

AKSU Journal of Social Sciences (AKSUJOSS)
ISSN: 2504 – 933X
Vol.4,No.2 (September) 2024,pp.1-16
DOI:https://doi.org/10.61090/aksujoss.2024.015
URL: htpp://www.aksujournal.com/vol.4.2

Received: **2nd March, 2024**
Accepted: **24th August, 2024**
Published online: **1st September, 2024**

Economic Growth in Nigeria: Assessing the Effect of Agriculture and Transport Sectors

Ime Okon Utuk
Department of Economics
Akwa Ibom State University, Obio-Akpa Campus, Nigeria
utuk_ime2003@yahoo.com

Ededet Bassey Eduno
Department of Economics
Akwa Ibom State University, Obio-Akpa Campus, Nigeria
ededetuduno@aksu.edu.ng

Inigbehe Michael Okon
Department of Economics
Akwa Ibom State University, Obio-Akpa Campus, Nigeria
mikeokon72@yahoo.com

Abstract
The purpose of this study was to empirically examine the effect of transport infrastructure and agriculture sector development on the economy of Nigeria. The study covers the periods from 2000 to 2022 and applied the Augmented Dickey-Fuller (ADF) unit root test, ARDL bounds testing method, and Canonical Cointegration Regression (CCR) model in analyzing the time series data used. From the result of the analysis, it was discovered that agriculture sector development has a positive significant effect on economic growth. Road transport infrastructure quality (LNROADQ) was positively signed as expected but has no significant impact on Nigeria's economic growth. Therefore, it is proposed that the Nigerian government should focus more on upsurging the transport infrastructure for higher economic development by continuously investing and constructing roadways, railways, seaports, and airports. In this regard, there is a need to increase and encourage private participation in the provision of transport infrastructure. Also, more budgetary allocation will help address issues relating to mechanization, rehabilitation of irrigation facilities and dams, storage, and research and development among others that have continued to negatively impact agriculture sector productivity.

Keywords: Real gross domestic product, agriculture value added, road transport, Nigeria, Canonical Cointegration Regression

Introduction
The transport infrastructure is the driving force behind economic development and social well-being through excellent production and private-sector investment efficiency (Achour & Belloumi, 2016; Banister & Berechman, 2001; Subhra & Nath, 2017). In particular,

transport infrastructure development could cut travel costs, encourage international investors and broaden the trade between common resources (Management & Kingdom, 2020; Salinas-jiménez, 2004). Transport infrastructure performs a crucial role in industrial development as far as social capital is concerned and has evident spillover effects on regional advancement, factor re-assignment and manufacturing efficiency, which fosters the accumulation of industry, population and the economy(Dynamics & Development, 2019; Fageda & Gonzalez-aregall, 2017; Holl, 2004). The transport infrastructure, on the other hand, can have an economic effect only if certain economic requirements, requirements for investment and political and institutional requirements are fulfilled.

Economic development is a process of structural transformation, and agriculture is the essential engine to jumpstart the process. Lin (2018) noted that agriculture plays a critical role in transforming economies to reach the goal, along with achieving other essential development goals like ensuring food security and improving nutrition. As put by Dickson and Ita (2011), agriculture is a source of food and raw materials for the industrial sector and it is essential for the expansion of employment opportunities, for the reduction of poverty and improvement of income distribution, for speeding up industrialization, Therefore, to end hunger and under-nutrition while accelerating economic growth, agricultural transformation must become a reality (Lin, 2018). In this regard, a few studies have investigated the relationship between agricultural output and economic growth in the case of Nigeria (Oluwafemi et al., 2015; Izuchukwu, 2017; Oje-Okoro, 2019; Odetola & Etumnu, 2017; Ahungwa et.al., 2017; Aminu & Anono, 2019; Onunze, 2017; Oyinbo & Rekwot, 2018; Ideba, Iniobong, Otu & Itoro, 2019; Tolulope & Chinonso, 2019; Olutoye & Olutoye, 2017; Omorogiuwa et al, 2018).

The transport infrastructure is the driving force behind economic development and social well-being through excellent production and private-sector investment efficiency (Achour & Belloumi, 2016; Banister & Berechman, 2001; Subhra & Nath, 2017). In particular, transport infrastructure development could cut travel costs, encourage international investors and broaden the trade between common resources(Management & Kingdom, 2020; Salinas-jiménez, 2004). Transport infrastructure performs a crucial role in industrial development as far as social capital is concerned and has evident spillover effects on regional advancement, factor re-assignment and manufacturing efficiency, which fosters the accumulation of industry, population and the economy (Dynamics & Development, 2019; Fageda & Gonzalez-aregall, 2017; Holl, 2004). The transport infrastructure, on the other hand, can have an economic effect only if certain economic requirements, requirements for investment and political and institutional requirements are fulfilled.

Similarly, transport infrastructure is seen as the driving force behind economic development and social well-being through excellent production and private-sector investment efficiency (Achour & Belloumi, 2016; Banister & Berechman, 2001; Subhra & Nath, 2017). In particular, transport infrastructure development could cut travel costs, encourage international investors and broaden the trade between common resources (Management & Kingdom, 2020; Salinas-jiménez, 2004). Transport infrastructure performs a crucial role in industrial development as far as social capital is concerned and has evident spillover effects on regional advancement, factor re-assignment and manufacturing efficiency, which fosters the accumulation of industry, population and the economy (Dynamics & Development, 2019; Fageda & Gonzalez-aregall, 2017; Holl, 2004). The transport infrastructure, on the other hand, can have an economic effect only if certain economic requirements, requirements for investment and political and institutional requirements are fulfilled. Transport is an indicator of economic performance as an economic factor and, at the same time, transport is a function of economic growth. Therefore, the issues of evaluating the efficiency of transport infrastructure and the relation between transport infrastructure and economic development are the topics for debate in both academic and non-academic circles. For instance, in Nigeria, several studies have been conducted on the relationship between transport infrastructure and economic growth (Adesoye, 2014; Ijaiya and Akanbi, 2009; Loto, 2006; Egbetunde and Fasanya, 2013).

Given several recent initiatives and programmes carried out to improve transport infrastructure and agriculture sector development in Nigeria. This study adds to the existing literature by examining the effect of transport infrastructure and agriculture sector development on the economy of Nigeria. This study focuses on country-specific research

because the study is needed to throw more light on the dynamic relationship among the variables. The study is laid out as follows: The next section presents a literature review. The methodology of the study is described in the third section. The fourth section contains results and discussion. Section five provides a summary, conclusion and policy recommendations.

Literature Review

A plethora of studies exist on the relationship between agricultural output and economic growth. For example, Chang, Chen and Hsu (2006) in an extended model of Matsuyama that incorporated government taxation and infrastructure expenditure showed that higher agricultural productivity creates a positive growth effect via the revenue generation that dominates the negative growth effect through the comparative advantage.

Ideba, Iniobong, Otu & Itoro (2014) investigated the relationship between agricultural public capital expenditure and economic growth in Nigeria over the period 1961 to 2010 using annual data obtained from the Central Bank of Nigeria. The data were analysed using the Augmented Dickey-Fuller test, Johansen maximum likelihood test and Granger Causality test. The result of the Johansen co-integration test showed that there exists a long-run relationship between all the explanatory variables and the explained variable. The result of the parsimonious error correction model showed that agricultural public capital expenditure had a positive impact on economic growth. Also, the Granger Causality test showed a unidirectional relationship between agricultural public capital expenditure and agricultural economic growth. This means that agricultural economic growth does not cause expansion of agricultural public capital expenditure; rather it indicates that agricultural public capital expenditure raises the nation's agricultural economic growth. This investigation does not emphasise policy adjustment as a factor needed to promote economic growth.

Odetola & Etumnu (2013) investigated the contribution of the agriculture sector to the economic growth in Nigeria using the growth accounting framework and time series data from 1960 to 2011. The study found that the agricultural sector has contributed positively and consistently to the economic growth in Nigeria, reaffirming the sector’s importance in the economy. The contribution of agriculture to economic growth is further affirmed by a causality test which showed that agricultural growth Causes GDP growth, however, no reverse relationship was found. The resilient nature of the sector is evident in its ability to recover more quickly than other sectors from shocks resulting from disruptive events e.g. civil war (1967-70) and economic recession (1981-85) periods. The study also found that the crop production subsector contributes the most to agricultural sector growth and that growth in the agriculture sector is overly dependent on the growth of the crop production subsector. This indicates the importance of this subsector and probably, lack of attention or investment to the other subsectors.

Oguwuike (2018) examined the effect of agricultural output on the economic growth of Nigeria T(1981-2016). Specifically, the objectives of the study are to examine the effect of crop production, livestock, fishery and forestry on economic growth in Nigeria. Secondary data on GDP, crop production, livestock, fishery and forestry was obtained from the CBN statistical bulletin. The econometrics methods of ordinary least square, Cointegration, and error correction mechanisms were used for the analysis. The outcome of the ADF unit root test shows that the variables (GDP, crop production, livestock, fishery and forestry) were stationary. Also, the co-integration result showed that there exists cointegration among the variables in the model. The Parsimonious Error Correction Model 2 indicates that the R is 86% meaning that the dynamic model is a good fit. The Durbin-Watson value of approximately 2.0, indicates a lesser level of autocorrelation, meaning that the successive values of the error term are serially dependent or correlated. Moreover, the first and third lags of GDP are positively and significantly related to the current level of economic growth. The coefficient of crop production is positively signed and statistically significant at a 5 per cent

level with GDP. The coefficient of fishing is positively signed but statistically not significant at the 5 per cent level with GDP. The coefficient of livestock is positively signed and statistically significant at a 5 per cent level with GDP.

The coefficient of forestry is negatively signed but statistically significant at 5 per cent at the level with GDP. Based on these results, this study recommends the following: Nigerian government should put good structures in place that allows better and higher agricultural output; The various state government should look beyond the monthly federation allocation account as their major source of revenue for developmental projects but work towards utilization and exploitation of fallow lands in their states for farming; Agricultural institutions should be revived, revamped and some privatized with proper supervision for better productivity; Long term agricultural development plans/projects that are realistic should be created and executed; Nigeria government should increase budgetary allocation to the agricultural sector and ensure effective utilization of the funds/budgets that translates into improved and increased production or output annually; Agricultural credit schemes should be encouraged, strengthened and made easily accessible to farmers for increased agricultural output; Subsidization and availability of agricultural inputs for farmers that translates into higher output; Nigerian government should create secured and enabling environment for commercial farming that minimized subsistence farming and there should be workable and lasting solution towards resolution of crisis between farmers and herdsmen.

Sunday, Samuel, and Inimfon, (2021) examined the Agricultural Sub Sectors' Outputs and Economic Growth in Nigeria. This research was carried out to provide empirical information on the relationship between the agricultural sub-sector's production and the growth of the Nigerian economy (proxy by the per capita GDP). Time series data were employed in this research and the analyses of the data were done using descriptive tests, unit root tests, and multivariate regression based on the autoregressive regressive distributed lag (ARDL) testing bound model approach to cointegration. The result of the data analysis indicated that the agricultural sub-sector production significantly influences the movement of the per capita GDP of Nigeria in both short and long-run periods. The implication of the finding justifies the need for agricultural production intensification as a panacea for sustainable economic growth in the country. The prioritization of the agricultural sector and intensifying agricultural production as means of accelerating economic growth in the country were strongly recommended.

A research conducted by Emeh (2017), covering a period of 30 years the period from 1981 to 2012, where he investigated the role of agriculture in economic growth and development. He examined the role that the agricultural sector played in the advancement of the Nigerian economy, considering the years of neglect by the government and decision-makers. Emeh's research used econometrics to validate his hypothesis where he used the Solow growth model that included gross capital formation (GCF) as the proxy for capital, labour proxy by post-secondary enrollment, while agricultural output and economic growth and development as a proxy for real gross domestic product (RGDP). The restricted Error Correction Approach was employed for the long-run relationship. The study revealed that agriculture plays a remarkable role in the economic growth and development of Nigeria. From his findings, it was shown that the agricultural sector still contributed to the gross domestic product, though, there has been a decline since the 1990's explained by the arrival of the new bride (oil discovery) in the late 1970s.

Peter, Tarila and Oghenefejiro (2020), carried out a study on agricultural funding-based contributions and performance of Nigerian agriculture from 1986 to 2018, following the prescription of financial intermediation theory. It relies on ex-post facto research design and employs and makes use of data from the statistical bulletin of the Central Bank of Nigeria, 2018 and Work Bank Economic Outlook 2019. Total government expenditure

(TGE), agricultural credits (ACG) and foreign direct investment (FDI) serve as the independent variables; while crop production (CRP), livestock production (LSP), forestry production (FRP) and fishing production (FSP) represent the dependent variables. The study utilizes Jarque-Bera, Breush-Godfrey, Breush Pagan Godfrey, and Ramsey reset for normality tests, Augmented Dickey-Fuller (ADF) technique for stationarity test, Fully Modified Ordinary Least Square (FMOLS) and Engle-Granger Single Equation Co-integration Tests for the search of a possible link between the sets of variables. From the analyses, the results of the study reveal that TGE and AGS are significantly and positively related to CRP, LSP and FSP while FDI maintains a negative relationship with them.

On another hand, TGE and FDI have a negative relationship with FRP, but AGS is positively related to FRP. The Co-integration analysis reveals that there is a long-run relationship between all the variables used in the four models. On this basis, the study concludes that agricultural funding-based contributions have a significant and long-run relationship with the performance of the Nigerian agricultural sector. The paper recommends that the government should strengthen the agricultural credit guarantee scheme and increase expenditures on the sector.

Emmanuel et al. (2021) examined the impact of agricultural output on economic growth in Nigeria. GDP being the dependent variable was used as a proxy for economic growth while crop, livestock, forestry, and fishery were the independent variables. Annual times series data of the variables covering the period between 1986-2020 were sourced from CBN and National Bureau for Statistics. The study carried out pre-diagnostic tests including the Unit root test to test the stationarity of the data and the cointegration test to confirm the long-run relationship between variables. Error correction model (ECM) was used in the data analysis. Findings from the study revealed that there exists a long-run relationship between the variables. The results of the error correction model (ECM) revealed that the coefficient of livestock and fishery production were both positive with values of 5.0526 and 67.26 respectively and significant at a 5% level with the p-value 0.0432 and 0.0292. Crop production and forestry had a negative and insignificant impact on Nigeria's economic growth with coefficients of -4.593964, and -2.625762 and p-values of 0.6432, and 0.6432, respectively. The study, therefore, recommended that the Nigerian government should review its policies on forestry and crop production so that they can have an impact on Nigeria's economic growth, and encourage more production of livestock and fisheries to have more input., The government should establish and fund more research institutes to improve seedlings to increase the productivity of crops.

Olabanji et al. (2017) examine the long-run relationship between agricultural output and economic growth in Nigeria for the period 1981 to 2014 using time series data. Results from Johansen's maximum likelihood co-integration approach and Vector error correction model support evidence of a long-run relationship between agricultural output and economic growth in Nigeria. Granger causality test also confirms the co-integration results indicating the existence of causality between agricultural output and economic growth in Nigeria. The nature of the causality however depends on the variable used to measure Agricultural output. The study therefore recommends that the government should further strengthen agricultural policies in the area of funding, storage facilities, and market access to enhance agricultural production. Policy Strategies that will make agriculture more profitable and attractive, and less laborious with improved technology should be adopted and promoted to attract investors and the youths back to agriculture.

Osabohien et al. (2019) set out to examine the impact of agricultural exports on Nigeria's economic growth. The study used the Autoregressive Distribution Lag (ARDL) econometric technique to analyze the long-run relationship and the impact of agricultural exports on Nigeria's economic growth. Economic growth is the dependent variable and is

proxied by the real gross domestic product, the explanatory variables include agricultural export, foreign direct investment, inflation rate and the labour force. The results from the ARDL technique revealed that agricultural exports significantly affect Nigeria's economic growth; this suggests that a 1 per cent increase in - agricultural exports will boost economic growth in Nigeria by approximately 25 per cent. Therefore, from the results, the study recommended that agricultural exports need to be promoted through the increase in agricultural production base.

Although many studies have attempted to relate transportation infrastructure and economic growth and other related issues. For instance, Jiwattanakulpaisarn et al. (2012) tested the contribution of highway capacity to regional economic development in 48 neighbouring states in the United States. However, the indicator they used to measure the level of national transportation infrastructure development is incomprehensive. Stephan (2000) measured the effects of public infrastructure (consisting of transport and human capital infrastructure) on local private production using a panel data set of 327 German counties and found that transport and human capital positively contribute to the productivity and output of the local private sector.

Zhang and Cheng (2023) investigate the relationship between transport infrastructure development and economic growth in the UK from different periods. Principal component analysis (PCA) is used to construct a comprehensive measure of transport infrastructure development. This paper then applies the Vector Error Correction Model (VECM) to investigate both long-run and short-run relationships between transport infrastructure development and economic growth from 1970 to 2017 in the UK. Empirical results suggest that transportation infrastructure has a long-run promotive effect on economic development. However, in the short run, this effect turns out to be significantly negative. The analysis of the study indicates differentiated roles that the UK's transport infrastructure played in economic growth, which should be considered in future policy design for achieving economic sustainability in the UK.

Yousif (2019) investigated the causality relations between road land and economic growth in Saudi Arabia. The study is based on secondary data gained from the Saudi Arabian Monetary Agency and World Bank from 1988 to 2017. The Granger causality test was used to investigate the relationship between the variables with Akiake Lag Length Selection Information Criteria, while the Vector Autoregression (VAR) model was used to find the causality. The result reveals unidirectional causality from real GDP to the road; however, there is no evidence to support that transportation infrastructure is the cause of economic growth. Granger causality from GDP to investment in infrastructure indicates that reinvestment in infrastructure is caused by economic growth and not vice versa. Economic growth drove pressures on existing transport infrastructure and required additional investment. The finding is in line with the commonly accepted notion advocating that economic growth or development provides necessary financial and technical support for transportation infrastructure investment and improvement.

Maparu and Mazumder (2017) examined the causal relationships between transport infrastructure (road, rail, air, and port infrastructure), economic development and urbanization in India from the period 1990-2011. They used several time series estimation techniques such as the Engle and Granger cointegration test, Johansen cointegration test, vector error correction model (VECM), and Granger causality test to analyze their study. Their results showed that in the long run, transport infrastructure is cointegrated with economic development, and the directional of causality is from economic development to different sub-sectors of transport infrastructure in most of the cases drawing support in favour of Wagner’s law. However, no causation has been found from urbanization to transport

infrastructure but the reverse is not true as unidirectional causation runs from highway and port transport to urbanization.

Ghosh et al. (2019) empirically re-examine the relationship between transport infrastructure and economic growth in India for the period 1990–2017. Multivariate dynamic models are applied to estimate the relationship between economic growth and different modes of transport infrastructure namely road, rail and air transports in the vector error correction model framework. The results reveal that road and air transport have significant positive contributions to economic growth in the long run while rail transport is insignificant. This study further examines the said issue using unit-free index variables and has constructed a composite index of transport infrastructure using principal component analysis to analyze the nexus between aggregate transport infrastructure and economic growth in India in the post-globalization era. The results of the study indicate the bidirectional causality between aggregate transport infrastructure and economic growth. The results of this study suggest incorporating feedback issues in policy formulations.

Khadaroo and Seetanah (2008) examined the association between transport capital and economic growth for Mauritius over the period 1950- 2000 using a dynamic time series analysis in a vector error correction model (VECM) framework and found a positive contribution of transport infrastructure to the economic performance of Mauritius. Tripathi and Goutam (2010) examined the long-run equilibrium relationship between road transport, employment, output and gross capital formation in India from 1970-71 to 2007-08. They used the vector auto-regression approach (VAR) to analyze the impact of road transport on macroeconomic variables. The results of their study revealed that road transportation has a significant and positive long-run relationship with economic growth and gross public capital formation.

Mohamad et al. (2016) measured the impact of transportation infrastructure on economic growth in Pakistan using panel data from developed and less developed provinces. The results of their study found bidirectional causality between transport infrastructure and economic growth in the case of rich and much-developed provinces and unidirectional causality from economic growth to transportation infrastructure in underdeveloped provinces. Using annual data from Armenia, Georgia and Turkey for 1982-2010, Badalyan, Herzfeld and Rajcaniova (2014) examined the relationship and the direction of causality between transportation infrastructure, investment in infrastructure and economic growth. The VECM results revealed that in the short run, gross capital formation and the road/rail goods transported have a positive and statistically significant impact on economic growth. Also, they reported the existence of bidirectional causality between economic growth and infrastructure investment and between road and rail passengers carried and infrastructure investment in both the short and long runs.

In Nigeria, Ighodaro (2009) explored transport infrastructure and economic growth in Nigeria. Findings from the study show that in the three national development plans in Nigeria, the road transportation system has been given more priority followed by water and air. It was found that the local government authority controls about 67% of the total road network in Nigeria. The contribution of transport to total gross domestic product has been on a downward trend even though 20% of the annual budget is put on road projects at both the state and the federal level. The estimated loss to the Nigerian economy as a result of the poor state of the roads is about N450 billion yearly. The empirical part of the study shows that no causality was found between road development and economic growth in Nigeria. However, the long-run part of the VECM estimation shows that the lag value of the road development variable is very significant in the determination of economic growth in Nigeria. The short-run dynamics of the growth rate of the economy revealed that the error correction terms of road development variables as well as its lag values are not significant in the determination of

economic growth in Nigeria. It is therefore recommended that rather than construct new roads, policymakers should adequately maintain the existing roads as this will further reduce the cost of transportation of goods and services, thereby reducing poverty and boosting economic growth in Nigeria.

Bosede, Abalaba and Afolabi (2013) presented empirical evidence on the impact of transportation - infrastructure improvement on economic growth in Nigeria for the period 1981 to 2011. Using the Ordinary Least Square Regression (OLS) technique, the paper made use of the generalized Cobb- Douglas production and extended the neoclassical growth model to include transport infrastructure stock (i.e., the output of the transport sector) along with capital stock (i.e investment on transport infrastructure) as the input and gross domestic product. The study found that transport output and investment made on transport infrastructure in Nigeria has a significant positive contribution to growth which shows that each impact is strong and statistically significant. The experience from Nigeria suggests that it is necessary to design an economic policy that will improve the transport infrastructure as well as increase the investment made in the sector for sustainable economic growth in Nigeria. There is a need to reduce pressure on the existing road networks by opening up the waterways and railways.

Oyesiku et al. (2013) studied the impact of public sector investment in transport on economic growth in Nigeria using OLS. Their findings revealed that transportation has an insignificant impact on economic growth. Siyan, Eremionkhale and Makwe (2015) studied the impact of road transportation on economic growth in Nigeria and their finding suggests that the transport sector has a positive impact on economic growth in Nigeria.

Nwokoye et al. (2017) investigate the empirical link between transportation infrastructure and the diversification of the Nigerian economy. Descriptive demonstrations are adapted to provide a situational focus to the study, while a generalized method of moment (GMM) model is specified and estimated. Findings reveal that economic diversification is a negative function of the transportation concentration ratio. In the same vein, the result suggests that transportation infrastructure is a significant factor in diversifying the sectoral output share of the country and the export base of the economy from the oil sector to the non-oil sector. To address this, the study put forward policy suggestions to improve the effectiveness and efficiency of transportation infrastructure geared for rapid diversification of the economy.

Methodology and Data Source

Theoretical Framework

Given a production function:

$$Y(t) = F[K(t), A(t)L(t)] \quad (1)$$

The above production function assumes that at any point in time, the economy has some amount of capital (*K*), labour (*L*) and knowledge or effectiveness of labour (*A*), and these are combined to produce output (*Y*). From the production function, '*t*' denotes time which does not enter the production function directly but through capital, labour and knowledge. That is, output changes over time only if the inputs to production change. In particular, the amount of *Y* obtained from given quantities of *K* and *L* rises over time. The model assumes that there is technological progress only if the amount of *A* increases.

Model Specification

Based on equation (1), the study proposes a simple production function where real GDP and the variables of interest, as well as other influencing variables, are modelled as:

$$LNRGDP_t = Й_0 + LNROADQ_t + Й_2LNAGVAL_t + Й_3LNMANO_t + Й_4LNLAB_t + Й_5LNEXT + Ж_t \quad (2)$$

where; LNRGDP is real gross domestic product(₦² b)(a proxy for economic growth); LNROADQ is road transport infrastructure quality (a proxy for transport infrastructure); agriculture sector development is a proxy by AGVAL which stands for agriculture value added (% of GDP). Value added in agriculture measures the output of the agricultural sector less the value of intermediate inputs; LNMANO is manufacturing sector output (₦ billion); LNLAB is labour force (Million); and LNEXT is external debt (₦ billion). The data series is transformed into a natural logarithm (LN) to avoid the issues with dynamic properties and to interpret each resulting coefficient of a regression equation, as elasticities.$Й_0$ is a constant term, and sub–script *t* is a time trend. Ж is the random error term assumed to be normally, identically and independently distributed. $Й_1$, $Й_2$, $Й_3$, $Й_4$, $\beta_5$are elasticities of real GDP concerning other respective variables. Apriori expectation: $Й_1$, $Й_2$, $Й_3$, $Й_4$, $\beta_5 > 0$.

Estimation Techniques

First of all, many studies have demonstrated that most time series have unit roots (Nelson and Plosser (1982), Stock and Watson (1988) and Campbell and Peron (1991)). As such, the means of variance of such time series are not independent of time. To test for the stationarity of the individual variables used in this study, the Augmented Dickey-Fuller (ADF) unit root test was performed. The null hypothesis is that there is no unit root. The rule is that if the ADF test statistic is greater in absolute terms than the critical value at all levels of significance, we accept the null hypothesis, i.e., the variable is stationary but if the ADF test statistic is less than the critical value at all levels of significance, the variable is non-stationary; we reject the null hypothesis and go ahead to difference once. If the variable does not become stationary at the first difference we differ twice. However, it is expected that the variable becomes stationary at first difference.

Thereafter, this study deployed the ARDL bounds test approach for cointegration to test for the existence of cointegration(long-run relationship) among the variables. The ARDL bounds testing method consents to the study of long-run relationships between variables, irrespective of whether they are stationary at levels (I(0)), first difference (I(1)) or fractionally integrated. This helps to circumvent some of the common problems encountered in time series empirical research, such as the absence of unit root test power and confusion about the stationarity properties of the study variables. The rule of thumb for the ARDL bounds testing method is that should the F-statistic exceed the upper critical bounds value, then the H0 (null hypothesis) is rejected; should the F-statistic fall between the bounds, it is inconclusive and should the F-statistic fall below the lower critical bounds value, it is no co-integration.

Furthermore, the Canonical Cointegration Regression (CCR) model was used to obtain fully efficient estimation in the long run. This method provides a check for the robustness of results and can produce reliable estimates in small sample sizes. In addition, CCR is a single equation regression which, can also apply multivariate regression without modification and losing efficiency (Park, 1992). Following (Adom et al., 2015) the CCR estimator is obtained as follows:

$$\hat{O}_{CCR} = \left(\sum_{tt=1}^{TT} Z^{*1}_{t\,t} \right)^{-1} \sum_{tt=1}^{rr} Z^{*}_{t\,t} Y^{*1}$$

Data Source

The study used time series data from secondary sources spanning from 2000 to 2022. The sources were World Development Indicators, theglobaleconomy.com, indexmundi.com, tradingeconomics.com, countryeconomy.com and the Statistical Bulletin of the Central Bank of Nigeria (CBN).

Results and Discussion

Unit Root Test

In this study, the ADF test was conducted using the Schwarz information criterion and the automatic lag selection set at 4 lags. The test was executed using intercept, and trend and intercept. Only test regressions that are integrated of order zero, that is, I(0) or test regressions that are integrated of order one, that is, I(1) are reported. Table 1 reports the results of ADF tests. The unit root test reveals that the variables are integrated in a mixed order of I(0) and I(1). This combination of integration gives the foundation for the use of the Auto-regressive Distributed Lag (ARDL) bounds test to check for evidence of a long-run relationship among the variables.

Table 1: Augmented Dickey-Fuller (ADF) Unit Root Results

Variable	ADF test				Order of Integration
	Levels		1st difference		
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	
LNRGDP	-4.737136*	---	---	---	I(0)
LNROADQ	-2.040552	-2.275920	-6.124014*	---	I(1)
LNAGVAL	-1.912313	-2.516866	-3.573747**	---	I(1)
LNLAB	3.457457	-1.247874	-4.457404*	---	I(1)
LNMANO	-2.369957	0.424927	-2.419302	-3.748923**	I(1)
LNEXT	0.173412	-0.846356	-3.715951**	---	I(1)

Note: The ADF test was performed using the Schwarz information criterion and the automatic lag selection set as 4 lags. Also, *, ** and *** imply statistical significance at 1%, 5% and 10% levels respectively.

Source: Author's computation using Eviews 10

ARDL Bound Test

ARDL long run form and bounds test is estimated and the result is shown in Table 2. The model is specified in its original form where LNRGDP is the dependent variable and LNROADQ, LNAGVAL, LNMANO, LNLAB, and LNEXT are independent variables. Due to the sample size, the study chose a maximum lag length of 1 for the dependent variable and independent variables. In addition, the specification was with Restricted Constant and No Trend, and the model selection criteria were Akaike information criterion. The result in Table 2 revealed that the null hypothesis of no long-run relationship exists is rejected since the F-statistic value 22.19072 is greater than the upper bound I(1) which has a value of 4.15 at a 1% level of significance.

Table 2: F-Bounds Test

		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	22.19072	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Source: Author's computation using Eviews 10

Long-Run CCR Estimates

Table 3 shows the interrelationship among the variables estimated in the model using the Canonical Cointegrating Regression (CCR) method with constant(level) trend specification.

The results showed that the coefficient of road transport infrastructure quality (LNROADQ) (proxy for transport infrastructure) depicted an insignificant positive effect on economic growth; hence there exists a positive and insignificant long-run relationship between transport infrastructure and economic growth in Nigeria. Therefore, a per cent change in road transport infrastructure (LNROADQ) insignificantly increases economic growth in Nigeria by 0.129704%. Peter, Rita, and Edith (2015) noted that government attention to the road transportation system and even the entire transportation sector is poor. Money meant for the maintenance of old projects and the development of new projects is diverted for personal use. This has been the situation in Nigeria and most West African countries.

More so, the labour force (LNLAB) explored a positive and significant long-run relationship with economic growth, that is labour force increases real gross domestic product (a proxy for economic growth) by 1.286148 per cent. This result contradicts Lawrence and Mary's (2019) study that reveals an insignificant and negative long-run relationship between the labour force and economic growth in Nigeria.

The coefficient of external debt (LNEXT) portrayed a negative relationship with economic growth that is significant at a 1% level. this means, that a percentage increase in external debt other things being equal, is associated with about a 0.056479% decline in real GDP(a proxy for economic growth). The negative sign of this variable indicates that government borrowing from external sources has not been efficiently utilized in expanding the productive base of the economy which will spur long-term economic growth. This finding agrees with Yusuf and Mohd (2021) who reported a negative relationship between external debt stock and economic growth in Nigeria.

The coefficient of agriculture value added (LNAGVAL)(a proxy for agriculture sector development) indicated a positive impact on economic growth that was significant at a 1% significance level. A percentage increase in agriculture value added holding other explanatory variables constant triggers an increase of about 0.227858% in economic growth.

Lastly, a unit increase in manufacturing sector output (LNMANO) will lead to a 0.339240 unit increase in economic growth in Nigeria as shown in Table 3.

Table 3: CCR Estimates (Long Run)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNROADQ	0.129704	0.160994	0.805645	0.4323
LNAGVAL	0.227858	0.055041	4.139750	0.0008*
LNMANO	0.339240	0.064728	5.241024	0.0001*
LNLAB	1.286148	0.189008	6.804724	0.0000*
LNEXT	-0.056479	0.007108	-7.946404	0.0000*
C	-15.17202	2.802742	-5.413278	0.0001*
R-squared	0.982798	Mean dependent var		10.86252
Adjusted R-squared	0.977422	S.D. dependent var		0.338972
S.E. of regression	0.050934	Sum squared resid		0.041508
Long-run variance	0.000752			

Note: *, ** and *** imply statistical significance at 1%, 5% and 10% levels respectively.
Source: Author's computation using Eviews 10

Post-Estimation Tests

Some post-estimation tests were conducted to determine the reliability of the estimated model. Specifically, in Table 4, the Correlograms Q-Statistics was deployed to conduct the residual test for serial correlation. The last two columns reported in the correlogram are the Ljung-Box *Q*-statistics and their *p*-values. The *Q*-statistic at lag is a test statistic for the null hypothesis that there is no autocorrelation up to order 12. From the Correlogram in Table 6, the Q-statistics are insignificant at all lags as depicted by their probability value, indicating there is no presence of serial correlation. Similarly, there is no autoregressive conditional heteroskedasticity (ARCH) in the residuals of the model because the *Q*-statistics is not significant at all lags as shown by the probability values of the correlograms of the squared residuals in Table 5.

The normality test was equally used to determine if the residuals are normally distributed at a 5 per cent level. The Jarque-Bera statistic formed the basis for rejecting or accepting the null hypothesis of normal distribution at a 5 per cent level. The Jarque-Bera test statistic (0.243324) in Figure 1 indicates that the residual of the model is normally distributed since the p-value of 0.885447 is greater than the significance level of 5% i.e., 0.885447 >0.05.

Table 4: Correlograms Q-Statistics

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |** . |	. |** . |	1	0.313	0.313	2.4665	0.116
.** | . |	*** | . |	2	-0.234	-0.369	3.9159	0.141
.** | . |	. | . |	3	-0.218	-0.003	5.2421	0.155
. * | . |	. * | . |	4	-0.144	-0.174	5.8482	0.211
. |* . |	. |* . |	5	0.082	0.159	6.0576	0.301
. |* . |	. | . |	6	0.177	-0.000	7.0873	0.313
. | . |	. | . |	7	0.068	0.038	7.2481	0.404
. * | . |	. * | . |	8	-0.146	-0.167	8.0514	0.428
.** | . |	. | . |	9	-0.223	-0.064	10.075	0.344
.** | . |	.** | . |	10	-0.229	-0.249	12.389	0.260
. | . |	. | . |	11	-0.021	0.069	12.409	0.334
. | . |	.** | . |	12	0.040	-0.248	12.492	0.407

Source: Author's computation using Eviews 10

Table 5: Correlograms of Squared Residuals

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |* . |	. |* . |	1	0.132	0.132	0.4359	0.509
. |* . |	. |* . |	2	0.124	0.109	0.8431	0.656
. |* . |	. |* . |	3	0.118	0.091	1.2272	0.746
. * | . |	. * | . |	4	-0.096	-0.138	1.4992	0.827
. | . |	. | . |	5	-0.063	-0.063	1.6239	0.898
. |* . |	. |* . |	6	0.120	0.159	2.1001	0.910
. * | . |	. * | . |	7	-0.103	-0.101	2.4702	0.929
. | . |	. | . |	8	0.024	0.015	2.4913	0.962
. | . |	. | . |	9	0.021	-0.004	2.5093	0.981
. | . |	. | . |	10	-0.015	0.030	2.5189	0.991
.** | . |	.** | . |	11	-0.229	-0.267	5.0381	0.929

.**| . |	.**| . |	12	-0.227	-0.228	7.7612 0.804

Source: Author's computation using Eviews 10

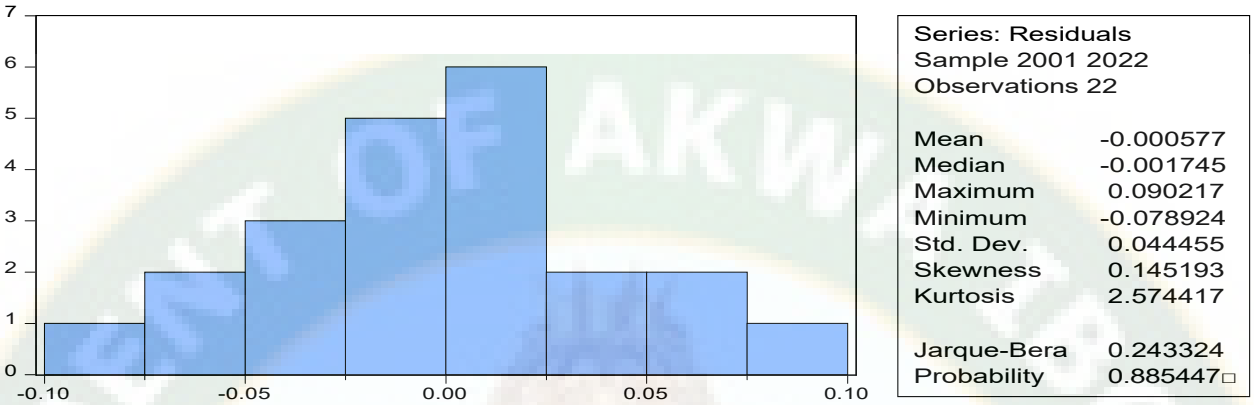


Figure 1: Normality Test

Source: Extracted from Eviews 10

Conclusion and Policy Recommendation

This study primarily aimed at examining the effect of transport infrastructure and agriculture sector development on the economy of Nigeria. The study utilized secondary data spanning from 2000 to 2022 culled from World Development Indicators, the global economy. com,indexmundi.com, tradingeconomics.com, countryeconomy.com and the Statistical Bulletin of the Central Bank of Nigeria (CBN), and Augmented Dickey-Fuller (ADF) unit root test, ARDL bounds testing method, and Canonical Cointegration Regression (CCR) model were employed to address the objective of the study. From the result of the analysis, it was discovered that there is a negative and significant relationship between external debt (LNEXT) and economic growth. On the other hand, agriculture value added (LNAGVAL) has a positive significant effect on economic growth. Also, manufacturing sector output (LNMANO) increases economic growth. In the same manner, the labour force (LNLAB) impacts economic growth significantly. Road transport infrastructure quality (LNROADQ) was positively signed as expected but has no significant impact on Nigeria's economic growth (proxy by real GDP).

Therefore, it is proposed that the Nigerian government should focus more on upsurging the transport infrastructure for higher economic development by continuously investing and constructing roadways, railways, seaports, and airports. In this regard, there is a need to increase and encourage private participation in the provision of transport infrastructure. Also, more budgetary allocation will help address issues relating to mechanisation, rehabilitation of irrigation facilities and dams, storage, and research and development among others that have continued to negatively impact agriculture sector productivity.

References

Achour, H., and Belloumi, M. (2016). Investigating the Causal Relationship between Transport Infrastructure, Transport Energy Consumption and Economic Growth in Tunisia. Renewable and Sustainable Energy Reviews, 56, 988–998. https://doi.org/10.1016/j.rser.2015.12.023

Adesoye, A. B. (2014). Infrastructural Financing in Nigeria: Growth Implications. *Journal of Economics and Sustainable Development,* 5(5), 8-17.

Amaefula, C. G. (2019). Impact of Agricultural Sector on Nigeria's Economic Growth Using Regression and Percentage Ratio Measure. *International Journal of Research and Innovation in Applied Science (IJRIAS)*, 4(9), 72- 77.

Badalyan, G., Herzfeld, T., and Rajcaniova, M. (2014). Transport Infrastructure and Economic.

Growth: Panel data approach for Armenia, Georgia and Turkey. Paper presented at the 142nd EAAE Seminar Growing Success: Agriculture and Rural Development in an enlarged EU, May 29-30, 2014, Corvinus University of Budapest, Budapest, Hungary.

Banister, D., and Berechman, Y. (2001). Transport Investment and the Promotion of Economic Growth. 9.

Campbell, J. Y., and Perron, P. (1991). Pitfalls and Opportunities: What Macroeconomists Should Know about Unit Roots. Vol. 6, NBER Macroeconomics Annual.

Chang, J J., Chen, B., and Hsu, M. (2006). Agricultural Productivity and Economic Growth: Role of Tax Revenues and Infrastructures. *Southern Economic Journal*, 72(4), 891-914.

Dickson, M. and Ita, V. (2011). Public Policy and Rural Development in Nigeria: An Overview of Agricultural Programmes, 1976-2006. *International Journal of Social Science*, 3(2), 111-119.

Dynamics, F., and Development, L. E. (2019). The Economic Effects of Transport Infrastructures : A Critical Review of the Empirical Evidence. https://doi.org/10.1016/B978-0-12-813096-4.00007-X

Egbetunde, T., and Fasanya, S.O. (2013). "Public Expenditure and Economic Growth in Nigeria: Evidence from Auto-Regressive Distributed Lag Specification," Zagreb International Review of Economics and Business, Faculty of Economics and Business, University of Zagreb, 16(1), 79-92.

Emeh E. O. (2017). Impact of agricultural sector on economic growth of Nigeria 1984-2015. *International Journal of Agriculture and Earth Science*, 3(8), 2489-0081

Emmanuel, Y., E., Azara, A. I., Dishok, N.I., Yilkes, D.O., Mutgap, L. D. (2021). Agriculture and Economic Growth In Nigeria. *Arts and Social Science Research*, 11(1), 258 – 277.

Fageda, X., and Gonzalez-aregall, M. (2017). Do all Transport Modes impact on Industrial Employment ? Empirical evidence from the Spanish Regions. Transport Policy, 55(January), 70–78. https://doi.org/10.1016/j.tranpol.2016.12.008

Ghosh, S., Kumar, P., and Dinda, S. (2019). Revisited the Relationship Between Economic Growth and Transport Infrastructure in India: An Empirical Study. Munich Personal RePEc Archive (MPRA) Paper No. 116876.

Ibe, E., and Obodoechi, D.N. (2019). Agricultural Output and Economic Growth: The Nigerian Case. DBN Journal of Economics and Sustainable Growth, 2(1),1-10

Ideba, E. E., Iniobong, E., Otu., W., and Itoro, N. (2014). Analysis of Agricultural Public Capital Expenditure and Agricultural Economic Growth in Nigeria. *American Journal of Experimental Agriculture*, 4(4),443-456.

Ijaiya, G.T., and Akanbi, S.B. (2009). An Empirical Analysis of Long Run Effect of Infrastructure on Industrialisation in Nigeria. *J.Int. Econ. Rev*., 2(1), 135-149.

Ighodaro, C. (2009). Transport Infrastructure and Economic Growth in Nigeria. *J. Res. Nat. Dev.*, 7 (2),1-13.

Izuchukwu, O. (2017). Analysis of the contribution of the Agricultural Sector on the Nigerian Economic Development. *World Review of Business Research*, 1(1), 191-200.

Jiwattanakulpaisarn, P., Noland, R.B., and Graham, D.J. (2012). Marginal Productivity of Expanding Highway Capacity. *J. Transport Econ*., 46 (3), 333-347

Khadaroo, J., and Boopen, S. (2008). Transport and Economic Performance: The Case of Mauritius. *Journal of Transport Economics and Policy*, 42(2), 255-267.

Lawrence, B. A., and Mary, O. A. (2019). Foreign Direct Investment, Corruption And Economic Growth in Developing Economies: Empirical Study of Nigeria. *Am. J. Innov. Res. Appl. Sci.*, 9(1), 92-103.

Loto M. A (2006). The State of Infrastructural Facilities and its Implications for Private Investment-Led Growth in Nigeria inOlasupoAkano and Kayode A. Familoni (eds), The National Economic Empowerment and Development Strategy: Philosophy, Opportunities and Challenges, pp. 474-487, University of Lagos Press.

Management, P., and Kingdom, U. (2020). An Overview of Economic Theory and Evidence of Public-Private Partnerships in the Procurement of (Transport) Infrastructure. 62(November 2019). https://doi.org/10.1016/j.jup.2019.100995

Maparu, T. S. & Mazumder, T. N. (2017). Transport Infrastructure, Economic Development and Urbanization in India (1990-2011): Is there any Causal Relationship? Transportation Research Part A, 100(1), 319-336.

Mohmand, Y. T., Wang, A., and Saeed, A. (2016). The Impact of Transportation Infrastructure on Economic Growth: Empirical Evidence from Pakistan. *The International Journal of Transportation Research*", ISSN: 1942-7867 March.

Nelson, C. R., and Plosser, C. I. (1982). Trends and Random Walks in Macroeconomic Times Series: Some Evidence And Implications. *Journal of Monetary Economics*,10(1),139-162.

Nwokoye (nee Nwabude), E., Chukwunonso, E., and Igbanugo, C. I.(2017). Transportation Infrastructure and Diversification of the Nigerian Economy: Implications for the Developmental State (September 01, 2017). *Nigerian Journal of Economic and Social Studies*, 59(3), Available at SSRN: https://ssrn.com/abstract=3305646

Odetola, T., and Etumnu, C. (2013). Contribution of Agriculture to Economic Growth in Nigeria, International Food Policy Research Institute (IFPRI), Abuja, Nigeria,' Proceedings of The 18th Annual African Econometric Society (AES), 2013, at the session organized by the Association for the Advancement of African Women Economists (AAAWE), Accra, Ghana.

Oje-Okoro, I. (2019). Analysis of the Contribution of the Agricultural Sector on the Nigerian Economic Development. World Review of Business Research 1(1), 191-200.

Olabanji, E., Adebisi, F., Ese, U., and Emmanuel, O. (2017). Agricultural Output and Economic Growth in Nigeria. *Journal of African Research in Business & Technology*, DOI: 10.5171/2017.516093

Oluwafemi, Z. O, Adedokun, M.A, Ogunleye, A.A, and Oladokun, Y.O.M.(2015). An Empirical Analysis of the Contribution of Agricultural Sector to Nigerian Gross Domestic Product: Implications for Economic Development. *Developing Country Studies*, 5(21), 36-42.

Osabohien,R., Akinpelumi, D., Matthew, O., Okafor, V., Iku,E., Olawande, T., and Okorie, U. (2019).Agricultural Exports and Economic Growth in Nigeria: An Econometric Analysis. *IOP Conf. Ser.: Earth Environ. Sci.* 331 012002. DOI 10.1088/1755-1315/331/1/012002

Oyesiku, K., Onakoya, A.B., and Folawewo, A. (2013). An Empirical Analysis of Transport Infrastructure Investment and Economic Growth in Nigeria. *Social Sciences* 2(6), 179-188.

Peter C. U, Tarila N. and Oghenefejiro, P. (2020), Agricultural Funding-Based Contributions and Performance of Nigerian Agricultural Sector. *International Journal of Academic Research in Business and Social Science*, 1(1) 2222-6990.

Peter, S., Rita, E., Edith, M. (2015). The Impact of Road Transportation Infrastructure on

Economic Growth in Nigeria. *International Journal of Management and Commerce Innovations,* 3 (1),673-680.

Salinas-jiménez, M. M. (2004). Public Infrastructure and Private Productivity in the Spanish Regions. 26, 47–64. https://doi.org/10.1016/j.jpolmod.2004.01.003

Siyan, P., Eremionkhale, R. and Makwe, E. (2015). The impact of road transportation infrastructure on economic growth in Nigeria. *International Journal of Management and Commerce Innovations* 3(1), 673-680.

Stock, J. H., and Watson, M. W. (1988). "Testing for Common Trends: Technical Appendix," Discussion Paper 167D, Harvard University, Kennedy School of Government.

Stephan A. (2000). The Contribution of Transport and Human Capital Infrastructure to Local Private Production: A Partial Adjustment Approach, www.ssoar.info, 2000.

Subhra, T., and Nath, T. (2017). Transport Infrastructure, Economic Development and Urbanization in India (1990 – 2011): Is there any Causal Relationship ? *Transportation Research Part A*, 100, 319–336. https://doi.org/10.1016/j.tra.2017.04.033

Sunday B. A., Samuel, J. U., and Inimfon V. P. (2021). Agricultural Sub Sectors' Outputs And Economic Growth in Nigeria: Implication for Agricultural Production Intensification. *AKSU Journal of Agriculture and Food Sciences*, 5 (1), 56 – 68.

Tripathi, S., and Goutam V. (2011). Road Transport Infrastructure and Economic Growth in India. *Journal of Infrastructure Development*, 2, 135-151.

Yousif, G. M. A. (2019). The Impact of Transportation Infrastructure on Economic Growth: Empirical Evidence from Saudi Arabia. *Journal of Economics, Management and Trade*, 23(4), 1–13. https://doi.org/10.9734/jemt/2019/v23i430138

Yusuf, A., and Mohd, S. (2021). The impact of Government Debt on Economic Growth in Nigeria. *Cogent Economics & Finance*, 9 (1), 1946249, DOI: 10.1080/23322039 .2021.1946249

Zhang, Y., and Cheng, L. (2023).The Role of Transport Infrastructure in Economic Growth: Empirical Evidence in the UK. *Transport Policy*, 133(1), 223-233. https://doi.org/10.1016/j.tranpol.2023.01.017