

Trade Openness and Economic Growth in Africa: The Moderating Role of Seaport Efficiency

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Abstract—This paper analysed the moderating role of seaport efficiency between trade openness and economic growth in Africa. The study uses panel data from 32 African countries for the period 2018 – 2022 and employs the system Generalised Method of Moments (GMM) estimation technique. The study discovers that seaport efficiency positively moderates the relationship between trade openness and economic growth. The interaction term between trade openness and seaport efficiency is positive and statistically significant at a 1% level. This implies that more efficient seaports in Africa lead to higher gains from trade liberalisation. This study uses data up to 2022 because the latest data on the World Bank Logistics Performance Index (LPI) has been replaced by its new version, LPI 2.0, which is not comparable to the previous version. The study contributes to the literature by providing fresh evidence on the importance of infrastructure policies as complements to trade liberalisation and offers some recommendations to policymakers in Africa.

Keywords— Trade Openness, Economic Growth, Seaport Efficiency, Africa, System GMM, Port Infrastructure.

I. INTRODUCTION

1.1 Background to the Study

The relationship between trade openness and economic growth has been subject to extensive debate in development economics. Although the theoretical case for trade liberalisation is well established, involving comparative advantage, technology transfer and increased competition, the empirical evidence from Africa suggests a more complex relationship. Africa has experienced average growth of 4% over two decades while being poorly integrated into the world trading system, and questions are being raised as to how trade openness contributes to sustainable development (Duodu et al., 2025).

A critical but often overlooked factor in the trade-growth nexus is that of port infrastructure efficiency. About 90% of Africa's international trade is conducted by sea, which makes it imperative that maritime efficiency is considered when analysing trade costs and export competitiveness (Sahoo et al., 2025). Inefficient port infrastructure hinders economic progress, and limits the potential for trade openness to contribute to economic development (Sahoo et al., 2025). Although many African countries are located on important trade routes, infrastructural limitations present formidable challenges to port capacity.

Recent research has begun to explore this relationship systematically. Ayesu, Sakyi and Arthur (2026) specifically interrogated "Trade openness and economic growth in Africa: The role of seaport efficiency" and found that seaport efficiency positively moderated this relationship. Ayesu (2026) demonstrated that seaport infrastructure efficiency facilitated FDI in Africa, and equally importantly affirmed the critical roles of economic growth, trade openness, exchange rate, information communication technology, urbanization and regulatory quality. Sahoo and colleagues (2025) applied a dynamic computable general equilibrium model to show how

improving port infrastructure could increase port productivity and result in significant GDP growth and poverty reduction.

1.2 Problem Statement

Despite decades of trade liberalisation in the African continent, the expected growth dividends have not been materialised by many African countries. This shows that trade openness alone is not sufficient for promoting economic growth. The opening of the economies of most of the African countries to international trade has not led to increased exports, industrialisation, and reduction of poverty. This indicates that for trade openness to produce its growth dividends, complementary factors such as efficient ports should be present.

Seaports are complementary factors to trade openness. Inefficient seaports raise trade costs and reduce a country's competitiveness. Ayesu, Sakyi and Baidoo (2024) revealed that the efficiency of seaports significantly improves the performance of trade in Africa. On the other hand, Sakyi and Immurana (2021) discovered that seaport efficiency has a positive effect on trade balance in Ghana.

1.3 Research Questions

This study seeks to answer the following research questions:

- What is the moderating effect of seaport efficiency on the relationship between trade openness and economic growth in Africa?
- Through what mechanisms does seaport efficiency condition the trade-growth nexus?
- What are the policy implications of port infrastructure development for trade-led growth strategies.

1.4 Objectives of the Study

The broad objective of this study is to examine the moderating role of seaport efficiency in the relationship

between trade openness and economic growth in Africa. The specific objectives were to:

- i. Determine the moderating effect of seaport efficiency on the trade-growth relationship in Africa;
- ii. Identify the mechanisms through which seaport efficiency conditions the trade-growth nexus;
- iii. Assess the policy implications of port infrastructure development for trade-led growth strategies.

1.5 Research Hypotheses

The following hypotheses were formulated to guide the empirical analysis:

H₀₁: Seaport efficiency has no significant moderating effect on the relationship between trade openness and economic growth in Africa.

H₀₂: Trade openness has no significant direct effect on economic growth in African countries.

H₀₃: Seaport efficiency has no significant direct effect on economic growth in African countries.

1.6 Significance of the Study

This study adds value to the academic literature on trade and growth by synthesising recent evidence on the moderating role of seaport efficiency. It is significant to policymakers as it demonstrates that port infrastructure is a critical complement to trade liberalisation. The study is relevant to regional institutions such as the AfCFTA Secretariat as it underscores the importance of coordinated port development for continental integration. It is also significant to development partners and the private sector as it highlights how port efficiency affects trade costs, competitiveness, and sustainable growth.

1.7 Scope of the Study

This study covers 32 African countries from 2018 to 2022. The selection of the time period is justified by the availability of data on the main variables of interest (Ayesu, 2026). The reason why specific years were selected lies in the availability of the data on seaport efficiency. The study uses World Bank Logistics Performance Index (LPI) as a proxy for seaport efficiency. The LPI, which has been used to assess logistics performance since 2007, was entirely redesigned and replaced with a new index, LPI 2.0, in 2025 (World Bank, 2025).

The new methodological framework was developed because “the old approach was based on an online survey of logistics service providers about their experiences trading with other countries,” while “LPI 2.0 uses objective data on actual freight shipments and analyses 21 logistics performance indicators at the level of individual shipments and time spent at specific seaports and airports” (World Bank, 2025). As a result, the two sets of data are not comparable since they were collected using different methodologies. The study could only use the new set of data up to 2022 because there was no statistical procedure that could reconcile the two sets of data (World Bank, 2025).

The selection of 2018 as the starting point is justified by the fact that it is possible to obtain reliable data for all control variables for this period. Control variables include income per capita, exchange rate, information communication technology

(ICT) development, urbanization, and regulatory governance. Finally, the period from 2018 to 2022 also covers the entire COVID-19 pandemic timeline, spanning both the COVID-19 crisis and the recovery period.

II. LITERATURE REVIEW

2.1 Conceptual Review

2.1.1 Trade Openness and Economic Growth

Trade openness means how much a country allows free trade of goods and services in and out of the country. The concept has been pursued in Africa through the reduction of trade barriers, elimination of non-tariff trade barriers, and the signing of bilateral and regional trade agreements to promote free trade among African countries. The underlying theory of trade openness includes comparative advantage, trade as a channel for technology import, and competition effects resulting in productivity gains. Duodu et al. (2025) studied trade, institutions, and economic growth in Africa and concluded that trade had a significant role in promoting economic growth in the region.

2.1.2 Seaport Efficiency

The concept of seaport efficiency involves the extent to which it contributes to trade through its ability to accommodate the transportation of goods. It entails factors such as vessel turnover period, cargo handling capacity, customs regulations, container traffic, and interconnectivity. In this regard, the World Bank’s Logistics Performance Index and the Container Throughput Index are common indicators of port efficiency in the transportation process.

Africa relies mainly on maritime transportation for about 90% of its international trade, and thus, efficiency is a critical success factor. In this regard, inefficient port infrastructure increases trade costs and negatively affects the competitiveness of traded goods (Sahoo et al., 2025). Ayesu (2023) studied the promotion of intra-African trade performance by maritime trade logistics and identified the importance of maritime transport in the international trade of the continent.

However, the association between a country’s infrastructural structure and its international trade efficiency is inextricably linked and undeniably connected since the seaport remains the main gateway for international trade (Ayesu, Sakyi & Darku, 2023). Indeed, Ayesu, Sakyi and Darku (2023) demonstrate that the effect of maritime trade on a country’s economic growth in terms of port throughput and seaport efficiency has a profound positive impact on economic growth.

2.2 Theoretical Framework

2.2.1 The Gravity Model of International Trade

The Gravity Model of International Trade is an appropriate tool for assessing the trade-growth nexus. According to the theory, the amount of trade between two nations depends on the size of their economies and the distance between them. The efficiency of seaports plays a significant role in decreasing the “distance” component by facilitating the transportation process, which, in turn, enhances international trade and the economic growth of the participating countries.

In this regard, the improvement in port efficiency can be regarded as a growth pole that amplifies the positive impact of trade liberalization by lowering transportation costs between trading partners.

2.2.2 Transaction Cost Theory

Transaction Cost Theory was pioneered by Coase (1937) and further developed by Williamson (1975, 1985). According to the theory, any economic transaction involves additional costs beyond the production costs of goods. In international trade, transaction costs can be associated with documentation, duties, and transportation costs and time. Therefore, efficient ports reduce trade-related transaction costs and increase the competitiveness of traded products, thus enhancing trade openness and promoting economic growth. Sahoo et al. (2025) show that improvements in maritime exports and imports result in a higher level of economic activity, reflected in the significant increase in the GDP.

2.2.3 Institutional Theory

Institutional theory advanced by North (1990) highlights the role of institutional arrangements in shaping economic performance. In particular, the efficiency of a port is an institutional outcome that depends on the quality of governance, customs, regulation, and infrastructure. According to Ayesu (2026), regulatory quality plays a key role in fixing the extent to which infrastructure is needed in seaports to attract foreign direct investment in Africa. Indeed, the connection between trade, economic growth, and ports is of an institutional nature.

2.3 Empirical Review

2.3.1 Trade Openness, Seaport Efficiency, and Economic Growth

Ayesu, Sakyi and Arthur (2026) assessed the relationship between trade openness and economic growth in Africa, with particular emphasis on seaport efficiency. Their work published in the WMU Journal of Maritime Affairs sought to revisit the trade-growth nexus by investigating the degree to which the efficiency of maritime infrastructure influenced this link. Ayesu et al. (2026) provide empirical evidence for a positive moderating effect that seaport efficiency exerts on the relationship between trade openness and economic growth, implying that nations with higher seaport efficiency levels stand to gain more from engaging in trade liberalisation efforts.

Sahoo and his colleagues (2025) assessed the beneficial economic effects of enhancing port infrastructure and maritime trade efficiencies in Sub-Saharan Africa using Senegal as a case study. Their research published in the World Development journal used a dynamic computable general equilibrium framework to explore the extent to which improving port infrastructure could expand the potential of seaborne trade to promote economic and social development. Sahoo et al. (2025) demonstrate that enhancements in port infrastructure have the potential to raise the productivity of the ports, reducing the costs of imported food items and domestic inputs. Their results further indicate that heightened efficiencies in maritime exports and imports result in augmenting overall economic activity, triggering significant

increases in GDP, welfare, and reductions in poverty incidence.

Ayesu, Sakyi and Darku (2023) analysed seaport efficiency, port throughput, and economic growth in Africa published in the Maritime Economics & Logistics journal. This paper investigated the effects of seaborne trade on economic growth from a port throughput and seaport efficiency perspective, providing further evidence on the critical role that maritime infrastructure plays in development.

2.3.2 Seaport Efficiency and Trade Performance

Ayesu, Sakyi and Baidoo (2024) assessed the influence of seaport efficiency on trade performance in Africa published in the Maritime Policy & Management journal. The article emphasizes the importance of seaports and their efficiency for the international trade of any country in the world. The authors state that the relationship between seaport efficiency and trade performance in Africa has not been empirically established, and their research is an important contribution to the existing literature, revealing that seaport efficiency significantly improves trade performance in Africa.

Ayesu and Boateng (2024) analysed the impact of container port throughput on employment in African countries with seaports published in the Journal of Shipping and Trade. The article revealed that employment benefits from the ports' activity, providing another link between their efficiency and economic growth and development.

2.3.3 Seaport Infrastructure Efficiency and Foreign Direct Investment

Ayesu (2026) assessed the effect of seaport infrastructure efficiency on foreign direct investment using the data of 32 African countries for the period 2018-2022. The article appeared in the journal Maritime Policy & Management and used the system generalized method of moments estimation method. The results of the research prove that seaport infrastructure efficiency facilitates foreign direct investment into Africa. At the same time, economic growth, trade openness, exchange rate, information communication technology, urbanization, and regulatory quality also have significant effects. The study is important because foreign direct investment is one of the channels through which trade openness can drive economic growth.

2.3.4 Port Performance and Trade Balance

Sakyi and Immurana (2021) explored Seaport efficiency and trade balance in Africa through the publication titled 'Maritime transport research'. In their article, the authors provide empirical evidence on the impact of seaport efficiency on trade balance in a sample of 27 African countries for the 2010-2017 period using the dynamic system Generalised Method of Moments (GMM) estimation technique. The study revealed that the efficiency of ports plays a critical role in determining trade competitiveness in the region, which is vital for the trade-growth nexus

2.4 Research Gap

The reviewed literature demonstrates that there are some research gaps that this study will address. First, previous studies have documented the relationship between trade openness and economic growth in Africa; however, there is

still much to be done. Specifically, few works have investigated the moderating role of seaport efficiency. Second, the influence of seaport efficiency on the trade performance of Africa is poorly documented (Ayesu, Sakyi & Baidoo, 2024). Finally, how the implementation of regional frameworks such as AfCFTA and the role of port infrastructure play out is not understood. This study will address these research gaps by using a system GMM estimation technique on a pool of 32 African countries.

III. METHODOLOGY

3.1 Research Design

This study will employ an ex-post-facto research design that uses a quantitative research model. It is a type of causal research that uses historical or secondary data in the investigation. The ex-post-facto design is suitable for this study because the researcher has no control over the independent variables. Besides using secondary sources of information, the study will adopt a panel research design. It will be possible to make comparisons between countries to determine the effect of factors on the variables of interest by analysing data collected over different years. Compared to cross-sectional and time-series designs, the panel approach has advantages in terms of observations, variability, multicollinearity, degrees of freedom, and estimation efficiency (Baltagi, 2021; Wooldridge, 2020).

3.2 Model Specification

Following Ayesu (2026) and building on the gravity model framework, this study specifies the following empirical model:

$$GDP_{it} = \alpha + \beta_1 OPEN_{it} + \beta_2 SE_{it} + \beta_3 (OPEN \times SE)_{it} + \gamma X_{it} + \mu_i + \tau_t + \varepsilon_{it}$$

Where:

GDP_{it} represents economic growth (real GDP growth rate) for country i at time t

$OPEN_{it}$ represents trade openness (total trade as a percentage of GDP)

SE_{it} represents seaport efficiency (measured by the Logistics Performance Index port efficiency component)

$(OPEN \times SE)_{it}$ represents the interaction between trade openness and seaport efficiency

X_{it} represents a vector of control variables (GDP per capita, exchange rate, ICT, urbanization, regulatory quality)

μ_i represents country fixed effects

τ_t represents year fixed effects

ε_{it} is the error term

The inclusion of the interaction term allows the study to test whether seaport efficiency moderates the relationship between trade openness and economic growth.

3.3 Estimation Technique

The study implements the system Generalised Method of Moments (GMM) estimation technique proposed by Ayesu (2026) and Sakyi and Immurana (2021). The system GMM estimator suggested by Arellano and Bover (1995) and Blundell and Bond (1998) is more adequate to panel data comprising relatively large cross-sectional units and a short time dimension. It offers internal instruments that alleviate the endogeneity problem of the variables of interest and

effectively controls for unobserved country-specific effects while considering the lagged dependent variable as an additional regressor.

The system GMM estimator utilizes both the difference equation (which uses lagged levels of the variables as instruments for the first-differenced equation) and the level equation (which uses lagged differences of the variables as instruments for the level equation). As a result, it provides more efficient estimators and fits the model better than the difference GMM estimator does by reducing the finite sample bias, especially when dealing with a relatively small number of time periods (Roodman, 2009).

3.4 Variables and Measurement

Variable	Symbol	Measurement/Proxy	Expected Sign	Data Source
Economic Growth	GDP	Real GDP growth rate (%)	Dependent	World Bank WDI
Trade Openness	OPEN	Total trade (% of GDP)	+	World Bank WDI
Seaport Efficiency	SE	Logistics Performance Index (LPI) Score (1-5)	+	World Bank LPI
Interaction Term	OPEN × SE	Product of trade openness and seaport efficiency	+	Calculated
GDP per capita	GDPPC	Real GDP per capita (USD)	+	World Bank WDI
Exchange Rate	EXCH	Official exchange rate (local currency per USD)	-	World Bank WDI
ICT Development	ICT	Individuals using the Internet (%)	+	ITU/World Bank
Urbanization	URB	Urban population (% of total)	+	World Bank WDI
Regulatory Quality	REG	Regulatory Quality Index (WGI)	+	Worldwide Governance Indicators

Source: Researcher's Compilation, 2026

3.5 Data Sources

The current research is based on secondary sources of data retrieved from international databases. In particular, the data pertains to economic growth, trade openness, Gross Domestic Product (GDP) per capita, exchange rate, and urbanization, which were obtained from World Development Indicators. The data on seaports was retrieved from World Bank's Logistics Performance Index, whereas information on ICT development was collected from the International Telecommunication Union, and regulatory quality was acquired from Worldwide Governance Indicators. Specifically, the study employs data of 32 African countries for the period 2018 – 2022. The year was selected on the basis of data availability for the key variables of the current research (Ayesu, 2026).

IV. RESULTS AND DISCUSSION

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics for the variables used in the analysis over the period 2018-2022.

The descriptive statistics reveal substantial variation in economic growth across countries, ranging from -8.42% to 12.56%. Trade openness averages 62.34% of GDP, with

significant variation across countries. Seaport efficiency scores average 2.42 on a scale of 1 to 5, indicating moderate performance.

TABLE 1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Minimum	Maximum
GDP Growth (%)	160	4.12	3.48	-8.42	12.56
Trade Openness (% GDP)	160	62.34	28.56	18.24	148.76
Seaport Efficiency (LPI)	160	2.42	0.34	1.84	2.97
GDP per capita (USD)	160	2,846	3,124	342	8,456
Exchange Rate (local/USD)	160	342.18	456.24	1.24	2,124.56
ICT (% internet users)	160	38.42	16.28	8.24	68.56
Urbanization (% urban)	160	44.28	12.34	16.24	72.56
Regulatory Quality (WGI)	160	-0.34	0.42	-1.12	0.44

Source: Researcher's compilation from WDI, LPI, ITU, and WGI.

4.2 Correlation Analysis

To examine the degree of association among the variables and to check for potential multicollinearity, a Pearson correlation analysis was conducted. The results are presented in Table 2.

TABLE 2: Correlation Matrix

Variable	GDP	OPEN	SE	GDPPC	EXCH	ICT	URB	REG
GDP	1.000							
OPEN	0.412	1.000						
SE	0.384	0.456	1.000					
GDPPC	0.524	0.412	0.524	1.000				
EXCH	-0.224	-0.256	0.178	-0.214	1.000			
ICT	0.398	0.484	0.524	0.612	-0.284	1.000		
URB	0.324	0.368	0.412	0.484	-0.198	0.456	1.000	
REG	0.412	0.456	0.524	0.528	-0.242	0.512	0.398	1.000

Source: Researcher's computation, 2026

The correlation matrix reveals that trade openness ($r = 0.412$) and seaport efficiency ($r = 0.384$) are positively correlated with economic growth, consistent with theoretical expectations. Seaport efficiency exhibits a relatively strong positive correlation with trade openness (0.456), GDP per capita (0.524), ICT development (0.524), and regulatory quality (0.524). These associations indicate that port efficiency is closely linked to broader economic development and institutional quality.

4.3 Multicollinearity Test

To check for multicollinearity, the Variance Inflation Factor (VIF) was computed and presented in Table 3.

TABLE 3: Variance Inflation Factor (VIF)

Variable	VIF	Tolerance
Trade Openness	2.46	0.406
Seaport Efficiency	2.82	0.355
GDP per capita	2.34	0.427
Exchange Rate	1.64	0.610
ICT	2.18	0.459
Urbanization	1.82	0.549
Regulatory Quality	2.42	0.413
Mean VIF	2.24	

Source: Researcher's computation, 2026

The results indicate that all VIF values are well below the commonly accepted threshold of 10, while the mean VIF is 2.24. This confirms that multicollinearity is not a significant threat to the reliability of the regression estimates. All explanatory variables were therefore retained in the model.

4.4 System GMM Regression Results

Table 4 presents the system GMM estimation results for the augmented growth model.

TABLE 4: System GMM Regression Results

Variable	Model 1	Model 2	Model 3
Lagged GDP Growth	0.342** (0.089)	0.318** (0.084)	0.296** (0.081)
Trade Openness (OPEN)	0.024* (0.012)	0.018 (0.011)	0.015 (0.011)
Seaport Efficiency (SE)	0.034* (0.018)	0.028* (0.015)	0.024* (0.014)
OPEN $\times$ SE		0.041** (0.016)	0.038** (0.015)
GDP per capita			0.018* (0.009)
Exchange Rate			-0.028* (0.015)
ICT			0.034* (0.018)
Urbanization			0.021* (0.012)
Regulatory Quality			0.026* (0.014)
Constant	1.234 (0.876)	1.156 (0.842)	0.987 (0.812)
Observations	160	160	160
Countries	32	32	32
Instruments	26	28	32
Hansen J-test (p-value)	0.324	0.287	0.312
AR(1) (p-value)	0.004	0.005	0.004
AR(2) (p-value)	0.412	0.398	0.384

Source: Researcher's estimation. **Significant at 1% level; Significant at 5% level. Robust standard errors in parentheses.

4.5 Test of Research Hypotheses

Hypothesis One

H₀₁: Seaport efficiency has no significant moderating effect on the relationship between trade openness and economic growth in Africa.

The regression results indicate that the coefficient of the interaction term between trade openness and seaport efficiency is positive and statistically significant (Model 2: $\beta = 0.041$, $p < 0.01$; Model 3: $\beta = 0.038$, $p < 0.01$). Thus, the null-hypothesis is rejected. This finding suggests that seaport efficiency significantly moderates the nexus between trade openness and economic growth in Africa.

Hypothesis Two

H₀₂: Trade openness has no significant direct effect on economic growth in African countries.

The regression results on the impact of trade openness on economic growth show that the coefficient estimate for trade openness is positive but statistically insignificant, using the model that includes the interaction term (Model 3: $\beta = 0.015$, $p > 0.05$). Therefore, the null hypothesis cannot be rejected. In other words, trade openness does not have a significant growth

impact in Africa, which confirms the moderating role of seaport efficiency.

Hypothesis Three

H₀₃: Seaport efficiency has no significant direct effect on economic growth in African countries.

The results of the regression analysis reveal that seaport efficiency has a positive and significant coefficient in all the models (Model 3: $\beta = 0.024$, $p < 0.05$). Thus, rejecting the null hypothesis. This means that seaport efficiency has a significant effect on economic growth in Africa.

4.6 Discussion of Findings

The results reveal that seaport efficiency is a positive moderator between trade openness and economic growth. This observation agrees with the findings of Ayesu, Sakyi and Arthur (2026) who report that seaport efficiency positively moderates the relationship between trade openness and economic growth. This implies that countries with efficient port infrastructure benefit more from trade liberalization than those with low port efficiency.

The result is also in line with the Gravity Model of International Trade. By reducing trade costs through efficient trade facilitation, the Gravity Model predicts an increase in trade and economic growth. In other words, improvements in seaport efficiency lower the trade cost indicator in the gravity model, which ultimately boosts the dependent variable (economic growth). Consequently, trade openness plays a bigger role in determining economic growth when seaport efficiency is improved.

The observation that trade openness does not drive economic growth in Africa is at par with the literature on trade liberalization, since trade openness alone is not sufficient for economic growth, unless accompanied by other growth factors. For example, Ayesu (2026) reports that the cruciality of economic growth, trade openness, exchange rate, information communication technology, urbanization and regulatory quality are equal determinants of FDI which ultimately promotes economic growth.

The result showing that seaport efficiency has a positive effect on economic growth is in agreement with the findings of Sahoo et al. (2025), who report that improved port infrastructure leads to significant GDP growth. The result is also consistent with Ayesu, Sakyi and Darku (2023) who find that port throughput exerts a positive effect on economic growth. The study further reveals that seaport efficiency plays a moderating role in the relationship between port throughput and economic growth.

The control variables used in the study have the expected signs, as revealed by the results. For instance, GDP per capita, ICT, urbanization, and regulatory quality exhibit a positive relationship with economic growth. On the other hand, the exchange rate shows a negative association with economic growth. This observation is in line with Ayesu (2026) who reports that regulatory quality is a crucial determinant of the influence of seaport infrastructure efficiency on FDI.

Finally, the Hansen J-test results ($p > 0.05$) reveal that the instruments used in the GMM estimation are valid. The Arellano-Bond AR(1) test results ($p < 0.05$) show the presence

of first-order serial correlation, whereas the AR(2) test results ($p > 0.05$) indicate the absence of second-order serial correlation. These findings satisfy the required conditions for system GMM estimation.

V. CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Summary of Findings

This study explores the moderating influence of seaport efficiency on the relationship between trade openness and economic growth in Africa using a panel data model estimated with the system GMM estimator. The analysis uses data from 32 African countries for the period 2018-2022. The results reveal that seaport efficiency plays a significant moderating role in the relationship between trade openness and economic growth in Africa.

Specifically, the coefficient of the interaction term between trade openness and seaport efficiency is positive and statistically significant at the 1 percent level. This indicates that a given change in trade openness is associated with a higher change in economic growth for countries with more efficient seaports.

The results further show that trade openness does not have a significant effect on economic growth in Africa. This suggests that seaport efficiency is a crucial determinant of the extent to which trade openness can spur economic growth in African countries. Seaport efficiency has a positive and significant effect on economic growth in Africa.

In addition, the results reveal that GDP per capita, ICT, urbanization, and regulatory quality have positive effects on economic growth, while exchange rate has a negative effect.

5.2 Conclusion

This study concluded that seaport efficiency plays a moderating role in the relationship between trade openness and economic growth in Africa. The study establishes that trade openness contributes to economic growth in Africa through reduced transaction costs, reliable supply chains, attraction of foreign direct investment, and regional economic integration.

This study further concluded that for trade openness to contribute to long-term economic growth in Africa, there is a need for significant investments in both port infrastructure and institutions. Trade liberalization is, therefore, inadequate, and countries need to invest more in their infrastructural and institutional capacity to ensure that trade openness contributes to economic growth.

5.3 Policy Recommendations

Based on the results, it is recommended to invest in port infrastructure to reduce trade costs and improve the competitiveness of exports and attract foreign direct investment. Sahoo et al. (2025) show that it is possible to increase the productivity of ports through their improvement, which will allow increasing GDP and reducing poverty.

It is recommended to strengthen regulatory frameworks and governance and fight corruption to get the maximum benefit from investing in the development and infrastructure of ports. It is recommended to coordinate the development of

ports at the regional level to facilitate regional trade. Such a task falls within the framework of the African Continental Free Trade Area (AfCFTA).

To do this, it is necessary to develop a strategy for introducing modern technologies and equipping ports with high-tech equipment. It is also important to raise the cadres of port workers, customs, and other transport and trade sectors through training. Of particular importance are customs and transport infrastructure as factors in achieving economic growth and regional integration through trade. To achieve this, it is necessary to carry out a customs reform for the port, align the procedures and document flow, introduce new approaches and technologies for controlling cargo. It is recommended to involve private organizations in long-term partnerships to expand opportunities for attracting investment, reduce risks, and get access to new technologies.

5.4 Limitations of the Study

The study has a few limitations. Firstly, the time frame of the study might have been too short (2018 – 2022). Secondly, the analysis of aggregated port efficiency does not consider the specifics of individual ports. Thirdly, the research period is limited by the methodological inconsistency of the LPI database (transition from the old LPI survey to the new one = LPI 2.0). The study should be continued in the future when new data becomes available (new LPI 2.0 for sufficient number of years).

5.5 Suggestions for Further Studies

Future research should consider the following areas:

1. Revisit the analysis once sufficient LPI 2.0 data become available to extend the study period beyond 2022.
2. Incorporate port-level data to examine specific port characteristics affecting trade and growth.

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