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Research on the Impact of Digital Economy on Foreign Direct Investment in China

Bing Enguang*

School of International Economics and Trade, Anhui University of Finance and Economics, Bengbu, 233030, China
**Corresponding author:1273425446@qq.com*

Abstract: *Using the statistical data of 30 provinces, cities and autonomous regions in China from 2011 to 2020, this paper analyzes the impact of digital economy development on foreign direct investment. The results show that: first, the development of digital economy has a significant role in promoting the inflow of foreign direct investment, and the results are still stable after the use of instrumental variable method to deal with the potential endogenous problems; Second, the impact of digital economy development on foreign direct investment has significant regional heterogeneity, which shows that the impact of foreign direct investment in eastern China is higher than that in central and western China. Third, the development of the digital economy promotes foreign direct investment by reducing transaction costs. The conclusion of this paper will bring the corresponding enlightenment for the sustainable development of foreign direct investment in China.*

Keywords: *Digital economy; Foreign direct investment; Transaction cost*

1. Introduction

Since the reform and opening up more than 40 years ago, the rapid development of China's economy has benefited from the implementation of China's export-oriented strategy. In the face of the complex and changeable economic environment at home and abroad, the pressure on China to stabilize foreign trade and foreign investment continues to increase. The report of the 20th National Congress of the Communist Party of China pointed out that it is necessary to build a high-level opening up pattern and create a good business environment. Therefore, our country urgently needs to open up new foreign capital growth point.

At present, the digital economy has become a new driving force for economic transformation and growth, and an important focus for China to enhance its new advantages in international competition. With the continuous improvement of the digital economy, the production factors of digital technology have become an important factor to attract foreign investment, especially in developing countries, FDI has become an important means to promote economic growth and improve international competitiveness. In the complex domestic and international economic environment, only by mastering new production factors, including digital technology, can China provide a new catalyst for attracting foreign investment. According to the relevant data of the National Bureau of Statistics, by the end of 2022, China's actual utilization of foreign capital increased rapidly from US $116.01 billion in 2010 to US $189.13 billion. The digital economy developed rapidly during this period. According to the "Digital China Development Report (2022)", by the end of 2022, the scale of China's digital economy reached 50.2 trillion yuan, ranking the second in the world, and accounting for 41.5% of GDP. The development of digital economy seems to have some connection with foreign direct investment. At present, the researches of domestic and foreign scholars mainly focus on the upgrading of digital economy and industrial structure, the technical complexity of digital economy and export, and the high-quality development of digital economy and trade, etc. However, digital economy is rarely introduced into the theory of international capital flow. There are few literatures to study the impact of digital economy development on foreign direct investment from the perspective of transaction costs. The rise of digital economy has brought new opportunities and challenges to foreign direct investment. How to deal with the impact of digital economy on foreign direct investment is one of the important issues facing policy makers and business decision makers in various countries. This study attempts to propose relevant countermeasures to better meet the challenges brought by the development of digital economy and promote the sustainable development of foreign direct investment.

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2. Theoretical Analysis and Research Hypothesis

Existing research shows that there is a lot of literature on the digital economy and foreign direct investment. Some scholars discuss the impact of digital economy on foreign direct investment based on the macro level of digital economy development in host countries, and the research results show that the development of digital economy can promote the inflow of foreign capital [1-3]. Choi pointed out that the development of Internet technology in host countries significantly promoted FDI inflow [4]. Based on trade costs and institutional quality, Qi Junyan found that the development of the host country's digital economy promoted international capital flow [5]. However, Zhan Xiaoning and Ouyang Yongfu found that digital economy plays an increasingly important role in the direction of international capital flow based on the typical facts of the rise of digitalization in multinational enterprises and the slowing growth of foreign capital [6]. With the vigorous development of the digital economy, many new industries and business models have emerged around the world. The development of digital economy not only improves the technical level of all walks of life, but also becomes an important basis for multinational companies to make international investment. Today, the technical level of the digital economy and its related industries has become an important reference standard for international investment. In other words, a higher level of digital economy in the host country can attract investment from the home country to the host country by improving its competitiveness [7]. From the perspective of infrastructure construction, Pan Shenbiao and Wang Jianbin, based on the research on the Internet level data of countries along the "Belt and Road", found that with the advancement of digital infrastructure construction, the gap in Internet level has gradually narrowed, which can not only make up for backward development and other problems, but also overcome geographical restrictions and promote the smooth progress of investment [8].

From the perspective of transaction costs, the development of digital economy breaks the time and space restrictions in the traditional economic model, reduces the asymmetry and incomplete information, promotes the comprehensive upgrading of industrial structure with its unique penetration rate and development efficiency, and shorters the process of industrial chain optimization. Transaction costs can be subdivided into search costs, transport costs and management costs. The digital economy helps to reduce the cross-border transaction costs of enterprises by reducing information asymmetry, improving market openness and reducing transaction uncertainty [9]. Specifically, first of all, the digital economy can help enterprises obtain market information, thus reducing the search costs generated by enterprises in the transaction process, and to a certain extent, reducing the business risk. Secondly, the development of digital economy makes logistics and transportation more intelligent, which is conducive to the development of warehousing and transportation industry, that is, the development of digital economy can effectively reduce the transportation cost of multinational enterprises. Finally, the digital economy uses the Internet to improve market transparency, reduce transaction uncertainty, and overcome blind speculation caused by the lack of information, thereby improving the efficiency of enterprise management and helping to reduce management costs. Therefore, the development of the digital economy can reduce search costs, transportation costs and management costs, that is, the development of the digital economy can reduce transaction costs. Foreign enterprises pursue profit maximization when conducting cross-border transactions and are more inclined to enter enterprises with lower transaction costs. Therefore, the development of digital economy has the characteristics of reducing the cost of cross-border transactions, making cross-border transactions more convenient and efficient.Based on the above analysis, this paper proposes the following hypothesis.

Hypothesis H1: The development of digital economy has a significant promoting effect on foreign direct investment.

Hypothesis H2: The development of digital economy promotes foreign direct investment by reducing transaction costs.

3. Model Construction, Variable Selection and Data Source

3.1. Model Construction

According to the above analysis, the benchmark regression model and the intermediary effect model are established.

$$lnfdi_{it} = \alpha_0 + \alpha_1 dige_{it} + controls + \lambda_i + \mu_t + \varepsilon_{it} \quad (1)$$

$$market_{it} = \beta_0 + \beta_1 dige_{it} + controls + \lambda_i + \mu_t + \varepsilon_{it} \quad (2)$$

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$$lnfdi_{it} = \gamma_0 + \gamma_1 dige_{it} + \gamma_2 market_{it} + controls + \lambda_i + \mu_t + \varepsilon_{it} \quad (3)$$

3.2. Variable Declaration

3.2.1. Explained Variable

Level of foreign direct Investment (*fdi*) : This paper measures the level of foreign direct investment by the proportion of the actual utilization of foreign capital in GDP of each province (autonomous region and city), and the actual utilization of foreign capital is converted by the exchange rate of RMB against US dollar in the current year.

3.2.2. Explaining Variable

Digital economy Development level *(dige*): In view of the availability of data, this paper adopts the measurement method of Zhao Tao et al., and divides the development level of digital economy into two aspects: Internet development and digital inclusive finance [10]. Among them, the Internet development index adopts the measurement index of Huang Huiqun et al. [11], and the digital inclusive finance adopts the measurement index of Guo Feng et al. [12]. The development index of digital economy is obtained by the principal component analysis method.

3.2.3. Control Variable

First, the degree of opening to the outside world(*open*): in the context of economic globalization, there is a close relationship between the degree of opening to the outside world and foreign direct investment. The higher the degree of opening to the outside world, the more FDI inflows may be. Therefore, this paper selects the proportion of total import and export trade in GDP of each region to measure the level of opening-up. Second, urbanization level (*urban*) : This paper selects the proportion of urban population in the total population to measure the urbanization level. With the advancement of urbanization, the expansion of market size, the improvement of infrastructure and the improvement of labor quality will provide more business and investment opportunities for foreign investors. Third, human capital level (*hc*) : the improvement of human capital level has a positive impact on regional investment introduction, and the impact degree is gradually increasing [13]. Based on Li's method of selecting human capital indicators, the average years of schooling in each province (autonomous region and city) are used to measure [14]. Fourth, infrastructure construction (*infra*)**:** This paper selects the ratio of road transportation length to resident population in each region as a measurement index. The level of infrastructure construction plays an important role in the location selection of OFDI, and the more perfect the regional infrastructure is, the more attractive it will be to FDI [15].

3.2.4. Intermediate Variable

Transaction cost (*market*) : Referring to the research method of Fan Gang (2017), this paper takes the degree of marketization as the substitute variable of transaction cost, and selects the proportion of non-state-owned economy in the main business income of industrial enterprises to measure the degree of marketization in various regions [16].

3.3. Data Source

In view of the availability of data, the data in this paper are selected from the panel data of 30 provinces, autonomous regions and municipalities in China from 2011 to 2021 (excluding Xinjiang) to analyze the impact of digital economy development on foreign direct investment. The variable data selected in this paper are mainly from National Bureau of Statistics, China Statistical Yearbook, China Urban Statistical Yearbook, etc., and some missing values are filled by interpolation method.

4. Empirical Results and Analysis

4.1. Empirical Results and Analysis

According to the baseline regression in Table 1, the coefficient of the digital economy is significantly positive at the 1% level, and the regression coefficient is 0.467. After adding control variables, the regression coefficient of the development level of the digital economy increases from 0.467 to 0.513, but the coefficient of the digital economy is also significantly positive at the 1% level. It shows that the development of digital economy is conducive to foreign direct investment, and hypothesis 1 is verified. The rapid development of China's digital economy has accelerated the digitization, networking and

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ecology of our society, which is conducive to the sustainable development of foreign capital and thus promotes the inflow of foreign capital.

From the perspective of control variables, the coefficient of opening to the outside world is significantly positive, indicating that China's opening to the outside world has a positive impact on foreign direct investment. By opening up the market and reducing trade barriers, multinational companies are more likely to enter the target country or region to conduct business. Opening up provides multinational enterprises with more market opportunities, high-quality resources, policy support and innovative cooperation, improves the competitiveness and efficiency of foreign investors in the local economy, and thus promotes the inflow of foreign direct investment. The coefficient of human capital level is positive and has passed the significance test. It shows that the improvement of human capital level will promote foreign direct investment. High levels of human capital can provide multinational companies with skills and expertise, reduce labor costs, increase productivity, and promote innovation and technology transfer. Therefore, when choosing an investment location, multinational companies usually consider the level of human capital in the target region to ensure that they can obtain enough human resources to support their business development. The level coefficient of infrastructure construction is positive and has passed the significance test, indicating that infrastructure construction has an important impact on foreign direct investment. The lack of perfect infrastructure will limit the production and business activities of foreign investors, while good infrastructure can improve the competitiveness and efficiency of foreign investors in the target market and attract more foreign direct investment. In short, infrastructure development is an important factor in foreign direct investment. The urbanization level coefficient is significantly positive, indicating that the improvement of urbanization level usually attracts more foreign direct investment. With the advancement of urbanization, the expansion of market size, the improvement of infrastructure and the improvement of labor quality will provide more business and investment opportunities for foreign investors. Therefore, the improvement of urbanization level usually has a positive impact on foreign direct investment.

Table 1: Results of baseline regression.

Variable	(1)	(2)	(3)	(4)
	fdi	*fdi*	*market*	*fdi*
dige	0.467*** (0.124)	0.513** (0.163)	-0.634*** (0.163)	0.497** (0.164)
market				-0.025* (0.011)
open		1.34*** (0.269)	1.821* (0.968)	1.295*** (0.289)
urban		7.534*** (1.178)	-4.026 (2.893)	7.436*** (1.181)
hc		0.088*** (0.148)	-0.502 (0.347)	0.075 (0.152)
infra		0.819*** (0.363)	0.087 (0.121)	0.822** (0.022)
_cons	5.542*** (0.038)	-4.239* (2.084)	151.103*** (2.985)	-0.5309 (3.088)
Provincial fixed effect	YES	YES	YES	YES
Year fixed effect	YES	YES	YES	YES
N	300	300	300	300
R^2	0.044	0.133	0.478	0.134

4.2. Mediation Effect Analysis

In order to verify the impact mechanism of the development level of digital economy on foreign direct investment, this paper included transaction cost as an intermediary variable in the analysis framework, and adopted the intermediary effect model for reference to the research methods of Wen Zhonglin and Ye Baojuan [17]. The regression results are shown in columns (3) and (4) of Table 1. It can be seen that the development of digital economy has a significant role in promoting the marketization level, and the marketization level is negatively correlated with transaction costs. Therefore, the development of digital economy can reduce transaction costs, and the reduction of transaction costs is conducive to the entry of foreign enterprises. In other words, the development of digital economy in China promotes foreign direct

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investment by reducing transaction costs.

4.3. Robustness Test

In order to verify the reliability of the conclusion, the robustness test is carried out by replacing core explanatory variables and instrumental variables. The core explanatory variable is replaced by the digital economy development index measured by entropy value method. The robustness test results are shown in Table 2. There is no significant difference between the regression results and the baseline regression results, which proves that the results are robust.

Table 2: Regression results of robustness test.

Variable	(1)	(2)	(3)
	Entropy evaluation method	Entropy evaluation method	Instrumental variable
dige	4.279*** (0.749)	3.943*** (0.163)	0.868*** (0.240)
open		1.332*** (0.230)	1.033* (0.585)
urban		6.530*** (0.966)	8.222*** (2.223)
hc		0.066 (0.153)	0.016 (0.194)
infra		0.877** (0.367)	0.737*** (0.268)
_cons	2.635*** (0.050)	-1.778* (3.488)	6.342*** (4.333)
Provincial fixed effect	YES	YES	YES
Year fixed effect	YES	YES	YES
N	300	300	300
R^2	0.041	0.127	0.478

4.4. Heterogeneity Analysis

Table 3: Regression results of heterogeneity test.

Variable	(1)	(2)
	Eastern region	Central and western regions
dige	0.771** (0.266)	0.280* (0.113)
open	1.755*** (0.298)	0.597 (1.196)
urban	-15.857*** (2.634)	4.043* (1.908)
hc	-0.523*** (0.178)	-0.261 (0.162)
infra	-1.066 (0.919)	1.003* (0.504)
_cons	-8.902 (5.825)	0.145 (2.250)
Provincial fixed effect	YES	YES
Year fixed effect	YES	YES
N	120	180
R^2	0.374	0.127

Through the measurement of the development level of digital economy in different regions of China, it is found that there are obvious differences in the development of digital economy in different regions of China, and different digital economy development levels may have a heterogeneous effect on foreign direct investment. According to the criteria of the National Bureau of Statistics for the division of the eastern and central regions, this paper divides 30 provinces (autonomous regions and municipalities) into the eastern and central regions, and carries out regression respectively. The results are shown in Table 3.

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The influence of the development level of digital economy on FDI has regional heterogeneity. The development of digital economy in the eastern region and the central and western regions has significantly promoted FDI, but the estimated coefficient value of the eastern region is larger, indicating that the development of digital economy in the eastern region has a more significant promoting effect on FDI. The possible reason is that the eastern region, due to the factors of developed economy, perfect infrastructure and high quality of talents, has developed rapidly in the digital economy and attracted a large number of foreign direct investment. The development of digital economy in the central and western regions is relatively slow, mainly because of the lack of advanced technology, talent and infrastructure restrictions, resulting in a relatively small scale of foreign direct investment. But the resource endowment and labor cost advantages of the central and western regions have attracted some foreign investment, especially in manufacturing and services. In short, the impact of digital economy development on foreign direct investment in eastern and central and western regions is mainly restricted by regional economy and talent quality.

5. Research Conclusion and Enlightenment

5.1. Conclusions

Based on the panel data of 30 provinces (autonomous regions and municipalities) in China from 2011 to 2020, this paper empirically studies the impact of digital economy development on FDI inflow, and incorporates transaction costs into the same analytical framework to further explore the impact and mechanism of digital economy development on FDI inflow. The research conclusions are as follows: First, the development level of digital economy has a significant positive impact on the inflow of foreign direct investment, and this impact is still valid after a series of robustness tests. Second, according to the heterogeneity test, there is regional heterogeneity in the impact of the development level of digital economy on the inflow of foreign direct investment. Compared with the central and western regions, the eastern region is in a more advanced position in the development of digital economy, so it has a more significant role in promoting foreign direct investment. Third, mechanism analysis finds that transaction costs inhibit the process of digital economy development affecting the inflow of foreign direct investment. By reducing transaction costs through digital economy development, the business environment for international investment is improved, so that the development level of digital economy can achieve the goal of promoting foreign direct investment. Therefore, the development level of the digital economy can promote foreign direct investment through the path of reducing transaction costs.

5.2. Policy Suggestion

First, improve the digital economy planning and accelerate the development of the digital economy. With the continuous release of new technological revolution and industry innovation impetus, the development of digital economy is not only an inevitable trend, but also an important strategic choice to form new advantages in international competition. Local governments should implement the top-level strategic plan for the development of the national digital economy in a timely manner, and formulate more detailed regional development plans according to their regional conditions, resource endowments, and industrial bases, and strive to explore a localized development path for each region. Under the reality that the digital economy can become a new driving force to promote the inflow of foreign capital, local governments should also start from three aspects: data factorialization, digital industrialization, and industrial digitalization, increase the infrastructure of the digital economy, further consolidate the dividend advantages brought by new information technology for the inflow of foreign capital, and fully release the positive role of digital industrialization on the inflow of foreign capital. Second, actively expand the market to reduce transaction costs and strengthen the penetration of the digital economy.The government should further improve the construction of digital infrastructure, such as 5G, the Internet and the Internet of Things, so as to reduce the transaction costs of multinational companies in location decisions and increase their willingness to enter the market. At the same time, establish and improve the market rules for data elements in the field of digital economy, continue to optimize the business environment for enterprises, actively expand the market, and firmly promote the development strategy of digital economy. Through these measures, we will strive to create new comparative advantages of the digital economy and further form a new gravitational field to attract foreign investors.Third, accelerate the construction of digital economic infrastructure and guide the balanced development of the eastern, central and western regions of the region. There is regional heterogeneity in the promotion effect of digital economy development on foreign direct investment, and the development level of digital economy

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in China is not balanced, the development level of digital economy in the eastern region is relatively high, and the central and western regions are relatively backward compared with the eastern region. We need to make reasonable measures to narrow the digital economic gap between regions, strengthen the construction of digital infrastructure in the central and western regions, and guide the balanced development of our digital economy.

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