Is Nigeria's resource curse reversible? Examining the mediating effects of technological advancement and institutional quality

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Abstract
Nigeria's persistent dependence on natural resources continues to fuel concerns about the existence of the resource curse despite several economic and institutional reforms. This study investigated whether the resource curse in Nigeria is reversible by examining the roles of technological advancement and institutional quality in the nexus between natural resource dependence and economic growth. Annual data spanning 1996-2024 were sourced from the World Development Indicators, Worldwide Governance Indicators, and the Central Bank of Nigeria Statistical Bulletin. The study employed the Augmented Dickey-Fuller unit root test and the Johansen cointegration technique to determine the time-series properties and long-run relationships among the variables. Long-run effects were estimated using the Dynamic Ordinary Least Squares method, while diagnostic tests were conducted to ensure model reliability. The results showed that natural resource dependence exerts a negative effect on economic growth, confirming the persistence of the resource curse in Nigeria. Although institutional quality and technological advancement positively influenced economic growth, neither was sufficient to mitigate the adverse impact of resource dependence. The study recommends stronger institutions, better management of resource revenues, greater technological innovation, and accelerated economic diversification to foster sustainable growth.
Key words: *Dynamic Ordinary Least Squares; economic growth; institutional quality; Resource curse; technological advancement.*
JEL Classification Codes: O11, O13, O33, O43, O47

I. INTRODUCTION

Nigeria is endowed with substantial human, capital, and natural resources, including vast arable land capable of supporting sustainable and inclusive economic growth (Abusomwan, 2020; Jato & Ayaga, 2022). Despite this potential, a large proportion of the population remains in poverty, unemployment, especially in the manufacturing and agricultural sectors, is widespread, there is low economic diversification, and insecurity has intensified, undermining confidence in the Nigerian economy (Nigeria Economic Summit Group, 2022). A key structural contributor to these challenges is Nigeria's long-standing mono-economic dependence on crude oil revenues, which has historically deemphasised other productive sectors (Idowu, 2020; NBS, 2012). These features of the Nigerian economy in the presence of abundant natural resources seem to have validated the claim that Nigeria is a resource-cursed country (Rashid, 2018; Sachs & Warner, 2001; Sala-i-Martins & Subramanian, 2013; Shahbaz et al., 2019).

Natural resource dependence curse hypothesis posits that rent from natural resources, which was supposed to stimulate economic prosperity could become a 'curse' and could be inimical to economic outcomes such as employment and growth (Arezki & van der Ploeg, 2007). Existing empirical and policy literature identifies currency appreciation resulting from revenues from natural resources, political and institutional weakness, corruption, embezzlement, weak legal institutions as factors responsible for the resource curse in Nigeria (Heller, 2006; Humphreys et al., 2007; Mehlum et al., 2006). Among these, institutional quality and weak technological base seem to stand out as constraints worsening the resource curse (Auty & Warhurst, 1993; Collier & Hoeffler, 2005; Sachs & Warner, 2001).

Institutional quality including political right, the level of government effectiveness, regulatory quality, the rule of law and civil liberty is expected to reverse the resource curse in several ways. First, from the grieve and grievances school of thought, transparency and accountability in the management of the rents from natural resources potentially creates an awareness of content and averts social strife and contentions (Collier & Hoeffler,

2005). Secondly, with institutional quality and the absence of grieve and grievances, military expenditure declines and the gains from the reduced cost of handling insecurity could be channeled to infrastructural development that will reduce unemployment and boost output (Humphreys et al., 2007). Also, countries with strong institutions could be less vulnerable to the resource curse because the growth recovery process in growth dynamism is stimulated by the strength of regulatory, legal and policy making institutions in the economy (Henry, 2019). Furthermore, an inclusive political process implied by the political rights of citizens suggests inclusion in the ownership and management of the natural resources and therefore a reduction in agency conflicts (Auty, 2001; Arezki & Van der Ploeg, 2007; Sarmidi et al., 2014; Yang, 2010).

Technological advancements could stimulates growth via efficiency in the utilization of the factors of production and in value addition to productivity (Abusomwan, 2020). The rents from natural resources are predominantly from the exports of natural resources in their crudest form (primary exports) (Brunnschweiler & Bulte, 2008). The appetite for quick gains and lack of technology necessitates the exchange of raw natural resources for manufactured products from abroad (Van der Ploeg, 2010). These have implications for weakening local production, unemployment at the commanding heights of the economy and declining outputs (Collier & Hoeffler, 2005; Sachs & Warner, 2001). Al Sabah (2011) opined that resource curse could be reduced through innovation and Sadik-Zada (2020) posited that technological progress could enhance economic modernization via natural resources.

This study, therefore, empirically examines the moderating roles of institutional quality and technological advancement in reversing the resource curse in Nigeria.

Research Objectives

The main objective of the study is to investigate the mediating role of institutional quality and technological advancement in reversing the resource curse in the Nigerian economy. Specifically, the study seeks to:

1. Re-ascertain, with new data, the existence of the resource curse in Nigeria.
2. Examine the role of technological advancement in the natural resource dependence-economic growth nexus for the Nigerian economy
3. Investigate the intermediating role of institutional quality in reversing the resource curse in Nigeria

Research Hypotheses

The research hypotheses of the study, stated in the null form, are:

1. The resource curse no longer exists for Nigeria
2. Technological advancement does not significantly enhance the natural resource dependence-economic development nexus for the Nigerian economy
3. Institutional quality does not play a mediating role in reversing the resource curse in Nigeria

II. EMPIRICAL REVIEW

Osaghae (2015) examined whether the abundance of petroleum resources in the Niger Delta has translated into sustainable development or reinforced the resource curse. Rather than approaching the issue from a national perspective, the study focused on the Niger Delta, Nigeria's major oil-producing region, where the effects of oil wealth are expected to be most visible. Using a qualitative political economy approach, the author observed that despite substantial oil revenues and increased fiscal allocations, the region continues to grapple with poverty, environmental degradation, poor infrastructure, political marginalisation, and inequitable distribution of resources. These outcomes were attributed largely to weak governance, ineffective institutions, and the capture of oil revenues by a privileged few. The study, therefore, argued that resource abundance becomes a blessing only when resource revenues are managed transparently and effectively for the benefit of society. Although the study offers important insights into Nigeria's resource management challenges, it does not empirically quantify the relationship between natural resource dependence and economic development, nor does it consider technological advancement as a channel for reversing the resource curse.

Ross (2015) reviewed the extensive body of literature on the resource curse to assess the extent to which natural resource wealth influences political and economic outcomes. Drawing on evidence from numerous empirical studies, the review demonstrated that countries heavily dependent on petroleum resources often experience governance challenges such as corruption, authoritarianism, and political instability. Nevertheless, the study emphasized that the adverse consequences of natural resource dependence are not inevitable, as countries with stronger institutions and effective governance structures are better positioned to transform resource wealth into sustainable development. While the review provides a comprehensive understanding of the mechanisms through which the resource curse operates, it does not empirically investigate the mediating roles of institutional quality and technological advancement, particularly within the Nigerian context.

Eregha and Mesagan (2016) investigated whether institutional quality could reverse the resource curse in selected oil-producing African countries. Using panel data and interaction terms between oil resource abundance

and institutional quality, the study examined whether stronger institutions could convert natural resource wealth into sustained economic growth. The findings showed that institutional quality exerted only a weak positive influence on per capita income growth, while its interaction with oil resource abundance was negative and statistically significant. This suggests that the institutional frameworks in many African oil-producing countries remain insufficient to offset the adverse effects of resource dependence. The authors therefore stressed the need to strengthen governance structures, improve accountability, and enhance institutional effectiveness in order to ensure that resource wealth contributes meaningfully to long-term development. However, the study focused on a panel of African economies and did not incorporate technological advancement into the analysis.

Porter and Watts (2017) explored the role of institutional politics and state capabilities in addressing the resource curse in Edo State, Nigeria. Adopting a qualitative case-study approach, the authors examined how political leadership, governance structures, and institutional capacity shape development outcomes in resource-rich environments. The study found that many externally sponsored institutional reforms fail because of weak state capacity and the structural constraints associated with resource dependence. At the same time, effective leadership and collaborative governance networks were shown to create opportunities for successful reforms capable of translating resource wealth into developmental gains. The study concluded that institutional quality and state capability are central to determining whether natural resource abundance becomes a blessing or a curse. Despite its contributions, the study did not employ quantitative techniques or investigate the role of technological advancement.

Entele (2021) examined the extent to which institutional quality and information and communication technology (ICT) services help resource-rich economies escape the resource curse. Employing panel data covering the period 1995–2019 and using the fixed-effects estimator, the study analysed the relationship among natural resource abundance, institutional quality, ICT services, and economic growth. The findings revealed that both natural resource abundance and weak institutions adversely affect economic performance, confirming the existence of the resource curse and institutional deficiencies in many resource-rich countries. However, improvements in human capital, institutional quality, and ICT adoption were found to enhance economic growth and reduce the adverse effects of resource dependence. The study therefore recommended policies aimed at strengthening institutions, promoting human capital development, and expanding access to ICT services. Nevertheless, because the study relied on cross-country evidence, its conclusions may not fully capture the peculiarities of the Nigerian economy.

Shobande (2022) investigated whether foreign direct investment supports the resource curse hypothesis in Nigeria. The study employed the Vector Error Correction Model (VECM) and Granger causality tests to analyse the relationship among natural resources, foreign direct investment, exchange rates, trade, and economic welfare. The results confirmed the existence of a long-run equilibrium relationship among the variables. In addition, natural resources, foreign direct investment, and exchange rates were found to exert causal effects on economic welfare, while bidirectional causality was observed between natural resource exports, trade, and welfare. Although the study acknowledged that foreign direct investment and effective resource management could improve welfare outcomes, it also emphasized that excessive dependence on natural resources exposes the economy to exchange-rate volatility and external shocks. Consequently, the author recommended prudent management of natural resources and greater economic diversification. However, the study did not examine whether institutional quality and technological advancement mediate the relationship between resource dependence and economic development.

Balogun, Obele, and Adeniyi (2024) examined the interaction between oil revenue and institutional quality in shaping economic growth in Nigeria over the period 1993–2022. Using annual data obtained from the World Development Indicators and the Central Bank of Nigeria Statistical Bulletin, the study employed the Autoregressive Distributed Lag (ARDL) technique for estimation. The results indicated that oil revenue stimulates economic growth in the short run but exerts a negative effect in the long run, suggesting the persistence of the resource curse. Institutional quality, however, contributed positively to growth in both the short and long run. More importantly, the interaction between oil revenue and institutional quality enhanced economic growth, implying that stronger institutions improve the developmental benefits derived from resource wealth. The study also established that access to clean fuels and technologies supports economic performance. The authors therefore advocated stronger political institutions and economic diversification policies to ensure that oil revenues are utilised more effectively. Nevertheless, the study focused primarily on economic growth and did not explicitly examine technological advancement as a mediating variable.

In general, the reviewed studies suggest that the developmental consequences of natural resource dependence depend largely on the quality of institutions, governance systems, and the level of technological progress. Although recent studies increasingly acknowledge the importance of institutional quality and technological advancement in mitigating the resource curse, only limited attention has been given to examining the two variables simultaneously within a single empirical framework. In addition, many studies on Nigeria have

relied on qualitative approaches, ARDL models, or panel estimation techniques. Consequently, there remains a gap in the literature regarding the application of the Dynamic Ordinary Least Squares (DOLS) estimator to investigate whether institutional quality and technological advancement jointly mediate the relationship between natural resource dependence and economic development in Nigeria.

III. METHOD OF ANALYSIS

The study adopts a quantitative empirical research design suitable for applied policy analysis. The objectives of the study will be analysed using the Stock–Watson Dynamic Ordinary Least Squares (DOLS) technique. The choice of DOLS is informed by its robustness to serial correlation and endogeneity in cointegrated systems (Stock & Watson, 1993), thereby enhancing the reliability of the study and ensure policy-relevant findings.

Unit root tests will be conducted to establish the order of integration of the variables (Dickey & Fuller, 1981), followed by cointegration tests to confirm long-run relationships (Johansen, 1988). Post-estimation diagnostics including tests for normality, serial correlation, heteroskedasticity, and parameter stability will be undertaken to ensure the robustness of the results for institutional and policy use.

The baseline resource curse DOLS model is specified as:

$$y = \delta_0 + \delta_1 lnGDP + \delta_2 NRD + \delta_3 IV + \delta_4 OP + \delta_5 PR + \delta_6 TA \sum_{i=1}^{5} \sum_{j=-q,p}^{2} \gamma_i \Delta X_{t-j} + \mu \quad (1)$$

Where;

- *Y* represents growth of real GDP per capita at purchasing power parity;
- *lnGDP* represents initial income measured as long of real GDP per capita;
- *NRD* is natural resource dependence measured as share of exports of primary products in GDP;
- *IV* is investment measured as ratio of real ross investment to GDP ratio.
- *OP* is trade openness measured as exports plus imports to GDP ratio.
- *PR* captures institutional quality using political rights as a control variable;
- *TA* is technological advancement
- X is the vector of explanatory variables; and
- μ is the stochastic error term.

Models for the mediating roles of institutional quality and technological advancement are presented in equations 2 and 3.

$$y = \delta_0 + \delta_1 lnGDP + \delta_2 NRD + \delta_3 IV + \delta_4 OP + \delta_5 PR + \delta_6 (PR * NRD) + \sum_{i=1}^{6} \sum_{j=-q,p}^{2} \gamma_i \Delta X_{t-j} + \mu \quad (2)$$

$$y = \delta_0 + \delta_1 lnGDP + \delta_2 NRD + \delta_3 IV + \delta_4 OP + \delta_5 TA + \delta_6 (TA * NRD) + \sum_{i=1}^{5} \sum_{j=-q,p}^{2} \gamma_i \Delta X_{t-j} + \mu \quad (3)$$

The inclusion of the lags and leads is to make the errors independent (see Edo, et al., 2019). The long run coefficients of the explanatory variables are δ_i $(i = 1, 2, 3, 4, 5, 6)$. They explain the responsiveness of changes in VAP to changes in the explanatory variables. γ_i $(1, 2, 3, 4, 5, 6)$ represent the coefficients of the first difference variables. The study focuses on the Nigerian economy for the 1996-2024 period.

Data Sources

The data for this study were obtained from secondary sources, namely the World Development Indicators (2026) published by the World Bank, the Worldwide Governance Indicators (2026) for institutional quality, and the Central Bank of Nigeria Statistical Bulletin (2026) for gross fixed capital formation. These sources provide consistent and reliable annual time series data for the variables used in the study covering the period 1996 to 2024.

Table 4.1. Measurement of Variables and Data Sources

Variable	Measurement	Source
Y	GDP per capita growth (annual %)	WDI
lnGDP	Natural logarithm of GDP per capita, PPP (constant 2021 international $)	WDI
NRD	Total natural resource rents (% of GDP)	WDI
IV	Gross Fixed Capital Formation (billion naira)	CBN
OP	Trade (% of GDP)	WDI
IQ	Control of corruption	WGI
TA	Individuals using the internet (% of population)	WDI

Source: Authors' Compilation (2026)

IV. EMPIRICAL RESULTS

Table 4.2. Descriptive Statistics of the Study Variables

Statistic	**Y**	**GDP**	**NRD**	**IV**	**OP**	**IQ**	**TA**
Mean	1.838700	5,800.985	12.94652	18,982.97	27.93838	-1.166552	14.99704
Median	2.158314	6,301.184	13.04363	9,183.060	28.17730	-1.130000	11.50000
Maximum	12.21039	9,086.876	24.93573	87,237.81	42.93101	-0.900000	41.21140
Minimum	-8.342423	2,930.713	4.554107	1,494.750	8.729206	-1.500000	0.008830
Standard Deviation	3.618290	1,925.525	5.240312	23,833.50	10.70835	0.139265	14.18561
Skewness	-0.069170	-0.176991	0.244445	1.695513	-0.244549	-0.593985	0.471717
Kurtosis	5.329562	1.749155	2.320036	4.651871	1.657178	3.067377	1.848751
Jarque–Bera	6.580582	2.041982	0.847482	17.19185	2.467885	1.710771	2.676995
p-value	0.037243	0.360238	0.654594	0.000185	0.291142	0.425119	0.262239
Observations	29	29	29	29	29	29	29

Note. Y = GDP per capita growth (annual %); GDP per capita = GDP per capita, PPP (constant 2021 international $); NRD = Total natural resource rents (% of GDP); IV = Gross Fixed Capital Formation (₦ billion); OP = Trade (% of GDP); IQ = Control of Corruption; TA = Individuals using the internet (% of population).
Source: Authors 'computation using EViews 13 (2026).

Table 4.1 presents the descriptive statistics of the variables used in the study from 1996 to 2024. GDP per capita growth averaged 1.84%, while GDP per capita averaged 5,800.99 (constant 2021 international dollars). Total natural resource rents averaged 12.95% of GDP, Gross Fixed Capital Formation averaged ₦18,982.97 billion, and trade openness averaged 27.94% of GDP. The average control of corruption score was -1.17, indicating relatively weak institutional quality, whereas internet usage averaged 15.00% of the population, reflecting gradual improvements in technological advancement.

The standard deviation indicates that Gross Fixed Capital Formation exhibited the greatest variability over the study period, while control of corruption was the least volatile. The Jarque-Bera test shows that GDP per capita growth and Gross Fixed Capital Formation deviate from normality ($p < .05$), whereas,the remaining variables are approximately normally distributed ($p > .05$). Overall, the variables exhibit adequate variation for subsequent econometric analysis.

Table 4.2. Summary of Augmented Dickey-Fuller (ADF) Unit Root Test Results

Variable	Model	Level ADF Statistic	5% Critical Value	First Difference ADF Statistic	5% Critical Value	Order of Integration	Decision
Y	Constant	-2.943	-2.972	-7.093	-2.976	I(1)	Stationary at first difference
LNGDP	Constant	-1.225	-2.972	-3.092	-2.976	I(1)	Stationary at first difference
NRD	Constant & Trend	-3.622	-3.581	-5.414	-3.588	I(0)	Stationary at level
LNIV	Constant & Trend	-1.146	-3.581	-4.483	-3.588	I(1)	Stationary at first difference
OP	Constant	-2.381	-2.972	-4.584	-2.976	I(1)	Stationary at first difference
IQ	Constant	-1.330	-2.972	-5.087	-3.005	I(1)	Stationary at first difference
TA	Constant & Trend	-3.111	-3.595	-3.344	-3.595	I(1)	Stationary at first difference

Note. ADF = Augmented Dickey-Fuller. The null hypothesis is that the series has a unit root. Lag lengths were selected automatically using the Schwarz Information Criterion (SIC). I(0) denotes stationarity at level, while I(1) denotes stationarity after first differencing.

Source: Authors' computation using EViews 13 (2026).

Table 4.2 presents the summary of the Augmented Dickey-Fuller (ADF) unit root test results. The findings indicate that natural resource dependence (NRD) is stationary at level and is therefore integrated of order zero, I(0). Conversely, GDP per capita growth (Y), the natural logarithm of GDP per capita (LNGDP), the natural logarithm of gross fixed capital formation (LNIV), trade openness (OP), control of corruption (IQ), and technological advancement (TA) are non-stationary at levels but become stationary after first differencing, implying that they are integrated of order one, I(1). The mixture of I(0) and I(1) variables, with no variable integrated of order two, I(2), supports the application of the Johansen cointegration test and the Dynamic Ordinary Least Squares (DOLS) estimator in the subsequent analysis

Table 4.3. Johansen Cointegration Test Results

Hypothesized Number of Cointegrating Equations	Trace Statistic	5% Critical Value	*p*-value	Max-Eigen Statistic	5% Critical Value	*p*-value
None	218.272	125.615	0.0000	79.152	46.231	0.0000
At most 1	139.120	95.754	0.0000	53.348	40.078	0.0009
At most 2	85.772	69.819	0.0016	33.336	33.877	0.0579
At most 3	52.436	47.856	0.0175	23.413	27.584	0.1565
At most 4	29.023	29.797	0.0612	18.747	21.132	0.1044
At most 5	10.277	15.495	0.2600	10.260	14.265	0.1954

At most 6	0.016	3.841	0.8986	0.016	3.841	0.8986

Note. The Johansen cointegration test was estimated using a linear deterministic trend (Case 3), with a constant in the cointegrating equation and short-run dynamics. The lag interval in first differences was 1 to 1. *p*-values are based on the MacKinnon-Haug-Michelis (1999) procedure.
Source: Author's computation using EViews 13 (2026).

Table 4.3 presents the results of the Johansen cointegration test. The Trace statistic rejects the null hypothesis of no cointegration up to the hypothesis of at most three cointegrating equations, while the Maximum Eigenvalue statistic rejects the null hypothesis of no cointegration and at most one cointegrating equation at the 5% significance level. Although the two statistics identify different numbers of cointegrating vectors, they consistently reject the null hypothesis of no cointegration.

The results, therefore, confirm the existence of a long-run equilibrium relationship among GDP per capita growth, GDP per capita, natural resource dependence, gross fixed capital formation, trade openness, institutional quality, and technological advancement. This implies that the variables move together in the long run despite short-run fluctuations. Consequently, the null hypothesis of no cointegration is rejected, providing sufficient justification for estimating the long-run relationships using the Dynamic Ordinary Least Squares (DOLS) estimator.

Table 4.4. Dynamic Ordinary Least Squares (DOLS) Estimation Results

Variables	Model I	Model II	Model III
LNGDP	10.264*** (2.050)	9.342*** (2.693)	1.173 (4.839)
NRD	-0.051 (0.114)	-2.732*** (0.809)	-0.561 (0.323)
LNIV	-12.341*** (1.225)	-3.317*** (0.702)	-3.624** (1.448)
OP	0.078* (0.040)	0.026 (0.046)	0.194** (0.058)
IQ	5.685** (1.709)	36.620** (11.407)	-
TA	0.688*** (0.104)	-	0.057 (0.177)
NRD × IQ	-	-2.406** (0.750)	-
NRD × TA	-	-	0.014 (0.014)
Constant	15.507 (20.807)	-11.068 (14.758)	20.114 (36.151)
R^2	0.986	0.982	0.980
Adjusted R^2	0.955	0.941	0.936
S.E. of Regression	0.796	0.905	0.947
Long-run Variance	0.227	0.381	0.417
Observations	27	27	27

Note. Dependent variable: GDP per capita growth (Y). Values in parentheses are Newey-West heteroskedasticity and autocorrelation consistent (HAC) standard errors. Model I estimates the baseline relationship between economic growth and the explanatory variables. Model II incorporates the interaction between natural resource dependence and institutional quality (IQ_NRD), while Model III incorporates the interaction between natural resource dependence and technological advancement (TA_NRD). DOLS = Dynamic Ordinary Least Squares. *, ** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively.
Source: Author's computation using EViews 13 (2026).

Table 4.4 reports the Dynamic Ordinary Least Squares (DOLS) estimates for the three model specifications. Across all models, the goodness-of-fit is high, with R^2 values ranging from 0.980 to 0.986, indicating that between 98.0% and 98.6% of the variation in GDP per capita growth is explained by the explanatory variables. Similarly, the adjusted R^2 values, ranging from 0.936 to 0.955, confirm the strong explanatory power of the estimated models.

In Model I, GDP per capita (LNGDP), institutional quality (IQ), and technological advancement (TA) exert positive and statistically significant effects on economic growth, while gross fixed capital formation (LNIV) has a negative and significant effect. Natural resource dependence (NRD) is negative but statistically insignificant, whereas trade openness (OP) is positive and weakly significant at the 10% level.

In Model II, which incorporates the interaction between natural resource dependence and institutional quality, LNGDP and IQ remain positive and significant, whereas NRD and LNIV exert significant negative effects on economic growth. Although trade openness is positive, it is statistically insignificant. The interaction term IQ_NRD is negative and statistically significant, indicating that institutional quality significantly modifies the relationship between natural resource dependence and economic growth. Specifically, the negative interaction suggests that improvements in institutional quality did not mitigate the adverse effect of natural resource dependence during the study period.

In Model III, trade openness exerts a positive and statistically significant influence on economic growth, while gross fixed capital formation continues to have a significant negative effect. However, GDP per capita, natural resource dependence, and technological advancement are statistically insignificant. Furthermore, the

interaction between natural resource dependence and technological advancement (NRD_TA) is positive but statistically insignificant, indicating that technological advancement does not significantly alter the long-run relationship between natural resource dependence and economic growth.

On the whole, the results suggest that institutional quality is an important determinant of economic growth in Nigeria, although its interaction with natural resource dependence indicates that existing institutional improvements have not been sufficient to offset the adverse effects associated with resource dependence. In contrast, technological advancement does not significantly modify the impact of natural resource dependence on economic growth, despite its positive direct effect in the baseline model. These findings imply that reversing Nigeria's resource curse may require stronger institutional reforms alongside more effective policies that enhance the productive use of technological innovation.

Table 4.5. Diagnostic Test Results for the Estimated DOLS Models

Diagnostic Test	Null Hypothesis	Model I	Model II	Model III	Decision	Conclusion
Breusch-Godfrey Serial Correlation LM Test	No serial correlation	F = 0.627 (p = 0.544); Obs*R^2 = 1.712 (p = 0.425)	F = 0.112 (p = 0.895); Obs*R^2 = 0.320 (p = 0.852)	F = 0.653 (p = 0.531); Obs*R^2 = 1.777 (p = 0.411)	Fail to reject H_0 (All Models)	No serial correlation in Models I-III
Breusch-Pagan-Godfrey Heteroskedasticity Test	Homoskedasticity	F = 1.033 (p = 0.431); Obs*R^2 = 6.376 (p = 0.382)	F = 0.993 (p = 0.454); Obs*R^2 = 6.181 (p = 0.403)	F = 0.508 (p = 0.796); Obs*R^2 = 3.529 (p = 0.740)	Fail to reject H_0 (All Models)	No heteroskedasticity in Models I–III
Ramsey RESET Test	Model is correctly specified	F = 0.010 (p = 0.920)	F = 0.117 (p = 0.736)	F = 8.284 (p = 0.009)	Fail to reject H_0 (Models I & II); Reject H_0 (Model III)	Models I and II are correctly specified, whereas Model III exhibits specification error.

Note: The figures reported for the Breusch-Godfrey and Breusch-Pagan-Godfrey tests include both the F-statistic and the corresponding Obs*R^2 (Chi-square) statistic with their respective probability values. The Breusch-Godfrey test examines the presence of serial correlation, the Breusch-Pagan-Godfrey test assesses the presence of heteroskedasticity, while the Ramsey RESET test evaluates the functional form and specification of the estimated model.

Source: Authors' computation using EViews 13 (2026).

Table 4.5 presents the post-estimation diagnostic test results for the three estimated Dynamic Ordinary Least Squares (DOLS) models. The diagnostic tests were conducted to ascertain whether the estimated models satisfy the classical linear regression assumptions regarding serial correlation, homoskedasticity, and functional form specification.

The results of the Breusch-Godfrey Serial Correlation LM test indicate that all three models are free from serial correlation. Model I reports an F-statistic of 0.627 with a probability value of 0.544, and an Obs*R^2 probability of 0.425. Model II records an F-statistic of 0.112 with a probability value of 0.895, alongside an Obs*R^2 probability of 0.852. Similarly, Model III yields an F-statistic of 0.653 with a probability value of 0.531, while the corresponding Obs*R^2 probability is 0.411. Since all the probability values exceed the 5% level of significance, the null hypothesis of no serial correlation cannot be rejected for all three models. This implies that the residuals

are independently distributed, suggesting that the estimated coefficients are efficient and the statistical inferences are reliable.

The Breusch-Pagan-Godfrey heteroskedasticity test further reveals that the residuals of the three models exhibit constant variance. Model I produces an F-statistic of 1.033 with a probability value of 0.431 and an ObsR^2 *probability of 0.382. Model II records an F-statistic of 0.993 with a probability value of 0.454 and an Obs*R^2 probability of 0.403, while Model III reports an F-statistic of 0.508 with a probability value of 0.796 and an Obs*R^2 probability of 0.740. Since the probability values are greater than the 5% significance level, the null hypothesis of homoskedasticity cannot be rejected in all three cases. This indicates that the variance of the error terms remains constant across observations, thereby ensuring that the estimated standard errors are unbiased and efficient.

The Ramsey RESET test was employed to examine whether the estimated models suffer from functional form misspecification or omitted variable bias. The results show that Models I and II satisfy the model specification requirement, with F-statistics of 0.010 ($p = 0.920$) and 0.117 ($p = 0.736$), respectively. Since these probability values exceed the 5% significance level, the null hypothesis of correct model specification cannot be rejected. This suggests that the estimated functional forms for Models I and II are appropriate and adequately capture the underlying relationship among the variables.

However, Model III reports an F-statistic of 8.284 with a probability value of 0.009, which is statistically significant at the 5% level. Consequently, the null hypothesis of correct model specification is rejected, indicating that Model III may suffer from functional form misspecification or omitted variable bias. This suggests that the model may require further refinement through the inclusion of additional relevant variables, nonlinear terms, or an alternative functional specification to better explain the mediating role of technological advancement.

Overall, the diagnostic tests demonstrate that all three DOLS models satisfy the assumptions of no serial correlation and homoskedasticity, indicating that the estimated coefficients are efficient and the associated statistical inferences are reliable. In addition, Models I and II are correctly specified, making them suitable for policy interpretation and hypothesis testing. Although Model III exhibits evidence of specification error, it remains free from serial correlation and heteroskedasticity. Consequently, while the estimates from Model III should be interpreted with caution, the overall diagnostic results provide substantial support for the robustness and reliability of the estimated DOLS models.

V. DISCUSIONS

The findings of this study contribute to the growing debate on whether Nigeria has overcome the resource curse and whether technological advancement and institutional quality are capable of changing the country's resource-driven development trajectory. The discussion is presented in relation to the three research hypotheses and interpreted alongside previous empirical evidence.

The first objective of the study was to re-examine whether the resource curse still characterises the Nigerian economy. The empirical evidence suggests that the problem has not disappeared. Although the magnitude and level of significance of natural resource dependence vary across the estimated models, the variable consistently maintains a negative relationship with economic development, with a statistically significant effect observed in Model II. This persistent negative association indicates that Nigeria's heavy reliance on natural resources, particularly crude oil, continues to undermine sustainable development rather than promote it. Put differently, the country's abundant resource endowment has not translated into the expected improvements in living standards and long-term economic transformation.

This outcome is consistent with the argument advanced by Osaghae (2015), who observed that despite enormous oil revenues and increased fiscal transfers to the Niger Delta, the region continues to suffer from poverty, environmental degradation, and poor infrastructure because resource wealth has not been effectively managed. The result also lends support to Ross (2015), who argued that the developmental benefits of natural resources are often undermined by weak institutions, corruption, and governance failures. Likewise, Eregha and Mesagan (2016) reported that oil abundance continued to exert adverse effects on economic performance across African oil-producing countries, largely because existing institutional arrangements were incapable of translating resource wealth into sustained growth. Similar concerns were expressed by Shobande (2022), who noted that although natural resources can improve economic welfare, weak resource management and excessive dependence on oil continue to expose Nigeria to macroeconomic instability. Taken together, these studies reinforce the conclusion that the resource curse remains a reality in Nigeria, leading to the rejection of the first null hypothesis.

The second objective examined whether technological advancement enhances the relationship between natural resource dependence and economic development. The findings present a mixed picture. On its own, technological advancement contributes positively to economic development, suggesting that investments in

technology remain an important driver of economic progress. However, when technology interacts with natural resource dependence, its influence becomes statistically insignificant. This suggests that while technology supports overall development, it has not yet become sufficiently integrated into Nigeria's resource sector to reduce the adverse effects associated with resource dependence.

This result differs from the findings of Entele (2021), who demonstrated that improvements in information and communication technology, together with stronger institutions and human capital development, enable resource-rich countries to escape the resource curse. The difference in findings is understandable. Entele's analysis covered a panel of resource-rich economies with varying levels of technological development, whereas the present study focuses exclusively on Nigeria. Despite recent improvements in digital technology, technological innovation within Nigeria's extractive sector remains relatively limited, while investment in research, industrial technology, and value-added processing continues to fall below the level required to transform natural resources into a catalyst for sustainable development. Consequently, although technological advancement contributes to economic performance, it has not yet become a significant mechanism for weakening the negative influence of natural resource dependence. On this basis, the second null hypothesis is not rejected.

The third objective investigated whether institutional quality mediates the relationship between natural resource dependence and economic development. The estimates indicate that institutional quality independently contributes positively to economic development, confirming that improvements in governance, accountability, and public sector effectiveness are beneficial to the economy. However, the interaction between institutional quality and natural resource dependence is negative and statistically significant. This indicates that while stronger institutions support economic development in general, they have not been sufficiently effective in transforming resource dependence into a source of sustainable development. In other words, existing institutional improvements have not been strong enough to neutralise the structural challenges associated with Nigeria's dependence on natural resources.

This finding is broadly in line with Eregha and Mesagan (2016), who concluded that institutional quality in many African oil-producing countries remains too weak to reverse the resource curse despite its positive contribution to economic performance. The conclusion also reflects the observations of Osaghae (2015), who attributed the persistence of underdevelopment in the Niger Delta to weak governance, poor institutional performance, and the capture of resource revenues by political elites. Similarly, Porter and Watts (2017) argued that institutional reforms alone cannot guarantee developmental outcomes unless they are accompanied by stronger state capacity, effective leadership, and the political commitment needed to translate resource wealth into tangible improvements in citizens' welfare.

However, the present findings differ from those reported by Balogun, Obele, and Adeniyi (2024), who observed that the interaction between oil revenue and institutional quality significantly enhanced economic growth in Nigeria. This difference may be explained by variations in the scope and methodology of the two studies. While Balogun et al. concentrated on oil revenue and economic growth using the ARDL approach, the present study examined natural resource dependence and economic development using the Dynamic Ordinary Least Squares (DOLS) estimator. The broader measure of resource dependence adopted in this study, together with differences in model specification and estimation technique, may account for the contrasting outcomes.

generall, the evidence suggests that Nigeria has not yet escaped the resource curse. Although technological advancement and institutional quality each contribute positively to economic development when considered independently, neither has been sufficiently effective in weakening the adverse influence of natural resource dependence. This points to deeper structural challenges that extend beyond incremental improvements in governance or technology. Reversing the resource curse will therefore require comprehensive reforms to strengthen institutions, accelerate technological innovation, promote economic diversification, improve transparency in resource governance, and increase productive investment outside the extractive sector. Only through such coordinated reforms can Nigeria transform its natural resource wealth into a sustainable foundation for long-term economic development.

Declaration: All authors declare that they have no conflicts of interest.

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