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The Interaction between Natural Resource Endowment and Institutional Quality on Economic Performance: (Empirical Study of Nigeria Case)

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Abstract **Original Research Article**

This study analysed the relationship between natural resource endowment, institutional quality, and GDP per capita (GDPPC) in Nigeria from 1996 to 2024. Various tests, including Augmented Dickey-Fuller and Phillips-Perron, assessed unit root properties and structural breaks. Findings indicated a positive but insignificant long-run relationship (β = 0.180, p = 0.448) and a marginally positive short-run effect (ΔNRE*INQ = 0.107, p = 0.059) followed by a negative lagged impact (ΔNRE*INQ (1) = -0.186, p = 0.001). Granger causality tests showed a unidirectional short-run influence from resource endowments to GDPPC without reverse causality. The study suggests that while Nigeria's resource wealth can support long-term growth, short-term fluctuations weaken economic stability. Policymakers should consider stabilising strategies like independent wealth funds and economic diversification to mitigate vulnerabilities to price shocks.

Keywords: Resource endowment, Growth, institutions, Nigeria, volatility.

Introduction

It is believed that institutions impact how natural resources are managed. The impact may serve competing or complementary interests between the institution and the management of natural resources. Countries with weak institutions adopt ill-conceived industrialisation programmes that fail to structurally transform their economies into prosperity (Mehlum *et al*., 2006). Exploiting natural resources with their attendant weak institutional frameworks incentivises the mismanagement of rents and exacerbates the growth drag (Grabowski & Self, 2021).

Zalle (2019) opined that natural resources would prevent the development of respectable property rights and deprive people of institutional reforms that are the incentives to economic growth. This, in turn, leads to the institutional curse of natural resources, as reflected in poor economic performance (Sala-I-Martin & Subramanian, 2013). Furthermore, Isham *et al*. (2005) demonstrate that countries rich in natural resources tend to be captivated with high levels of corruption and experience other problems that are associated with resource-driven factors. Natural resources also undermine institutional development because governments use natural resource rents to appease dissent, shift public accountability and counter pressures for institutions

(Oliver *et al*, 2022). In addition, Sachs and Warner (2001) showed that the best-endowed countries in terms of natural resources are those with the lowest quality of institutions due to corrupt activities reflecting the inefficiency of institutions. This is because the abundance of natural resources aids rent-seeking activities in public services.

The interaction between natural resources and institutional quality is critical when assessing economic performance in Nigeria. High-quality institutions, such as strong governance, legal systems, and transparent policies, are essential for effectively managing resource wealth and avoiding the resource curse (Collier, 2010). Nigeria's vast oil reserves have generated revenue but often coexisted with corruption, weak institutions, and economic mismanagement (Autry & Oshan, 2017). For example, despite being Africa's largest oil producer, Nigeria's GDP growth remains vulnerable due to institutional challenges, leading to corruption levels ranked among the highest globally (Transparency International, 2022).

Nigeria's governance indicators, as reported by the World Bank in 2020, show poor performance in areas such as political stability and government effectiveness, especially when compared to other resource-rich nations. Despite abundant natural resources, including oil and gas, Nigeria faces significant challenges such as high poverty, unemployment, inflation, and poor infrastructure, impacting its economic performance (World Bank, 2024).

Nigeria's heavy dependence on oil revenues has led to the "resource curse," resulting in a low GDP per capita despite abundant natural resources. This reliance on oil exports provides significant revenue but also creates economic vulnerabilities, exposing the country to global oil price fluctuations and hindering diversification into other sectors.

Dutch Disease is an economic phenomenon in which a booming natural resource sector leads to currency appreciation, harming other sectors, such as manufacturing and agriculture. This occurs because resource exports increase demand for the nation's currency, making other exports more expensive and less competitive internationally (Martin *et al*., 2014). For example, the Netherlands in the 1960s experienced a decline in its manufacturing industries following the discovery of natural gas. Similarly, Nigeria's oil boom has contributed to currency appreciation, which has hurt non-oil sectors (Oyinlola & Akinlolu, 2017). The real challenge is striking a balance between resource wealth and sustainable economic diversification.

Institutions play a pivotal role in how resources are managed, how policies are implemented, and, ultimately, how better economic performance is realised (Acemoglu, 2001, p. 17). The adverse effects of poor institutional quality are prevalent in Nigeria's economic indicators, particularly in its oil sector. For instance, according to the National Bureau of Statistics (NBS, 2023), Nigeria's real GDP growth has been erratic, with the average growth rate dropping from 6% in the early 2000s to under 2% by 2020, and to 1.46% in the fourth quarter of 2023. Corruption and misallocation of resources have consistently harmed the economy, as reflected in the nation's Human Development Index (HDI), which ranks Nigeria 161st out of 189 countries (UNDP, 2020).

2.0 LITERATURE REVIEW

The Link among Institutional Quality, Natural Resource Endowment and Economic Performance

Strong institutions promote transparency, accountability, and property rights, which are essential for fostering economic growth and development. Some studies have examined the effect of natural resources on specific institutions such as property rights and democracy (Saeed & Sara, 2017). A study conducted by Holder (2006) reveals that natural resources hinder economic growth by undermining property rights. Additionally, Bhattacharyya and Hodler (2020) demonstrate that, in the absence of democratic institutions, natural resource abundance is *associated* with increased corruption. Sachs and Warner (1995) demonstrate that natural resource abundance fosters a climate that discourages openness and, consequently, restricts economic growth.

Economic performance is a complex interplay of various indicators, including GDP growth, per capita income, employment rates, and living standards. Each of these elements provides valuable insights into a country's financial stability and the quality of life of its citizens. Theories linking institutional quality, natural resources, and economic performance suggest that strong institutions are crucial for managing natural resources effectively, thereby boosting economic development. Paul Collier, in his book "The Plundered Planet" (2010), argues that resource wealth must be channelled productively through democratic governance and attention to societal needs to prevent exploitation and ensure economic performance. Moshiri (2015) investigates whether oil shocks have an asymmetric effect on economic growth in oil-exporting countries and demonstrates how this effect depends on the quality of institutions. Countries with good institutional quality respond more effectively to oil shocks; however, in countries with poor institutional quality, negative oil shocks weaken economic performance, and positive oil shocks do not lead to long-term growth (Acemoglu *et al*., 2001). For instance, Norway, with its transparent institutions, has effectively utilised oil revenues to support social welfare and development, in contrast to Nigeria, where weak institutions have led to corruption and the mismanagement of oil wealth. Furthermore, a study by the World Bank (2019) indicates that countries with high institutional quality can achieve up to 55% greater GDP growth from resource extraction. This illustrates the importance of quality governance in transforming natural resource wealth into sustainable economic performance.

The Resource Curse Theory posits that countries rich in natural resources often experience slower economic growth, ineffective governance, and conflict due to factors such as corruption and volatility in global prices (Sachs & Warner, 1995). Furthermore, empirical evidence suggests that reliance on resource wealth can lead to the neglect of other economic sectors, thereby fostering corruption and mismanagement. For instance, Jeffrey Sachs and Andrew Warner's influential paper, "The Curse of Natural Resources" (1995), found that resource-rich countries tended to grow more slowly than their less resource-endowed counterparts. Furthermore, the Dutch Disease effect describes how resource abundance can lead to currency appreciation, thereby undermining other sectors, such as manufacturing and agriculture (Corden & Neary, 1982). For instance, Nigeria's oil sector exemplifies this paradox: despite its vast oil reserves, the country continues to struggle with economic instability and corruption. Conversely, Norway demonstrates effective resource management by using oil revenues to invest in social services and infrastructure, thereby promoting sustained economic growth (Olofsdotter, 1998).

The Theory of Institutional Quality and Resource Management emphasises the role that institutions play in mediating the relationship between natural resources and economic performance. According to Acemoglu, Johnson, and Robinson (2001), countries with strong institutions, characterised by transparent governance, accountability, and the rule of law, are better positioned to leverage their natural resources for economic prosperity. A study by the World Bank (2020) highlighted that countries with strong institutional frameworks tend to utilise resource revenues more effectively, leading to higher economic growth. In contrast, weak institutions can lead to corruption and inefficient resource allocation, as seen in many resource-dependent countries (Auty, 1993).

Empirical Review

The empirical reviews in this study consider various studies on the interplay between institutional quality and natural resource endowment on economic performance.

Bergougui et al. (2017) analyse the impact of oil resource abundance and institutional quality on real GDP per capita in eight major oil-producing Arab countries from 1996 to 2015. Utilising panel analysis techniques, including pooled OLS, fixed effects, and random effects models, the study incorporates institutional indicators such as regulatory quality, government effectiveness, and the rule of law. The results indicate that the rule of law exerts the most significant positive influence on economic development in these countries.

Epo and Nochi (2019) analyse the impact of natural resources and institutional quality on the economic growth of 44 African countries from 1996 to 2016 using the system generalised method of moments (SGMM). Their findings indicate that total natural resource rents negatively affect economic growth, whereas the share of ore and metal exports positively influences it, even after controlling for political stability. Additionally, both the rule of law and regulatory quality show a significant positive effect on growth.

Similarly, Ji et al. (2014) examined the relationship between resource abundance, institutional quality, and economic growth in China using panel and cross-sectional data from 1990 to 2008. They applied a panel-data model with time-varying coefficients to analyse the effects of policy shocks on resource impact. The study found that resource abundance positively affects economic growth and has a nonlinear impact on institutional quality at the provincial level during the sampled period.

Sini et al. (2022) investigate the influence of natural resource endowment on the relationship between capital flows and economic growth in 54 African nations from 2012 to 2020, using system GMM and Westerlund regression techniques. Key findings indicate that capital flows positively affect economic growth, contingent on resource extractions. Additionally, human capital significantly influences long-term growth. The study suggests prioritising human capital development and reducing reliance on resource extraction.

Ali *et al*. (2022) utilised the two-step dynamic system of the Generalised Method of Moments to demonstrate that natural resource windfalls significantly influence stock markets in G-7 countries, especially in the presence of high-quality institutions. The research highlights that G-7 nations with strong, developed institutions effectively channel natural resource rents into financial markets, leading to favourable economic outcomes, particularly in response to political and policy changes.

Xiaolei *et al*. (2023) explore how natural resource abundance affects green economic growth in 48 Belt and Road countries, focusing on institutional quality. Using the SBM model and GML, they apply panel threshold models to analyse the resource curse. Their findings indicate that for BRI countries, institutional quality must exceed a certain threshold to mitigate the resource curse on green growth. High-income countries benefit significantly from resource abundance with higher institutional quality, while low- and middle-income nations still face challenges. The study concludes that enhancing institutional quality is crucial for fostering green economic growth in these countries.

Waliu *et al*. (2022) investigate how human capital and institutional quality influence natural resource endowment, foreign direct investment (FDI), and economic growth in the MENA region from 1990 to 2017 using the ARDL technique. Their findings highlight a positive correlation between natural resource endowment and growth, while human capital shows both negative and positive impacts. Aggregated institutional quality yields negative estimates, but disaggregated quality produces mixed outcomes. FDI promotes growth in the short term, yet its long-term effects are negligible; human capital can soften FDI's adverse effects, and institutional quality reshapes the negative connection between FDI and growth.

Musibau *et al* (2022) analyse the impact of FDI, globalization, and economic governance on West African economic growth using panel ARDL technique from 1996 to 2016. The findings indicate that natural resource endowment significantly boosts economic growth, while FDI also contributes positively but varies in impact. Effective governance enhances regional growth but reduces the positive effects of natural resources, whereas regulatory quality strengthens these benefits.

Soula *et al*. (2023) examine how natural resources and institutional quality affect economic growth in Africa. Their study focuses on 43 resource-rich and 9 non-resource-rich countries and employs the Driscoll-Kraay estimation technique. Findings indicate that poor institutional quality hinders the positive impact of natural resources on growth, with little influence of institutional quality in both country types. The research concludes that natural resources impact growth more significantly in resource-scarce

countries, suggesting the need for resource-rich nations to improve their institutional frameworks for better economic outcomes.

Shakti and Prajna (2020) examine the resource curse hypothesis in Odisha's mining-rich districts, considering factors like natural resource abundance and economic growth from 1995-2015. Using a panel ARDL model with MG, PMG, and DFE estimators, they identify a long-term negative relationship between resource abundance and economic growth, indicating the presence of the resource curse, attributed to weak institutions and inadequate policies.

Eregha and Mesagan (2016) analysed the relationship between institutional growth and oil resource-per-capita GDP in five African oil-producing countries: Algeria, Angola, Egypt, Libya, and Nigeria, from 1996 to 2013. Using Pooled OLS, Fixed Effect, and Random Effect Models, they found that institutional quality slightly improved per-capita income growth, highlighting the weak institutions' role in perpetuating the resource curse. The authors asserted the need for improved institutional quality for better resource management and economic prosperity.

Olayungbo and Kazeem (2017) examine oil revenue, institutional quality, and economic growth in Nigeria from 1984 to 2014 using the ARDL model. They found that oil revenue positively impacts growth in the short term but negatively in the long term. Corruption negatively affects economic growth, while gross capital formation positively contributes in both time frames. Despite the robustness of their findings

Anna (2017) investigated how natural resources and institutions influence economic growth using data from 113 countries between 1970 and 2014, focusing on Nigeria. The study found that natural resources often correlate with lower institutional quality, negatively affecting economic growth. Conversely, a robust institutional environment, indicated by a rule-of-law index, is associated with increased GDP per capita growth, especially when combined with natural resources. The conclusion emphasizes that the impact of natural resources varies based on institutional quality and dependence on these resources.

Esu (2017) examined the impact of oil abundance on Nigeria's economic growth from 1980 to 2015 using the ARDL model. The study found that oil revenue and human capital positively and significantly influence economic growth in both the short and long term. Political stability, government effectiveness, rule of law, and control of corruption were also negative but insignificant influences, while regulatory quality had a positive yet insignificant effect on growth.

Research Gap

The relationship between institutional quality, natural resource endowment, and economic performance remains unclear due to various influencing factors, complicating definitive conclusions about their interactions and economic implications.

Many existing studies often explore these elements in isolation. For instance, authors such as Rodrik (2008), José & Carlos (2017), Gylfason (2001) and Sachs and Warner (1995), and Sharma (2022) emphasise the role of institutional quality as a critical driver of economic growth, arguing that better governance can lead to improved economic outcomes. However, there is limited empirical exploration of how these two variables interact specifically within the Nigerian context.

Furthermore, previous studies have shown that poor institutional frameworks hinder the economic benefits derived from natural resources. However, the moderating effect of institutional quality on the relationship between natural resource endowment and economic performance in the Nigerian context remains under-researched. Most studies employ either cross-country analysis or fail to incorporate Nigeria's unique conditions, including ethnic diversity, political instability, and economic policies. Therefore, this identified research gap provides robust opportunities for this study to inquire, paving the way for practical policy recommendations and ensuring that Nigeria's wealth in natural resources is translated into sustainable economic development.

3.0 METHODOLOGY

The paper employs a methodological framework based on Justin Yifu Lin's 2011 structural economic theory, emphasising the government's role in enhancing infrastructure for economic diversification. Ju et al. (2015) highlight that economic growth involves transitioning to higher productivity through capital accumulation, supported by comparative advantages and strong institutional frameworks. Additionally, Haussmann and Rodrik (2003) stress the significance of structural transformation in developing nations, indicating that effectively leveraging unique structural characteristics can accelerate growth.

To examine the conditional relationship between institutions and resource and Economic Performance, GDPPC is modelled as a function of the interaction between natural resource endowment and institutional quality and selected macroeconomic controls. The functional form is specified as:

$$GDPPC = f(NRE, INQ, FDI, GFCF, NRE*INQ) \quad (3.1)$$

In equation 3.1, GDPPC represents economic performance, NRE denotes natural resource endowment measured by resource rents as a percentage of GDP, INQ captures institutional quality, FDI represents foreign direct investment inflows, GFCF denotes gross fixed capital formation, and NRE*INQ is the interaction term accounting for the conditional effect of natural resource endowment on economic performance moderated by institutional quality.

The dynamic ARDL model is thus specified:

$$GDPPC_t = \gamma_0 + \gamma_1 GDPPC_{t-1} + \gamma_2 INQ_t + \gamma_3 NRE_t + \gamma_4 GFCF_t + \gamma_5 FDI_t + \gamma_6 (INQ*NRE)_t + \varepsilon_t. \quad (3.2)$$

In equation (3.2), $GDPPC_t$ represents economic performance and is modelled as a function of its past value ($GDPPC_{t-1}$), institutional quality (INQ_t), natural resource endowment (NRE_t), gross fixed capital formation ($GFCF_t$), foreign direct investment inflows (FDI_t), and the interaction between institutional quality and natural resource endowment INQ*NRE. The coefficient γ_1 captures the persistence of GDP per capita, while γ_2, γ_3, γ_4, and γ_5 measure the individual short-run effects of institutional quality, resource endowment, capital formation, and FDI, respectively. The coefficient γ_6 represents the conditional effect of NRE on economic performance depending on the level of institutional quality. The error term ε_t accounts for unobserved shocks affecting $GDPPC_t$. To distinguish between short run dynamics and long run equilibrium relationships, the ARDL error correction representation is specified as:

$$\Delta GDPPC_t = \delta_0 + \Sigma_i \delta_{1i} \Delta GDPPC_{t-i} + \Sigma_i \delta_{2i} \Delta INQ_{t-i} + \Sigma_i \delta_{3i} \Delta NRE_{t-} + \Sigma_i \delta_{4i} \Delta GFCF_{t-i} + \Sigma_i \delta_{5i} \Delta(INQ*NRE)_{t-i} + \omega_1 GDPPC_{t-1} + \omega_2 INQ_{t-1} + \omega_3 NRE_{t-1} + \omega_4 GFCF_{t-1} + \omega_5 (INQ \times NRE)_{t-1} + \xi_t \quad (3.3)$$

In equation (3.3), $\Delta GDPPC_t$ represents short-run changes in economic performance, modelled as a function of its own lagged changes (δ_{1i}), lagged changes in institutional quality (δ_{2i}), natural resource endowment (δ_{3i}), gross fixed capital formation (δ_{4i}), and the interaction between institutional quality and natural resource endowment (δ_{5i}). The coefficients on the lagged levels—ω_1, ω_2, ω_3, ω_4, and ω_5—capture the long-run equilibrium relationship between $GDPPC_t$ and the explanatory variables, with ω_1 particularly reflecting the speed of adjustment toward long-run equilibrium following a short-run shock. The error term ξ_t accounts for stochastic disturbances not explained by the model. This specification allows the analysis of both short-run dynamics and long-run conditional effects, including how the impact of natural resource endowment on $GDPPC_t$ may vary with institutional quality through the interaction term.

To determine the direction of causality because the variables are I(0) and I(1), the Toda-Yamamoto causality test was specified thus;

$$GDPPC_t = c_1 + \sum_{i=1}^{p} \alpha_i\, GDPPC_{t-i} + \sum_{i=1}^{p} \beta_i\, INQ_{t-i} + \sum_{i=1}^{p} \gamma_i\, NRE_{t-i} + \sum_{i=1}^{p} \Omega_i\, GFCF_{t-i} + \sum_{i=1}^{p} \theta_i\, (INQ \times NRE)_{t-i} + \sum_{i=1}^{p} \lambda_i\, FDI_{t-i} + \epsilon_{1t} \quad (3.4)$$

$$INQ_t = c_2 + \sum_{i=1}^{p} \rho_i\, INQ_{t-i} + \sum_{i=1}^{p} \kappa_i\, GDPPC_{t-i} + \sum_{i=1}^{p} \phi_i\, NRE_{t-i} + \sum_{i=1}^{p} \gamma_i\, GFCF_{t-i} + \sum_{i=1}^{p} \psi_i\, (INQ \times NRE)_{t-i} + \sum_{i=1}^{p} \omega_i\, FDI_{t-i} + \epsilon_{2t} \quad (3.5)$$

$$NRE_t = c_3 + \sum_{i=1}^{p} \mu_i\, NRE_{t-i} + \sum_{i=1}^{p} \chi_i\, GDPPC_{t-i} + \sum_{i=1}^{p} \xi_i\, INQ_{t-i} + \sum_{i=1}^{p} \gamma_i\, GFCF_{t-i} + \sum_{i=1}^{p} \pi_i\, (INQ \times NRE)_{t-i} + \sum_{i=1}^{p} \rho_{1i}\, FDI_{t-i} + \epsilon_{3t} \quad (3.6)$$

$$FDI_t = c_4 + \sum_{i=1}^{p} \lambda_{1i}\, FDI_{t-i} + \sum_{i=1}^{p} \alpha_{1i}\, GDPPC_{t-i} + \sum_{i=1}^{p} \beta_{1i}\, INQ_{t-i} + \sum_{i=1}^{p} \gamma_i\, GFCF_{t-i} + \sum_{i=1}^{p} \gamma_{1i}\, NRE_{t-i} + \sum_{i=1}^{p} \theta_{1i}\, (INQ \times NRE)_{t-i} + \epsilon_{4t} \quad (3.7)$$

$$INQ * NRE_t = c_5 + \sum_{i=1}^{p} \delta_i\, (INQ \times NRE)_{t-i} + \sum_{i=1}^{p} \alpha_{2i}\, GDPPC_{t-i} + \sum_{i=1}^{p} \gamma_i\, GFCF_{t-i} + \sum_{i=1}^{p} \beta_{2i}\, INQ_{t-i} + \sum_{i=1}^{p} \gamma_{2i}\, NRE_{t-i} + \sum_{i=1}^{p} \lambda_{2i}\, FDI_{t-i} + \epsilon_{5t} \quad (3.8)$$

In equations (3.1)–(3.8), each variable is modelled as a function of its own past values and the lagged values of other relevant variables to capture the dynamic interrelationships and potential Granger causality effects. In equation (3.4)**,** GDP per capita ($GDPPC_t$) is expressed as a function of its own lagged values (α_i), institutional quality (INQ_{t-i}, β_i), natural resource endowment (NRE_{t-i}, γ_i), their interaction term ($INQ * NRE_{t-i}$, θ_i), and foreign direct investment (FDI_{t-i}, λ_i), with ϵ_{1t}capturing random shocks. Equation (3.5) models institutional quality as dependent on its own lags (ρ_i), lagged GDPPC (κ_i), lagged NRE (ϕ_i), the interaction term (ψ_i), and FDI (ω_i), while ϵ_{2t}represents the disturbance term. In equation (3.6)**,** natural resource endowment depends on its own lags (μ_i), lagged GDPPC (χ_i), lagged INQ (ξ_i), the interaction term (π_i), and lagged FDI (ρ_{1i}), with ϵ_{3t}as the error term. Equation (3.7) models FDI as a function of its own lags (λ_{1i}), lagged GDPPC (α_{1i}), lagged INQ (β_{1i}), lagged NRE (γ_{1i}), and the interaction term (θ_{1i}), with ϵ_{4t}capturing shocks. Finally, equation (3.8) represents the interaction term ($INQ * NRE_t$) as a function of its own lags (δ_i), lagged GDPPC (α_{2i}), lagged INQ (β_{2i}), lagged NRE (γ_{2i}), and lagged FDI (λ_{2i}), with ϵ_{5t}as the disturbance. This system allows for examining both direct and conditional causal relationships between economic performance, institutional quality, natural resource endowment, their joint effect, and FDI inflows.

Sources of Data

The study utilises secondary empirical data sourced from the World Governance Indicators, World Development Indicators, World Bank, Central Bank of Nigeria Statistical bulletins, and the National Bureau of Statistics of Nigeria. The time series data, covering 1996 to 2024, facilitates comprehensive analysis and insight into trends over nearly three decades.

Justification for Employing the Principal Component Analysis

The six Worldwide Governance Indicators: Voice and Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption were combined into a single composite index using principal component analysis (PCA). This method extracts the first principal component, which captures the maximum shared variance among the highly correlated indicators (pairwise correlations 0.75–0.95), thereby generating data-driven weights while addressing multicollinearity that would arise from separate inclusion (Langbein & Knack, 2010). PCA reduces dimensionality, mitigates measurement error, and produces a parsimonious measure of institutional quality widely employed in the empirical institutions literature (Emara & Chiu, 2016; Polat, 2020; Ejemeyovwi *et al*., 2024; Shaharuddin *et al*., 2024). The resulting index, normalised to a 0–100 scale, serves as the primary measure of institutional quality (INQ) in all specifications, with robustness to equal weighting reported in Appendix C.

Estimation Technique

The estimation phase employed the ARDL error correction framework to analyse both short-run and long-run dynamics. Its bounds testing approach accommodates mixed orders of integration (I(0) and I(1)), distinguishing it from traditional methods requiring uniform integration orders, typically I(1). The technique is effective with small samples (30-80 data points), producing robust and consistent results. It addresses endogeneity by assuming all variables are endogenous and entails a single long-run relationship for clear identification. According to Pesaran, Smith, and Shin (2001), ARDL fosters a unique reduced-form equation linking dependent and exogenous variables. Additionally, Toda-Yamamoto Granger causality tests were utilised to explore the causality direction among natural resource endowment, institutional quality, and economic performance. Model stability was evaluated via CUSUM and CUSUMSQ tests, supplemented by diagnostics addressing serial correlation, heteroskedasticity, normality, and variance inflation to affirm the models' robustness and validity, with all analyses performed using EViews 14.

Ethical considerations

The study outlines an empirical economic inquiry using secondary, publicly accessible macroeconomic and socio-economic data, thereby avoiding direct human-subject interaction and the need for institutional review board approval while maintaining academic integrity. Key practices include transparent data sourcing and methodology, with clear attribution to sources like the World Development Indicators and the Central Bank of Nigeria. The econometric approach is detailed, enabling replication and critical peer evaluation. The study provides comprehensive citations to mitigate plagiarism, objectively reports all findings—even statistically insignificant ones—and presents model diagnostics that reveal limitations, thereby avoiding selective reporting. It acknowledges the research limitations candidly, enhancing intellectual honesty regarding conclusions. This ethically robust framework promotes a transparent and reproducible investigation into the relationships between natural resource endowment, institutional quality, and their effects on Nigeria's economic performance, focusing on investment, governance, and human capital pathways influenced by resource dependence.

4.0. DATA PRESENTATION AND RESULTS

The estimation phase employed the ARDL error correction framework to capture both short run and long run dynamics, while pairwise Granger causality tests were conducted to examine the direction of causality among natural resource endowment, institutional quality, and economic performance. A series of diagnostic evaluations covering serial correlation, heteroskedasticity, normality and stability tests was performed to confirm the robustness, validity and stability of the estimated models. All empirical analyses were conducted using

EViews.

Principal Component Analysis of Governance Indicators

A composite governance index was constructed using Principal Component Analysis (PCA) on six governance indicators: rule of law, government effectiveness, regulatory quality, voice and accountability, control of corruption, and political stability. PCA reduces dimensionality by extracting the common variation across these indicators. Table 4.1 shows the eigenvalue, variance explained, and loadings of the first principal component, which was used as the governance index in the analysis.

Table 4.1: Principal Component Analysis of Governance Indicators (1996–2024)

Item	**PC1**
Eigenvalue	2.8456
Proportion of Variance Explained	0.4743
Cumulative Variance Explained	0.4743
Governance Indicators	**PC1 (Loading)**
Rule of Law (ROL)	0.4985
Government Effectiveness (GEF)	-0.3303
Regulatory Quality (RQ)	0.3561
Voice and Accountability (VOA)	0.3445
Control of Corruption (COC)	0.4627
Political Stability (POLS)	-0.4277

Source: Author's Computation.

Table 4.1 reports the Principal Component Analysis results for the governance indicators over the period 1996 to 2024. The first principal component has an eigenvalue of 2.8456 and explains about 47.4 percent of the total variation, indicating a strong common governance factor among the indicators. Rule of law, regulatory quality, voice and accountability, and control of corruption load positively on the component, showing that improvements in these areas move together and reflect stronger governance quality. Government effectiveness and political stability load negatively, reflecting their inverse relationship with some governance dimensions within the sample period rather than conceptual inconsistency. Overall, the magnitude and spread of the loadings confirm that the first principal component provides a reliable composite measure of governance quality and is therefore used as the governance index in the empirical analysis.

Descriptive Statistics

This subsection presents an overview of the descriptive statistics for the key variables used in the study, including institutional quality, natural resource endowment, foreign direct investment, real GDP per capita, gross fixed capital formation.

Interaction between natural resource endowment and institutional quality is also included to capture their combined influence on economic outcomes. The detailed results are reported in Table 4.1.1.

Table 4.2: Descriptive Statistics

	GDPPC	FDI	NRE	INQ	GFCF	NRE*INQ
Mean	2.079045	0.398216	13.01583	0.000690	9187833.	-3.091713
Median	2.245000	0.384849	13.04363	0.377500	9178168.	4.181241
Maximum	12.21000	0.885559	24.93573	1.167700	11766417	13.53043
Minimum	-4.018925	-0.039285	4.554107	-1.937100	6860444.	-36.29366
Std. Dev.	3.216243	0.263043	5.186866	1.017699	1310859.	15.39645
Skewness	0.650398	0.028274	0.234732	-0.780173	0.131179	-1.008149
Kurtosis	4.936012	1.958849	2.379244	2.085157	2.016769	2.603874
Jarque-Bera	6.573588	1.313691	0.731929	3.953203	1.251319	5.102035
Probability	0.037373	0.518484	0.693527	0.138539	0.534909	0.078002
Observations	29	29	29	29	29	29

Note: The table presents descriptive statistics for the key macroeconomic and institutional variables. The statistics include the mean, median, maximum, minimum, standard deviation, skewness, kurtosis, Jarque–Bera statistic, probability, sum, sum of squared deviations, and number of observations. Skewness indicates the asymmetry of the distribution, while kurtosis measures the peakedness. The Jarque–Bera test assesses the normality of the series, with the probability value indicating whether the null hypothesis of normality can be rejected.

Source: Author's computations, 2026.

The descriptive evidence in Table 4.2 presents a clear picture of the behaviour of the study variables over the sample period. Real GDP per capita growth averages 2.08 % (median: 2.25 %), fluctuating widely between a minimum of −4.02 % and a maximum of 12.21 %. The standard deviation (3.22 %) exceeds the mean, reflecting pronounced macroeconomic volatility that mirrors recurrent economic shocks in Nigeria, as documented in the literature (Ndikumana & Boyce, 2011). The distribution is positively skewed (skewness: 0.65) and leptokurtic (kurtosis: 4.94), and the Jarque-Bera probability (0.04) indicates non-normality. Foreign direct investment inflows remain low at 0.40 % of GDP (median: 0.38 %) and vary between −0.04 % and 0.89 %, with a standard deviation of 0.26 %. The

distribution is nearly symmetric (skewness: 0.03) and flat (kurtosis: 1.96), with the Jarque-Bera probability (0.52) supporting normality, reflecting a constrained investment environment (UNCTAD, 2023).

Natural resource endowment averages 13.02 % of GDP (median: 13.04 %) and ranges from 4.55 % to 24.94 %, indicating strong exposure to global commodity cycles (Ross, 2015). The standard deviation (5.19 %) reflects substantial variation. Institutional quality, measured via normalised PCA scores, averages 0.000690 (median: 0.38) with a range of −1.94 to 1.17 and a standard deviation of 1.02. Skewness (−0.78) and kurtosis (2.09) suggest a moderately left-skewed distribution, with the Jarque-Bera probability (0.14) supporting approximate normality, reflecting governance cycles (Kaufmann *et al*., 2023).

Gross fixed capital formation averages 9,187,833 (median: 9,178,168), showing wide variation from 6,860,444 to 11,766,417 (standard deviation: 1,310,859), consistent with volatile investment patterns in developing economies (Aghion *et al*., 2019). The interaction term between natural resource endowment and institutional quality (NRE*INQ) records a mean of −3.09 (median: 4.18), with a wide range from −36.29 to 13.53 and a standard deviation of 15.40. Its distribution is left-skewed (−1.01) and moderately flat (kurtosis: 2.60), with the Jarque-Bera probability (0.08) suggesting mild non-normality. This underscores the conditional moderating role of institutions in shaping the growth effects of natural resources (Mehlum *et al*., 2006).

Correlation Analysis

Prior to conducting the econometric analysis, it is important to examine the relationships among the variables to identify potential associations and multicollinearity issues. Table 4.2.1 presents the pairwise correlation coefficients for all key variables over the sample period 1996–2024. The correlation analysis provides insights into the strength and direction of linear relationships, highlighting which variables may interact or move together in the Nigerian economic context.

Table 4.3: Pairwise Correlation Matrix

Variable	GDPPC	INQ	FDI	NRE	GFCF	NRE*INQ
GDPPC	1					
INQ	–0.356	1				
FDI	0.193	0.558***	1			
NRE	0.417**	–0.607***	–0.112	1		
GFCF	–0.355	0.681***	0.166	–0.661***	1	
NRE*INQ	–0.235	0.971***	0.610***	–0.545**	0.615***	1

Notes: N = 29. GDPPC = real GDP per capita growth (%), NRE = natural resource endowment (% of GDP), INQ = institutional quality index (0–100), (%), GFCF = gross fixed capital formation (% of GDP), NRE*INQ = interaction term, FDI = foreign direct investment net inflows (% of GDP). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$ (two-tailed tests.

Source: Author's computations, 2026.

Table 4.3 presents Pearson correlations among real GDP per capita growth (GDPPC), institutional quality (INQ), natural resource variables, and the full set of covariates. The results indicate that GDP per capita growth is positively and significantly correlated with natural resource endowment (NRE, 0.417**), consistent with resource-driven growth episodes and demographic dividend effects observed in Nigeria (Sala-i-Martin & Subramanian, 2013). Its negative correlation with institutional quality (−0.356) provides preliminary evidence that stronger institutions may moderate short-term growth volatility arising from commodity dependence, a pattern highlighted in the resource-curse literature (Ross, 2015).

Foreign Direct Investment inflows exhibit the expected signs with growth, but do not attain conventional significance levels in bivariate analyses.

Institutional quality exhibits the strongest associations within the sample, FDI inflows (0.558*******), and is strongly negatively correlated with natural resource endowment (−0.607*******). These patterns are consistent with theoretical expectations that superior institutions foster human capital accumulation and economic diversification, while mitigating Dutch disease dynamics (Acemoglu *et al*., 2005; Rodrik *et al*., 2004).

The interaction term NRE *INQ is highly correlated with institutional quality (0.971*******) and strongly associated with FDI inflows (0.610***) and gross fixed capital formation (GFCF, 0.615*******), suggesting that the moderating effect of institutions on the resource-growth nexus may operate partly through enhanced investment and capital accumulation channels (Bhattacharyya & Hodler, 2014). At the same time, NRE *INQ is negatively correlated with natural resource endowment (−0.545******), reflecting the complex interplay between resource dependence and institutional quality in shaping economic outcomes.

Stationarity Test

Given the small annual sample of the macroeconomic data, stationarity was assessed using the Augmented Dickey–Fuller (ADF), Phillips–Perron (PP), and Zivot–Andrews (1992) unit root tests, which were performed to show the stationarity of the data. Tables 4.4a-4c report the results in levels and first differences.

Table 4.4a: Augmented Dickey–Fuller (ADF) Unit Root Test Result

Variable	Levels		First Difference		Order of Integration
	ADF Statistic	p-value	ADF Statistic	p-value	
GDPPC	–2.886	0.0597	–7.302***	0.0000	I(1)
INQ	–2.708	0.0880	–3.522**	0.0151	I(1)
NRE	–2.513	0.1232	–5.482***	0.0001	I(1)
GFCF	–0.249	0.9199	–8.837***	0.0000	I(1)
FDI	–2.728	0.0820	–7.931***	0.0000	I(1)
NRE*INQ	-3.2248***	0.0314	-	-	I(0)

Note: ADF = Augmented Dickey–Fuller test statistic; levels and first differences represent the original series and its first-differenced form, respectively. ** and *** denote significance at the 5% and 1% levels, respectively. I(0) indicates stationarity at levels, while I(1) indicates stationarity after first differencing.

Source: Author's computation, 2026.

The Augmented Dickey Fuller unit root test was conducted to determine the stationarity properties of the variables. As shown in Table 4.4a, most of the series become stationary after first differencing, indicating integration of order one. Specifically, gross domestic product per capita GDPPC becomes stationary at first difference (ADF = −7.302, p = 0.0000), institutional quality INQ (ADF = −3.522, p = 0.0151), natural resource endowment NRE (ADF = −5.482, p = 0.0001), natural gas revenue Gross fixed capital formation GFCF (ADF = −8.837, p = 0.0000), infrastructure and foreign direct investment FDI (ADF = −7.931, p = 0.0000).

In contrast, the interaction term between natural resource endowment and institutional quality NRE multiplied by INQ is stationary at levels (ADF = −3.2248, p = 0.0314), indicating integration of order zero. This suggests that the combined effect of natural resource endowment and institutional quality exhibits a stable time series behaviour even when the individual components are non-stationary at levels.

Overall, the unit root results reveal a mixed order of integration, with most variables integrated of order one, while the interaction term is integrated of order zero. Given the small sample size, these results are interpreted with caution and are used primarily to inform model specification rather than to strictly enforce asymptotic cointegration based estimation requirements.

Table 4.4b: Phillips–Perron (PP), Unit Root Test Result

Variable	Levels Adj. t-Stat	Prob.	First Difference Adj. t-Stat	Prob.	Order of Integration
GDPPC	-2.814	0.0691	-7.427***	0.0000	I(1)
INQ	-1.736	0.4028	-3.633***	0.0117	I(1)
NRE	-2.540	0.1172	-10.354***	0.0000	I(1)
GFCF	-2.196	0.2122	-13.241***	0.0000	I(1)
FDI	-2.572	0.1105	-8.473***	0.0000	I(1)
NRE*INQ	-2.295	0.1805	-4.191***	0.0031	I(1)

Note: PP = Phillips–Perron test statistic; levels and first differences refer to the original series and its first-differenced form, respectively. *** denotes significance at the 1% level. I(0) indicates stationarity at levels, I(1) indicates stationarity after first differencing.

Source: Author's computation, 2026

The Phillips–Perron (PP) unit root test was conducted on the selected macroeconomic and institutional variables to assess their stationarity properties and determine their order of integration. As shown in Table 4.4b, most variables are non-stationary at levels, failing to reject the null hypothesis of a unit root at the 5% significance level. Specifically, GDP per capita (GDPPC, PP = −2.814, p = 0.0691), Institutional Quality (INQ, PP = −1.736, p = 0.4028), Natural Resource Endowment (NRE, PP = −2.540, p = 0.1172), Gross Fixed Capital Formation (GFCF, PP = −2.196, p = 0.2122), Foreign

Direct Investment (FDI, PP = −2.572, p = 0.1105), and the interaction term (NRE*INQ, PP = −2.295, p = 0.1805) all exhibit non-stationarity in levels, consistent with the stochastic trends commonly observed in macroeconomic series.

All other non-stationary variables achieve stationarity only after first differencing, with their first-difference statistics significant at the 1% level, confirming they are integrated of order one, I(1).

Overall, the dataset exhibits a mixed order of integration, with both I(0) and I(1) variables present. This integration structure justifies the use of the Autoregressive Distributed Lag (ARDL) bounds testing approach for cointegration analysis, as it allows estimation of long-run relationships without requiring all series to be uniformly stationary, thus reducing the risk of spurious regression and ensuring robust inference.

Table 4.4c: Zivot–Andrews Unit Root Test Results (Structural Break)

Variable	ZA t-Statistic	Prob.	5% Crit	Order of Integration
GDPPC	-4.271	0.3193	-5.08	I(1)
INQ	-6.219	0.0031	-5.08	I(0)
NRE	-4.867	0.0055	-5.08	I(0)
GFCF	-7.577	0.0047	-5.08	I(0)
FDI	-3.164	0.0407	-4.93	I(1)
NRE*INQ	-6.780	0.0006	-5.08	I(0)

Note: ZA = Zivot–Andrews test statistic; Critical value at 5% = –4.80. I(0) denotes stationarity at levels, I(1) denotes stationarity after first differencing.

Source: Author's computation, 2026.

The Zivot–Andrews unit root test was employed to account for possible endogenous structural breaks in the series, recognising that ignoring such breaks may bias conventional unit root results. The test allows for a one-time shift in both the intercept and trend, providing a more robust assessment of stationarity in the presence of structural change. The results presented in Table 4.4c reveal mixed integration properties across the variables.

At the five percent significance level, the null hypothesis of a unit root cannot be rejected for GDP per capita (GDPPC, ZA = –4.271), and Foreign Direct Investment (FDI, ZA = –3.164), as their test statistics are less negative than the 5% critical value of –5.08 (or –4.93 in the case of FDI). This indicates that these variables are non-stationary at levels and must be differenced once to achieve stationarity, classifying them as integrated of order one, I(1). Conversely, Institutional Quality (INQ, ZA = –6.219,), Natural Resource Endowment (NRE, ZA = –4.867), Gross Fixed Capital Formation (GFCF, ZA = –7.577), and the interaction term between Natural Resource Endowment and Institutional Quality (NRE*INQ, ZA = –6.780) reject the null hypothesis of a unit root, indicating stationarity at levels and

classifying these variables as integrated of order zero, I(0).

Cointegration Analysis

The existence of a stable long-run relationship among the variables is examined using the autoregressive distributed lag (ARDL) bounds testing procedure proposed by Pesaran, Shin, and Smith (2001). This approach is particularly advantageous in small samples.

Table 4.5: ARDL Bound Test Results. INQ Model

	Sample Size	10%	5%	1%
		F-Statistic= 4.705683		
I(0)	30	2.578	3.125	4.537
I(1)	30	3.858	4.608	6.370
I(0)	Asymptotic	2.260	2.620	3.410
I(1)	Asymptotic	3.350	3.790	4.680
		t-Statistic=-4.848781		
I(0)	Asymptotic	-2.570	-2.860	-3.430
I(1)	Asymptotic	-3.860	-4.190	-4.790

Note: I(0) and I(1) represent lower and upper critical bounds for the ARDL bounds test, corresponding to stationary and non-stationary series. F-statistic and t-statistic are calculated to test the null hypothesis of no long-run relationship. Trend type for all models: Unrestricted constant (Case 3). Sample size corresponds to the number of observations used in the ARDL estimation.

Source: Author's Computation.

The ARDL bounds test results for the economic performance equation proxied by GDPPC, the equation with five regressors and a sample size of thirty are presented in Table 4.5. The computed F statistic of 4.7056 and t statistic of -4.848 lead to a clear rejection of the null hypothesis of no long run relationship at the 1% level. Specifically, the F statistic exceeds the upper I(1) critical bound, while the t statistic is more negative than the corresponding lower bound under Case III with an unrestricted intercept and no trend. This provides strong evidence of a stable cointegrating relationship between institutional quality, natural resource endowment, and the included control variables, confirming the existence of a long run equilibrium and justifying estimation and interpretation of the normalised long-run coefficients in the subsequent analysis.

Lag Length Criteria

Table 4.6: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-642.0887	NA	2.85e+13	48.00657	48.29454*	48.09220
1	-596.0683	68.17843	1.46e+13	47.26432	49.28006	47.86371
2	-534.4566	63.89360*	3.42e+12*	45.36716*	49.11069	46.48030*

Note: LR = sequential modified LR test statistic; FPE = Final Prediction Error; AIC = Akaike Information Criterion; SC = Schwarz Criterion; HQ = Hannan-Quinn Criterion. * indicates the lag order selected by the respective criterion.

Source: Author's Computation.

Table 4.6 presents the VAR lag order selection criteria for the model specification. The results show that most of the information criteria consistently select an optimal lag length of two periods. This convergence justifies the choice of a maximum lag of two, ensuring an appropriate balance between model adequacy and parsimony while minimising the risk of overfitting. The selected lag structure therefore provides a robust foundation for subsequent estimation and inference.

Short run and Long Run Autoregressive Distributed Lag (ARDL) Estimation

The Autoregressive Distributed Lag approach proposed by Pesaran, Shin, and Smith is used to estimate both short run dynamics and long run equilibrium relationships. This framework is well suited to the study because the variables exhibit a mix of stationary and non-stationary properties, as shown in Table 4.4. It remains applicable regardless of integration order and performs reliably in small samples without the need for prior differencing or restrictive pre testing procedures.

Table 4.7: Summary of ARDL Estimates. Dependent Variable: GDPPC

Variable	Coefficient	Std. Error	t Statistic	Prob.
Long run Coefficients				
INQ	-3.196761	3.572221	-0.894895	0.3805
NRE(-1)	0.666852	0.266614	2.501186	0.0203
FDI	2.046228	2.766421	0.739666	0.4673
NRE*INQ(-1)	0.180498	0.233506	0.772993	0.4478
GFCF	1.12E-06	6.41E-07	1.750249	0.0940
Short run Dynamics				
ECM(-1)*	-0.900760	0.147970	-6.087467	0.0000

D(NRE)	0.281261	0.103151	2.726684	0.0126
D(NRE(-1))	-0.320852	0.120458	-2.663605	0.0145
D(NRE*INQ)	0.106961	0.053643	1.993943	0.0593
D(NRE*INQ(-1))	-0.185768	0.050656	-3.667227	0.0014
C	-15.11548	2.563013	-5.897546	0.0000
R squared	0.697968			
Adjusted R squared	0.626056			
F statistic	9.705820			
Prob(F statistic)	0.000065			
Durbin Watson stat	2.139024			

Source: Author's computation.

The ARDL results reported in Table 4.7 indicate a statistically sound model that explains variations in economic performance, as measured by real GDP per capita. The adjusted R squared of 0.626 suggests that approximately 63% of the changes in GDP per capita are explained by natural resource endowment, institutional quality, their interaction term, foreign direct investment, and capital formation. The overall model is jointly significant, as reflected by the F statistic of 9.706 with a probability value of 0.000, confirming the relevance and adequacy of the specification. The Durbin-Watson statistic of 2.139 is close to the benchmark value of two, indicating the absence of serious serial correlation and supporting the reliability of the estimated coefficients.

In the long run, natural resource endowment exhibits a positive and statistically significant effect on economic performance ($\beta = 0.667$, $p = 0.020$). This implies that increases in resource endowment contribute to higher GDP per capita over time, suggesting that resource revenues can enhance economic performance when sustained. Institutional quality, although negatively signed, is not statistically significant in the long run ($\beta = -3.197$, $p = 0.381$), indicating that its direct long run effect on economic performance is weak within the estimated model. Foreign direct investment also shows a positive but insignificant coefficient, suggesting that its growth-enhancing effects may not persist in the long run. The interaction term between natural resource endowment and institutional quality is positive but insignificant, implying that institutional quality does not significantly moderate the long run resource growth relationship. Gross fixed capital formation is positive and weakly significant ($\beta = 0.00000112$, $p = 0.094$), indicating that sustained investment contributes marginally to long run economic performance.

The short run dynamics reveal strong adjustment behaviour toward long run equilibrium. The error correction term is negative and highly significant ($ECM = -0.901$, $p = 0.000$), confirming the existence of a stable long run relationship. This coefficient implies that about 90 percent of short run deviations from equilibrium in GDP per capita are corrected within one period, reflecting a rapid speed of adjustment.

Changes in natural resource endowment exert mixed short run effects on economic performance. The contemporaneous change in NRE has a positive and significant effect on GDP per capita ($D(NRE) = 0.281$, $p = 0.013$), suggesting that resource inflows stimulate economic activity in the short run. However, the lagged change is negative and significant ($D(NRE(-1)) = -0.321$, $p = 0.015$), indicating that the initial gains from resource shocks

may be followed by adjustment costs or inefficiencies that dampen growth. The interaction term between natural resource endowment and institutional quality shows a positive contemporaneous effect that is marginally significant (D(NRE**INQ) = 0.107, p = 0.059), implying that better institutions may help convert short run resource inflows into growth. Conversely, its lagged effect is negative and strongly significant (D(NRE**INQ(−1)) = −0.186, p = 0.001), suggesting delayed coordination or governance challenges that offset earlier gains.

Overall, the results show that economic performance responds to both long run structural factors and short run resource driven shocks. Natural resource endowment plays a central role, with beneficial long run effects with dynamic short run dynamics. The highly significant error correction mechanism confirms stability of the long run relationship, while the short run coefficients highlight the importance of adjustment processes and the conditional role of institutions in shaping resource led growth outcomes.

Table 4.8: Summary of Pairwise Granger Causality Tests

Null Hypothesis:	F-Statistic	Prob.	Mode of Causality
INQ does not Granger Cause GDPPC	2.10623	0.1456	No Causality
GDPPC does not Granger Cause INQ	1.08586	0.3550	
NRE does not Granger Cause GDPPC	3.23011	0.0589	No Causality
GDPPC does not Granger Cause NRE	0.32117	0.7286	
FDI does not Granger Cause GDPPC	0.19859	0.8213	No Causality
GDPPC does not Granger Cause FDI	1.60692	0.2232	
NRE*INQ does not Granger Cause GDPPC	2.26288	0.1277	No Causality
GDPPC does not Granger Cause NRE*INQ	1.29160	0.2949	
GFCF does not Granger Cause GDPPC	2.91102	0.0756	No Causality
GDPPC does not Granger Cause GFCF	0.59119	0.5622	
NRE does not Granger Cause INQ	2.30497	0.1234	No Causality
INQ does not Granger Cause NRE	2.57360	0.0990	

Source: Author's computation.

Granger Causality Results

Table 4.8 presents the results of the pairwise Granger causality tests examining short-run predictive relationships between GDP per capita and key macroeconomic and institutional variables. The findings indicate no statistically significant causality in the short run. For institutional quality, the null hypotheses that INQ does not Granger cause GDPPC (F = 2.10623, p = 0.1456) and that GDPPC does not Granger cause INQ (F = 1.08586, p = 0.3550) cannot be rejected. Similarly, for natural resource endowment, the null that NRE does not Granger cause GDPPC (F = 3.23011, p = 0.0589) and the reverse (F = 0.32117, p = 0.7286) are not rejected.

Foreign direct investment shows no causality with GDP per capita in either direction (F = 0.19859, p = 0.8213; F = 1.60692, p = 0.2232), and the interaction term between NRE and INQ is similarly insignificant (F = 2.26288, p = 0.1277; F = 1.29160, p = 0.2949). For gross fixed capital formation, neither direction is significant (F = 2.91102, p = 0.0756; F = 0.59119, p = 0.5622).

The test of causality between NRE and INQ also shows no significant short-run feedback, with F = 2.30497, p = 0.1234 for NRE → INQ, and F = 2.57360, p = 0.0990 for INQ → NRE.

Overall, these results indicate that short-run fluctuations in GDP per capita are largely independent of the selected macroeconomic and institutional variables, suggesting that these variables' influence on economic performance is more likely to operate through long-run structural mechanisms rather than through immediate predictive effects.

Post Estimation Test

Following the estimation of the ARDL models and Granger causality tests, post-estimation diagnostics were carried out to verify the robustness of the results. These procedures are intended to examine the distribution of residuals, check for heteroskedasticity, autocorrelation, and assess the stability of the estimated coefficients over the sample period.

Table 4.9: Breusch-Godfrey Serial Correlation LM Test Results

Test	Statistic	Value	Df	Probability	Remarks
Wald Test	F-statistic	67.026	(2, 16)	0.0000	Rejected
	Chi-square	134.051	2	0.0000	
Breusch–Godfrey Serial Correlation LM Test	F-statistic	0.322	(2, 14)	0.7299	Not rejected
	Obs*R-squared	1.187	0.5523		
Breusch–Pagan–Godfrey Heteroskedasticity Test	F-statistic	0.977	(10, 16)	0.4985	Not rejected
	Obs*R-squared	10.235	0.4202		
	Scaled explained SS	2.606	0.9892		
Ramsey RESET Test	t-statistic	1.681990	15	0.1133	Not rejected
	F-statistic	2.829089	(1, 15)	0.1133	

Source: Author's Computation.

Table 4.9 presents the post estimation diagnostic results assessing serial correlation and heteroskedasticity in the estimated model. The Breusch Godfrey LM test indicates that the null hypothesis of no serial correlation up to two lags cannot be rejected, as reflected by the F statistic of 0.322 with a probability value of 0.7299 and the Obs R squared statistic of 1.187 with a probability value of 0.5523. These results confirm the absence of residual autocorrelation, suggesting that the

specified lag structure sufficiently captures the underlying dynamics of the model and that the estimated coefficients are not biased by serial dependence.

In addition, the Breusch Pagan Godfrey heteroskedasticity test fails to reject the null hypothesis of constant error variance, with an F statistic of 0.977 and probability value of 0.4985, alongside an Obs R squared value of 10.235 with a probability of 0.4202. This confirms homoskedastic residuals and supports the reliability of the standard errors.

The Ramsey RESET test also indicates no evidence of model misspecification, with a t statistic of 1.682 ($p = 0.1133$) and an F statistic of 2.829 ($p = 0.1133$), suggesting that the functional form of the model is appropriate. While the Wald test strongly rejects the joint null hypothesis at the one percent level, with an F statistic of 67.026 and Chi-square value of 134.051, indicating the joint significance of the imposed restrictions, the overall diagnostic outcomes validate the robustness of the model and the credibility of the inferential results.

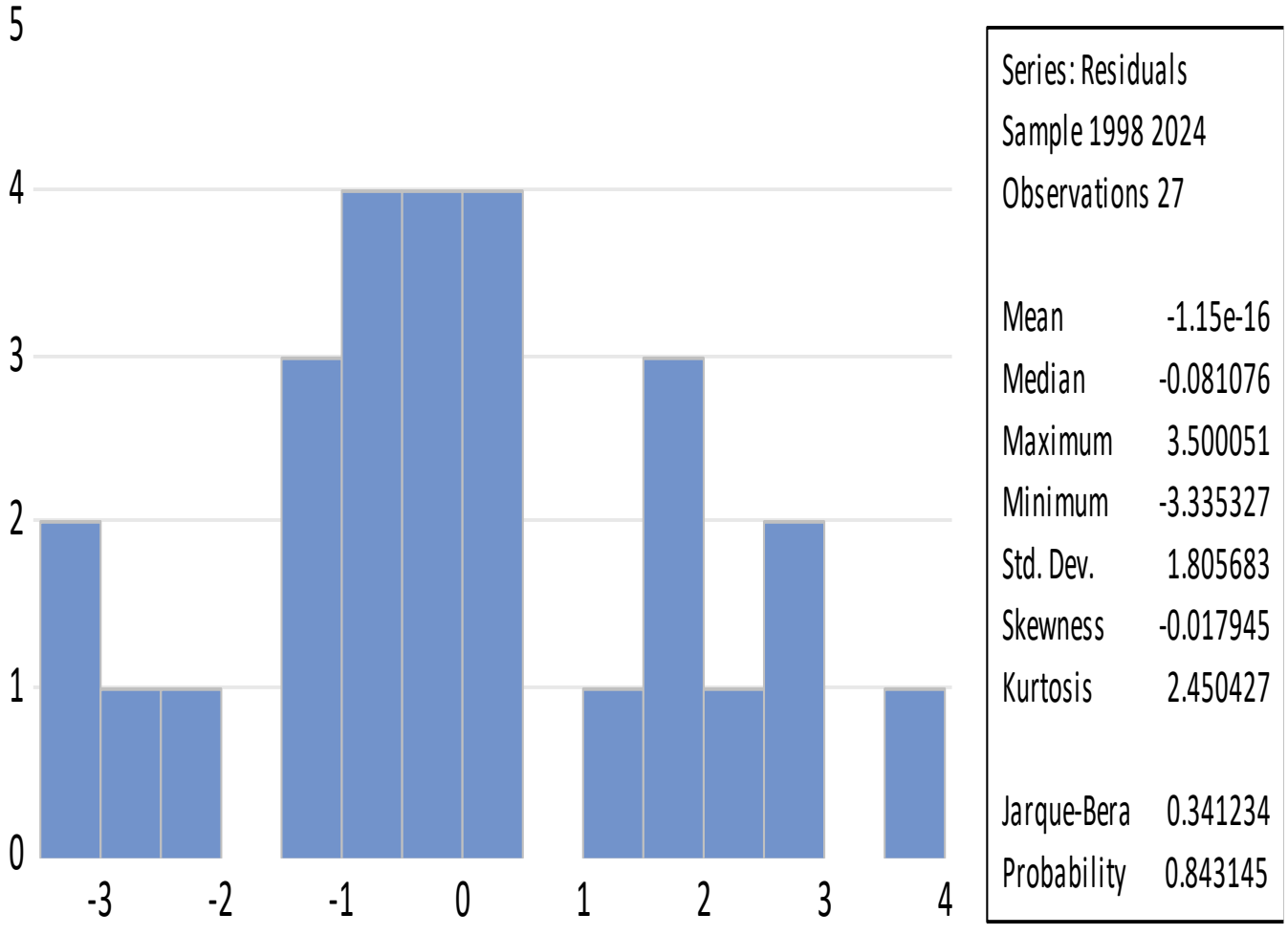

Figure 4.1: Histogram of Normality Test

Figure 4.1 presents the histogram and normality statistics for the residuals from the ARDL estimation (1998–2024). The residuals are symmetrically distributed around a mean of near zero (–1.15e-16), with a modest standard deviation of 1.806. The distribution exhibits mild positive skewness (0.018) and is slightly leptokurtic (kurtosis 2.450), but the Jarque–Bera statistic of 0.341 (p = 0.843) fails to reject the null hypothesis of normality at any conventional significance level.

These results confirm that the residuals are normally distributed, satisfying a core assumption of the classical linear regression model and supporting valid statistical inference on the coefficient estimates.

Stability Test Results

The stability test results assess the consistency of the estimated parameters over the sample period and verify whether the model remains structurally reliable over time

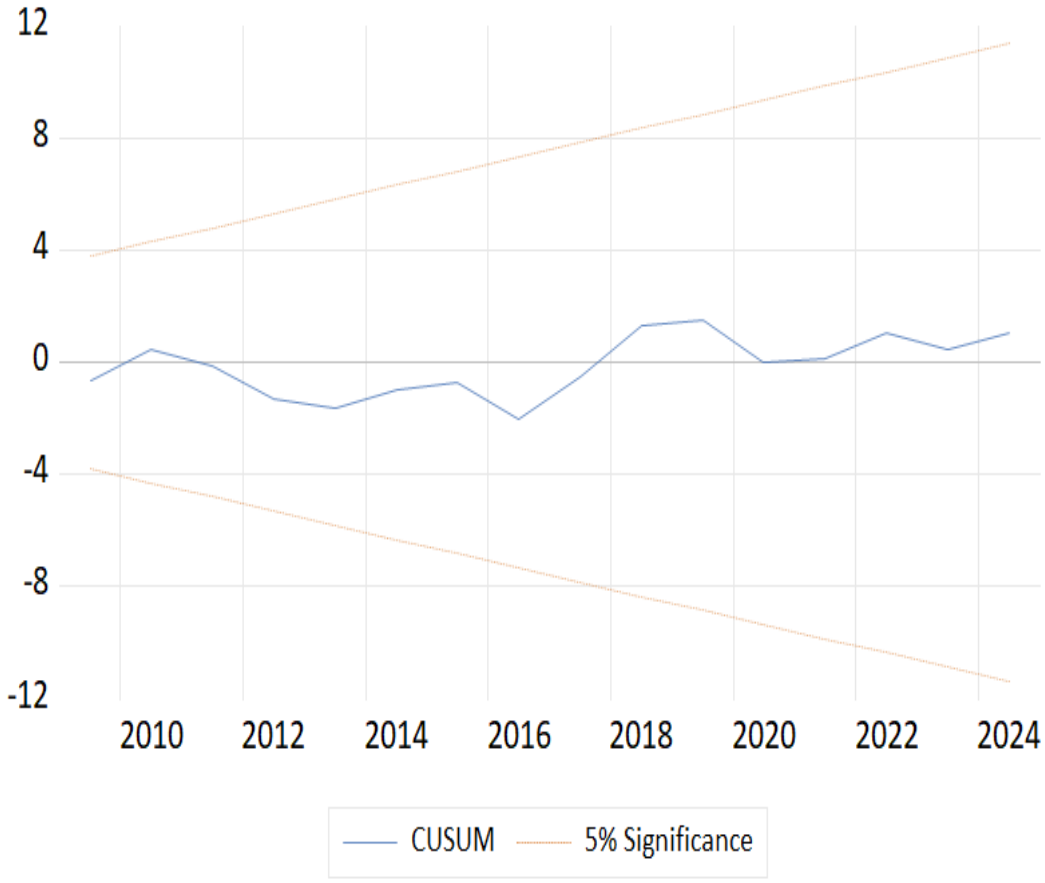

Figure 4.2: Stability Test Result - CUSUM

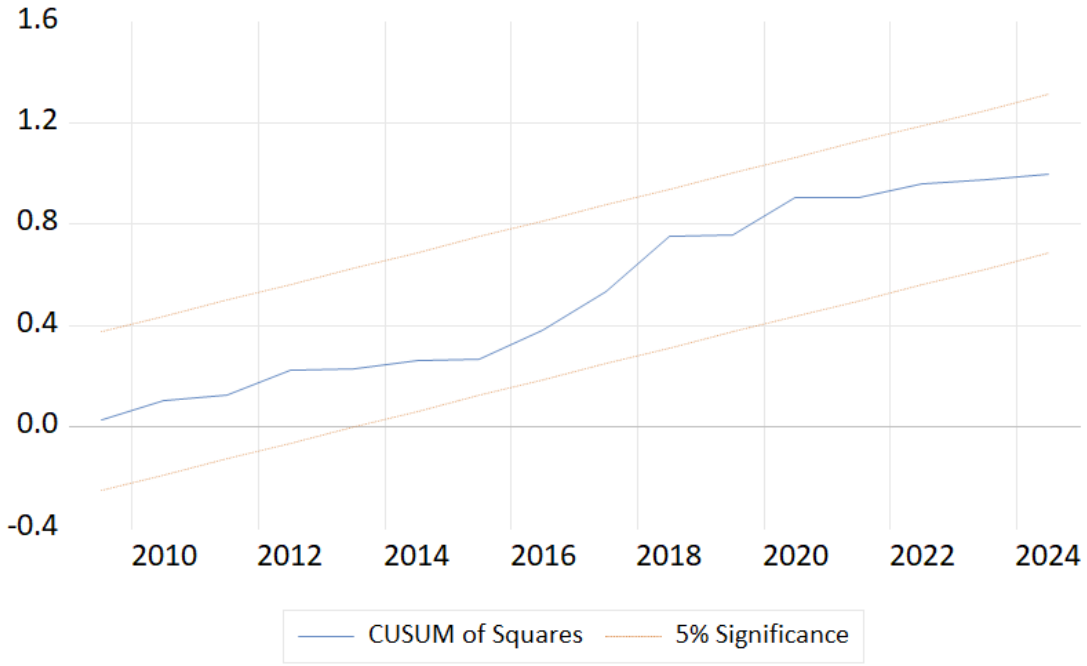

Figure 4.3: Stability Test Result - CUSUM of squares.

Figures 4.2 and 4.3 present the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests for parameter stability in the estimated ARDL specification. The CUSUM plot (Figure 4.9) remains entirely within the 5 % critical bounds throughout the sample period (2010–2024), indicating no evidence of systematic parameter instability. Similarly, the CUSUMSQ plot (Figure 4.3) stays well within the critical bounds, confirming constancy of residual variance and the absence of structural breaks in the error process.

These results provide strong support for the structural stability of the estimated long-run and short-run relationships. The absence of significant departures from the bounds holds despite major macroeconomic shocks in Nigeria during the period, including the 2014–2016 oil price collapse and the COVID-19 recession. Combined with the earlier diagnostics of no serial correlation, homoskedasticity, and moderate multicollinearity, the CUSUM and CUSUMSQ tests affirm the reliability of the coefficient estimates and reinforce confidence in the robustness of the core findings regarding the role of natural resource endowment and institutional quality in Nigeria's economic performance.

DISCUSSION OF FINDINGS

Discussion of findings

This paper examined the interactive effect of natural resource endowment and institutional quality on economic performance in Nigeria.

The ARDL results present a mixed picture: they largely fail to reject the null hypothesis that interaction between institutional quality and natural resource endowments has no significant impact on economic performance in Nigeria (H_0) in the long run but reveal short-run nuances. In the long run, the interaction term (NRE*INQ) has a positive coefficient of 0.180 ($p = 0.448$), which is not statistically significant at the 5% level. This insignificant positive effect suggests that institutional quality does not substantially moderate the long-run growth impact of resource rents within the sample period, implying that resources' contribution to GDP per capita operates

independently of governance strength in equilibrium. Short-run dynamics show a positive marginal effect from the interaction (ΔNRE_INQ = 0.107, p = 0.059), marginally significant at the 10% level, followed by a negative and significant lagged effect (ΔNRE_INQ(-1) = −0.186, p = 0.001). These patterns indicate that initial coordination benefits from resources under better institutions are quickly offset by adjustment challenges or inefficiencies. The error-correction mechanism confirms the stability of the long-run relationship, supporting the model's validity. Granger causality tests reveal no short-run causality involving the interaction term, further indicating that its influence, if any, manifests through structural rather than immediate predictive channels.

This finding of an insignificant long-run interaction is consistent with studies that downplay the moderating role of institutions in resource-dependent economies, particularly when volatility dominates. For example, Olayungbo and Olayiwola (2021) examined oil price shocks and growth in Nigeria using ARDL on quarterly data from 1981 to 2018, finding that resource effects on GDP are largely direct through fiscal channels, with institutions playing a limited moderating role in the long run. Their results showed that positive oil shocks enhanced growth via spending, but without strong evidence of institutional amplification, which they attributed to Nigeria's persistent governance weaknesses that mute moderation. Similarly, Inuwa *et al*. (2022) used disaggregated ARDL on Nigerian data from 1981 to 2019, concluding that natural resource rents positively affect growth but the interaction with institutional quality is weak and insignificant long-run, as rents bypass institutions through direct revenue allocation. This aligns with the current findings, where the positive but non-significant interaction reflects resources' autonomous contribution to income, perhaps due to entrenched oil fiscal federalism overriding institutional variations. Eregha and Mesagan (2022) reinforced this in a panel of oil-abundant African countries, including Nigeria, finding resource rents support growth via investment but institutional moderation is marginal in the long run, consistent with the rapid ECM suggesting quick reversion despite short-run swings.

The short-run positive contemporaneous interaction followed by negative lags is also consistent with recent volatility-focused research. Van der Ploeg (2021) reviewed resource curse literature, noting that in oil exporters like Nigeria, short-run resource surges under better institutions initially boost performance through fiscal expansion, but lagging negative effects emerge from misalignment or rent dissipation, mirroring the current findings. Kurtz and Brooks (2016), in a comparative study of oil-rich nations, found similar patterns: initial positive interactions between resources and institutions and growth, offset by delayed volatility costs, which they attributed to human capital constraints that limit absorption. In Nigeria, this resonates with the findings: resource booms (e.g., 2010–2014) temporarily leverage institutions to improve spending efficiency, but subsequent price drops erode those gains, explaining the lagged negativity without long-run significance.

However, the findings contradict studies emphasising strong institutional moderation in the resource-growth nexus. Mehlum *et al*. (2006) argued that high-quality institutions turn resources into blessings by channelling rents productively, finding significant positive interactions in cross-country data. Their work showed that in "producer-friendly" institutional settings, resources enhance growth, but the insignificant long-run term suggests Nigeria's institutions fall short of this threshold, perhaps due to persistent corruption despite reforms. Bhattacharyya and Hodler (2014) similarly found negative resource effects amplified by poor institutions in panel data, contradicting the positive (though insignificant) interaction by implying stronger moderation. This discrepancy may stem from Nigeria's unique federal structure, where resource rents are distributed constitutionally, diluting institutional effects compared to centralised systems in their samples. Ross (2015) in a review highlighted how oil dependence weakens institutions long-term, expecting negative interactions, but the results show no such erosion, possibly because Nigeria's data capture recent EITI-driven transparency gains offsetting historical decay.

The contradiction with these studies likely arises from methodological and contextual differences.

Cross-country analyses (e.g., Mehlum *et al*., 2006) capture average effects, masking Nigeria-specific factors like rapid urbanisation or diversification efforts that moderate resource impacts

In Nigeria, the positive contemporaneous interaction may reflect boom-period institutional leverage, as seen in the 2021 Petroleum Industry Act redistributing rents more equitably (African Development Bank, 2023). The lagged negativity aligns with van der Ploeg (2021), who notes volatility as the dominant curse channel in oil economies, where initial gains are reversed by policy inconsistency.

These findings advance the literature by emphasising short-run volatility over long-run moderation in Nigeria's resource-performance link. Consistent with Eregha and Mesagan (2016), they show resources can drive growth when fiscal channels are active, but contradict Ross (2015) by highlighting no persistent institutional erosion. This suggests Nigeria's curse is more volatility-driven than institutionally mediated, calling for stabilisation funds and diversification.

SUMMARY, CONCLUSION AND RECOMMENDATION

Summary of Study

This section comprises the summary, conclusions, policy implications, and recommendations of the findings. The study established that natural resource wealth can promote institutional and economic development in Nigeria, but its benefits are contingent on strong institutions, and prudent fiscal management, with short-run volatility requiring stabilising policies and transparent governance. Furthermore, it highlighted the moderating role of institutional quality in amplifying resource-driven growth, underscoring effective governance as a criterion for converting resource wealth into sustainable development.

Policy Implications

The empirical findings of this study provide clear guidance for policymakers on harnessing Nigeria’s natural resource wealth. While resource endowment can drive both institutional development and economic growth over the long term, short-run volatility and governance challenges necessitate deliberate strategies to stabilise revenues, strengthen institutions, and promote economic diversification. The following policy implications are drawn directly from the empirical results. The model demonstrated moderating role of institutional quality in amplifying resource-driven growth, which indicates that effective governance is a prerequisite for translating resource wealth into sustainable development. Policymakers should focus on reforms that improve bureaucratic efficiency, enhance judicial independence, and strengthen accountability frameworks. More importantly, the findings underscore the need for an integrated resource management strategy that combines revenue stabilisation, institutional strengthening, and economic diversification. By systematically directing resource endowment toward infrastructure, innovation, and productive employment, Nigeria can maximise the long-term developmental benefits of its natural resources while minimising the risks of short-run volatility and rent-seeking behaviour.

Conclusion

The study established that natural resource endowment significantly shapes economic performance and institutional quality in Nigeria. The findings demonstrate that while resource wealth contributes positively to long-run income growth and institutional development, these benefits are highly contingent upon the presence of strong governance frameworks. Short-run volatility in resource revenues can temporarily weaken institutions and output, underscoring the critical need for stabilisation mechanisms such as sovereign wealth funds, counter-cyclical fiscal policies, and transparent fiscal management. The positive interaction between resource endowment and institutional quality highlights that effective governance amplifies the growth-enhancing effects of resource wealth, while investments in infrastructure further strengthen this relationship. In a nutshell, the study provides robust evidence that sustainable and inclusive economic development in

resource-dependent economies like Nigeria requires a coordinated approach in which natural resources, institutional quality and other macroeconomic factors, jointly strengthen long-term growth.

Recommendations

Based on the empirical findings, several policy recommendations emerged. First, although the long-run effect of natural resource endowment on economic performance is positive but statistically insignificant, the short-run results reveal negative contemporaneous and lagged effects on GDP per capita. This indicates that resource shocks can temporarily depress economic performance even if long-term potential exists. Policymakers should therefore implement strategies that stabilise resource revenues, including sovereign wealth funds, commodity price hedging mechanisms, counter-cyclical fiscal policies, and prudent expenditure planning. These measures can cushion the economy against volatility, ensuring that natural resource wealth is translated into productive investments that generate sustainable growth. Coordinated policies that integrate resource management and governance will enable Nigeria to convert its natural endowments into durable development outcomes while mitigating the classic symptoms of the resource curse, such as rent-seeking, Dutch disease, and fiscal mismanagement.

Finally, the short-run negative and lagged effects of resource endowment on economic performance, coupled with the moderate adjustment speed indicated by the error-correction term, underscore the need for integrated and forward-looking policies. Policymakers must simultaneously strengthen institutions, diversify the economy, and strategically manage natural resources so that governance mechanisms amplify the long-run growth benefits while mitigating short-term contractions. The positive short-run interaction between institutional quality and resource endowment, although marginal, highlights the importance of synchronising institutional reforms with resource management policies. This holistic approach will enable Nigeria to transform resource abundance into sustained economic prosperity, reduce susceptibility to commodity price volatility, and prevent the manifestation of resource curse dynamics.

Contribution to Knowledge

This study contributes to knowledge by providing empirical evidence from Nigeria that natural resource endowment has a positive long-run effect on economic performance, while short-run volatility can temporarily reduce GDP per capita. It demonstrates that resources can weakly support institutional quality over time and highlights the moderating role of institutions in translating resource wealth into growth. The interaction analysis shows that coordinated policy, governance, and infrastructural development are essential for harnessing the benefits of resources and mitigating short-run disruptions. By integrating ARDL, ECM, and Granger causality techniques, the study refines the conditional resource curse hypothesis, emphasising that resource wealth can drive long-term, inclusive, and stable development when effectively managed.

Suggestions for Further Studies

Future research could examine state-level heterogeneity in institutional quality and its effect on resource-driven growth. Additionally, studies could investigate how global commodity price shocks interact with domestic governance structures, providing more insight into resource management policies.

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