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The Impact of ASEAN's Digital Economy Development Level on China's Foreign Direct Investment

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Abstract
The development of digital economy has given rise to new industries, new business forms and new models, significantly influencing the direction of international investment flows. This study investigates the impact of the development level of digital economy of six ASEAN countries on China's foreign direct investment. On this basis, the paper introduces the Digital Economy Development (DEL) index, derived from four key components: business and institutional environment, digital infrastructure construction, digital innovation capability, and digital information technology application, constructed using the Entropy method. For the impact of the development level of digital economy on foreign direct investment, the extended gravity model with the digital economy development level is used as the framework. The findings indicate that a 1% enhancement in a country's digital economy, as measured by the DEL index, corresponds to a notable 0.11% improvement in China's foreign direct investment stock. When examining the effects of each component of the DEL index, all four elements significantly contribute to the expansion of China's foreign direct investment. Notably, the business and institutional environment and the digital infrastructure construction components emerge as particularly influential factors in driving this expansion.
Keywords: Digital Economy Development Index, Network Readiness Index, Investment Gravity Model.

1. Introduction

Nowadays, the widespread adoption and continuous evolution of emerging information technologies, including the Internet, e-commerce, and artificial intelligence, have catalyzed the gradual emergence of the digital economy as a potent catalyst for global economic growth. It has also assumed a pivotal role in safeguarding the quality of economic development. The rapid expansion of the Internet and information technology has magnified the significance of digital technology in economic activities, prominently exemplified by the influence of big data and artificial intelligence.

For the purposes of this study, the definition of the digital economy aligns with the description provided in the G20 Digital Economy Development and Cooperation Initiative. According to this definition, the digital economy is "Digital economy is a new economic form that integrates data resources, modern information network and information and communication technology" (Current Presidency, Documents. http://www.g20chn.org). Given that the digital economy is poised to permeate all facets of both the economy and society, evaluating the level of digital economy development within a host country becomes a complex challenge, as relying solely on a few indicators may not provide a comprehensive or accurate assessment.

Currently, there is no globally accepted standard system for measuring the level of digital economy development. Scholars often rely on the "network readiness index" established by the World Economic Forum (WEF, https://www. weforum.org). Therefore, this paper also draws upon this framework. However, it's important to note that the "network readiness index" primarily focuses on information technology and may not comprehensively reflect the development of the digital economy. Based on the definition of the digital economy, this paper also acquire indicators from the latest data found in the Global Information Technology Report (GIT, www. weforum.org/girt) and the Global Competitiveness Report (GCR, www.weforum. org/gcr), jointly released by Harvard University and the World Economic Forum (WEF, https:// www.weforum.org).

Based on the current situation of research at home and abroad, scholars mostly analyze the impact on China's OFDI from some traditional factors such as bilateral political relations[3], resource[4-5], institutional distance between countries[6], institutional quality[7-8] and governance level[9], while the existing literature rarely studies the relationship between the development of digital economy and China's OFDI decisions. In the current era of rapid development of digital economy, it is unthinkable for a country to ignore the basic condition of informatization and digital technology when making international investment decisions. Therefore, a deep exploration in this field is very necessary. As a result, this paper build on the fundamental concept of the digital economy and develops the Digital Economy Development Level Index (DEL) for six ASEAN countries.

The development of the DEL index then allows us to examine the effect of the digital economic development level on foreign direct investment. (Zhang Bochao,2018)Through in-depth research on the development of digital economy in countries along the Belt and Road, analyzed that the development of digital economy can drive the interworking construction of national information infrastructure and optimize the allocation of social resources[10]. In terms of digital finance,(Zhang Xun et al. ,2019) found that digital finance develops faster in less developed areas, and can significantly improve the family income of low-income people. Moreover, digital finance not only brings equal entrepreneurial opportunities, but also improves the overall living standard of the people[11]. This paper tries to construct the DEL index from four dimensions of components: business and institutional environment, digital infrastructure construction, digital innovation capacity and digital information technology application. To measure the impact of digital economy development in the six ASEAN economies in 2011-2020 on China's foreign direct investment

This paper mainly introduces a new idea for the decision optimization of China's OFDI from the perspective of digital economy, and also examines the development level of digital economy of ASEAN countries, so as to study its influence on the scale change and location choice of China's direct investment in the region. It will be of great practical value to the overall strategic investment layout and development direction among countries.

2. Methodology

A. The Construction of the Digital Economy Development Level (DEL) Index

This paper selects relevant indicators based on the fundamental digital economy concept to evaluate the digital economy development levels across six ASEAN countries. The study uses data from 2011 to 2020 in six ASEAN countries for statistical analysis. Building on the core principles of the digital economy, its necessary conditions for development, and the "Network Readiness Index" framework from the GIT report, this paper establishes four Level 1 indicators tied to key aspects of the digital economy. These Level 1 indicators include (1) Business and Institutional Environment, (2) Digital Infrastructure Construction, (3) Digital Innovation Capability, and (4) Digital Information Technology Application. Furthermore, these four indicators are further subdivided into 23 Level 2 sub-indicators that encompass a wide range of dimensions in digital economy development.

All indicators used in this paper are sourced from the most current data in the Global Information Technology Report (www.weforum.org/girt.) and the Global Competitiveness Report (www.weforum.org/gcr). Specific details about indicator selection are provided as follows:

Table 1: The Construction of Digital Economy Development Level Comprehensive Evaluation Index System in ASEAN Countries

Level 1 indicators	Secondary indicators		Data Range	Data Sources
Business and	Intellectual property protection	S1	1-7	GIT
	Efficiency of legal system in setting disputes	S2	1-7	GIT

Level 1 indicators	Secondary indicators		Data Range	Data Sources
Institutional Environment (DELs)	Venture capital availability	S3	1-7	GIT
	Laws relating to ICTs	S4	1-7	GIT
	Effectiveness of law bodies	S5	1-7	GIT
Digital Infrastructure Construction (DELc)	Fixed broadband network subs.	C1	0-100	GIT
	Mobile network coverage	C2	0-1	GIT
	Mobile phone subs.	C3	0-300	GIT

Table 2: The Construction of Digital Economy Development Level Comprehensive Evaluation Index System in ASEAN Countries (continued)

Level 1 indicators	Secondary indicators		Data Range	Data Sources
Digital Infrastructure Construction (DELc)	Secure internet servers	C4	0-∞	GIT
	Households W/Personal computer	C5	0-1	GIT
	Mobile broadband subs.	C6	1-7	GIT
Digital Innovation Capability (DEL_i)	Firm that spend on R&D	I1	0-∞	GCR
	University-industry collaboration in R&D	I2	0-∞	GCR
	ICT PCT patents application/million people	I3	0-∞	GIT
	Capacity for innovation	I4	0-∞	GIT
	Quality of management schools	I5	1-7	GIT
	Availability of the latest technologies	I6	1-7	GIT
Digital Information Technology Application (DELt)	Business-to-consumer internet use	T1	1-7	GIT
	Internet access in schools	T2	1-7	GIT
	Use of virtual social networks	T3	1-7	GIT
	Firm-level technology absorption capacity	T4	1-7	GIT
	ICT use and government efficiency	T5	1-7	GIT
	Importance of ICTs to government vision	T6	1-7	GIT
Notes: All indicator attributes above are positive indicators				

Source:www.weforum.org/girt and www.weforum.org/gcr

B. Weight Estimation

In order to establish the weight of the indicators of digital economy development level, the academic community commonly employs four methods. First, the straightforward approach involves taking the arithmetic average of each index data as the ultimate score for the digital economy development level—an approach known as the simple arithmetic average method. Second, a hierarchical analysis method is employed, gradually constructing a comparison matrix for the target layer. This method involves analyzing the influence of each index on the upper-level index to determine the corresponding weight. Third, a reduction in dimensionality technique is applied, transforming complex multiple indexes into several principal components. This approach, widely known as principal component analysis, allows the extracted principal components to reflect most of the information from the original data. Finally, the Entropy method, classified as an objective assignment method, calculates weight by assessing the amount of information carried by the data.

Usually, the principal component analysis method is widely used in the index calculation. However, considering that there are only six countries studied in this paper, and the indicators are divided into four dimensions, if the principal component analysis method is used to reduce the dimension, it cannot be determined that the extracted principal component is the data set of the single dimension classification indicators to be studied in this paper, so the indicators cannot be accurately explained. Therefore, the entropy method is used in this calculation. The entropy method can explicitly calculate the desired components.

Entropy weight method is to calculate tho the degree of variation of each index, providing a basis for the comprehensive evaluation of multiple indexes. It can overcome the problem of analysis difficulty caused by the small difference of the selection index, and can reflect the implicit information of the data, Also can explicitly calculate the desired components. (Fang Chengjie et al., 2016) Since the information of the entropy weight method is all derived from the objective data, it can well ensure the objectivity and accuracy of the results[12]

The specific steps of the entropy weight method are as follows:

1) Indicators without outline quantification.

In this paper, the extreme value method is selected to treat the measurement index X ij in the measurement system of digital economy development level of six ASEAN countries dimension. At the same time, in order to make the data meaningful, referring to the study of Zhang Meizhu et al.（2017）, the method of data translation is adopted in the dimension processing[13] . In addition, different algorithms are used for data standardization of positive and negative indicators. See formulas (1) and (2):

Positive Indicator:

$$x_{ij}{}' = \frac{x_{ij} - \min(x_{1j,\dots}x_{nj})}{\max(x_{1j,\dots}x_{nj}) - \min(x_{1j,\dots}x_{nj})} \quad (1)$$

Negative Indicator:

$$x_{ij}{}' = \frac{\max(x_{1j,\dots}x_{nj}) - x_{ij}}{\max(x_{1j,\dots}x_{nj}) - \min(x_{1j,\dots}x_{nj})} \quad (2)$$

Where i indicates the year and j represents the measure index. Xij and X'ij represent the measurement index values of the digital economy development level of the six ASEAN countries before and after standardization, and max (X ij) and min (X ij) represent the maximum and minimum values of X ij respectively.

2) Calculate the index coefficient of difference

Undimensionalized treatment of the original data, to calculate the contribution degree of year i under the j th index.

$$P_{ij} = \frac{X_{ij}'}{\sum_{i=1}^{n} x_{ij}} \quad (3)$$

Calculate the entropy value of the item J index.

$$e_j = -\frac{1}{ln}\sum_{i=1}^{n} p_{ij}\, ln(p_{ij}) \quad (4)$$

Calculate the difference coefficient.

$$g_j = 1 - e_j \quad (5)$$

Calculate the weight of each index（W j）

$$w_j = \frac{g_j}{\sum_{i1}^{m} g_j} \quad j=1,2,3\dots\dots m \quad (6)$$

Calculate the composite score of the index（S）

$$S = \sum_{j=1}^{m} w_j \cdot p_{ij} \quad (7)$$

Table 3: The weight of indicators

w_s1	0.033854
w_s2	0.029791
w_s3	0.022333
w_s4	0.04161
w_s5	0.04023
w_c1	0.065332
w_c2	0.007207
w_c3	0.006948
w_c4	0.170783
w_c5	0.049366
w_c6	0.054736
w_i1	0.026662
w_i2	0.036781
w_i3	0.202111
w_i4	0.018343
w_i5	0.045021
w_i6	0.021973
w_t1	0.016416
w_t2	0.015277
w_t3	0.012405
w_t4	0.020102
w_t5	0.027846
w_t6	0.034875

Source : According to the STATA 17.0 collate the calculation results

3. Model Construction and Variable Selection

A. Model Construction

The idea of the gravitational model was originally derived from Newton's law of gravitation. So far, gravity model has become an important tool for many scholars to study bilateral economic and trade relations and influencing factors. Tinbergen (1962) and Poyhone (1963) first applied the gravity model to the study of international economic and trade relations. After conducting research and analysis using this model, they finally reached a consistent conclusion that the scale of bilateral trade is directly proportional to the total economic output of the two countries (investors and host countries), and inversely proportional to the distance between the two capitals. Afterwards, the model was continuously improved and expanded by other scholars, forming an extended gravity model. With the development of economic globalization, the expanded gravity model has also begun to be applied to the study of international investment. Therefore, based on the actual development status of the six ASEAN countries in the context of the digital economy, this paper introduces the core explanatory variable of digital economy development level and other control variables on the basis of the existing variables in the model, in order to construct an extended investment attraction model. Meanwhile, in order to control for heteroscedasticity and facilitate regression, this paper transforms the original model into natural logarithmic linear form. The The specific regression model is set as follows:

$$\ln OFDI_{it}=\beta_0+\beta_1\ln DEL_{it}+\beta_2\ln GDP_{it}+\beta_3\ln DISCAP_{it}+\beta_4\ln GDPR_{it}+\beta_5\ln TECH_{it}+\beta_6\ln TAX_{it}+\gamma_i+\lambda_t+\varepsilon_{i,t},$$

(8)

where i represents the host country, and t represents the year (t= 2011,2012,..., 2020). OFDIit represents the stock of China's foreign direct investment in country i in period t; GDPit represents represents the ratio of GDP between China and country i in period t; DISCAPit represents the transportation cost between Beijing, China and the capital of country i; DELit indicates the level of digital economy development of country i during period t; GDPRit indicates the GDP growth rate of country i in period t; TECHit represents the strategic asset level of country i in period t; TAXit represents the tax burden level of country i in period t; β0 is a constant term, β1…β6 indicates the parameters to be estimated; gi represents the individual fixed effects; lt represents the time fixed effects; ei,t represents the random perturbation term.

B. Variable Selection

The specific selection instructions for each explanatory variable in the above model are as follows:

(1) OFDI : which represents the stock of China's foreign direct investment. The paper studies the impact of the development level of digital economy in the six ASEAN countries on China's OFDI. Compared with flow data, stock data is more effective in measuring the long-term and continuous nature of external investment. Therefore, the paper will be selected as the explanatory variable for China's OFDI stock. The data sources comes from the Statistical Bulletin of China's Foreign Direct Investment over the years.

(2) DEL: which represents the indicator system for the digital economy development level . In addition to the scores obtained from the comprehensive evaluation indicators, the specific scores of the four dimensional indicators (DELs, DELc,DELi and DELt) are included in the model for robustness testing respectively.The data comes from the calculation results of this paper.

(3) GDP: which represents the ratio of China's GDP to the host country's GDP , is calculated in constant US dollars based on 2015. The explanatory variable measures the ratio of market size between the two countries, which is directly proportional to the scale of China's outward direct investment. The Data comes from the World Bank Development Indicators (WDI) database.

(4) DISCAP: which represents the cost of distance between the two capitals. The paper draws inspiration from the approach of Jiang Dianchun and Zhang Qingchang (2011), using the bilateral distance between the two capitals multiplied by international oil prices as the distance cost variable. The distance cost calculated from it will vary with changes in international shipping costs, and it can also overcome the fixed effects model's inability to identify individual fixed effects that do not change over time. Generally speaking, the higher the distance cost, the greater the obstacle for China's outward direct investment. The data comes from the CEPII database in France and IMF database.

(5) GDPR: which represents the GDP growth rate of the host country. This explanatory variable measures the market growth potential of the host country. Cheng Huifang and Ruan Xiang (2004) believe that the greater the market potential of a country, the greater its future market consumption capacity and development space, and it will more attract foreign direct investment. The Data comes from the World Bank Development Indicators (WDI) database.

(6) TECH: which represents the strategic asset level of the host country. The paper draws on previous research and measures the proportion of high-tech product exports to manufactured goods. Generally, the higher the technological level of a country, it can more attract foreign direct investment, and China's OFDI also has a clear motivation for technology acquisition (Deng, 2009). The data comes from the World Bank Development Indicators (WDI) database.

(7) TAX: which represents the tax level of the host country. Generally, countries with high tax rates will increase the operating costs of foreign investment, thereby reducing operating profits, thereby having the opposite effect of suppressing foreign investment. On the contrary, low tax bearing countries often become tax havens for foreign-funded enterprises due to their lower tax payments, thus attracting a large amount of foreign investment (Wang Yongqin, 2014). Data comes from WID database.

The descriptive statistical results of the above variables are shown in the table below:

Table 4: The descriptive statistics

VarName	Obs	Mean	SD	Min	Median	Max
InOFDI	60	4.041	1.008	2.077	3.990	6.395
InDEL	60	0.328	0.260	0.060	0.233	0.952
InDEL_s	60	0.073	0.050	0.010	0.046	0.162
InDEL_c	60	0.097	0.103	0.007	0.057	0.352
InDEL_i	60	0.092	0.086	0.011	0.061	0.337
InDEL_t	60	0.065	0.033	0.013	0.054	0.123
InGDP	60	3.899	1.236	2.471	3.608	6.795
InDISCAP	60	13.284	0.384	12.359	13.331	13.956
InGDPR	60	4.400	3.111	-6.100	5.050	7.500
InTECH	60	2.773	1.483	-2.303	3.263	4.013
InTAX	60	1.948	3.873	-2.996	0.860	7.348

Source: According to the STATA 17.0 collate calculation results

4. Results and Discussion

A. Correlation Analysis

Before the regression, The test of the pearson correlation coefficient matrix was first performed to determine the magnitude of the degree of linear correlation between the variables. Form the correlation analysis, it was showed that there is a significant positive relationship between DEL and OFDI, consistent with the expected hypothesis. In addition, GDP、DISCAP in control variables were significantly associated with OFDI at 1% significance level. However, considering that the correlation coefficient matrix only measures the relationship between two variables, the interference of control variables and potential variables (such as time effect and individual effect) is not excluded, so the results are only for reference, and the specific relationship requires further regression analysis. In addition, the absolute value of the correlation coefficient can also be preliminarily excluded by judging whether the absolute value of the explanatory variables is greater than 0.9.

Table 5: Pearson's Correlation of the variables

	lnOFDI	lnDEL	lnGDP	lnDISCAP	lnGDPR	lnTECH	lnTAX
lnOFDI	1.000						
lnDEL	0.700***	1.000					
lnGDP	-0.154	-0.305**	1.000				
lnDISCAP	-0.041	0.285**	-0.275**	1.000			
lnGDPRr	-0.386***	-0.309**	0.221*	-0.064	1.000		
lnTECH	0.232*	0.566***	-0.710***	-0.037	-0.279**	1.000	
lnTAX	-0.267**	-0.687***	-0.093	-0.269**	0.370***	-0.282**	1.000

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1) Hausman Test and F Test

In econometrics, the panel data can effectively solve the problem of missing variable bias. For the panel data, the most important thing is to judge which model is suitable to use for analysis. The general panel data may be a mixed effect model, fixed effect model and random effect model. In this paper, Hausman test and F test are mainly used to determine which model is suitable to analyze. Hausman test can be used to determine selecting random effect model or fixed effect model; F test can determine selecting fixed effect model or mixed effect model, the test results are as follows:

Table 6: Hausman test and F test

Hausman test			F test		
chi2 statistic	p value	result	chi2 statistic	p value	result
49.58	0.000	reject	9.86	0.000	reject

As can be seen from the Table 5, the Hausman test and the F test result statistics significantly reject the null hypothesis, so a fixed effects model should be selected in this paper.

2) Regression Analysis

The paper conducted a full-sample regression analysis based on Equation 8, and the regression results of the benchmark model on the impact of ASEAN digital economy development level on China's OFDI showed (1) ~ (3) , are the regression results of the extended gravity models of DEL, GDP, DISCAP, GDPR, TECH, and TAX in the host countries. From the perspective of regression coefficient, the influence result is in line with expectations, that is, the ratio of GDP of the two countries, the digital economy development level and the technical level of the host countries will have a positive impact on China's foreign direct investment activities, while the bilateral distance cost and tax level will have a negative impact. It can also be seen that the model goodness of fit R-squared increased from 0.637 to 0.792 with the continuous addition of control variables, and the fitting effect became better and better. In addition, all the explanatory variables in all the extended models have basically passed the significance test, from which the model can be considered to have a relatively good interpretation effect. The extended model (3) included all of the explanatory variables, except for TAX, which passed the significance test. Among them, GDP, DEL and TECH were significant at 1%, while DISCAP and GDPR were significant at 5%.

Table 7: Regression Analysis

	(1)	(2)	(3)
VARIABLES	lnOFDI	lnOFDI	lnOFDI
lnDEL	10.574***	7.707***	7.047***
	(16.05)	(22.63)	(23.96)
lnGDP		0.634	1.160***
		(1.16)	(4.26)
lnDISCAP		-0.782**	-0.567**

		(-3.79)	(-3.86)
InGDPR			-0.019**
			(-2.67)
InTECH			0.395***
			(9.40)
InTAX			-0.017
			(-1.24)
Constant	0.570*	9.423*	3.755
	(2.04)	(2.09)	(1.48)
Observations	60	60	60
R-squared	0.637	0.730	0.792
Number of groups	6	6	6

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In summary, the final regression results of the extended gravity model are shown in Equation (9):

$$\text{InOFDI}_{it}=\beta_0+\beta_1\text{InDEL}_{it}+\beta_2\text{InGDP}_{it}+\beta_3\text{InDISCAP}_{it}+\beta_4\text{InGDPR}_{it}+\beta_5\text{InTECH}_{it}+\beta_6\text{InTAX}_{it}+\gamma_i+\lambda_t+\varepsilon_{i,t}$$ (9)

Overall, the estimated coefficients of each variable in the model are basically consistent with the theoretical expectations discussed above. The results of regression of each variable are analyzed as follows:

(1) **$DEL_{it:}$** in the host country: The estimated coefficients for this variable passed the significance test of 1%. In regression (1), the core explanatory variable DEL showed a significant positive relationship with the dependent variable OFDI at the significance level of 1%, with the coefficient size of 10.574. The implication is that for every 1% increase in DEL, the scale of OFDI will increase by 10.574% when the other conditions remain unchanged. This shows that with the development of the ASEAN countries digital economy, its increasingly perfect digital infrastructure and the corresponding supporting system measures and the development of digital technology innovation will become a host country an advantage to attract foreign investment, which makes China in its direct investment using online convenient emerging investment mode, reduce the cost of investment will greatly increase China's foreign direct investment stock.

(2) **GDPit:** The regression coefficient of this variable has passed significance test of 1% , and every 1% increase in the ratio of China's GDP to the GDP of the host country will increase China's OFDI stock by 1.16%. The means that the growth of China's economic aggregate has a significant driving effect on international investment, and the larger the market size of the host country, the better the corresponding market ability to absorb capital.

(3) **DISCAPit:** The regression coefficient of this variable is significantly negative at the 5% level, which indicates that it is obstacles to China's OFDI. For each 1% increase in bilateral distance cost, China's foreign direct investment stock will be reduced by 0.57% accordingly.

(4) **GDPRit:** The estimated coefficient of this variable is significantly positive at 5%, indicating that the greater the market growth potential of the host country increases the scale of China's direct investment in the country. The reason is that when making OFDI, China not only attaches great importance to the current economic development of the host country, but also attaches great importance to the future development potential and market consumption capacity of the host country.

(5) **TECHit:** The estimated coefficient of this variable is significantly positive at the 1% level, and for every 1% increase, China's outward direct investment scale will increase by 0.40% accordingly. This shows that with the development of economy, China pays more and more attention to the exchange and promotion of technological factors between countries in the process of international investment, which also means that there is still an obvious motivation for technology acquisition in China's outward direct investment activities at the present stage.

(6) **TAXit:** The estimated coefficient of this variable is negative, that is, the tax level of the host country will have a certain hindering effect on China's direct investment in the country. This shows that China's OFDI is more inclined to countries with low tax.

3) Heterogeneity Analysis

To study the path through which DEL affects OFDI, the heterogeneity analysis was conducted by regressing out the four sub-indexes under DEL separately. Results are shown in Table 7.

Table 8: Heterogeneity Analysis

	(1)	(2)	(3)	(4)
VARIABLES	lnOFDI	lnOFDI	lnOFDI	lnOFDI
lnDEL_s	31.758***			
	(5.69)			
lnDEL_c		16.319***		
		(7.78)		
lnDEL_i			5.202***	
			(8.36)	
lnDEL_t				13.047**
				(3.56)
lnGDP	2.414***	0.167	2.025**	2.523**
	(4.89)	(0.65)	(3.17)	(3.14)
lnDISCAP	-0.698**	-0.420*	-0.940***	-0.935**
	(-3.06)	(-2.44)	(-4.20)	(-3.38)
lnGDPR	-0.029	-0.024***	-0.040**	-0.044*
	(-1.64)	(-4.19)	(-2.82)	(-2.24)
lnTECH	0.563***	0.141**	0.398***	0.521***
	(6.51)	(2.85)	(5.42)	(4.59)
lnTAX	0.022	-0.018	0.003	0.031
	(0.91)	(-1.19)	(0.18)	(1.20)
Constant	0.097	7.129**	7.220	4.463
	(0.02)	(3.17)	(1.51)	(0.68)
Observations	60	60	60	60
R-squared	0.769	0.819	0.665	0.646
Number of groups	6	6	6	6

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

From the empirical test results in Table 7, The four dimensions of digital economy development level are positively correlated with the dependent variable at the significance level of at least 5%, indicates that the sample countries either Business and Institutional Environment(DELs), Digital Innovation Capability (DELi), Digital Infrastructure Construction (DELc), Digital Information Technology Application (DELt),will increase China's direct investment in their countries, and the influence of DELs and DELc is more pronounced.

5. Conclusion and Recommendation

Conclusion

This paper first analyzes the three mechanisms of the development of digital economy, namely Operating Cost Reduction Mechanism, Transformation of International Investment Model and Operational Mechanism of Business and Institutional Environment Optimization. Then, with the six ASEAN countries as the research object, the comprehensive evaluation index system of the digital economy development level is constructed, and the entropy value is used to measure the digital economy development level of the sample countries and the measurement results are analyzed. On this basis, the extended investment gravity model is used to test the impact of the digital economy development level of the host country on China's outward direct investment decision. At the same time, the index of four different dimensions include the comprehensive evaluation index in the model, and the 2SLS model. In addition, the sample country regression was tested for heterogeneity. The research conclusions of this paper are summarized as follows:

First of all, the digital economy development level of the sample countries is uneven and obvious. From the perspective of regional differences, Singapore has shown distinct characteristics in all aspects of the development of the digital economy in the sample countries, and they are all at a relatively high level. Although Singapore has a small land size, the national governance mechanism has its own characteristics that other countries cannot follow. Under this influence, the unique digital economy development model formed by Singapore is of very important reference significance to the large developed cities in China. In addition, Cambodia, Vietnam and Indonesia's digital economy development level is relatively backward.

Secondly, according to the results of the empirical test, the digital economy development level in the sample countries has a significant positive effect on promoting China's investment in the region. This shows that the development of digital economy has significantly reduced the trade cost in international economic and trade exchanges, thus leading to the transformation of China's foreign direct investment model and further improving the level of China's foreign direct investment. In addition, the development of digital economy improves production efficiency by reducing the production and operation costs of enterprises, and the use of digital information technology overcomes the disadvantage of outsiders, which further expands the scale of China's foreign direct investment.

Finally, the development of digital economy is constantly "forcing" host countries to formulate more appropriate institutional policies and improve their own institutional quality, which not only provides institutional guarantee for Chinese enterprises' investment and operation in the local area, but also reduces investment risks. The results of the robustness test shows that among the four different dimensions of the index of the digital economy development level in the host country, the application of digital information technology plays a more obvious role in promoting China's investment in the region. Moreover, after controlling for the potential endogeneity problem, the 2SLS model regression results agree with the benchmark regression results.

Recommendations

Recommendation for the future studies include: face up to the impact of the digital economy development level on attracting a country's foreign direct investment decision-making, and make it clear that the digital economy development level varies among ASEAN countries. Therefore, to change the mode and type of China's OFDI, make full use of the differentiated elements among countries, and transfer the production links into countries with more cost advantages, so as to achieve the goal of mutual benefit and win-win results. And fully draw on the experience of countries with a high level of digital economy development to narrow the digital divide and promote the development of the country.

References

[1] World Economic Forum, https://www.weforum.org.
[2] FOSS N J.Resources,firms and strategies:a reader in the resource-based perspective [M]. Oxford: Oxford University on Demand,1997.
[3] Deardroff, A. V.(1995),“Determinants of Bilateral Trade: Does Gravity Work in A Neoclassical World?”, NBER Working Paper NO. 5377, Cambridge Mass: National Bureau of Economic Research.
[4] Hsiao C. Analysis of panel data (second edition) [M]. PeKing University Press, Bei Jing, 2003.
[5] Searle S R. Linear Models [M]. New York,1971, Wiley.
[6] Maddala G S. The likelihood approach to pooling cross-section and time series data [J]. Econometrica , 1979, 39 , 939-953.
[7] Maddala G S. The likelihood approach to pooling cross-section and time series data [J]. Econometrica , 1979, 39 , 939-953.
[8] Mundlak Y. On the pooling of time series and cross-section data [J]. Econometrica, 1978, 46, 69-85.
[9] Hausman J A. Specification tests in econometrics [J]. Econometrica, 1978, 46, 1251-1272.
[10] Hausman J A. W E Taylor. Panel data and unobservable individual effects [J]. Econometrica, 1981, 49, 1377-1398.
[11] World Economic Forum. Accessed 2011-2019. www. weforum.org/girt.
[12] “Professor Klaus Schwab.” World Economic Forum. Accessed 2011-2019. www. weforum.org/gcr.
[13] 陈岩，马利灵，钟昌标.中国对非洲投资决定因素：整合资源与制度视角的经验分析们.世界经济，2012(10):91-112.
[14] 祁春凌，邹超.东道国制度质量、制度距离与中国的对外直接投资区位[J].当代财经，2013(07):100-110.
[15] 蒋冠宏，蒋殿春.中国对外投资的区位选择：基于投资引力模型的面板数据检验[J].世界经济，2012(9):21-40.
[16] 王永钦，杜巨澜，王凯.中国对外直接投资区位选择的决定因素：制度、税负和资源禀赋[J].经济研究，2014(12):126-142.
[17] 陈松，刘海云.东道国治理水平对中国对外直接投资区位选择的影响——基于面板数据模型的实证研究[].经济与管理研究，2012(6):71-78.
[18] 张伯超，沈开艳“一带一路”沿线国家数字经济发展就绪度定量评估与特征分析[J].上海经济研究，2018(01):94-103.

[19] 张勋，万广华，张佳佳，何宗樾.数字经济、普惠金融与包容性增长[J].经济研究，2019,54(08):71-86.

[20] 方成杰，钱德玲，徐士彬，等.基于可拓学和熵权的中巴公路泥石流易发性评价[J].自然灾害学报，2016, 25(6):18-26.

[21] 张美竹，秦趣，刘正康. 基于熵值法的人工湿地生态旅游评价研究--以六盘水明湖国家湿地公园为例 [J] ．六盘水师范学院学报，2017，第六期，11-14.