The Influence Factors of China's Cross-border E-commerce Export Trade Using Gravity Model

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Abstract

Purpose – This study examines the influencing factors of China's cross-border e-commerce exports in the context of the current situation and trends of China's cross-border e-commerce development. Through an improved trade gravity model, it provides more in-depth research and constructive opinions on the development of cross-border e-commerce in China. In this paper, factors such as consumption gap, volume of trade frictions, number of tourists, Internet usage and trade openness are added to the formula of the traditional trade gravity model in the improved trade gravity model to examine the influencing factors on China's cross-border e-commerce exports.

Design/methodology – According to the empirical analysis, China's cross-border e-commerce exports to ten countries are used as dependent variables, and consumption gap, trade friction volume, trade distance, trade openness and number of Internet users are taken as independent variables. Regression analysis is conducted through a modified gravity model to test whether the hypotheses hold.

Findings – The analysis shows that the hypothesis that China's cross-border e-commerce exports are influenced by trade openness, trade distance, consumption gap between trade parties, and the number of Internet users in the importing country is supported by these four hypotheses, but not all independent variables have an impact on them. Specifically, the number of travelers, trade frictions do not have an impact on China's cross-border e-commerce. That is to say, trade friction between China and the United States and political issues such as China-India and China-Japan territorial disputes that emerged before do not affect the development of cross-border e-commerce in China.

Originality/value – The analysis shows that the factors influencing China's cross-border e-commerce exports are the trade openness of the importing country, the trade distance, the number of Internet users in the importing country, and the consumption gap between the two sides of the trade. The trade openness and the number of Internet users positively contribute to China's cross-border e-commerce, while the consumption gap and trade distance are negatively related to them. And the analysis found that the Sino-US trade war and the Sino-Indian territorial disputes and other trade frictions to China's cross-border e-commerce exports did not have a substantial impact.

Keywords: Cross-border E-commerce, Export Trade, Influencing Factors, Trade Gravity Model, Trade Friction
JEL Classifications: D12, F14, O53

1. Introduction

With the popularity of the Internet and the development of information technology, as well as the advancement of payment tools and logistics services, e-commerce is growing rapidly worldwide, the number of merchants through Internet platforms is increasing, and online

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shopping by consumers is becoming more common (Chen and Chang, 2005; Efendioglu and Yip, 2004; Giuffrida et al., 2017; Lau et al., 2005; Wang et al., 2020). The World Trade Organization (WTO) defines e-commerce as the production, sale, delivery of goods and services through computer networks. After the financial crisis in 2008, the rise of cross-border e-commerce has become a new growth point for economic development in many countries (Chen and Yang, 2021; Zhu et al., 2019). The development and popularity of cross-border e-commerce is considered as a new paradigm shift to expand international cross-border trade between countries, reduce trade barriers and encourage trade promotion and growth (Mensah et al., 2020). Therefore, cross-border e-commerce is a new type of trade developed with the popularization of Internet technology and the development of information technology, which is the transaction of trade subjects belonging to different customs borders through cross-border e-commerce platforms and the delivery of goods through the international logistics system. Therefore, cross-border e-commerce not only shortens trade links and reduces costs, but also promotes international trade (Bakos, 2001; Lendle et al., 2016; Ma et al., 2018; Yu et al., 2021). The rise of cross-border e-commerce has boosted global trade volumes, and when the barriers across borders disappear, it will no longer matter whether consumers buy domestic or cross-border products. Retailers will have a golden opportunity to organize sales not by region but by customer demand, selling products and services that match a specific market, regardless of location. E-commerce growth rates in Asia are in double digits in most product categories, and China is a major market for the Internet services of the largest retailer, Alibaba (Van Heel et al., 2014). Over the past decades, China has become a major force in promoting and developing cross-border e-commerce (Abdulkarem and Hou, 2021; Qi et al., 2020). In this context, revitalizing cross-border e-commerce has become a new channel for expanding international trade in China.

Among them, China's cross-border e-commerce has been able to develop rapidly in recent years, and countries are focusing on performance indicators such as the value and impact factors of China's cross-border e-commerce exports. According to China Electronic Commerce Research Center, China's cross-border e-commerce transactions increased from about RMB 70,000,000 in 2017 to RMB 9 trillion in 2018, an increase of 11.6% y-o-y. In 2019, China's cross-border e-commerce market transactions were RMB 10.8 trillion, accounting for more than 30% of China's total imports and exports. Thus the rise of cross-border e-commerce provides a new way for China to expand its international trade (Yin and Choi, 2021).

In this context, the continuous growth of China's cross-border e-commerce market has made important contributions to the stability of China's foreign trade. In particular, with the rapid development and continuous strengthening of the Chinese economy and the continued promotion of the Chinese-led Belt and Road, China's is also becoming more and more vocal in the international arena (Zhai, 2018). In the aftermath of the international financial crisis, globalization has slowed down, the international multilateral trading system has been damaged, and the United States has provoked trade frictions between China and the United States on the grounds of the excessive U.S.-China trade deficit, as well as intellectual property rights. The trade frictions between the two sides mainly focus on countervailing and anti-dumping, intellectual property disputes, blockade of high-tech talents, and financial sanctions.

Therefore, it is essential to improve the export competitiveness of china's cross-border e-commerce and maintain the stable and high-quality development of export trade under the unstable global economy. At the same time, China is facing increasing competition and pressure in the international market, and how China's cross-border e-commerce market will

develop in the future has become a problem. Based on the characteristics of China's cross-border e-commerce, which is mainly export-oriented, China's cross-border e-commerce exports account for 75% of total cross-border transactions in 2020. This highlights the demand for Chinese goods in the global market and confirms the role of cross-border e-commerce in China in driving exports (Ho and Adjouro, 2021).

Previous studies have examined cross-border e-commerce in terms of trade costs, trade distance, international trade, and logistics performance. Gomez-Herrera et al. (2014) analyzed the drivers and barriers of cross-border e-commerce among 27 EU members using a gravity model and found that the gravity model performs well in explaining online cross-border trade flows, and the study found that cross-border e-commerce helps to reduce relevant geographically related trade costs. Meanwhile, Kim Thai-young et al. (2017) examined the impact of distance on cross-border e-commerce using data from 721 regions in five EU countries and showed that distance is not "dead" in e-commerce and that express delivery reduces distance for cross-border e-commerce. Zhao (2020) used an extended trade gravity model to empirically analyze the factors influencing the scale of cross-border e-commerce transactions between Belt and Road countries and China, and the results show that additional factors such as per capita income and consumer groups have significant effects on the scale of cross-border e-commerce, especially geographical distance has a significant effect on the scale of cross-border e-commerce transactions. In addition, several papers have studied the impact of government policies on the performance of cross-border e-commerce firms. He and Wang (2019) explored the factors affecting cross-border e-commerce trade in terms of exports and imports, respectively, using panel data from 1998-2016 for ASEAN countries as an example. The findings show that GDP and real exchange rate affect the development of cross-border e-commerce trade.

According to the above literature analysis, although a number of scholars have studied cross-border e-commerce, the development of cross-border e-commerce in China is still in the growth stage, and there is still a lot of upside in the future, especially along with the rise of China's comprehensive national power in the international arena, cross-border e-commerce trade will definitely become the main force of China's trade development in the future. Therefore, in order to revitalize China's international trade and make cross-border e-commerce a new way for China to expand international trade, this paper adds six variables: consumption gap, trade friction volume, trade distance, trade openness, number of Internet users, and number of tourists, and collects data from the top ten countries in China's cross-border e-commerce exports during the period of 2014-2018. After modifying the traditional trade gravity model, and this is empirically analyzed.

2. Literature Review and Hypothesis

2.1. Cross-border E-commerce and International Trade

E-commerce has the potential to act as an engine of global economic growth and international trade and to improve economic efficiency (Stare, 2003). And the growth of e-commerce and economic globalization has also contributed to the development of cross-border e-commerce (Yang et al., 2021). Buyers and sellers in online transactions are not limited to domestic electronic markets, but operate in a broader and more general global marketplace (Burinskiene, 2012; Cui et al., 2019; Han et al., 2018; Zhang et al., 2021). Although cross-

border e-commerce shares some similarities with traditional e-commerce, there are differences in buyers and sellers, trading platforms, marketing models, and logistics habits (Mou et al., 2020). In terms of the definition of cross-border e-commerce, cross-border e-commerce refers to online transactions between consumers and businesses located in different countries, which are usually paid for by brands or wholesalers through diplomatic means in their home countries using inventory management systems. Alternatively, it can be a business or brand that transacts with consumers, or 2 individual transactions through channels such as electronic auction platforms. Research by Yousefi (2018) shows that cross-border e-commerce has unique characteristics compared to traditional trade, with technology and the Internet playing an integral role in its popularity and rapid growth. This ubiquitous platform allows e-traders to access a wider range of markets and sell large volumes of small-volume products to a large number of buyers in different countries. Cross-border e-commerce can connect buyers and sellers around the world through the Internet, shorten foreign trade links, reduce transaction costs, save time, and promote the development of foreign trade. At the same time, it can shorten foreign trade links and improve foreign trade efficiency. Since e-commerce is a computer-mediated transaction, it not only improves its traceability, but also protects consumers' rights more effectively (Mensah et al., 2020; Valarezo et al., 2018; Wang et al., 2015; Wang et al., 2017; Yunsong and Bing, 2019). Thus cross-border e-commerce is becoming an important channel to facilitate international trade, and it offers great business opportunities for all countries and regions to benefit from global transactions (Zhu et al., 2019).

In the traditional business environment, consumers are able to touch and see the products in a physical store to purchase the goods, but offline physical stores have disadvantages such as high procurement costs and limited product variety. In addition, offline brick-and-mortar stores did not allow cross-border purchases, and consumers could only purchase overseas goods through agents who imported the goods. Today, consumers can purchase goods in borderless online stores. Due to competitive prices and a wide range of products, cross-border e-commerce offers attractive opportunities for consumers (Bao et al., 2021; Kim Thai-young et al., 2017; Terzi, 2011). Cross-border goods purchased by consumers are also shipped directly to the desired location, and returns within a certain grace period are accepted for a full refund. Cross-border e-commerce platforms transcend national borders, allowing consumers to purchase directly from overseas, and consumers are able to enjoy preferential tariffs and taxes with product prices lower than those of commercial agency imports, making cross-border online shopping increasingly popular among e-commerce consumers (Lin et al., 2018). There have been many findings in the literature that cross-border e-commerce contributes to the growth of international trade and improves the export performance of firms. A study by Ho et al., (2021) found that a 1% increase in cross-border e-commerce would increase China's international trade by 0.08% and 0.26% in the short and long term respectively. A study by Houghton and Winklhofer (2004) showed E-commerce also has an impact on the export performance of firms. Therefore, in order to attract more customers and increase the export value of cross-border e-commerce, it is important to understand the factors that have an impact on cross-border e-commerce exports.

The main forms of cross-border e-commerce include B2C, B2B, C2C, etc. Among them, B2C and B2B are the main forms. Import and export in international trade usually involves international payment, import and export customs release, international transportation, and transportation insurance. Security and risk control also have to be considered. These make the difference between cross-border e-commerce and e-commerce. For SMEs, cross-border

e-commerce is gaining importance and it can provide more opportunities in overseas markets (Liu et al., 2015). Moreover, under China's "One Belt, One Road" policy, the development of cross-border e-commerce is strongly supported by the government. Due to the policy support from the Chinese government and the huge demand market in China, many countries want to do cross-border e-commerce with China through the Internet. This is also a good opportunity for Chinese domestic cross-border e-commerce enterprises to explore the international market (Cheng et al., 2019).

2.2. Trends in China's Cross-border E-commerce Market

With the market opening of the World Trade Organization (WTO) and Free Trade Agreement (FTA) and the rapid popularization of the Internet environment, cross-border e-commerce has developed rapidly, and the existing domestic consumption model is gradually shifting to a global model that crosses national boundaries. Cross-border e-commerce is a new form of trade arising from the gradual development of the Internet. International e-commerce relies on information infrastructure such as the Internet and modern logistics to optimize traditional trade methods to realize online commerce between supply and demand, so that business activities can be carried out anytime and anywhere. In addition, due to the convenience of the Internet, overseas consumers can be easily accessed, trade barriers can be easily broken through cross-border e-commerce, and trade efficiency can be improved by omitting intermediate supply chains. And cross-border e-commerce has become an important channel to help companies enter the international market. This phenomenon is highly recognized, especially in China (Mou et al., 2019). Benefiting from the demand of the global market, China's cross-border e-commerce market is also rapidly emerging.

With the increasing popularity of the Internet over the past few decades, it can be argued that the Internet has enormous potential to facilitate trade. Rodríguez-Crespo and Martínez-Zarzoso (2019) show that the use of the Internet increases the volume of trade and that it increases when the trading countries have similar levels of ICT. Lin (2015) studied the impact of the Internet on facilitating international trade. The results showed that a 10% increase in Internet users would increase international trade by 0.2%-0.4%. Therefore, it is said that the development of the Internet has not only reduced trade barriers but also reduced spatial distances (Wang and Choi, 2019). Innovations in Internet information technology, maintenance of infrastructure, and changes in people's perceptions have led to an increasing number of people around the world participating in online shopping. Business through the Internet, with its dynamic, fast-growing and highly competitive nature, offers new ways to create wealth (Amit and Zott, 2001). The Chinese Internet industry launched a recent "go global" policy in the early 2000s, actively promoting itself as a "ship" to help other Chinese companies get out of the country (Shen, 2018).

According to data released by the United Nations Conference on Trade and Development (UNCTAD) in 2019, the report divides the development of e-commerce in China into four phases: the initial phase (1996-2000); the accelerated development phase (2000-2008); the standardization phase (2008-2014); and the globalization phase (from 2014-2017). The report notes that China's national cross-border e-commerce transactions grew more than fivefold (1.2 to 6.6 trillion yuan) between 2010 and 2016 (Duan et al., 2021). In 2018, cross-border e-commerce sales accounted for 29.5% of China's total imports and exports. As a result, cross-border e-commerce has become the main mode of China's foreign trade, growing 16 times faster than general trade. The main mode is B2B e-commerce, which accounts for 88% of all

cross-border e-commerce (Mou et al., 2020). By the end of 2019, there were over 23,265 cross-border e-commerce companies in China. Cross-border e-commerce companies and platforms that successfully represent B2C include Tmall International and NetEase Kaola (Chuan et al., 2021).

In addition, with the implementation of China's "One Belt, One Road" policy, the application of high technology and the construction of China's global logistics network, China's cross-border e-commerce exports have great potential for development. China also attaches great importance to the development of cross-border e-commerce and has developed various policies to facilitate transactions between countries. For example, the Ministry of Finance has introduced tax rebates and exemptions to encourage Chinese companies to export their products to other countries. The State Council has also enacted a series of policies to encourage companies to expand into overseas markets and establish overseas retail systems (Fan, 2019; Lee et al., 2019; Miao et al., 2019). According to Internet Retailer, the volume of transactions by Chinese suppliers grew by 200% in 2016 as they expanded their distribution channels to global trading platforms. 80% of online suppliers operate on eBay, Amazon, AliExpress, DHgate and several other platforms, while relatively large e-commerce exporters have established their own marketing platforms (Ma et al., 2018). Based on this, the focus of Chinese e-commerce development has now gradually expanded from domestic to global, forming an integrated cross-border business (Shen et al., 2020). Due to factors such as huge overseas markets and high-tech industrial technology, the export cross-border e-commerce industry is expanding and more and more Chinese companies are turning their trade online.

Meanwhile, according to data released by China's National Bureau of Statistics, as of 2018, the main countries and regions of China's export cross-border e-commerce are: the United States 17.5%, France 13.2%, Russia 11.3%, the United Kingdom 8.4%, Brazil 5.6%, Canada 4.5%, Germany 3.7%, Japan 3.4%, South Korea 2.5%, India 2.4% and others 27.5%.

In terms of the distribution of China's cross-border e-commerce exporters, developed countries such as the United States and France remain the main exporters of Chinese e-commerce because of their well-established infrastructure and mature online shopping environment. With significant growth in emerging markets such as Russia, Brazil, Canada and the UK, a large number of Chinese e-commerce companies and sellers continue to flock to emerging markets. After improving the traditional trade gravity model, this article combines my country's export data to ten major cross-border e-commerce countries (the United States, France, Russia, UK, Brazil, Canada, Germany, Japan, South Korea and India) from 2014 to 2018, and examines the impact of various variables on China's cross-border e-commerce. Our hypothesis is as follows:

H1: *The consumption gap between the two sides of the trade is negatively correlated with China's cross-border e-commerce export trade.*
H2: *The amount of trade frictions is negatively correlated with China's cross-border e-commerce export trade.*
H3: *Trade distance is negatively correlated with China's cross-border e-commerce export trade.*
H4: *The trade openness of importing countries is positively correlated with the export trade of Chinese cross-border e-commerce.*
H5: *The number of Internet users in importing countries is positively correlated with China's cross-border e-commerce export trade.*
H6: *The number of travelers is positively correlated with China's cross-border e-commerce export trade.*

3. Methodology

3.1. The Gravity Model

Gravity has long been one of the most successful empirical models in economics, and it does an excellent job of organizing the large variation in economic interactions across space observed in trade and factor movements (Anderson, 2011). The concept and idea of the gravity model of trade originated from the law of gravity discovered by physicist Isaac Newton, and the gravity model of trade specifies trade as a positive function of the attractive "mass" of two economies and a negative function of the distance between them (Kong and Kneller, 2016; Lewer and Van, 2008; Yamarik and Ghosh, 2005). Gravity models have been widely used in the empirical literature to explain bilateral trade (Egger, 2005; Hassan, 2001; Mátyás, 1998). In describing trade flows, the gravity model even shows excellent empirical robustness (Kepaptsoglou et al., 2010). When applied to the flow of goods between countries, the model emphasizes that trade increases with the size and proximity of trading partners. In addition to distance, some models include tariff and price variables of trading partners, as well as factors such as proximity between trading partners, common language, presence of colonial relations, continuity of countries, exchange rate fluctuations or the existence of currency agreements (Garcia et al., 2013; Porojan, 2001). The use of the gravity model was criticized in its early applications for lacking a theoretical foundation (Chung et al. 2013). However, since the gravity model has undergone substantial improvements and modifications, especially after Anderson and Van Wincoop (2003) provided a firmer theoretical foundation, it has been widely used in trade economics and other fields (Gomez-Herrera et al. 2014). The general form of the gravity model of trade, first proposed by Tinbergen (1962) and Pöyhönen (1963), is as follows:

$$T_{ij} = A(Y_i Y_j)/D_{ij} \tag{1}$$

where T_{ij} is the value of bilateral trade between countries i and j, Y_i and Y_j are the respective national incomes of countries i and j, D_{ij} is a measure of bilateral trade between the two countries, and A is a constant of proportionality. To obtain an estimable form of the trade gravity equation, we take the natural logarithm of the gravity model equation (1) and add an error term to obtain the following equation.

$$\ln(T_{ij}) = A + \alpha_1 \ln(Y_i Y_j) + \alpha_2 \ln(D_{ij}) + \varepsilon_{ij} \tag{2}$$

In equation (2), A, α_1 and α_2 are coefficients to be estimated. The error term ε_{ij} represents any other contingent event or shock that may affect bilateral trade between the two countries.

Equation (2) provides the core set of variables used for estimation purposes. However, in this paper, we will focus on the impact of trade openness, consumption gap, trade distance, number of Internet users, the number of tourists from importing countries to China, and the amount of trade frictions on cross-border e-commerce exports, employing the following trade gravity model:

$$\ln(EX_i) = \alpha_0 + \alpha_1 \ln Open_i + \alpha_2 \ln IT_i + \alpha_3 \ln D_i + \alpha_4 InInter_i \\ + \alpha_5 INTourist_i + \gamma Friction_i + \varepsilon_i \tag{3}$$

Among them, i represents the main export partner countries of China's cross-border e-commerce, including the United States, Russia, France, the United Kingdom, Brazil, Canada, Germany, Japan, and South Korea. EX represents my country's cross-border e-commerce export data to country i; Open indicates that the openness of country i refers to the degree of trade openness. Generally speaking, the higher the trade openness of exporting countries, the more convenient the import and export trade, which is more conducive to my country's cross-border e-commerce exports; IT is the absolute value of the difference per capita between the two trading countries; D represents the geographic distance between China and the place of import of cross-border e-commerce; Inter is the number of secure Internet servers per million people in the importing place of cross-border e-commerce. The secure server is a manifestation of the level of infrastructure in a country's e-commerce trade. In general, it is assumed that the secure Internet server owned by the trading partner country the greater the number, the better the development of cross-border e-commerce. Tourist indicates the number of tourists from country i to China; Friction indicates whether there is trade friction between country i and China (this includes anti-dumping on exports, tariff increase, etc., but also conflicts such as territorial disputes), if there is trade friction then Friction=1, otherwise Friction=0.

3.2. Data

Before the 21st century, because China's cross-border e-commerce was still in its infancy, and at that time cross-border e-commerce accounted for a small proportion of China's trade volume, it was not closely related to international trade, and related statistics were relatively few. Therefore, based on the principle of data availability and accuracy, this paper selects the data of the 10 countries (the United States, France, Russia, the United Kingdom, Brazil, Canada, Germany, Japan, and South Korea) with high export trade volume of China's cross-border e-commerce for the period of 2014~2018.

Among them, consumption gap, trade openness and Internet users come from the World Bank, Data on China's cross-border e-commerce import and export transactions come from the China Electronic Commerce Research Center, the National Bureau of Statistics of China, iiMedia Research. The trade distance used in this article refers to the product of the spatial distance from the e-commerce center of the main trading partner country of cross-border e-commerce to Guangzhou, China, and the international crude oil price. The reason why not choose the distance between the capitals of both sides of the trade is that the e-commerce centers of many countries are not the capitals. In addition, since the general trade distance cannot reflect the changes in transportation costs (crude oil prices, labor costs, etc.) over time. Therefore, this article selects the absolute distance between trading partner countries multiplied by the international crude oil price to represent the trade distance. The result of the distance data comes from the geographic website. Data on the number of tourists from importing countries to China are from the China Tourism Statistics Bulletin. Data on trade frictions are from China's Ministry of Commerce.

3.3. Operationalization of Variables

3.3.1. Dependent Variable

For the dependent variable, we used China's cross-border e-commerce exports to 10 countries from 2014 to 2018. Cross-border e-commerce export value comes from China's cross-

border e-commerce import and export transaction value data from China E-commerce Research Center, National Bureau of Statistics of China, iiMedia Research.

We set the data from 2014 to 2018 because 2014 was the beginning of China's cross-border e-commerce, so we used the initial stage of cross-border e-commerce as a benchmark, and until 2018, it was because this research wanted to avoid the outbreak in December 2019. The impact of covid-19 on cross-border e-commerce. The period from 2014 to 2018 is the prosperous period of China's cross-border e-commerce, so the dependent variable used in this article is China's cross-border e-commerce exports to 6 countries from 2014 to 2018. The amount is expressed in U.S. dollars; we have taken the natural logarithm of the U.S. dollar amount.

3.3.2. Independent Variables

a) Consumption gap

The consumption gap chosen for this paper is the absolute value of the difference between China and country i's GDP per capita. Generally speaking the larger the consumption gap between the two sides of the trade the more unfavorable the development of cross-border e-commerce, so this coefficient is predicted to be negative.

$$CG = /GDP_c - GDP_i/ \tag{4}$$

b) Volume of trade frictions

The amount of trade frictions used in this paper includes trade conflicts between two trading parties, e.g., tariffs imposed by one party on the other, anti-dumping, etc., and also political events such as territorial disputes between two trading parties. Frictions=1 if there are trade frictions between two trading parties, otherwise Frictions=0. Generally speaking, the higher the trade frictions between two countries, the more detrimental to the development of cross-border e-commerce, so the coefficient is expected to be negative.

c) Trade distance

The trade distance used in this article refers to the product of the spatial distance from the e-commerce center of the cross-border e-commerce importing country to Guangzhou, China and the international crude oil price. The reason why not choose the distance between the capitals of both sides of the trade is that the e-commerce centers of many countries are not the capitals. In addition, since the general trade distance cannot reflect changes in transportation costs (crude oil prices, labor costs, etc.) over time, this article selects the absolute distance between trading partner countries multiplied by the international crude oil price to represent the trade distance. Generally speaking the greater the trade distance the higher the cost of transportation consumed, the more unfavorable to the development of cross-border e-commerce, so the coefficient is predicted to be negative.

$$TD = S_i * I \tag{5}$$

where:

TD：Represents the trade distance from country i to China.

S_i: Represents the spatial distance from the e-commerce center of country i to Guangzhou, China.

I: Indicates the international crude oil price

d) Trade openness

A large number of studies have used the trade share of GDP and found that there is a positive and close relationship between trade share and economic growth (Harrison, 1996; Yanikkaya, 2003). Therefore, the trade openness selected in this article is calculated by dividing country i's import and export volume by country i's GDP. Generally speaking the greater the trade openness the more favorable the development of cross-border e-commerce, so the coefficient is predicted to be positive.

$$TO = (X + M)_i / GDP_i \qquad (6)$$

where:
  TO: Indicates the trade openness of country i.
  X: The import value of the importing country.
  M: The export value of the importing country.
  GDP_i: The GDP value of country i.

e) Number of internet services

A country's technological infrastructure plays a key role in providing for the evolution of information and communication technologies. And Internet technology provides the foundation for the continued advancement of new goods and services, new markets and new business models in the digital economy. It is also providing the foundation for the development of e-commerce (Freund and Weinhold, 2004; Xing, 2018).

So, this dependent variable represents the number of secure Internet services per million population in country i. The transaction method of cross-border e-commerce is that consumers make cross-border online purchases with the help of Internet platforms. Therefore, Internet penetration is a basic prerequisite for the development of cross-border e-commerce, and in general, the higher the Internet penetration rate of a country, the larger the scale of online transactions.

f) Number of tourists

The number of travelers uses the number of travelers from country i to China, and the data comes from the China Tourism Statistics Bulletin. Theoretically, the more overseas consumers travel to China, the more they know about Chinese culture and the more they like Chinese goods, which is conducive to the development of cross-border e-commerce, so the coefficient is predicted to be positive.

4. Result

4.1. Test of Hypothesis

As mentioned in this study, after sorting out the variable data of the ten research target countries, this article uses a multiple linear regression model to study the impact of each variable on China's cross-border e-commerce export trade volume. Before performing multiple linear regression, logarithmic processing is performed on the original data to eliminate the adverse effects of different measurement units. The statistical and regression results of the main variables are shown in the table below.

Table 1. Model Set Table

| | | | Model summary | | |
Model	R	R squared	modified R squared	standard error of the estimate	Durbin-Watson
1	0.859^a	0.738	0.702	1.253591695	0.879

According to Table 1, the ADVSTE R of this study reached 73.8%, which means that 73.8% of the changes in China's cross-border e-commerce exports can be explained by the independent variables participating in this study.

Table 2. Analysis Table

| | | | ANOVA | | |
Model	Sum of squares	Degrees of freedom	Mean square	F	Significance Probability
Regression	190.722	6	31.787	20.227	.000b
Residual	67.574	43	1.571		
All	258.296	49			

In addition, it can be seen from Table 2 that since P=0.000<0.05, it can be confirmed that at least one independent variable in this study can significantly affect the dependent variable. Specifically, to further determine which independent variable has a significant influence on the dependent variable, the following coefficient table needs to be analyzed:

Table 3. Coefficient Analysis Table

| | Coefficient | | | | | | |
| Model | Non-standardized coefficient | | Standardized coefficient | t | Significance Probability | Collinearity Statistics | |
	B	standardization error	beta			Tolerance	VIF
(Constant)	82.537	48.826		1.690	0.098		
In Open	1.653	0.566	0.440	2.922	0.006	0.268	3.727
In D	-0.874	0.307	-0.331	-2.849	0.007	0.450	2.221
In IT	-3.081	1.297	-0.248	-2.377	0.022	0.559	1.789
In Inter	0.273	0.132	0.250	2.070	0.044	0.418	2.390
In Tourist	-0.058	0.162	-0.045	-0.359	0.721	0.382	2.619
γ Friction	0.976	0.589	0.149	1.657	0.105	0.753	1.328

In Open is the trade openness of country i; In D is the geographical distance between China and the cross-border e-commerce importing country; InIT is the absolute value of the difference in GDP per capita between the two trading countries; InInter is the number of Internet users per million in country i; InTourist is the number of tourists from country i to China; and γfriction indicates the degree of trade frictions between China and country i.

According to the regression results of coefficient Table 3, the P-values of In Open, In D, In IT, and In Inter are all less than 0.05, so the trade openness of the importing country, trade distance, consumption gap between the two sides of the trade, and the number of internet

users in the importing country can significantly affect China's cross-border e-commerce export trade. P=0.006<0.05 for In Open, and the coefficient B=1.653>0, indicating that the higher the trade openness of importing countries, the more favorable to China's cross-border e-commerce exports, so the hypothesis H4 of this paper holds. P=0.007<0.05 for In D, indicating that trade distance can significantly affect China's cross-border e-commerce exports, but the coefficient B=-0.874<0, It shows that the farther the distance between the two sides of the trade, the higher the transportation cost of consumption, the more unfavorable to China's cross-border e-commerce exports, assuming H3 holds. P=0.022<0.05 for In IT, indicating that the consumption gap between the two sides of trade has a significant effect on cross-border e-commerce exports has a significant effect, but the coefficient B=-3.081<0 that indicates that when the consumption gap between the two sides of trade is bigger, the export of Chinese cross-border e-commerce is lower instead, so the hypothesis H1 holds. P=0.022<0.05 for In Inter and coefficient B=0.273>0, indicating that the Internet users in importing countries have a significant effect on China's cross-border e-commerce exports, and the higher the Internet users in importing countries, the more beneficial to China's cross-border e-commerce exports, so hypothesis H5 holds.

However, the p-values of both InTourist and γ Friction are greater than 0.05, indicating that the number of tourists, trade frictions between trade parties have no significant impact on China's cross-border e-commerce exports have no significant effect, Hypothesis H6 does not hold and Hypothesis H2 does not hold.

Therefore, it can be seen from the above regression results that the export development of cross-border e-commerce in China is mainly determined by the trade openness of the importing country, the trade distance, the consumption gap between the two sides of the trade and the number of Internet users in the importing country. China should consider the influence of these four factors of importing countries while developing cross-border e-commerce.

5. Conclusion and Implication

With the development of modern information technology, cross-border e-commerce has become a new type of trade. Not only can cross-border e-commerce optimize and rationalize the existing resources of each country, the rise of cross-border e-commerce also promotes the development of international trade (He and Wang, 2019). This study is based on the development of cross-border e-commerce in China, with data collected from ten countries (USA, France, Russia, UK, Brazil, Canada, Germany, Japan, and South Korea) from 2014 to 2018. After improving the traditional trade gravity model, the effects of the six variables on China's cross-border e-commerce exports were constructed and empirically analyzed. The regression findings show that the trade openness of the importing country, the trade distance, the consumption gap between the two sides of the trade, and the number of Internet users in the importing country can significantly affect China's cross-border e-commerce export trade. However, the number of travelers and trade frictions have no significant effects on China's cross-border e-commerce exports.

From the results of the empirical study, the results of the analysis show that the trade openness of importing countries has a positive impact on China's cross-border e-commerce exports. The meaning of "open" has become similar to the concept of "free trade", that is, a trading system that eliminates all trade distortions. The ideal indicator of a country's openness

is an index that includes all barriers that distort international trade, such as the average tariff rate and the non-tariff barrier index. Among them, in most studies, trade openness is measured by (X+M)/GDP, that is, exports plus imports divided by GDP (Yanikkaya, 2003). Regardless of which measure of trade openness is used, the various measures provide a way to determine how open an economy is to world trade. Simply put, for example, the higher the Open of a given country, the more open its economy is to the benefits of trade (Squalli and Wilson, 2011). Cross-border e-commerce is an Internet-based platform for electronic transactions, so when the importing country is more open to trade, it means that the trade barriers are lower and more favorable to the development of cross-border e-commerce. According to the results of this paper, P=0.006<0.05 for In Open, and the coefficient B=1.653>0, so when the trade openness of importing countries is greater, the more favorable to the development of import and export trade, and more favorable to the development of cross-border e-commerce in China. This paper takes the top ten countries of China's cross-border e-commerce exports as the research object, and the analysis results can show that ten countries are relatively open to the outside world, which is conducive to the development of cross-border e-commerce.

On the other hand, it can be seen from the results of the analysis that trade frictions have no impact on the development of China's cross-border e-commerce, that is, the trade war between China and the United States, the territorial disputes between China and India and the anti-dumping actions of importing countries on Chinese goods have no substantial impact on China's cross-border e-commerce exports. In 2018, the United States initiated trade sanctions against China in order to narrow the trade deficit with China, which has affected the development of Chinese cross-border e-commerce exports in the U.S. market. Especially from 2018 to the end of 2019, a larger-scale trade friction occurred between China and the United States, which had a considerable impact on both China and the United States as well as the world economy. During the trade friction, the U.S. cracked down on Chinese high-tech products, not only by imposing tariffs on about $60 billion worth of Chinese exports of U.S. goods, but also by banning U.S. companies from exporting key production components to China and banning Chinese company Huawei from entering the U.S. market, among others. But the goods exported by cross-border e-commerce are mainly household goods, kitchen utensils, clothing and other necessities. These goods avoid the tariffs imposed on them in the trade friction, so China's cross-border e-commerce exports will not be affected by the trade friction and reduce. According to the analysis in this paper, it is also concluded that trade frictions with importing countries do not directly affect the development of cross-border e-commerce in China.

The results of the analysis show that In D has P=0.007<0.05 and coefficient B=-0.874<0, indicating that trade distance has a negative impact on cross-border e-commerce, which means that the farther the distance between the two sides of the trade, the higher the logistics costs consumed in the transportation of goods, and the more detrimental to the development of cross-border e-commerce. Although the popularity of the Internet has diminished the distance, distance is still an impediment to the development of cross-border e-commerce. The study by Hortacsu et al. (2009) also shows that distance remains an important impediment to trade between geographically diverse buyers and sellers. Trade distance determines the transportation cost of cross-border e-commerce products, and the farther the distance, the higher the transportation cost, which is not conducive to the development of cross-border e-commerce exports in China.

Consumption is an important part of a country's economic development, and is also one of the "three major carriages" driving national economic growth, from the level of consumption capacity can be seen in a country's national living standards. The greater the consumption gap between two countries, the more obvious the differences between products and the weaker the competitiveness of the same industry, which in turn will promote inter-industry trade. The effect of consumption gap between the two sides of trade on China's cross-border e-commerce exports shows a negative contribution In IT's p=0.022<0.05, and coefficient B=0.273>0, this shows that the gap between China and the importing countries is not particularly large in terms of the goods exported by the industry, the types of goods exported are similar and the consumption levels are similar, so the smaller consumption gap between the two countries is more conducive to cross-border e-commerce exports.

The P-value of InInternet=0.022<0.05 and the coefficient B=0.273>0 indicate that the Internet users in importing countries have a significant effect on China's cross-border e-commerce exports, and the higher the Internet users in importing countries, the more beneficial to China's cross-border e-commerce exports. Nowadays, the Internet has become an important platform for global buyers and sellers to conduct trade. It serves as a new mode of advertising and helps to provide information to potential buyers. By reducing the fixed and variable costs of matching and switching between trading partners, it has improved trade efficiency, expanded trade volumes, facilitated trading among existing players, and encouraged traders to enter the market (Biswas and Kennedy, 2014). Cross-country evidence also shows the relationship between the Internet and globalization: countries that export more tend to have higher Internet penetration rates than countries that export less. Since Internet use is nearly universal among firms in most developed countries, exporting firms (especially those exporting to developed countries) are likely to have higher rates of Internet access (Clarke and Wallsten, 2006). In this variable, countries with high Internet penetration such as the United States, the United Kingdom, Brazil, Canada, France, Russia, South Korea, Japan and Germany have an even more absolute advantage. Therefore, the higher the number of Internet users in the importing countries, the more favorable the development of cross-border e-commerce in China.

Similar cultures facilitate trade in goods between two countries, and when two countries with a common language, the same colonizers, or the same colonial history will trade more with each other (Chen and Li, 2014; White and Tadesse, 2008). Naturalization tourism by foreign consumers can reflect an interest in Chinese culture, and also consumers will buy products from their home country during their inbound tourism, thus making them more aware of Chinese culture as well as customs. By having a favorable perception of China and thus may purchase Chinese goods through cross-border e-commerce. However, the regression result is different from the hypothesis of this paper, InTourist's p=0.721>0.05 for the number of travelers to China, indicating that the export of cross-border e-commerce is not affected by the number of travelers, although traveling to China can learn more about Chinese culture, Chinese customs, etc., but the export of cross-border e-commerce is not affected by the presence or absence of travel to China.

Taking South Korea and Japan, the neighboring countries to China in this paper, as an example, both Korea, China and Japan are located in East Asia with a long history of economic and trade exchanges and highly integrated industrial chains. With the continuous and rapid development of Korea, China and Japan's foreign trade, the position of these three

countries in global trade is also improving. Especially in recent years, based on the complementary advantages of trade between Korea, China and Japan, economic cooperation has deepened comprehensively, promoting cooperation among the three countries in the field of cross-border e-commerce. In addition, the "Belt and Road" initiative and the implementation of the China-Japan-South Korea Free Trade Area (FTA) have also promoted multi-sectoral cooperation and new types of economic cooperation. According to data released by China's Ministry of Commerce, trade between the three countries grew from $130 billion in 1999 to more than $720 billion in 2018, increasing its share of the global economy from 17 percent to 24 percent. Cooperation among the three countries has played an important role in promoting regional and world economic growth. Currently, the focus of e-commerce development in China has gradually expanded from domestic to global, resulting in an integrated cross-border business (Shen et al., 2020). Therefore, it is significant to study the influencing factors of cross-border e-commerce in China to promote the development of Korea, China, and Japan.

For China to develop cross-border e-commerce, it should first select its trading partners preferably. The analysis above shows that the export scale of China's cross-border e-commerce is positively correlated with the trade openness of importing countries, and excellent trading partners are an important factor for the development of China's cross-border e-commerce. Although China's export market for cross-border e-commerce is mature, it still has great potential in emerging markets.

Second, improving logistics channels and reducing transaction costs. From the analysis above, it can be seen that China's cross-border e-commerce exports are negatively correlated with the trade distance between the two trading parties. Therefore, shortening the trade distance between the two countries, improving the infrastructure and perfecting the logistics system can help reduce the transportation cost and improve the transaction efficiency of the items.

Finally, the focus is on prioritizing trading partners with strong infrastructure. From the previous analysis, it can be concluded that China's cross-border e-commerce exports are positively correlated with the number of Internet users and negatively correlated with the consumption gap. China should focus on selecting countries or regions with higher infrastructure, thus promoting the development of China's cross-border e-commerce.

By analyzing the factors influencing China's cross-border e-commerce export trade, this paper is innovative in terms of research background, research methodology, and model construction. However, due to the fact that China's cross-border e-commerce is still in the development stage and the relevant data are incomplete, this paper has some limitations in studying the factors influencing cross-border e-commerce export trade. The following points mainly exist.

First, due to the relatively late development of cross-border e-commerce in China, the incomplete data associated with cross-border e-commerce, and the global outbreak of the new crown epidemic in 2019, this paper only selects the top ten countries of China's cross-border e-commerce exports from 2014-2018 for analysis based on the availability as well as the correctness of the data. The scale of cross-border e-commerce transactions in some countries as well as the influence of political factors, there will be some deviation between the obtained and actual values.

Secondly, this paper should analyze the influencing factors of cross-border e-commerce in

China with the characteristics of cross-border e-commerce in China, and should include variables such as Belt and Road, regional agreements, and foreign direct investment. After that, it will be improved in the subsequent studies to become a better study.

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