

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

Ying Liu

School of Economics, Henan University, Kaifeng, Henan, 475000 China

ABSTRACT

This research focuses on the impact of digital economy on foreign direct investment (FDI) in China. By combing the relevant literature, we clarify the connotation of digital economy, the influencing factors of FDI and the current research status of the relationship between the two. Built an Economic forecasting model based on the 31 provinces data 2013 - 2022, with total FDI as the explained variable, the Comprehensive Index of Digital Economy Development as the core explanatory variable, and human capital, trade openness, development economic level and industrial structure as the controlled variables. Descriptive statistics show that there is a big difference between the FDI and digital economy development level of China's provincial administrative regions. Benchmark regression results show that digital economy development has a facilitating effect on FDI, and the conclusion remains robust after autocorrelation, heteroskedasticity test and correction. Accordingly, policy recommendations are put forward to strengthen the construction of digital infrastructure, accelerate the agglomeration of digital industries, improve the digital governance system, optimize the environment for foreign investment and promote foreign investment cooperation in the digital field, with the goal of fostering the growth of the digital economy, attract overseas capital, and ensure the sustained and healthy advancement of China's economic landscape.

KEYWORDS

Digital economy; Foreign direct investment; Impact mechanism; Empirical analysis; Policy recommendations

1 Introduction

1.1 Research background

The reform and opening-up strategy have attracted numerous foreign investors to China, boosting cross-border investment and improving foreign investment policies. In November 2021, China's Ministry of Commerce reported that while global FDI fell by 34.7% in 2020, China's FDI rose by 5.7% to \$149.34 billion, nearing the U.S. total of \$156.32 billion. FDI brings capital, advanced management experience and technology, and is an important force for accelerating economic growth^[1]. It has significantly contributed to China's economic growth through technology spillovers, industrial upgrades, and capital agglomeration. As a key FDI destination, China benefits from foreign capital inflows, which enhance its openness and support economic stability and growth.

As the digital economy grows globally, it increasingly integrates with the real economy, driving economic growth. Digital technology continues to innovate and penetrate various industries, deeply merging with traditional sectors. Businesses are leveraging this trend for digital transformation, enhancing R&D, innovation, and competitiveness.

In early 2022, the Development and Reform Commission issued a policy emphasizing core technology research and new infrastructure to support digital economic growth, self-reliance, and industry transformation. China's digital economy drives real economy growth and strengthens risk resilience, contributing to stable FDI inflows even amid the global downturn in 2020.

With digitalization and globalization advancing, a growing digital economy lowers trade costs, drives innovation, attracts talent, and enhances governance. This reduces FDI inflow costs, improves technology transfer, strengthens protections, and fosters a transparent business environment. It also lowers risks for multinational corporations, promoting resource access. While the digital economy optimizes and upgrades the global value chain, it also brings creative destruction^[2]. Thus, studying how digital economy development influences FDI utilization is essential.

1.2 Significance of the study

1.2.1 Theoretical significance

Since the reform and opening-up, China's actual utilization of FDI has steadily increased, and academic research on FDI has been extensive. Most studies on FDI influencing factors focus on traditional aspects such as market size, openness, industrial structure, and human capital.

As an emerging economic form, the digital economy has been widely studied in relation to international trade. However, research on its impact on FDI remains limited. Existing studies primarily explore the relationship between the host country's digital economy and China's OFDI, with little focus on how China's own digital economy influences FDI

utilization.

This paper analyzes the impact of China's digital economy development on FDI using data from 31 provincial-level administrative regions from 2013 to 2022. By establishing a systematic set of indicators to assess digital economy development and calculating FDI stock data at the provincial level, the study provides empirical insights. It not only expands research on digital economy and FDI but also offers practical references for optimizing China's foreign capital utilization and digital economy growth.

1.2.2 Practical significance

In 2020, China introduced the "dual-cycle" development pattern to enhance the interplay between domestic and international markets while advancing efforts to stabilize foreign investment. To achieve this, improving the quality of FDI utilization is essential, ensuring that foreign capital is used more efficiently by enterprises.

As a technology-driven economic model, the digital economy has gained global attention. It not only integrates with the real economy and transforms traditional industries but also reshapes international investment patterns, significantly impacting global FDI activities.

With China accelerating digital economy development and enhancing digital capabilities, studying its relationship with FDI utilization holds great practical value. This research can help China seize new opportunities, expand its openness, and elevate both inbound and outbound investment to a higher level.

1.2.3 Research methods

This research leverages panel data from China's 31 provincial-level administrative regions between 2013 and 2022 to construct a robust set of indicators aimed at measuring the digital economy development level in different regions, and calculating the stock data of FDI in each provincial-level administrative region. In the empirical analysis, model construction and sample data problems are eliminated as much as possible by constructing models, descriptive statistics, replacing samples and multiple tests, so as to verify how the level of China's digital economy development will have an impact on FDI.

2 Model construction

2.1 Model construction

Considering that China's FDI may not only be affected by the level of development of the digital economy, we add the core explanatory variables and each control variable to the model, and establish the following econometric models.

$$FDI_{it} = \alpha_0 + \beta_1 DIF_{it} + \beta_2 Human_{it} + \beta_3 Trade_{it} + \beta_4 DEL_{it} + \beta_5 Industry_{it} + \varepsilon_{it}$$

Where FDI_{it} is the explanatory variable, denoting the total foreign investment in province i in year t . $Human_{it}$, $Trade_{it}$, DEL_{it} , $Industry_{it}$ are the control variables, $Human_{it}$ denotes the human capital of province i in year t . $Trade_{it}$ denotes the trade openness of province i in year t . DEL_{it} denotes the level of economic development of province i in year t . $Industry_{it}$ denotes the industrial structure of province i in year t . DIF_{it} is the core explanatory variable i.e., the composite index of digital economic development of province i in year t . α_0 is a constant term, a random error term, $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are parameters to be estimated.

2.2 Variable selection

Selected panel data for 31 provinces for the decade 2013-2022.

2.2.1 Explained variable

Foreign direct investment is represented by the actual utilized foreign investment in each province annually, computed as the region's total FDI for the year (in billions of dollars) adjusted by the exchange rate level of that year.

2.2.2 Core explanatory variables

Digital economy development index. We create a comprehensive index to evaluate provincial economic development levels using metrics like Internet and mobile phone penetration, industry employment, related outputs, and China's digital financial inclusion index. These factors are standardized and weighted, with higher values reflecting more advanced digital economy development.

2.2.3 Controlled variable

Trade openness. Trade openness reflects a region's integration into international trade. Higher trade openness indicates stronger global trade links, lower barriers, and a more open economy, making the region more attractive to foreign investors by offering broader sales channels and consumer markets. It is typically measured by the total import and export volume.

Human capital. Human capital enhances productivity, technology absorption, innovation, and industrial upgrading, while lowering long-term labor costs and attracting foreign investment. However, it may increase short-term labor costs, intensify talent competition, and reduce investment appeal if mismatches occur. It also influences regional foreign investment levels.

Industrial structure. A region's industrial structure impacts FDI attraction. A diversified, advanced structure with a strong manufacturing and service ecosystem offers varied opportunities. Advancement is measured by the ratio of tertiary to secondary industry value-added, with a higher ratio indicating greater progress.

Level of economic development. A region's high economic development, characterized by strong infrastructure, a large market, and robust consumption power, enhances its appeal to foreign investment. Provincial GDP is commonly used to measure the level of economic development.

Table 1 Relevant variables description

Implicit variable	Foreign direct investment	FDI	Total foreign direct investment
Independent variable	Digital economy development level	DIF	Digital economy development index
Controlled variable	Human capital	Hum	Number of students enrolled in general higher education in the region/population of the region
	Trade openness	Trade	Total regional imports and exports
	Development level	Del	Gross regional product (GRP)
	Industry structure	Ind	Value added in tertiary/secondary industries

3 Empirical results and analysis

3.1 Descriptive statistics

Before conducting the regression statistical analysis, in order to develop a clearer and more intuitive grasp of the chosen data, we set up a benchmark regression model through the sample data of 31 provinces in China from 2013 to 2022, in which the variable data are mainly obtained from the website of the National Bureau of Statistics, and we get the descriptive statistics of the variables.

Table 2 Descriptive statistics results

Variant	Description	AVG	SDE	MIN	MAX
FDI	Foreign direct investment	571.805	853.898	0.207	12234.89
DIF	Digital economy development level	0.129	0.102	0.017	0.59
Hum	Human capital	0.021	0.006	0.008	0.04
Trade	Trade openness	11958.930	19029.18	21.419	83773.58
Del	Development level	28276.770	24121.93	828.200	129513.60
Ind	Industry structure	1.427	0.745	0.665	5.24

From the individual variables in Table 2, the maximum value of the explanatory variables reaches 12,234, and the minimum value is only 0.207.

Among the core explanatory variables, the maximum value of the composite index of the development level of digital economy reaches 0.59, and the minimum value is only 0.017. Furthermore, the large gap between the maximum and minimum values of the indicators at each level highlights significant differences in foreign direct investment utilization and digital economy development across China's provincial administrative regions.

3.2 Correlation analysis

In general, regression results that deviate from theory and expectations may be due to more significant covariances between the explanatory variables involved in the regression. To validate the robustness of the empirical results, it is imperative to analyze the correlation between the explanatory variables and the control variables. Therefore, this paper focuses on the comprehensive index of digital economy development level and all control variables for correlation analysis, with the findings illustrated in the table.

Table 3 Correlation coefficient

	DIF	Hum	Trade	Del	Ind
DIF	1				
Hum	0.207	1			
Trade	0.659	−0.004	1		
Del	0.832	0.102	0.640	1	
Ind	0.376	0.216	0.156	−0.055	1

As can be seen from Table 3, among the selected variables, the correlation coefficient of DIF and Del is higher, reaching 0.832, while the values of other correlation coefficients are more reasonable. To prevent the correlation between the two variables from affecting subsequent analysis, this paper conducts a variance inflation factor (VIF) test for a detailed examination, and the results are shown in the table.

Table 4 Variance inflation factor test (VIF)

Variant	VIF	1/VIF
DIF	8.08	0.12376
Hum	1.10	0.90909
Trade	1.81	0.52486
Del	6.92	0.14451
Ind	2.42	0.13223
Mean VIF	4.066	

Normally, as long as the VIF value is below 10, it can be considered to pass the test. From Table 4, the maximum VIF value is 8.08 of DIF, which is less than the critical value of VIF of 10. Combining the above two test results, it is concluded that there is no covariance problem that will affect the regression results in this paper. Therefore, this paper can proceed to the next step of regression analysis.

3.3 Baseline regression results analysis

After the heteroskedasticity and autocorrelation test and correction of the data, fixed effects are used to fix the province and year, column (1) has no controlled variables, column (2) adds a single controlled variable, column (3) adds two controlled variables, column (4) adds four controlled variables, and column (5) adds all the controlled variables, and all the models are fixed for the province effect and year effect. From the table of benchmark regression results, it can be seen that the development of digital economy has a significant role in promoting foreign direct investment, so the hypothesis can be proved.

Table 5 Benchmark regression results

	(1)	(2)	(3)	(4)	(5)
DIF	1555.581*** (7.21)	1393.839*** (5.679)	734.799*** (2.895)	510.861** (1.972)	744.789*** (2.735)
Human		−3693.01* (−1.962)	−5804.028*** (−3.296)	−12748.21*** (−5.191)	−8828.08*** (−4.317)
Trade			0.014*** (3.455)	0.004 (1.019)	0.005 (1.362)
Del				0.009*** (4.295)	0.007*** (3.042)
Industry					−34.004 (−0.947)
Constant term	371.86*** (13.198)	471.112*** (1.903)	429.031*** (9.036)	460.158*** (11.002)	466.091*** (9.163)
Provincial effects	True	True	True	True	True
Yearly effects	True	True	True	True	True
N	310	310	310	310	310
Adj.R ²	0.9401	0.9314	0.9220	0.9349	0.9429

From the regression results, for the core explanatory variable digital economy development level, the coefficient of the composite index of digital economy development level is positive and significant at the 1% level, which indicates that the level of digital economy development of a region has a significant positive impact on FID, and the higher the level of digital economy development, the higher the total amount of FID in the region. The significance of the control variables is lower, that is, the controlled variables have a smaller degree of influence on the region's attraction of foreign direct investment.

3.4 Robustness testing

3.4.1 Replacement indicator for regression analysis

After obtaining the regression results, it is essential to verify whether the model is robust or not, therefore, we adopt the replacement indicator method to conduct the robustness test to ensure that the regression results are robust.

First, the original measure is replaced with an indicator that corresponds to the economic meaning of the explanatory variables, exchanging total foreign direct investment for the total investment of foreign direct investment enterprises in 31 provinces over the period 2013–2022 (adjusted by exchange rate). A benchmark regression analysis is carried out on the five explanatory variables with the total investment of foreign direct investment enterprises (FDI*), and the results are presented below.

Table 6 Robustness testing

VARIANT	DIF	human	trade	DEL	industry
FDI*	441.9584*** (3.056270)	2549.156** (2.083262)	0.015340*** (7.418200)	0.001984** (2.004831)	-254.8694*** (-7.922579)

The results show that the level of digital economy development is still significant at the 1% significant level for total investment in OFDI firms, and the coefficient is positive, which means there is a positive contribution, proving the robustness of the data.

3.4.2 Endogenous issues

Although the results of the benchmark regression are stable, there may also be a two-way impact between the level of the digital economy and foreign direct investment. Not only does the development of the digital economy have a positive impact on attracting FDI, but the increase in FDI is also likely to have some impact on the development of China's digital economy. For example, it can bring capital and advanced technology to promote the construction of digital infrastructure and technology upgrades to accelerate the integration of the digital economy. Thus, it is necessary to reduce the reverse influence of foreign direct investment levels on digital economy development to a certain degree. For this purpose, we conduct regression analysis using the first-period lag (DIF lagged one period) and the second-period lag (DIF lagged two periods).

Table 7 Lag regression results

Variant	DIF(-1)	DIF(-2)	human	trade	DEL	industry
FDI	999.1458*** (3.291969)		-11421.50*** (-6.0446)	0.001362 (0.5769)	0.010372*** (4.9428)	-51.5618 (-1.2873)
FDI		744.78*** (2.7273)	-8828.084*** (-5.778)	0.004857** (0.322)	0.0069** (5.5298)	-34.00443** (-3.22)

As can be seen from the regression results, both sets of results are significant at the 1% level. This proves the robustness of the regression results. Upon passing the robustness test, the regression coefficients and significance levels of the core explanatory variables show no significant deviation from the original regression outcomes. The results demonstrate that regions with higher digital economy development levels are more successful in attracting a larger total amount of foreign direct investment.

4 Conclusion and response

4.1 Conclusion

Utilizing panel data from China's 31 provinces during 2013–2022, this research assesses the role of digital economy development in China's foreign direct investment attraction. The analysis culminates in the following conclusions. During the decade from 2013 to 2022, China's digital economy development level displayed an overall upward trend. However, regional disparities in digital economy development are significant, and some regions still have considerable potential to further develop their digitization levels. The total amount of foreign direct investment in China's provinces maintained a year-on-year growth trend during 2013–2022, subject to the level of geographic location and regional development differences, the total amount of each province, although the gap is large, but the overall upward trend, China's foreign investment level as well as the foreign investment environment is good. The study, using model construction and econometric analysis, finds that advancing the digital economy positively enhances China's foreign direct investment (FDI) attraction. By boosting production efficiency, innovation, and cross-border e-commerce, the digital economy indirectly encourages foreign investment.

4.2 Response

Policy recommendations on the development of the digital economy for foreign investment can be considered in the following areas:

First, invest in digital infrastructure by expanding 5G networks, big data, and supercomputing centers. Strengthen national supercomputing in biomedicine, genetics, and aerospace while enhancing cost-efficiency through data-driven production. Develop cross-border network lines to support foreign enterprises and lower market entry costs.

Second, promote the growth of digital industries. The government should continue to promote the strategy of "digital industrialization" and "industrial digitalization", dredge the "meridians" of development, and attract high-quality FDI. Therefore, China's local governments should make full use of the digital economy. The spillover effect brought about by development will break down the barriers to digital technology exchanges between provinces, remove institutional and institutional barriers, and strengthen digital resources between regions. Sharing, accelerate the flow of talents, capital and other factors, and achieve inter-regional cooperation and common development^[3]. Strengthen R&D and application in key areas, advancing digital industrialization to enhance technological advantages for foreign companies. Expand talent development by improving industry-academia collaboration, boosting human capital efficiency for multinationals. Optimize the industrial chain by building a comprehensive, high-efficiency digital ecosystem to improve resource allocation for global enterprises.

Third, strengthen digital governance. Advance legal digitization to ensure data security, patent protection, and fair competition. Improve market governance for investment, issue resolution, and business operations. Enhance market transparency and data accuracy to support economic analysis and forecasting.

Fourth, enhance the foreign investment environment. The government should continue to promote the strategy of "digital industrialization" and "industrial digitalization", dredge the "meridians" of development, and attract high-quality FDI^[4]. Improve investment quality, attract foreign capital in key areas, expand investment channels, and support enterprise relocation. Ensure national treatment, legal participation in procurement and standard-setting, and equal access to support policies. Strengthen foreign investor protection, improve rights protection mechanisms, and enhance intellectual property enforcement.

Fifth, promoting foreign investment and cooperation in the digital field, actively negotiating and implementing multi-bilateral digital economy investment cooperation memorandums, and guiding the rational and orderly cross-border layout of the digital economy industry chain. It will promote the use of electronic certificates for outward investment, promote the digitization of outward investment facilitation, and enhance the guiding role of public service products for outward investment in the digital field.

To sum up, we can take several steps to enhance the attractiveness of the digital economy to foreign investment. First, we should strengthen the construction of digital infrastructure. Second, we need to accelerate the agglomeration of digital industries. Third, improving the digital governance system is essential. Fourth, we must optimize the environment for foreign investment. Finally, promoting cooperation in foreign investment in the digital field is crucial. These policy measures will effectively boost the appeal of the digital economy to foreign investors. As a result, they will contribute to the sustained and healthy development of China's economy.

About the Author

Ying Liu, female, is an undergraduate student at the School of Economics, Henan University, with research interests in international economics and trade, development economics, and industrial economics. E-mail: l5489464yyy@163.com.

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