

Research Article

An AMOS Model for Examining the Factors Influencing the Development of China Cross-Border E-Commerce Comprehensive Pilot Areas

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Cross-border e-commerce has greatly promoted the development of China's foreign trade, and the cross-border e-commerce comprehensive pilot area (CBECCPA, in brief) is the main form for promoting the development of cross-border e-commerce. The study aims to find out what factors and to what extent these factors affect the development of the CBECCPAs. Adopting the structural equation model analysis (AMOS) method and the data in 2017 of the 35 CBECCPAs set in the former three batches in China, the paper studies the effects of four main factors, including economic foundation, telecommunication network foundation, e-commerce logistics, and scientific and technological innovation, on the development of the CBECCPAs. The empirical results show that the economic foundation of the city where a CBECCPA locates has a vital impact, scientific and technological innovation has a quite important effect, e-commerce logistics has an important impact, and telecommunications network foundation has a slight influence on the development of CBECCPA. On the basis of empirically analysis results, it is suggested to strive to develop the cities' economy, increase investment in scientific and technological development, attach importance to scientific and technological innovation, and perfect the urban logistics system. Some suggestions are put forward, such as to make great efforts to develop the economy sustainably, to encourage to scientific and technological innovation, and to improve the logistics system. It is meaningful for the construction and development of the fourth and fifth batches of CBECCPAs.

1. Introduction

In recent years, cross-border e-commerce has developed rapidly. In 2020, the transaction scale of cross-border e-commerce industry in China reached a new breakthrough of 10.5 trillion yuan, the penetration rate of the cross-border e-commerce industry exceeded 30% to 33.29%, and the total retail import and export trade of cross-border e-commerce reached 1.69 trillion yuan. As one of the new forms of international trade, cross-border e-commerce is of great significance to the formation and development of the new patterns of "international and domestic double cycle." As a pilot area in China, a lot of good practice have been explored in CBECCPAs, such as the two platforms of cross-border e-commerce, online integrated services and offline industrial

park, six regulation and service systems of information sharing, financial services, intelligent logistics, e-commerce integrity, statistical monitoring, and risk prevention and control. At present, China has approved 105 CBECCPAs sets in five batches, with varying degrees of development. On July 9, 2021, the Opinion of The State Council of the PRC on Accelerating New Forms and Models of Foreign Trade (No. 24 [2021] of The State Council of the PRC) was proposed to further expand the scope of CBECCPA. Therefore, it is particularly important and necessary to find out what factors and to what extent these factors affect the development of China's CBECCPAs. The paper analyzes and determines the main factors that affect the development of China's CBECCPAs, builds an AMOS Model for analyzing effects of CBECCPAs, finds the extent these main factors affect the

development of China's CBECCPAs by path coefficients, and puts forward three suggestions on the further healthy and rapid development of CBECCPAs.

2. Research Hypothesis

Economic system is one of the important factors influencing the import and export of regional Cross-border e-commerce. Zhang [1] constructed a coupling model of cross-border e-commerce system and economic system in the CBECCPA. The model adopts an order parameter index system of economic system which includes cross-border e-commerce, foreign trade, e-commerce, e-commerce logistics, economic development, social consumption, talent environment, and technological innovation. The empirical study shows that the order degree and coupling degree of cross-border e-commerce system and economic system are uneven among the 35 CBECCPAs in China. It is suggested to improve the coupling coordination degree of the two systems to continuously obtain competitive advantages.

Based on the former studies, Hypothesis 1, related to the economic foundation, can be proposed as below:

Hypothesis 1. The economic foundation has a positive impact on the development of the CBECCPAs.

If the economic foundation is relatively weak, the progress of the construction of the CBECCPA will be slow, and the further implementation of the policies and measures of CBECCPA will be prolonged, thus making its development slow.

Liu et al. [2] analyze the effects of robots on the long-run economic growth. It implies that the technology could affect cross-border e-commerce. Thus, Hypothesis 2, related to scientific and technological innovation, can be proposed as below.

Hypothesis 2. Scientific and technological innovation has a positive impact on the development of the CBECCPA.

The development of science and technology undoubtedly provides certain technical support for the construction of the CBECCPA, so the city with well-developed science and technology is conducive to the development and construction of the CBECCPA.

The impact of logistics supply chain on cross-border e-commerce is not necessarily positive. By evaluating 20 cities where 20 CBECCPAs located with the entropy weight model, Li [3] believed that there is no inevitable positive correlation between the development potential of logistics supply chain and the trade volume of cross-border e-commerce. However, the set of CBECCPAs is beneficial to stimulate economy and positive spillover effect of logistics supply chain and to promote the growth of the trade volume of cross-border e-commerce. Burinskiene [4] has adopted an efficiency modelling approach to analyze the supply chain. Trade facilitation is an important factor that influences the cross-border logistics and the cross-border e-commerce. Wang et al. [5] established an influence mechanism model of

trade facilitation on cross-border e-commerce, taking 35 CBECCPAs as study samples. It is found that trade facilitation has a significant impact on urban cross-border e-commerce trade. Nie [6] studied the impact of CBECCPA on cross-border e-commerce with difference-in-difference analysis, based on the data of 59 large- and medium-sized cities in China from 2012 to 2019. The study shows that the implementation of trade facilitation policies has effectively promoted the rapid development of cross-border e-commerce. So, Hypothesis 3, related to e-commerce logistics, can be proposed as below.

Hypothesis 3. E-commerce logistics has a positive impact on the development of CBECCPA.

The perfection of the logistics chain system means the possibility of better performance of the CBECCPA.

Basic performance, service performance, and growth performance are important indicators influencing and evaluating the development of CBECCPAs. Zhang and Chen [7] built a model of evaluating 35 CBECCPAs' operation performance in 2018, which includes 3 secondary indicators including basic performance, service performance, and growth performance and 11 thirdly indicators. Weights are given to the indicators by combining Delphi method and analytic hierarchy process. Pei [8] evaluated 35 CBECCPAs' operation performance in 2018 with an index system which consists of 3 secondary indicators including basic performance, service performance, and growth performance and 9 thirdly indicators. Weights are given to the indicators by the coefficient of variation weighting method. Both research studies show the approval time and the level of economic development of the city where a CBECCPA locates is positive related to the CBECCPA's performance. The basic performance and service performance are the main factors that influence CBECCPAs' operation performance.

Oyekunle [9] examined the status of e-business activities, impact, and challenge in Nigerian universities by stratifying random sample of 18 universities and suggested that it should factor in Internet connectivity for all new buildings in addition to increasing the number of Internet access points in existing buildings. The results out of the empirical analysis studying of the sixth industry in South Korea showed that cognitive, emotional, and social factors and the factors that induce the experience of the 6th industry presented in this study have a positive effect on the experience satisfaction [10].

Based on the above studies, Hypothesis 4, related to telecommunication network foundation, is proposed in this study as below.

Hypothesis 4. Telecommunication network foundation has a positive impact on the development of CBECCPA.

The better the telecommunication network infrastructure of the city is, where a CBECCPA is located, the stronger penetrative ability and better development the CBECCPA would have.

3. Research Methodology

3.1. Building an AMOS Model for Analyzing Effects of CBECCPAs. This paper builds an AMOS model for analyzing the effects on CBECCPAs by making four main impact factors as four secondary indicators, namely, potential variables. The potential variables are the economic foundation, the telecommunication network foundation, e-commerce logistics, and scientific and technological innovation. The construction of the model and the selection of factors refer to the order parameters selected by Zhang Xiaodong (2019)³ in his coupling model of cross-border e-commerce system and economic system. The four potential variables are measured by corresponding thirdly indicators, namely, explicit measures. The AMOS model is constructed as follows (as shown in Figure 1).

In this paper, the economic foundation of the city where the CBECCPA locates is measured by GDP, total volume of imports, total volume of exports, total retail of social consumer goods, and the percentage of tertiary industry to GRP. This above five factors selected are five secondary indicators in the AMOS model. The GDP of the city where CBECCPA is located is expressed as GDP, the total value of imports of the city where CBECCPA is located is expressed as TVI, the total value of export of the city where CBECCPA is located is expressed as TVE, the total value of retail of social consumer goods of the city where CBECCPA is located is expressed as TRS and the percentage of tertiary industry to GDP of the city where CBECCPA is located is expressed as PTI, as listed in Table 1. The target is to calculate and point out to what extent and how the local economic foundation of the city where the CBECCPA is located affects and determines the CBECCPA's development and construction.

Cross-border e-commerce is the digitalization of international trade. Based on the existing research results, this paper selects two secondary indicators including the number of subscribers of mobile telephones at year-end (expressed as NSM) and the number of subscribers of Internet services (expressed as NSI) to quantify the basis of e-commerce network and to investigate the role of the Internet in the development of cross-border e-commerce, as listed in Table 1.

Since cross-border e-commerce goods are delivered by parcel or express packages and the delivery industry is still largely dependent on labor in 2017, the model adopts four secondary indicators, including the number of persons employed in transportation, warehousing and postal service (expressed as NPE), express volume (expressed as EV), the income from express business (expressed as IEB), and the number of express business outlets (expressed as NEO) to reflect status of the city's e-commerce logistics, where the CBECCPA is located, as listed in Table 1.

Scientific and technological innovation was quantified by two secondary indexes, namely, annual expenditure on science and technology (expressed as STE) and the number of patent applications of the city (NPA). The annual expenditure on science and technology reflects the city's attention to and support for the development of science and technology, while the number of patent applications reflects the achievements of the city's science and technology

development, and the two comprehensively reflect the city's science and technology development, as listed in Table 1.

In theory, the import and export value of cross-border e-commerce are the indicator reflecting the status of cross-border e-commerce. However, due to the lack of data of import and export value of cross-border e-commerce for some cities, where CBECCPAs are located, this article selects the International and Hong Kong, Macao, and Taiwan express business volume (expressed as ILB) and the International and Hong Kong, Macao, and Taiwan express business revenue (expressed as ILR) as the two thirdly indicators to quantify export and import status of cross-border e-commerce, as listed in Table 1.

3.2. Results and Discussion. To ensure that the sample data achieve the required reliability and validity, the data in this research are of the former three batches of 35 CBECCPAs and the cities, where the CBECCPAs are located. Due to the lack of data in 2019 and the impact of the COVID-19 epidemic in 2020, this research adopts the data in 2017.

3.2.1. Model Evaluation. Firstly, exploratory factor analysis was conducted. According to SPSS statistical analysis, the KMO value of reliability is 0.787, not less than 0.7, and P value of Bartlett's spherical test is less than 0.05, which meets the requirement of factor analysis, as shown in Table 2.

The goodness of fit index GFI was 0.990, greater than 0.9, indicating it fits well. The chi-square index and df ratio (CMIN/DF in brief) is 4.978, less than 5, can be acceptable. The root mean square error approximately (RMSEA in brief) is 0.039, less than 0.05, indicating it is a good fitting. The fitting results and standards are shown in Table 3. According to the fitting results, the fitting effect of the analysis model partly meets the requirements of various indicators, the overall fitting effect is good, and the model quality is good.

3.2.2. Empirical Results. The path coefficients of the fitting results show that the path coefficients of economic foundation, telecommunications network foundation, e-commerce logistics, and scientific and technological innovation are 0.70, 0.25, 0.31, and 0.59, respectively. The path coefficients of GDP and total value of retail of social consumer goods to the economic foundation are rather big, 0.96 and 0.97, respectively. The path coefficient of annual expenditure on science and technology of cities, where CBECCPAs are located (RDIP) on scientific and technological innovation, is 0.95, as shown in Figure 2.

The significance level of path coefficients of various factors in the model is shown in Table 4.

3.2.3. Result Analysis. The path coefficient of economic foundation to export and import status of cross-border e-commerce is 0.70 and the corresponding significance level is 0.06, which mean that, at the confidence level of 99.9%, Hypothesis 1 is true. Thus, the economic foundation has an essential positive impact on the development of CBECCPA. Cities with a better economic foundation have a higher level

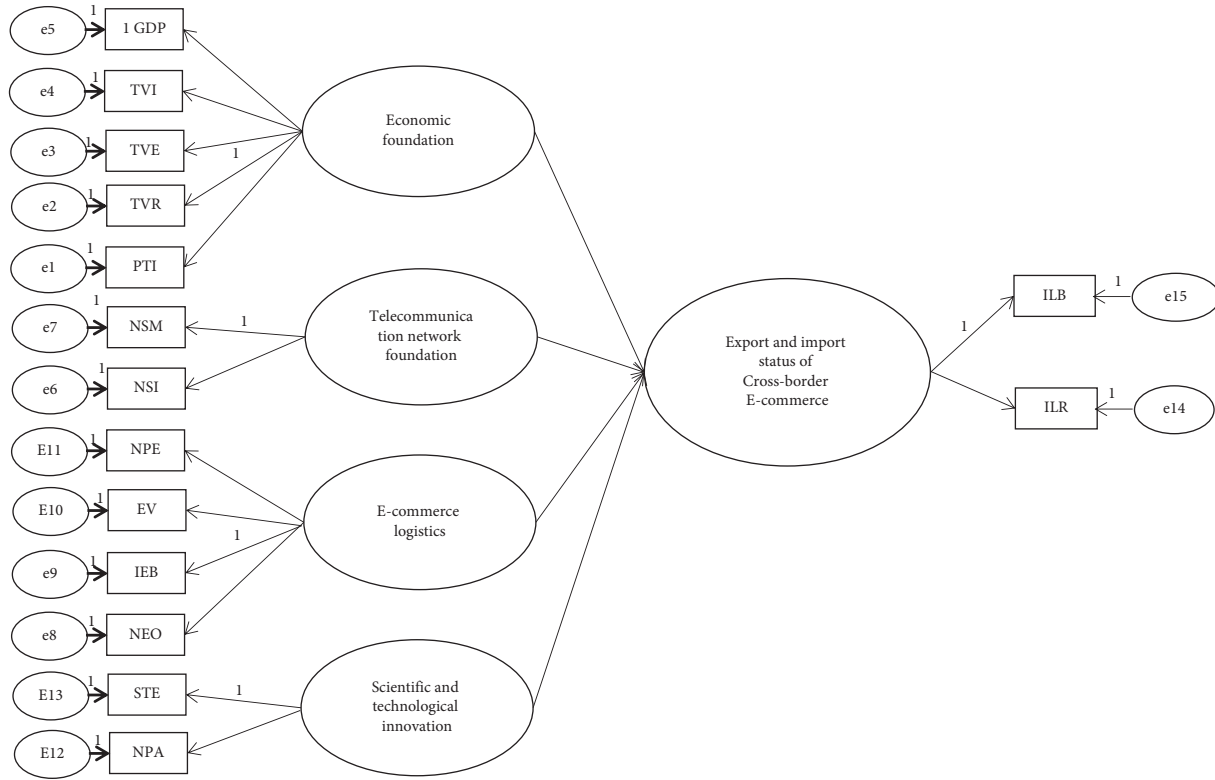


FIGURE 1: AMOS model for analyzing effects of CBECCPAs.

TABLE 1: Summary and connotations of related indicators.

Secondary indicators	Thirdly indicators in brief	Connotation for thirdly indicators (of the city where a CBECCPA is located)	Unit
Economic foundation	GDP	GDP	Ten thousand of RMB
	TVI	Total value of import	Thousands of dollars
	TVE	Total value of export	Thousands of dollars
	TVR	Total value of retail of social consumer goods	Hundred million of RMB
	PTI	Percentage of tertiary industry to GDP	%
Telecommunication network foundation	NSM	Number of subscribers of mobile telephones at year-end	Thousands of families
	NSI	Number of subscribers of internet services	Thousands of families
E-commerce logistics	NPE	Number of persons employed in transportation, warehousing and postal service	By person
	EV	Express volume	Thousands of pieces
	IEB	Income from express business	Hundred million of RMB
	NEO	Number of express business outlets	A piece
Scientific and technological innovation	STE	Annual expenditure on science and technology	Ten thousand of RMB
	NPA	Number of patent applications	A piece
Cross-border e-commerce status	ILB	International and Hong Kong, Macao, and Taiwan express business volume	Thousands of pieces
	ILR	International and Hong Kong, Macao, and Taiwan express business revenue	Hundred million of RMB

TABLE 2: KMO and Bartlett’s spherical test.

Measure of Kaiser–Meyer–Olkin for sample sufficient degree		787.
Bartlett’s spherical test	The approximate chi-square df Sig.	931.589 91 000.

TABLE 3: Overall fit degree of the model.

Indicators	Standard	Fitting results
X2/d	1 < X2/d < 3 is a good fit, and X2/d < 5 needs to be corrected	1.657
CMIN/DF	4 fit well, 5 is acceptable	4.978
CFI	>0.9 is a good fit, and >0.8 is acceptable	0.990
RMSEA	<0.05 is a good fit and <0.08 is acceptable	0.039
AGFI	>0.9 is a good fit, and >0.8 is acceptable	0.941
NFI	>0.9 is a good fit, and >0.8 is acceptable	0.844

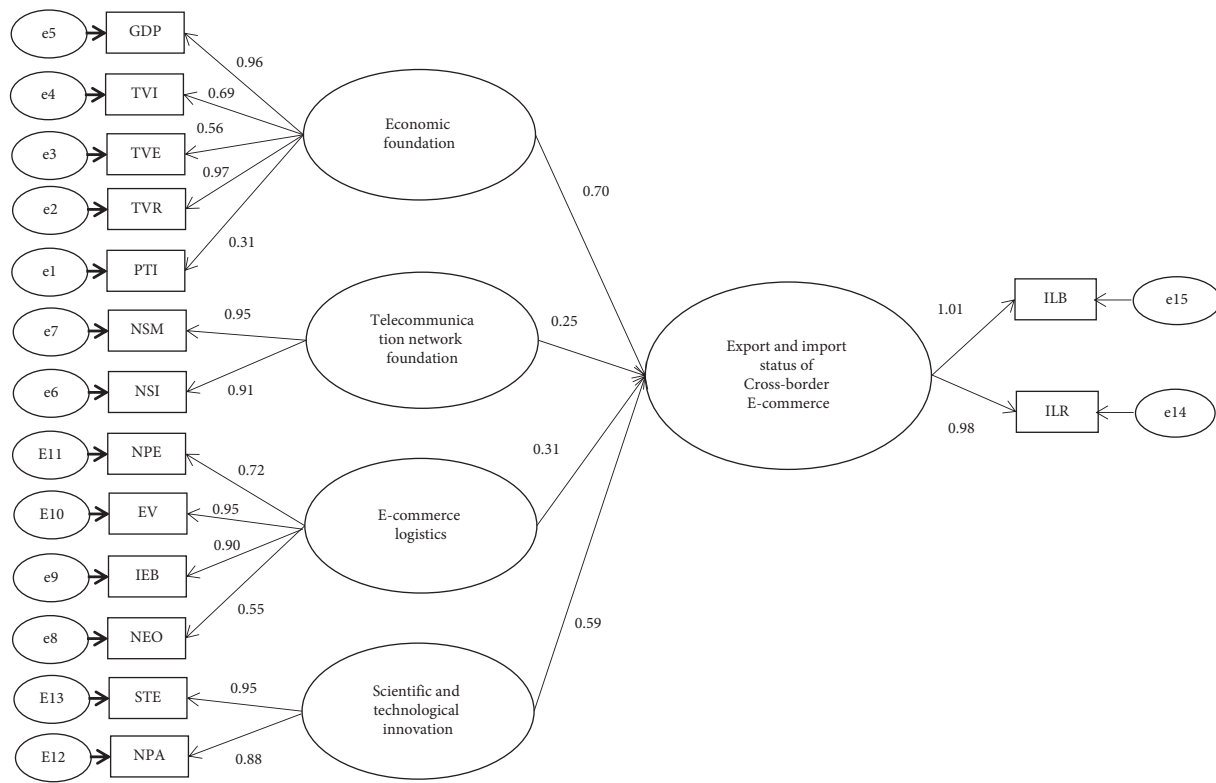


FIGURE 2: Path coefficient diagram.

TABLE 4: Path coefficients and their degree of confidence.

	Estimate	S.E.	C.R.	P
Economic foundation to export and import status of cross-border e-commerce	0.70	0.092	11.505	0.061
Telecommunication network foundation to export and import status of cross-border e-commerce	0.25	0.014	9.743	***
E-commerce logistics to export and import status of cross-border e-commerce	0.31	0.059	10.527	***
Scientific and technological innovation to export and import status of cross-border e-commerce	0.59	0.015	10.415	***

*** denotes $P < 0.001$.

of development of CBECCPA, while cities with a relatively weak economic foundation have a lower development of CBECCPA. Among the five thirdly factors, GDP and TVR play a key role in the overall economic capabilities and consumption level of the city, where the CBECCPA is located.

The path coefficient of telecommunication network foundation to export and import status of cross-border e-commerce is 0.25, and the significance level is less than 0.001, which means that, at 99.9% confidence level, Hypothesis 2 is established, but the telecommunication

network foundation has less influence on the development of CBECCPA.

The path coefficient of e-commerce logistics to export and import status of cross-border e-commerce is 0.31, and the corresponding significance level is less than 0.001, which means that, at 99.9% confidence level, Hypothesis 3 is true, and the construction and improvement degree of e-commerce logistics is influential but not decisive on the development of CBECCPA.

The path coefficient of scientific and technological innovation to export and import status of cross-border e-commerce is 0.59, and the corresponding significance level is less than 0.001, which means that, at 99.9% confidence level, Hypothesis 4 is true, and scientific and technological innovation has an important impact on the development of the CBECCP.

Annual expenditure of science and technology (STE) and the number of patent applications (NPA) reflects the degree of emphasis and development of a city's scientific and technological innovation. It really provides the technical support, especially on cross-border e-commerce platform system construction, optimization of the payment system, and other related technology improvement of platform network. Scientific and technological innovation is an important driving force for the development of CBECCPA.

4. Conclusions

4.1. Research Conclusions. The economic foundation and scientific and technological innovation of the cities, where the CBECCPAs are located, have an essential impact on the development of the CBECCPAs. The construction and improvement degree of e-commerce logistics of the city, where the CBECCPAs are located, is influential but not decisive to the development of the CBECCPAs. The telecommunication network foundation of the city, where the CBECCPAs are located, has less impact on the development of CBECCPAs.

4.2. Suggestions. Based on the path coefficient results of empirical analysis with the structural equation model, this research mainly proposes the following suggestions.

4.2.1. To Make Great Efforts to Develop the Economy Sustainably. The economic foundation is the main support for the development of the CBECCPA. To develop the economy, it is necessary to deepen the reform further and to open wider to the outside, to promote the "domestic and international double cycle" by foreign trade. It is also important to promote tertiary industry development. It is directly related to cross-border e-commerce and CBECCPAs. Besides, to encourage traditional export and import, enterprises transform to online business, so to avoid the effects of COVID-19 epidemic and increase the total value of exports and imports.

4.2.2. To Attach Importance to Scientific and Technological Innovation. To create an environment in which innovation drives development, it is suggested that expenditure on scientific and technological projects should be increased to solve the tough problem such as developing a series of fast scan monitor technology and equipment. Much attention and expenditure should be used to talent training and building a platform of communication. Besides, to reform the scientific and technological management system could create an innovation environment fundamentally and promote CBECCPAs' fast and long-term development.

4.2.3. To Improve the Logistics System. It is suggested to strengthen the development of e-commerce logistics, especially intelligent logistics for China's fourth and fifth batch of CBECCPAs. To increase investment to improve the infrastructure level and comprehensive modern design of the e-commerce logistics are important. Meanwhile, to enhance logistics efficiency, customs clearance speed and efficiency is another key part. Customs innovate and optimize cross-border e-commerce clearance process and management demands continuously according to the changing situations and different business types. Thus, E-logistics cost will be cut and the efficiency could be improved, so to promote the development of CBECCPAs.

4.3. Further Implication. Since some data for the fourth and fifth batch of CBECCPAs are not be obtained, the sample size of the paper is 35, while the other 70 CBECCPAs have not be studied. The sample has a limited representative capacity. Moreover, the data adopted in this paper are only in 2017. If similar study was carried on for the following years, the conclusions of the paper would be more confirmed and relative changes of impacts on CBECCPAs by the four main factors would be found. Therefore, it is necessary to keep on studying the development of CBECCPAs. In the case of sufficient sample data, the construction of the index system should be improved to make the research conclusions more scientific and reference.

There are still some other factors influencing the development of CBECCPAs. For different stages, different factors play a different role. It should be analyzed further later.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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References

- [1] X. Zhang, “The coupling and coordinated development of cross-border e-commerce and economic system: An empirical study based on 35 comprehensive pilot zones of cross-border e-commerce,” *Journal of Business Economics*, vol. 38, no. 10, pp. 121–129, 2019.
- [2] J. Liu, L. Ren, X. Chu, and D. Gong, “The effects of robots on the long-run economic growth,” *Tehnički Vjesnik-Technical Gazette*, vol. 27, no. 01, pp. 73–80, 2020.
- [3] Y. Li, “Development, potential measurement and economic impact of regional logistics supply chain in China: A case study of cities in integrated pilot zones for cross-border e-commerce,” *Journal of Business Economics*, vol. 20, pp. 115–118, 2020.
- [4] A. Burinskiene, “Pharma supply chain: efficiency modelling Approach,” *Journal of System and Management Sciences*, vol. 08, no. 02, pp. 65–73, 2018.
- [5] R. Wang, Q. Gu, and B. Zhong, “What trade facilitation is needed for cross-border e-commerce? -- Evidence from integrated pilot zones for cross-border e-commerce in 35 Cities in China,” *Zhejiang Journal*, vol. 04, pp. 100–110, 2020.
- [6] S. Nie, “The impact of trade facilitation on the development of Cross-border e-commerce in China -- based on panel data analysis of 59 comprehensive cross-border e-commerce pilot zones,” *Foreign Trade and Economic Cooperation*, vol. 03, pp. 31–34, 2021.
- [7] X. Zhang and Y. Chen, “Research on the operational performance evaluation of integrated pilot zones for cross-border E-commerce,” *China circulation economy*, vol. 33, no. 09, pp. 73–82, 2019.
- [8] D. Pei, “Performance evaluation and promotion strategy of Cross-border e-commerce operation in China -- Based on the analysis of sample data in comprehensive pilot area of cross-border e-commerce,” *Journal of Business Economics*, vol. 06, pp. 145–148, 2020.
- [9] R. A. Oyekunle, “E-business prospect and status in Nigerian universities,” *Journal of Logistics, Informatics and Service Science*, vol. 06, no. 02, pp. 43–75, 2019.
- [10] S. W. Shim and L. S. Jung, “The impacts of Experiential factors on Satisfaction and Behavioral Intention: An empirical study in the 6th industry,” *Journal of System and Management Sciences*, vol. 11, no. 01, pp. 54–68, 2021.