Research on Import and Export Promotion Effect of China's Digital Trade–An Empirical Analysis Based on Stochastic Frontier Gravity Model

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Abstract. As a product of rapid development and integration of intelligent technology and Internet, digital trade is very important for the development of global industrial chain, especially in COVID-19, which can enhance economic resilience and risk tolerance. The data of China, Japan, South Korea, Russia and Mongolia in the Northeast Asian economic circle from 2001 to 2020 are selected as research samples. The factor analysis method is used to construct the measurement index system to measure the digital trade, and the export stochastic frontier gravity model is constructed for research. The research results show that at this stage, China's digital trade hinders China's export trade, However, the long-term promotion effect on China's export trade has not changed; The digital trade of other countries in Northeast Asia has a significant promoting effect on China's export trade; As sub indicators of digital trade, information infrastructure network, digital technology, industrial digital trade, digital industrialization trade and trade potential all have a promoting effect on China's export trade.

Keywords: Digital trade · Export Promotion Effect · Factor Analysis · Stochastic frontier analysis · Stochastic frontier gravity model

1 Introduction

With the innovation of science and technology, intelligent digital platform and the impact of COVID-19, the traditional international trade needs transformation and upgrading. Under the background of the global trend towards big data governance, digital trade, as the product of the rapid development and integration of intelligent technology and Internet, is an important part of the digital economy and promotes the development of the global economy, especially foreign trade. Adjusting the structure of global value chain and even reshaping it play an irreplaceable role. Therefore, we should deeply study digital trade to make it a new engine to drive the growth of China's export trade to Northeast Asian countries, so as to promote China's economy, especially export growth and even the transformation and upgrading of export structure, and accelerate the construction of an international and domestic double cycle development pattern.

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2 Construction of Stochastic Frontier Gravity Mode

2.1 Brief Description of Theory

2.1.1 Stochastic Frontier Model

The stochastic frontier model was first propose d by Aigner, lovell and Schmidt and continuously developed and innovated by later scholars [1, 2]. It is mainly used to measure the production efficiency of manufacturers in economics. The basic form of the model in the form of panel data is:

$$\mathrm{Yijt} = f(\mathrm{Xijt}, \beta)\exp(\nu\mathrm{ijt} - \mu\mathrm{ijt})$$

$$\mathrm{Y} * \mathrm{ijt} = f(\mathrm{Xijt}, \beta)\exp(\nu\mathrm{ijt})$$

$$\mathrm{TEijt} = \mathrm{Yijt}/\mathrm{Y} * \mathrm{ijt} = \exp(-\mu\mathrm{ijt})$$

$$\mu\mathrm{ijt} = \mathrm{e} - \eta(\mathrm{t} - \mathrm{T})\mu\mathrm{ij}$$

where Y_{ijt} and Y^*_{ijt} represent the actual output and optimal output (frontier output) that the i-th individual can achieve under the j-th index in the t period; X_{ijt} represents the input variable of individual i under index j in period t; β is the parameter to be estimated; ν_{ijt} refers to the random disturbance term in the form of panel data, which is any impact of external factors on the production function, $\nu_{ijt} \sim N(0, \sigma^2)$; $\mu_{ijt} \geq 0$ is the term of technical inefficiency, which reflects the gap between the manufacturer and the optimal production; It is generally assumed that ν_{ijt} and μ_{ijt} are independent of each other; TE_{ijt} refers to the technical efficiency term, which is the ratio of the actual output to the optimal output. When there is no technical non efficiency term μ_{ijt}, TE is 1 and the output reaches the maximum. When there is μ_{ijt}, the value of TE is between (0, 1); η is the parameter to be estimated. If it is 0, it is the model in which the technical efficiency does not change with time. If it is not 0, it is the model in which the technical efficiency changes with time [4].

2.1.2 Stochastic Frontier Gravity Model

Under the assumption of no trade friction cost, the estimation result obtained by the trade gravity model is the average value of the estimation effect, which is the problem of the trade gravity model. In the trade gravity model, the stochastic frontier analysis method is used to form a stochastic frontier gravity model, We can decompose the influencing factors of trade efficiency into natural factors and human factors (i.e. trade non efficiency items) and analyze them respectively, so as to further refine and rationalize the research on the factors affecting trade efficiency. In the stochastic frontier gravity model, trade exports are regarded as output variables, and the core variables in the gravity model are regarded as input variables, which is similar to the problem of maximizing output or minimizing cost in manufacturers' production. The specific form of the stochastic frontier trade gravity model in the panel data structure can be written as follows:

$$\mathbf{LnT_{ijt}} = f(\mathbf{X_{ijt}}, \boldsymbol{\beta})\mathbf{exp}(\boldsymbol{\nu}_{\mathbf{ijt}} - \boldsymbol{\mu}_{\mathbf{ijt}}), \boldsymbol{\mu}_{\mathbf{ijt}} \geq \mathbf{0};$$

Among them, T_{ijt} represents the bilateral trade volume between the two countries or the export volume of country i to country j, X_{ijt} represents the core variables in the gravity model, generally including GDP, population and the distance between the two countries, IJT represents the random disturbance term, ν_{ijt} represents the trade non efficiency term, and μ_{ijt} generally represents the impact of human factors on trade efficiency. The optimal output is the trade potential, and the technical efficiency is the valuation of trade efficiency.

2.2 Description of Model Construction and Index Selection

Firstly, according to the understanding of the meaning of Digital Trade and the definition of this paper, the common summary of the concepts of digital trade put forward by all parties, referring to relevant literature and research practice and data availability, this paper selects the data of China, Japan, South Korea, Russia and Mongolia in the Northeast Asian economic circle from 2001 to 2020, Select the digital trade measurement indicators shown in Table 1.

Secondly, the core variable digital trade (szmy) and its corresponding five sub indicators are obtained by factor analysis method: information network infrastructure (xxwl),

Table 1. Digital Trade measurement indicators

Primary index	Secondary index	Tertiary index
Digital Trade	Information network infrastructure	Telephone rental of mobile cellular wireless communication system (PCs.) X1
		Secure Internet server (set) X2
		Number of fixed (wired) bandwidth users [person] x3
	Digital technology level	Number of non resident patent applications X4
		Number of resident patent applications (Nos.) X5
		Total domestic R & D expenditure, constant price in 2005, PPP (thousand US dollars) X6
		Proportion of added value of medium and high-tech industries in total added value (%) X7
	Industrial Digital Trade	Number of mobile phone users (person) X8
		Proportion of population covered by at least 2G mobile network (%) X9
		Internet users per 100 people X10
	Digital industrialization trade	Computer and information services ($million) X11
		Information and communication technology (ICT) service exports (% of service exports) X12
	Trade potentialities	Exports of goods and services as a percentage of GDP X13

digital technology level (szjs), industrial digital trade (cysz), digital industrialization trade (szcy) and trade potential (myql).

2.3 Construction of Stochastic Frontier Gravity Model

2.3.1 Construction of Main Stochastic Frontier Gravity Model

Based on the existing literature and the research practice of this paper, the time-varying stochastic frontier gravity model is set from the perspective of China's export trade for estimation [3]. The variables selected in the following models are significant and economically significant variables left after regression screening. During regression, the data are logarithmicized in order to reduce the fluctuation range and heteroscedasticity of the data, The model set is as follows:

$$\begin{aligned}\mathbf{LnEXPijt} &= \beta\mathbf{0} + \beta\mathbf{1LnGDPit} + \beta\mathbf{2LnGDPjt} + \beta\mathbf{3LnPOPit} \\ &+ \beta\mathbf{4LnDISij} + \beta\mathbf{5LnWZijt} + \nu\mathbf{ijt} - \mu\mathbf{ijt}\end{aligned}$$

Among them, EXP_{ijt} represents the trade export volume of individual I (China) to individual J (foreign) in t period, and represents the export scale of China to other countries in Northeast Asia. GDP_{jt} refers to the gross domestic product of Northeast Asian countries in current US dollars; Gdp_{it} represents China's GDP in current US dollars; POPit refers to the population of China in t period; DIS_{ij} indicates the distance between China and other countries; WZ_{ijt} indicates the amount of foreign capital used in China's fixed asset investment in the T period.

2.3.2 Construction of Stochastic Frontier Trade Non Efficiency Term Model

In order to measure the effect of trade inefficiency in China's export trade and further measure the effect of digital trade on China's export trade, the following stochastic frontier trade inefficiency model is constructed:

$$\begin{aligned}\mu\mathbf{ijt} = {} & \delta_0 + \delta_1\mathbf{szmycit} + \delta_2\mathbf{szmywjt} + \delta_3\mathbf{xxwlit} + \delta_4\mathbf{szjsit} + \delta_5 \\ & \mathbf{cyszit} + \delta_6\mathbf{szcyit} + \delta_7\mathbf{myqlit} + \delta_8\mathbf{jcss} + \delta_9\mathbf{jr} + \delta_{10}\mathbf{jr1} \\ & + \delta_{11}\mathbf{zfxn} + \delta_{12}\mathbf{fta} + \delta_{13}\mathbf{sco} + \delta_{14}\mathbf{cus} + \varepsilon\mathbf{ijt}\end{aligned}$$

where μ_{ijt} represents the non efficiency term of trade, that is, the impact of human factors on export trade in the process of trade, and ε_{ijt} represents the random disturbance term. $Szmyc_{it}$ and $szmyw_{jt}$ respectively indicate the development degree of China's Digital Trade and foreign digital trade in the T period; $xxwl_{it}$ refers to the information network infrastructure of China in the T period; $szjs_{it}$ represents the digital technology level of China in the T period; $cysz_{it}$ and $szcy_{it}$ respectively represent China's industrial digital trade and digital industrialization trade in the t period; $myql_{it}$ is the percentage of exports of goods and services in GDP; jcss and cuscus respectively indicate the quality of port infrastructure (1 = very underdeveloped to 7 = very developed and efficient) and the burden of customs formalities (1 = very inefficient and 7 = very effective); Jr_{jr} and jr1 respectively represent the percentage of domestic credit in banking sector and financial sector in GDP; zfxn refers to the efficiency of the government and is replaced

by the government integrity index; fta and sco respectively indicate whether China has signed a free trade agreement with its trading partner countries and whether its trading partner countries have joined the Shanghai Cooperation Organization. They are dummy variables. If the two countries sign a free trade agreement in a certain year, it will be recorded as 1 from that year, otherwise it will be recorded as 0. Similarly, if a country joins sco in a certain year, it will be taken as 1 from that year, otherwise it will be 0.

2.3.3 Data Selection and Source Description

Taking the Northeast Asian economic circle as the sample, this paper studies the effect of digital trade in China's export trade. In the selected countries, due to the lack and partial unavailability of data from North Korea, this paper only selects China, Japan, South Korea, Russia and Mongolia as the research sample, and the selected data span from 2001 to 2020. The data sources of this paper are shown in Table 2.

Table 2. Indicators and data sources

Index	Data Sources
Population by country (pop)	International Monetary Fund Database
GDP of each country	
China's exports to trading partners (exp)	World Trade Organization (WTO) database
Distance between China and its trading partners (dis)	Measured by Baidu map
Data on China's utilization of foreign capital (wz)	Organization for economic cooperation and development (data sorting of National Research Network)
Proportion of exports of goods and services in GDP	
Telephone rental of mobile cellular wireless communication system (pcs)	Wits database
Secure Internet server (set)	World Bank (national research network data collation)
Number of fixed (wired) bandwidth users (person)	
Number of mobile phone users (person)	
Information and communication technology (ICT) service exports (proportion in service exports, BOP%)	
Exports of goods and services as a percentage of GDP	
Customs procedure burden (CUS)	
Port infrastructure quality (JCSS)	

(*continued*)

Table 2. (*continued*)

Index	Data Sources
Computer and information services ($million)	World Trade Organization (data sorting of guoyan.com)
Number of non resident patent applications(pcs)	World Bank (EPS data platform)
Number of resident patent applications(pcs)	
Bank domestic credit as a percentage of GDP (jr)	
Domestic credit in the financial sector as a percentage of GDP (jr1)	
Total domestic R & D expenditure, constant price in 2005, PPP (thousands of US dollars)	World science and technology database (data sorting of National Research Network)
Proportion of added value of medium and high-tech industries in total added value (%)	United Nations Statistics Division Data
Proportion of population covered by at least 2G mobile network (%)	
Internet users per 100 people	Asian Development Bank (ADB) database (data sorting of National Research Network)
Government effectiveness (replaced by government integrity index) (zfxn)	
Whether to join the Shanghai Cooperation Organization (sco)	SCO official website
Is there a free trade agreement with China (fta)	Official website of respective trade zones

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3 Empirical Analysis of Stochastic Frontier Gravity Model

3.1 Applicability Test of Model

The estimation results of stochastic frontier gravity model are sensitive to the selected function form, and whether there is an invalid rate term, It is also a necessary condition for the application of the model. Therefore, firstly, LR test is adopted for the model, and the results are shown in Table 3. First, the significance level of rejection of the original assumption without trade inefficiency is 1%. Second, the significance level of rejection of the original assumption of non time-varying trade inefficiency is 2.5%. Therefore, it is appropriate to adopt the time-varying stochastic frontier force model in this paper.

Table 3. Applicability test of stochastic frontier gravity model

Original hypothesis	Unconstrained mode (ln(H0))	Constraint model (ln(H1)	LR statistics	freedom	2.5% critical value	conclusion
Non efficiency trade items ($\mu = \eta = 0$)	89.910	86.117	7.586	1	3.841	refuse***
Non efficient, non-time-varying trade ($\eta = 0$)	89.910	86.178	7.465	2	6.483	refuse**

Note: * indicates the significance level of 10% ** Represents a significance level of 5% *** Indicates a significance level of 1%; LR = 2[ln(H0) − ln(H1)]

3.2 Empirical Analysis of Stochastic Frontier Gravity Model

In this paper, Frontier4.1 software is used to conduct regression analysis on the data of five Northeast Asian countries from 2001 to 2020 according to the random frontier gravity model set previously. In order to verify the robustness of regression values, this paper lists the results of time-varying and time invariant models for comparison. It can be seen from Table 3 that the symbols of the main variables in the two models are consistent, the difference is small, and in line with the theoretical expectation. Although the symbols of Changshu terms are opposite, the constant terms of the time-varying model are not significant, indicating that the estimation results of the model have strong robustness. In the time-varying model, LR statistics and η reject the original assumption that there is no trade inefficiency term and the trade inefficiency term does not change with time at the level of 1% and 5% respectively, indicating that the model is applicable and can give a more reasonable explanation for the factors affecting China's export trade. The value of γ is 0.85 at the level of 1% indicating that in China's export trade, Non efficiency items, i.e. human factors, are the important reasons why China's export volume is less than the potential export volume. η is 0.099 and the level passing the significance test is 5% indicating that the rate of improvement of trade efficiency over time is 0.099.

According to the regression results of time-varying model in Table 4, China's GDP and foreign GDP have passed the test with significance levels of 10% and 1% respectively, and the sign is positive, When domestic and foreign GDP increases by 1% at the same time, China's exports will increase by 0.377% and 0.788% respectively, indicating that the growth of economic scale can promote the increase of China's export trade, and the increase of economic scale of trading partner countries can promote the increase of China's export trade more than the increase of domestic economic scale. The main reason is that when the scale of foreign economy increases, the purchasing power increases, So as to import more goods.

3.3 Analysis of Trade Non Efficiency Term Model

According to the non efficiency term model constructed earlier in this paper, and using one-step regression, the results are shown in Table 4. Among them, LR statistics and

Table 4. Regression results of Stochastic Frontier Gravity Model

Model	Time varying model			Time invariant model		
variable	coefficient	standard deviation	T value	coefficient	standard deviation	T value
Constant term	4.104	18.346	0.224	**** −3.696	1.141	−3.238
Lngdpi	**0.337	0.197	1.709	****0.349	0.031	11.243
Lngdpj	****0.788	0.014	54.742	****0.779	0.015	52.355
Lnpopi	1.783	6.015	0.296	****4.068	0.406	10.009
Lndis	****−1.146	0.134	−8.524	****−0.985	0.194	−5.088
Lnwz	****0.283	0.068	4.136	****0.313	0.040	7.764
σ^2	****0.005	0.002	3.521	0.0210	0.022	0.982
γ	****0.850	0.124	3.801	***0.740	0.282	2.621
μ	*0.007	0.054	0.138	−0.250	0.341	−0.735
η	***0.099	0.048	2.067	–		
Log Likelihood	89.91024			86.18		
LR statistics	16.80****			9.33****		

Note: * indicates the significance level of 15% ** Indicates a significance level of 10% *** Represents a significance level of 5%, *** * Indicates a significance level of 1%.

values are significant at the level of 1%, indicating that the selection of trade non efficiency model in this paper is appropriate. As can be seen from Table 4, firstly, in the regression results with influencing factors of trade inefficiency, the symbols of the main variables of the stochastic frontier gravity model are consistent with the previous ones, indicating that the results are robust. Secondly, investigate the regression results of trade inefficiency model:

3.3.1 Analysis of Core Explanatory Variables

First, the core variable coefficient of China's Digital Trade (szmyc) is positive, and the level passing the significance test is 10%, which shows that China's digital trade inhibits the growth of exports to Northeast Asian countries, The main reason for this result is that China's digital trade development level is still in the primary investment construction and improvement period compared with other developed countries, and a large amount of cost investment is required in the early stage. Therefore, it will increase the trade cost and have a certain impact on China's export trade. The regression value of Digital Trade (szmyw) of other Northeast Asian countries is negative, and the level passing the significance test is 5%, indicating that the development of digital trade level of other Northeast Asian countries with trade relations with China can drive the increase of

China's export trade, and every 1% increase can drive the increase of China's export by 0.546%, which is mainly due to the development of foreign digital trade, It has reduced the intermediate links of China's exports to it, reduced the unique barriers faced by traditional trade, such as offline tax clearance, reduced the time spent in trade, improved trade efficiency, made the digital enabled traditional trade more convenient, intelligent and digital, and made the trade in the form of data flow and digital goods more tradable and efficient, Thus, it has a stimulating effect on China's export and is conducive to the growth of China's export trade.

Second, analyze the sub indicators of China's Digital Trade: the value of information network infrastructure (xxwl) is negative and has passed the significance test at the level of 10%, indicating that the development of China's information network infrastructure can drive the development of China's Digital Trade and promote the increase of China's export trade. When the level of information network infrastructure increases by 1%, It can drive China's export trade to increase by 3.349%. Because the information network infrastructure is the foundation of the development of digital trade, its improvement can promote China's export trade. The coefficient of digital technology level (szjs) is negative, and the level passing the significance test is 5%. When the digital technology level increases by 1%, it will drive China's export trade to increase by 0.811%. The reason is that the development of digital technology can better enable the real industry, continuously improve its digital level and promote the transformation and upgrading of industrial structure, The rapid and profound integration of the technical route and the development mode of digital trade has led to the in-depth development of computing networking and sensor intelligence, so as to drive the increase of China's exports through the development of digital trade. The coefficients of Industrial Digital Trade (cysz) and digital industrialized trade (szcy) are both negative, indicating that they have a promoting effect on China's export trade, but the digital industrialized trade has not passed the significance test, mainly because China's digital industrialization level is still in the primary stage, and the promoting effect on digital trade has not yet emerged, Industrial digital trade has passed the significance test at the level of 10%, and every increase of 1% will drive China's export to increase by 0.752%. Digital Industrial Trade and industrial digital trade complement each other. When various industries more and more use digital technology to upgrade their digitization, it is also the process of continuously improving the level of industrial digitization, The higher the level of industry digitization, it is possible to introduce advanced digital technology, namely digital industry, so as to drive the development of digital industry and jointly promote the development of digital trade. The regression value of trade potential (myql) is negative, indicating that trade potential plays a leading role in China's export trade. Every 1% increase in trade potential can increase China's export by 0.532%, because the greater the trade potential, the further improvement of bilateral trade relations and economic and trade cooperation, the continuous expansion of trade space, and the increase of traditional trade and service trade to varying degrees, Thus, it can drive the growth of China's export trade.

3.3.2 Analysis of Other Trade Non Efficiency Variables

The positive value of customs procedure burden (CUS) indicates that it has a reverse blocking effect on China's export trade, but it has not passed the significance test. The value of port infrastructure quality (JCSS) is negative, and the level passing the significance test is 1%, indicating that it is one of the driving forces driving the growth of China's export trade, because the quality of infrastructure can have a certain impact on the efficiency of cargo handling and loading and unloading. The higher the efficiency, the lower the cost, and every 1% increase in infrastructure quality will increase China's export trade by 0.165%. As a substitute variable of finance, the percentage of domestic credit in GDP (Jr) of banking sector and its supplementary variable, that is, the proportion of domestic credit in GDP (jr1) of financial sector, are positive but small, and the level passing the significance test is 5%, indicating that one of the factors inhibiting China's export growth is the financial situation of trading partner countries, which may be because in Northeast Asia, Different countries have different levels of economic development, developed and developing countries coexist, and the degree of freedom of financial markets is different. Even some countries are completely free of finance, and there will be further restrictions on foreign financing. Therefore, it is not conducive to China's export, but it has little impact from the regression value. The regression value of government effectiveness (ZFXN) is negative, and it has passed the significance test at the level of 10%. The government effectiveness here is replaced by the government integrity index. Therefore, the more honest the government is, the less gray areas in the process of trade, and the higher the efficiency, the more it can promote the development of trade. The regression value of whether to sign a free trade agreement (FTA) is negative, indicating that the signing of FTA will stimulate China's export trade, but it has not passed the significance test. It may be that in Northeast Asia, only South Korea has signed a FTA with China, and China has not signed a free trade agreement with other countries, so on the whole, The effect of free trade agreements has not been fully demonstrated. We should actively consult and strive to sign more free trade agreements with regional countries. The value of whether to join the SCO is positive, and the level passing the significance test is 1%, indicating that joining the SCO has a restraining effect on China's export trade. The main reason is that among the regional countries, most of the countries joining the SCO are not in Northeast Asia, only Russia is located in it, and China and Russia have not signed a free trade agreement, Although the nature of SCO has expanded, it still focuses on counter-terrorism. Moreover, other countries in Northeast Asia have not joined SCO, so the promotion effect on China's export trade has not been shown (Table 5).

Table 5. Regression results of trade non efficiency

Model	Time varying model			
	variable	Coefficient	standard deviation	T value
Stochastic frontier gravity model	Constant term	0.096	4.106	0.023
	Lngdpi	***0.323	0.079	4.089
	Lngdpj	***0.693	0.015	45.128
	Lnpopi	**2.823	1.435	1.968
	Lndis	***−0.734	0.070	−10.452
	Lnwz	***0.227	0.031	7.426
Trade inefficiency model	Constant	−0.129	0.213	−0.608
	cus	0.063	0.050	1.274
	jcss	***−0.165	0.030	−5.447
	jr	**0.003	0.001	2.267
	jr1	**0.001	0.001	1.691
	zfxn	*−0.001	0.002	−0.701
	fta	−0.140	0.192	−0.729
	sco	***0.397	0.080	4.961
	xxwl	*−3.349	1.792	−1.866
	szjs	**−0.811	0.413	−1.962
	cysz	*−0.752	0.407	−1.849
	szcy	−0.440	0.317	−1.391
	myql	*−0.532	0.289	−1.845
	szmyc	*5.862	3.147	1.863
	szmyw	**−0.546	0.221	−2.467
	σ^2	***0.003	0.001	5.119
	γ	***0.786	0.097	8.122
	Log Likelihood	128.258		
	LR statistics	93.492***		

Note: * indicates the significance level of 10% ** Represents a significance level of 5% *** Indicates a significance level of 1%.

4 Research Conclusions and Policy Recommendations

This paper takes the relevant data of five countries in Northeast Asia from 2001 to 2020 as samples. The following conclusions are drawn:

First, from the results of the stochastic frontier gravity model: the economic scale (GDP), China's population (market scale) and the degree of foreign capital utilization of

China and its trading partners can promote the growth of China's exports, but the distance between China and its trading partners will hinder the increase of China's export trade.

Second, from the regression results of the trade non efficiency term model: digital trade has a promoting effect on China's export trade, Although China's digital trade construction is currently in the initial stage and needs continuous capital investment, which may increase the trade cost, in the future, digital trade will catch up with the international economic development and has great advantages, which is a powerful starting point to stimulate economic development.

Third, from the sub indicators of Digital Trade: information network infrastructure, digital technology, industrial digital trade, digital industrialized trade and trade potential have a promoting effect on the growth of foreign trade. Although some indicators are not very significant, the long-term trend conducive to the development of Digital Trade and promoting the growth of China's foreign trade will not change.

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References

1. Beverelli C, Fiorini M, Hoekman B (2017) Services trade restrictiveness and manufacturing productivity: the role of international situations. J Internal Econ 104(1):166–182
2. Bond SR (2002) Dynamic panel data models: a guide to micro data methods and practice. Portuguese Econ J 1(2):141–162
3. Burri M (2017) New legal design for digital commerce in free trade agreements. Digiworld Econ J 107(3):1–21
4. Meltzer J (2019) Governing digital trade. World Trade Rev 18(S1):S23–S48