can get more and faster feedback, and accelerate the evolution of the market and social ecosystem. It also brings economic activities into a new stage, creates a more efficient, convenient and sustainable development mode, and realizes the leapfrog development of combining information technology and economic activities. Continuous innovation of digital products can directly promote the improvement of technological capabilities. The digital economy can also strengthen the allocation of factor resources, improve the matching efficiency, and can objectively promote technological progress, and promote trade through technological progress. Therefore, based on the above analysis, this paper believes that improving the level of technological innovation may be the key driving force for digital economy to affect inter-provincial trade. Technological innovation can reshape the regional trade pattern and enhance the competitiveness of inter-provincial trade in the digital era. See Figure 1 for the technological innovation trend roadmap of the impact of digital economy on inter-provincial trade.

3.2 Digital economy drives the development of domestic trade by breaking down trade barriers

Different from the traditional economic model before, digital economy, as a new economic model, can be reflected in production, consumption and other links. At the same time, relying on the rapid development of Internet technology, it can improve the speed of information transmission, reduce transaction costs, reduce data processing costs and optimize resource allocation, which is the inherent advantage of the digital economy^[11]. It therefore has a natural connection with inter-provincial trade. By combining digital economy with production, digital economy can promote the automation and informatization of production. As a new economic growth factor, data is incorporated into the production function and constructs the production factor system. Data is characterized by sharing, easy to replicate and repeated use. The integration of data with traditional factors of production can expand economic effects and help to improve the quality and efficiency of labor, knowledge, management, capital and technology factors^[12]. By combining digital economy with consumption, the development of digital economy can meet consumers' demand for the diversity of commodities. In addition, the balance between supply and demand is realized by expanding the supply market, and the rapid iteration of the digital economy enriches the diversity of commodities and stimulates consumer demand^[13]. The expansion of demand scale nationwide requires manufacturers to expand the supply scale and improve the supply capacity, so as to drive all regions to strengthen cooperation and smooth the flow of goods between regions, transforming the single direction output of product supplier to two-way exchange flow between product supply and demand^[14]. By combining digital economy with circulation links, digital economy exists in the form of technology and cloud, which weakens the geographical location restrictions and makes the circulation more smooth and barrier-free. First of all, relying on Internet technology, digital economy effectively breaks the boundaries between regions, breaks through the boundaries of geographical space, and reduces the restrictions of geographical location on spatial activities. Secondly, digital industrialization enhances the network effect and scale economy effect of the traditional real economy operation, which can significantly reduce the transaction cost of commodities, blur the market boundary of each region, and reintegrate the pattern of the domestic market. Industry digital to enhance the platform economic effect, with the advantages of new digital technology and super regional, fully integrate online resources to online commodity circulation channels, remove circulation space restrictions, effectively break the regional trade barriers, fully reduce transaction costs^[15], to promote the regional trade, strengthen the connection between regions. Therefore, based on the above analysis, this paper believes that the digital economy can act on production, circulation, consumption and other links, break the trade barriers between the two sides, and break through the space restrictions to promote the direct inter-provincial trade of various regions, especially for e-commerce and network trade.

3.3 Digital economy promotes trade by reducing transaction costs

According to the theory of digital economy, information is an important factor of production of digital economy, and information is also an indispensable and important part of the transaction. Transaction costs include information cost, search cost, decision cost and so on. With its network technologies such as big data and cloud platforms, the digital economy can act on transaction costs and reduce transaction costs. On the one hand, the digital economy, relying on the large platforms such as the Internet, provides an equal platform for information exchange, ensuring the transparency and equality of information, accelerating the efficiency and rate of information exchange, and enabling both parties of the transaction to obtain more complete information. In terms of information cost, the development of digital economy has greatly reduced the transaction cost caused by the unequal and incomplete information between the two parties. Secondly, relying on the big data platform, information search is more fast and convenient. The construction of information think tanks and various databases makes the channels and ways of obtaining information more diversified. On the other hand, this technology weakens the time and energy needed to search for information, provides information support for both parties to make decisions, and also increases the probability of product transaction. E-commerce can weaken local protectionism and strengthen the information symmetry of market transactions. As information, the network platform can provide the required information for both supply and demand at a relatively low cost, reducing the cost of information search and processing^[16]. On the other hand, the development of technology digitalization weakens the "information asymmetry" problem between the market transaction subjects. The problem of information asymmetry stems from the incomplete information acquisition of both parties in the transaction, resulting in the transaction costs. Driven by the development of digital economy, information has become a key factor of economic development, and the flow of information has therefore become frequent, and the information barriers between different subjects can be broken. In general, the advantages of information transmission and multilateral market of the digital economy can break down the market segmentation, break through the market boundary, and act on all aspects of transaction costs such as information cost and search cost. Based on the above analysis, this paper believes that the digital economy can rely on information elements and digital technology, act on the search cost and information cost, and promote trade flow by reducing trade costs.

3.4 Digital economy can drive the development of regional trade through space spillover effect

The core-edge theory states that the previously unrelated regions have evolved from the initial isolated development mode to the unbalanced development mode of mutual connection, and then gradually evolved into the region of balanced development. The core edge can be understood as that the central area in a space occupies many advantages in human resources, technology, capital and other aspects, and the area outside the core area becomes the marginal area. The marginal areas are even more backward in terms of economic level, population number and technological development level. The core area and the marginal area are relative in concept, and they are mutually dependent and mutually influential in development. The core area can absorb the production factors such as labor force and capital from the marginal areas. On the other hand, the labor force, knowledge, innovation and other factors in the core area will also penetrate and spread to the marginal areas. China's border areas include the nine provinces of Heilongjiang, Jilin, Liaoning, Inner Mongolia, Gansu, Xinjiang, Xizang, Guangxi and Yunnan, which are undoubtedly the marginal areas of the whole country. According to the core edge theory, the border areas lag behind for a long time and lack the development power. One of the reasons is that resources and labor flow to the core areas, and technology, capital and other factors are more inclined to flow to the core areas, which hinders the economic development of the border areas. In the era of digital economy, information has become a key element, which indicates that the digital economy has the characteristics of inherent externalities and permeability. It can reduce the limitation of time and space through efficient information transmission, and enhance the breadth and depth of regional economic activity correlation. The high mobility of information also brings key elements such as knowledge and technology, which will not only flow within the core area, but also spread to the marginal areas outside the core area through space spillover. From this point of view, when the digital economy in the core areas takes the lead in the rapid development, the spatial spillover effect will also spread to the marginal areas, especially when the use of Internet technology will spread more quickly and defrontier. In short, in the whole country, the border areas belong to the marginal areas, etc. The development of digital economy in the surrounding developed areas can break through the asymmetric restrictions of time, space and information, and inject new vitality into the border areas through the space spillover effect.

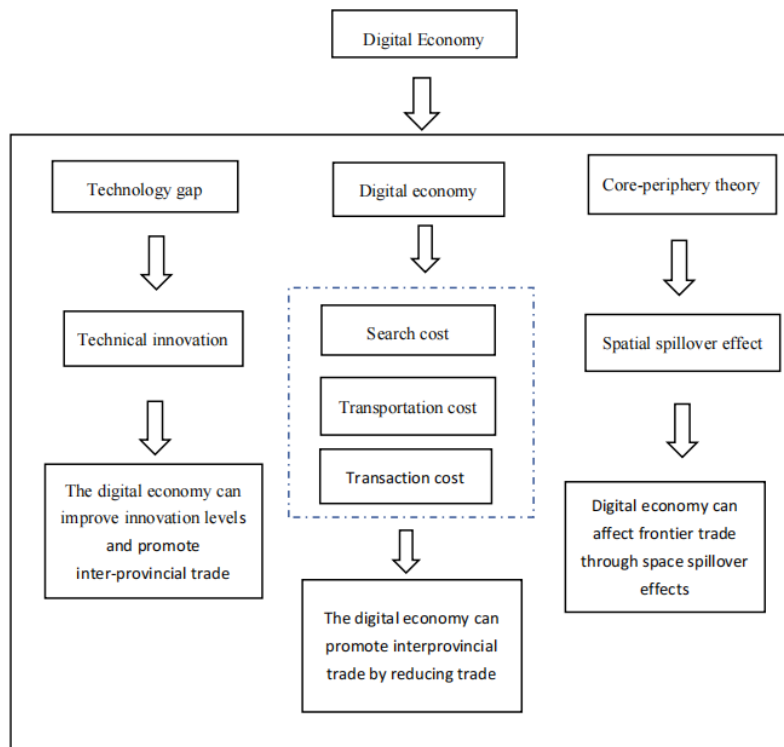


Figure 1: Theoretical mechanism of digital economy in promoting the development of frontier trade

4. Conclusion and recommendations

4.1 Conclusion

At present, the digital economy has become the engine and driving force of economic development in the new era, and is undoubtedly the main trend of future development. From the perspective of constructing domestic and foreign double cycles, this paper analyzes the theoretical mechanism of the influence of digital economy on domestic trade in border areas. Based on the theory of technological progress, the theory of digital economy and the core edge, the following conclusions are the combination of digital economy: Digital economy can improve the trade level and promote the development of domestic trade by breaking the trade barriers. Overall, the digital economy can go through multiple channels. A variety of ways, on the trade between regions. However, under the existing development conditions, the development degree of digital economy in border areas is far lower than that in other developed areas. As a major underdeveloped area in China, the border areas have long been lagging behind in terms of economy and infrastructure construction. For a long time, the economic development of the border areas is blocked, and the connection with the mainland is not close is the main problem. At present, the booming development of digital economy is undoubtedly a powerful driving force for the development of local economy and industry. It is also an opportunity for border areas to transform the disadvantages of regional conditions into advantages, strengthen trade and economic ties with the mainland, and integrate into the large domestic market. Based on the domestic market, the transformation of the crowd of the domestic market is the transformation of development momentum from external to endogenous. Therefore, all regions must focus on the development of digital economy, actively build an organic link between new economic forms and traditional trade, and seize the dividend of the digital era with the support of domestic and foreign policies and the policy of double circulation and the construction of a unified national market.

4.2 Policy recommendations

The border areas have been restricted by geographical location, trade with the mainland blocked. At the same time, the infrastructure in the border areas is generally backward, and the population loss is serious. The digital economy is relying on new technologies and new infrastructure, which is undoubtedly a fatal drawback for the border areas. In order to seize the dividend of the development of

digital economy and drive the development of border areas, we must focus on the following points. First, we need to strengthen the construction of digital infrastructure. Border areas should vigorously develop the digital economy, do a good job in infrastructure construction, such as building digital platforms, developing the new generation of information and communication technologies such as the Internet of Things, cloud computing and artificial intelligence, realize the transformation from society to digital, and provide a solid base for the development of digital economy. Second, we need to promote the deep integration of the digital economy and the real economy. The real economy has always been a solid foundation for economic growth, and it vigorously promotes industrial innovation, digital integration, and the development of e-commerce. E-commerce is a pioneer in the integration of digital economy and digital infrastructure. Through e-commerce, it drives trade between provincial regions, gives full play to the advantages of border provinces with ethnic characteristics and regional characteristics, and organically combines information technology with characteristic products in border areas, so as to realize the empowerment of digital economy and promote development through trade. The focus of the market from external to internal, to develop the domestic unified market. In addition, high-quality talents are the basis for the application of innovative knowledge and technology. The serious loss of population in border areas and the lack of talent attraction are serious problems hindering the development. Frontier areas should pay attention to the training and attraction of talents, improve supporting facilities and policies such as living and welfare, and attract more labor force. Finally, the digital divide and Matthew effect should be avoided, and the digital economy should be vigorously developed to enhance the balance between regions, narrow the gap between border areas and developed regions, promote the equal development of digital technology and digital information among regions, and inject strong impetus into the development of border areas.

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