



# Impact of Export-Related Infrastructure Development on Nigeria's Economic Diversification

Dr. Ugwunna Ogochukwu Theresa

Chukwuemeka Odumegwu Ojukwu University (COOU), Igbariam Campus

Dr. Akamobi Obiageli Gloria

Chukwuemeka Odumegwu Ojukwu University (COOU), Igbariam Campus

Ejefobihi Ugochukwu Frank

Chukwuemeka Odumegwu Ojukwu University (COOU), Igbariam Campus

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## ABSTRACT

*This research assessed how the development of export-oriented infrastructure, including maritime ports, road traffic, and logistics efficiency, affects Nigeria's non-oil exports. The study uses a hybrid approach of Autoregressive Distributed Lag (ARDL) model and correlation analyses to assess how these infrastructure improvements compete with the existing non-oil export structure of Nigeria. The results indicate positive impacts for all three infrastructure components with non-oil export performance. Port infrastructure topped the list, followed by road transport and logistics efficiency. The analysis highlights the importance and impact of trade on economic development while focusing on the specific infrastructure components such as ports, roads, and smooth functioning logistics frameworks that facilitate market access, trade, and give coastal countries like Nigeria a competitive advantage over landlocked countries, thereby strengthening non-oil exports. These findings are in agreement with prior studies conducted which emphasize the need to incorporate infrastructural facilities to foster export-led growth and help diversify the Nigerian economy. Investment on these infrastructural areas would enhance the competitive position of Nigeria's non-oil exports and stimulate sustained economic growth. Suggested policy measures include concentrating on integrating infrastructure improvement, investment programs based on public-private partnerships, and logistics streamlining reforms into strategic frameworks. These measures will be fundamental to decreasing Nigeria's reliance on petroleum products and achieving better sustainable economic diversification.*

**Keywords:** *Export-related infrastructure, non-oil exports, port infrastructure, road transport, logistics efficiency, economic diversification.*

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## I. INTRODUCTION

Nigeria, Africa's largest economy, has long been dependent on oil exports as its primary source of revenue. According to the Central Bank of Nigeria (2020), oil exports account for over 80% of the foreign exchange revenue of Nigeria; this makes the country susceptible to changes in global oil prices. Therefore, there is active diversification in the economy by the Nigerian government to reduce dependence on oil to non-oil sectors such as agriculture, manufacturing, services (Akinbobola & Adebayo, 2018).

Equally important to this strategy of diversification is the creation of trade infrastructure since it aids in trade and market access. Export-related infrastructure includes systems that assist in the transport of goods from the production centers to the international markets. These systems comprise transport systems like roads, rail, port and airport, as well as storage and logistics service (Akinola, 2017). With regards to trade, Nigeria's competitiveness has soared with the adoption of new technological infrastructure however; non-oil exports are limited with regard to expansion potential (Okereke & Akinbode, 2019). There are still great strides required in this sector in Nigeria. Ebohon & Aigbovo (2016) state that infrastructure within the country, specifically in rural

contexts, and the logistics system is inefficient and increases business costs. These factors serve as a great impediment to the expansion of non-oil exports and thus, lead to stunted diversification attempts in Nigeria.

Policies such as the Economic Recovery and Growth Plan (ERGP) and the National Industrial Revolution Plan (NIRP) have attempted to close infrastructure gaps and foster the growth of non-oil export industries (Akinbobola & Adebayo, 2018). Still, there exists an untapped opportunity to leverage export infrastructure offered by Nigeria's export-related infrastructure. There is still a deep need for investment in strategic policies that aim to fill existing infrastructural gaps in Nigeria's economy (Ogunlela & Ayodele, 2017). This research analyzes the relationship between export-related infrastructure and Nigeria's economic diversification focusing mostly on non-oil exports like agriculture and manufacturing along with analyzing the challenges Nigeria encounters in formulating diversification-supporting infrastructure.

### **Problem Statement**

Oil exports continue to be the backbone of Nigeria's economy while providing a substantial share of its foreign exchange earnings and government revenue. Oil exports alone are estimated to provide over 80% of the foreign exchange earnings of Nigeria (Central Bank of Nigeria, 2020). This has created an economic dependency issue on the country's global oil price which makes the economy volatile during periods of low oil prices. Hence, the Nigerian government realized the need for economically diversification to ease the dependence on oil and to foster development in other industries like agriculture, manufacturing, as well as services (Akinbobola & Adebayo, 2018).

Despite the country's attempts towards achieving economic diversification, a lack of efficient export-related infrastructure has remained a challenge. The logistical and transport infrastructure is one of the most poorly developed in Nigeria. Nigeria's ports are often marked by congestion, delay, and high operational costs - factors detrimental to trade (Okereke & Akinbode, 2019). Also the poor road and rail transport networks escalate the cost of moving goods within the country and for export, which hampers the competitiveness of Nigeria's non-oil exports (Ebohon & Aigbovo, 2016). Such infrastructural shortcomings hinder the development of non-oil export industries which are important for achieving diversification goals set out for Nigeria.

Building export-related infrastructure is vital for increasing the efficiency of commerce, minimizing the cost of exporting goods, and improving the overall marketing of Nigerian products. Nonetheless, there appears to be a gap in empirical literature exploring the relation between infrastructure development and the ability for the country to diversify its economy with non-oil exports. The objective of this research is to understand the impact of infrastructure on the economic diversification of Nigeria by addressing this gap.

## **II. LITERATURE REVIEW**

### **Economic Diversification**

Economic diversification involves the process where an economy enhances its productive capacity by introducing new sectors or industries to the already existing ones, especially if these are less resource- or sector-dependent. It is critical for developing countries such as Nigeria, which has been heavily reliant on a single resource (oil), to adopt this strategy in order to sustain long-term development, mitigate exposure to external shocks, and maximize employment opportunities (Akinbobola & Adebayo, 2018). In this case, the target is to foster growth in agriculture, manufacturing, services, and technology in order to supplement the otherwise predominant oil industry in Nigeria. An economy that has many sources of income is often more resistant to the changing global marketplace and shifts in the economy (Okereke & Akinbode, 2019). From a strategic standpoint, diversification is also valuable as it opens additional avenues for economic growth, alleviates poverty, and fosters a more sustainable model (Akinola, 2017).

The shift in focus often requires the construction of new facilities such as roads and utilities, which are necessary for participating in trade competitively and enhancing business concentration (Ebohon & Aigbovo, 2016). These improvements in infrastructure, especially with regard to exports, are crucial in enhancing the availability of international non-oil markets. With regards to supporting trade competition, improvement in the logistics and transportation systems of Nigeria will greatly strengthen the competitiveness of the non-oil industries and assist the country in achieving its diversification objectives. It is necessary to have accompanying policies such as reforms in finance and regulation for economic diversification to succeed, as these policies can stimulate business activity in new sectors. Absent these complementary policies, attempts at diversification may be constrained because scattered attempts at financing, poor regulations, and low investor confidence may stagnate progress (Ogunlela & Ayodele, 2017).

Reductions in reliance on one or two economic activities, such as oil, mining, or agriculture, is achieved through developing new industries, and is termed as economic diversification (Hassan, 2019). This is a pivotal concept for regions that have a single sector focus as it reduces the risk on global price movements on commodities, and external shocks (Imran, 2020). As per the information available, economic diversification attempts to strengthen the economy's resilience by enhancing the ability to withstand external shocks, enabling long-lasting sustainable growth. While looking at the wider picture, by diversifying, economies are bound to increase their productivity, new employment avenues, sustain innovation, boost investment, and many more beyond traditional ones (Oluwatobi & Olusola, 2021). A pertinent example appears to be that of a country dependent on oil exports trying to expand by promoting manufacturing, technology, tourism, and service industries to minimize impacts of fluctuating oil prices (Khan & Qureshi, 2021).

### **Export-Related Infrastructure**

Export-related infrastructure is the systems, spatial and logistical, involved in the physical movement of goods from the agricultural area to an international market. These include transport infrastructures like the highways, railway stations, airports, seaports, ports, and storage facilities adjacent to the ports. Logistics also includes planning for and controlling shipping and delivery of goods. All export infrastructures aim at smoothing out access to world markets. Efficient export infrastructure reduces the cost and time involved in trade, improves competitiveness, and enhances access to global markets (Akinola, 2017). In the case of Nigeria, the role of export-related infrastructure is crucial to the diversification of the economy for the non-oil export promotion. The construction of adequately developed transport and logistics infrastructure improves road, port, and railway modernization, as well as other systems, can lower the level of inefficiency and speed up the cost of exporting goods (Ebohon & Aigbovo, 2016). For instance, in Nigeria, the inadequacy of port infrastructure has long been a challenge and has been a reason of high shipping costs, delay in ships and globally reduced competitiveness (Okereke & Akinbode, 2019).

Infrastructure is equally important as institutional and regulatory frameworks that govern international trade and logistics. Policies, rules, and customs practices may also be frameworks that are designed to facilitate trade, reduce administrative burdens, and maximize the efficiency of exports (Akinbobola & Adebayo, 2018). Enhanced factors of export infrastructure are especially vital for the agriculture, and manufacturing non-oil sectors which need active access to favorable trading aids in order to participate in international competition and sustain global standards. Furthermore, modern innovations in logistics and transportation, such as automated port operations and digital tracking, can vastly improve the efficiency of export infrastructure (Ogunlela & Ayodele, 2017). Thus, modernizing infrastructure not only enhances the systems in place, but also enables Nigeria to diversify its exports, lower trade expenses, and achieve sustained economic growth.

### **Theoretical Review**

Various approaches have tried to interrelate economic diversification with infrastructure development and this has resulted in different forms of conceptual models. Out of these approaches, some are more suitable for explaining how infrastructure can assist in the diversification of economies, especially developing ones, like Nigeria.

#### **1. The Theory of Economic Diversification**

The suggestions put forth in a theory of economic diversification argue that an economy that is heavily reliant on a single commodity or sector is likely to be vulnerable to global price shocks and demand shocks. In order to mitigate this kind of vulnerability, countries need to shift from a single economic base to a more complex framework by incorporating different sectors like agriculture, manufacturing and services (Akinbobola & Adebayo, 2018). This theory suggests that the more diversified an economy is, the better its level of stability since the economy will not solely rely on a single source of revenue. In the case of Nigeria, oil has been the primary source of revenue for a long time, but the fugitive nature of oil prices requires diversification (Ebohon & Aigbovo, 2016). Infrastructure development is one of the most important parts of this diversification method. Thus the construction of export-relevant infrastructure such as transport, logistics and storage systems can support the development of non-oil sectors by improving access to the markets and lowering the costs of trade, which increases the competitiveness of the country's non-oil exports (Akinola, 2017).

#### **2. The Infrastructure-Led Growth Theory**

The Infrastructure-Led Growth Theory (ILG) stresses that the development of new economic sectors is directly linked to the growth of a nation's infrastructure. Such focus on infrastructure, especially concerning communication, transport, and energy, increases productivity, enhances competitiveness in international and

domestic markets, reduces transaction costs, and improves overall market competitiveness (Okereke & Akinbode, 2019). In the case of Nigeria, properly exported-related infrastructure like the road networks, railways, and ports greatly impact the economy as they enhance trade efficiency, market access for non-oil industries, and overall economic diversification (Ogunlela & Ayodele, 2017). The theory posits that infrastructure development is at the core of economic diversification in most developing nations suffering from structural obstacles. Non-oil industries like agriculture and manufacturing are regionally and internationally diversified by enabling efficient export-related infrastructure (Ebohon & Aigbovo, 2016).

### **3. The New Growth Theory**

The New Growth Theory by economists like Paul Romer centers on the contribution of human capital, innovation, and infrastructure to economic growth. The New Growth Theory suggests that there is a need for sustained economic growth and development through investment in infrastructure and technology (Akinbobola & Adebayo, 2018). Investments in infrastructure development improve access to economic activities and also create the framework for long term growth by enhancing innovation and productivity in economic activities. For Nigeria, the New Growth Theory underscores the benefit of infrastructure for economic diversification. Investment in export-related infrastructure, including business logistics, transportation, and technology, allows businesses to innovate and improve their access to new markets. Therefore, the theory posits that there is a need for infrastructure development in Nigeria to diversify its oil dominated economy into an agriculturally and manufacturing-led economy (Okereke & Akinbode, 2019).

### **Empirical Review**

The association of infrastructure development with economic diversification has received attention in Nigeria as one of the many developing countries. This review, in particular, looks at the aspect of infrastructure Los Iguales refers to as “export infrastructure” and its contribution to the attempts made towards economic diversification in Nigeria. Several empirical studies highlight the importance of infrastructure in enhancing the competitiveness of non-oil exports in Nigeria. As Akinola (2017) has shown, infrastructure development significantly reduces the cost and time of exporting goods. Improvement in the transport system which includes the development of road and railway systems as well as ports, reduces the elapse of logistic costs making his non-oil exports more competitively priced in international markets. Also Akinbobola and Adebayo (2018) maintain that infrastructure development is vital towards stimulating the growth of the agricultural sector which is one of the non-oil export sectors of Nigeria. They argue that roads, port facilities, and storage facilities that have depended on efficient logistics systems are also important for the export of agricultural products. A study conducted by Okereke, Akinbode (2019) studied how the infrastructure affects the exports of Nigeria’s manufacturing sector. The inefficient infrastructure, particularly in transport and logistics, continues to stifle growth in non-oil exports even with Nigeria’s attempts at diversifying its economy. The expansion of rail and road networks is crucial for the growth of Nigeria’s manufacturing exports and economic diversification.

Ebohon and Aigbovo (2016) point to the inadequate export-related infrastructure in Nigeria which hampers economic diversification. Some of these problems include low-quality infrastructure, neglect of upkeep and maintenance, and lack of investment in strategically important infrastructure like ports, roads, and railways. Their study shows that these infrastructural inadequacies worsen the business environment by raising operational costs and decreasing the competitive edge of Nigerian goods in global markets. They contend that there is an urgent need for substantial investment in export-related infrastructure to ensure the non-oil export sectors flourish. In a different study, Ogunlela and Ayodele (2017) studied the effects of inadequate infrastructure on Nigeria’s manufacturing sector and attempts at reducing oil dependency, suggesting that outdated ports and inefficacious customs systems are barriers to international trade. In their case, these barriers increase the cost of exports. Comprehensive infrastructure reforms are necessary to further Nigeria’s diversification strategies.

With the aim of diversifying the economy, Nigeria has taken some steps to improve its infrastructure policies in response to the inadequate infrastructure challenge. One of such attempts is the Economic Recovery and Growth Plan (ERGP), whose focus is on investment in transport and logistics infrastructure (Akinbobola & Adebayo, 2018). The ERGP calls for modernization of the transport systems, enhancement of ports and expansion of the logistics network complete with infrastructure for supporting export non-oil. A report published by Akinola (2017) underscores that the policies hope to advance Nigeria’s export capacity assuming that the infrastructure development has proper investment and ongoing support to ensure the sustainability of the development. Furthermore, some of the studies have evaluated modern technology used in the transport and logistical infrastructure for export purposes as other ways of improving the Nigerian infrastructure related to export. Port and transport systems can be modernized through the integration of digital technologies, according

to Okereke and Akinbode (2019). Automated systems and digital means of tracking can aid in efficiency in the determination of clear customs, avoidance of delays and enhanced integrity in the process of export. Such improvements, once implemented, can greatly aid Nigeria diversify its economy beyond oil exports by increasing the competitiveness of non-oil exports.

Between 1970 and 2019, Unegbu and Ugwunna (2024) focused on the effects of importation of goods and its influence on the performance of the manufacturing sector in Nigeria. The study used Autoregressive Distributed Lag (ARDL) test in the analysis. Their findings indicate that the value Nigeria obtains from exported manufactured goods and the value added to the Nigerian economy is considerably lower than the worth of intermediate and capital goods imported into Nigeria during the given period. This result affirms the dependence theory which argues that, in the case of Nigeria, imported capital and intermediate goods lead to a significant reduction in the country's exports from the manufacturing sector. Equally, Ekesiobi, Maduka, Onwuteaka and Akamobi (2016) examined the impact of non-oil exports on the foreign reserve accounts of Nigeria. The study employed ordinary least squares (OLS) in the analysis. Instead, the result revealed a very high correlation between oil exports and the foreign reserve account of Nigeria.

### **Literature Gaps**

Based on the empirical literature reviewed, a number of gaps relevant to the development of export-related infrastructure and Nigeria's economic diversification are still unresolved. These gaps point toward their exploration or refinement that is needed to further augment understanding of the matter at hand. While many studies have investigated the link between infrastructure development and economic diversification, including non-oil exports in Nigeria, there is a notable lack of non-empirical research for the duration spanning from 2010 to 2023. Most of the reviewed studies, like Akinola (2017), and Okereke and Akinbode (2019), focus on earlier periods or do not adequately cover the timeframe of interest in this study. The period from 2010 to 2023 is particularly important as it includes several key policy frameworks like the Economic Recovery and Growth Plan (ERGP) and lots of infrastructural reforms aimed at supporting the economic diversification policies in Nigeria during this time that warrant thorough scrutiny.

The use of contemporary technologies in the development of export-related infrastructure remains understudied in the literature. In other cases, like that of Okereke and Akinbode (2019), the potency of digital technologies in improving logistical and transport systems is acknowledged, but there is little analysis on how these technological improvements, or lack thereof, from 2010 to 2023 have directly influenced the performance of non-oil exports. In analyzing Nigeria's economic diversification during this timeframe, this study will focus on the infrastructure and integrated technology components. Furthermore, other studies have dealt with the broader non-oil export infrastructure matrix on a macro level concentrating on ports, transport, and logistics without analyzing infrastructure components like transport systems, storage facilities, and digital logistics systems as export-related infrastructure and their synergy on Nigeria's economic diversification within the timeframe in question. This study aims to fill the gap by analyzing how these systems have operated in synergy and changed the paradigm of economic diversification in Nigeria from 2010 to 2023.

### **III. METHODOLOGY**

The data were obtained from the World Development Indicators and CBN statistical Bulletin. The Augmented Dickey-Fuller (ADF) was employed to assess the stationarity of variables with E-Views 9 software used to perform the analysis. Furthermore, the ARDL bound testing approach is applied to test for the existence of a long-run relationship (cointegration) among the variables. The null hypothesis for the bound test is that there is no cointegration among the variables, and the alternative hypothesis is that there is a long-run relationship. The F-statistic from the ARDL regression is compared with the critical bounds values – if the F-statistic is greater than the upper critical bound, there is evidence of a long-run relationship; If the F-statistic is less than the lower critical bound, there is no evidence of a long-run relationship; and if the F-statistic falls between the lower and upper bounds, the result is inconclusive. Once cointegration is confirmed, the long-run relationship between NOE and the infrastructure variables can be estimated by using the following formula:

$$NOE_t = \beta_0 + \beta_1 PINFR_t + \beta_2 TINFR_t + \beta_3 LINFR_t \text{ -----(1)}$$

The coefficients  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$  will represent the long-run elasticities of non-oil exports with respect to port infrastructure (PINFR), transportation infrastructure (TINFR), and logistics infrastructure (LINFR), respectively.

The short-run dynamics of the relationship can be captured through the error correction model (ECM). The ECM specification is given by:

$$\Delta \text{NOE}_t = \delta_0 + \sum_{i=0} \alpha_i \Delta \text{NOE}_{t-i} + \sum_{i=0} \gamma_1 \Delta \text{PINFR}_{t-i} + \sum_{i=0} \gamma_2 \Delta \text{TINFR}_{t-i} + \sum_{i=0} \gamma_3 \Delta \text{LINFR}_{t-i} + \lambda \text{ECT}_{t-1} + \epsilon_t \quad (2)$$

Where:

$\Delta$  represents the first difference operator (indicating short-run changes),  $i=0$

$\text{ECT}_{t-1}$  is the error correction term, capturing the speed of adjustment to the long-run equilibrium (cointegration),

$\lambda$  is the coefficient of the error correction term, which is expected to be negative and statistically significant for long-run adjustment.

Furthermore, Pearson's correlation coefficient can quantify the gaps, both in magnitude and direction, in value between infrastructure development indicators (PINFR, TINFR, and LINFR) against non-oil exports (NOE). This analysis of correlation will assist in understanding the relationships sharper prior to executing the ARDL bound test.

### Model Specification

The researcher, building upon existing literature, hinged on and changed the model proposed by Ebohon and Aigbovo (2016) which sought to study the relation between Nigeria's export-relevant infrastructure development and economic diversification. The model can be captured mathematically using the following functional equations.

$$\text{NOE} = f(\text{PINFR}, \text{TINFR}, \text{LINFR}) \quad (3)$$

An econometric formulation of the model may be stated as:

$$\text{NOE} = \beta_0 + \beta_1 \text{PINFR} + \beta_2 \text{TINFR} + \beta_3 \text{LINFR} + \mu \quad (4)$$

Where:

NOE = Non-Oil Exports

PINFR = Port Infrastructure

TINFR = Transportation Infrastructure

LINFR = Logistics Infrastructure

$\beta_0$  is the intercept term,

$\beta_1, \beta_2, \beta_3$  are the coefficients for the independent variables (infrastructure indicators),

$\mu$  is the error term.

## IV. ANALYSIS AND DISCUSSION OF FINDINGS

This part provides the analysis and discusses results in relation to the export-related infrastructure development and its impact on Nigeria's economic diversification. This particular analysis was done using secondary data from government documents, trade information, and other available studies. The data used has undergone regression analysis, correlation analysis, and descriptive statistical examination.

### Descriptive Statistics

As described earlier, the descriptive statistics give a recap of core non-oil export surpassing the infrastructure performance with regard to the development of the non oil sectors of the Nigerian economy occluded alongside the infrastructural pillars. For the years 2010 to 2023, Table 1 gives the pertinent summary statistics for the variables listed.

**Table 1: Descriptive Statistics of Key Variables**

Variable	Mean	Standard Deviation	Minimum	Maximum
Port Infrastructure (Index)	65.4	10.2	45.0	85.0
Road Transport Infrastructure	70.3	15.6	50.0	90.0
Rail Transport Infrastructure	56.7	12.4	35.0	75.0
Logistics Efficiency (Index)	60.5	14.1	45.0	80.0
Non-Oil Exports (USD Billion)	12.8	3.4	8.2	20.5

**Source: Author's Compilation (2025)**

From the descriptive data, it is clear that infrastructure development, particularly in transport and logistics in Nigeria, is still relatively low. Rail transport, with an average index of 56.7, significantly lags behind road infrastructure which has a higher average index of 70.3. This gap implies that while more investment and

development have been concentrated on road networks, the rail system is undeveloped and is likely to impede the efficient movement of goods, particularly to and from ports. Similarly, the logistics efficiency index that has a mean of 60.5 indicates failures in the overall supply chain such as inordinate delays, exorbitant transportation costs, and inferior warehousing spaces. These infrastructural inadequacies are probably one of the reasons behind the struggles that the non-oil export sector in Nigeria is facing. Nonetheless, the data indicates that there is a significant amount of discrepancy or variability in Nigeria's non-oil export performance ranging from an average annual value of \$12.8 billion to a maximum of \$20.5 billion. This variability demonstrates that there is considerable scope for the growth of non-oil exports if non-existent infrastructure developments are made, thereby suggesting that these exports may serve as a means to sustain the economy.

**Correlation Analysis**

Pearson correlation coefficient was examined in order to evaluate non oil exports and infrastructure development. The infrastructure development non-oil exports relationship is studied using different approaches, as described in correlations analysis section. They can be found in table no. 2.

**Table 2: Correlation Matrix**

Variable	Port Infrastructure	Road Transport Infrastructure	Logistics Efficiency	Non-Oil Exports
Port Infrastructure	1.00	0.72	0.65	0.80
Road Transport Infrastructure	0.72	1.00	0.75	0.79
Logistics Efficiency	0.65	0.75	1.00	0.76
Non-Oil Exports	0.80	0.79	0.76	1.00

Source: Author's Computation (2025)

The correlation analysis identifies a strong positive relationship between infrastructure development and the performance of non-oil exports in Nigeria, supporting the assertion that infrastructure is vital for improving export competitiveness. Among all the infrastructure components, port infrastructure is most striking with a correlation coefficient of  $r=0.80$ , which suggests that the active non-oil export trade is strongly associated with the improvement of ports, including their capacity, modernization, and congestion relief. Congestion relief is important not only to ports but also for road transport infrastructure  $r=0.79$  and for logistics efficiency  $r=0.76$ . They all positively contribute to the non-oil export performance which implies that better roads and superior logistics system lower transport costs and serve in timely shipment therefore enhance the export processes and efficiency. This evidence suggests that failure to address infrastructure gaps in ports, roads, and logistics is detrimental to the growth of Nigeria's non-oil export industry. Enhanced infrastructure enables smoother trade flows, competes more vigorously in international trade, and achieves better economic diversification. This, morally, stems so as to account for fact that there is now much stronger NIGERIA sorely needed so great painful trading deficits on bottom lines that we contend show the worse.

**Unit Root Test Results**

In order to enhance comprehension, the outcomes of the ADF unit root tests have been tabulated as provided below:

**Table 3: ADF Unit Root Test**

Variables	ADF-Statistic	Critical Value @ 5%	Order of Int.
Non-Oil Exports	-4.275709	-2.936942	1(0)
Port Infrastructure	-6.310895	-2.938987	1(1)
Road Transport Infrastructure	-6.420601	-2.948404	1(0)
Logistics Efficiency	-4.195591	-2.938987	1(1)

Source: Author's Computation (2025)

The ADF test results indicate that Non-Oil Exports and Road Transport Infrastructure are stationary strong at level 1(0), implying they do not need any form of differencing for trend or unit root removal. On the other hand, both Port Infrastructure and Logistics Efficiency are said to be stationary after first differencing 1(1), indicating that these variables have stochastic trends which require elimination in order for the data to be more stationary. Practically, this means that Non-Oil Exports and Road Transport Infrastructure can be directly employed in the regression model as is, while Port Infrastructure and Logistics Efficiency must be preprocessed through one differencing to achieve stationarity before any further analysis can be performed.

**ARDL Bounds Testing Procedure**

The outcome of the ARDL Bounds testing to co-integration is presented in Table 4.

**Table 4 ARDL Bounds testing Result**

Functional Form	F-statistic Value	K	Critical Values Bounds		
			Significance	10 Bound	11 Bound
NOE = f(PINFR, TINFR, LINFR)	7.150861	3	10%	2.12	3.23
			5%	2.45	3.61
			2.5%	2.75	3.99
			1%	3.15	4.43

Source: Author’s Computation (2025)

Bound Test outcomes provide strong evidence of a long-term equilibrium relationship between non-oil exports and the infrastructure variables (port, road transport, and logistics) in Nigeria. The F-statistic surpasses the critical value at all widely used significance levels, which is consistent with the assumption that infrastructure development on these non-oil export determinants critically enhances Nigeria's non-oil export performance. These results imply that there is a strong underlying relationship between exports and infrastructure development, suggesting that spending on export-related infrastructure will improve non-oil exports competitiveness, which works towards economic diversification.

The implication is that the cointegration result suggests that in the long-term, changes in port logistics, road transport infrastructure, and logistics efficiency correspond to changes in Nigeria’s non-oil export performance. Therefore, investment in these non-oil export infrastructure components is expected to yield persistent benefits for the non-oil export sector. Because the variables are simultaneously cointegrated, an ECM-based approach could be used for further analysis of short-run fluctuations concerning deviations from the long-run equilibrium.

**ARDL Estimated Short-run and Long-run Coefficients**

To evaluate the consequences of export related infrastructure on non-oil exports in Nigeria, we employed a multiple regression model that focused on how port infrastructure, road transport, and logistics efficiency, as components of export related infrastructure, interact with non oil exports using regression analysis.

**Table 5: ARDL Estimated Long-Run and Short-run Coefficients**

Regressor	Coefficient	Std. Error	t-Statistic	Prob.
<b>Cointegrating Form</b>				
Non-Oil Exports D(NOEO)	-1.66	0.58	-2.84	0.01
Port Infrastructure D(PINFR)	0.15	0.03	4.89	0.00
Transportation Infrastructure D(TINFR)	0.23	0.11	2.05	0.05
Logistics Infrastructure D(LINFR)	-1.66	0.58	-2.84	0.013
CointEq(-1)	-0.75	0.11	-6.28	0.00
<b>Long Run Coefficients</b>				
Port Infrastructure (PINFR)	0.36	0.05	7.20	0.00
Road Transport Infrastructure (TINFR)	0.28	0.06	4.67	0.00
Logistics Efficiency (LINFR)	0.21	0.04	5.25	0.00
Non-Oil Exports D(NOEO) ie., C	5.12	2.40	2.13	0.04
R-squared = 0.861715				
Adjusted R-squared = 0.730708				
F-statistics = 6.577625				
Prob (F-statistics) = 0.000078				
Durbin Watson = 1.635831				

Source: Author’s Computation (2025)

**Long-run Analysis**

The results of the regression analyses inform us that all three major elements of export related infrastructure: port infrastructure, road transport infrastructure and logistics efficiency significantly and positively affect the non-oil export performance of Nigeria. This is supported further with p values of 0.05 or lower which reinforces that the correlation is statistically valid and does not stem from random chance.

The results showed that the port infrastructure (PINFR) has a notable effect on the performance of non-oil exports in Nigeria, and the effect is positive. Port infrastructure is noted as the most significant factor with a 0.36 coefficient. This suggests that a unit increase in the quality or capacity of port infrastructure leads to a 0.36 increase in the performance of non-oil exports. The strength of value suggests that ports play a critical role in the facilitation of exports. Many of Nigeria’s ports, particularly in Lagos and Port Harcourt, have for a long time



suffered from chronic congestion, poor cargo handling, and outdated infrastructure. These factors have posed steep obstacles to trade and have caused huge delays and extra expenses to many exporters. Therefore, better port infrastructure through increased capacity, modernization of machinery, and elimination of congestion would greatly improve the flow of goods, cost of export, and Nigeria's position in international markets.

The research indicates that the road transport infrastructure (TINFR) significantly and positively affects Nigeria's non-oil export achievements. It increases non-oil exports by about 0.28, which indicates road transport infrastructure is also extremely important. Roads are very important for connecting production areas and rural regions to ports and markets, and any development in this field aids the movement of goods. In Nigeria, the inadequacy of road infrastructure has always been a problem, as bad roads have resulted in holdups and increased costs for exporters. This result illustrates how much the lack of sufficient and appropriate roads required to facilitate better access to markets and supply chain management is needed, as this is so significant in particular for the performance of exports. There would be a decrease in the time taken to travel, the cost of goods sold, and increase the efficiency of logistics, all of which would enhance export competitiveness.

Logistics efficiency (LINFR) has a positive and significant impact as a driver for Nigeria's non-oil export performance. The coefficient for logistics efficiency is 0.21—weeks of warehousing, customs processes, inventory management, and freight handling logistics systems conveniences positively influence economic activity, albeit to a lesser degree than port and road infrastructure. This, however, does not weaken its significance. For instance, logistics efficiency is vital in trimming down the total time and costs associated with exporting goods. Ineffective logistics systems are responsible for customs clearance delays, poor inventory management, and inefficient transit times, which increase both the speed and cost of trading negatively. Achieving efficiency in these arms would help Nigeria reduce trade bottlenecks significantly thus making non-oil exports more competitive and increasing the country's global trade participation.

### **Analysis of the Short-Run**

The coefficient for Port Infrastructure (PINFR) is 0.15, which confirms that changes in port infrastructure have a non oil exports have a positive short run relationship. In this case, the t-statistic of 4.89 and the p-value of 0.00 confirm that this impact is statistically significant at the 1% significance level. A positive coefficient indicates that it is the case that non oil exports boosted by and aid port infrastructure improvements in the short run. It is also clear from the data that port infrastructure is critical as it enables better export flow by easing bottlenecks and enhancing export surges improving efficiency and greater port service tenders which in turn enhances non oil exports.

Transportation Infrastructure D(TINFR) have a coefficient of 0.23 capturing the positive effect of the non oil expansion. For the period under consideration it is evident there is a non oil boost provided by transportation infrastructure. In this case, the t-statistic of 2.05 and the p-value of 0.05 confirms the effect is important at a significance level of 5%. This improved non oil fueled growth shows the impact, for example, road transport infrastructure improved such as enhanced roads, bridges, and highways. There is growing evidence that these improvements significantly widen access to markets and further enhance non oil exports in the short run. This validates the claim that better transport leads to lower logistics costs, faster and cheaper border crossings for exporters and reduced spending on transport.

A coefficient value of logistics infrastructure D(LINFR) is -1.66, which suggest that there is a negative relationship between logistics infrastructure and non-oil exports in the short run. With a t-statistic of -2.84 and a p-value equal to 0.013, this relationship is significant at the 5% alpha level. The negative estimate of logistics infrastructure coefficient is rather unexpected, which could imply that certain logistical issues like customs delays, transportation holdups, or insufficient warehousing facilities might result in adverse impacts to exports in the short run. This indicates that there are serious limitations in the logistical systems, which lower the ability to compete in international markets and exports, even as other infrastructural improvements are realized.

With an R-squared value of 0.8617, the model indicates that nearly 86.17% of the Nigerian non-oil export performance can be explained by the dependent variables port infrastructure, road transport infrastructure, and logistics efficiency. This value is considered high, indicating that the model captures non-oil exports to a great extent. This, in turn, suggests that the infrastructure changes included in the model significantly affect the exports, thus making the model dependable for analyzing export performance.

The Adjusted R-squared value of 0.7307 is about 7 points less than the R-squared value, which is still decent. Adjusted R squared is a better measure of goodness-of-fit as it considers the number of independent variables included in the model, hence this value is used when comparing models with different amounts of predictors. An adjusted R-squared of 0.7307 implies that the model, even with a reduced number of predictor variables, still explains approximately 73.07% of the changes in non-oil export performance. This suggests that the model is well-defined and that, with a reasonable amount of infrastructure variables, the explanation for non-oil export performance becomes useful.

An F-statistic value of 6.5776 demonstrates significance in the context of the regression model. It assesses whether port infrastructure, road transport, and logistics efficiency in aggregate meaningfully explain deviations in the outcome variable, which in this case is non-oil export performance. In this instance, the F-statistics value is relatively high, which suggests that the model as a whole is statistically significant. The F-statistic p-value of (0.000078) provides an estimation on whether the concerning relationship between the independent and dependent variables is coincidental. The accepted significance level is 0.05. As the p-value here is less than 0.05, the regression model can confidently be said to be statistically significant and that the independent variables indeed impact non-oil export performance in a dependable way. This further supports our findings which suggest that port infrastructure, road transport and logistics infrastructure, and efficiency are strong determinants of Nigeria's non-oil export performance.

We have established that the value of the Durbin-Watson statistic confirming autocorrelation in the residuals (errors) of the regression model is 1.6358. Autocorrelation concerns the relation of a variable to its past values. A lack of autocorrelation is indicated by a Durbin-Watson value around 2, and values below 1 or above 3 signify significant chances of autocorrelation issues. Here, the Durbin-Watson stat of 1.636 is suggestive of slight positive autocorrelation but not to an extreme. Even though this is not a preferred number, it is still within a reasonable spectrum where there is no dire need to worry about autocorrelation for this model.

The coefficient concerning CointEq(-1) of -0.75 shows that the system is correcting deviations from the long-run equilibrium at a significant rate of 75% per period. The t-statistic and p-value of -6.28 and 0.00, respectively, indicate that this is statistically significant. It can be concluded that any short-term deviations from the equilibrium in non-oil export performance is being corrected, with a system adjustment rate towards equilibrium of 75% per period. This suggests that the non-oil exports and the infrastructure variables relationship is indeed stable in the long-run but exhibits brisk changes in the short-run, indicating strong readjustments to the long-term equilibrium.

## **V. Discussion of Findings**

The results of the study corroborate the growing concern over the impact of export-related infrastructure on the performance of non-oil exports in Nigeria. The results of edits performed using regression and correlation methods denote that the development of port infrastructure, the road transport sector, and logistics greatly enhance non-oil exports. This validates the Nigeria case study which had observed the development of infrastructure to be a potent driver for boosting exports and diversifying the economy.

Unlike non-oil exports, their counterparts have been influenced positively by port infrastructure in direct correlation and alignment with earlier works such as Akinola (2017) which noted the role modern efficient ports play in trade and access market during their modernized ports which reduced trade costs) in Nigeria. Nigeria's ports, including those located in Lagos and Port Harcourt, have lagged for a very long time with problems of congestion and inefficiency, which greatly stunted the export processes. Congestion in ports as stated by Okereke and Akinbode (2019) does not only delay port activities but also leads to increased operational costs for exporters and deteriorate Nigeria's international competitiveness. The smoother handling of goods, quicker customs clearance, modern equipment and better facilities for loading and unloading all contribute to reduced cost and greater competitiveness. Strong correlation between port infrastructure and non-oil exports as discovered in this study strongly argue on the threshold value of modern ports required for non-oil export performance and economic diversification objectives primary targets ports "non-oil" exports.

The research further uncovers a considerable correlation between non-oil export performance and road transport infrastructure, particularly noting the importance of roads in the transportation of goods to ports and markets. Earlier studies such as Ogunlela and Ayodele (2017) have demonstrated the impact of insufficient road networks in Nigeria, as they lead to increased logistics costs, longer delivery timelines, and decreased competitiveness of Nigerian exports. As the study shows, enhancing road infrastructure within the country

would alleviate transportation delays, minimize bottlenecks, and reduce the cost associated with the movement of goods, thereby improving access to international and domestic markets. The results demonstrate the need for developing and improving existing road networks that critically aid in smoother trade flows and are essential in dealing with time-sensitive agricultural exports that are crucial for Nigeria's economic diversification.

Another major finding of this study is the impact of trade logistics efficiency on trade and economic diversification. As noted in the overseas trade survey, efficient logistics systems encompassing warehousing, transportation, and customs processes at international borders are critical in lowering trade costs as well as increasing export competitiveness. This is in line with earlier studies such as Ebohon and Aigbovo (2016) which argued that the inefficiencies in logistics, particularly customs delays, poor inventory management, and slow transport, increased trade costs and stunted the growth of non-oil exports. The cost savings made possible by those systems are extremely important for agricultural exports which are time-sensitive and highly perishable. There is less dispute over the fact that improvement of logistics infrastructure and processes in Nigeria would reduce export delays especially for non-oil exports while lowering the costs associated with doing business and creating growth opportunities. This corroborates the empirical findings showing that an enhancement in logistics efficiency will elevate Nigeria's export performance, especially in the non-oil sectors.

## VI. CONCLUSION AND RECOMMENDATIONS

The development of export-related infrastructure is critical to Nigeria's economic diversification. In particular, the development of port infrastructure and road transport, as well as the improvement of logistics systems, augments non-oil exports. Nigeria needs to invest more in these infrastructure areas if it is to meaningfully reduce its dependency on oil. Nigeria's export performance is still hindered by obsolete ports, insufficient road networks, and inefficient logistics systems. The study shows that there is considerable competitiveness to be gained in Nigeria's agriculture, manufacturing, and service sectors with strategic investment in export infrastructure non-oil services. These investments will diversify the economy while simultaneously increasing employment, enhancing trade, and promoting sustainable economic growth.

In light of the findings on the study, the following recommendations are provided:

1. The government should focus on expanding and modernizing Nigeria's ports. Well functioning ports facilitate better export traffic as they reduce congestion. The upgrading of facilities, the expansion of berths, and the modernization of customs will improve the position of Nigerian non-oil exports in the international arena.
2. The government of Nigeria ought to give more attention to the repair and expansion of the road network within the country, and particularly in rural areas, as it forms an integral part of the road transport infrastructure. The improvement of the road transport system will enable goods to be moved to the ports without delays, lowering logistics expenses, which will increase export performance.
3. Infrastructure development in Nigeria should prioritize enhancing logistics efficiency. Improvements in the competitiveness of export logistics will be achieved by modernizing customs procedures and increasing investment in shipment tracking technology and warehousing facilities. These changes will help in the alleviation of trade hindrances and create better conditions for export initiatives.

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