

The Impact of Trade Openness on Logistics Performance in Africa

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Abstract

This study examines the impact of trade openness (TO) on logistics performance across 43 African countries from 2007 to 2020. Using the fixed effects estimation technique, the study evaluates how TO, technological innovation (INN), industrialization (IND), political stability (POLS), and economic growth (EG) influence logistics performance, measured by the Logistics Performance Index (LPI). The findings reveal that TO has a negative effect on logistics performance, while IND and POLS also negatively impact LPI. However, INN shows a positive but statistically insignificant relationship and EG has a significant negative effect. These findings highlight the complexities of logistics performance in Africa, emphasizing the need for policy reforms that address challenges in trade logistics, IND, and governance to enhance overall logistics efficiency and economic integration in the region. The study contributes to the literature on trade and logistics in developing economies.

Categories: Logistics Management, Trade and economic development

Keywords: trade openness, logistics performance, africa, fixed effects, technological innovation

Introduction

Trade openness (TO) has long been considered a crucial engine for economic growth (EG) and development, especially in regions like Africa, where access to international markets, technology, and capital is essential for economic transformation [1,2]. As African economies strive to diversify from resource dependency and integrate more deeply into global value chains, the role of trade becomes even more pronounced [3]. TO involves reducing tariffs, eliminating non-tariff barriers, and facilitating the free movement of goods, services, and capital across borders, which can accelerate industrialization (IND), boost export diversification, and promote knowledge transfer. However, the degree to which TO translates into sustainable EG hinges on the capacity of countries to efficiently manage the flow of goods through robust logistics systems [4].

Africa's economic landscape is undergoing a major transformation, in large part due to the African Continental Free Trade Area (AfCFTA). The AfCFTA is one of the most ambitious trade agreements ever implemented, with the goal of fostering greater intra-African trade by reducing tariffs on 90% of goods and removing various trade barriers across the continent and reducing extreme poverty [5]. The agreement has the potential to significantly enhance Africa's trade competitiveness and create a single continental market for goods and services, thereby promoting EG and deeper integration with global markets. Through AfCFTA, African countries can position themselves to benefit from economies of scale, increase investments, and develop regional value chains [6]. Additionally, it offers an opportunity for African nations to build more resilient economies by reducing their dependence on volatile global commodity markets and increasing their participation in global supply chains.

However, TO alone, even in the context of AfCFTA, is not enough to guarantee the successful integration of African economies into the global marketplace. A critical determinant of whether trade liberalization efforts will yield the expected benefits is the efficiency of logistics performance across the continent. This is because logistics performance, which encompasses transportation infrastructure, customs procedures, and the reliability of supply chains, plays a central role in determining the cost, speed, and reliability of trade [7]. In regions with poor logistics, the gains from TO can be significantly diminished, as high transportation costs, delays, and inefficiencies in moving goods across borders erode competitiveness. Therefore, a thorough understanding of how TO interacts with logistics performance is crucial for maximizing the economic potential of increased trade integration [8].

In Africa, logistics performance is particularly relevant due to the continent's unique infrastructural and institutional challenges. Many African countries suffer from inadequate transport networks, congested ports, and inefficient customs operations, all of which contribute to high trade costs and slow delivery times [9]. These logistics challenges are further compounded by a lack of coordination between countries, poor regulatory frameworks, and limited private sector involvement in developing and managing logistics infrastructure. As a result, Africa's logistics performance ranks behind other regions, which severely

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hampers its ability to compete globally. The continent's landlocked countries, in particular, face significant hurdles in accessing international markets due to poor connectivity and dependence on neighboring coastal countries for access to ports.

The need to enhance logistics performance in the context of increasing TO is, therefore, a pressing issue for Africa. Improving logistics systems is essential for translating the opportunities provided by trade agreements like AfCFTA into real economic benefits [10]. Without efficient logistics, African businesses and industries may struggle to compete globally, missing out on the advantages of open markets and reduced trade barriers. Furthermore, enhancing logistics performance is not only critical for export competitiveness but also for attracting foreign direct investment, which often depends on the quality of a country's infrastructure and ease of doing business [11,12].

Given the critical role logistics plays in enabling the success of TO, it is surprising that the dynamic relationship between these two factors has received limited attention in the African context. While existing research on trade liberalization predominantly focuses on its broader economic impacts, such as gross domestic product (GDP) growth and export performance [13-18], the pivotal role of logistics performance as a catalyst for these outcomes remains underexplored. Furthermore, while some studies have examined the influence of logistics performance on trade growth [9,19-21], the reverse impact, specifically how TO drives improvements in logistics performance, has not been sufficiently addressed. This study, therefore, seeks to shift the narrative by investigating the impact of TO on logistics performance in Africa, arguing that enhancing trade can serve as a powerful lever for improving logistics efficiency. By situating this investigation within the unique infrastructural and institutional challenges of developing regions, the study underscores the urgency of understanding and addressing this nexus. To the best of the researchers' knowledge, this represents a pioneering effort to examine the TO-logistics performance relationship using a broader sample of African countries, thereby addressing a critical gap in the literature. From a policy perspective, the findings are anticipated to provide actionable insights for African governments and regional bodies such as the African Union and the AfCFTA Secretariat, advocating for targeted policies that leverage TO to drive logistics efficiency. Such measures have the potential to unlock wider economic benefits, including enhanced trade competitiveness, job creation, poverty alleviation, and IND, reinforcing the centrality of logistics in Africa's economic transformation agenda.

Literature review

Theoretical Background

Institutional theory provides a valuable lens for examining the relationship between TO and logistical performance, emphasizing the significance of formal and informal institutions such as regulatory frameworks, customs systems, and government policies [22]. In Africa, where logistics systems are frequently weak, institutional quality is critical in deciding how successfully TO translates into improved logistics [20]. As African economies become more involved in global commerce, competent institutions become crucial in controlling the movement of goods across borders, ensuring that trade procedures are efficient, predictable, and aligned with international standards [23]. The quality of regulatory institutions, particularly those that oversee customs and border control, significantly impacts logistics performance in an open trade economy [9]. Countries with strong customs authority and transparent trade regulations enjoy faster clearing processes, lower costs, and fewer bureaucratic delays, allowing them to reap the full benefits of economic openness [24]. Countries with weak institutions, on the other hand, confront major logistics bottlenecks because inefficient or corrupt activities at border crossings can hamper the smooth transit of goods, resulting in higher transaction costs and delivery delays [25]. Thus, institutional theory emphasizes that while TO may increase the number and complexity of commodities sold, its positive influence on logistics depends on the quality of a country's regulatory systems [26]. Governance quality and institutional stability are equally important in determining logistical performance. Stable political settings and sound governance frameworks facilitate the establishment of efficient logistical networks. In contrast, bad governance and institutional instability create uncertainty, making it difficult for countries to attract investments in logistical infrastructure or successfully manage trade flows [27]. To fully profit from TO, African countries must implement strong governance frameworks that safeguard investments, enforce trade regulations, and support infrastructure development to improve logistics performance [28]. In addition to political and regulatory concerns, institutional theory emphasizes the necessity for African countries' logistics systems to meet global standards. As TO reveals flaws in existing logistics systems, African countries face increasing pressure to update their infrastructure and implement best practices to remain competitive in the global market [29,30]. Mimetic isomorphism, a notion in institutional theory, implies that less developed nations frequently replicate the logistics practices of more sophisticated economies to enhance their trade outcomes. This adaption process may include adopting international logistics standards, such as ISO certifications, modernizing transportation networks, and improving digital capabilities for tracking and tracing shipments [31]. However, institutional theory recognizes the issues posed by poor institutions, particularly in developing nations where corruption, a lack of transparency, and ineffective regulatory frameworks can impair logistical performance [32]. In many African countries, institutional inefficiencies might erode the potential benefits of commercial openness.

Corrupt customs methods, for example, might lead to greater transaction costs, unpredictability in shipping schedules, and unnecessary delays [33]. This emphasizes the significance of anti-corruption measures and institutional reforms in ensuring that TO leads to real gains in logistical performance. Institutional theory offers a comprehensive framework for investigating how TO affects Africa's logistics performance. It highlights the significance of strong, adaptive institutions in reaping the benefits of free trade [34]. Countries that invest in regulatory reform, increase governance, and align their logistics systems with global standards will be better positioned to improve their logistics performance in the face of trade liberalization [28]. In contrast, weak institutions riddled with corruption and inefficiency can stifle prosperity, underlining the significance of institutional strengthening and capacity building across the continent [35].

Empirical literature

Determinants of Logistics Performance

Globalization necessitates efficient product and service delivery, as well as efficient logistics management in all linked activities. Logistics has gained a lot of attention in recent decades as a result of major changes in the global economy and greater competitiveness [36]. Global economic integration and company globalization help to shape international logistics systems and supply chains in international marketplaces [37]. Göçer et al. [38] claim that logistics is a key component of national attraction. High-quality logistics management and infrastructure promote a country's development. The infrastructure promotes the effective and comfortable movement of goods, as well as a country's inclusion into global supply chains [39]. A country's transport infrastructure promotes the quality of its logistics system, and improving the quality of transport infrastructure benefits national economies as well. All of these facts point to the importance of governments spending more on transport infrastructure to improve both logistical performance and EG. Countries are upgrading their commercial connections and logistics [40]. One of the most important aspects of achieving long-term EG is a well-functioning logistics infrastructure. Countries with high logistical costs lag in international competitiveness [41]. According to a recent analysis by the International Industry Analysis Research and Consulting Group, the worldwide logistics industry was about \$5,000 billion in 2019. It is expected to reach \$6,537 billion by 2025, expanding at a compound yearly growth rate of 4.7% between 2020 and 2025. Many people assume that the logistics market accounts for about 12% of global GDP [42]. This rate may, of course, vary per country. Some estimate that the logistics industry accounts for up to 10% of GDP in a given year in the United States; however, in a developing country such as Turkey, the logistics industry's share of GDP was 9% in the first decade of the 2000s, but it fell to 8.1% between 2011 and 2018 [43].

The Logistics Performance Index (LPI), developed in 2007 to quantify nations' logistics performance, is a highly helpful and dependable benchmarking tool [5,44]. The LPI and its indicators are calculated using data from a global survey of companies responsible for freight transportation and global trade facilitation (i.e., multinational freight forwarders and major express carriers), as well as professional experience and knowledge [45]. The LPI assesses nations' overall logistics effectiveness across six important parameters based on feedback from professional managers who evaluate the logistics performance of the countries with whom they conduct commerce [36]. The first dimension is the efficiency of customs and border management clearance, which evaluates the effectiveness of individual customs procedures based on speed, simplicity, and predictability. Another important consideration is the quality of a country's transport and information technology infrastructure, which is required for seamless commerce. The ease of arranging competitively priced overseas shipments is also assessed, indicating how well a country can organize international shipments at reasonable costs, demonstrating its integration into global trade networks. Furthermore, the competency and quality of logistics services are assessed, which assesses the ability of local logistics services to efficiently handle supply chain operations. The LPI also assesses the ability to track and trace consignments, with a focus on how well shipments are tracked along the supply chain to ensure transparency and reliability. Finally, shipping timeliness in reaching consignees is an important aspect, as is the frequency with which shipments arrive within the specified delivery time, which is vital for retaining a competitive edge in trade [46-48]. The LPI helps national leaders and private sector traders understand the issues that they and their trading partners encounter when decreasing logistical barriers to international trade [20]. As a result, recognizing the LPI's propellants is critical for all of these elements to formulate better policies, establish effective strategies, and improve or preserve their country's present logistics performance. Better resource utilization and optimization of logistics performance by correctly setting driver levels have a significant impact on the industry and humanity as they result in lower medium to long-term costs and lead times, as well as increased customer satisfaction.

The Impact of TO on Logistics Performance

TO, or the level of economic engagement in global markets, is an important factor in determining a country's logistical success. TO entails eliminating international trade barriers, such as tariffs and quotas, and facilitating more fluid cross-border exchanges. As countries' economies open up to global markets, their logistical infrastructure, services, and policies must evolve to handle the growing flow of products and services [49]. TO generally improves logistics performance by increasing the need for efficient supply

chain systems. When a country becomes more open to commerce, it faces higher volumes of imports and exports, putting strain on logistics infrastructure and services to keep up [50]. According to Aboul-Dahab [46], countries that engage in greater international trade frequently invest in improved infrastructure, such as highways, ports, and customs facilities, to accommodate increased trade flows. This leads to better logistics performance, as efficient infrastructure is essential for the timely and cost-effective flow of goods. TO frequently encourages regulatory measures that increase logistics efficiency. In response to rising trade, governments may streamline customs operations, implement new technology, and remove administrative bottlenecks [51]. Trade liberalization stimulates the use of contemporary customs-clearing technologies, which improve border administration efficiency while also reducing the time and costs involved with international shipping. These improve a country's overall logistical performance, increasing its competitiveness in global markets [52]. TO, along with infrastructure and policy improvements, has a favorable impact on the development of logistics services. To accommodate the increased demand for international trade, an open economy requires high-quality logistics services [53]. Marti et al. [40] discovered that nations with higher TO tend to develop advanced logistics services, including warehousing, freight forwarding, and transportation to support global supply chains. These services are critical for ensuring that commodities travel smoothly across borders and hence improve logistical performance. A country's geographical factors also have an impact on TO and logistical success. Landlocked countries, for example, frequently have particular hurdles in reaching global markets because they lack direct access to seaports. Asubonteng et al. [54] discovered that landlocked countries must invest extensively in regional infrastructure and partner with neighboring countries to overcome logistical constraints. These countries may find that TO alone is insufficient to improve logistics performance; instead, strategic collaborations and investments in cross-border logistics networks are required. TO improves logistics performance by promoting infrastructure development, regulatory reforms, and service enhancements. However, the magnitude of this impact is determined by a country's current logistics capabilities, geographic factors, and complementary policies [55]. Countries that actively engage in logistics infrastructure and services are better positioned to benefit from TO, whereas those with weak systems may encounter difficulty in handling larger trade volumes [56].

Research Method

Sources of data

The study draws on data from 43 African countries, covering the period between 2007 and 2020. These countries and the study period were selected based on the availability of reliable data, ensuring consistency and comparability across the sample. Additionally, the period between 2007 and 2020 encapsulates significant developments in Africa's TO, including the increasing momentum toward regional integration, the implementation of the AfCFTA, and improvements in infrastructure in many African countries. The primary source of the data used in this research is the World Development Indicators, a comprehensive database provided by the World Bank.

Description of variables

Dependent Variable

The dependent variable in this study is logistics performance, which is measured using the LPI, an indicator developed by the World Bank. The LPI assesses the efficiency of logistics services in different countries by considering six core components: "customs performance, infrastructure quality, international shipment ease, logistics competence, tracking and tracing abilities, and timeliness of deliveries." This index provides a comprehensive measure of a country's logistics capabilities and is particularly useful for examining the performance of logistics systems in Africa, where challenges related to infrastructure, customs procedures, and transportation networks are prevalent.

Independent Variables

The key independent variable in this study is TO, which is quantified as "the sum of a country's exports and imports, expressed as a percentage of its gross domestic product (GDP)." Higher levels of TO generally indicate greater participation in global trade, which can have significant implications for logistics performance, as increased trade volumes typically require more efficient transportation, customs, and supply chain management.

The study incorporates several control variables that may influence logistics performance. These include technological innovation (INN), IND, political stability (POLS), and EG. INN is captured through the number of patent applications, representing the volume of inventions and innovations within a country. IND is measured by manufacturing value added (% of GDP). This variable reflects the level of industrial activity within an economy, which is closely linked to logistics performance, as higher levels of IND typically necessitate more sophisticated logistics infrastructure to support the movement of raw materials and finished goods. POLS is proxied using the World Bank's POLS estimate. POLS is an essential factor in logistics, as unstable political environments can disrupt supply chains, increase risks associated with

transportation, and deter investment in infrastructure. EG, measured by GDP growth (annual percentage), is included to account for the general level of economic activity within a country.

Analytical Framework

The analytical framework for this study is depicted in Figure 1. This outlines the relationships between the dependent variable (logistics performance), the independent variable (TO), and control variables (INN, IND, POLS, and EG). This framework illustrates how TO influences logistics performance in Africa, while accounting for the confounding effects of the control variables.

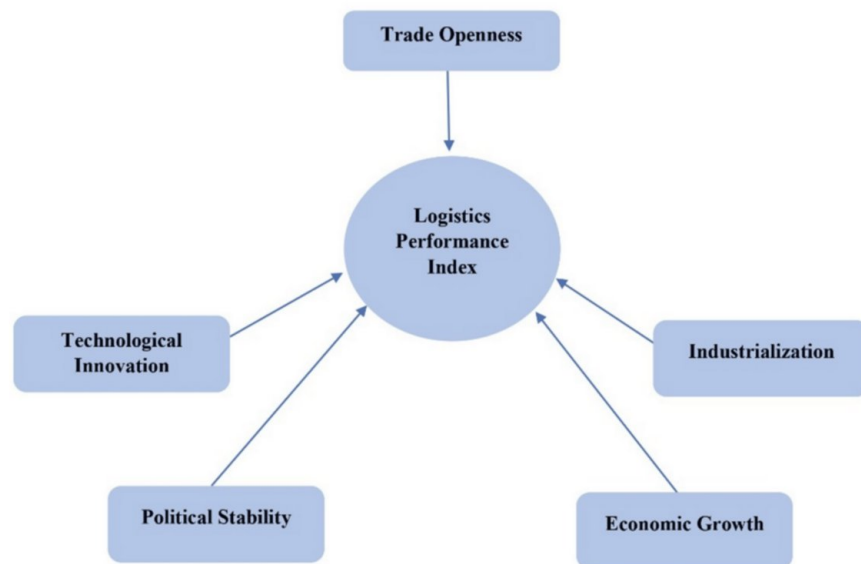


FIGURE 1: Analytical Framework

Model Specification

To estimate the impact of TO on logistics performance while controlling for the influence of other relevant factors, the empirical model can be expressed as:

$$LPI_{it} = \alpha_0 + \beta_1 TO_{it} + \beta_2 INN_{it} + \beta_3 IND_{it} + \beta_4 POLS_{it} + \beta_5 EG_{it} + \varepsilon_{it} \dots \quad (1)$$

Where LPI_{it} is logistics performance for country i at time t , representing the overall logistics efficiency. TO stands for trade openness, the main independent variable, while INN represents technological innovation, and IND reflects industrialization. POLS captures political stability, and EG represents economic growth. The model also includes a constant term α and an error term ε , which accounts for other unobserved factors influencing logistics performance.

Analytical Technique

The study employs both fixed effects (FE) and random effects (RE) models to analyze the relationship between TO and logistics performance. The FE model controls for time-invariant characteristics specific to each country, allowing the analysis to focus on within-country variations over time. This approach effectively mitigates omitted variable bias arising from unobservable factors that may differ between countries but remain constant throughout the study period [57,58].

On the other hand, the RE model assumes that the individual effects are uncorrelated with the explanatory variables. This assumption enables the inclusion of both time-varying and time-invariant factors in the analysis, thus providing a more comprehensive view of how TO, INN, IND, POLS, and EG influence logistics performance. If the assumption of no correlation holds, the RE model offers more efficient estimates than the FE model [59].

To determine which model is more appropriate for this analysis, the Hausman test is employed. This test evaluates whether the unique individual effects are correlated with the explanatory variables. Specifically,

the null hypothesis states that the RE model is suitable for the data. If the Hausman test yields a significant result (less than 5%), it indicates that the FE model is more appropriate, as the RE estimates would be biased and inconsistent due to the correlation between individual effects and explanatory variables [60].

Results

Descriptive statistics

The descriptive statistics in Table 1 provide a summary of the variables used in the study. The LPI has a mean of 2.4798, indicating moderate logistics performance across the sampled African countries, with a relatively narrow spread (standard deviation of 0.3452) around the mean. TO has a mean value of 66.9840, indicating that, on average, trade constitutes a significant portion of GDP, but it also displays wide variability, highlighting substantial differences in trade integration among the countries. INN shows significant variability, with a mean of 903.2737 and a very high standard deviation of 2047.5290, suggesting that while some countries have high levels of patent applications, others have very low innovation activity. IND has a mean of 11.7183, showing moderate manufacturing activity as a percentage of GDP, but again with notable variability (standard deviation of 6.6011). POLS has a negative mean of -0.6387, indicating a general lack of POLS across the countries, though some countries experience positive stability (maximum of 1.2010). Lastly, EG shows a mean of 3.6871, reflecting modest annual GDP growth on average, but the range is vast, with a minimum of -46.0821 and a maximum of 21.4521, indicating significant fluctuations in EG across the countries.

	LPI	TO	INN	IND	POLS	EG
Mean	2.4798	66.9840	903.2737	11.7183	-0.6387	3.6871
Median	2.4500	58.4918	52.5000	10.4358	-0.4977	4.2655
Maximum	3.7753	170.7599	10960.00	48.9548	1.2010	21.4521
Minimum	1.6100	0.7569	2.0000	1.5326	-2.6992	-46.0821
SD	0.3452	31.3315	2047.5290	6.6011	0.8359	5.1731

TABLE 1: Descriptive Statistics

LPI, Logistics Performance Index; TO, trade openness; INN, technological innovation; IND, industrialization; POLS, political stability; EG, economic growth

Correlation and variance inflation factor analysis

The correlation and variance inflation factor (VIF) analysis presented in Table 2 depict the relationships among the independent variables in the study and check for multicollinearity issues. In terms of correlations, TO is moderately positively correlated with POLS, suggesting that more politically stable countries tend to have higher TO. However, TO has weak correlations with INN and EG, indicating minimal direct associations. Similarly, INN shows weak correlations with the other variables, with a notable negative relationship with EG (-0.1626), suggesting that higher patent applications might be associated with lower EG, though this relationship is weak. IND is weakly correlated with all other variables, with its highest negative correlation with POLS, implying a minimal inverse relationship. Overall, the low correlation values suggest minimal risk of multicollinearity from the correlation perspective. The VIF values support this, with all VIFs below the critical threshold of 10, indicating no serious multicollinearity issues. TO and POLS have the highest VIF values, 2.3337 and 2.2905, respectively, but these values are still well within acceptable limits. The tolerance values, which are the inverse of VIF, are also above 0.2, confirming that no variables are overly collinear with others. This suggests that the independent variables can be used together in the regression model without concerns about multicollinearity distorting the results.

	TO	INN	IND	POLS	EG	VIF	Tolerance
TO	1.0000	−0.1893	0.0111	0.6574	−0.0759	2.3337	0.4285
INN		1.0000	0.1628	−0.0026	−0.1626	1.2948	0.7723
IND			1.0000	−0.1656	−0.1410	1.2082	0.8277
POLS				1.0000	−0.0358	2.2905	0.4366
EG					1.0000	1.1544	0.8663

TABLE 2: Correlation and VIF Analysis
TO, trade openness; INN, technological innovation; IND, industrialization; POLS, political stability; EG, economic growth; VIF, Variance Inflation Factor

Regression results

The regression results in Table 3 show the impact of the explanatory factors on logistics performance. Based on the Hausman test results, the discussion of the study's findings is centered on the FE model, which is identified as the most appropriate estimation technique. From the model diagnostics, the FE model demonstrates a high explanatory power with an R^2 value of 0.8699, indicating that the independent variables explain around 87% of the variations in logistics performance within the sample countries.

In the FE model, TO is found to have a significant negative effect on logistics performance, with a coefficient of −0.0079 ($p < 0.01$), suggesting that increases in TO may adversely impact logistics systems unless accompanied by adequate infrastructure development. INN presents a positive effect on logistics performance, although this effect is statistically insignificant. Furthermore, IND reveals a significant negative effect, with a coefficient of −0.0227 ($p < 0.01$), indicating that heightened levels of industrial activity may strain logistics systems. POLS also demonstrates a significant negative impact, with a coefficient of −0.2366 ($p < 0.05$), suggesting that stable political environments do not necessarily lead to improvements in logistics infrastructure. Lastly, EG exhibits a significant negative relationship with logistics performance, evidenced by a coefficient of −0.0338 ($p < 0.05$).

Variables	Fixed Effects	Random Effects
TO	-0.0079*** (0.0027)	0.0014 (0.0017)
INN	0.0002 (0.0001)	0.0001*** 0.00003
IND	-0.0227*** (0.0081)	-0.0159*** 0.0057
POLS	-0.2366** (0.1106)	-0.0315 (0.056490)
EG	-0.0338** (0.0157)	-0.0269** (0.0114)
C	3.4068*** (0.2272)	2.7507*** (0.1647)
R^2	0.8699	0.2844
Adjusted R^2	0.7956	0.2257
Hausman test χ^2 [Prob. > χ^2]	31.2465 [0.0000]	
F-statistic	11.7036	4.8475
Prob(F-statistic)	0.0000	0.0008
Number of Countries	43	43

TABLE 3: Regression Results

TO, trade openness; INN, technological innovation; IND, industrialization; POLS, political stability; EG, economic growth

Discussion

The regression results reveal several significant insights into the factors influencing logistics performance in the sampled African countries. Notably, the finding that TO has a significant negative impact on logistics performance, despite expectations that increased trade should enhance logistics efficiency, raises critical concerns. This counterintuitive result suggests that the growth in trade volumes may not be matched by the necessary improvements in logistics infrastructure. As trade liberalization expands the flow of goods, countries that fail to develop their logistics systems concurrently may experience inefficiencies, bottlenecks, and strained capacity, ultimately hindering overall logistics performance. This highlights the importance of aligning trade policies with infrastructure investments to ensure that logistics systems can accommodate growing trade demands.

INN also plays a role in logistics performance, although its positive effect is statistically insignificant in this study. This finding may imply that while some countries exhibit high levels of patent activity, the translation of technological advancements into practical improvements in logistics efficiency is lacking. It may suggest that innovation alone is not sufficient; rather, effective implementation, integration into existing systems, and the development of a supportive ecosystem for innovation are crucial for realizing the benefits of technological advancements in logistics.

The negative relationship between IND and logistics performance further underscores the challenges faced by countries undergoing rapid industrial growth. The coefficient of -0.0227 ($p < 0.01$) indicates that increased manufacturing activity may overwhelm existing logistics frameworks, leading to decreased performance. This finding underscores the necessity for a parallel focus on logistics development as countries industrialize. Without sufficient infrastructure and capacity to support increased production and distribution activities, countries may encounter significant supply chain disruptions and inefficiencies.

POLS and EG reveal surprising negative effects on logistics performance, raising important questions about the mechanisms underlying these relationships. The significant negative coefficient for POLS (-0.2366 , $p < 0.05$) suggests that while stable governance is typically associated with favorable economic outcomes, it does not automatically lead to improvements in logistics systems. One plausible explanation is that in stable political environments, the urgency to invest in logistics infrastructure may diminish, particularly when immediate trade or industrial bottlenecks are absent. This complacency could result in underinvestment in critical infrastructure, diverting resources to other sectors perceived as more pressing or politically advantageous. Additionally, stable environments may prioritize long-term strategic goals over immediate operational enhancements in logistics. The finding is incongruent with the institutional theory, which posits that stable political environments foster infrastructure development and EG.

The negative impact of EG (-0.0338 , $p < 0.05$) also challenges conventional expectations, implying that GDP growth may not translate uniformly into logistics performance improvements. This disconnect could arise if EG is driven by non-logistics-intensive sectors, such as extractive industries or agriculture, where robust logistics networks are less critical. Furthermore, the pace of economic expansion may outstrip infrastructure development, leading to inefficiencies in the logistics sector. Another possibility is that growth-oriented policies may prioritize macroeconomic indicators over sectoral improvements, resulting in logistics systems that lag behind the broader economy.

Conclusions

This study examined the impact of TO on logistics performance in 43 African countries between 2007 and 2020, controlling for other key factors including INN, IND, POLS, and EG. Using FE, based on the Hausman test results, the study found that TO and IND negatively impacted logistics performance, suggesting that increased trade and industrial activities may strain existing logistics infrastructure. POLS and EG also had negative effects, while INN showed a positive but insignificant relationship.

Given these findings, the study presents key policy and managerial recommendations. First, while TO is essential for economic integration, policymakers and logistics managers should focus on improving logistics infrastructure to accommodate the increasing volume of trade. Investments in transportation networks, customs efficiency, and technological upgrades are crucial to ensure that trade activities translate into better logistics performance. For managers, this entails prioritizing operational efficiencies, such as streamlining customs procedures and adopting cost-effective technology solutions to optimize supply chain processes. Governments should also foster public-private partnerships to mobilize resources and expertise for the development of logistics systems. These partnerships can empower logistics firms to scale operations, upgrade equipment, and train personnel for emerging trade demands.

Additionally, the negative impact of IND on logistics performance suggests that the rapid growth of the industrial sector may be outpacing logistics capacity. Managers in the industrial and logistics sectors must collaborate to align industrial policy with logistics development strategies. This includes improving the connectivity of manufacturing hubs to transport networks and optimizing supply chain management processes to reduce bottlenecks. A more integrated approach, combining industrial planning with robust logistics systems, would ensure that industrial growth is adequately supported.

Moreover, governments in Africa must prioritize creating stable political environments to foster consistent and reliable logistics operations. Reducing political risk through effective governance, conflict resolution mechanisms, and promoting transparency will help mitigate disruptions in logistics and trade activities. Finally, while INN did not have a significant effect in this study, it remains a vital component for modernizing logistics systems. Policymakers can support these efforts by promoting research and development in INN, offering incentives for technology adoption, and creating an enabling environment for digital transformation. These combined efforts would lead to long-term improvements in logistics infrastructure, enabling African countries and businesses to better integrate into global supply chains.

This study opens several avenues for further research to deepen the understanding of logistics performance in Africa. Future research could investigate how significant global and regional shocks, such as the global financial crisis and the COVID-19 pandemic, have influenced trade and logistics performance across African countries. These events likely disrupted supply chains, altered trade flows, and reshaped logistics priorities, and understanding their long-term impacts could provide valuable insights into building resilient logistics systems. Another area that warrants further exploration is the relationship between environmental sustainability and logistics performance. With growing global emphasis on green logistics and sustainability, future studies could examine how African countries are adapting their logistics systems to meet environmental standards. Research could focus on how green logistics initiatives, such as reducing carbon emissions, optimizing energy use, and implementing sustainable packaging and transportation practices, impact logistics performance. Another potential area for future research is to explore the role of digitalization in logistics. While INN was examined in this study, the broader scope of digitalization, including the adoption of e-commerce platforms, digital supply chains, and automation in logistics, remains relatively underexplored.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Mubarik Abdul Mumin, Ibrahim Nandom Yakubu

Acquisition, analysis, or interpretation of data: Mubarik Abdul Mumin, Ibrahim Nandom Yakubu

Drafting of the manuscript: Mubarik Abdul Mumin, Ibrahim Nandom Yakubu

Critical review of the manuscript for important intellectual content: Mubarik Abdul Mumin, Ibrahim Nandom Yakubu

Disclosures

Human subjects: All authors have confirmed that this study did not involve human participants or tissue.

Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue.

Conflicts of interest: In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** As a member of the editorial board of Cureus Journal of Business and Economics, I will recuse myself from the editorial process to avoid any potential conflicts of interest.

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