Can the Digital Economy Promote the High-Quality Development of Communication Service Trade? —— A Study Based on the Perspective of Computers and Information Services

Qianrui Zhao *

High School Attached to Northeast Normal University (Qinghua Campus)

* Corresponding Author Email: 1523793908@qq.com

Abstract. Digital economy has developed rapidly and been widely used. The trade in computer and information services has also shown new characteristics such as networking and digitalization. Digital economy is important to promote communication's development. The paper analyzes the impact of digital economy on China's computer and information service trade from the cost savings effect and technology spillover effect, and put forward some empirical suggestions.

Keywords: digital economy, computer and information service trade, high-quality development.

1. Introduction

The world is experiencing the third Internet-based technological revolution. The infrastructure system formed by the continuous integration, superposition and iteration of new-generation information technologies such as artificial intelligence, 5G networks, Internet of Things and big data centers is the driving force for the sustainable development of digital economy. China attaches great importance to the development of the digital economy. In the government report, it is clearly stated that “we will establish a digital information infrastructure, promote the large-scale application of digital technologies, promote the large-scale rollout of 5G, and promote the digitalization of industries”. Trade in communications services, which is jointly constituted by trade in telecommunications, computer and information services is an important force in China's efforts to build a trade powerhouse and realize high-quality economic development.

In terms of the internal structure of trade in communication services, according to data from the Ministry of Commerce and UNCTAD (United Nations Conference on Trade and Development), the proportion of trade in computer and information services.

has risen from 71.6% in 2000 to 95.5% in 2020, while the share of trade in telecommunications services declines from 28.4% in 2000 to 4.3% in 2020. Therefore, the study in this paper mainly focuses on trade in computer and information services. According to UNCTAD data, global trade in services in 2020 declined by 16.5%, while trade in knowledge-intensive services saw new growth of 8.3% year-on-year. As a representative of knowledge-intensive services trade, trade in communication services is not only a tradeable object, but also a driving force for tourism, financial services and other services. Can the digital economy promote the high-quality development of China's trade in computer and information services? If so, in what ways does the digital economy contribute to the development of trade in computer and information services? How can trade in computer and information services seize the opportunities of the digital economy to achieve high-quality development? The answer to these questions is of great theoretical and practical significance for the sustainable development of China's trade in communication services and digital economy led by trade in computer and information services.

2. Literature Review

Currently, academic research on the digital economy and trade in computer and information services is centered on two main areas.

First, analyzing the relationship between the digital economy and trade in computer and information services from the perspective of the digital economy as a whole. Most scholars believe that there is a positive relationship between the digital economy and trade in services. Maune argues that trade in telecommunication services is the most digitized service type [1]. Yu Miaojie and Guo Lambin believe that in order to promote the high-quality development of China's services trade, it is necessary to accelerate the implementation of the "new digital infrastructure" and enhance the incentive effect of the digital economy on services trade in the context of the booming digital economy [2].

Secondly, analyzing the relationship between digital economy and trade in computer and information services from the segmentation of digital economy, i.e., from the perspective of digital technology application and digital infrastructure construction. Zhu Fulin points out that digital technology has become an important tool to boost the development of global trade in services in the post epidemic era. On the one hand, digital technology has greatly improved the cross-border tradeability of services, and on the other hand, it has given rise to the reform of the industrial organization of trade in services and pushed the transformation of services trade mode [3]. The development of services trade in the era of global services epidemic is an important tool for the development of global services trade. Wu Zhongqing and Dai Minghui take the effect of the rise of digital technology on trade costs in RCEP member countries as the research object, and choose panel fixed-effects model for empirical testing. It was found that digital technology has a significant negative impact on trade costs [4]. Another studies found that the construction of new information infrastructure can significantly promote the expansion of China's export trade and the increase of export technology complexity [5].

In general, research on digital economy and trade in communication services has a certain theoretical and empirical foundation. Most scholars start from the current development situation of China's communication service trade and international competitiveness and its influencing factors, and conclude that China's communication service trade is developing rapidly, but its international competitiveness is still insufficient. This lays the foundation for the research of this paper. However, these researches mostly stay at the level of trade in communication services, and the research on trade in computer and information services is relatively small. This paper analyzes the mechanism of digital economy on communication service trade from both theoretical and empirical perspectives, so as to provide targeted policy suggestions for promoting the innovative development of China's communication service trade.

3. Data and methodology

3.1. Methodology

The deeper development of the digital economy relies on the application of digital technologies and the development of digital infrastructures. In order to more reasonably and robustly assess whether the digital economy has promoted the development of trade in computer and information services, this paper measure the high-quality development of computer and information services trade in terms of quantity and quality. The econometric model is constructed as follows:

$$lnT_{it} = \alpha_0 + \alpha_1 lnD_{it} + \beta X_{it} + \varepsilon_{it}$$
$$lnTQ_{it} = \alpha_0 + \alpha_1 lnD_{it} + \beta X_{it} + \varepsilon_{it}$$

Where T_{it} denotes the size of trade in computer and information services in region i in period t, and TQ_{it} denotes the quality of trade in region i in period t. D_{it} denotes the level of digital economy in region i in period t. X_{it} is control variables, and ε_{it} is the random perturbation term. Other factors affecting the high quality development of computer and information services trade are: the level of

innovation, the level of economic development, the level of foreign investment, the level of regional openness, and the level of foreign investment.

3.2. Variable settings and data descriptions

3.2.1. Explanatory variable

Scale of trade in computer and information services (T): expressed as total trade in computer and information services.

Computer and Information Services Trade Trade Quality (TQ): the paper constructs a high-quality development index system for trade in computer and information services from five dimensions: innovation, coordination, green, openness and sharing. The quality of trade in computer and information services is evaluated by assigning corresponding weights to different indicators through the entropy value method.

3.2.2. Explanatory variables

The core explanatory variable is the level of digital economy development (D). This paper refers to Zhao Tao's study and constructs a comprehensive development index evaluation system of digital economy from the dimensions of digital infrastructure construction and digital technology application, and evaluates the level of digital economy development by assigning corresponding weights to different indexes through the entropy method. The results are shown in Table 1.

3.2.3. Control variables

With reference to existing studies, other variables affecting the high quality development of trade in computer and information services are mainly: the level of technological innovation on computing and information services (r&d), measured by the ratio of internal expenditure on R&D to GDP; the level of urban economic development (gdp), measured by GDP per capita; foreign direct investment (fdi), measured by the ratio of actual foreign investment to GDP; the degree of regional openness (open), measured by the ratio of regional import and export trade to GDP.

Table 1. Indicator system of the level of development of the digital economy

First-level Indicators	Second-level Indicators	Third-level Indicators	Weight (%)
Digital infrastructure construction	Hardware	Telecommunications fixed asset investment	12.03
	Traffic	Mobile call/ interconnection call duration volume	9.89
		Internet broadband access ports	10.23
	Subscriber	Cell phone penetration rate	10.01
		Internet penetration rate	12.04
Digital Technology Application	Enterprise	Number of high-tech enterprises	10.96
	Talent	Scientists and engineers	11.96
	Input and output	Expenditures on R& D achievements and scientific and technological services for the year	10.71
		Number of R& D achievement application and S&T service programs	12.17

3.3. Data source

The data for the indicators in this paper mainly come from the provincial statistical bureaus and the National Bureau of Statistics in 2010-2020 of China. The data on technology spillover effect come from the Compendium of Statistical Data on Sixty Years of New China and the 2010-2020 China Statistical Yearbook.

4. Results

Based on the above econometric model, this paper examines the impact of the digital economy on the trade size and quality of computer and information services. The specific regression results are shown in Table 2. In model (1) and model (5) without adding any control variables, the regression results of core explanatory variables are presented as positive, indicating that digital economy can promote the scale and quality of computer and information service trade. When adding control variables, the goodness of fit of the regression results gradually increases, which indicates that the control variables are selected appropriately. Finally, the fixed-effects and random-effects models are used for regression, and the Hausman test shows that the fixed-effects model is more robust. According to the basic regression results, it can be concluded that digital economy development will bring about an average of 0.4488 units of expansion in scale and 1.3614 units of improvement in quality. This indicates that, after controlling for a series of factors, the level of development of the digital economy has a more significant positive effect on trade in computer and information services. Therefore, the digital economy can contribute to the improvement of the scale and quality of trade in computer and information services.

Table 2. Basic regression results

	lnT				lnTQ			
	(1) FE	(2) FE	(3) FE	(4) RE	(5) FE	(6) FE	(7) FE	(8) RE
lnD	0.6062***	0.4232***	0.4641***	0.4488***	0.9917***	1.0503***	1.3962***	1.3614***
	(21.93)	(8.33)	(3.74)	(3.34)	(29.14)	(16.37)	(14.48)	(14.83)
lnr&d		0.3215***	0.0914	0.2882***		0.0925**	0.1722**	0.3671***
		(4.11)	(-1.13)	(5.40)		(-2.25)	(-2.56)	(7.56)
lnfdi		-0.0341*	-0.0225	0.0082		-0.120 5	-0.0432**	-0.0013*
		(-2.04)	(-0.79)	(0.28)		(-1.22)	(-3.11)	(-2.41)
lngdp			1.3304***	0.9393***			0.0447	-0.5127***
			(8.71)	(6.74)			(0.21)	(-3.42)
lnopen			0.1121***	0.1386***			0.0432***	0.3067***
			(3.76)	(4.27)			(6.81)	(7.27)
R^2	0.6894	0.7541	0.7485	0.7836	0.6642	0.7165	0.7961	0.8574

Note: Numbers in brackets are t-values. *, **, *** denote statistical significance at the 0.1, 0.05, and 0.01 levels, respectively.

5. Discussion

According to the above regression results, it can be seen that the digital economy can indeed promote the "quantity" and "quality" of China's computer and information services trade. What we need to know more is by what mechanism does this facilitation occur.

5.1. Digital Economy expands China's trade scale in computer and information services through cost-saving effects

Digital economy reduces production costs, transaction costs and communication costs through the construction of digital infrastructure and the application of digital technology, realizes the improvement of production efficiency and allocation efficiency, and promotes the scale of trade in computer and information services. The construction of digital infrastructure can be processed, analyzed and transmitted at a lower cost, realizing the diminishing marginal cost of digital economy [6]. This diminishing marginal cost effect can further penetrate into the enterprise, with the flow of technology to drive the flow of information, capital flow and talent flow, to realize the effective allocation of resources, and ultimately realize the compression of fixed costs and achieve low-cost product replication.

Digital technology also has a significant negative impact on trade costs. On the one hand, the third world revolution led by digital technology promotes the development of digital revolutions such as the Internet, artificial intelligence, blockchain and other digital revolutions, and the number of Internet users is rapidly rising, further increasing the demand for communication products and services. On the other hand, the construction of digital infrastructure has further improved digitalization of trade methods, significantly improving the efficiency of production, management, trade circulation and other links, and greatly improving the efficiency of existing technologies, products and services. It also greatly improves the supply capacity of existing technologies, products and services, creates new high-quality supplies, and expands the scale of trade [7].

5.2. Digital Economy enhances China's trade quality in computer and information services through technology spillovers effects

Digital economy promotes technological upgrading and innovation through the construction of digital infrastructure and the application of digital technology, thereby enhancing the quality of trade in computer and information services and realizing sustainable development [8]. It is mainly reflected in the following two aspects. First, the digital economy is a product of the combination of big data and the economy, which is conducive to the breakthrough of innovative technologies from the limitations of geographic boundaries and the spillover effect. Second, the construction of digital infrastructure based on 5G, artificial intelligence and data centers reduces the information mismatch between the two sides of the trade, breaks the time and space limitations of traditional trade modes, provides a platform for searching for information and exchanging communication, improves the speed and efficiency of core technology research and development, greatly promotes the innovative activities of computer and information services trade, broadens the trade scene of computer and information services. The digital economy drives the redistribution of innovation resources in the original environment and brings about the optimization and upgrading of trade structure. Therefore, the digital economy promotes technological innovation through the application of digital technology and the construction of digital infrastructure, optimizes the efficiency of resource allocation, and promotes the upgrading of trade in computer and information services through technological spillover [9].

6. Conclusion

Digital economy has developed rapidly and been widely used. The trade in computer and information services has also shown new characteristics such as networking and digitalization. Digital economy is important to promote communication's development. Through empirical research, this paper finds that digital economy can promote the expansion of the "quantity", i.e. trade scale, and improve the "quality" of China's trade in computer and information services. On the one hand, the digital economy promoted the expansion of trade in computer and information services in terms of "quantity" through the cost-saving effect. On the other hand, the technology spillover effect promotes the high-quality development of trade in computer and information services.

China should accelerate the deployment of digital infrastructure and pay enough attention to the regions in central and western China that are lagging behind in the development of digital economy, accelerate the innovation of digital technology, which, as part of the digital economy, plays a powerful role in promoting the development of the digital economy According to the empirical results, the digital economy can promote the development of computer and information services trade through two paths to realize the impact on the development of China's computer and information services trade, so government should increase investment in R&D funds,, set up inter-regional collaborative innovation mechanism, break down the policy barriers of innovation collaboration between innovation subjects in various regions, and realize the free flow of innovation factors between regions; expand the degree of opening up to the outside world and guide the integration of the traditional trade

with the digital economy, so as to promote the development of China's computer and information service trade.

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