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Organisation of Petroleum Exporting Countries Quota and Nigerian oil output

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Abstract
This paper investigates the impact of the Organization of Petroleum Exporting Countries quota system on Nigeria's crude oil output over the period 1999 to 2025. Major petroleum sector indicators such as Nigeria's OPEC production quota, OPEC total production, quota compliance rate, and OPEC spare capacity, were employed as explanatory variables, while crude oil production served as the dependent variable. Secondary data were obtained from the National Bureau of Statistics, OPEC Annual Statistical Bulletin, OPEC Monthly Oil Market Report, and author's computation (2026). To ensure analytical rigor, the Augmented Dickey-Fuller unit root test was utilized to examine the stationarity properties of the variables, while the Auto-Regressive Distributed Lag model was applied to estimate both short-run and long-run dynamics. The bounds testing approach confirms the existence of a long-run relationship between OPEC-related variables and Nigeria's crude oil output. Empirical findings indicate that OPEC total production and OPEC spare capacity exert a negative and statistically significant influence on crude oil production, In contrast, the quota compliance rate exhibits a positive and significant relationship with crude oil production, and However, Nigeria's OPEC production quota is found to have a negative and insignificant effect on crude oil production in Nigeria The study concludes that while OPEC mechanisms play a critical role in shaping Nigeria's oil output, their effectiveness is largely conditioned by domestic production capacity and operational efficiency. It therefore recommends that policy efforts be directed toward aligning quota levels with domestic capacity through sustained investment in infrastructure and improved operational performance.

Keywords: Nigeria OPEC production quota, OPEC total production, quota compliance rate, OPEC spare capacity crude oil production

Introduction

The global oil market is fundamentally shaped by coordinated production decisions among major oil-producing countries, particularly through the activities of the Organization of the Petroleum Exporting Countries. A core instrument of this coordination is the allocation of production quotas to member states, including Nigeria, with the overarching objective of stabilizing oil prices and regulating global supply. In contemporary literature, OPEC quota has been rigorously conceptualized. Adebayo (2023) [1] defines it as the maximum allowable crude oil output assigned to member countries within a specified period to maintain equilibrium in the global oil market. Similarly, Okeke (2022) [33] conceptualizes it as a collective production ceiling designed to prevent excess supply and the resultant price collapse in international markets. In the same vein, Usman and Abdullahi (2024) [43] describe OPEC quota as a strategic supply management mechanism employed to balance global demand and supply dynamics. These quotas are periodically reviewed and adjusted in response to changing market fundamentals, geopolitical developments, and macroeconomic conditions.

The implications of OPEC quotas for Nigeria's oil output are multifaceted. On the one hand, adherence to quota allocations promotes price stability, thereby ensuring relatively predictable oil revenues in an economy that is heavily dependent on crude oil exports. On the other hand, production ceilings constrain Nigeria's capacity to expand output during periods of favorable market conditions, thereby limiting potential revenue gains. More importantly, Nigeria's oil sector is confronted with structural inefficiencies—such as crude oil theft, pipeline vandalism, underinvestment, and aging infrastructure—which often result in actual production levels falling below assigned quotas, thereby exacerbating revenue losses. Accordingly, recent statistical data underscore the volatility of Nigeria's oil production relative to OPEC quotas. Under the OPEC+ framework, Nigeria's production quota has been retained at 1.5 million barrels per day (bpd) through 2026 (OPEC, 2025) [29]. However, actual output has exhibited considerable fluctuations. Nigeria recorded 1.54 million bpd in January 2025[11], followed by declines to 1.47 million bpd in February and 1.40 million bpd in March 2025 (NBS, 2025; OPEC Monthly Oil Market Report, 2025) [38]. Temporary improvements were observed in June and July 2025[38], with outputs of 1.505 million bpd and 1.507 million bpd, respectively (OPEC, 2025).

A broader temporal analysis reveals persistent underperformance. Average crude oil production stood at 1.33 million bpd in 2023[1] against a quota of approximately 1.74 million bpd (CBN, 2024; OPEC, 2024), and improved marginally to 1.38 million bpd in 2024, still below the 1.5 million bpd quota (NBS, 2024) [16]. Historically, Nigeria's production capacity exceeded 2.0 million bpd, with peaks of 2.1 million bpd in 2010 and about 2.0 million bpd in 2019 (CBN, 2023), indicating a substantial decline in productive capacity over time. Recent data further highlight production instability. Output declined to 1.31 million bpd in February 2026 before improving slightly to 1.45 million bpd in March 2026 (OPEC, 2026). In aggregate terms, Nigeria produced approximately 599.64 million barrels in 2025[11], reflecting a shortfall of over 166 million barrels relative to projected

output (CBN 2025; NBS, 2025). Furthermore, crude oil continues to account for over 70% of export earnings and between 50–60% of government revenue, underscoring the fiscal sensitivity of the economy to production fluctuations (CBN, 2025) [29]. Estimated revenue losses of about ₦3.5 trillion in 2023, alongside daily production losses of 200,000–400,000 bpd due to oil theft and pipeline vandalism between 2022 and 2024[26, 30], further emphasize the magnitude of the challenge (National Bureau of Statistics, 2024[28]; Nigerian Upstream Petroleum Regulatory Commission, 2024) [30].

Empirical literature provides additional insights into this relationship. Adebayo and Salihu (2023) [2], employing a Vector Error Correction Model (VECM), establish that OPEC quotas exert a negative and statistically significant effect on Nigeria's oil output in both the short and long run. Eze, Okonkwo, and Nwankwo (2024) [17], using the Auto-Regressive Distributed Lag (ARDL) approach, find that while quota compliance significantly influences production levels, deviations are largely driven by domestic constraints. Similarly, Usman and Abdullahi (2024) [43], applying a Dynamic Ordinary Least Squares (DOLS) technique, conclude that although quotas contribute to price stability, they simultaneously constrain output growth in oil-dependent economies. Despite these insights, Nigeria faces a dual constraint in optimizing oil output. Externally, OPEC-imposed quotas limit production expansion; internally, structural inefficiencies hinder the country's ability to meet even these limits. The persistence of oil theft estimated at 200,000–400,000 bpd and the gap between technical capacity (above 2.0 million bpd) and actual production (approximately 1.3–1.5 million bpd) illustrate the depth of these challenges (CBN, 2025[35]; Nigerian Upstream Petroleum Regulatory Commission, 2024) [30]. Consequently, Nigeria experiences substantial revenue losses, weakened foreign exchange earnings, and increased macroeconomic vulnerability. The production shortfall of over 166 million barrels in 2025[29] alone exemplifies the scale of lost economic opportunities.

Notwithstanding the growing body of empirical research, significant gaps remain. Existing studies such as Adebayo and Salihu (2023) and Eze *et al*. (2024) [2, 16] primarily focus on the direct impact of OPEC quotas on oil output, often overlooking the interactive effects of domestic production constraints and external quota restrictions. Furthermore, many analyses rely on pre-2020 datasets, thereby failing to capture recent developments, including heightened oil theft, regulatory reforms, and OPEC+ production adjustments. There is also limited application of comprehensive econometric frameworks that integrate both external quota dynamics and internal inefficiencies using updated data. In light of these gaps, there is a compelling need for a more robust and contemporaneous empirical investigation into the impact of OPEC quotas on Nigeria's oil output. Such an approach is essential for informing policy strategies aimed at enhancing production efficiency, improving compliance capacity, and maximizing the economic benefits of Nigeria's membership in the Organization of the Petroleum Exporting Countries.

Against this backdrop, the study seeks to address the following research questions: To what extent has Nigeria's OPEC production quota influenced its oil output (crude oil production)? How has total OPEC production affected Nigeria's crude oil output? In what way has the quota compliance rate impacted Nigeria's oil output? And how has OPEC's spare capacity shaped Nigeria's crude oil production? The remainder of the study is structured as follows: the next section presents the literature review, followed by the methodology, results and discussion, and finally the conclusion and policy recommendations.

Literature Review

Organization of Petroleum Exporting Countries Quota

The global oil market is a highly dynamic and strategically significant arena where even minor fluctuations in supply can trigger dramatic price shifts worldwide. At the center of this complex system is the Organization of the Petroleum Exporting Countries (OPEC), whose production decisions reverberate across economies, energy markets, and financial systems. Among OPEC's most critical instruments is the production quota, a mechanism that dictates how much crude oil each member nation is allowed to produce, thereby influencing global supply, price stability, and national revenue streams. The Organization of the Petroleum Exporting Countries quota refers to the officially assigned maximum level of crude oil production allocated to each member country within a specified period. The quota system is a strategic mechanism designed to regulate the supply of crude oil in the global market, stabilize oil prices, and ensure that member states derive predictable revenue from oil exports. Adebayo (2023) [1] defines Organization of the Petroleum Exporting Countries quota as the ceiling of oil production agreed upon by member nations to maintain market equilibrium and avoid price volatility caused by overproduction. This perspective highlights the quota as a regulatory tool that directly addresses market volatility. The study supports this view by demonstrating that quota adherence reduces abrupt price fluctuations in member countries, thereby stabilizing revenue streams. Empirical evidence from Adebayo shows that countries exceeding their quotas often trigger price drops, validating the significance of controlled production ceilings.

Similarly, Okeke (2022) [33] defines Organization of the Petroleum Exporting Countries quota as a production limit imposed collectively on member countries to prevent oversupply, which could lead to global oil price collapse. Okeke's study emphasizes the collective nature of the quota system, noting that coordination among member states is crucial. The research indicates that non-compliance by even one member can disrupt global oil prices, underscoring the interdependence among OPEC members. This view aligns with market observations where quota breaches by a single country can have ripple effects on supply, price, and revenue for all members. Usman and Abdullahi (2024) [43] conceptualize Organization of the Petroleum Exporting Countries quota as a coordinated output control instrument used by OPEC to align global oil supply with demand, thereby fostering stability in the international oil market. Their study extends the understanding of quotas by linking them directly to global demand-supply dynamics rather than solely price stabilization. They argue that effective quota management ensures market equilibrium, minimizes surplus production, and provides predictable economic outcomes for member countries. Empirical evidence in their research shows that coordinated quota reductions during periods of declining demand helped sustain oil prices, confirming the functional significance of the quota system.

Organization of the Petroleum Exporting Countries quotas are not static; they are periodically reviewed and adjusted based on global demand fluctuations, economic conditions,

and geopolitical events. Compliance with quotas ensures that member countries avoid excessive production that could destabilize the market, while non-compliance or underproduction can lead to revenue losses or market imbalances. In practice, OPEC quotas are binding guidelines rather than legally enforceable limits, meaning that member countries may occasionally exceed or underutilize their assigned production levels depending on national priorities, infrastructural capacity, and domestic challenges. In essence, the Organization of the Petroleum Exporting Countries quota system is both a market stabilization tool and a revenue management mechanism. It balances the dual goals of controlling global oil supply to maintain price stability and securing predictable economic returns for member countries, including Nigeria, whose economy heavily depends on crude oil exports.

Nigeria's Oil Output

Nigeria's oil output represents the total volume of crude oil produced within the country's oil sector over a given period, typically measured in barrels per day (bpd). It is the most critical indicator of the nation's production capacity and serves as a key determinant of national revenue, foreign exchange earnings, and overall economic stability. The performance of Nigeria's oil output is influenced by a combination of domestic and international factors, including infrastructure efficiency, security challenges, policy frameworks, and global market dynamics. Ajayi and Bello (2023) [5] describe Nigeria's oil output as "the measurable flow of crude oil extracted and processed within the country, reflecting both the operational capacity of the petroleum sector and the efficacy of regulatory compliance." Their study underscores the role of operational efficiency, noting that fluctuations in output often mirror infrastructure functionality, such as pipeline integrity and maintenance schedules. Empirical findings indicate that even minor disruptions in production facilities can lead to daily output losses of 100,000–300,000 bpd, affecting both export earnings and fiscal revenues.

Iheanacho (2022) [21] defines Nigeria's oil output as "the aggregate crude production that translates domestic oil resources into economic gains, shaped by market demand, internal security, and technological capability." This perspective highlights the interconnectedness of production levels with economic outcomes. Iheanacho's analysis reveals that periods of insurgency and pipeline vandalism in the Niger Delta directly correlate with output declines, resulting in revenue deficits of billions of naira. For example, production fell from 1.8 million bpd in 2019 to approximately 1.33 million bpd in 2023, reflecting the cumulative effects of these domestic challenges (Central Bank of Nigeria, 2024[10]; Nigerian Upstream Petroleum Regulatory Commission, 2024) [30].

Oluwafemi and Okoro (2024) [36] conceptualize oil output as "a strategic national resource metric, capturing the volume of crude oil produced and exported, which in turn underpins Nigeria's balance of payments and government fiscal stability." Their study emphasizes the macroeconomic significance of oil output, arguing that shortfalls in production relative to potential capacity often due to operational inefficiencies and policy bottlenecks have amplified consequences on government revenue and economic planning. Empirical evidence shows that Nigeria's oil output has frequently lagged behind OPEC-assigned quotas, with an average production of 1.38 million bpd in 2024[27] against a quota of 1.5 million bpd, highlighting persistent underutilization of the country's production potential (OPEC, 2024; National Bureau of Statistics, 2024) [27, 28]. Conclusively, Nigeria's oil output is more than just a measure of crude production; it serves as a barometer of national economic performance, fiscal health, and global market participation.

Theoretical Literature

Resource Dependence Theory

The Resource Dependence Theory was propounded by Pfeffer and Salancik in 1978[40]. The theory asserts that organizations and entities are dependent on external resources controlled by other actors, and this dependence shapes their strategies, behavior, and decision-making. The theory emphasizes that scarcity or control of critical resources generates power dynamics, compelling dependent entities to adopt strategies that secure access to these resources for survival and growth. In the context of the oil sector, OPEC quotas represent a critical external resource that directly influences Nigeria's oil production capacity, revenue generation, and strategic planning. The theory assumes that organizations are not autonomous and must interact with their environment to acquire essential resources, that power imbalances exist because entities controlling critical resources can influence dependent actors, and that organizations adopt strategies to manage dependencies, mitigate uncertainty, and maintain stability in resource acquisition.

Proponents argue that Resource Dependence Theory effectively explains how organizations respond strategically to external constraints. Adebayo and Salihu (2023) [2] contend that Nigeria's compliance with OPEC quotas reflects strategic adaptation to external resource dependence, balancing global market demands with domestic operational capacities. Usman and Abdullahi (2024) [43] highlight that quota assignments directly influence production decisions and revenue planning. Opponents, such as Pfeffer (1987) [41] and Aldrich (1979), argue that Resource Dependence Theory overemphasizes external control and may underestimate internal factors like managerial competence, technology, and organizational culture, which can independently shape outcomes. Resource Dependence Theory is highly relevant to this study because Nigeria's oil output is directly influenced by OPEC quotas, which act as external controls on production. The theory provides a framework to understand how Nigeria navigates these external restrictions while managing internal challenges such as pipeline vandalism, oil theft, and aging infrastructure. Resource Dependence Theory anchors this study because it provides a comprehensive lens to examine the relationship between OPEC quotas and Nigeria's oil output, accounting for both external pressures and domestic strategies to optimize production and revenue.

Market Power Theory

Market Power Theory was postulated by Stigler in 1964[42]. The theory holds that firms or organizations with significant control over the supply of a commodity can influence its price and market outcomes. The theory emphasizes that entities with concentrated market control can strategically regulate supply to achieve desired economic objectives. In the context of global oil markets, OPEC collectively exercises market power by controlling production through quota allocations, which stabilizes oil prices and maximizes

member revenues. The theory assumes that markets are not perfectly competitive, that certain actors can exert influence over supply and prices, and that organizations or cartels act strategically to maintain profitability and market stability. Proponents argue that Market Power Theory explains OPEC's ability to influence global oil prices through coordinated production limits. Okeke (2022) [33] emphasizes that OPEC's quotas are a deliberate mechanism to maintain market balance and protect member revenues, while Eze, Nwosu, and Okeke (2024) [16] provide empirical evidence that quota restrictions shape Nigeria's oil output, illustrating OPEC's exertion of market power. Opponents, such as Bain (1956) [7], argue that market power may be temporary due to competition, substitutes, or technological innovations that reduce an entity's influence. Market Power Theory is relevant to this study as it explains why OPEC imposes quotas and how these limits influence Nigeria's production decisions.

Empirical Literature

Adewale and Balogun (2023) [4] examined how compliance with OPEC quotas affected daily crude oil output in Nigeria over the period 2010–2022[26]. The dependent variable was daily crude oil output, and the independent variables were quota compliance rate, investment in upstream capacity, and pipeline vandalism index. Using Ordinary Least Squares (OLS) regression, the study found that quota compliance rate had a negative and statistically significant effect on daily oil output, showing that stricter quotas reduced production levels. Investment in upstream capacity had a positive and significant effect on daily output, indicating that improvements in capacity boosted production. Pipeline vandalism index was also negative and significant, showing that increased vandalism incidents significantly reduced output. The study concluded that quota compliance negatively affected output but that upstream investment could offset this effect if security challenges were addressed. Additionally, Obele (2025) [32] explored OPEC influence on Nigeria's oil sector development from 2005 to 2024[28], with oil sector growth as the dependent variable and OPEC quota levels, capital investment, and regulatory policy changes as independent variables. Using panel regression with structural break analysis, the study found that OPEC quota levels significantly predicted oil sector growth only when capital investment increased substantially, indicating that quota effects were conditional on investment levels. Capital investment had a positive and significant effect on growth, meaning sectors with higher investment grew faster. Regulatory policy changes had a weaker positive effect, suggesting that policy reforms alone were insufficient to significantly raise output without corresponding investment. The study concluded that OPEC quotas influenced sector performance more strongly in environments with substantial local investment.

Chukwu and Nnamani (2025) [13] evaluated the influence of OPEC quotas on Nigeria's export earnings from crude oil from 2000 to 2023[5], using export earnings as the dependent variable and OPEC quota compliance, crude oil output volume, foreign exchange rate, and world oil price as independent variables. Using Panel Corrected Standard Errors (PCSE), the study found that OPEC quota compliance negatively affected export earnings by constraining output volume, showing that lower production limits directly reduce earnings. Crude oil output volume had a strong positive effect on export earnings, indicating that higher production boosted earnings. The foreign exchange rate had a negative influence, meaning currency depreciation reduced export earnings in naira terms. World oil price had a positive and significant effect on earnings, with higher global prices massively improving export returns. The study concluded that quota limitations significantly reduce earnings and that macroeconomic variables play key roles in moderating this effect. Also, Chinedu and Marvellous (2025) [12] examined the effect of OPEC quota shifts on Nigeria's upstream production capacity development from 2005–2024[30]. The variables were upstream production capacity (dependent); OPEC quota shifts, investment in gas to liquids (GTL) projects, and security expenditure (independent). Using a Fixed Effects panel regression, the study found that quota shifts had an insignificant effect on capacity growth, while GTL investment had a strong positive impact. Security expenditure was negatively significant, meaning that increased spending on security corresponded with lower capacity expansion. The study concluded that investments in alternative energy projects stimulate capacity growth more than quota changes influence production planning.

Olu *et al* (2025) [35] investigates the relationship between oil price, exchange rate volatility, and trade transactions in Nigeria for the period covering from 2008 to 2024[16]. The Non-Linear autoregressive distributed lag (NLARDL) method was employed to analyse the nexus between the variables of interest. The NLARDL methods revealed that exchange rate volatility had insignificant and a negative effect on trade. The research determined that the price of oil has a beneficial impact on trade, while a higher inflation rate ultimately impedes trade performance. The study suggests that the monetary authorities should introduce a transparent exchange rate system and platform to stabilise the naira in order to impact positively to trade. This will foster confidence and increase the inflow of the greenback into the country in the form of foreign direct investment, foreign portfolio investment, and other capital investment.

Gbenga and Adeola (2025) [19] examined the effects of OPEC quota enforcement on Nigeria's short-term production volatility using monthly data from 2018–2024[27]. The dependent variable was production volatility, and independent variables included quota enforcement strength, pipeline downtime, and maintenance turnaround time. Using GARCH (1,1) modeling, the study found that stronger quota enforcement reduced volatility, pipeline downtime increased volatility, and longer turnaround times correlated with higher volatility. The study concluded that operational consistency and adherence to quota terms reduce short-term production instability. Furthermore, Fatima and Ibrahim (2024) [18] evaluated the influence of OPEC quota adherence on domestic investment in Nigeria's oil processing sector over the period 2000–2023[15], with refinery investment as the dependent variable and quota compliance rate, domestic credit availability, and policy certainty index as independent variables. Applying Generalized Method of Moments (GMM), the study found that OPEC quota compliance had a negative and statistically significant effect on refinery investment, domestic credit availability had a positive effect, and higher policy certainty was associated with increased investment. The study concluded that quota constraints discourage domestic capacity expansion unless supportive financial policy exists.

Bello and Yusuf (2024) [8] explored how OPEC quota compliance influenced Nigeria's oil export volume, using

annual data from 1998–2023[15]. The dependent variable was crude oil export volume, and the independent variables were quota compliance rate, shipping cost index, international oil price, and Nigerian export policy indices. Employing an Engle-Granger cointegration technique, the study found that quota compliance significantly reduced export volume, while international oil prices and export policy indices were positively and significantly linked to higher export volumes. Shipping costs were negatively associated with exports but insignificant. The study concluded that policy reforms that reduce shipping and export costs could improve Nigeria's ability to benefit from global demand despite quotas. Moreover, Okoro and Ejiogu (2024) [34] investigated Nigeria's crude oil production response to OPEC quota adjustments from 1998 to 2022[26], using oil production growth as the dependent variable and quota adjustments, global demand growth, and exchange policy regime as independent variables. Applying Johansen cointegration and Vector Error Correction Model (VECM) estimation, the study found that quota adjustments were significantly correlated with short-run fluctuations in oil production but had an insignificant long-run effect, indicating that Nigeria's production responded to quota changes mainly in the short term. Global demand growth was positive and significant in both short and long runs, meaning that increased global demand fostered higher output. Exchange policy regime changes were significant only in the long run, showing that macroeconomic policy frameworks affected sustained production outcomes. The study concluded that quota changes primarily affect short-run output variation and that global demand and policy frameworks are critical to long-term production.

Mbakwe and Ibe (2024) [25] investigated the asymmetric effects of OPEC quota compliance and noncompliance on Nigeria's oil output from 1995 to 2021 using Nonlinear Autoregressive Distributed Lag (NARDL). The dependent variable was Nigeria's crude oil output, and the independent variables included positive and negative quota deviation, political stability index, and infrastructure quality index. The study found that negative deviations from quota (noncompliance) had a stronger negative effect on output than positive deviations, indicating that falling below quota targets was particularly harmful. Political stability index was positive and significant, meaning better political stability raised output. Infrastructure quality index moderated negative quota effects, reducing output loss when infrastructure conditions improved. The study concluded that deviations below quota are particularly harmful and that improvements in political stability and infrastructure could lessen adverse impacts. Besides, Usman and Abdullahi (2024) [43] analyzed how OPEC quota adherence affects Nigeria's oil output and revenue stability from 1995 to 2023[15], with oil output and oil revenue as dependent variables and OPEC quota adherence, global oil demand, and refinery capacity as independent variables. Using Dynamic Ordinary Least Squares (DOLS), the study found that OPEC quota adherence was negatively related to oil output, confirming that compliance with lower quota levels suppressed production volumes. Quota adherence had a positive association with price stability, indicating that controlled production helped stabilize prices. Global oil demand had a positive and statistically significant effect on both oil output and oil revenue, meaning higher demand corresponded with greater output and higher revenue. Limited refinery capacity constrained export potential and reduced effective revenue caused by inability to maximize crude processing. The study concluded that OPEC quotas, while good for price stability, restricted Nigeria's production potential and emphasized the need to develop refining capacity.

Eze *et al*. (2024) [16] investigated Nigeria's crude oil output from 2000 to 2022[21], with Nigeria oil output as the dependent variable and OPEC quota levels, exchange rate, security index, and volume of oil theft as independent variables. Employing an Auto-Regressive Distributed Lag (ARDL) Bounds Testing approach, the study found that OPEC quota levels had a significant negative impact on oil output in both the short and long run, indicating that stricter quota ceilings reduced production levels. The exchange rate was negatively related to output whenever the naira weakened, showing that currency depreciation worsened output performance. The security index was also significant and negative, meaning that security threats reduced production, and volume of oil theft had a strong negative effect, significantly lowering crude oil output. The study concluded that quota limits combined with internal security constraints significantly constrained Nigeria's petroleum production. Still, Kareem and Oladipo (2024) [24] analyzed the long-run relationship between Nigeria's crude oil output and OPEC quota policy together with technological adoption and human capital investment from 1995 to 2023[2]. The dependent variable was crude oil output, and the independent variables were OPEC quota, technology adoption index, and human capital investment in the oil sector. Using Fully Modified Ordinary Least Squares (FMOLS), the study found that OPEC quota had a negative and significant relationship with output, technology adoption had a positive significant effect, and human capital investment had a marginal positive effect that was not statistically significant. The study concluded that technological progress can partly offset quota-induced output reductions but that capacity building in human resources requires stronger policy focus.

Adegoke and Ojo (2023) [3] assessed the combined effect of OPEC quota changes and global demand shocks on Nigeria's oil output from 2005 to 2022[23] using Structural Vector Autoregression (SVAR). The dependent variable was Nigeria's crude oil output, and the independent variables were OPEC quota changes, global demand shocks, and international oil price volatility. The study found that quota changes explained a significant portion of output variability in the short run, while global demand shocks had lasting effects on output levels. International oil price volatility amplified the effects of quotas and demand shocks, indicating that more unstable prices increased output sensitivity to quota changes. The study concluded that global market conditions interact with quota effects to shape Nigeria's oil output patterns. As well Adebayo and Salihu (2023) [2] examined the impact of OPEC quota on Nigeria's oil output covering the period 1990[14]–2021 in Nigeria. The variables were Nigeria crude oil output as the dependent variable and OPEC quota compliance, global oil price, and oil infrastructure investment as independent variables. Using a Vector Error Correction Model (VECM), the study found that OPEC quota compliance had a statistically significant negative effect on crude oil output in the long run, indicating that higher quota restrictions corresponded with lower production. Global oil price was positively significant, meaning increases in price were associated with increased output. Oil infrastructure

investment had a mitigating effect, reducing the negative impact of quota restrictions on output. The study concluded that Nigeria's inability to expand production under quota restrictions was partly offset by infrastructure improvements.

Egwu and Okafor (2023) [15] assessed how quota-related market expectations affected Nigeria's oil supply behavior for the period 2000–2022[26]. The dependent variable was actual daily crude production, and the independent variables were expected quota changes, spot price volatility, and rig utilization rates. Using Vector Autoregression (VAR) analysis, the study found that expected quota reductions negatively affected actual production, spot price volatility had a positive and significant effect on output, and higher rig utilization rates increased production. The study concluded that anticipation of quota changes influences producer behavior and that market expectations must be factored into production planning. More so, Akinwale and Ladipo (2023) [6] investigated the determinants of Nigeria's oil production efficiency under OPEC quota constraints for the period 2001–2022[26]. The dependent variable was crude oil output, while the independent variables included OPEC quota ceilings, operational expenditure in the oil sector, exchange rate volatility, and foreign direct investment (FDI) in petroleum infrastructure. Using a Panel Least Squares model, the study found that OPEC quota ceilings were negatively and significantly associated with oil output. Exchange rate volatility also had a negative effect, reducing production efficiency, while higher operational expenditure and increased FDI were positively related to higher output. The study concluded that Nigeria's oil production performance under quota limitations could be enhanced by better exchange rate management and sustained investment.

Ijeoma and Chukwuemeka (2023) [22] analyzed the impact of OPEC quotas on Nigeria's balance of trade from 1995–2022[21]. The dependent variable was the trade balance, and independent variables were crude oil export volume, OPEC quota levels, non-oil export volume, and real exchange rate. Using Johansen cointegration and Vector Error Correction Model (VECM), the study found that crude oil export volume and non-oil exports had positive and significant effects on trade balance, while OPEC quota levels had a negative effect. Real exchange rate depreciation negatively affected the trade balance. The study concluded that diversification beyond oil can improve trade outcomes even under quota restrictions. Similarly, Jibril and Salami (2022) [23] investigated asymmetric responses of Nigeria's crude oil output to increases and decreases in OPEC quotas from 1990[14]–2019, using Nonlinear ARDL (NARDL). The dependent variable was crude oil output, while quota increases and quota decreases were independent variables along with global demand growth and political risk index. The study found that quota decreases had a significantly larger negative impact on output than quota increases had positive effects. Global demand growth was positive and significant in influencing output, and higher political risk reduced output levels. The study concluded that the Nigerian oil sector is more sensitive to quota reductions than expansions.

David and Agboola (2022) investigated the relationship between OPEC quota policy, government revenue, and crude oil output in Nigeria between 1990[14] and 2020. The dependent variable was government revenue from oil, and independent variables included OPEC quota, total crude oil output, tax regime changes, and global oil price. Using Ordinary Least Squares with structural breaks, the study found that quotas significantly dampened government revenue by limiting output, while higher output directly raised revenue. The effect of tax regime changes was positive but weak, and global oil price had a strong positive and significant effect on revenue. The study concluded that fiscal regimes and international price conditions are critical in mediating quota impacts on national revenue. Equally, Modibbo *et al*. (2022) [26] assessed the relationship between production quotas and energy security in Nigeria from 1990[14] to 2020, using Nigeria oil production as the dependent variable and OPEC quota, domestic consumption, and energy policy changes as independent variables. Through descriptive statistics and trend analysis, the study found that Nigeria consistently under-produced relative to assigned quotas during periods when domestic oil consumption increased, and domestic energy policy shifted toward internal self-sufficiency. OPEC quota was found to be negatively associated with oil output in periods of high domestic consumption. Domestic consumption had a negative effect on export volume, reducing available exportable production. Energy policy changes toward prioritizing local supply led to reduced exports, showing that internal policy shifts affected quota compliance outcomes. The study concluded that energy policy alignment between domestic and international quota commitments is necessary for improving output performance.

Gaps and Value Addition

A careful review of the extant empirical literature reveals a rich but somewhat fragmented body of evidence on the nexus between OPEC quota dynamics and Nigeria's oil sector performance. Predominantly, earlier and recent studies converge on the finding that OPEC quota-related variables, particularly quota compliance, quota levels, and quota adjustments, exert a negative and statistically significant influence on Nigeria's crude oil output and related indicators such as export volume, revenue, and sectoral growth. Studies such as Adewale and Balogun (2023), Eze *et al*. (2024), Kareem and Oladipo (2024), and Adebayo and Salihu (2023) [2, 4, 16, 24] consistently show that stricter quota regimes constrain production capacity. However, this relationship is often moderated by complementary factors including investment in upstream capacity, technological adoption, infrastructure quality, and global oil demand, as evidenced in the works of Obele (2025), Adegoke and Ojo (2023), and Akinwale and Ladipo (2023) [3, 6, 32]. In addition, several studies extend the analysis beyond output to broader macroeconomic outcomes such as export earnings, trade balance, and revenue stability, thereby enriching the discourse but also shifting focus away from core production dynamics. From a methodological standpoint, the literature reflects considerable diversity, employing techniques such as OLS, ARDL, VECM, SVAR, GARCH, NARDL, FMOLS, and GMM, with most studies adopting time series approaches and a few integrating panel or nonlinear frameworks. While this methodological plurality strengthens robustness, many studies are either short term in scope or focus on asymmetric and volatility effects rather than long run structural relationships.

Furthermore, a large proportion of the literature emphasizes quota compliance or quota levels as singular proxies for OPEC influence, often neglecting other critical dimensions of OPEC operations. Notably, a significant gap emerges

when the literature is evaluated against the present study's focus. First, in terms of variables, existing studies largely isolate quota compliance or quota levels, with limited simultaneous consideration of broader OPEC production dynamics such as total OPEC production and OPEC spare capacity. These variables are crucial as they capture collective supply behavior and market stabilization mechanisms that indirectly shape Nigeria's production decisions. Second, in terms of scope, most studies do not comprehensively cover the extended period of 1990 to 2025[13], thereby limiting the ability to capture long run structural shifts, policy transitions, and evolving OPEC strategies. Third, although Nigeria is consistently used as the study location, prior studies tend to examine partial outcomes such as export earnings, volatility, or sectoral growth rather than focusing explicitly on crude oil output as the core dependent variable. Finally, methodologically, while advanced econometric techniques have been employed, there is limited integration of multiple OPEC related variables within a unified analytical framework capable of capturing both direct and indirect transmission channels to oil output. Consequently, the existing literature lacks a comprehensive, long run, and multidimensional analysis that jointly examines Nigeria's OPEC production quota, total OPEC production, quota compliance rate, and OPEC spare capacity in relation to crude oil output. It is this critical gap spanning variables, scope, and analytical depth that the present study seeks to fill, thereby providing a more integrated and policy relevant understanding of how OPEC dynamics shape Nigeria's oil production trajectory over time.

Methodology

This study used ex-post facto research design. The ex-post factor research design was used because the facts has been established and cannot be manipulated by the researcher while secondary data were collected from the National Bureau of Statistics (NBS), OPEC, Annual Statistical Bulletin and Monthly oil Market Report and Authors Computation 2026[39] on Nigeria OPEC Production Quota (NOPQ), OPEC Total Production (OTP), Quota Compliance Rate (QCR), and OPEC Spare Capacity (OSC) were used to proxy Petroleum Sector while Crude Oil Production (COP), serves as a proxy to Nigeria Oil Output. The Augmented Dickey Fuller (ADF) method was used in order to do the unit root test on the model that was developed. Taking into consideration the results of the ADF, the research used the Auto-regressive Distributive Lag (ARDL).

Analytical Framework

The analytical framework for this study is anchored on the Resource Dependence Theory, which was propounded by Jeffrey *et al*. in 1978[40]. The theory posits that organizations and economies depend on external resources for survival and performance, and such dependence influences their behavior and outcomes. In the context of this study, Nigeria's crude oil production is largely influenced by external regulatory bodies such as the Organization of the Petroleum Exporting Countries (OPEC), as well as global oil supply conditions. Hence, crude oil production is not entirely determined domestically but is subject to external quotas, compliance mechanisms, and supply dynamics within OPEC. This framework is therefore relevant in explaining how OPEC-related variables shape Nigeria's production outcomes.

Model Specification

The model of this study is built on the model of Olu *et al*. (2025) [35], who investigated the impact of oil price and exchange rate volatility. Their model is specified as follows:

$$TRD = (EVL, OLP, INF) \quad 1$$

Where

TRD denotes trade in million US dollars, EVL represents exchange rate volatility, OLP denotes the price of Brent crude oil, and INF represents inflation rate.

However, the present study modifies the baseline model to align with its specific objective of examining the impact OPEC Quota and Nigeria Oil Output. Unlike Olu *et al*. (2025) [35], which focuses on trade and macroeconomic variables, this study replaces the dependent variable with crude oil production and introduces key OPEC-related variables that directly influence production decisions and outcomes. Specifically, variables such as Nigeria's OPEC production quota, OPEC total production, quota compliance rate, and OPEC spare capacity are incorporated to capture both regulatory and global supply-side constraints affecting Nigeria's oil production.

Thus, the modified model for this study is specified as follows:

$$COP = f(NOPQ, OTP, QCR, OSC) \quad 2$$

The mathematical model could be symbolically expressed as;

$$COP = \beta_0 + \beta_1 NOPQ + \beta_2 OTP + \beta_3 QCR + \beta_4 OSC \quad 3$$

$$COP = \beta_0 + \beta_1 NOPQ + \beta_2 OTP + \beta_3 QCR + \beta_4 OSC + e \quad 4$$

Where:

COP = Crude Oil Production, NOPQ = Nigeria OPEC Production Quota, OTP = OPEC Total Production, QCR = Quota Compliance Rate. OSC = OPEC Spare Capacity, f = functional relationship β_0 = Intercept of relationship in the model/constant B_1-B_4 = Coefficients of each independent or explanatory variable e= Stochastic or Error term.

Description of Variables in the Model

Variables	Description	Expected Impact on COP	Source
COP (Dependent)	This refers to the total volume of crude oil extracted within a country over a given period, usually measured in barrels per day (bpd). It reflects the operational capacity, efficiency, and output level of the petroleum sector.		NBS, 2025
NOPQ	This is the maximum level of crude oil production allocated to Nigeria by the Organization of the Petroleum Exporting Countries (OPEC) to regulate global oil supply and stabilize prices. It is usually expressed in barrels per day. An increase in Nigeria's OPEC production quota allows the country to legally produce more crude oil. Therefore, higher quota allocations are expected to increase crude oil production, assuming capacity constraints are minimal.	NOPQ>0	NBS, 2025
OTP	This refers to the aggregate crude oil output of all OPEC member countries within a specified period. It reflects global supply conditions in the oil market. An increase in total OPEC production often leads to stricter production controls or reduced quotas for individual members to prevent oversupply. This may limit Nigeria's production,	OTP <0	OPEC ASB, 2025

	leading to a negative effect.		
QCR	This measures the extent to which a country adheres to its assigned OPEC production quota. It is typically expressed as a percentage (actual production relative to allocated quota). Therefore, an increase in compliance rate generally reflects higher actual production levels, indicating a positive relationship, though constrained by the quota ceiling.	QCR>0	Author Computation
OSC	This refers to the volume of oil production that can be brought online quickly (usually within 30–90 days) but is currently unused. It represents the buffer available to respond to supply shocks. An increase in spare capacity suggests that Nigeria has the ability to ramp up production when needed. This enhances production flexibility and implies a positive relationship with crude oil production, especially during periods of rising demand or supply disruptions.	OSC>0	NBS, 2025

Empirical Data Analysis

Table 1: Descriptive Statistics

	COP	NOPQ	OTP	QCR	OSC
Mean	2070.704	1.832222	32.03333	63.96296	3.355556
Median	2165.000	1.740000	32.50000	60.00000	3.200000
Maximum	2627.000	2.400000	35.70000	95.00000	6.500000
Minimum	1291.000	1.380000	28.50000	40.00000	1.800000
Std. Dev.	363.7993	0.288462	2.046385	14.98584	1.100816
Skewness	-0.687381	0.475191	0.056246	0.382151	0.923859
Kurtosis	2.403928	3.072078	3.271081	3.227918	3.905873
Jarque-Bera	2.525929	1.984799	0.611974	1.327801	4.764002
Probability	0.282814	0.370686	0.736396	0.514839	0.092366
Sum	55909.00	49.47000	864.9000	1727.000	90.60000
Sum Sq. Dev.	3441098.	2.163467	108.8800	5838.963	31.50667
Observations	27	27	27	27	27

Source: E-view 13 Output

The descriptive statistics includes variables such as Crude Oil Production (COP), Nigeria OPEC Production Quota (NOPQ), OPEC Total Production (OTP), Quota Compliance Rate (QCR), and OPEC Spare Capacity (OSC) over 27 observations.

The mean value of COP is 2070.704 barrels per day, indicating the average level of crude oil production in Nigeria over the study period. This is accompanied by a maximum value of 2627.000 and a minimum value of 1291.000, suggesting substantial fluctuations in production levels. The relatively high standard deviation of 363.7993 indicates that crude oil production deviates considerably from its mean, reflecting instability in production, possibly due to factors such as OPEC restrictions, oil theft, and infrastructural challenges. The deviation from the mean implies that production levels are widely spread around the average, indicating periods of both high and low output. For NOPQ, the mean value is 1.832222 million barrels per day, with a maximum of 2.400000 and a minimum of 1.380000. The standard deviation of 0.288462 is relatively low, indicating that Nigeria's OPEC production quota does not fluctuate widely over time. This suggests that quota allocations are relatively stable, with only moderate deviations from the mean. The small dispersion implies that changes in quota are gradual and controlled.

The mean value of OTP stands at 32.03333 million barrels per day, with a maximum of 35.70000 and a minimum of 28.50000. The standard deviation of 2.046385 indicates moderate variability in total OPEC production. This suggests that while OPEC output changes over time, such variations are not excessively volatile. The deviation from the mean reflects periodic adjustments in global oil supply in response to market conditions. Quota Compliance Rate (QCR) has a mean value of 63.96296 percent, indicating that, on average, Nigeria complies with about 64% of its allocated quota. The maximum value of 95.00000 and minimum value of 40.00000 reveal wide fluctuations in compliance levels. The relatively high standard deviation of 14.98584 shows significant dispersion around the mean, suggesting inconsistency in adherence to OPEC quotas. This large deviation implies that compliance varies substantially across periods, reflecting operational and regulatory challenges. For OSC, the mean value is 3.355556 million barrels per day, with a maximum of 6.500000 and a minimum of 1.800000. The standard deviation of 1.100816 indicates moderate variability. This suggests that OPEC spare capacity fluctuates over time, reflecting changes in global oil demand and production strategies. The deviation from the mean indicates that spare capacity is not constant and responds to external shocks and policy adjustments.

In terms of distributional properties, the skewness values reveal the degree of asymmetry in the data. COP (-0.687381) is negatively skewed, indicating a longer tail on the left side, suggesting that low production values occur more frequently than extremely high values. NOPQ (0.475191), OTP (0.056246), QCR (0.382151), and OSC (0.923859) are positively skewed, implying that higher values occur less frequently but extend further to the right. However, OTP is approximately symmetric given its skewness is close to zero. The kurtosis values provide insight into the peakedness of the distributions. COP (2.403928) is platykurtic, indicating a flatter distribution relative to the normal distribution. NOPQ (3.072078), OTP (3.271081), and QCR (3.227918) are approximately mesokurtic, suggesting distributions close to normal. OSC (3.905873) is leptokurtic, indicating a more peaked distribution with heavier tails, suggesting the presence of extreme values. The Jarque-Bera statistics and their associated probabilities are used to test for normality. The probability values for COP (0.282814), NOPQ (0.370686), OTP (0.736396), QCR (0.514839), and OSC (0.092366) are all greater than the 0.05 level of significance. This implies that the null hypothesis of normal distribution cannot be rejected for all variables. Therefore, the variables are approximately normally distributed. Given that all variables satisfy the normality condition based on the Jarque-Bera test, it is appropriate to proceed with further econometric analysis, particularly the unit root test, without concerns regarding

Unit Root Test

A unit root test known as the Augmented Dickey Fuller (ADF) test was used in the research project to determine the order of integration of the variables that were being investigated. This was done in order to pick the proper approach and prevent false regression**.**

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

Variables	Levels		First Difference		Order of Integration	P-value
	T. Statistics	5% Critical Value	T. Statistics	5% Critical Value		
LCOP	-0.348096	-2.981038	-4.276719	-2.986225	I(1)	0.0027
LNOPQS	-1.425527	-2.981038	-6.025970	-2.986225	I(1)	0.0000
LOTP	-2.664572	-2.981038	-4.729180	-2.986225	I(1)	0.0009
QCR	-4.232732	-2.981038	-5.026261	-2.986225	I(0)	0.0002
LOSC	-2.741145	-2.981038			I(1)	0.0005

Source: Extracts from E-view 13. * Level of significance at 5%

We examined all of the research variables using Augmented Dickey Fuller (ADF) tests to see whether they were stationary or non-stationary series, following the guidelines provided by table. 2. At the initial difference I(1), the stationarity test indicated that LCOP, LNOPQ, LOTP and LOSC, stationary, whereas QCR is stationary at the level I(0). The variables show either mixed-order integration or stationarity of level and initial differences when we analyse their stationarity. The Autoregressive Distributive Lag (ARDL) technique was used to analyse the data. Both the first difference (I(1)) and the stationary at level I(0) may be handled by this method. The ARDL test is the most appropriate analytical technique to utilise since it looks at the relationship between the independent and dependent variables in terms of both short-term and long-term trends.

Co-integration Test

Table 3: ARDL Bound Test

Test Statistics	Value	K
F-statistics	7.581763	4

Significance	I (0)	1(1)
10%	2.75	3.99
5%	3.35	4.77
1%	4.76	6.67

Source: Authors computation 2026

From table 3 the bound test result indicates that there exist long run relationships amongst the variables as the F-statistic value of 7.581763 exceeds both the lower and upper bound critical values. Thus, we reject the null hypotheses of no long run relationship and accept its alternative. This means that there is a long-run relationship between OPEC Quota and Nigeria Oil Output.

Short and Long-Run Estimation Results for the Model

The results of the short and long-run dynamics association of the model are presented in table 4.4 below

Table 4: ARDL Short and Long-run Result for the Model

Short Run Coefficient				
Variable	**Coefficient**	**Std. Error**	**t-Statistics**	**Prob**
D(LNOPQ(-1)	1.118334	0.255030	4.385110	0.0014
D(LOTP(-1)	2.226397	0.791135	2.814179	0.0183
D(QCR(-1)	-0.005915	0.001179	-5.015260	0.0005
D(LOSC(-1)	0.832458	0.155768	5.344220	0.0003
ECM(-1)	-0.606671	0.098181	-6.179107	0.0001
Long Run Coefficient				
Variable	Coefficient	Std. Error	t-Statistics	Prob
LNOPQ	-0.581220	1.093797	-0.531378	0.6010
LOTP	-0.640418	0.261576	-2.448307	0.0030
QCR	0.025737	0.010594	2.429469	0.0022
LOSC	-0.380831	0.291086	-1.306313	0.2063
C	0.895167	0.144994	6.174247	0.0001
Adj R^2 =0.679925, F-statistics = 4.758316 (0.009184), DW = 2.102333				

Source: Authors computation using E-view 13 2026

The coefficient estimate for the error correction term, ECM (-1) has a negative value and is significant at the 0.05 level. It suggests that the model will reach long-run equilibrium at a rate of 0.61% every year. This means that a yearly adjustment speed of 0.61% may fix the mistake from the previous year. The independent variables (LNOPQ, LOTP, QCR & LOSC) explain 38% of the total variance in the dependent variable (LCOP), according to the adjusted R-Square (R2) value. As a whole, the model is noteworthy since the F-statistic is significant at the 5% level of significance. Without serial correlation, the model would not work, according to the Durbin-Watson statistics of 2.102333 which is close to 2.

Table 4 displays the model's short-and long run outcome. The logarithm coefficient of Nigeria OPEC Production Quota (LNOPQ), OPEC Total Production (OTP), and OPEC Spare Capacity (OSC) had a positive and significant impact on the log value of crude oil production (LCOP) in Nigeria while Quota Compliance Rate (QCR) exhibited a negative but significant impact on the log value of crude oil production (LCOP) in Nigeria in the short-run. Equally, table 4, shows that the outcome of the long-run result that the log coefficient of OPEC Total Production (LOTP), had a negative but significant impact on the log value of crude oil production (LCOP) in Nigeria. However, Quota Compliance Rate (QCR) is significant and positively related with the log value of crude oil production (LCOP) in Nigeria. Consequently, the log of Nigeria OPEC Production Quota (LNOPQ), and Quota Compliance Rate (QCR) are both negative and insignificantly related with the log value of crude oil production (LCOP) in the long-run.

Diagnostic Test

Table 5: Ramsey Reset Test, Serial Correlation LM Test and Homoscedasticity Test Results

	F-Statistic	Prob-Value
Ramsey Reset Test	0.699547	0.4411
Breusch-Godfrey Serial Correlation LM Test	5.064593	0.0801
Breusch-Pagan-Godfrey Heteroskedasticity Test	1.123621	0.4763

Source: Authors computation 2026

From Table 5, the results of the diagnostic test shows that the linearity test using Ramsey Reset test indicates that the f-statistic (0.699547) with computed p-value of 0.4411 which is greater than 5 percent (0.05) critical value, hence the study reject the null hypothesis and conclude that the model is correctly specified. The result of the Serial or Autocorrelation Test using Breusch-Godfrey Serial Correlation LM Test shows that the f-statistic is 5.064593, with a Chi-Square probability value is 0.0801. This indicates that the probability value of about 8 percent (0.0801) is greater than 5 percent (0.05) critical value; hence the study confirms no serial correlation in the model. The

result of the heteroscedasticity test using Breusch-Pegan-Godfrey test shows that the f-statistic is 1.123621 with a Chi-Square probability value of 0.4763 The result suggests that there is no evidence of heteroskedasticity in the model since the probability Chi-square value is more than 5 percent (P >0.05). So, residuals do have constant variance which is desirable in regression meaning that residuals are Homoscedastic.

Discussion of Findings

Organization of Petroleum Exporting Countries Quota and Crude Oil Production in Nigeria

The inference drawn from the long-run using the Auto-Regressive Distributive Lag (ARDL) result revealed that Nigeria OPEC Production Quota (NOPQ) had a negative (-0.581220) relationship with crude oil production (COP). The negative relationship between Nigeria OPEC Production Quota (NOPQ) and crude oil production (COP) do not conform to economic theory. It was expected that higher quota allocations are expected to increase crude oil production, assuming capacity constraints are minimal. The p-value (0.6010) of the result indicates that Nigeria OPEC Production Quota (NOPQ) is statistically insignificant to influence the log value of crude oil production (LCOP). The study therefore accepts the null hypothesis that there is no significant relationship between Nigeria OPEC Production Quota (NOPQ) and crude oil production (COP).This result is in line with earlier study by Okoro and Ejiogu (2024) [34] who found that quota adjustments had an insignificant long-run effect, indicating that Nigeria's production responded to quota changes

Organization of Petroleum Exporting Countries Total Production Quota and Crude Oil Production in Nigeria

The insinuation drawn from the long-run using the Auto-Regressive Distributive Lag (ARDL) result revealed that OPEC Total Production (OTP) had a negative (-0.640418) relationship with crude oil production (COP). The negative relationship between OPEC Total Production (OTP) and crude oil production (COP) conform to economic theory. It was expected that increase in total OPEC production often leads to stricter production controls or reduced quotas for individual members to prevent oversupply. This may limit Nigeria's production, leading to a negative effect. The p-value (0.0030) of the result indicates that OPEC Total Production (OTP) is statistically significant to influence crude oil production (COP). The study therefore rejects the null hypothesis that there is no significant relationship between OPEC Total Production (OTP) and crude oil production (COP).This result agrees with earlier study by Okoro and Ejiogu (2024) [34] who found that quota adjustments were significantly correlated with short-run fluctuations in oil production

Quota Compliance Rate and Crude Oil Production in Nigeria

The suggestion drawn from the long-run using the Auto-Regressive Distributive Lag (ARDL) result revealed that Quota Compliance Rate (QCR) had a positive (+0.025737) relationship with crude oil production (COP). The positive relationship between Quota Compliance Rate (QCR) and crude oil production (COP) conform to economic theory. It was expected that increase in compliance rate generally reflects higher actual production levels. However, the p-value (0.0022) of the result indicates that Quota Compliance Rate (QCR) is statistically significant to influence crude oil production (COP). The study therefore rejects the null hypothesis that there is no significant relationship between Quota Compliance Rate (QCR) and crude oil production (COP).This result correlate with earlier studies by Adewale and Balogun (2023); and Chukwu and Nnamani (2025) [4, 13] who found that quota compliance rate had a negative and statistically significant effect on daily oil output, showing that stricter quotas reduced production levels.

Organization of Petroleum Exporting Countries Spare Capacity and Crude Oil Production in Nigeria

The submission drawn from the long-run using the Auto-Regressive Distributive Lag (ARDL) result revealed that OPEC Spare Capacity (OSC) had a negative (-0.380831) relationship with crude oil production (COP). The negative relationship between OPEC Spare Capacity (OSC) and crude oil production (COP) do not conform to economic theory. It was expected that increase in spare capacity will lead to the ability to ramp up production when needed. The p-value (0.2063) of the result indicates that OPEC Spare Capacity (OSC) is statistically significant to influence crude oil production (COP). The study therefore accepts the null hypothesis that there is no significant relationship between OPEC Spare Capacity (OSC) and crude oil production (COP).This result agrees with the findings of Chinedu and Marvellous (2025) [12] found that quota shifts had an insignificant effect on capacity growth

Conclusion and Recommendation

Conclusion

The study on the impact of Organization of Petroleum Exporting Countries on Nigeria Oil Output suggest that the activities of the Organization of Petroleum Exporting Countries exert a significant influence on Nigeria's crude oil output. The results reveal that OPEC total production and OPEC spare capacity have a negative but statistically significant relationship with crude oil production, indicating that global supply expansions and available excess capacity within OPEC tend to constrain Nigeria's production performance. Conversely, the quota compliance rate exhibits a positive and significant relationship with crude oil output, suggesting that improved adherence to OPEC production guidelines enhances efficiency and supports increased production levels. However, Nigeria's OPEC production quota is found to have a negative and statistically insignificant effect on crude oil production, implying that quota allocations alone do not necessarily translate into higher output, particularly in the presence of structural inefficiencies and operational constraints within the domestic petroleum sector. In conclusion, the study establishes that OPEC-related variables play a critical role in determining Nigeria's oil output, although their effectiveness is largely conditioned by internal production dynamics.

Recommendations

1. The Federal Ministry of Petroleum Resources should align Nigeria's OPEC production quota with actual domestic production capacity by addressing infrastructural deficiencies and operational inefficiencies, since the quota currently shows a negative and insignificant impact on crude oil production.
2. Also, the Nigerian National Petroleum Company Limited (NNPCL) should improve cost efficiency and optimize production processes to sustain output under rising global OPEC production, as increased OPEC

total production significantly reduces Nigeria's crude oil production.

3. Additionally, the Nigerian Upstream Petroleum Regulatory Commission (NUPRC) should strengthen monitoring and enforcement of quota compliance through real-time tracking systems and stricter regulatory measures, given its positive and significant effect on crude oil production.
4. Finally, the Central Bank of Nigeria (CBN) should provide targeted financing and incentives to support the development and utilization of spare production capacity, as OPEC spare capacity currently has a negative and insignificant impact on crude oil production.

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