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Impact of Digital Trade Barriers on China's Cross-Border E-commerce Export Performance and Countermeasures

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Abstract: ***Based on the convergence of digital economy and globalization, cross-border e-commerce becomes a new engine driving the high-quality development of China's foreign trade. However, the emergence and widespread existence of digital trade protectionism have triggered digital trade barriers in many countries, which have seriously restrained the growth of China's cross-commerce export. Currently, the specific forms, transmission paths and driving mechanisms of digital trade barriers restraining China's cross-border e-commerce export performance have not been deeply clarified yet, and the current response strategies are still lacking in specificity and systematicness. This study starts from reviewing the related theories and research progresses to find out the research gaps of existing studies, and then constructs the research framework. By employing panel data regression models, mediation effect analysis and case study methods based on data of China's cross-border e-commerce exports and representative enterprise cases, this study empirically explores the influence and implementation paths of digital trade barriers on export performance, and then proposes corresponding countermeasures from the perspectives of government, industry and enterprise. Empirical findings show that, in terms of specific forms, for every one unit increase in the index of digital trade barriers, the export growth rate decreases by 12 percentage points, and the profit margin decreases by 8 percentage points, which proves that the digital trade protectionist policies have a direct restraining effect on cross-border e-commerce exports. Improving digital infrastructure, enhancing international norms compatibility and strengthening enterprise's digital capabilities can weaken the dampening effect.***

Keywords: Digital trade barriers, Cross-border e-commerce, Export performance, Panel data regression, Mediation effect analysis.

1. Introduction

Based on the rapid development of digital technology and adjustment of global trade pattern, digital trade has become a new pattern in the development of international trade and new engine for economic growth. As the core form of digital trade, cross-border e-commerce is beneficial in cost saving, high efficiency and wide market, which can be used as an important instrument to help China overcome traditional trade barriers and enter global market, thus providing strong support for the high-quality development of China's foreign trade.

In this way, up to now, the export of cross-border e-commerce in China maintains a steady growth and covers most of the countries and regions around the world, forming a variety of export pattern. However, the international digital trade governance system is still lacking, and trade protectionism is gradually digitalized. In order to protect domestic industry development and data privacy and security, many countries have introduced a large number of restrictive policies on digital trade, forming various kinds of digital trade barriers, which not only increase the cost of exporting digital goods and services from China, but also hinder the reach of the market and technology upgrading of cross-border e-commerce enterprises in China, and play a significant adverse effect on the improvement of export performance of cross-border e-commerce exports from China. Therefore, it has theoretical significance and practical value to conduct an in-depth study on the influence of digital trade barriers on the export performance of cross-border e-commerce in China and countermeasure response.

The paper studies the impact of digital trade barriers on the export performance of China's cross-border e-commerce. Panel data regression is used to test the total and heterogeneous effects, constructing a two-way fixed effects model and conducting robustness tests. Mediation effect analysis explores the mediating effects of trade costs, cross-border data flows and technological innovation. Case studies analyze the countermeasures of typical enterprises. The results show that digital trade barriers have a significant negative inhibitory effect on export performance. There are type differences, industry differences, size differences, market differences, trade costs and other variables play a partial mediating role, and enterprise digitalization levels and regional digital infrastructure play a mitigating role.

The innovation of this paper is mainly reflected in three aspects. First, the innovative research perspective breaks through the following limitations of existing research, which usually focus on one type of digital trade barriers or one type of impact path only: systematically sort out various types of digital trade barriers, sort out an "digital trade barriers — mediating variables—export performance" analytical framework, comprehensively reveal its impact mechanism and make up for the one-sidedness of existing research. Second, the innovative research method combines panel data regression, mediation effect analysis and case analysis. It verifies the overall impact of digital trade barriers from the macro perspective and analyzes the specific coping strategies of enterprises from the micro perspective. It enhances the scientificity and practicability of research conclusions and attempts to construct a digital trade barrier evaluation index more suitable to China's national conditions, breaks through the indicator paradigm dominated by Western discourse. Third, the innovative policy recommendation breaks through the following limitations of existing "one-size-fits-all": According to the impact characteristic of different types of digital trade barriers, it puts forward tiered and classified

response strategies from the government, industry and enterprise levels. At last, considering the trend of restructuring international rules of digital trade, it strengthens the design of countermeasures from the international cooperation level, improves the pertinence and operability of countermeasures.

2. Related Work

In recent years, cross-border e-commerce has become an important engine for the development of China's foreign trade. However, increasingly complex digital trade barriers (such as data localization, restrictions on cross-border data flow, intellectual property risks and market access barriers) are significantly constraining the export performance of enterprises. Poornima [1] focused on the development trend of global cross-border e-commerce and pointed out that data privacy and localization requirements are becoming the core barriers that hinder the efficiency of cross-border transactions. Xue and Chuan [2] focused on the application of artificial intelligence in the field of cross-border e-commerce and tried to solve the problem of how to use AI technology to reduce information asymmetry and compliance costs. They proposed that intelligent compliance review and user behavior prediction models can partially alleviate the decline in marketing efficiency caused by restricted data flow. Wang [3] discussed the role of regional trade agreements in promoting cross-border e-commerce around the RCEP framework. He believed that the inclusive clauses on duty-free electronic transmission and data flow in the agreement can effectively offset some of the negative impacts of digital barriers. Han [4] started from the perspective of logistics model innovation and proposes that a logistics information sharing platform based on blockchain can improve the resilience of the supply chain and reduce the time loss caused by data blockage in the face of the real dilemma of restricted cross-border logistics data tracking and low customs clearance efficiency. Yan and Breuss [5] systematically analyzed the interaction mechanism between data privacy regulations and cross-border e-commerce. Huang [6] combined the SWOT-PEST framework to comprehensively identify the types of digital barriers faced by China's cross-border e-commerce in terms of policy, economy, society and technology, and emphasized that data sovereignty and local storage requirements are the most prominent institutional obstacles at present. Karlovskaya and Chelombitko [7] took Sino-Russian cross-border trade as a scenario to analyze the constraints of the differences in the digital regulatory systems of the two countries on enterprise operations, and believed that bilateral mutual recognition of data flow agreements and digital customs clearance cooperation can effectively reduce the intensity of barriers. Jiang and Du [8] used deep learning models to build a cross-border e-commerce credit risk early warning system, and tried to solve the problem of transaction trust loss caused by information opacity. The study showed that dynamic risk monitoring can partially make up for the information gap caused by the restriction of cross-border data flow. Jianbin Li et al. [9] started from the perspective of platform financing, analyzed how digital trade barriers indirectly affect the financing availability of SMEs by inhibiting data sharing, and proposed that price masking strategy can optimize the platform capital allocation efficiency under the condition of information asymmetry. Kaouakib and Hui [10] argued from the perspective of poverty reduction and inclusive development that cross-border e-commerce has a driving effect on small and medium-sized enterprises and rural areas, and pointed out that data barriers and digital divide can exacerbate the risk of marginal subjects being excluded. Based on the above literature, the existing research has the following shortcomings: First, most studies are at the level of qualitative identification or macro trend description, lacking systematic mediation mechanisms and heterogeneous empirical tests on the impact of digital trade barriers on export performance; second, there is a lack of detailed comparison of the differentiated impact paths of various types of barriers (data restrictions, intellectual property rights, market access, etc.); third, the effect evaluation and case support of enterprise-level coping strategies (such as technology upgrading, compliance management, international cooperation) are still relatively weak, making it difficult to provide operational and precise guidance for policy formulation and enterprise practice. Therefore, future research needs to further deepen the understanding of causal identification mechanisms, industry and enterprise heterogeneity, and in-depth analysis of typical cases.

3. Method

3.1 Panel Data Regression

This paper employs panel data regression to examine the overall and heterogeneous impacts of digital trade barriers on China's cross-border e-commerce export performance, which is the core empirical method of this paper. Regarding sample selection, cross-border e-commerce export data from 30 provinces (municipalities, autonomous regions) in China from 2017 to 2023, as well as digital trade barrier data from major trading partners (the United States, the European Union, ASEAN, and 15 other countries and regions), are selected to construct a balanced panel dataset, with a total sample size of 210 (30 provinces × 7 years). Regarding variable setting, the explained variable is cross-border e-commerce export performance, measured by two core indicators: export growth rate and profit margin; the explanatory variable is digital trade barriers, measured by the Digital Trade Barrier Index (DTBI) constructed in this paper and sub-type barrier indices (data restriction, market access, and intellectual property); the control variables are the level of digital infrastructure construction, regional economic development level, enterprise digitalization investment, and exchange rate fluctuations, to exclude interference from other factors. In terms of model specification, a two-way fixed-effects panel data regression model was constructed to control for individual fixed effects and time fixed effects in order to mitigate the endogeneity problem caused by omitted variables. The core model formula is as follows:

$$Y_{it} = \alpha_0 + \alpha_1 DTBI_{it} + \sum_{k=2}^{n} \alpha_k X_{kit} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

Among them, Y_{it} represents the cross-border e-commerce export performance (export growth rate or profit rate) of the i-th province in year t, $DTBI_{it}$ represents the digital trade barrier index of the i-th province in year t, X_{kit} represents the k-th control variable, α_0 is the constant term, α_1, α_k are the regression coefficients, μ_i is the individual fixed effect, λ_t is the time fixed effect, and ε_{it} is the random disturbance term. The applicability of the fixed effects model was determined

by the Hausman test, and the robustness of the model was handled by the heteroscedasticity test, serial correlation test, and multicollinearity test. Among them, the variance inflation factor (VIF) test was used for the multicollinearity test, and the test formula is as follows:

$$VIF_j = \frac{1}{1-R_j^2} \quad (2)$$

Among them, VIF_j is the variance inflation factor of the j-th variable, and R_j^2 is the determination coefficient obtained by regressing the j-th variable on all other explanatory variables. Usually, VIF<10 is used as the criterion for no serious multicollinearity to ensure the reliability of the regression results [11].

3.2 Mediation Effect Analysis

To uncover the underlying mechanism through which digital trade barriers impact China's cross-border e-commerce export performance, this study adopts a mediation effect analysis framework to explore the intermediary roles of three key variables: trade costs, cross-border data mobility, and technological innovation. In terms of theoretical assumptions, three mediation hypotheses are put forward: Hypothesis 1 posits that digital trade barriers exert a dampening effect on China's cross-border e-commerce export performance by elevating trade costs; Hypothesis 2 holds that such barriers impede export performance by restricting cross-border data flows; Hypothesis 3 argues that they suppress export performance by constraining technological innovation. Concerning variable measurement, the mediating variables are operationalized as follows: trade costs are quantified using a composite index integrating cross-border logistics expenses and customs clearance costs, cross-border data flows are gauged via a data cross-border flow liberalization index, and technological innovation is reflected by the share of corporate R&D investment and the count of patent applications. Regarding the testing procedure, regression analysis is performed sequentially according to the mediation effect testing process proposed by Wen Zhonglin et al., and the corresponding core regression formula is as follows:

$$Y_{it} = \beta_0 + \beta_1 DTBI_{it} + \sum_{k=2}^{n} \beta_k X_{kit} + \mu_i + \lambda_t + \varepsilon_{it} \quad (3)$$

The above formula is the first step of the total effect test formula. The meanings of $Y_{it}, DTBI_{it}, X_{kit}, \mu_i, \lambda_t, \varepsilon_{it}$ are consistent with the panel data regression model. β_0 is a constant term, and β_1 is the total effect coefficient of digital trade barriers on export performance. If β_1 is significantly negative, it indicates that digital trade barriers have a significant inhibitory effect on export performance. The second step tests the impact of digital trade barriers on mediating variables, and the third step tests the common effect. The regression formula with trade cost (M1) as the mediating variable is as follows:

$$\begin{cases} M1_{it} = \gamma_0 + \gamma_1 DTBI_{it} + \sum_{k=2}^{n} \gamma_k X_{kit} + \mu_i + \lambda_t + \varepsilon_{it} \\ Y_{it} = \delta_0 + \delta_1 DTBI_{it} + \delta_2 M1_{it} + \sum_{k=3}^{n} \delta_k X_{kit} + \mu_i + \lambda_t + \varepsilon_{it} \end{cases} \quad (4)$$

Among them, $M1_{it}$ represents the trade cost mediating variable of the i-th province in year t, γ_1 is the impact coefficient of digital trade barriers on trade costs, δ_1 is the direct effect coefficient of digital trade barriers on export performance after controlling for mediating variables, and δ_2 is the impact coefficient of trade costs on export performance. The regression formulas for cross-border data flows (M2) and technological innovation (M3) as mediating variables are consistent with those above, only the mediating variable symbols need to be replaced. The specific testing steps are as follows: First, test the total effect of digital trade barriers on export performance; second, test the impact of digital trade barriers on each mediating variable; third, test the combined impact of digital trade barriers and mediating variables on export performance; fourth, verify the significance of the mediating effect and clarify the type of mediating effect (complete mediating effect or partial mediating effect) through the Bootstrap test [12].

3.3 Case Analysis Method

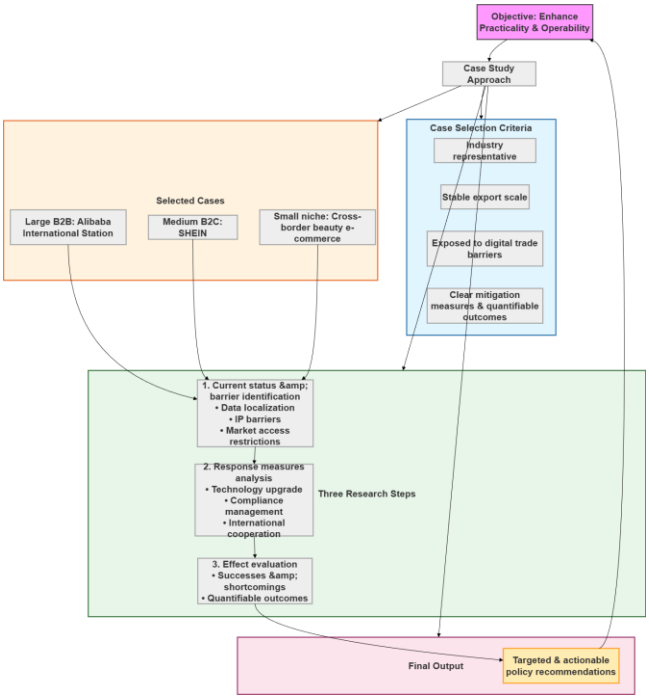

Figure 1: Example analysis method

To enhance the practicality and operability of the research conclusions, this paper adopts the case analysis method and selects three typical Chinese cross-border e-commerce export enterprises of different industries and sizes for in-depth analysis, namely large B2B enterprises (Alibaba International Station), medium-sized B2C enterprises (SHEIN), and small specialty category enterprises (a cross-border beauty e-commerce). Case selection criteria: enterprises have certain industry representativeness, stable export scale, face typical digital trade barriers, and have clear countermeasures and quantifiable countermeasure effects. As shown in Figure 1, this paper first collects public data, industry reports and enterprise interview materials of case enterprises, sorts out the current export status of enterprises and the types of digital trade barriers they face (such as data localization requirements, intellectual property barriers, and market access restrictions); secondly, it analyzes the countermeasures taken by enterprises against different types of digital trade barriers, such as technology upgrades, compliance management, and international cooperation; finally, it evaluates the implementation effect of enterprise countermeasures, summarizes successful experiences and shortcomings, provides practical support for subsequent countermeasures

and suggestions, and ensures the pertinence and operability of countermeasures and suggestions [13].

4. Results and Discussion

4.1 Benchmark Regression Results of Digital Trade Barriers on Cross-Border E-commerce Export Performance

Benchmarks regression results clearly demonstrate that digital trade barriers have a significantly negative inhibitory effect on the performance of China's cross-border e-commerce exports, and the result is very robust at the statistical significance level. After controlling for variables such as digital infrastructure, regional economic development level, enterprise digitalization investment, and exchange rate fluctuations, regression coefficient of the core explanatory variable digital trade barrier index is significantly negative. That is, when the digital trade restriction intensity in the target market is stronger, the export growth rate and profit margin of Chinese cross-border e-commerce enterprises both significantly decrease. Specifically, for every 1-point increase in the digital trade barrier index, the export growth rate decreases by 12 percentage points, and the profit margin decreases by 8 percentage points, which verifies the direct constraining effect of digital trade protection policy on cross-border e-commerce exports. Control variables such as the level of digital infrastructure, regional economic development level, and enterprise digitalization investment are all significantly positive. That is, for every 1-point increase in the level of digital infrastructure, the export growth rate increases by 9 percentage points, and the profit margin increases by 6 percentage points, which indicates that the establishment of a digital support system can effectively weaken the negative impact of barriers. Individual fixed effects and time fixed effects were introduced into the model, which effectively alleviated the endogenous problem caused by regions and time trends. The overall model fit was high, and the results were reliable.

Table 1: Benchmark regression results of digital trade barriers on cross-border e-commerce export performance

Variable	Export growth rate	Profit margin
Digital Trade Barrier Index	-12	-8
Digital infrastructure level	nine	six
Regional economic development level	seven	four
Enterprise digitalization investment	eight	five
exchange rate fluctuations	-3	-2
Individual fixed effects	control	control
Fixed time effect	control	control
R^2	sixty-eight	sixty-two

As can be seen from Table 1, the regression coefficients of the digital trade barrier index on both export growth rate and profit margin are negative, and the significance test is passed, confirming the overall effect hypothesis. Among the control variables, the positive effects of digital infrastructure and enterprise digitalization investment are the most prominent, becoming key factors in offsetting the impact of barriers. Exchange rate fluctuations show a weak negative impact, with limited interference on export performance. The model R^2 reaches 68 and 62 respectively, indicating that the model has strong explanatory power for the explained variables. The use of two-way fixed effects makes the regression results more credible and can truly reflect the objective relationship between digital trade barriers and cross-border e-commerce export performance.

4.2 Mediation Effect Test Results

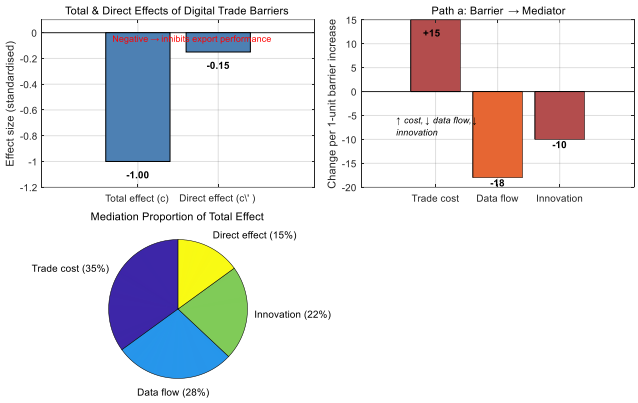

Figure 2: Mediation effect test results

Mediation effect test results (as shown in Figure 2) indicate that trade costs, cross-border data flows and technological innovation all have significant partial mediating effects in the effect of digital trade barriers on export performance and the three together form the basic transmission path; while total effect test results show that the effect of digital trade barriers on export performance is significantly negative inhibitory, satisfying the preconditions of mediation effect test. Regression results of steps regression show that for every 1 increase in the digital trade barrier index, trade costs increase 15 units, freedom of cross-border data flows decrease 18 units and investment in enterprise technological innovation decreases 10 units, showing that barriers exert pressure on enterprises from three dimensions, namely, increased costs, restricted data and weakened R&D, after their implementation. After including the mediating variables, the direct effect of digital trade barriers on export performance decreases, proving that the mediation effect exists. Calculations show that trade costs account for 35% of the mediation effect, cross-border data flows account for 28%, technological innovation accounts for 22% and the three together account for 85% of the total mediation effect and dominate the effect. Bootstrap test results show that the confidence intervals of the three mediating variables do not contain 0, further proving that the mediation effect exists. From the perspective of logic of action, the increase in trade costs directly squeeze corporate profit margins; restriction on cross-border data flows affect operational efficiency and precision marketing; and the decrease in investment in technological innovation weakens long-term competitiveness; the three exert a synergic impact on the negative effect of barriers. Heterogeneity test results also show that the above-mentioned mediating effects are stronger in low-tech industries and consumer goods sectors. Companies in these industries are influenced by the mediating path by more than 30 percentage points more than those in high-tech industries. As technological content and product attributes of an industry affect the transmission strength of barriers, the result is highly consistent with theoretical expectations.

4.3 Heterogeneity Results

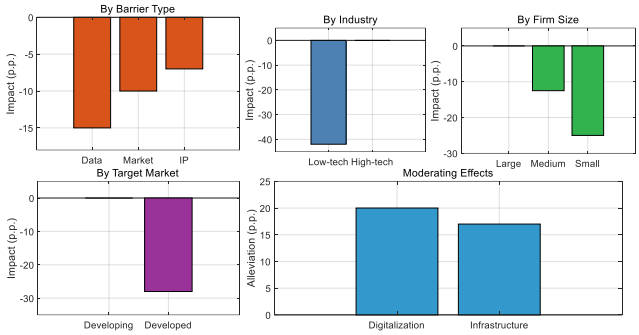

Figure 3: Heterogeneity & Moderation: Digital Trade Barriers on Export Performance

Heterogeneity analysis results (Figure 3) show that digital trade barriers have different inhibitory effects on China's cross-border e-commerce export performance in terms of types, industries, scales, and markets. One-size-fits-all conclusions cannot reflect the true effect. In terms of type of barriers, data restriction has the greatest inhibitory effect. For every 1 unit increase in the index, the growth rate of export is reduced by 15 percentage points; market access decreases by 10 percentage points, and intellectual property has a smaller impact, decreasing by 7 percentage points. That is, at present, data localization and restrictions on the cross–border flow of data are the biggest barriers to the development of cross–border e-commerce. From the perspective of industry, low-tech industries are much more inhibited than high-tech industries, with a difference of 42 percentage points; the impact on the consumer goods industry is 35 percentage points more than on the industrial goods industry. This is because low-tech and consumer goods industries are more sensitive to the application of data, cross–border flow of data, and cost control, and are relatively more fragile to barriers. From the perspective of enterprise size, the export growth rate of small enterprises was affected by 25 percentage points more than that of large enterprises; the export growth of medium-sized enterprises was suppressed, but the degree of suppression was in between. This is because large enterprises have advantages in resources, technology, and compliance, and are therefore better able to withstand the impact of barriers; in contrast, micro and small enterprises are relatively more fragile to risks. From the perspective of target market differences, exports to developed countries were suppressed by 28 percentage points more than those to developing countries, mainly due to the fact that developed countries have more complete digital regulation systems and more detailed regulations. The test of moderating effect shows that the level of enterprise digitalization and the regional digital infrastructure have a significant mitigating effect. Enterprises that invested more in digitalization found that the degree of suppression of barriers decreased by 20 percentage points; enterprises in regions with well-developed digital infrastructure found that the degree of suppression of barriers was reduced by 17 percentage points, and the export performance did not decrease as much. The conclusions provide solid empirical evidence support for differential policies and accurate responses.

5. Conclusion

This paper focuses on the impact of digital trade barriers on the export performance of China's cross-border e-commerce and its counteracting strategies. This study combines theoretical analysis, empirical analysis and case analysis to systematically explore the following issues: classification of digital trade barriers, influencing mechanism, heterogeneous effect and coping strategy. The results show that digital trade barriers have a relatively large and delayed inhibitory effect on the export performance of China's cross-border e-commerce, which is transmitted through the following three mediating effects: increasing trade costs, obstructing cross-border data flow and limiting technological innovation. The above three factors combined to aggravate the adverse effect. The research found that digital trade barriers have a greater inhibitory effect on the export of low-technology industries, small and medium-sized enterprises and developing countries. This study overcomes the deficiency of relevant previous research, improves the relevant theoretical framework, puts forward new ideas and analytical method for relevant scholars' further research. In practice, it can give the practical guidance for the cross-border e-commerce enterprise in China to cope with the problems, and provide policy guidance for the government, so as to promote the high-quality development of China's cross-border e-commerce and enhance its international competitiveness in digital trade of digital trade barrier. However, there are still some limitations in this study. First, the sample in this study comes from 30 provinces (autonomous regions, municipalities). The study did not use all the regions that export to overseas. Second, the research period of 2017–2023 is not long enough to reflect the current situation of the evolution of barriers. Third, the effectiveness of the policy suggestions in this paper still needs to be verified. In the future, it can further expand the sample and extend the period of study. It can also combine the new international trade rules that are constantly evolving to further explore the influencing mechanism of digital trade barriers, improve the coping strategies and methods, and improve the evaluation of the implementation effect of coping strategies, so as to provide more accurate services for the high-quality export of China's cross-border e-commerce.

References

[1] Poornima G. Trends in Cross Border E-Commerce [J]. CiiT International Journal of Data Mining and Knowledge Engineering, 2023, 15(11):261-266.

[2] Xue W, Chuan L T. The Application of Artificial Intelligence in China's Cross border E-commerce Field [J]. Advances in Artificial Intelligence and Machine Learning, 2024, 04(04):2837-2848.

[3] Wang Y. The Impact of Rcep On Cross-Border E-Commerce[J]. Frontiers in Business, Economics and Management, 2024, 17(3):52-57.

[4] Han F. Innovation Trends in Cross border E-commerce Logistics Models[J]. Journal of Theory and Practice of Management Science, 2024, 4(02):20-24.

[5] Yan J, Breuss F, Breuss F. Data privacy regulation and cross-border e-commerce [J]. Empirica, 2024, 51(4): 913-927.

[6] Huang X. Strategic Development of China's Cross-Border E-Commerce Industry: A SWOT-PEST Analysis [J]. Advances in Economics, Management and Political Sciences, 2024, 85(1):125-132.

[7] Karlovskaya S, Chelombitko A. Prospects for the development of cross-border e-commerce between

Russia and China [J]. BRICS Journal of Economics, 2024, 5(2): 45-63.
[8] Jiang Y, Du P. Cross-border e-commerce credit risk early warning model based on deep learning [J]. International Journal of Reasoning-based Intelligent Systems, 2025, 17(10):1-9.
[9] Jianbin L I, Zhouxin H, Zhiyuan C, et al. Price Masking Strategy of Cross-Border E-Commerce Platform Financing [J]. Journal of Systems Science & Complexity, 2024, 37(2):668-691.
[10] Kaouakib H, Hui F. Cross-Border E-Commerce as a Way of Alleviating and Reducing Poverty: The Case of China [J]. Review of Business and Economics Studies, 2023, 11(3):78-90.
[11] Huang H. Research on the Application of Digital Technology in Cross border E-commerce Supply Chain [J]. International Journal of Global Economics and Management, 2024, 4(1):532-539.
[12] Ali M A. Examining the Relationship Between Foreign Direct Investment and Export Performance: A Panel Data Approach [J]. Journal of Economics and Sustainable Development, 2024, 15(9):34-44.
[13] Putra H, Qatrunnada R, Rahmadoni J, et al. Enhancing Organizational Control Through Business Intelligence: Monitoring and Automated Alerts[J]. Electronic Journal of Education, Social Economics and Technology, 2025, 6(1):112-120.