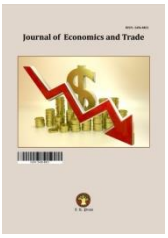

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The Impact of Global Logistics Disruptions on Cross-border E-Commerce Performance: Evidence from Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Cross-border e-commerce is quickly expanding worldwide phenomenon; import and export activities related to it are impacted by the disruptions associated with global logistics. To increase cross-border e-commerce trade, efficient global logistics are needed for the timely delivery of goods across international borders. There are many obstacles that disrupt global logistics, which have an impact on the performance of cross-border e-commerce. There is a study gap because most

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existing studies were conducted in developed economies but institutional frameworks and legislation differ among nations, making it crucial to comprehend the obstacles from Nigerian point of view. Examining the impact of global logistics disruptions on cross-border e-commerce performance in Nigeria, this study adopted the probit regression method. Probit model estimation results showed that cross-border e-commerce imports and exports in Nigeria are adversely and significantly impacted by global logistics disruptions. Furthermore, the regression analysis showed that the disruptions encountered by global logistics firms surpassed all attempts to guarantee that global logistics effectively supports cross-border e-commerce transactions. In light of this, the study came to the conclusion that global logistics disruptions impede the expansion of cross-border e-commerce in Nigeria, which has an impact on commodity pricing, global competitiveness, and the advancement of trade infrastructure technology. Customs regulations, tariffs, and taxes present difficulties for businesses, which affect planning and forecasting. The valuable insights from these findings provide practical policy implications for policymakers and businesses to reduce disruptions and ensure effective global logistics to enhance cross-border e-commerce trade.

Keywords: Global logistics; cross-border e-commerce; international trade; supply chains; import and export trades.

1. INTRODUCTION

Global logistics are becoming more important with the rapid expansion of cross-border e-commerce. Initiatives by global e-commerce companies can be aided by an effective global logistics infrastructure [1]. Wen [2] claims that the service goals of cross-border e-commerce are trade entities from several countries. Cross-border e-commerce depends on global logistics [3]. According to Wang et al. [4], cross-border e-commerce relies heavily on global logistics. The authors discovered that while laws and regulations are an independent factor influencing global logistics performance, cross-border payments, electronic clearance, and the degree of technological application serve as mediating factors. Any type of disruption to trade activity can have a serious negative impact on the exporting and importing countries [2]. For instance, the world's principal export and import trades suffered greatly as a result of the COVID-19 epidemic, the Russian-Ukrainian War, and the global financial crisis of 2008. Numerous aspects, including those pertaining to politics, infrastructure, supply chain service, taxation, customer disputes, and data acquisition failure risks, present challenges for businesses involved in global logistics.

Moreover, asymmetric information, limited rationality, biassed selection, or moral hazard would raise the possibility of financial loss for clients undertaking online transactions. A market can collapse due to even a very small level of transaction risk or international e-risk [5]. According to Wang et al. [6], there are some noteworthy characteristics associated with B2C cross-border e-commerce and logistics, such as lengthy lead times for deliveries and costly shipping postage. They lead to inconsistent and shifting customer preferences, which may lead to product returns. He et al. [7], Giuffrida et al. [8], Ehrler et al. (2021), Huo et al. [9], and Wang et al. [10] are among the notable studies in this field of global logistics and cross-border e-commerce; nevertheless, there is a study gap because these empirical investigations were conducted outside of Nigeria. Liu et al. [11,12] state that global logistics and cross-border e-commerce are important national initiatives. As cross-border e-commerce replaces other methods of international trade, global logistics are becoming increasingly important. Nigeria, for example, has a population of over 213 million and an average annual GDP growth rate of over 3.6%, making it one of the most attractive growing economies for international trade [13].

The country's economic progress is closely linked to the growing spread of cross-border e-commerce because most of the population is young and habituated to using technology for both domestic and international purchases. In 2021, Nigeria ranked as the world's top exporter of cocoa shells ($8.56 million) and the world's greatest importer of both bovine and horse hides ($56.8 million) as well as synthetic filament tow ($110 million). In addition, the nation's economy ranked 30th in the world in terms of GDP (current US dollars), 52nd in terms of total exports, 50th in terms of total imports, and 126th in terms of economic complexity as determined by the Economic Complexity Index [14]. This revelation highlights the necessity to examine the impact of global logistics disruptions on cross-border e-

commerce performance in Nigeria. Evidence from Nigeria is especially interesting since its institutional frameworks and legislation differ from those of other nations, making it crucial to comprehend the difficulties from Nigeria's point of view. Based on this premise, the study sought to investigate the impact of global logistics disruptions on cross-border e-commerce imports into Nigeria and exports from Nigeria and offer valuable insights on how global logistics effectiveness can enhance Nigerian cross-border e-commerce trades.

2. LITERATURE REVIEW

Cross-border e-commerce provides customers with superior products that have better quality, more affordability, and ease of use, and encourages innovation and creativity [15]. Cross-border e-commerce businesses must adopt the appropriate safety measures and be aware of the unique opportunities and challenges in order to ensure the safety and satisfaction of their customers [16]. Giuffrida et al. [8] claim that the adoption of cross-border e-commerce as an internationalisation strategy is growing, especially in nations whose e-commerce sectors have experienced significant development. Cross-border e-commerce has the potential to spur industry innovation and give rise to new technologies and business models [17]. Cross-border e-commerce requires a reliable and efficient supply chain to ensure the timely delivery of goods across international borders [18,19]. Cross-border e-commerce can be divided into two categories: cross-border import and cross-border export [20]. Chen and Sun [20] contend that cross-border e-commerce imports enable consumers to buy items from other nations at lower prices by eliminating middlemen and exposing businesses to new markets.

Cross-border e-commerce imports support international trade and economic growth. For global logistics to be optimised, the placement of a warehouse abroad is crucial [21,20]. Cross-border e-commerce exports involve the use of e-commerce platforms, electronic payment and settlement, and cross-border logistics and exchanges to finalise the delivery of goods [22, 23]. According to Liu et al. [15], cross-border e-commerce exports are becoming more common since they allow for the convenient, time- and space-efficient exchange of products across countries via the internet. Cross-border export entails delivery of foreign goods through payment processors, customs, logistics companies, and e-commerce platforms. Concerns about security and trust are raised by interacting with unidentified businesses and consumers while importing goods across borders [24].

There are financial ramifications to the growth of cross-border e-commerce, including reduced supply-demand mismatch, lower transaction costs for producers and consumers on the international market, and better resource allocation [20]. According to Yang [24], the advancement of blockchain technology is anticipated to enhance the efficiency, speed, and dependability of cross-border electronic commerce transactions. Cross-border e-commerce may be subject to different customs and tariffs in each country; businesses must be aware of these variances and abide by local legislation in order to maintain smooth operations [17]. Businesses can expand their customer base, enter new markets, and increase sales and revenue through cross-border e-commerce. More options, more reasonable costs, and quicker delivery times are provided by cross-border e-commerce [19]. Cross-border e-commerce depends on the internet, e-commerce platforms, and big data technologies for service goals including bilateral trade, payment, international logistics, and transportation operations [2]. Improvements in language barriers, logistics, and payment security have all contributed to the growth of cross-border e-commerce [1]. Greater customer interactions, improved products, growth, and profitability are all possible with cross-border e-commerce. The promotion of globalisation and the internet has made it possible for customers to purchase and sell things from anywhere at any time, facilitating global logistics [25].

Cross-border e-commerce cannot flourish without improved global logistics, and the overseas warehouse model both promotes and aids in the localisation of cross-border trade [18]. Shibasaki et al. [26] assert that more efficient logistics, improved business operations, and an increase in the volume of cross-border trade. He et al. [7] demonstrate that GDP per capita has a major impact on the dynamic link between cross-border e-commerce trade and global logistics. The growth of cross-border e-commerce trade will greatly increase customer satisfaction, ease of buying, and shopping experience. Cross-border e-commerce trade has increased logistics efficiency, business operations efficiency, and service quality, and it also helps to enhance the

volume of international trade (Srivastav & Nagpal, 2021). The competitiveness of international e-commerce trade is largely determined by global logistics. The distribution and capacity of a nation's global logistics facilities become increasingly important when creating a business plan aimed at increasing that nation's market share in cross-border e-commerce trade [7].

In light of this, a large portion of cross-border e-commerce has embraced an international warehouse operation in order to improve customer shopping experiences and localise cross-border trade while also addressing the problems of high service costs and delayed response times caused by global logistics [27]. The degree of development of a country has become a determining factor in the integration of the supply chain for cross-border e-commerce trade. Establishing international logistics for e-commerce necessitates a keen attention to global logistics. There are several phases involved in cross-border e-commerce dealing, such as contracting, shipment, payment, and negotiation [7]. According to Sun and Gu [28], the expansion of cross-border e-commerce depends on the assistance of global logistics. It is only when the two grow together that a win-win situation can be reached. He et al. [7] discovered a stronger bidirectional causal relationship between cross-border e-commerce import and global logistics, as well as between cross-border e-commerce export and global logistics, in a sample of OECD countries.

The significance of global logistics is increasing due to the rapid growth of cross-border e-commerce. Initiatives by cross-border e-commerce companies can be supported by efficient global logistics [1]. With the swift development in the volume of cross-border e-commerce transactions, logistics efficiency has become an important factor influencing enterprise efficiency. Thus, quality and efficiency of global logistics have emerged as critical variables to enhance core competitiveness for cross-border e-commerce [25]. The sustainable development of cross-border e-commerce and global logistics requires the resolution of certain disruptions. In theory, the rapid rise of cross-border e-commerce may boost transaction orders, facilitating the long-term development of global logistics. Global logistics disruptions include an unnecessarily lengthy order cycle, inadequate taxation laws, regulations from several public departments, inadequate market monitoring, slow customs clearance, demanding after-sales support, and inefficient distribution networks [29].

The uncertainty in global logistics is caused by a lack of international standards and laws for regulating cross-border transactions and the risks they entail. The high degree of uncertainty and paucity of information make prediction difficult [8]. Ren (2014) affirms that e-commerce can be costly and challenging when it comes to sending goods across international borders. The shipping regulations, customs procedures, and taxation that merchants have to deal with might differ significantly throughout countries. Customs and taxes can cause cross-border e-commerce businesses to encounter challenges such as increased prices, delivery hold-ups, issues with compliance, and unpredictability [18,24]. Due to long delivery periods and distances, delivery quality, increased service level expectations, returns management, and a larger reliance on local service providers, logistics is one of the most difficult problems to solve [9,30]. Customers may pay more for goods due to taxes and customs charges, which will make it harder for them to compete. Delivery delays caused by customs procedures could leave customers dissatisfied and cause a loss of sales. Cross-border e-commerce businesses have to comply with different taxes and customs laws in numerous countries, which can be challenging and time-consuming. Planning and forecasting are difficult for cross-border e-commerce businesses since customs laws and taxes can change at any time [18,24].

2.1 Nigerian Global Logistics and Cross Border e-Commerce

The logistics sector in Nigeria is one of the fastest growing, although there are still many areas that need development. The entire value of products imported increased from $51,635 million to $62,337 million in 2022, representing a growth rate of 20.7%, whereas the total value of goods exported increased from $48,853 million to $56,225 million, or roughly 15.1% growth rate [31]. As of 2021, Nigeria was ranked 50th in the world for total imports and 52nd for total exports [14]. The current global logistics boom in Nigeria is a result of several causes, including the growth of logistics apps and e-commerce, the expansion of the industrial and export sectors, and improved contacts with other countries. The industry has several obstacles, including a significant lack of infrastructure, onerous regulations from the government that make conducting business more difficult, a subpar

transport network, unstable electrical supply, pervasive corruption, and a high tax burden. The inefficiency of customs and ports at all points of entry is another significant obstacle to the global logistics industry in Nigeria. Clearance through customs is time-consuming, sluggish, and dependent on the agents' judgement. The length of time goods must remain in ports or on ships for inspection is significantly increased by this drawn-out process, which raises operating expenses. The Lagos Chamber of Commerce and Industry said that the Nigerian economy lost an estimated $8.1 billion in revenue per year as a result of poor execution, insufficient infrastructure, and corruption at the ports. Companies using some of the country's most important facilities, such as the Apapa port, saw their profit margins decline as logistical expenses increased [31].

History of logistics and logistics in Nigeria may be traced back to the establishment of trade relations with the colonial powers. Raw resources were taken from Africa, particularly Nigeria and other colonies gifted with vast plateaus and rain forests, to feed the fast-growing industries of Europe and America (NLSC, 2016). Adeleke [32] asserts that African societies are believed to have had their own distinct Indigenous Logistics System (ILS). It is important to note that this system was primarily created and governed by the culture, values, and, to a lesser degree, the shared cultural values and beliefs of outside actors. The distribution architecture of early rail systems facilitated trade channels, increasing accessibility to logistics for both local and foreign investments. Using the marine industry, investors developed strategic networks to capture distant markets, concentrating on outsourcing, business services, and packaging (NLSC, 2016). Globalisation has improved Nigerian businesses' access to bigger markets and promoted free trade, which has increased productivity and creativity. To this end, a number of factors affect Nigeria's import trade, such as tariffs, illegal immigration, and globalisation [33]. A quick glance at Fig. 1 below showed that, over the course of 41 years, Nigeria's import trade has grown steadily, significantly contributing to the country's GDP, employment, commerce, and capital imports, among other things.

Nigerian import trade was not very significant at the beginning of the period, with records of ₦12,839,600 in 1981 and ₦89,488,200 in 1991, and this transaction increased significantly to ₦1,358,180,330 in 2001. This can be attributed to the dividend of the return to democratic government in 1999, which incorporated several policies and import tariffs that appeared to drive import trade. While 2011 had a significant increase in Nigerian imports at ₦10,995,863,626; the year 2021, the last period of coverage, saw an even greater increase in Nigerian imports, totalling to ₦22,394,498,089. These results highlight Nigeria's reliance on imports, the country's growing hunger for imports, and the

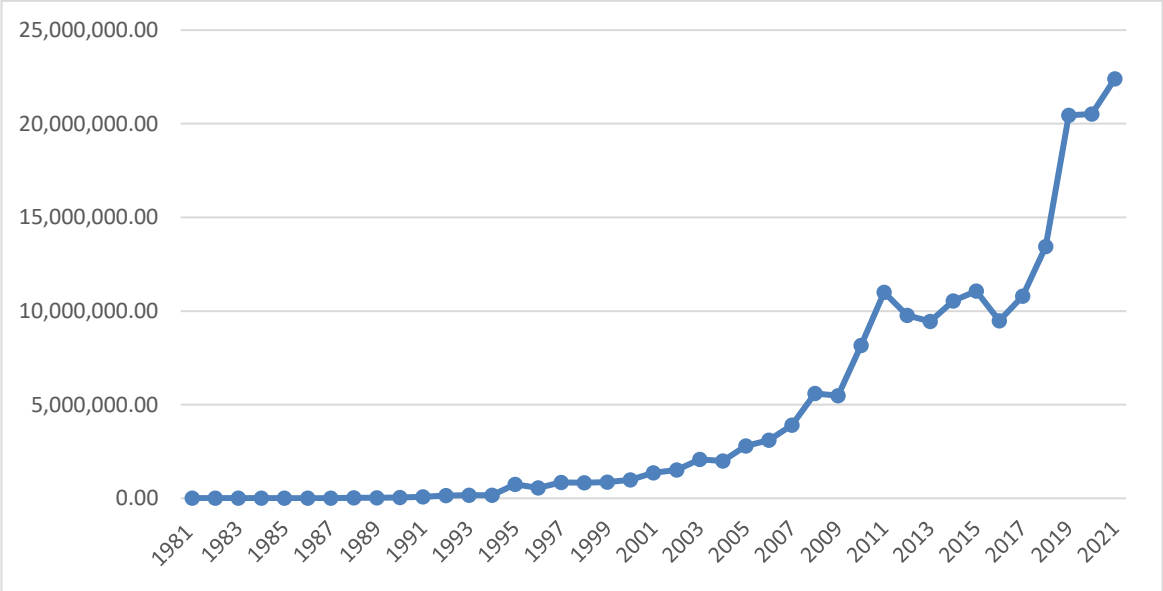

Fig. 1. Nigerian Imports Trade 1981 – 2021 (₦' Million)
Source: Study preparation from CBN's 2021 Statistical Bulletin

expansion of international logistics within the nation. Nigeria, for instance, imports finished items from China, such as electrical and electronic equipment, machinery, cars, and plastic and aluminium products. Nigeria's total imports are more diverse than its exports, with all of the major products it buys from China and India making up a sizable fraction of its total imports [34,35]. Import trade has a significant and positive influence on Nigeria's economic growth, both short- and long-term. Because of this, it is difficult to pinpoint the precise amount of Nigeria's top imports, even though the country imports a wide range of finished goods and goods that it is unable to produce [34].

The Nigerian external sector relied mostly on agriculture for its income prior to the discovery of oil. Nigeria's agricultural exports have supported other capital projects and helped the nation create foreign exchange. It has been demonstrated that the export of raw cocoa beans and sesame seeds has a major impact on Nigeria's GDP [3]. Similarly, Ibrahim and Sayuti [35] and Aisien and Adesuwa [34] found that Nigeria's principal export is crude oil, along with other basic items. Nigeria can export mineral fuels, raw hides and skins, cocoa, rubber, and mineral fuels to countries with low RCA.

In light of this, the value of Nigeria's exports in 1981 was ₦11,023,300, as shown in Fig. 2. While 1991 saw a gain in exports of ₦121,535,400, and 2001, the middle year of the decade, saw growth of ₦1,867,953,850, which could also be related to the restoration to democracy in 1999. Nigeria's trade in goods reached a record high of ₦15,236,665,988 in 2011. However, because the country is classified as a mono-economy for export goods and because crude oil prices fluctuated greatly between 2015 and 2016, this high transaction value dropped to ₦8,835,611,906 in 2016, plunging the nation into an economic recession. As a result, changes in flows later on could be somewhat correlated with the trend in crude oil prices. The observed difference between the trajectories of the two global trades in Fig. 3 indicates that Nigerian imports are more inelastic to macroeconomic variables than exports, indicating that the country's exports are not as varied as its imports.

Significant trade imbalances and the countries' declining foreign exchange revenues have both been exacerbated by these disparities. Nonetheless, large amounts of imports and exports from Nigeria have a big impact on global logistics. Trade has a major impact on global logistics in both directions. The logistics industry is in charge of managing the movement of goods across international borders, planning distribution, storage, and transit routes, and making sure that all laws and regulations are followed [36,37,38]. Nigerian e-commerce logistics reduces manufacturing costs, which improves scheduling, efficiency, and competitiveness. Online shopping and commercial services are accessed by millions of internet users, yet Nigerians continue to have concerns regarding the security and dependability of their accounts. The sector has been impacted by the proliferation of internet retailers [39,40].

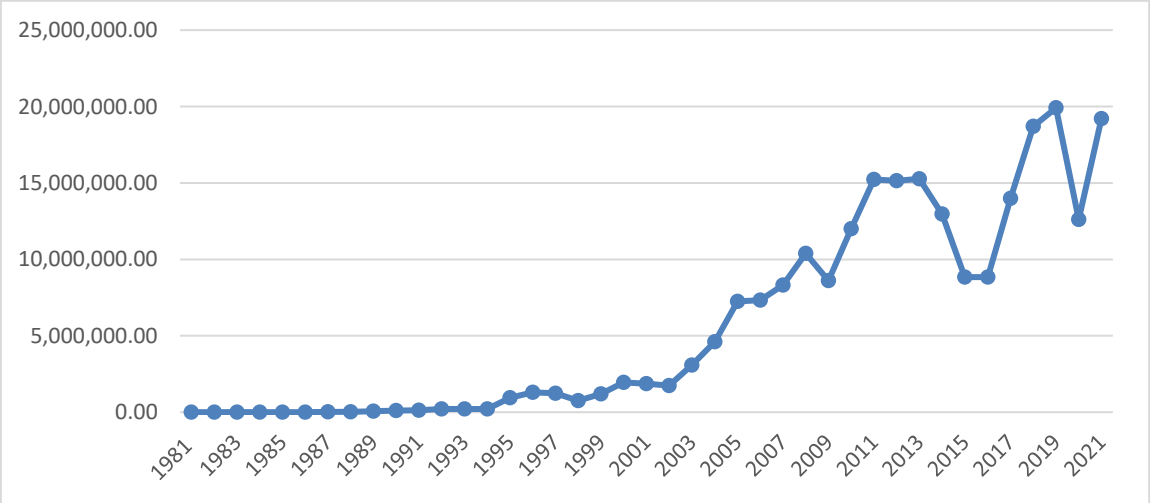

Fig. 2. Nigerian Exports Trade 1981 – 2021 (₦' Million)
Source: Study preparation from CBN's 2021 Statistical Bulletin

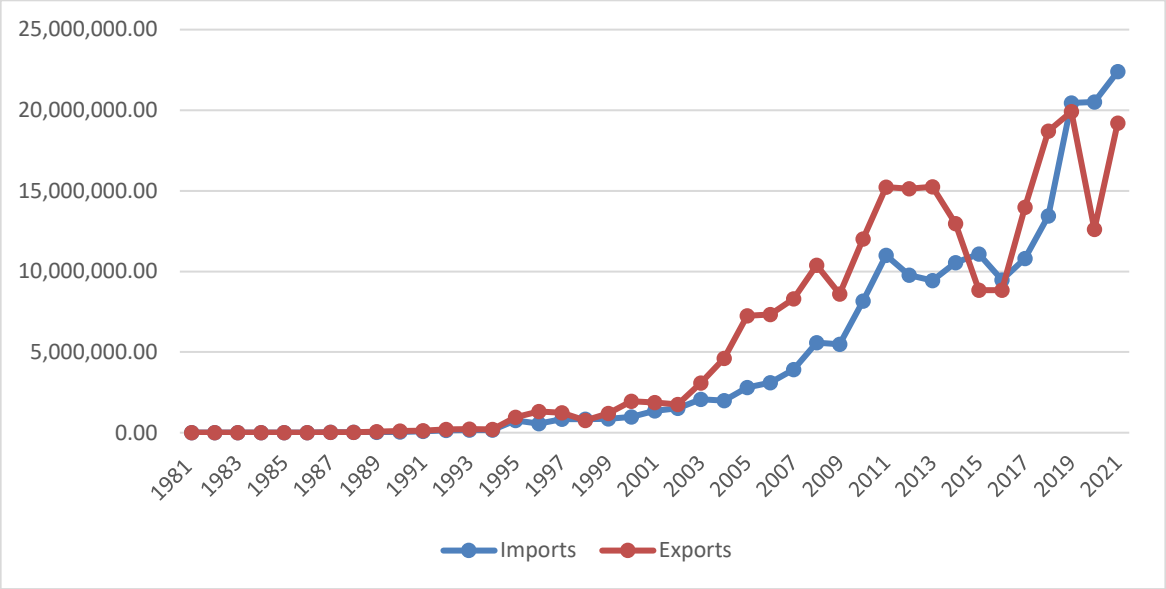

Fig. 3. Nigerian Exports and Trade Imports 1981 – 2021 (₦' Million)
Source: Study preparation from CBN's 2021 Statistical Bulletin

3. METHODOLOGY

The choice of research philosophy affects every aspect of research methodology, including research design, data collection methods, data analysis techniques, and ethical issues. Research philosophy also dictates the adoption of ontology or epistemology [41,42]. This study will adopt an epistemological perspective; epistemology examines issues related to the nature, sources, and limits of knowledge [43]. Different research paradigms are based on different epistemological assumptions. For example, positivism assumes that knowledge is objective and can be discovered by experimentation and empirical observation, but interpretivism assumes that knowledge is subjective and is formed via social interactions and experiences [41,42]. This empirical study will take into account quantitative research designs. The positivist approach employs quantitative data gathering methods such as surveys and experiments to establish cause-and-effect linkages [44,45]. Thus, primary data will be used in the study to conduct an empirical investigation of the impact of global logistics disruptions on cross-border e-commerce performance in Nigeria. This suggests that explanatory survey research was carried out in order to collect, assess, and interpret this impact. The statistical data collection questionnaire was constructed based on existing literature. The researcher created the questionnaire following a comprehensive examination of several viewpoints regarding global logistics disruptions and cross-border e-commerce performance.

The questionnaires were distributed via an online Google form to the employees of Nigerian logistics companies involved in global logistics. Employees were given a link to the online survey questionnaire, which was completed with the assistance of HR managers from the different organisations. The consent form, demographics, and enquiries about global logistics disruptions and cross-border e-commerce performance make up the three sections of the online survey questionnaire. On a scale, participants are asked to indicate how much they agree or disagree with each statement. This closed-ended question encourages consistent responses by minimising prejudice and personal interpretation. The questions are presented in line with the study's objectives through a 20-item questionnaire that uses a five-point Likert scale. The assigned values range from 1 point, which is "strongly disagree," to 5 points, which is "strongly agree." The research topic's title was disclosed to the participants. As a result, the material was reviewed to make sure it was relevant and sufficient after a sufficient number of responses were received.

The study was unable to obtain information from the entire employees that make up the population, and the difficulty was resolved by the researcher by examining samples from the population and deriving conclusions. Objectivity

is one of the qualities of scientific research, and the researchers kept this in mind when they chose the sample from the population. A basic random sampling procedure was employed to avoid bias in the sample. Potential bias in the sample is lessened by this objective approach. The 470 employees of the chosen organisations (Martegold Logistics, Topreach Global, Manal Nigeria, and Swalk Global Concept) comprise the populations for this study. The sample size was determined using the Yaro Yamane sample size (n) formula.

The variables used in this study include global logistics disruptions as the independent variable and cross-border e-commerce performance (cross-border e-commerce imports, exports, and trades) as the dependent variables. Primary data was used to get the data for these variables. As a result, a structured questionnaire was created based on our research objectives and the perspectives on the reviewed literature. Using the data collated from the response of the survey, inferential methods of analysis were adopted in the study. The Probit model of regression was employed in the study to empirically investigate the objectives of the study. This regression method is consistent with the study of Yang et al. [29]. The response is a dichotomous piece of statistical data that has a value of 0 denoting the absence of a characteristic and a value of 1 denoting its presence. A probit model is used to analyse the relationship between the independent variable and the dependent variable (response) [46]. The Probit model is also utilised in regression analysis to model binary variables, which are variables whose values can only be one of two—0 or 1.

The probit regression model, like the logistic regression model, uses the standard normal distribution's cumulative distribution function to estimate the connection between the predictor variables and the binary response variable [47]. Nevertheless, in the dataset compiled from the survey, potential disruptions in global logistics will be represented by a value of 1 for the Probit model's application in this study, and no disruption will be represented by a value of 0. The probability that a company would have disruptions is predicted using the probit regression model [48]. According to Shvets [49], the Probit model is widely used to predict binary events, such as the chance of default, the chance that a person would cast a ballot, or the chance that a business will be disrupted, in the fields of economics, finance, and other management and social sciences. The Probit model can be estimated using maximum likelihood estimation, and the effect of each predictor variable on the likelihood of the result can be assessed using the computed coefficients [46].

This adopted regression model is useful for obtaining reasonable and reliable results and is also in line with the existing studies that used this analytical procedure, such as Yang et al. [29], He et al. [7], Zhong et al. [50], Hsiao et al. [1], Liang et al. [51], Wang et al. [52], and He and Wang [53]. The empirical models to be estimated in the study were proxied as cross-border e-commerce imports (CBECI), cross-border e-commerce exports (CBECE), cross-border e-commerce trades (CBECT), global logistics disruptions (customs laws and tariffs (CLT), infrastructure deficits (ID), high logistics costs (HLC), trust and security concerns (TSC)). Thus, in line with Yang et al. [29], the model to be adopted in the study is specified below.

$$Y_i = \beta_o + \beta_1 X_{i1} + \mu_i \, . \quad (1)$$

Where:

Y_i = Dependent Variable Measured by CBECI, CBECE and CBECT
X_{i1} = Independent Variables Measured by CLT, ID, HLC, and TSC
β_o = Intercept of the Regression Model
β_1 = Regression Coefficient Associated with X_{i1}
μ = Standard Error Associated with the Regression Model.

Equation (1) was rewritten to suit the study, along with the objectives of the study.

Thus, the impact of global logistics disruptions on cross-border e-commerce imports in Nigeria is formulated as:

$$CBECI_i = \beta_o + \beta_1 CLT_{i1} + \beta_2 ID_{i2} + \beta_3 HLC_{i3} + \beta_4 TSC_{i4} + \mu_i \quad (2)$$

While the impact of global logistics disruptions on cross-border e-commerce exports in Nigeria is formulated as:

$$CBECE_i = \beta_o + \beta_1 CLT_{i1} + \beta_2 ID_{i2} + \beta_3 HLC_{i3} + \beta_4 TSC_{i4} + \mu_i \quad (3)$$

In order to carry out a robust check on the outcomes of equations (2 & 3), equation (4)

presents the impact of global logistics disruptions on cross-border e-commerce trades in Nigeria.

$$CBECT_i = \beta_o + \beta_2 CLT_{i2} + \beta_3 ID_{i3} + \beta_4 HLC_{i4} + \beta_5 TSC_{i5} + \mu_i \quad (4)$$

Validity and reliability tests will be conducted for this study to guarantee accurate and significant outcomes. When a measure is reliable, it is consistent or stable throughout time, between different observers, or between different scale items. A validity test is a crucial component of research technique that entails figuring out how well a test or measurement captures the subject matter it is meant to capture. The internal consistency and reliability of the scales were evaluated using Cronbach's alpha. A scale is deemed to have good reliability if its Cronbach's alpha coefficient is 0.7 or above. While a high alpha value (>0.90) may imply duplicate items on the scale, a low alpha value may indicate a low number of questions on the scale [54]. Exploratory factor analysis (EFA) is one of the techniques frequently used in evaluating construct validity. EFA was used in the study to determine the underlying structure of a set of variables. The study ensured privacy and secrecy by providing consent notes to participants in accordance with ethical considerations. This ensured that the study was carried out in an honest and morally responsible manner, devoid of prejudice or discrimination.

4. RESULTS AND DISCUSSION

4.1 Global Logistics Disruptions and Cross-border e-Commerce Imports

The model demonstrated a good fit since an omnibus test of the model coefficients estimated the fitness of the model and was statistically significant at the 5% level, indicating that there is a significant improvement in fit as compared to the null model. The coefficient of the intercept suggests that the expected likelihood of CBECI is 2.602 if all of the predictors (CLT, ID, HLC, and TSC) are evaluated at zero. Thus, with a global logistics disruption (CLT, ID, HLC, and TSC) score of zero, the estimated likelihood of cross-border e-commerce imports has a high predicted probability, as expected. The coefficient intercept is significant at the 5% level, according to the Wald Chi-Square result, which is the test statistic for the regression coefficients. With a value of -0.636, the estimated chance of CBECI is expected to decrease as the CLT score increases. The expected chance of cross-border e-commerce imports will decline by 0.636 with response to higher customs regulations and duties. The regression coefficients' test statistic, the Wald chi-square, yields a result that is statistically significant at the 5% level.

Given that the coefficient of ID is -1.050, the expected probability of CBECI falls as the ID score rises. Therefore, it follows that when infrastructural deficits increase, the possibility of cross-border e-commerce imports will decrease. There is a 5% level of statistical significance for the Wald Chi-Square result, which is the test statistic for the regression coefficients is statistically significant. The HLC coefficient is -0.781, meaning that a higher HLC score will lead to a lower CBECI prediction. As anticipated, the probability of imports via cross-border e-commerce will decrease due to high logistics costs. The Wald Chi-Square result, which is the test statistic for the regression coefficients, is statistically significant at the 5% level of significance. The coefficient of TSC, which is -0.483, indicates that the expected probability of the CBECI falls as the TSC score increases. It is to be predicted that rising security and trust issues will make cross-border e-commerce imports less likely. The Wald Chi-Square result, which is the test statistic for the regression coefficients, is statistically significant at the 5% level. Regression analysis produced a significant result that is in line with previous research. For instance, He et al. [7] discovered a long-term correlation between cross-border e-commerce trade and global logistics. Similarly, Yang et al. [29] found that the difficulties with CBEC logistics include an excessively lengthy order cycle, inadequate tax laws, rules from multiple government agencies, poor market surveillance, slow customs clearance, expensive after-sales assistance, and ineffective distribution networks. Giuffrida et al. [8] discovered that imports from cross-border e-commerce are adversely affected by regional limits, high logistics costs, customs control, and typical commodity trading times.

4.2 Global Logistics Disruptions and Cross-border e-Commerce Exports

The omnibus test model shows a good fit since the fitness of the model was determined by testing the model coefficients, and a significant improvement in fit over the null model was found, with statistical significance at the 5% level. The coefficient of the intercept shows that the predicted probability of the CBECE is 2.399 when all of the predictors (CLT, ID, HLC, and TSC) are evaluated at zero. This means that a

Table 1. Global Logistics Disruptions and Cross-Border E-Commerce Imports

CBECI	Omnibus Test[a]	Coefficient (B)	Std. Error	Wald Chi-Square	Exp(B)
Likelihood Ratio Chi-Square	72.283*				
Intercept		2.602	0.8731	8.885*	13.496
CLT		-0.636	0.3029	4.409*	0.529
ID		-1.050	0.2862	13.462*	0.350
HLC		-0.781	0.2551	9.374*	0.458
TSC		-0.483	0.2436	3.936*	0.617

Source: Probit Regression using Generalized Linear Model option on SPSS
Note: (1) Number of observation is 203
(2) CBECI = Cross-Border E-Commerce Imports, CLT = Customs Laws and Tariffs, ID = Infrastructure Deficit, HLC = High Logistics Costs, and TSC = Trust and Security Concerns
a. Compares the fitted model against the intercept-only model.
**Significant at 5%.*

Table 2. Global Logistics Disruptions and Cross-Border E-Commerce Exports

CBECE	Omnibus Test[a]	Coefficient (B)	Std. Error	Wald Chi-Square	Exp(B)
Likelihood Ratio Chi-Square	55.642*				
Intercept		2.399	0.8165	8.633*	11.012
CLT		-0.905	0.2923	9.593*	0.404
ID		-0.879	0.2490	12.468*	0.415
HLC		-0.549	0.2244	5.977*	0.578
TSC		-0.567	0.3129	3.284*	0.567

Source: Probit Regression using Generalized Linear Model option on SPSS
Note: (1) Number of observation is 203
(2) CBECE = Cross-Border E-Commerce Exports, CLT = Customs Laws and Tariffs, ID = Infrastructure Deficit, HLC = High Logistics Costs, and TSC = Trust and Security Concerns
a. Compares the fitted model against the intercept-only model.
**Significant at 5%.*

cross-border e-commerce export with a high forecasted possibility is expected to increase when the global logistics disruptions (CLT, ID, HLC, and TSC) score is zero. At the 5% level, the coefficient intercept is significant, according to the Wald Chi-Square test statistic, which is less than 0.05. As the CLT score increases, the expected probability of CBECE decreases since the coefficient of CLT is -0.905. The a priori prediction states that when taxes and rules pertaining to customs are tightened, there will be a decrease in the probability of exports of cross-border e-commerce. The test statistic for the regression coefficients as depicted in the Wald Chi-Square result is statistically significant at the 5% level. The anticipated probability of CBECE decreases as the ID score increases since the coefficient of ID is -0.879. Consequently, it suggests that the likelihood of exporting cross-border e-commerce would decline as the infrastructure deficit grows. The Wald Chi-Square result, the test statistic for the regression coefficients, is statistically significant at the 5% level.

A greater HLC score will result in a worse CBECE forecast, according to the HLC coefficient of -0.549. Increased logistic costs are expected to lower the likelihood of exports of cross-border e-commerce. At the 5% significance level, the Wald Chi-Square result, which is the test statistic for the regression coefficients, is statistically significant. The predicted likelihood of the CBECE is shown to decrease with increasing TSC score, according to the coefficient of TSC, which is -0.567. When confidence and security are compromised, there is less likelihood of exporting cross-border e-commerce. The test statistic for the regression coefficients, the Wald Chi-Square result, is statistically significant at the 5% level. The findings of He et al. [7], which showed that a breakthrough in cross-border e-commerce exports depended on the position of the global logistics, uphold these results. The study revealed a two-way causal relationship between cross-border e-commerce imports and interanational logistics.

4.3 Global Logistics Disruptions and Cross-border e-Commerce Trades

The outcomes of the model estimation demonstrated a good fit, as determined by an omnibus test of the model coefficients, which also showed the model's fitness and statistical significance at the 5% level. The regression coefficients are evaluated using the Wald Chi-Square test statistic, which indicates that the coefficient intercept is significant at the 5% level and that if all of the predictors (CLT, ID, HLC, and TSC) are evaluated at zero, the predicted probability of the CBECT is 2.736. This indicates that a cross-border e-commerce trade with a score of zero for global logistics disruptions has a high predicted chance. The anticipated likelihood of CBECT decreases as the CLT score rises since the CLT coefficient is -1.039. However, the likelihood of cross-border e-commerce transactions will decline with higher taxes and customs regulations. The Wald Chi-Square result, which is the test statistic for the regression coefficients, signifies that the outcome is statistically significant at the 5% level. The predicted probability of CBECT falling as the ID score rises since the coefficient of ID is -0.804. That means that when the infrastructure deficit rises, the possibility of cross-border e-commerce transactions will decrease. The test statistic for the regression coefficients, the Wald Chi-Square result, revealed that the result is statistically significant.

Table 3. Global Logistics Disruptions and Cross-Border E-Commerce Trades

CBECT	Omnibus Test[a]	Coefficient (B)	Std. Error	Wald Chi-Square	Exp(B)
Likelihood Ratio Chi-Square	79.113				
Intercept		2.736	0.6111	20.041*	15.419
CLT		-1.039	0.2909	12.757*	0.354
ID		-0.804	0.2957	7.402*	0.447
HLC		-0.537	0.1688	10.137*	0.584
TSC		-1.176	0.2779	17.906*	0.309

Source: Probit Regression using Generalized Linear Model option on SPSS
Note: (1) Number of observation is 203
(2) CBECT = cross-border e-commerce trades, CLT = Customs Laws and Tariffs, ID = Infrastructure Deficit, HLC = High Logistics Costs, and TSC = Trust and Security Concerns
a. Compares the fitted model against the intercept-only model.
**Significant at 5%.*

Table 4. Reliability and validity results

	Cronbach's Alpha	Pattern Matrix$_a$ (Average)	KMO and Bartlett's Test	Goodness-of-fit Test
CBECI	0.849	0.758		
CBECE	0.763	0.743		
CBECT	0.882	0.704		
GSCD	0.798	0.724		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			0.938*	
Chi-Square				130.541*

Source: Reliability Test and Factor Analysis using SPSS
Note: (1) Number of observation is 203
(2) CBECI = cross-border e-commerce imports, CBECE = cross-border e-commerce exports, CBECT = cross-border e-commerce trades, and GSCD = global logistics disruptions.
**Significant at 5%*

The HLC coefficient is -0.537, which indicates that if the HLC score rises, the CBECT projection will fall. As expected, the possibility of cross-border e-commerce trade would decrease because of growing logistics costs. The Wald Chi-Square result indicated that the test statistic for the regression coefficients is statistically significant at a significance level of 5%. The coefficient of TSC, which is -1.176, indicates that the predicted likelihood of the CBECT is decreasing as the TSC score increases. Cross-border e-commerce trades are less likely to occur when trust and security issues are greater. At the 5% level, the Wald Chi-Square result, the test statistic for the regression coefficients, is statistically significant.

4.4 Reliability and Validity

The outcomes in Table 4 compare the responses to several scale items and determine if they are consistent with one another; the study used Cronbach's alpha. The Cronbach's alpha results for the scale showed strong reliability for both independent and dependent variables since the coefficients were more than 0.7. This implies that the study was able to achieve internal consistency and reliability in the survey. The results of the pattern matrix also averaged above 0.7, and the loading of the factor revealed that the outcomes are high enough to have convergent validity. Furthermore, the study found that the discriminant validity was well validated since there was no cross-loading among the factors, and the factor correlation matrix result indicated that there was a greater-than-0.7 correlation between the factors. The measure of sample adequacy was demonstrated by the KMO and Bartlett's test with a coefficient of 0.938, which is above 0.7 and produced excellent results and was statistically significant at the 5% level. The goodness-of-fit of the test, with a chi-square value of 130.541 and being statistically significant at the 5% level, is an indication of a good fit [55,56].

5. CONCLUSION AND PRACTICAL POLICY IMPLICATIONS

The study observed that disruptions in global logistics may make cross-border e-commerce imports more difficult. Taxes and customs charges have the potential to raise the cost of goods, reduce competition, and delay delivery. Cross-border e-commerce businesses must deal with complex and erratic taxes and customs regulations, which makes forecasting and budgeting difficult. Disruptions include protracted order cycles, inadequate tax laws, inadequate market oversight, and inefficient distribution systems. The study discovered that disruptions in global logistics can prevent exports of cross-border e-commerce. Global logistics are disrupted by a variety of issues other than regulation that affect cross-border e-commerce exports. The absence of global norms and rules is the cause of uncertainty in CBEC exports. When sending items over foreign boundaries, merchants must struggle with issues like shipping regulations, customs procedures, and taxation. These challenges may result in increased prices, postponed deliveries, issues with compliance, and uncertainty.

The study found that global logistics disruptions in Nigeria outweighed global logistics companies' best efforts to guarantee that global logistics support cross-border e-commerce transactions. Cross-border e-commerce imports support international trade and economic growth. Cross-border e-commerce has been extremely beneficial to Nigeria's economy as globalisation has expanded free trade and given Nigerian companies access to wider markets. Effective global logistics makes it easier to manage the movement of goods and services across international borders and to plan information technology, warehousing, transportation, and inventory control for prompt and economical delivery. Customs limitations, cultural differences, and travel alternatives make it complicated.

The study concludes that effective global logistics have not positively contributed the efficiency performance of cross-border e-commerce trades in Nigeria due to the numerous challenges experienced by global logistics companies to sustain efficient operations and services. Therefore, disruptions in the global logistics have a detrimental impact on the expansion of cross-border e-commerce in Nigeria. Exorbitant logistics costs impede the expansion of cross-border e-commerce by having a negative effect on global competitiveness and commodity pricing. Customs regulations, tariffs, and fluctuating tax laws provide difficulties for businesses, which makes forecasting and planning labour-intensive. Local legislation, traceability, and customs clearance all have a big impact on the expansion of cross-border e-commerce. Global logistics imports and exports are influenced by trade infrastructure, taxation, government regulations, inadequate road systems, electricity, and corruption.

In addition, high currency rates that drive up transaction costs and exacerbate trust and security issues are among the global logistics disruptions impacting Nigerian cross-border e-commerce. Nigerian cross-border e-commerce and global supplier chains encounter difficulties with trade sustainability and coordination. Successful business practices and good stakeholder participation will greatly reduce a number of issues and enhance cross-border e-commerce imports. Cross-border e-commerce businesses need to make investments in compliance and logistics, work with customs officers and other authorities to ensure smooth operations, and prevent logistics disruptions. Fast and secure logistics delivery is essential for cross-border e-commerce growth and competition, necessitating efficient logistics; this would help to improve delivery times. Companies and other stakeholders must educate themselves on the legal frameworks and rules governing target markets and secure certifications or trustmarks as evidence of their dedication to security and customer safety. It is evident that taking care of security concerns will enhance the exchange and transfer of information.

Stakeholders are responsible for ensuring effective logistics integration, cost control, and information flow. These are essential for effective global logistics management in order to guarantee that cross-border e-commerce transactions support global trade and economic development. The right policies and regulations must strike a balance between business growth and consumer protection, and choosing a warehouse location is essential for smooth global logistics. Effective information flow would help minimise a variety of potential disruptions in the dynamic sector of global logistics, which are essential for cross-border e-commerce and economic growth.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

CONSENT

As per international standards or university standards, Participants' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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