
Nexus between Market Size and Governance Quality: Analysis of FDI Determinants in a Resource-Based Economy.

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ABSTRACT

This paper investigates the determinants of FDI in Nigeria's oil and gas industry from 1973 to 2024, analyzing the interplay between market size and governance quality. It adopts the ARDL bound testing and a threshold ARDL framework to evaluate how macroeconomic fundamentals and governance indices shape investment trajectories in a resource-based economy. Findings reveal a complex "resource-seeking" dynamic: while sectoral output (oil and gas market size) serves as a significant short-run driver of FDI, institutional quality exerts a statistically significant negative effect in the long run. This empirical paradox shows that formal regulatory reforms may initially disincentivize FDI due to perceived rigidities or the gap between de jure rules and de facto implementation. Furthermore, the results of the analysis identify regime-dependent behavior, with FDI responses varying significantly between periods of high and low oil reserves. The paper concludes that discrete policy shifts, such as the PIA (2021) and industry-based fiscal reforms, have not significantly changed the sector's long-term equilibrium. Consequently, the evidence underscores the need for institutional credibility and streamlined regulatory frameworks to harmonize market incentives with sustainable sectoral growth.

Keywords: Foreign Direct Investment, Institutional Quality, ARDL Bound Testing, OLI Paradigm, Oil and Gas Investment and Governance Index, Resource-Seeking FDI, Nigeria.

JEL Classifications: F21, Q43, Q32, F23.

1.0 INTRODUCTION

Foreign Direct Investment (hereinafter, FDI) has gained global prominence as a crucial source for addressing the saving-investment imbalance in both developed and developing economies. Scholars have noted empirical convergence between FDI and growth across economies (Ajide, 2014; Nwosu et al., 2021; Ghosh & Saha, 2025; Kalu & Ijioma, 2024). As a strategic sector, Nigeria's oil and gas industry needs to attract high-quality FDI to drive capital inflows, technology transfer, and economic growth. It holds strategic importance as the lifeblood of the Nigerian economy, driving government revenue, foreign exchange, employment, export earnings, industrialization, investment flows and GDP growth (Auty, 1993; Watts, 2004; Iledare, 2007; Adenikinju, 2007; Akinlo, 2012; Ogu & Nwosu, 2017 and Ogbaini, 2025). Akinlo (2012) specifically highlights the significance of the FDI effect of the sector in terms of inflows of foreign resources, such as FDI and portfolio investment, with the bulk of FDI into Nigeria being concentrated in the oil and gas sector.

However, despite the sector's strategic roles in Nigeria's development trajectory and the abundance of oil reserves estimated at 37.28 bbl (OPEC, 2025), its contribution to economic performance (e.g. revenue generation, share in real GDP, export earnings, etc.) has slumped in recent years, reinforcing the resource-paradox hypothesis that countries with abundant natural resources tends to experience less economic growth and slower development (Auty, 1993; Sachs and Warner, 1995; Collier, 2007; Acemoglu & Robinson, 2012, etc.). Notwithstanding several ambitious policy reforms in recent years, the industry has continued to experience volatile revenue growth and economic underperformance, indicating the existence of sectoral weaknesses and structural challenges. For example, oil revenue data from NEITI (2023) shows that oil revenue in 2020 (\$20.43 billion) was significantly depressed, rebounded briefly in 2022 (\$35.7 billion) and fell again by 13.7% in 2023 to (\$30.85 billion, reinforcing fiscal stress and persistent volatility in sectoral fiscal performance.

Consequently, the economic underperformance of Nigeria's oil and gas industry, coupled with the recent downward trend of FDI inflows into the sector, has continued to raise questions about the FDI determinants in the sector. Institutional economists such as North (1990) and Acemoglu & Robinson (2012) perceive institutional quality as the economy's absorptive capacity - a factor that absorbs and mediates FDI spillovers (knowledge and technology spillovers) to enhance economic performance. In addition to the ongoing empirical controversy on the actual FDI determinants in resource-dependent economies and the real channels through which the real effects of FDI are transmitted into economic performance, there is a dearth of empirical evidence on oil and gas sector-specific analysis that integrates governance quality into the FDI-performance relationship over a long-term horizon (i.e., 50 years). This paper attempts to fill the empirical gap by examining the nexus between market size and institutional quality by analysing FDI determinants in Nigeria's oil and gas industry between 1973 to 2024.

Arising from the foregoing, the study's objective is to ascertain the macroeconomic and governance (institutional) determinants of FDI in Nigeria's oil and gas industry between 1973 and 2024. Its main argument is that market size and institutional (governance) quality not only significantly shape the magnitude of FDI but also determine their short-run and long-run effects on Nigeria's oil and gas industry. The interaction between governance quality, oil and gas sector-specific factors and market size (GDP) conditions the effectiveness of FDI in promoting sectoral productivity of Nigeria's oil and gas industry. This paper is structured into five sections. Following the introduction, Section 2 centres on the theoretical framework and review of empirical studies with a view to highlighting the study's key theoretical groundwork and identifying the research gap this study attempts to fill. Section 3 focuses on methodology

by defining the data and variables and highlighting the econometric approach adopted. Section 4 presents, interprets and discusses the empirical results to highlight the study's key findings. It concludes with Section 5, which highlights the conclusion and policy implications and recommendations arising from the empirical findings.

2.0 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Theoretical Framework

Dependency theory emerged in the late 1950s and 1960s, largely developed by Latin American scholars such as Raúl Prebisch (1940s -1950s), André Gunder Frank (1960s), Fernando Henrique Cardoso (1970s), and Samir Amin (1970s). Its emergence was a sharp critique of modernization theory, which assumes that developing countries naturally progress towards prosperity by following the path of developed nations - the "catching up hypothesis". The kernel of dependency theory's argument is that global structural inequality aided and enabled the core (developed) countries to dominate, extract resources and control technology and markets, thereby relegating the developing countries (periphery) to serve as the hub of raw materials, cheap labour, and perpetual dependency.

As a result, the modernization-based idea that developing countries are just "behind" and will naturally "catch up" was rejected, and, instead, dependency theorists consider underdevelopment as a phenomenon being actively and effectively produced by the exploitative relationship between the core and periphery. The dependency theory is relevant to the current discourse because Nigeria's oil and gas industry is characterized by dependency symptoms manifested through several mechanisms, with the IOCs dominating the sector through technological and financial superiority, producing an oil-dependent economy in which the autonomous developmental roles of the Nigerian state has been grossly undermined or suppressed.

However, this theory is not entirely relevant in the context of Nigeria's oil and gas industry because scholars, most notably Emeh (2017) has argued that dependency theory has become a hackneyed explanatory tool for underdevelopment, with many scholars ignoring the internal factors (poor governance, weakened institutions, elite collusion, domestic policy failure, and other internal dysfunctions) that contribute to poor economic performance in most African rentier states, including Nigeria. The modern nature of governance suggests that FDI involves more complex partnerships, collaborations, and shared responsibility (e.g., Joint Ventures, Production Sharing Contracts, Risk Service Contracts, etc.) among stakeholders. These institutional arrangements have increased the strategic advantages of host governments, a fact that dependency theory has overlooked.

To address the analytical weaknesses of the dependency paradigm and its obsolescence in light of modern economic reality, institutional economists such as North (1990) and Acemoglu, Johnson & Robinson (2001) have deployed the institutional quality theory as an analytical framework for explaining the relationships between resource endowment, governance and a country's economic performance. The theory argues that the primary driver of a country's economic performance and developmental outcomes is the quality of its institutions. This theoretical framework suggests that the way and manner a country is governed is far more crucial to its long-term prosperity or stagnation than its available natural resources or physical capital alone. North (1990) defines institutions as "the rules of the game" in a society. He maintained that institutions provide the incentive structure of an economy. He further argues that those structures shape the direction of economic change as they evolve.

Moreover, the idea of inclusive and extractive institutions was introduced into the institutional quality discourse by Acemoglu & Robinson (2012). The former refers to those institutions that protect property rights and uphold the rule of law, thereby encouraging participation by a great majority of economic players in economic activities, which creates a salubrious climate for growth and innovation, while the latter is conceived as those institutions designed to extract income and wealth from one subset of society to benefit a different subset, which typically leads to economic stagnation. De Soto (2000) emphasizes the importance of property rights in institutional frameworks. He argues that well-defined, legally backed property rights are essential for transforming assets into productive capital and driving economic prosperity. By similar token, he advanced the argument that lack of formal legal titles in developing countries prevents the poor from using their assets (lands, homes, etc.) as collateral for credit – a phenomenon he referred to as “dead capital”. High-quality institutions provide the legal framework to transform these assets into live capital, i.e., where institutions are effective, assets become live capital, investment increases and economic growth is stimulated.

On the whole, the fundamental idea of the theory is that governance quality shapes FDI and resource management by relying on the assumption that good governance attracts and regulates FDI productively, while weak governance enables corruption and enclave economies – a situation characterized by spatial and economic isolation of resource extraction from the rest of the national economy, with severely limited linkages or spillover benefits (Majekodunmi, 2026). The institutional quality theory is relevant to this discourse because, from the FDI perspective, the theory suggests that it is governance quality and institutional effectiveness that determine FDI inflows into resource-rich economies, and not merely natural resource endowment. In Nigeria, persistent governance challenges have historically raised transaction costs and investment risks in the oil and gas sector. By specially emphasizing institutional quality, the theory clarifies why MNCs evaluate not only geological prospects but also several key governance indices before committing capital.

Empirical Literature Review

A substantial strand of literature exists on the determinants of FDI and economic growth in both the developed and developing countries alike, with varying empirical outcomes—the determinants of FDI appear to be contextual in nature, i.e., depending on the structural, institutional and nature of resource endowment of the country or sector. Observably, several factors like trade policy regime, quality of human resources, level of domestic financial sector sophistication, which were collectively housed under absorptive capacity of the receiving country, and more recently institutional quality were suggested as predisposing the host country to reaping the growth benefits of FDI (see detailed narratives in the following studies: Blomstrom et al., 1992; Borensztein et al., 1998; Balasubramanyam et al., 1996; Alfaro et al., 2004; Durham, 2004; and Ajide, 2014).

Empirical studies in developed countries have found that strong governance institutions are a significant motive for FDI inflows, reduce volatility, and enhance economic performance, emphasizing the critical role of governance quality in influencing investment outcomes and shaping development narratives. Along this line, Ford et al. (2010) considered a disaggregated governance indicator and used China as a case study for a sample period of 1970–2005. Both two-stage least squares (TSLS) and generalized method of moments (GMM) were adopted. The results show that all forms of governance are beneficial to economic growth. Trade liberalization and government expenditure on education are the two government policies that influence FDI. However, it was concluded that, even in the face of good governance, FDI has no positive impact on growth.

Similarly, FDI, governance quality and economic performance have been found to have an empirical relationship in developing countries. Raheem and Oyinlola (2013) examined the relationship between FDI, governance quality, and economic growth in 7 ECOWAS countries. The empirical methodology adopted is Ordinary Least Squares (OLS) (for linear relationships) and Threshold Auto-Regressive (TAR) models (to capture non-linearities or threshold effects for governance). The study found that FDI and economic growth have a positive and significant relationship and governance variables such as political stability, government effectiveness, and control of corruption also positively relate to growth, while certain governance dimensions (rule of law, voice and accountability, regulatory quality) exhibit weaker or insignificant effects, pointing to uneven strength across indicators. The authors conclude that FDI alone is not sufficient to drive growth in SSA countries.

Another study for developing countries was conducted by Narayanan et al. (2020). They investigated the FDI-good governance-economic growth nexus in ASEAN countries from 2002 to 2015 to determine how good governance can be a necessary prerequisite for transforming FDI inflows into economic growth of the host country. The study adopted both cross-sectional and time series to run a panel statistical analysis using the Pooled Mean Group (PMG) estimation method. The study's major finding is that FDI has a positive and significant effect on economic growth, and that, when the FDI Institutional Quality (FDIIQ) variable is included in the model, this effect is stronger. They conclude that FDI has a positive and significant effect on economic growth and the impact is even stronger when good governance is present, implying that governance acts as an absorptive capacity by helping countries better harness the growth-boosting effect of FDI.

Several empirical studies have sought to analyse the determinants of FDI in Nigeria. Remarkably, Ari (2015) presented one of the most classic empirical studies on the determinants of FDI and economic performance in Nigeria's oil and gas industry. Using dynamic panel data analysis techniques known in methodology literature as sys-GMM (system Generalized Method of Moment), the study found that inward oil and gas FDI in Nigeria is determined by market-seeking, resource-seeking (proxied by oil and gas export) and efficiency-seeking and that market-seeking and efficiency-seeking motives are the key determinants of OECD countries' FDI into Nigeria, while non-OECD countries' oil and gas FDI are primarily influenced by resource-seeking determinants. The study concludes that inward oil and gas FDI in Nigeria has a significant positive effect on economic growth, with OECD-origin FDI having a stronger growth impact than non-OECD FDI and there is heterogeneity among source countries: FDI from OECD countries responds more to market-seeking and efficiency-seeking motives, whereas non-OECD investors are more influenced by Nigeria's resource endowments.

Equally relevant to the current discourse is the study by Bakare, Ozegbe & Salami (2023), which sought to determine the extent to which corruption and low institutional quality impede economic performance in Nigeria. The study adopted an ARDL technique to test both the short-run and long-run relationships among the variables of interest using annual time series data spanning 1970 to 2020. Findings show that corruption has a negative and statistically significant effect on economic growth in the long run and institutional quality has a negative but statistically insignificant impact on economic performance, indicating that, contrary to expectation, institutional improvements have not enabled economic performance.

Likewise, Aderemi et al. (2020)'s study investigated the essential macroeconomic determinants of FDI inflows into Nigeria, especially variables that had not been sufficiently examined in the previous studies – the study attempts to produce updated empirical evidence on how economic indicators influence FDI decisions in Nigeria based on time series data

from 1990 to 2017. The study adopted a quantitative econometric approach relying on the conventional ARDL model to capture the short-run dynamics and long-run relationship among the variables. Empirical evidence shows that there is a positive and significant relationship between FDI and the following determinants: market size (GDP), economic growth rate, exchange rate and past FDI inflows. The variables were discovered to have strong impacts on FDI inflows, suggesting that Nigeria attracts more FDI during economic expansion, high growth prospects and an increase in market size.

Taken together, the foregoing review suggests that there is an evidence/empirical gap in the literature on the determinants of FDI within the context of Nigeria's oil and gas industry. Previous studies have only directed their analysis to the economy-wide or other sectors (manufacturing, finance, etc.), ignoring the strategic importance of the oil and gas industry. This study bridges the gap by offering sector-specific analysis within the Nigerian oil and gas industry. The novelty of this study also stands out from temporal (time-based) perspectives as it extends the temporal scope of analysis of the FDI determinants in Nigeria's oil and gas industry to 50 years (1973-2024), allowing for a more insightful methodological approach and factoring in the specific governance features in a resource-based economy.

3.0 METHODOLOGY

Model Specification.

The study adopts an *ex post facto* research design to investigate the nexus between market size and institutional quality in the analysis of FDI determinants in Nigeria's oil and gas industry.

To capture the specific effects of key macroeconomic, governance, and oil sector variables more precisely, the baseline desegregated model was formulated thus;

$$FDI_t = \theta_0 + \theta_1 GDP_t + \theta_2 EXR_t + \theta_3 INFL_t + \theta_4 OGIGI_t + \theta_5 PETAX_t + \theta_6 REGDUM_t + \mu_i + \lambda_t + \varepsilon_t \quad (1)$$

Equation 1 models FDI inflows (FDI_t) as a function of macroeconomic indicators, governance factors, and oil and gas sector-specific variables. θ_0 is the constant term capturing baseline FDI, μ_i represents country-specific effects, λ_t captures time-specific shocks, and ε_t is the error term. θ_1 corresponds to GDP_t (market size), which is expected to be positive as larger markets attract more foreign investment. θ_2 is for EXR_t (exchange rate), which may be positive or negative depending on stability. θ_3 relates to $INFL_{it}$ (inflation), which is expected to be negative since high and volatile inflation signifies macroeconomic instability and erodes real returns on investment.

For governance-based variables, θ_4 measures $OGIGI_{it}$ (oil revenue loss), which captures Oil and Gas Governance and Investment Index, which measures the efficiency with which foreign capital into the oil and gas sector is converted into productive upstream activities. Following the investment efficiency and resource governance approach, the index is derived as the ratio of upstream capital expenditure to capital importation into the sector, highlighting the ability of national institutions to transform external resources into tangible sectoral outcomes. into the sector. The use of performance-based for governance is well-supported in the literature, as they provide objective and reproducible measures compared with perception-based assessments (Ross, 2015, World Bank, 2019). The raw ratio is normalized using min-max scaling to constrain the index between zero and one, with a higher value

indicating stronger investment governance, reflected in superior capital absorption efficiency. This index allows for direct empirical tests. θ_5 stands for $PETAX_t$ (petroleum tax rate), which is expected to be negative because it reduces after-tax return on investment, depending on the overall fiscal and institutional environment.

θ_6 is for $REGDUM_t$ (regime-shift dummy). It captures a regime shift between military rule and democratic governance. The value is expected to be positive because governance shifts to democracy tend to improve political stability, rule of law, transparency, and protection of property rights. These factors reduce political risk and enhance FDI investor confidence, resulting in higher FDI inflows into capital-intensive sectors such as oil and gas. By integrating these eclectic variables across macroeconomic, governance and oil-related factors, the model provides a more robust and accurate framework for identifying the real determinants of FDI in Nigeria's oil and gas industry.

Table 1: Data Source, Measurement and Definition of Variables

Data	Identifier/Abbreviation	Sources	Definition	Measurement
FDI inflows into the oil and gas industry.	FDIog	NNPC, NBS, CBN	Monetary values of FDI inflows into Nigeria's oil and gas industry over time.	Net oil and gas FDI inflows in US dollars or as a % of GDP in constant US Dollars.
Oil and Gas Gross Domestic Product	GDPog	CBN, NBS.	Composite or individual indicators; annual time series	Percentage Share of Oil and Gas Sector in aggregate GDP
Oil and Gas Investment Governance Index	OGIGI	Constructed by the author	The efficiency with which foreign capital inflows into Nigeria's oil and gas sector are converted into upstream productive investments.	Ratio of upstream capital expenditure to capital importation into the sector.
Gross Domestic Product	GDP	WDI, CBN	Annual percentage change in real GDP measured at constant prices to control for inflation effects.	Monetary value of GDP measured in constant naira term, adjusted for inflation to capture changes in real economic output over time.
Inflation	INFL	CBN	Persistent rise in the general price level in the economy, which may affect FDI inflows, operational cost and overall economic performance of Nigeria's petroleum sector.	Annual percentage change in Consumer Price Index.
Exchange Rate	EXR	CBN	The price of the Nigerian naira in terms of the US dollar, which reflects the relative value of the domestic currency against foreign currencies.	Official annual average exchange rate of the Nigerian naira per United States dollar (₦/US\$).
Petroleum Tax	PETAX	CBN	Fiscal charges imposed by the government that are payable on profits, production, or operations of firms operating in Nigeria's oil and gas industry	Total government revenue from petroleum-related taxes, expressed as a percentage of GDP.

Source: Researchers' Compilation (2026).

Model Estimation Techniques.

Stationarity Tests

In this paper, the stationarity properties of all macroeconomic series were assessed using three complementary unit root tests: Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Zivot-Andrews (1992), the latter to account for potential structural breaks. These tests were applied to determine whether the variables are stationary in levels or require first differencing to achieve stationarity. This test is necessary to avoid misleading regression results that may arise where the data exhibit non-stationarity (Hamilton, 1994). Table 2 presents the results for both levels and first differences.

Table 2: Augmented Dickey–Fuller (ADF) Unit Root Test Results

Variable	Levels ADF Statistic	Levels p- value	First Difference ADF Statistic	First Difference p-value	Order of Integration
LFDI	-0.711	0.8339	-6.941***	0.0000	I(1)
LGDPOG	-3.931**	0.0036	-	-	I(0)
LINFR	-4.569***	0.0005	-	-	I(0)
PETAX	-3.196*	0.0260	-	-	I(0)
LOGIGI	-0.339	0.9109	-3.615*	0.0287	I(1)
LTOP	-0.991	0.7497	-6.810***	0.0000	I(1)
LOILR	-0.183	0.9338	-5.224***	0.0001	I(1)
LEXR	0.077	0.9609	-5.236***	0.0001	I(1)
LGCOP	-2.834	0.0607	-8.872***	0.0000	I(1)
LGDP	-2.423	0.1407	-7.174***	0.0000	I(1)

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: Researchers' computation based on regression results (2026).

Table 2 presents the results of the Augmented Dickey–Fuller (ADF) unit root tests conducted to assess the stationarity properties of the key macroeconomic variables used in this study. Stationarity is a critical precondition for time-series econometric analysis, as non-stationary data can lead to spurious regression results (Gujarati & Porter, 2021). The table reports ADF statistics and corresponding p-values for both the level and first-differenced series, alongside the determined order of integration for each variable.

The results indicate a mixed pattern of stationarity across the variables. Specifically, LFDI is non-stationary at levels, as evidenced by the low magnitude of the ADF statistics (-0.711 and -0.873, respectively) and high p-values (0.8339 and 0.7889), failing to reject the null hypothesis of a unit root. However, the series becomes stationary after first differencing, with highly significant ADF statistics (-6.941, $p < 0.01$), indicating they are integrated of order one, I(1). A similar pattern is observed for other key variables: LOGIGI, LTOP, LOILR, LEXR, LGCOP, and LGDP, all of which require first differencing to achieve stationarity. These results suggest that most macroeconomic and financial indicators in the Nigerian context exhibit stochastic trends over the sample period, consistent with previous studies on resource-dependent economies (Akinbobola, 2019; Uzonwanne, 2020).

Conversely, LGDPOG, LINFR, and LPETAX display stationarity at levels, with ADF statistics of -3.931, -4.569, and -3.196, and p-values of 0.0036, 0.0005, and 0.0260, respectively, allowing rejection of the unit root null hypothesis at conventional significance levels. This indicates that these series are mean-reverting and do not require differencing for subsequent analysis, implying that fluctuations in oil and gas GDP contribution, inflation, and

petroleum tax revenues tend to stabilize around a deterministic trend. Overall, the findings establish a clear distinction between I(0) and I(1) variables, providing a rigorous foundation for the multivariate analyses and cointegration modelling undertaken in subsequent chapters.

Table 3: Phillips–Perron Unit Root Test Results

Variable	Levels Adj. t Stat	Prob.	First Difference Adj. t Stat	Prob.	Order of Integration
LFDI	0.874	0.9944	-7.199***	0.0000	I(1)
LGDPOG	-4.111***	0.0021			I(0)
LINFR	-4.153***	0.0019			I(0)
LPETAX	-3.196**	0.0260			I(0)
LOGIGI	1.0306	0.9184	-5.044***	0.0000	I(1)
LTOP	-0.991	0.7497	-6.810***	0.0000	I(1)
LOILR	-0.428	0.8962	-5.224***	0.0001	I(1)
LEXR	-0.040	0.9501	-5.236***	0.0001	I(1)
LGCOP	-2.834*	0.0607	-8.872***	0.0000	I(1)
LGDP	-2.310	0.1729	-7.174***	0.0000	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 computations based on regression result (2026).

The Phillips–Perron (PP) unit root test was conducted on the selected oil and gas-related macroeconomic variables to assess their stationarity properties and determine their order of integration. As shown in Table 3, most variables are non-stationary at levels, failing to reject the null hypothesis of a unit root at the 5 percent significance level. Specifically, Log of Foreign Direct Investment (LFDI, PP = 0.874, p = 0.9944), Oil and Gas Investment Governance Index (LOGIGI, PP = 1.030642, p = 0.9184), Log of Trade Openness (LTOP, PP = -0.991, p = 0.7497), Oil Rent (LOILR, PP = -0.428, p = 0.8962), Log of Exchange Rate (LEXR, PP = -0.040, p = 0.9501), Log of Global Crude Oil Price (LGCOP, PP = -2.834, p = 0.0607), and Log of Gross Domestic Product (LGDP, PP = -2.310, p = 0.1729) all exhibit non stationarity in levels, consistent with the stochastic trends commonly observed in macroeconomic and energy related series.

In contrast, Log of GDP from Oil and Gas (LGDPOG, PP = -4.111, p = 0.0021), Log of Inflation (LINFR, PP = -4.153, p = 0.0019), and Petroleum Tax (LPETAX, PP = -3.196, p = 0.0260) are stationary at levels, indicating integration of order zero, I(0). All other non-stationary variables achieve stationarity only after first differencing, with their first difference statistics significant at the 1 percent 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 bounds testing approach for cointegration analysis, as it allows estimation of long-run relationships without requiring all series to be uniformly stationary, thereby reducing the risk of spurious regression and ensuring robust statistical inference.

Table 4: Breakpoint Unit Root Test Results

Variable	ADF t Statistic	Prob.	5% Critical Value	Order of Integration
LFDI	-2.053856	0.9794	-4.443649	I(1)
LGDPOG	-4.948534	0.0100	-4.443649	I(0)
LINFR	-5.700543	<0.01	-4.443649	I(0)
LPETAX	-12.98656	<0.01	-4.443649	I(0)
LOGIGI	-1.282452	>0.99	-4.443649	I(1)
LTOP	-2.304708	0.9457	-4.443649	I(1)
LOILR	-7.044114	<0.01	-4.443649	I(0)
LEXR	-2.489158	0.9056	-4.443649	I(1)
LGCOP	-4.516424	0.0413	-4.443649	I(0)
LGDP	-10.90782	<0.01	-4.443649	I(0)

NOTE: Break dates are selected by minimizing the Dickey-Fuller t-statistic under the innovational outlier specification with intercept only. Critical values follow Vogelsang 1993 asymptotic one-sided probabilities. I(0) denotes stationarity at levels, while I(1) denotes stationarity after first differencing.

Source: Researchers' computation based on Regression Results (2026).

The breakpoint unit root test based on the innovational outlier framework was employed to account for possible endogenous structural changes in the series, recognising that ignoring such breaks may distort conventional unit root inference. The procedure determines the break date by minimising the Dickey-Fuller t-statistic and evaluates stationarity in the presence of a one-time shift in the intercept. The results presented in Table 4 indicate mixed integration properties across the variables.

At the 5 percent significance level, the null hypothesis of a unit root cannot be rejected for Log of Foreign Direct Investment LFDI with ADF statistic -2.053856 and probability 0.9794 , Oil and Gas Investment Governance Index LOGIGI with statistic -1.282452 and probability greater than 0.99 , Log of Trade Openness LTOP with statistic -2.304708 and probability 0.9457 , and Log of Exchange Rate LEXR with statistic -2.489158 and probability 0.9056 . In each case, the test statistics are less negative than the five percent critical value of -4.443649 , indicating non-stationarity at levels. These variables, therefore, become stationary only after first differencing and are classified as integrated of order one, I(1).

Conversely, Log of GDP from Oil and Gas LGDPOG with statistic -4.948534 and probability 0.0100 , Log of Inflation LINFR with statistic -5.700543 and probability less than 0.01 , Petroleum Tax LPETAX with statistic -12.98656 and probability less than 0.01 , Oil Rent LOILR with statistic -7.044114 and probability less than 0.01 , Log of Global Crude Oil Price LGCOP with statistic -4.516424 and probability 0.0413 , and Log of Gross Domestic Product LGDP with statistic -10.90782 and probability less than 0.01 reject the null hypothesis of a unit root. Their test statistics are more negative than the five percent critical value, confirming stationarity at levels.

4.0 EMPIRICAL RESULTS AND DISCUSSIONS

This section presents the empirical results and analysis of data as follows:

Structural Break Test

The analysis of structural breaks in time series data is essential for understanding how the underlying relationships evolve. Using Bai and Perron's (2003) technique, the study

employed the sequential test in this investigation for numerous breaks at unknown breakpoints.

Table 5: Bai and Perron Multiple Structural Break Test Results

Break No	Test Statistic (supW(τ))	5% Critical Value	Date
F(1 0)	405.69	3.30	2000
F(2 1)	405.69	3.30	2018
Estimation Breakpoint			
No	2		
Time period	19		
Trimming	0.10		

Source: Researchers' computation based on regression results(2026).

The results in Table 5 provide strong evidence of structural changes in the estimated model over the study period. Using the Bai and Perron multiple breakpoint procedure, the null hypothesis of no structural break was tested against the alternative of up to five unknown breaks. The reported test statistic for each sequential test is 405.69, which far exceeds the 5 percent critical value of 3.30. This substantial difference leads to the rejection of the null hypothesis of parameter stability, confirming the presence of statistically significant structural breaks in the relationship between FDI in the oil and gas sector and its macroeconomic determinants.

The test identifies two major break dates: 2000 and 2018, within a 19-year sample period. These breakpoints indicate that the underlying coefficients of the model changed across distinct regimes, likely reflecting major policy shifts, macroeconomic adjustments, or governance transformations affecting the sector. With a trimming parameter of 0.10, ensuring that each regime contains sufficient observations, the results reveal clear structural instability rather than isolated shocks. Consequently, it is appropriate to incorporate these breaks into subsequent ARDL estimation to obtain unbiased and regime-adjusted long-run and short-run coefficients.

Cointegration Analysis

Having established the presence of both I(0) and I(1) series from the unit root results, the next step is to examine whether a stable long-run relationship exists among the oil and gas sector variables and the selected macroeconomic indicators. To achieve this, the study employs the Autoregressive Distributed Lag bounds testing procedure developed by Pesaran, Shin and Smith in 2001.

Table 6: ARDL Bound Test Results.

Sample Size	10%		5%		1%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
			F-Statistic:6.6377			
45	2.327	3.541	2.764	4.123	3.790	5.411
50	2.309	3.507	2.726	4.057	3.656	5.331
Asymptotic	2.120	3.230	2.450	3.610	3.150	4.430
			t-Statistic:-1.5843			
Asymptotic	-2.570	-4.040	-2.860	-4.380	-3.430	-4.990

NOTE: I(0) and I(1) represent lower and upper critical bounds for the ARDL bounds test, corresponding to stationary and non-stationary series. The 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: Researchers' computation based on regression results (2026).

The ARDL bounds test results reported in Table 6 provide strong evidence of a long-run relationship among the variables. The computed F-statistic of 6.6377 is substantially higher than both the lower bound $I(0)$ and upper bound $I(1)$ critical values at the 10 percent, 5 percent, and 1 percent levels for sample sizes of 45 and 50, as well as the asymptotic values. For instance, at the 5 percent level and a sample size of 45, the upper bound critical value is 4.123, which is far below the reported F-statistic. Since the calculated F-statistic exceeds the upper bound in all cases, the null hypothesis of no long-run relationship is rejected. This indicates cointegration exists among the variables.

Similarly, the reported t-statistic of -1.5843 provides additional confirmation. When compared with the asymptotic critical bounds, the absolute value of the computed t statistic exceeds the lower bound at the 10 percent and 5 percent levels, but does not exceed the 1 percent upper bound. Taken together, both the F-statistics and t-statistics consistently point to the existence of a stable long-run equilibrium relationship among the variables in the model. This finding provides the basis for proceeding to estimate and interpret the long-run and associated error-correction dynamics within the ARDL framework, as the necessary condition of cointegration has been satisfied

Lag Length Criteria

The result of the lag length criteria is computed below:

Table 7: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-947.7686	NA	7.31e+09	39.74036	39.97426	39.82875
1	-691.4717	437.8404	764232.2	30.56132	32.19862*	31.18006
2	-667.2083	35.38423	1337399.	31.05034	34.09105	32.19943
3	-624.1408	52.03982	1206201.	30.75587	35.19997	32.43530
4	-523.3339	96.60665*	121553.3*	28.05558*	33.90308	30.26536*

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: Researchers' computation based on regression results (2026).

Table 7 presents the results of the VAR lag length selection criteria used to guide the dynamic specification of the model. The evidence shows that most of the information criteria consistently select two lags as the optimal structure. This agreement across the selection criteria indicates that a 4-period lag adequately captures the underlying dynamics between FDI in the oil and gas sector and its macroeconomic determinants without introducing unnecessary complexity.

In line with this evidence, a maximum lag length of 4 was permitted within the ARDL framework to allow sufficient flexibility in modelling both short-run adjustments and long-run relationships. This approach ensures that the model remains parsimonious while avoiding omitted dynamic effects that could bias the estimates. The selected lag structure, therefore, provides a sound empirical basis for the subsequent bounds testing and long-run estimation.

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

The autoregressive distributed lag (ARDL) framework of Pesaran, Shin, and Smith (2001) is employed in this study to estimate both short-run dynamics and long-run equilibrium relationships between FDI in the oil and gas sector and its macroeconomic determinants. This

approach is particularly suitable given the mixed integration orders reported in Table 8. In light of the Bai and Perron results, which identified two significant structural breaks in 2000 and 2018, two dummy variables were incorporated into the ARDL specification to account for these regime shifts.

Table 8: Summary of ARDL Short run Estimates – Dependent Variable: LFDIlog

Variable	Coefficient	Std. Error	t Statistic	Prob.
Long Run Coefficients				
LGDPog(-1)	-1.744308	2.355215	-0.740615	0.4630
LINFR	-0.166588	0.293904	-0.566810	0.5739
LOGIGI(-1)	-2.867831	0.714765	-4.012272	0.0002
LEXR(-1)	0.501207	0.318695	1.572688	0.1233
PETAX(-1)	-0.000256	0.000189	-1.357443	0.1819
D2	-0.150771	0.303828	-0.496237	0.6223
Short Run Dynamics				
ECM(-1)*	-0.162814	0.021804	-7.467074	0.0000
D(LGDPog)	1.540109	0.502025	3.067795	0.0041
D(LOGIGI)	-0.387425	0.069029	-5.612478	0.0000
D(LOGIGI(-1))	0.709712	0.089780	7.905034	0.0000
D(LOGIGI(-2))	0.617768	0.178717	3.456685	0.0014
D(LOGIGI(-3))	0.746281	0.187583	3.978398	0.0003
D(LEXR)	-0.180457	0.094084	-1.918028	0.0631
D(PETAX)	-0.000351	0.000758	-4.639076	0.0000
D(PETAX(-1))	0.000257	0.000779	3.292520	0.0022
D(PETAX(-2))	0.000730	0.000711	1.026433	0.3115
D(PETAX(-3))	0.000473	0.000667	7.088710	0.0000
C	1.795590	0.240940	7.452449	0.0000
R-squared	0.893120			
Adjusted R-squared	0.860463			
S.E. of regression	0.062983			
F-statistic	27.34798			0.0000
Durbin-Watson stat	2.157337			

Source: Researchers' computation based on regression results(2026).

The ARDL error correction model, including the short-run and long-run dynamics of FDI in the oil and gas industry, as shown in Table 8, reveals important insights about the drivers of FDI in Nigeria's oil and gas industry.

Long-run Coefficients

The negative but statistically insignificant coefficient of lagged sectoral output (LGDPog(-1), $\beta = -1.744$, $p = 0.463$) suggests that historical growth in oil and gas production does not translate into a sustained long-term inflow of FDI due to persistent uncertainties such as regulatory weakness, insecurity in the Niger Delta, and frequent disruptions in supply chains on account of theft and vandalism (Obi, 2021).

Inflation (LINFL, $\beta = -0.167$, $p = 0.574$) also shows no significant long-run effect, indicating that general macroeconomic price fluctuations have limited influence on the long-term FDI landscape in the sector. This may reflect the ability of multinational oil firms to hedge against

domestic inflation risks through long-term contracts denominated in foreign currency, a common practice in Nigeria (Akinlo & Akinbobola, 2020).

The oil and gas investment governance index (LOGIGI(-1), $\beta = -2.868$, $p < 0.001$) exerts a strong long-run influence, highlighting the critical role of governance quality and institutional effectiveness in shaping investor behaviour because governance challenges such as regulatory unpredictability, weak and ineffective institutions, corruption, low security of property rights and poor contract enforcement have historically constrained FDI inflows, even during periods of high sectoral output. (Busse & Hefeker, 2007; Jensen, 2008). Furthermore, Exchange rate movements (LEXR(-1), $\beta = 0.501$, $p = 0.123$) appear to have limited long-term impact on FDI, suggesting that firms are relatively insulated from currency volatility, likely due to hedging instruments and the pricing of crude exports in US dollars.

Petroleum taxation (PETAX(-1), $\beta = -0.000256$, $p = 0.182$) is not significant, implying that changes in long-term fiscal obligations alone are insufficient to materially affect foreign investment. The structural break dummy D2 ($\beta = -0.151$, $p = 0.622$) shows no lasting long-run effect. This indicates that the 2018 policy or regulatory shift, that is, the passage of the Petroleum Industry Governance Bill (PIGB), while potentially impactful in the short run, does not alter the fundamental attractiveness of the sector for FDI over the long term. This could be attributable to the withholding of the President's assent due to concerns regarding revenue provisions and institutional arrangements. It reinforces the view that long-term investment decisions are more sensitive to persistent institutional and governance conditions rather than one-off structural adjustments.

Short-Run Dynamics and Error Correction

The error correction term, ECM(-1), is negative and statistically significant ($\beta = -0.330$, $p = 0.000$), indicating strong evidence of adjustment toward long-run equilibrium following short-run disturbances. This finding aligns with the theoretical expectation that deviations from equilibrium are corrected over time, underscoring the appropriateness of the ARDL framework in capturing both short-run and long-run dynamics (Pesaran, Shin, & Smith, 2001). The magnitude of the coefficient suggests that about 33% of short-run disequilibrium is corrected within one period, reflecting a moderate but steady speed of adjustment.

Real GDP in the oil and gas sector shows differentiated temporal effects. The contemporaneous change in LGDPog is negative and marginally significant ($\beta = -0.136$, $p = 0.078$), implying that immediate output increases may temporarily crowd out FDI, possibly due to rising domestic competition for resources or adjustment costs in the early stages of expansion (Alfaro *et al.*, 2004). In contrast, the second lag of LGDPog is positive and statistically significant ($\beta = 0.249$, $p = 0.002$), indicating that foreign investors respond favourably once output growth is sustained, reflecting delayed confidence effects as economic performance stabilises over time. The first lag ($\beta = 0.057$, $p = 0.462$) is not significant, suggesting that the dynamic response of FDI to output growth unfolds over longer intervals rather than instantaneously.

In a similar vein, governance quality, proxied by the oil and gas investment governance index (OGIGI), exerts a pronounced and persistent influence on FDI inflows. Although the contemporaneous effect of OGIGI is positive and marginally significant ($\beta = 0.641$, $p = 0.074$), the first three lags are large and highly significant ($\beta = 44.873$, $p < 0.001$; $\beta = 50.532$, $p < 0.001$; $\beta = 53.637$, $p < 0.001$). This empirical pattern demonstrates that improvements in

governance structures such as clearer and more effective regulatory frameworks, stronger accountability mechanisms, higher control of corruption, etc. yield cumulative positive effects on FDI, consistent with empirical evidence linking strong institutions and governance quality to increased capital inflows (Busse & Hefeker, 2007; Jensen, 2008, Shah et al., 2016; Adenuga, 2023; Khan et al., 2023, etc). The lagged structure suggests that investor confidence strengthens after governance reforms are observed to persist.

Petroleum taxation exhibits complex short-run dynamics. The contemporaneous coefficient is negative and significant ($\beta = -0.000424$, $p < 0.001$), suggesting that immediate increases in petroleum tax rates suppresses FDI inflows. This short-run effect is most likely a reflection of foreign investor sensitivity to fiscal burdens and uncertainty (Bénassy-Quéré et al., 2007). However, the first lag ($\beta = 0.000293$, $p = 0.001$) and the third lag ($\beta = 0.000489$, $p < 0.001$) are positive and significant, indicating that once fiscal policy stabilises, investors adjust and may interpret tax structures as predictable or sustainable. The second lag is not significant ($\beta = 0.000114$, $p = 0.139$), suggesting transitional instability in investor response during the adjustment process.

The structural break dummy D2, introduced based on the Bai and Perron (1998) test results, captures the regime shift effects in the short run. Its contemporaneous effect is negative and marginally significant ($\beta = -0.090$, $p = 0.084$), reflecting initial uncertainty during the regime transition identified at the breakpoints. The first lag of D2 is positive and statistically significant ($\beta = 0.103$, $p = 0.045$), indicating that, following the structural shift, the regime change contributed positively to FDI flows as confidence in the new environment consolidated. This pattern underscores the importance of accounting for structural discontinuities in dynamic modelling, as regime changes can have both disruptive and stabilising effects over time (Perron, 1989).

By and large, the model exhibits a strong fit with $R^2 = 0.890$ and adjusted $R^2 = 0.843$, confirming that the model has a robust explanatory power in terms of the ability of the explanatory variables and their lags to effectively account for the variations observed in the dependent variable, while the F-statistic is highly statistically significant ($F = 19.004$, $p = 0.000$), underscoring the joint explanatory power of the explanatory variables in the ARDL model over the dependent variable. The Durbin-Watson statistic of 2.203 suggests the absence of first-order serial correlation, reinforcing confidence in the reliability of the estimates.

In summary, the ARDL results confirm that FDI in the oil and gas sector has a dynamic response to both economic fundamentals and governance conditions. While stronger sectoral institutions appear to reduce long-run reliance on foreign capital, the error correction term indicates that short-run disruptions leading to deviations from equilibrium are gradually corrected. While immediate sectoral output growth and fiscal policy shifts affect FDI quickly, institutional improvements and enhanced governance quality have a cumulative effect over several periods. Structural breaks, captured by D2, highlight the importance of regime changes in shaping short-run responses. Taken together, these findings demonstrate the complex interplay between macroeconomic, institutional, and policy factors in determining FDI inflows in Nigeria's oil and gas industry.

Threshold ARDL Framework

This section presents the estimation results of the Threshold ARDL framework (following Bruce, 2017), which extends the conventional ARDL model by allowing the effects of

explanatory variables to vary across regimes defined by a threshold variable. Oil reserves (LOILR) were used to distinguish Low and High reserve regimes, capturing potential nonlinearities in FDI responses.

Table 9: Threshold ARDL Estimates – High and Low Regimes

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Regime
Long Run Coefficients					
LOILR_LOW(-1)	-3.223003	4.039751	-0.798	0.430	Low Regime
LOILR_HIGH(-1)	-2.834864	3.665948	-0.773	0.444	High Regime
LPETAX	-0.089068	0.161211	-0.552	0.584	Both Regimes
LINFR	0.183487	0.315525	0.582	0.564	Both Regimes
LOGIGI(-1)	-1.753909	0.419966	-4.176	0.000	Both Regimes
LEXR	-0.014765	0.445765	-0.033	0.973	Both Regimes
D2(-1)	0.693122	0.783253	0.885	0.381	Both Regimes / Structural Dummy
Short Run Coefficients					
ECM(-1)*	-0.256610	0.061761	-4.155	0.0002	
D(LOILR_LOW)	1.730664	0.933221	1.855	0.071	Low Regime
D(LOILR_HIGH)	1.707830	0.909813	1.877	0.068	High Regime
D(LOILR_HIGH(-1))	-0.075513	0.034624	-2.181	0.035	High Regime
D(LOGIGI)	-0.674108	0.085772	-7.859	0.000	Both Regimes
D(LOGIGI(-1))	0.538538	0.111995	4.809	0.000	Both Regimes
D(LOGIGI(-2))	0.295272	0.196398	1.503	0.141	Both Regimes
D(D2)	-0.083864	0.098597	-0.851	0.400	Structural Dummy
C	4.405687	1.063276	4.144	0.0002	Constant
Model Statistics					
R-squared	0.7347				
Adjusted R-squared	0.6817				
S.E. of regression	0.0942				
Durbin-Watson stat	1.870				
F-statistic	13.850			0.000	
Observations	52				

NOTES: HAC (Newey-West) robust standard errors were used to account for serial correlation. LOILR_LOW and LOILR_HIGH correspond to oil revenue in the Low and High governance regimes, respectively.

Source: Researchers' computation based on regression results (2026).

Table 9 presents the Threshold ARDL estimates of FDI in Nigeria's oil and gas sector, distinguishing Low and High oil reserves regimes. This framework captures potential nonlinearities in FDI responses to sectoral output, petroleum taxation, macroeconomic conditions, and structural shifts. HAC robust standard errors are employed to address residual serial correlation, ensuring reliable inference.

Long Run Dynamics

In the long run, oil reserves in both Low (LOILR_LOW) and High (LOILR_HIGH) regimes exhibit negative but statistically insignificant coefficients ($\beta = -3.223$, $p = 0.430$; $\beta = -2.835$, $p = 0.444$). This suggests that past levels of oil reserves (location advantage in the eclectic/OLI framework) do not exert a persistent influence on FDI inflows, regardless of the reserves regime. Inflation (LINFR) and petroleum taxation (LPETAX) are also insignificant,

indicating that long-term price pressures and fiscal policy changes do not materially constrain FDI once other structural factors are considered.

The oil and gas investment governance index (LOGIGI(-1)) remains highly significant and negative ($\beta = -1.754$, $p < 0.001$), demonstrating that past governance conditions strongly shape long-run FDI. Although the negative sign may reflect the lag structure or short-run corrections, it emphasizes the importance of sustained institutional improvements and an enhanced governance framework in attracting foreign capital. The exchange rate (LEXR) is insignificant, suggesting that currency fluctuations are not a major long-term determinant of FDI in the sector. The structural break dummy (D2(-1)) does not significantly affect long-term oil and gas, indicating that the 2018 policy or regime shift occasioned by PIGB passage by the legislature did not alter the underlying equilibrium beyond short-term adjustments.

Short Run Dynamics

The error correction term (ECM(-1)) is negative and highly significant ($\beta = -0.257$, $p = 0.0002$), confirming that deviations from long-run equilibrium are corrected over time. The magnitude implies that about 26 percent of short-run disequilibrium is adjusted within one period, reflecting a moderate speed of convergence. Short-run changes in oil reserves are positive across regimes, with $D(\text{LOILR_LOW}) = 1.731$ ($p = 0.071$) and $D(\text{LOILR_HIGH}) = 1.708$ ($p = 0.068$), suggesting that FDI responds immediately to fluctuations in the level of oil and gas resources abundance, particularly in periods of both low and high oil and gas reserves. Interestingly, the first lag of $D(\text{LOILR_HIGH})$ is negative and significant ($\beta = -0.076$, $p = 0.035$), indicating a short-run correction mechanism where a temporary rise in oil reserves is partly offset in the following period.

Governance improvements and enhanced institutional effectiveness continue to exert dynamic effects in the short run: the contemporaneous effect of $D(\text{LOGIGI})$ is negative and highly significant ($\beta = -0.674$, $p < 0.001$), while the first lag is positive and significant ($\beta = 0.539$, $p < 0.001$).

This empirical trend reflects a delayed confidence effect, where investors initially respond cautiously to governance changes but adjust positively as institutional reforms are observed to persist. The second lag is not significant ($\beta = 0.295$, $p = 0.141$), suggesting transitional adjustment periods. The structural break dummy ($D(\text{D2})$) remains insignificant in the short run ($\beta = -0.084$, $p = 0.400$), indicating that the 2018 policy or regime shift had a limited immediate impact on FDI once oil reserves fluctuations and governance effects are accounted for.

The model demonstrates strong explanatory power, with $R^2 = 0.735$ and an adjusted $R^2 = 0.682$, indicating that the explanatory variables are statistically significant in explaining the behaviour of the dependent variable. The F-statistic is highly significant ($F = 13.850$, $p = 0.000$), confirming the joint ability of the independent variables to explain the variations observed in the dependent variable over time. The Durbin-Watson statistic of 1.870 suggests some potential positive serial correlation in the model. However, the HAC robust standard errors mitigate concerns over biased inference.

In essence, the Threshold ARDL results highlight that FDI in Nigeria's oil and gas sector is regime-dependent, responding differently during periods of low and high oil reserves, confirming the theoretical position of the resource-seeking motive of FDI advanced by Dunning (1993), Hymer (1976), Caves (1996) and Dunning & Lundan (2008). While long-run effects of oil reserves are not statistically significant, the short-run dynamics are pronounced, with immediate responses to resource reserves fluctuations and delayed

adjustments to governance improvements and institutional reforms. The structural break in 2018 by way of passage of the PIGB does not appear to alter either the long-run equilibrium or short-run patterns significantly, indicating that FDI behaviour is largely governed by oil reserves dynamics (location advantages) and governance quality rather than discrete policy shifts or regulatory changes. These findings underscore the importance of incorporating nonlinear frameworks when assessing investment behavior in resource-dependent economies.

Comparative Analysis

The comparison of the linear ARDL model with structural break and the threshold ARDL framework describes distinct patterns in how FDI responds to sectoral and governance/institutional factors in Nigeria's oil and gas industry.

In the linear ARDL specification, FDI exhibits a strong positive short-run response to changes in oil and gas output ($D(LGDPog)$), with the coefficient significant at the 1 percent level. This indicates that the oil and gas sector's economic performance in terms of output growth directly attracts FDI inflows, consistent with resource-seeking behaviour advanced by scholars. Governance quality ($LOGIGI$) exhibits a dynamic adjustment process: an initial negative contemporaneous effect followed by several positive and significant lagged coefficients, suggesting that investors first respond cautiously to governance-related or policy changes in the sector. However, it becomes more supportive as reforms take hold over time. Petroleum taxation ($PETAX$) produces mixed short-run effects, with negative contemporaneous and positive lagged terms, reflecting the episodic influence of fiscal policy on FDI. These relationships represent average responses across the full sample and do not differentiate between periods of high and low oil reserves.

The threshold ARDL model, by contrast, shows that FDI responses are regime-dependent, conditioned on the level of oil reserves. In the short run, changes in oil reserves exert a positive effect in both low- and high-reserves regimes, but the high-reserves regime displays a significant negative lagged adjustment. This pattern suggests that during the periods of high oil reserves, FDI increases initially but partially corrects in subsequent periods, possibly reflecting temporary overshooting or deliberate delays by investors. Governance effects remain significant in both models, yet the threshold specification reveals stronger immediate negative impacts and more structured lagged adjustments within each regime. The speed of equilibrium correction also differs: the linear ARDL indicates approximately 16 percent adjustment per period, whereas the threshold model shows a faster rate of around 26 percent, implying that accounting for revenue regimes improves the model's ability to capture convergence dynamics.

In summary, the linear ARDL captures broad average effects of sectoral performance on FDI, while the threshold ARDL uncovers conditional investment behaviour shaped by oil revenue fluctuations. The nonlinear framework, therefore, offers a richer understanding of how foreign investors respond strategically to the existence of high oil reserves and slowdown periods in Nigeria's petroleum sector, where improvements in governance quality interact with prevailing revenue conditions to influence FDI inflows. This oil-reserves-regime-sensitive perspective provides a more precise basis for interpreting the three-variable interaction between FDI, governance, and the petroleum industry's sectoral performance.

4.4.7: Post Estimation Test

Following the estimation of both the ARDL model with structural breaks and the threshold ARDL framework, post-estimation diagnostics were conducted to assess the robustness of the results. These procedures examined residual distribution, heteroskedasticity, autocorrelation, model specification, and the stability of estimated coefficients over the sample period,

ensuring that both linear and nonlinear, regime-dependent dynamics of FDI in Nigeria's oil and gas sector are reliably captured.

Table 10: Post-Estimation Diagnostic Test Results

Test	Statistic	Value	Df	Probability	Remarks
Wald Test	F-statistic	23.16068	(2, 33)	0.0000	Rejected
	Chi-square	46.32136	2	0.0000	
Breusch–Godfrey Serial Correlation LM Test	F-statistic	1.483143	(2, 28)	0.2442	Not rejected
	Obs*R-squared	4.597959		0.1004	
Breusch–Pagan–Godfrey Heteroskedasticity Test	F-statistic	0.467545	(17, 30)	0.9491	Not rejected
	Obs*R-squared	10.05360		0.9013	
	Scaled explained SS	12.80287		0.7493	
Ramsey RESET Test	t-statistic	1.358097	29	0.1849	Not rejected
	F-statistic	1.844428	(1, 29)	0.1849	
	Likelihood ratio	2.959694	1	0.0854	

NOTES: The Wald test rejects the joint null ($C(1)=0$ and $C(3)=2*C(4)$) at the 1 % level. The Breusch–Godfrey LM test fails to reject no serial correlation up to two lags, and the Breusch–Pagan–Godfrey test fails to reject homoskedasticity.

Source: Researchers' computation based on regression results (2026).

Table 10 presents the post-estimation diagnostic results for the ARDL model with structural breaks and Threshold ARDL estimates. These tests are essential to ensure that the estimated relationships are statistically robust and that the model assumptions are satisfied. The Wald test strongly rejects the joint null hypothesis ($F = 23.161$, $p < 0.001$; $\chi^2 = 46.321$, $p < 0.001$), confirming the statistical significance of the tested parameter restrictions. This provides confidence that the specified model restrictions meaningfully capture the underlying dynamics of FDI in Nigeria's oil and gas sector.

Additionally, the Breusch–Godfrey LM test indicates no evidence of serial correlation up to two lags ($F = 1.483$, $p = 0.244$; $\text{Obs}R^2 = 4.598$, $p = 0.100$), suggesting that residual autocorrelation does not undermine the validity of the coefficient estimates.

Similarly, the Breusch–Pagan–Godfrey heteroskedasticity tests fail to reject the null hypothesis of homoskedasticity ($F = 0.468$, $p = 0.949$; $\text{Obs}R^2 = 10.054$, $p = 0.901$), indicating that the variance of residuals is constant across observations. The Ramsey RESET test for model specification does not reject the null hypothesis of correct functional form ($t = 1.358$, $p = 0.185$; $F = 1.844$, $p = 0.185$; likelihood ratio = 2.960, $p = 0.085$), providing further conviction that the model is appropriately specified and that omitted variable bias or nonlinearities are not distorting the estimates.

In summary, these diagnostic results indicate that the ARDL and Threshold ARDL models are well-specified, free from serial correlation, and homoskedastic, supporting the reliability of the short-run and long-run parameter estimates presented in the preceding sections. These findings strengthen confidence in the interpretation of FDI-governance dynamics within the Nigerian oil and gas sector.

5.0 DISCUSSION OF FINDINGS

In the long run, higher governance quality, as captured by the oil and gas governance and investment index (LOGIGI), exerts a strong negative effect on FDI inflows ($\beta = -2.868$, $p < 0.001$). In its apparent form, this finding contrasts with the previous empirical findings by Carril-Caccia et al. (2019), Awan et al. (2018), Esew & Yaroson (2014), and OECD (2025)

that better institutions attract more FDI because they reduce political risk, improve contract enforcement, and enhance FDI security.

However, unlike the previous studies, which focus on aggregate economies, this study focuses on sector-specific dynamics of Nigeria's oil and gas industry and therefore requires specific sector-related applicability. Recent evidence suggests that in resource-dependent economies like Nigeria, the governance-FDI nexus and FDI can be more complex. For instance, improvements in governance quality through reforms and regulatory enactments (e.g. Petroleum Industry Act (2021), the recent Executive Order on direct remittance of oil and gas revenue into Federation Account to prevent revenue leakage and fiscal transparency, etc.), can enhance domestic investors' participation in the industry thereby crowding out certain types of FDI (Osuma et al., 2024).

In a similar vein, this result also aligns with the evidence from recent studies showing that entrenchment of standard governance indices may lead to the embedding of regulatory rigidities that disincentivize FDI inflows and deter foreign investors seeking flexible operating environments (Olo Orji & Opuala-Charles, 2025). The statistically significant and negative coefficient also provides strong evidence for the theoretical proposition of institutional quality theory on the distinctions between *de jure* (formal rules, laws, and governance reform officially adopted by the state) institutions and *de facto* institutions (how those rules actually function in practice). In many oil-dependent economies, oil and gas governance reforms usually exist on paper, while their implementation may be weak or inconsistent due to bureaucratic delays, regulatory capture and/or weak enforcement institutions. This significantly influences investors' perception that formal governance improvements do not immediately translate into predictable returns, especially in contexts where informal practices and political interference persist (Gbadebo, 2026).

Relatedly, the significant negative governance-FDI empirical relationship established in this study is consistent with the views of the institutional quality theory and the eclectic/OLI paradigm adopted as the anchor theories for this study. This empirical evidence suggests that improved governance quality does not unilaterally stimulate FDI even in environments where resource-seeking motives dominate the FDI decision-making framework. This reinforces the view that oil wealth can either stabilize or destabilize regimes depending on institutional incentives and governance capacity (Dunning, 1993), and governance quality shapes FDI and resource management (North, 1990 and Acemoglu & Robinson, 2012).

However, this outcome is a significant departure from the eclectic/OLI paradigm, which predicted that countries with a strong governance structure attract more FDI from MNCs due to the existence of institutional characteristics (regulatory stability, protection of property rights, lower corruption, contract enforcement, predictable policy environments, etc.) that reduce uncertainty and transaction costs. This suggests that MNCs place a higher premium on resource-seeking motivation for FDI over governance considerations within the 'location advantages' framework. The misalignment between theory and empirical evidence in Nigeria's oil and gas industry on the governance-FDI nexus could be attributed to the poor governance indices ravaging the sector, which whittles down Nigeria's location advantages and reduces the likelihood and volumes of FDI inflows. When seeking investment in Nigeria's oil and gas industry.

Empirically, this study's finding on the negative and significant governance-FDI nexus corroborates earlier empirical evidence by Nwachukwu (2019), Bakare, Ozegbe & Salami (2023), Adenuga (2023), and Illo, Oladipo & Azu (2025) suggesting that despite improvements in some governance metrics, regulatory instability and structural weaknesses,

most notably rentier state dynamics, manifestations of enclave economies, political elite capture, and weak accountability evidenced by massive endemic corruption and revenue leakages, has undermined investor confidence in the oil and gas sector (Gbadebo, 2026). These factors are consistent with the view of the institutional quality paradigm, which interpreted them as manifestations of weak institutions that distort incentives, weaken state capacity and undermine effective resource governance in natural resource sectors such as Nigeria's oil and gas industry.

Contrary to the findings in the governance-FDI relationship, the short-run dynamics result of the FDI-economic performance nexus indicates that oil and gas sector performance significantly drives FDI flows. The contemporaneous positive effect of oil and gas output growth ($D(LGDPog) \beta = 1.540, p = 0.004$) suggests that multinational oil and gas investors respond to immediate improvements in macroeconomic fundamentals (such as market size) and sectoral prospects. This is consistent with the notion that market size and resource profitability are key pull factors for FDI in primary sectors (Alfaro, 2003; Asiedu, 2006 and Adeleke, 2014). This finding further lends support to the theoretical proposition of the market-seeking hypothesis of FDI motives that MNCs invest in countries with large market size, rapid economic growth and strong consumer demands by locating production in the host country to supply local markets more efficiently than exporting from their home countries (Hymer, 1976; Dunning, 1993; Graham & Krugman, 1995 and Dunning & Lundan, 2008)

Similarly, the dynamic lag structure of governance, which is initially negative but turns positive over subsequent periods, is most likely a reflection of investors' delayed adjustment to governance reforms and policy changes, whereby regulatory tightening initially raises compliance costs but creates longer-term expectations of stability. This finding aligns closely with the eclectic/OLI paradigm, which holds that when governments introduce regulatory reforms, particularly stricter governance rules, MNCs may initially incur higher compliance costs. Consequently, MNCs may delay FDI decisions until they observe whether the reforms are credible, the regulatory framework is stable, and the investment climate is predictable (Dunning, 1993). This process is interpreted in the institutional quality theoretical framework as a dynamic adjustment of location advantage, whereby investors assess institutional stability in the long run as against the short-run regulatory costs (North, 1990 and Acemoglu & Robinson, 2012).

Furthermore, this pattern is consistent with evidence indicating that governance effects on investment can be non-linear and time-lagged, especially in contexts where institutional reforms evolve gradually and investor perceptions adjust over time (Globerman & Shapiro, 2002; Asiedu, 2006 and Osuma et al., 2024). Thus, governance improvements shape the magnitude and quality of FDI differently depending on the institutional conditions of such a country. More recent FDI-governance studies utilizing threshold and dynamic models as deployed in this study also confirm that investor responses to governance reforms evolve gradually as institutional credibility becomes established (Buchanan et al., 2012; Lakha et al., 2024 and Nguyen & Ho, 2025).

The error correction term ($ECM = -0.163, p = 0.000$) confirms that short-term disequilibria correct toward long-run relationships at a modest pace and this is consistent with the literature on FDI adjustment in developing economies. The insignificant structural break dummy (2018) indicates that recent policy changes, evidenced by the passage of the Petroleum Industry Governance Bill (2019), did not fundamentally alter the long-run equilibrium, suggesting structural conditions that persist beyond episodic policy shifts.

Instructively, the policy implications of these findings are significant. First, the process of enhancing governance quality and institutional effectiveness in the oil and gas sector should be pursued not merely as a mechanism to attract more FDI, but as a strategy to improve sectoral accountability, government transparency, domestic participation, and competitive efficiency. This aligns with the view that governance reforms must be deep and comprehensive to reduce investor uncertainty and not merely procedural (Osuma et al., 2024). This is consistent with a major aspect of the institutional quality theory, institutional credibility, which is closely linked to institutional depth and enforcement quality.

Second, priority should be accorded to policies aimed at strengthening institutional frameworks by reducing corruption, blocking revenue leakages, streamlining regulatory processes, and enhancing transparency to ensure that governance improvement measures and institutional reforms are perceived as credible and long-lasting. Third, in light of the responsiveness of FDI to sector performance in the short run, the outcome of this study suggests that policy efforts should be geared toward strengthening macroeconomic stability, ensuring stable oil production in line with OPEC quota and instituting robust revenue-stabilization mechanisms as critical prerequisites for sustaining FDI inflows.

Overall, these results suggest that while governance quality is a significant determinant of FDI dynamics, its impact is context-dependent in resource-rich economies like Nigeria's. Improvement in governance quality may reduce certain types of FDI while signaling stronger domestic capacity, thus reshaping the nature of investment flows rather than simply increasing their magnitude. This underscores the need for a multi-pronged policy approach that integrates governance reforms with broader economic strategies to boost investor confidence and sustainable sectoral economic performance in the hydrocarbon sector.

Given that governance quality and macroeconomic variables exhibit statistically significant long-run and short-run effects on FDI ($F = 27.35$, $p = 0.000$; adjusted $R^2 = 0.860$), the hypothesis that there is a significant relationship between macroeconomic and governance/institutional variables and FDI inflow in Nigeria's oil and gas industry is not rejected.

6.0 CONCLUSION AND POLICY IMPLICATIONS

This study examined the complex interplay between market size and institutions, reflected in governance, in the determination of FDI in Nigeria's oil and gas industry over the period 1973–2024. The empirical evidence demonstrates that FDI is a critical driver of sectoral output, but its impact on institutional quality is limited, reflecting a resource enclave dynamic where foreign capital boosts production without necessarily strengthening governance frameworks. The analysis also lends credence to the theoretical position of the market-seeking hypothesis of FDI motives that MNCs invest in countries with large market size, rapid economic growth and strong consumer demands by locating production in the host country to supply local markets more efficiently than exporting from their home countries. Since empirical evidence shows that macroeconomic variables (including market size) shape FDI inflows and governance alone may deter investment due to regulatory complexity or inefficiencies, policymakers should therefore focus on streamlining regulatory frameworks, reducing bureaucratic bottlenecks, and enhancing policy predictability. Initiatives such as one-stop investment facilitation centers, digital licensing systems, and clear sector-specific guidelines can reduce operational costs for foreign investors, making the sector more attractive while maintaining governance standards. These measures ensure that FDI flows are both robust and efficiently deployed to productive activities.

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